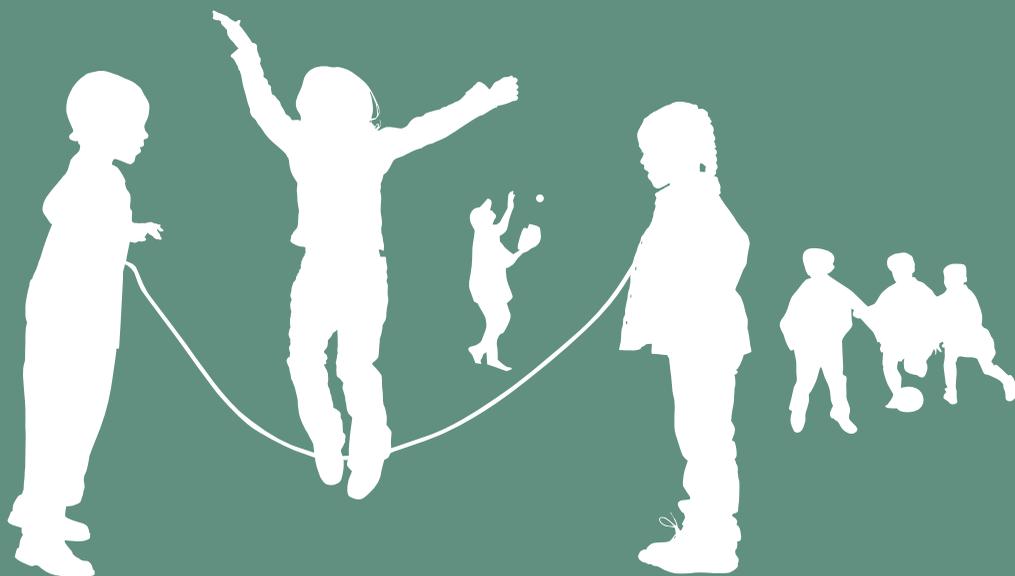


# The challenge of obesity in the WHO European Region and the strategies for response



**The challenge of obesity**  
**in the WHO European Region and the**  
**strategies for response**

The World Health Organization was established in 1948 as the specialized agency of the United Nations responsible for directing and coordinating authority for international health matters and public health. One of WHO's constitutional functions is to provide objective and reliable information and advice in the field of human health. It fulfils this responsibility in part through its publications programmes, seeking to help countries make policies that benefit public health and address their most pressing public health concerns.

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# **The challenge of obesity** **in the WHO European Region and the** **strategies for response**

*Edited by:*

Francesco Branca, Haik Nikogosian  
*and* Tim Lobstein

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# Abbreviations

## Organizations, other entities and activities

ACE-Obesity	Assessing the cost-effectiveness of obesity interventions project
ACSM	American College of Sports Medicine
ANGELO	analysis grid for elements linked to obesity
BEUC	European Consumers' Organisation
CDC	Centers for Disease Control and Prevention
CHIPS	Changing Individuals' Purchase of Snacks (intervention study)
CIAA	Confederation of Food and Drink Industries of the EEC
CINDI	countrywide integrated noncommunicable disease intervention (WHO programme)
DAFNE	data food networking (project)
EPIC	European Prospective Investigation into Cancer and Nutrition (study)
EU	European Union
Eur-A	27 countries with very low child and adult mortality (Andorra, Austria, Belgium, Croatia, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Monaco, the Netherlands, Norway, Portugal, San Marino, Slovenia, Spain, Sweden, Switzerland and the United Kingdom)
Eur-B	16 countries with low child and adult mortality (Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Georgia, Kyrgyzstan, Poland, Romania, Serbia and Montenegro, Slovakia, Tajikistan, The former Yugoslav Republic of Macedonia, Turkey, Turkmenistan and Uzbekistan)
Eur-C	9 countries with low child mortality and high adult mortality (Belarus, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, the Republic of Moldova, the Russian Federation and Ukraine)
FAO	Food and Agriculture Organization of the United Nations
HBSC	Health Behaviour in School-aged Children (study)
ICC	International Chamber of Commerce
ILO	International Labour Organization
INSERM	Institut national de la santé et de la recherche médicale (France)
IOTF	International Obesity TaskForce
MAGIC	Movement and Activity Glasgow Intervention in Children (study)
MONICA	monitoring trends and determinants in cardiovascular disease (study)
NCHS	United States National Center for Health Statistics
NGO	nongovernmental organization
NIS	newly independent states of the former USSR
OECD	Organisation for Economic Co-operation and Development
STEFANI	strategies for effective food and nutrition initiatives (model)
UNICEF	United Nations Children's Fund
WIC	Special Supplemental Nutrition Program for Women, Infants and Children
WTO	World Trade Organization

## Technical terms

CI	confidence interval
DALYs	disability-adjusted life-years
GDP	gross domestic product
HDL	high-density lipoprotein (cholesterol)
HIA	health impact assessment
LDL	low-density lipoprotein (cholesterol)
MET	metabolic equivalent
OR	odds ratio
PPP	purchasing power parity
SBT	standard behavioural treatment
SD	standard deviation
VAT	value-added tax
VO <sub>2</sub> max	maximal oxygen consumption
WHR	waist-to-hip ratio

## Foreword

*In response to the emerging challenge of the obesity epidemic, the WHO Regional Office for Europe organized the WHO European Ministerial Conference on Counteracting Obesity, which took place in Istanbul, Turkey on 15–17 November 2006.*

*This book collects the papers that were written by a large group of experts in public health, nutrition and medicine to provide background for the Conference; a smaller book already published by the Regional Office summarizes many of their conclusions.<sup>1</sup> Both this book and the summary illustrate the dynamics of the epidemic and its impact on public health throughout the European Region. In particular, the obesity epidemic's rapid expansion to the countries in the eastern half of the Region causes great concern, as they now suffer from a double burden of disease linked to both under- and overnutrition.*

*The epidemic's rapid growth is linked to the global increase in the availability and accessibility of food and the reduced opportunities to use physical energy. Food has never been so affordable, and products high in fats and sugar are the cheapest. Thus, modern societies are seen as "obesogenic" environments: meaning that they lead to overconsumption of food and to widespread sedentary lifestyles, which increase the risk of obesity. The two Conference publications describe how these influences are shaped in different settings, such as the family, school, community and workplace.*

*The books make both ethical and economic arguments for accelerating action against obesity. In addition to harming the health and well-being of a vast proportion of the population and generating large expenditures by health services, obesity has a striking and unacceptable impact on children. Obese children suffer longer years of exposure to the metabolic syndrome and show health effects such as diabetes earlier in life. Children's obesity is the clearest demonstration of the strength of environmental influences and the failure of the traditional prevention strategies based only on health promotion; children are far more receptive to commercial messages than recommendations from their teachers or health care providers. In addition, policy-makers should note that obesity both results from and causes social gaps. Socially vulnerable groups are more affected by obesity because they live in neighbourhoods that do not facilitate active transport and leisure, they have less access to education and information about lifestyles and health, and cheaper food options are nutrient poor and energy dense.*

*It is time to act. In Istanbul, the Region's Member States approved the European Charter on Counteracting Obesity, which lists guiding principles and clear action areas. Action should span government sectors, be international and involve multiple stakeholders. The Conference publications analyse effective programmes and policies in different sectors, such as education, health, agriculture and trade, urban planning and transport. They also describe how to design policies and programmes to prevent obesity and how to monitor progress. As to action from stakeholders, they call, for example, on the private sector – including food manufacturers, advertisers and traders – to revise its policies, both voluntarily and as a result of legislation. Professional organizations need to support the prevention and management of obesity and its associated morbidity. Consumers' organizations should collaborate in providing information and in keeping public awareness high. Intergovernmental actors need to ensure that the agreed action is enforced across national borders, by issuing adequate directives and policy guidance.*

*WHO's role is to provide policy advice based on evidence, to disseminate examples of best practice, to promote political commitment and to lead international action. At the global level, the Global Strategy on Diet, Physical Activity and Health provides clear direction. In the European Region, the First Action Plan for Food and Nutrition Policy placed nutrition on governments' agendas. WHO is now committed to proposing further detailed guidelines in support of this public health priority.*

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<sup>1</sup> *The challenge of obesity in the WHO European Region and strategies for response. Summary.* Copenhagen, WHO Regional Office for Europe, 2007 ([http://www.euro.who.int/eprise/main/who/InformationSources/Publications/Catalogue/20070220\\_1](http://www.euro.who.int/eprise/main/who/InformationSources/Publications/Catalogue/20070220_1), accessed 5 March 2007).

*Authoritative observers around the world have received the European Charter on Counteracting Obesity as a useful step forward, owing to its guiding principles and clear directions, and the wide consensus that it represents. This helps to create the right conditions in which countries can halt the increase in childhood obesity and curb overall the epidemic in no more than a decade. We at WHO are working to help make this goal achievable and, indeed, inevitable.*

Marc Danzon  
*WHO Regional Director for Europe*



# 1. Current prevalence and trends of overweight and obesity

## Main messages

- Overweight and obesity are serious public health challenges in the WHO European Region.
- Overweight affects 30–80% of adults in the countries of the WHO European Region. About 20% of children and adolescents are overweight, and a third of these are obese.
- The prevalence of obesity is rising rapidly and is expected to include 150 million adults and 15 million children by 2010.
- The trend in obesity is especially alarming in children and adolescents. The annual rate of increase in the prevalence of childhood obesity has been growing steadily, and the current rate is 10 times that in the 1970s. This contributes to the obesity epidemic in adults and creates a growing health challenge for the next generation.
- Surveillance of overweight and obesity should be improved. Measured body weight and body height data on nationally representative samples were lacking for half of the countries in the Region, and different approaches are used to define overweight and obesity in children and adolescents, thus making comparisons difficult.

## The challenge

Excess body weight poses one of the most serious public health challenges of the 21st century for the WHO European Region. According to data collected previously, there are major differences in the prevalence of overweight and obesity between the countries in the Region and between socioeconomic groups in those countries. This variation shows the importance of environmental and sociocultural determinants of diet and physical activity (1,2).

Overweight is responsible for a large proportion of the total burden of disease in the WHO European Region: more than 1 million deaths and 12 million life-years of ill health every year (3).

The health consequences of overweight for children during childhood are less clear, but a 1998 review showed that childhood obesity is strongly associated with risk factors for cardiovascular diseases and diabetes, orthopaedic problems and mental disorders, and linked to underachievement in school and to lower self-esteem (4). Other recent studies also showed both short-term and long-term adverse psychosocial and other health consequences resulting from overweight in childhood and adolescence (5–7).

Childhood obesity is an important predictor of adult obesity (2,8–12). Metabolic and cardiovascular risk profiles tend to track from childhood into adult life, resulting in an elevated risk of ill health and premature mortality. Also, adults who were obese adolescents are more likely to have lower incomes and experience higher degrees of social exclusion (13). Over 60% of children who are overweight before puberty will be overweight in early adulthood, reducing the average age at which noncommunicable diseases become apparent and greatly increasing the burden on health services, which have to provide treatment during much of their adult life (14).

As a natural part of the obesity epidemic, the number of overweight and obese women of childbearing age is increasing, as is the number of overweight or obese women at the time of booking maternal health care at the beginning of pregnancy (15–21). Many studies emphasize the importance of a pre-pregnancy weight within a normal range, and show links between pre-pregnancy overweight or obesity and:

- pregnancy and/or labour complications, including a higher risk for caesarean delivery, pre-eclampsia and gestational diabetes (19,22–26);
- a substantially increased risk of birth anomalies (19,27–29); and
- a low serum folate level (30) and possibly an increased risk of neural tube defects (31,32).

In addition, maternal obesity substantially increases a child's risk of being overweight (15,16,33). Obese mothers are much more likely to have obese children, especially if they have gestational diabetes or a pre-pregnancy metabolic syndrome, indicated by a high level of serum insulin, a high blood level of low-density lipoprotein (LDL) cholesterol, a low level of high-density lipoprotein (HDL) cholesterol and a high gestational weight gain. Increasing numbers of children are born with high birth weight (over 4500 g or above the 95th percentile for standardized birth weight). High birth weight is linked to obesity in later life, as shown in the cohorts born in Iceland in 1988 and 1994; the children whose weight was above the 85th percentile at birth were more likely to be overweight at the ages of 6, 9 and 15 years (34).

This chapter addresses a number of issues: the current prevalence of both overweight and obesity in children, adolescents and adults in the WHO European Region; the direction and extent of change in the prevalence of overweight; and the magnitude of the problem expected in the near future.

### Assessment of overweight and obesity

Anthropometry includes a set of simple, inexpensive and non-invasive methods to assess both the size and composition of the human body. Height and weight are considered to be the most useful anthropometric measures for monitoring nutritional status, such as underweight, overweight and obesity (3,35). The anthropometric indices derived from these measures need to be specified by age and gender and are often considered more useful than the measures alone. In that respect, weight for height is considered a most useful index for assessing preschool children (36). The body mass index (BMI), calculated as weight (kg) divided by height squared ( $m^2$ ), is a simple index of weight for height commonly used to classify underweight, overweight and obesity in adults (3). Since it does not distinguish between weight associated with muscle and weight associated with fat, BMI provides only a crude measure of body fatness (1). Other indices, such as waist and hip circumferences, measure different aspects of body composition and fat distribution and have independent and often opposite effects on cardiovascular disease risk factors (37). Waist circumference is a relatively simple and convenient measure and can be used to assess the quantity of abdominal fat. Hip measurements provide additional valuable information about gluteofemoral muscle mass and bone structure (1), and hip circumference is negatively associated with health outcomes in women (38). The waist-to-hip ratio (WHR) may therefore be a useful measure, since it also includes the accumulation of fat on the hips; such an accumulation may be beneficial for health (37).

A large number of studies have shown that self-reporting tends to underestimate the actual weight (39–46), especially in overweight or obese people, while height tends mainly to be overestimated, especially in short and in older individuals (> 60 years of age) (39,40,46), although an underestimation of height has also been noted (41,42). Moreover, socioeconomic differences in the validity of self-reports have been identified (40,43). These self-reporting biases can lead to changes in the distribution of BMI data, as well as to a misclassification of overweight and obese individuals. Underestimations of mean BMI can be on the order of 3 units in obese subjects (41,43): 0.29–0.44 unit in a French adult workplace cohort (40) and around 2.6 units of the mean BMI in teenagers (41). A Spanish study stated that measured values of BMI were 1.7 and 1.6 units higher than values self-reported by men and women, respectively (46). A Welsh survey showed an underestimation of the prevalence of overweight and obesity of 4.5% and 6.7% in men and women, respectively (45). Another validation study conducted in Wales among adolescents, in the context of the Health Behaviour in School-aged Children study (see also Chapter 4), indicated that self-reported measurements underestimate the true prevalence of overweight by about a quarter and the prevalence of obesity by about a third (47). An Australian report provided self-reported and measured data side by side, owing to the incomparability of the data (48). Reviewing the underreporting of BMI in adults in 1998–2001, Visscher et al. concluded that the difference between measured and reported obesity prevalence varies widely between studies, ranging from 0.0% to 49.6% of the true prevalence (49). Thus, self-reported data must be treated with caution, and because of the wide variation found this chapter applies no conversion factor to correct for self-reported data.

To estimate the proportion of the population considered overweight and obese, cut-off points need to be applied. For children and adolescents, overweight and obesity are defined differently and use different approaches (1,2). Before the launch of the new WHO Child Growth Standards in April 2006 (50), the use of the weight-for-height index was recommended for the classification of overweight in preschool children; this index was defined as a weight-for-height greater than +2 standard deviations (SDs) of the United States National Center for Health

Statistics (NCHS)/WHO international reference median (36). Apart from the weight-for-height index, the WHO 2006 Standards provide BMI-for-age values that can be used for the early detection of a growth pattern leading to increased obesity risk. Also, WHO is reviewing the development of a new reference for school-age children and adolescents. Until this review is completed, WHO (35) recommends the use of age- and gender-specific BMI-for-age percentiles for children in the United States, where overweight is defined as a BMI  $\geq$  85th percentile and obesity as a BMI  $\geq$  95th percentile (51,52). In 2000, Cole et al. published international age- and gender-specific cut-off points for young people aged 2–18 years (53). Since then, these cut-off points have been recommended by the International Obesity TaskForce (IOTF) and frequently used by investigators. They are based on the adult cut-off points, and project BMI in childhood to BMI in adulthood by using an international reference population. Some of the studies identified used both WHO and IOTF recommended cut-off points to report the prevalence of overweight and obesity. For those cases, this chapter bases prevalence on IOTF recommendations.

In adults, this book defines excess body weight as having a BMI of  $\geq$  25 kg/m<sup>2</sup>; obesity, as having a BMI of  $\geq$  30 kg/m<sup>2</sup>; and pre-obesity, as having a BMI of 25.0–29.9 kg/m<sup>2</sup>. Adults are overweight if they have a BMI of  $\geq$  25 kg/m<sup>2</sup>, although some authors use the term solely for those with a BMI of 25.0–29.9 kg/m<sup>2</sup> (1). James et al. (3) suggested that the most useful information for analysing the burden of disease from overweight is the population distribution of BMI values per gender and age group, rather than the more commonly used quantification of percentage of the population classified as overweight and obese.

### Data sources

Various sources were used to identify the most recent and representative overweight and obesity data on children, adolescents and adults in each of the 53 Member States in the WHO European Region. These sources were consulted in the following order: the WHO Global Database on Body Mass Index and the WHO Global Infobase, the WHO Global Database on Child Growth and Malnutrition, the Eurostat database, ministries of health, national research and academic institutions and nongovernmental organizations (NGOs), and electronic literature.

### WHO global databases

The WHO Global Database on Body Mass Index (54) was developed as part of WHO's commitment to implementing the recommendations of a consultation (1), which identified the lack of nationally representative cross-sectional data as an obstacle to facilitating international comparisons of obesity prevalence in adulthood, monitoring the magnitude of current and future obesity problems and evaluating the effectiveness of intervention strategies. It was developed as an interactive surveillance tool to monitor the nutrition transition – the shift from diets featuring grains and vegetables to those high in fat and sugar, an increasing number of meals eaten outside the home and a greater proportion of processed foods – and present prevalence data on adult underweight, overweight and obesity derived from both national and subnational representative surveys. It also feeds its data into the WHO Global Infobase (55), which collects, stores and displays information on noncommunicable diseases and their important risk factors for all WHO Member States.

The WHO Global Database on Child Growth and Malnutrition was initiated in 1986 to compile, standardize and disseminate the results of population-based nutritional surveys carried out worldwide (56,57). To date, the prevalence of wasting, stunting, underweight and overweight are presented using z-scores based on both the 2006 WHO standards and the 1977 NCHS/WHO international reference (50–52). The prevalence estimates are being recalculated on the basis of the new WHO Child Growth Standards (50).

### Eurostat database

Eurostat is the Statistical Office of the European Communities (58). It provides the European Union (EU) with high-quality statistics that enable comparisons between countries and regions. Eurostat does not collect data on body weight and body height. This is done by EU Member States' statistical authorities. They verify and analyse national self-reported data and send them to Eurostat, which consolidates the data and, using a harmonized methodology, ensures they are comparable.

### Ministries of health, national research and academic institutions, and NGOs

The WHO Regional Office for Europe identified both national and subnational representative data (such as

population- and school-based data) on overweight and obesity in all population groups by the end of September 2005, and presented them to the participants in a consultation with Member States on the WHO European Ministerial Conference on Counteracting Obesity (59). The Regional Office asked the participants to go through the overview of their countries' data sheets and identify additional data. Also, various national research and academic institutions, as well as NGOs such as IOTF, were contacted.

### Electronic literature search

The database resources were supplemented by a systematic search of articles in the PubMed online database (60) for all 53 Member States of the WHO European Region (1999 to April 2006). The search was performed on combinations of both medical subject headings and keywords. It involved the use of such keywords as overweight, obesity, skinfold, body weight, body height, BMI, body mass index and Quetelet's index, combined with the terms prevalence and incidence. Also, all 53 Member States' names were introduced individually. For adults, only papers that provided population representative data were considered, while for children and adolescents surveys carried out in schools were also considered.

### Data treatment

Using WHO categories, data were divided (where possible) according to the following age groups: children aged 0–5 and 6–9 years, adolescents aged 10–19 years and adults aged 20 years and more. For some countries, data on children or adolescents overlapped these defined age groups, in which case the results were included in the group for which the age range fell closest.

If both national and subnational representative data for a certain population group in a country were identified, this chapter reports only on the national data, while subnational data (if identified) are presented in the absence of nationally representative figures. For current data on prevalence, only surveys concluded in 1999 or later were included; for data on trends, all survey years identified were included when they had a comparable data collection methodology and subject age range. The annual change in prevalence was estimated by taking the difference between the earliest and the latest prevalence figure and dividing it by the number of years between the two survey points.

For 47 of the 53 Member States, either national or subnational studies on the prevalence of overweight and/or obesity among children, adolescents or adults were identified. Of these Member States, only 20 used measured weight and height to monitor the prevalence of overweight at the national level in children: Armenia (61), Azerbaijan (62), Bosnia and Herzegovina (63), Cyprus (64,65), the Czech Republic (66), France (67), Georgia (68), Greece (69), Iceland (70), Ireland (71,72), Kazakhstan (73), Poland (74), Portugal (75), Romania (76), Serbia<sup>1</sup> (77), Slovakia (78,79), Spain (80,81), Switzerland (82), The former Yugoslav Republic of Macedonia (83) and Ukraine (84). Nineteen used measured weight and height to monitor overweight at the national level in adolescents: Armenia (61), Austria (85), Azerbaijan (62), Cyprus (65), the Czech Republic (86), Greece (69), Hungary (87), Iceland (70), Ireland (71,72), Israel (88), Kazakhstan (73), Luxembourg (89), Poland (74), Slovakia (78,79), Spain (80,81), Switzerland (82), Turkey (90), Turkmenistan (91) and Uzbekistan (92). Eighteen used measured weight and height to monitor the prevalence of overweight at the national level in adults: Armenia (61), Azerbaijan (62), Bosnia and Herzegovina (93), Croatia (94), Finland (95), Ireland (96), Israel (97), Kazakhstan (73), Montenegro (98), Poland (74), Portugal (99), the Russian Federation (100), Serbia (98), Spain (101), The former Yugoslav Republic of Macedonia (83), Turkey (90), Turkmenistan (91) and Uzbekistan (92).

Five countries reported on the prevalence of overweight in children based on measured data representative at the subnational level: Germany (102–107), Italy (108–110), Lithuania (111), the Russian Federation (112,113) and the United Kingdom (114–116). Five – Croatia (117), France (118), Germany (106,107,119), Serbia (120–122) and the United Kingdom (114,123–125) – used such data to report on the prevalence of overweight in adolescents, and three – Albania (126), Georgia (127) and the United Kingdom (128–130) – used such data to report on the prevalence of overweight in adults.

Four countries collected self- or parent-reported anthropometric data in national samples of children:

<sup>1</sup> The separation of Montenegro and Serbia in 2006 brought the number of the Region's Member States to 53. The country names used in this book are those that were accurate when the data were collected.

Belgium, the Netherlands, Norway and Sweden (131–134). These countries, as well as Finland, also carried out national surveys of adolescents (131–135). The Health Behaviour in School-aged Children survey conducted in 2001–2002 gathered self-reported data on weight and height in 11-, 13- and 15-year-olds in 29 countries in the WHO European Region (136). In 2003, the Pro Children study collected parental reports of 11-year-olds from nationally representative schools in seven countries, and collected subnational data samples in another two: Belgium and Austria (137). Data on self-reported height and weight as a basis for reports on prevalence of overweight and obesity among adults were available from 28 countries: Austria (138), Belgium (131,139), Bulgaria (140), Cyprus (140), the Czech Republic (141), Denmark (142), Estonia (143), Finland (144), France (145), Germany (146), Greece (147), Hungary (148), Iceland (149), Ireland (152), Israel (151), Italy (152), Latvia (153), Lithuania (154), Malta (155), the Netherlands (156), Norway (140), Portugal (140), Romania (140), Slovakia (140), Slovenia (157), Spain (158), Sweden (159) and Switzerland (160).

## Prevalence of overweight or obesity Children and adolescents

Nationally representative surveys of young children (0–5 years) used the NCHS/WHO international cut-off points (161) to define the prevalence of overweight. According to the recalculated prevalence values with the WHO 2006 BMI-for-age standards, the highest rates were found in Ukraine (boys: 27.8%; girls: 27.3%) (84) and Bosnia and Herzegovina (boys: 17.1%; girls: 16.7%) (63).

As shown in Fig. 1.1 (64,65,67,69–71,74,75,78–82,104,107,108,110,116,121,132–134), based on measured height and weight from national data, 14.1% of Cypriot (64) and 17.2% of Greek (69) preschool children (2–6 years) were overweight. Among children of primary school age (both genders), the highest prevalence of overweight was found in Spain (6–9 years, 35.2%) (80,81) and Portugal (7–9 years, 31.5%) (75); the lowest was found in Slovakia (7–9 years, 15.2%) (78,79), France (7–9 years, 18.1%) (67), Switzerland (6–9 years, 18.3%) (82) and Iceland (9 years, 18.5%) (70) (Fig. 1.1).

National surveys based on self-reported weight and height found a prevalence of overweight for both genders of 20.3% in Belgium (5–9 years) (131), 19.5% in Sweden (8 years) (134), 18.5% in Norway (8–9 years) (133) and 14.5% in the Netherlands (2–9 years) (132).

The Pro Children study (137) showed that more boys (17.0%) than girls (14.3%) were overweight. Prevalence was highest in Portugal (boys: 27.1%; girls: 22.1%), Spain (boys: 21.3%; girls: 20.2%) and Austria (boys: 19.9%; girls: 15.3%), and lowest in Belgium (boys: 9.4%; girls: 10.9%), the Netherlands (boys: 11.6%; girls: 8.6%) and Denmark (boys: 12.5%; girls: 10.3%).

For adolescents, the few studies that collected national representative BMI data (based on measured height and weight) showed the highest prevalence of overweight in Irish girls (27.3%, 9–12 years) (72) and in Spanish boys (31.7%, 10–17 years) (80,81). The lowest prevalence of overweight adolescents was in the Czech Republic (9.0%, both sexes 14–17 years) (86).

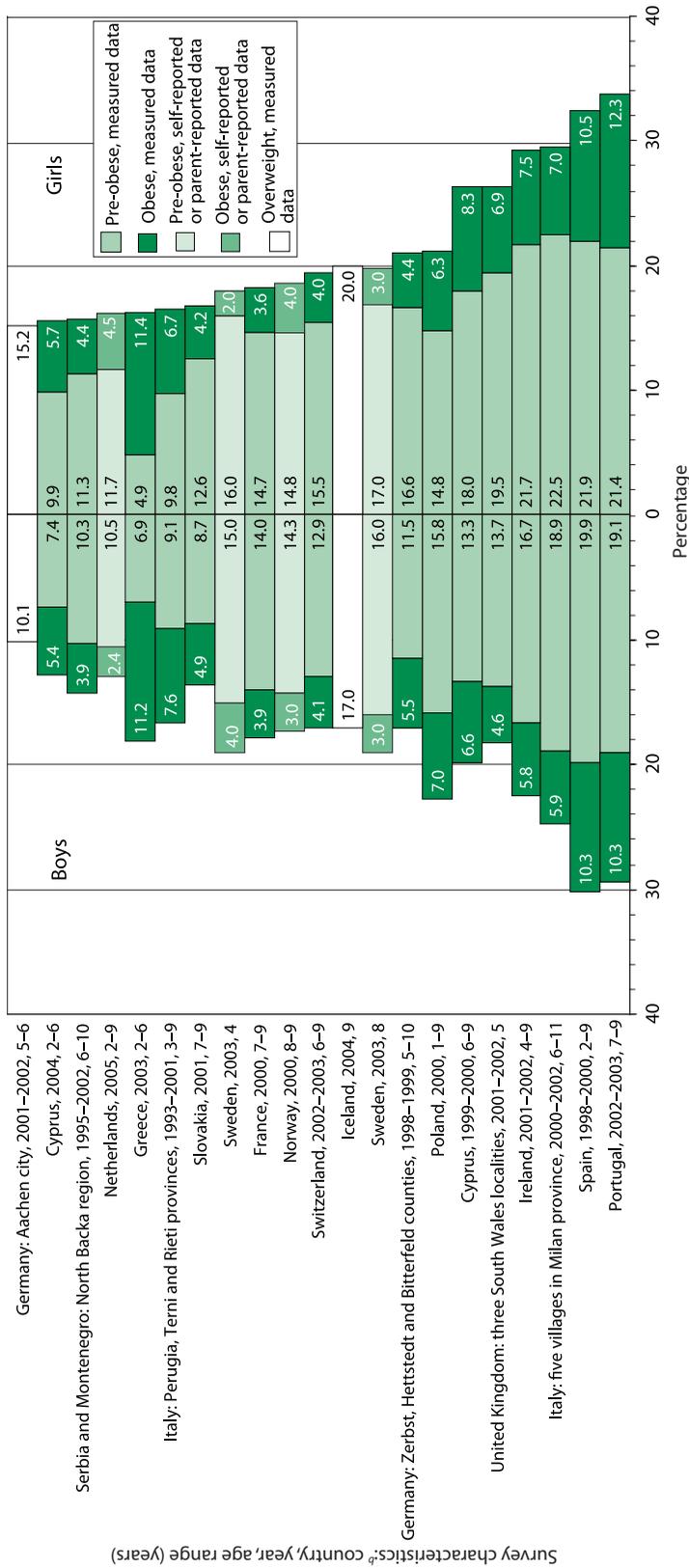
Fig. 1.2 shows the prevalence of pre-obesity and obesity in the 13- and 15-year-olds from the Health Behaviour in School-aged Children survey. It indicated that, among 13-year-olds, up to 34% of boys and 24% of girls were overweight; among 15-year-olds, the corresponding figures were 28% and 31%, respectively. Up to 9% of both 13- and 15-year-old boys were obese, as were 5% of both 13- and 15-year-old girls (136).

## Adults

Fig. 1.3 shows the prevalence of overweight and obesity in the European Region (61,62,73,74,90–94,96–98,126–129,131,138,140–149,152–156,159,160,162). In countries that carried out measurements on adults, 31.9–79.3% of men and 27.8–77.8% of women were overweight. The rates were highest in Albania (Tirana) (126), Bosnia and Herzegovina (93) and the United Kingdom (Scotland) (114), and lowest in Turkmenistan (91) and Uzbekistan (92). In addition, the prevalence of obesity ranged from 5.4% to 22.8% among men and from 7.1% to 35.6% among women. Data based on self-reported weight and height showed similar proportions as measured data. The prevalence of obesity and overweight (pre-obese and obese) among adults showed a range of 6–27% and 26–68%, respectively.

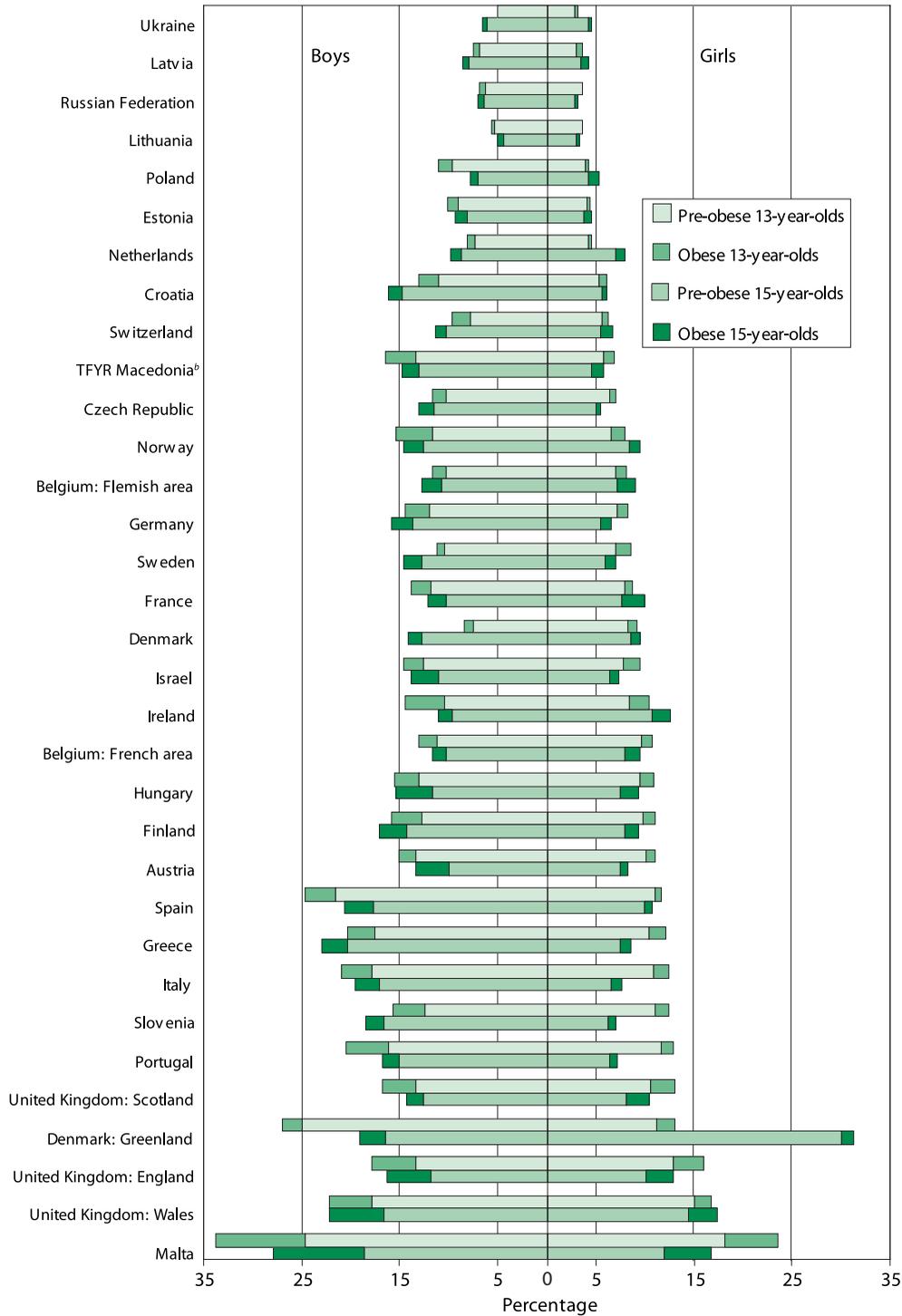
The prevalence of obesity was higher among men than women in 14 of 36 countries or regions with data for both genders, and the prevalence of pre-obesity was higher among men in all 36. As Fig. 1.3 shows, male and

**Fig. 1.1. Prevalence of overweight and obesity<sup>a</sup> among children 11 years or younger in countries in the WHO European Region based on surveys with an ending year of 1999 or later**



<sup>a</sup>Overweight and obesity are defined by using international age- and gender-specific cut-off points for BMI, passing through 25 kg/m<sup>2</sup> and 30 kg/m<sup>2</sup> by the age of 18 years, respectively (59). Overweight includes pre-obese and obese.  
<sup>b</sup>Intercountry comparisons should be interpreted with caution owing to different data collection methods, response rates, survey years and age ranges.

**Fig. 1.2. Prevalence of overweight<sup>a</sup> among 13-year-olds and 15-year-olds (based on self-reported data on height and weight) in countries in the WHO European Region, according to the 2001–2002 Health Behaviour in School-aged Children survey**

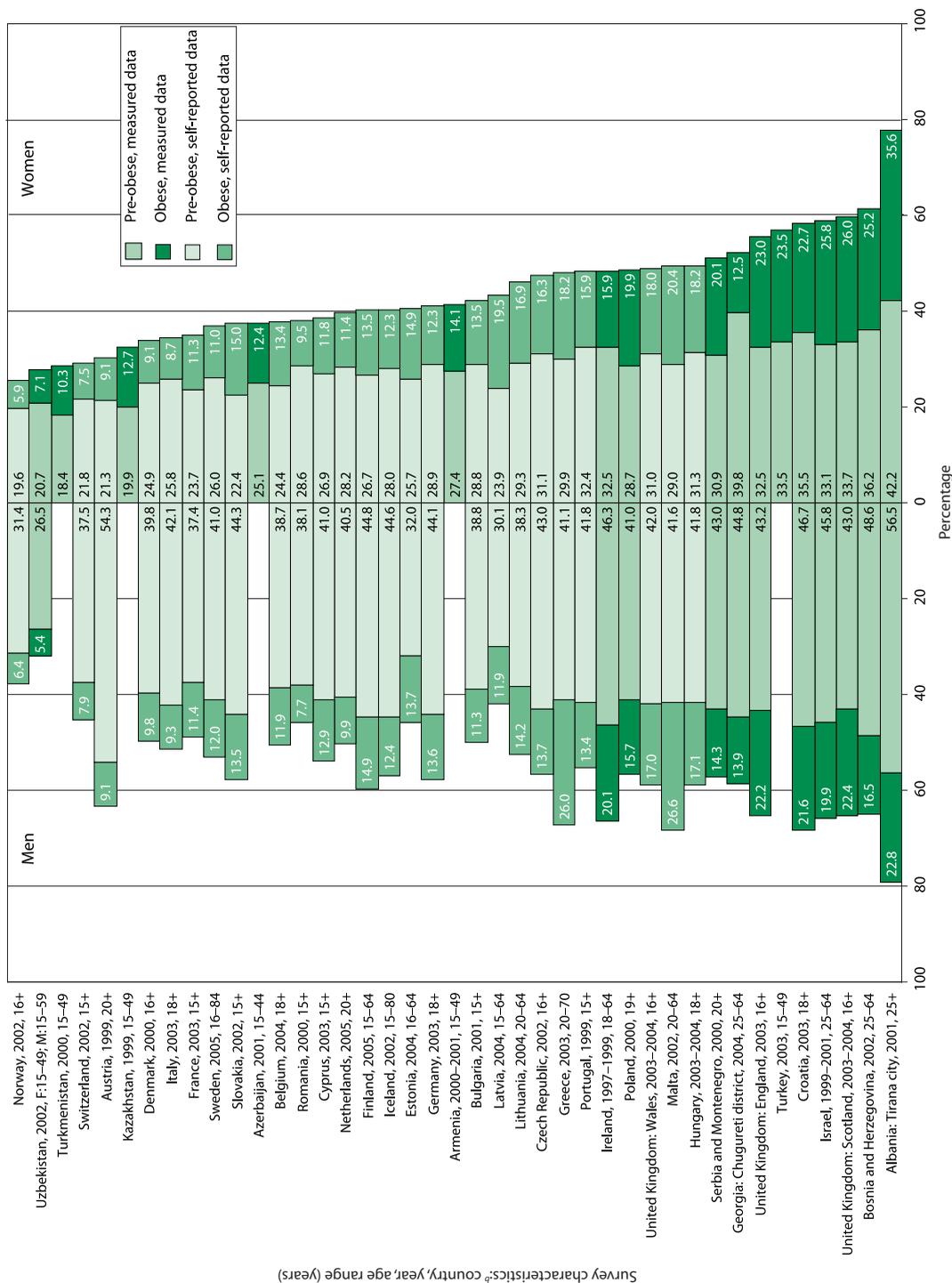


<sup>a</sup> Overweight and obesity are defined by using international age- and gender-specific cut-off points for BMI, passing through 25 kg/m<sup>2</sup> and 30 kg/m<sup>2</sup> by the age of 18 years, respectively (59). Overweight includes pre-obese and obese.

<sup>b</sup> The former Yugoslav Republic of Macedonia.

Source: Currie et al. (137).

Fig. 1.3. Prevalence of overweight and obesity<sup>a</sup> among adults in the WHO European Region based on surveys with an ending year of 1999 or later



<sup>a</sup> Overweight is defined as a BMI of  $\geq 25$  kg/m<sup>2</sup> and obesity as a BMI of  $\geq 30$  kg/m<sup>2</sup>. Overweight includes pre-obese and obese (1).

<sup>b</sup> Intercountry comparisons should be interpreted with caution, owing to different data collection methods, response rates, survey years and age ranges.

female obesity levels differed substantially in Albania (126), Bosnia and Herzegovina (93), Greece (147), Ireland (96), Israel (97), Latvia (153), Malta (155) and Serbia and Montenegro (98).

### Abdominal obesity

Only two national representative studies were identified that collected data on children and adolescents' abdominal fat distribution, besides measures of body weight and height. One studied Irish children aged 5–12 years in 2003–2004 (163) and the other, Hungarians aged 15–18 in 1997–2000 (87). The first found mean (SD) waist circumferences of 58.0 (6.0) cm in the group aged 5–8 years and 66.8 (9.4) cm in the group aged 9–12; the mean (SD) values for hip circumferences were 67.7 (6.5) cm and 80.3 (9.0) cm, respectively (163). In the Hungarian study, mean (SD) WHRs of 0.83 (0.05) and 0.77 (0.05) were found in boys and girls, respectively. The mean (SD) waist circumferences were 75.1 (9.1) cm in boys and 68.8 (8.1) cm in girls (87). In the absence of established cut-off points, neither study could indicate the number of children or adolescents with a high waist or hip circumference.

Greece (147) and Israel (164) reported on waist and/or hip circumference measures collected in national surveys of adults. In Greece, 54.3% of the men and 56.5% of the women had a large waist circumference (men: > 94 cm; women: > 80 cm) (147). An elevated WHR (men:  $\geq 1$ ; women:  $\geq 0.8$ ) was found in 34.9% of the total Israeli adult population, and it increased with age, particularly in women (164). In addition, the 2003 Health Survey for England (129) collected the waist and hip circumferences of people aged 16 years or older. The mean WHR was 0.92 in men and 0.82 in women, and the mean waist circumference was 96.5 cm in men and 86.4 cm in women. While raised WHR (men:  $\geq 0.95$ ; women:  $\geq 0.85$ ) was more prevalent in men than in women (33.1% versus 30.3%), raised waist circumference (men:  $\geq 102$  cm; women:  $\geq 88$  cm) was more prevalent in women (41.1% versus 31.1% in men). None of the three surveys used the same cut-offs, and comparisons were not possible.

### Trends in overweight and obesity

From 1975 to 2003, the mean birth weight increased in all Nordic countries, except Finland. The highest increase (200 g) was in Denmark (165). In line with this, Kramer et al. published data from Canada that showed an increasing trend in the proportion of large-for-gestational-age children and a corresponding decreasing trend in the proportion of small-for-gestational-age children (15). Data from the Swedish birth registry showed an increase in the proportion of children with a birth weight  $\geq 4.500$  g, from 2.8% in 1973 to 4.1% in 2004 (166). In 2004, Surkan et al. published an analysis of birth weight developments in Sweden from 1992 to 2001, based on more than 875 000 cases (16). The results revealed a 23% increase in the number of large-for-gestational-age births over the 10 years. At the same time, the prevalence of a maternal pre-pregnancy BMI of  $\geq 25$  kg/m<sup>2</sup> increased from 25% to 36%, while the prevalence of smoking mothers decreased from 23% to 11%. The study also found that the increase in large-for-gestational-age births was associated with both factors, with the maternal BMI giving a higher odds ratio for large for gestational age births than smoking. Chapter 7 provides further information on the association between birth weight, parental birth weight and BMI, attained BMI and levels of obesity in later life.

The prevalence of obesity has risen threefold or more since the 1980s, even in countries with traditionally low rates. Among both women and men, the prevalence of overweight has risen rapidly in Ireland (96) and the United Kingdom (England and Scotland) (128,129), by more than 0.8 percentage point a year, based on measured data. Based on self-reported data, annual increases in prevalence were highest in Denmark (1.2 and 0.9 percentage points in women and men, respectively, from 1987 to 2001) (167), Ireland (1.1 percentage points for both sexes from 1998 to 2002) (150,168), France (0.8 percentage point among adults from 1997 to 2003) (145), Switzerland (0.8 and 0.6 percentage point in women and men, respectively from 1992 to 2002) (160) and Hungary (0.6 percentage point for both sexes from 2000 to 2004) (148,169). On the other hand, self-reported adult obesity rates have fallen in Estonia (143,170–172) and Lithuania (154,173–175). If no action is taken and the prevalence of obesity continues to increase at the same rate as in the 1990s, an estimated 150 million adults will be overweight or obese by 2010 (55).

The epidemic is progressing at especially alarming rates among children. For example, overweight among children increased from 4% in 1960 to 18% in 2003 in Switzerland (82) and from 8% in 1974 to 20% in 2003 in England (176). In various regions of Spain, the prevalence of overweight in adolescents aged 13–14 more than

doubled from 1985 to 2002 (177). The only decrease in the prevalence of childhood obesity was observed in the Russian Federation (178) during the economic crisis that followed the dissolution of the USSR, as shown in Fig. 1.4 (82,107,125,176–188).

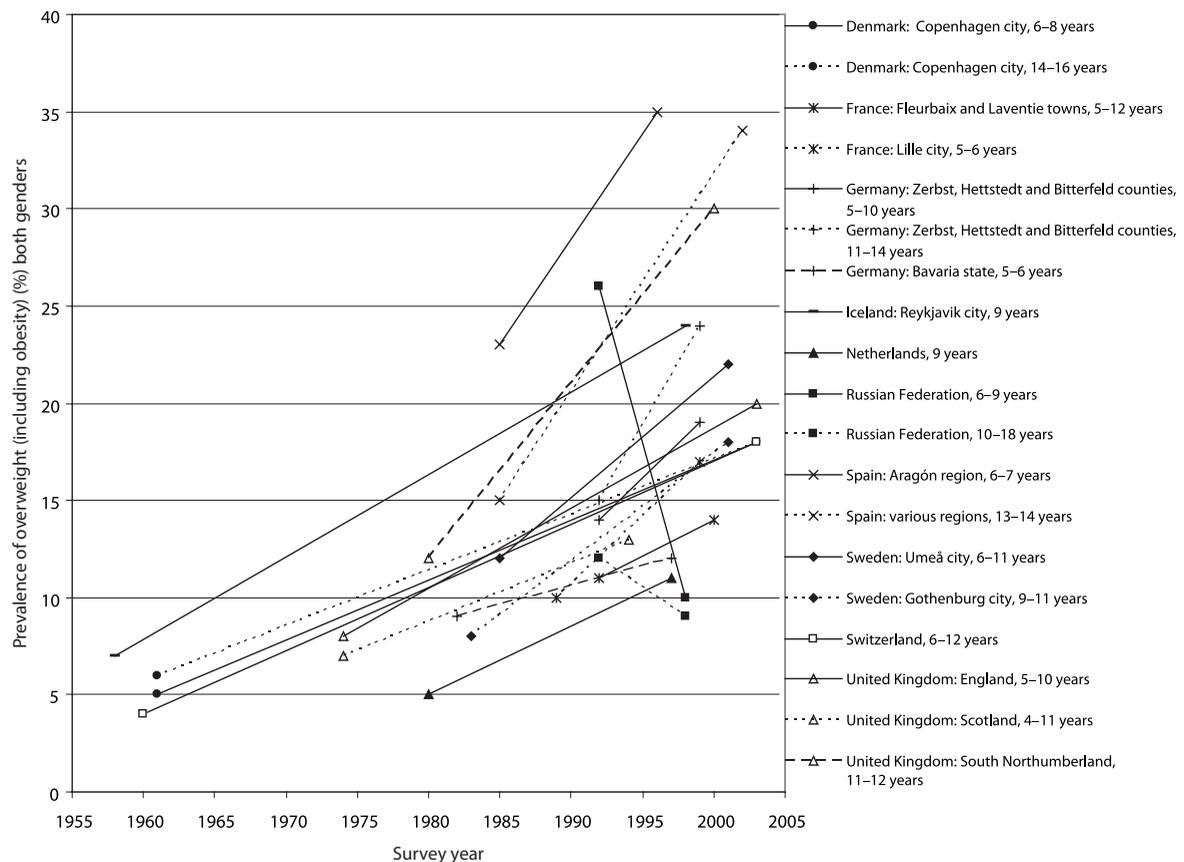
The annual increase in the prevalence of childhood overweight in the countries with surveys, shown in Fig. 1.5 (82,107,125,176–188), averaged 0.1 percentage point during the 1970s, rising to 0.4 percentage point during the 1980s, 0.8 percentage point in the early 1990s and reaching as high as 2.0 percentage points in some countries by the 2000s. IOTF predicts that about 38% of school-age children in the WHO European Region will be overweight by 2010 and that more than a quarter of them will be obese (189). This reinforces the epidemic of obesity in adults and creates a growing health challenge for the next generation.

### Better monitoring needed

This chapter can be considered the most comprehensive collection and analysis of data on the prevalence of overweight and obesity in the WHO European Region so far. While only a few countries had no recent data available, measured and valid BMI data were lacking for half the countries. Making comparisons between countries is difficult, due to their use of different data collection methods, response rates, age ranges, years of collection and definitions of overweight and obesity. Various investigators (1–3,190) have encountered the same difficulties in attempting earlier comparisons.

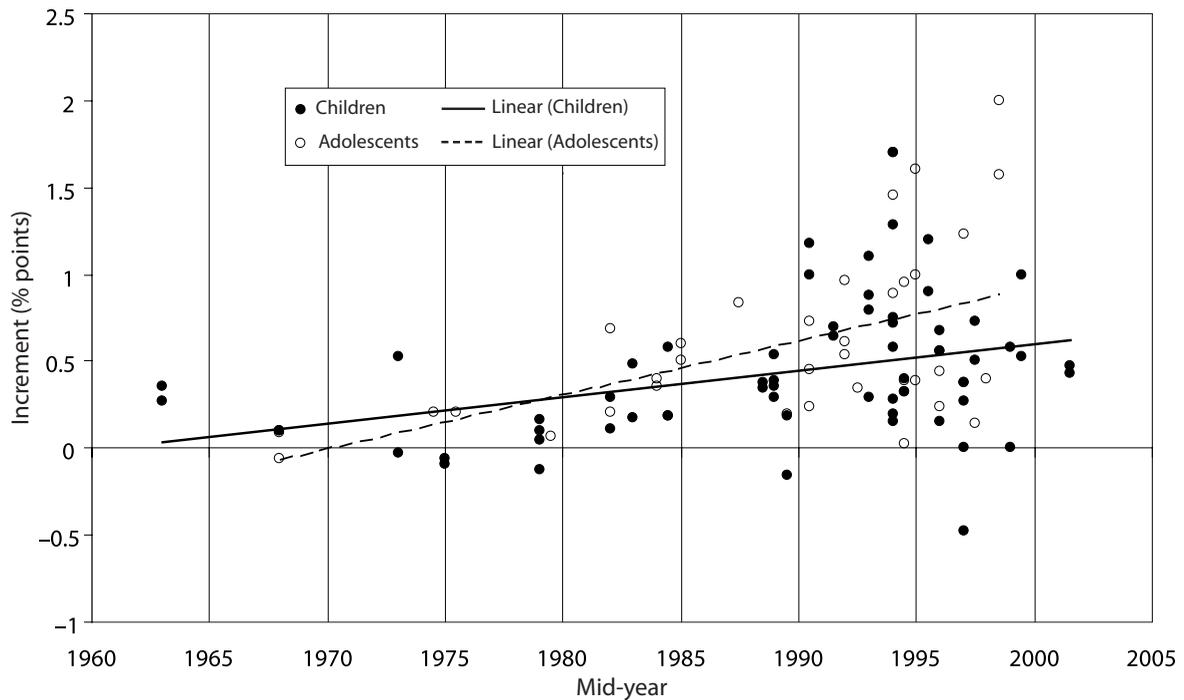
A robust monitoring system that covers similar age groups and includes various socioeconomic groups is therefore urgently needed to assess the physical measures of a country's children and adults. It is needed not only to gain a correct understanding of the progress of the epidemic but also to evaluate preventive initiatives that are progressively introduced. Moreover, special risk groups should be identified, such as women of childbearing age.

Fig. 1.4. Overweight<sup>a</sup> among school-aged children in selected European countries, 1958–2003



<sup>a</sup> Overweight is defined by using international age- and gender-specific cut-off points for BMI, passing through 25 kg/m<sup>2</sup> by the age of 18 years (59).

Fig. 1.5. Annual change in the prevalence of overweight among children and adolescents in selected European countries that conducted surveys, 1960–2005



They might carry several risks forward to the next generation during pregnancy and in their role as mothers and gatekeepers to healthy nutrition for their children, from breastfeeding to adult independence. The limitations of current data do not change the message that overweight and obesity appear to be growing consistently almost everywhere in the Region, although their prevalence varies widely between countries.

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## 2. Impact of obesity on health

### Main messages

- Obesity has important consequences for morbidity, disability and quality of life.
- Obese adults are especially likely to develop type 2 diabetes, cardiovascular diseases, several common forms of cancer, osteoarthritis and other health problems. Obese children also show raised levels of risk factors for many of these diseases.
- The severity and the duration of obesity contribute to the risk of co-morbidities.
- Although their mortality rate may be similar to that of adults with a normal weight, overweight adults have a higher risk of a number of noncommunicable diseases, which will contribute significantly to the total health burden.

Obesity is now reaching epidemic proportions and is increasingly recognized as an important public health problem (1,2). Epidemiological studies have consistently shown it to be associated with increased risks of morbidity, disability and mortality (3).

Recently, the impact of obesity on mortality has been presented as being nearly as important as that of cigarette smoking (4). This chapter attempts to summarize the impact of obesity on noncommunicable diseases and mortality.

### Morbidity

Obesity has been associated with a long list of conditions (1,5,6), the more important of which are further discussed below:

1. cardiovascular diseases: coronary heart disease (including ischaemic heart disease, angina pectoris and myocardial infarction), hypertension, dyslipidaemia and stroke;
2. various types of cancer: endometrial, cervical, ovarian, prostate, breast, colon, rectal, kidney, liver and gall bladder;
3. type 2 diabetes and insulin resistance;
4. end-stage kidney disease;
5. fatty liver disease;
6. osteoarthritis;
7. pulmonary embolism;
8. deep vein thrombosis;
9. polycystic ovary syndrome;
10. hyperuricaemia and gout;
11. gallstones;
12. reproductive disorders;
13. low back pain;
14. breathlessness;
15. sleep apnoea;
16. psychological and social problems;
17. complications in pregnancy;
18. complications in surgery.

## Metabolic syndrome

The constellation of metabolic abnormalities – including centrally distributed obesity (large waist circumference), decreased HDL cholesterol level, elevated triglyceride level, elevated blood pressure (hypertension) and high blood glucose level (hyperglycaemia) – is known as the metabolic syndrome (7). It is associated with increases in type 2 diabetes (threefold) and cardiovascular diseases (twofold). At least four definitions of this syndrome are now commonly used, but all of them include central obesity as a criterion. In a recent definition by the International Diabetes Federation, central obesity is the essential feature, and the metabolic syndrome is present if a large waist circumference (defined by cut-off points specific to different ethnic groups) is accompanied by any two of the other components (8).

## Cardiovascular diseases

Obesity is associated with some of the major risk factors for cardiovascular diseases, such as hypertension and low concentrations of HDL cholesterol, but it is also associated with small-particle-sized LDL cholesterol. The relative risks of cardiovascular disease end-points (myocardial infarction and stroke) in obese versus normal-weight individuals are 1.5–2.5 (9).

It seems paradoxical that mortality from coronary diseases and levels of major risk factors are declining while the prevalence of obesity and type 2 diabetes is increasing, but this illustrates that obesity is not the only risk factor for death from coronary heart disease. In populations where reduced salt or saturated-fat intake or widespread cessation of smoking has led to a decline in the total incidence of cardiovascular diseases, obesity remains an important risk factor and is likely to gain in relative importance.

The global INTERHEART study showed that central fat distribution (measured by large WHR or waist circumference) is a much more powerful determinant of cardiovascular disease than BMI in many ethnic groups around the world (10).

## Type 2 diabetes

Obesity is a well-known risk factor for type 2 (non-insulin-dependent) diabetes mellitus. Field et al. (11) found that the incidence of type 2 diabetes in middle-aged men and women with pre-obesity (BMI of 25–30 kg/m<sup>2</sup>), during the 10 years after baseline, was 3.5 and 4.6 times, respectively, that of people of normal weight (BMI of 18.5–24.9 kg/m<sup>2</sup>). In addition, this relative risk increased exponentially with further increases in BMI. Further, men and women with a BMI of 35 kg/m<sup>2</sup> had about 20 times the risk of developing diabetes of those of normal weight.

From several large prospective studies (9), overweight and obesity (BMI over 25 kg/m<sup>2</sup>) have been estimated to account for about 65–80% of new cases of type 2 diabetes. The risk is a function of the age of onset and the duration of obesity, and weight gain during adult life (9). In addition, people with a family history of type 2 diabetes, who are already at greatly increased risk, seem to be more vulnerable to excess fat and accumulation of abdominal fat (12).

## Cancer

At relatively low levels of BMI, obesity is already related to some forms of cancer, mainly colon cancer and hormone-related malignancies in the uterus, and cancer of the ovary, breast (post-menopausal) and prostate. In a prospectively studied population of more than 900 000 adults in the United States, obese men (BMI ≥ 30 kg/m<sup>2</sup>) had more than 50% increased risk of dying from cancers of the liver and gall bladder and from non-Hodgkin's lymphoma; obese women had a more than 50% increased risk of dying from cancers of the gall bladder, breast, uterus and kidneys (13). Women with a BMI ≥ 40 kg/m<sup>2</sup> had more than four times and six times the risk of dying from kidney cancer and uterine corpus cancer, respectively, than women with normal weight (BMI of 18.5–24.9 kg/m<sup>2</sup>) (13). When BMI reaches levels higher than 35 kg/m<sup>2</sup>, obesity is related to more cancer sites (13). The World Cancer Research Fund has estimated that 30–40% of all cancers can be attributed to inappropriate diet, physical inactivity and overweight (14). It has become increasingly clear that obesity is second only to smoking as the most important avoidable cause of cancer.

A number of other obesity-related morbidities have been investigated during the last decade (3,15). These include musculoskeletal disorders (such as osteoarthritis and gout), gallstones, non-alcoholic steatohepatitis, sleep

apnoea, asthma, narcolepsy, increased use of medication for noncommunicable illnesses, hirsutism, impaired reproductive performance, pregnancy disorders (such as gestational diabetes, hypertensive disorders, increased perinatal mortality, fetal neural tube defects and fetal macrosomia), cataracts, benign prostatic hypertrophy, renal disorders, deep vein thrombosis, pulmonary embolism and psychological disorders (such as depression and loss of self-esteem) (5,16–22).

## Disability

In 1990, Rissanen et al. showed that obese Finnish adults suffered more often than normal-weight adults from work disability due to cardiovascular and musculoskeletal diseases (23). A study of obese Swedes showed that obesity accounted for 10% of productivity loss due to sick leave or work disability (24) and that, in particular, disability is associated with waist circumference (25). In addition, symptoms of osteoarthritis are more severe in heavier patients.

An increase in the overall risk of noncommunicable diseases is already noticeable with a moderate increase in weight. The nadir of the risk curve can be placed at 21 kg/m<sup>2</sup>, and analyses of the burden of disease related to overweight and obesity have been carried out with reference to this BMI value. Table 2.1 shows the proportion of cases of the main noncommunicable diseases attributable to a BMI over 21 kg/m<sup>2</sup> in three reference groups of countries (with different mortality rates) in the European Region:

1. Eur-A (27 countries with very low child and adult mortality): Andorra, Austria, Belgium, Croatia, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Luxembourg, Malta, Monaco, the Netherlands, Norway, Portugal, San Marino, Slovenia, Spain, Sweden, Switzerland and the United Kingdom;
2. Eur-B (16 countries with low child and adult mortality): Albania, Armenia, Azerbaijan, Bosnia and Herzegovina, Bulgaria, Georgia, Kyrgyzstan, Poland, Romania, Serbia and Montenegro, Slovakia, Tajikistan, The former Yugoslav Republic of Macedonia, Turkey, Turkmenistan and Uzbekistan; and
3. Eur-C (9 countries with low child mortality and high adult mortality): Belarus, Estonia, Hungary, Kazakhstan, Latvia, Lithuania, the Republic of Moldova, the Russian Federation and Ukraine.

**Table 2.1. Proportion of cases of noncommunicable disease attributable to elevated BMI (> 21 kg/m<sup>2</sup>) in adults aged 30 years and over, WHO European Region**

Subregion	Disease cases (%)															
	Osteoarthritis		Colon cancer		Post-menopausal breast cancer		Endometrial cancer		Type 2 diabetes		Stroke		Ischaemic heart disease		Hypertensive disease	
	M	W	M	W	M	W	M	W	M	W	M	W	M	W	M	W
Eur-A	22	24	18	18	–	13	–	50	78	84	35	31	35	29	56	50
Eur-B	15	22	15	19	–	12	–	48	71	84	35	41	34	38	56	65
Eur-C	17	25	14	19	–	13	–	52	68	83	33	37	33	33	56	64

Source: James et al. (26).

Future studies should focus on the age of onset of obesity-related morbidity. For instance, obese people use medications for noncommunicable conditions for a greater number of years than those of normal weight, even after taking account of the early mortality associated with obesity.

## Mortality

The impact of obesity on early death seems to be one of the simplest epidemiological relationships, but the relationship between obesity and mortality has been controversial for many decades, and continues to be debated. In the 1970s and 1980s, most of the debate centred on the observation that obesity was not associated with an increased risk of mortality once traditional risk factors for cardiovascular diseases, such as hypertension, dyslipidaemia and type 2 diabetes, were taken into account. Manson et al. (27) argued that such adjustment is inappropriate, because these risk factors are in the causal pathway in the relationship between obesity and mortality: that is, obesity causes elevated risk factors for cardiovascular disease and type 2 diabetes, and this is responsible for

most of the excess deaths in obese people. The observation that obesity has very little impact on mortality in people without risk factors (such as hypertension and dyslipidaemia) and without type 2 diabetes does not mean that obesity is not related to increased mortality, because most obese people will have at least one of these conditions.

Moreover, Manson et al. argued that the effects of cigarette smoking should also be taken into account (27). Smoking is a confounder, as it is associated with leanness as well as with early mortality, and thus may obscure an association between obesity and mortality. Obesity has also been reported to be an effect modifier, meaning that the relationship between obesity and mortality is in general stronger in people who never smoked than in smokers (28). Within studies of cohorts, the relationship can be absent in smokers while obesity is clearly related to increased mortality among people who never smoked (29–31). Manson et al. also proposed that so-called reverse causation may have influenced the relationship between weight and mortality in some studies. They argued that many serious health conditions, such as several types of cancer, may lead to weight loss and to an increased risk of early death: that is, the diseases caused leanness instead of leanness causing the diseases (28).

Sjöström (32) observed that most early studies that did not find an association between obesity and mortality had either a short duration or a short follow-up. An example shows the importance of the duration of follow-up. If women aged 40–50 years are followed for 10 years, very little impact of obesity on mortality can be expected, since very few women die of obesity-related disorders between the ages of 50 and 60. If these women are followed for another 10 years, the impact of obesity may become apparent. Lindsted & Singh showed such a phenomenon in 1997 (33).

Most studies report relationships between BMI and mortality. BMI comprises both fat mass and fat-free mass, both affecting the risk of mortality independently (34) and in opposite directions (35). Waist circumference is a better alternative than BMI for identifying elderly men with an increased risk of mortality (36). Also, a large hip circumference has been associated with lower cardiovascular mortality rates (37). The latter is compatible with the finding that large hip circumferences have also been associated with a reduced risk of diabetes, hypertension and dyslipidaemia (38).

### Reduced life expectancy

Some studies have calculated the number of reduced years of life expectancy caused by obesity. The Framingham study calculated that obesity (BMI  $\geq 30$  kg/m<sup>2</sup>) at the age of 40 years was related to a loss of 6–7 years of life (6). Fontaine et al. calculated that a BMI  $\geq 33$  kg/m<sup>2</sup> from age 40 years was related to a loss of 2–3 years (39). The studies used different calculation methods and were based on different cohorts: the baseline measurements of the Framingham study date back to the 1950s, when cardiovascular disease (such as myocardial infarction) was associated with higher mortality than it is today. Patients who would have died prematurely of many of the diseases caused by obesity several decades ago may now survive, thanks to long-term medical treatment.

### Mortality in different age groups

The relative impact of obesity on mortality is highest in the youngest age categories (29,40). Reasons for small or no statistical associations between BMI and mortality in the elderly (41) may be due to a ceiling effect – the selective survival of obese people with few co-morbidities – or the use of a measure such as BMI, which may be less sensitive to mortality risk than, say, waist circumference (36).

Interestingly, the optimal BMI has been reported to shift upwards with age. The BMI with lowest absolute risk of mortality is somewhere between 18.5 kg/m<sup>2</sup> and 25 kg/m<sup>2</sup> for young adults, but has been reported to be around 27 kg/m<sup>2</sup> in older adults (42). This does not mean that weight gain is necessary for optimal survival, but it may reflect selective effects on survival or an aspect of reverse causation. Recently, researchers from the National Health and Nutrition Examination Survey studies concluded that a BMI of 25–29.9 kg/m<sup>2</sup> was not associated with increased risks of mortality in recent cohorts in the United States (43). For these adults, the increased likelihood of disease without an increased mortality risk may lead to a higher demand for long-term health care, compared with adults of normal weight (see Chapter 3 for further consideration of health care costs).

### Health consequences of childhood obesity

Attention to childhood overweight and obesity is highly warranted, as overweight and obese children are likely to be obese into adulthood (44) and to have noncommunicable diseases (45) at a younger age. Obese children

also have a direct, increased risk of disease (46), and they often suffer from stigmatization (47). Given the rapid increase in the prevalence of childhood obesity, the health consequences are likely to be underestimated. For most noncommunicable conditions resulting from obesity, the risks depend partly on the age of onset and duration of obesity. Obese children suffer from both short-term and long-term health consequences.

Dietz & Robinson (48) have reviewed these in detail, and they are summarized here. Obesity has social consequences related to the stigmatization of obese children and adolescents, resulting in clearly diminished chances of social and economic performance in adult life. The health consequences include an increased risk for metabolic abnormalities, such as type 2 diabetes (49), and non-alcoholic fatty liver disease (50) and sleep-associated breathing disorders (51), such as obstructive sleep apnoea syndrome (52).

Cook et al. (53) showed that 4% of adolescents and nearly 30% of overweight adolescents in the United States met the criteria for the metabolic syndrome. This has important implications for their future risk of type 2 diabetes and cardiovascular diseases. In addition, obese adolescents also have an increased risk of hepatic steatosis, gallstones, hypertension, sleep apnoea and orthopaedic complications. Very few studies have examined the long-term effects, but results from these studies suggest that they are similar to those in obese adults (54). Also, fatty liver disease has long been recognized as a feature of childhood obesity, and the presence of fatty fibrosis in liver tissue appears to be linked to the duration of obesity, rather than the extent (55).

Table 2.2 shows an estimate of the number of children likely to be affected by several metabolic effects of obesity in the 25 countries belonging to the EU in 2004. This indicates the worrisome risk of noncommunicable disease to which children are exposed as a result of excess body weight.

**Table 2.2. Estimated numbers of children aged 5.0–17.9 years with obesity-related disease indicators in the EU, 2006**

Indicator	Obese children	
	Lowest likely prevalence (%)	Lowest likely number affected (millions)
Raised triglycerides	21.5	1.09
Raised total cholesterol	22.1	1.12
High LDL cholesterol	18.9	0.96
Low HDL cholesterol	18.7	0.95
Hypertension	21.8	1.11
Impaired glucose tolerance	8.4	0.42
Hyperinsulinaemia	33.9	1.72
Type 2 diabetes	0.5	0.027
Metabolic syndrome (3 indicators) <sup>a</sup>	23.9	1.21
Metabolic syndrome (4 indicators) <sup>b</sup>	4.6	0.13
Hepatic steatosis	27.9	1.42
Elevated aminotransferase	12.8	0.65

<sup>a</sup> Metabolic syndrome was defined as having a number of the following indicators: hypertension, central adiposity, raised HDL blood cholesterol, raised blood triglycerides, raised blood glucose levels.

<sup>b</sup> The age range is 10.0–17.9 years.

Source: Lobstein & Jackson-Leach (56).

combines estimates of the number of years of life lost due to premature death and those spent suffering disability and disease. DALYs reflect the number of years of healthy life lost due to early death, disability or disease. James et al. (26) calculated DALYs in people aged 30 years and over worldwide that could be attributed to a BMI over 21 kg/m<sup>2</sup> (Table 2.3). For the European Region as a whole, they calculated that excess body weight causes the loss of nearly 12 million years of healthy life in adults each year.

### Preventing weight gain in all BMI ranges

Most of the relationships presented in this chapter have dealt with obesity defined as a BMI of  $\geq 30$  kg/m<sup>2</sup> or even higher values, and compared with a reference category of a BMI of 18.5–24.9 kg/m<sup>2</sup>, but this underestimates the total burden of disease due to excess weight. Studies that included categories with lower BMI values than

### Burden of disease

Obesity is clearly related to increased mortality, morbidity and disability rates, as discussed in this chapter. Because obesity has a stronger relationship with morbidity and disability than with mortality, focusing on the first two is more relevant. Despite its relationship with mortality, obesity is still related to an increased number of unhealthy life-years, as has been calculated from a cohort of Finnish adults followed for 15 years (57). Innovative methods are needed to calculate the number of unhealthy life-years in a lifetime after the onset of obesity, taking account of changes in treatment protocols for obesity and its co-morbidities and hence changes in survival rates. While the relationship between smoking and mortality clearly shows the impact of smoking on health, the impact of obesity may most clearly be seen in its relationship with morbidity and disability and through the composite measure of the disability-adjusted life-year (DALY).

To compare the disease burden attributable to different sources, it is convenient to use a measure that

**Table 2.3. Burden of disease in DALYs (per 1000 population) from diseases caused by excess weight (BMI > 21 kg/m<sup>2</sup>) in adults aged 30 years and over, WHO European Region**

Subregion	DALYs								
	Osteo- arthritis	Colon cancer	Post- menopausal breast cancer	Endometrial cancer	Type 2 diabetes	Stroke	Ischaemic heart disease	Hypertensive disease	Total
Eur-A	348	185	127	66	876	619	1271	166	3658
Eur-B	176	46	35	37	401	559	1304	306	2864
Eur-C	266	95	66	69	526	1291	2741	208	5262

Source: James et al. (26).

30 kg/m<sup>2</sup> also showed clearly increased relative risks. Chan et al. (58) and Carey et al. (59), for example, showed that relative risks of diabetes start to increase in men and women with a BMI level above 21 kg/m<sup>2</sup>, and Field et al. (11) found the relationship between BMI and the risk of developing a number of noncommunicable diseases was evident above a BMI of 22 kg/m<sup>2</sup>. These increased risks in relatively low BMI categories demonstrate the importance of preventing weight gain in all ranges. They also suggest that the total burden of disease among overweight, non-obese adults may be considerable, because more Europeans have a BMI of 25.0–29.9 kg/m<sup>2</sup> than a BMI of ≥ 30 kg/m<sup>2</sup>. Even if overweight people run a lower relative risk than obese people, the fraction of disease attributable to overweight may be as high, as if not higher than, that due to obesity.

In conclusion, the continuing epidemic of obesity can be expected to be associated with further reductions in life expectancy and large increases in the number of unhealthy life-years. Given the significance of the duration and extent of obesity, the current rapid rise in the numbers of obese children is likely to lead to a substantial increase in the burden of noncommunicable disease experienced in virtually all countries in the WHO European Region, resulting in considerable demands on health services.

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### 3. Economic consequences of obesity

#### Main messages

- Obesity is associated with high health care costs and economic productivity losses. Further costs are associated with people who are overweight but not obese.
- Cost estimates differ among studies, owing mainly to the data and methods employed: for example, single-year versus lifetime estimates.
- Obesity prevention programmes may reduce short-term health care costs, but their effect on longer-term costs is not known.

Becoming overweight or obese has economic consequences. These include the direct costs of health services, the indirect costs associated with lost economic production and individual costs, such as the purchase of so-called slimming products. This chapter summarizes the main findings in the literature on the subject and notes some methodological issues.

In recent years, numerous studies have tried to estimate the economic consequences of obesity. Most describe the medical costs associated with obesity (direct costs), while some also describe costs due to lost productivity (indirect costs). There is less scientific evidence on individual costs borne by obese people and their families, such as spending on domestic care, special clothing or slimming products.

#### Health care costs

Studies of the economic effects of obesity use a variety of approaches to estimate the health care costs (see the Conclusion). Table 3.1 summarizes the main evidence, showing estimates of direct costs for particular years (cross-sectional estimates) (1–19). Most studies provide rough estimates that do not allow for a comparable breakdown of expenditure on certain types of care, such as hospitalization, medical examinations and drugs, although some specific data are available, such as those provided for England, United Kingdom (Table 3.2).

Table 3.1 shows that health expenditure per person attributable to obesity ranged between US\$ 32 and US\$ 285. Studies in the WHO European Region indicate that, in general, the direct health care costs of obesity account for 2–4% of national health expenditure (9). Much of the variation in these figures results from differences in estimation methods, definitions of obesity, population structures and systems of health care.

Calculations in the United States indicate that, in comparison with people of normal weight (BMI of 20.0–24.9 kg/m<sup>2</sup>), obese people (BMI above 30 kg/m<sup>2</sup>) had 36% higher annual health care costs and overweight people (BMI of 25.0–29.9 kg/m<sup>2</sup>) had 10% higher annual health care costs (20). The cumulative costs of several major diseases, measured over eight years, showed a close link with BMI. For men aged 45–54 years with a BMI of 22.5, 27.5, 32.5 or 37.5 kg/m<sup>2</sup>, the cumulative costs were US\$ 19 600, US\$ 24 000, US\$ 29 600 and US\$ 36 500, respectively. Of course, the premature death of obese people may partly reduce lifetime costs, but they may also be greater at older ages, as the cumulative effects of prolonged obesity become apparent (21).

The indirect costs of obesity are associated with lost productivity: absence from work due to ill health or premature death. Estimates of such losses in England (Table 3.2) indicate that these costs could amount to twice the direct health care costs. Indirect costs are further discussed below.

One of the reasons for the recent increases in the cost of obesity, such as shown in Table 3.2, is the rising cost of treatment using prescription drugs. Fig. 3.1 shows the dramatic rise in the cost of anti-obesity drugs in England after 1998, following the licensing of orlistat for obesity treatment. During the period 1998–2002, the number of prescriptions for orlistat alone rose from 18 000 to over 540 000 (8).

An alternative approach to estimating the health care costs of obesity is to use individual data. Quesenberry et al. (15) estimated costs of obesity to members of a health maintenance organization at US\$ 92 (PPP) per member. Estimates were also provided for France (2) and Japan (13), using individual data. One finding of the Japanese

Table 3.1. Estimated economic costs of obesity according to available studies

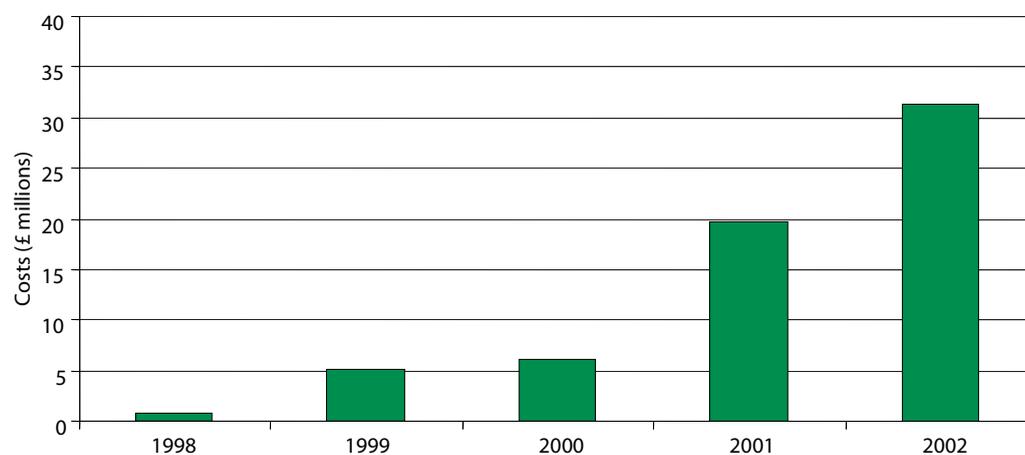
Country (study)	Year of estimate	BMI criterion (kg/m <sup>2</sup> )	Cost			
			Type	Per capita (in US\$ at PPP <sup>a</sup> )	Share of total current expenditure on health (%)	Share of GDP <sup>b</sup> (%)
<b>In the WHO European Region</b>						
Belgium (1)	1999	≥30	Direct	69	3	–
France (range) (2)	1992	≥30	Direct	71–148	0.6–1.3	–
France (3)	1992	≥27	Direct	202	1.8	0.9
Germany (range) (4)	2001	≥30	Direct	17–35	1.2–2.6	0.1–0.3
			Indirect	17–38	–	–
Netherlands (5,6)	1993	≥30	Direct	32	1.7	–
Sweden (7)	2003	≥30	Direct	45	1.8	0.7
			Indirect	157	–	–
Switzerland (4)	2001	≥25	Direct + indirect	186	–	0.6
United Kingdom (England, range) (8)	2002	≥30	Direct	NA <sup>c</sup>	2.3–2.6	–
EU (15 countries) (9)	2002	≥30	Direct + indirect	NA	NA	0.3
<b>Outside the WHO European Region</b>						
Australia (range) (10)	1995–1996	≥30	Direct	28–51	1.7–3.2	–
Canada (11)	1997	≥27	Direct	49	2.4	–
Canada (12)	2001	≥30	Direct	41	1.6	0.4
			Indirect	70	–	–
Japan (13)	1995–1998	≥30	Direct	55	0.2	–
New Zealand (14)	1991	≥30	Direct	26	NA	–
United States (15)	1994	≥30	Direct	92	2.7	–
United States (16)	1995	≥30	Direct	263	7.3	–
United States (17)	1995	≥29	Direct	194	5.4	–
			Direct + indirect	371	–	1.4
United States (18)	1998	≥25	Direct	285	7.1	–
United States (19)	2000	≥30	Direct	199	4.8	1.2
			Indirect	183	–	–

<sup>a</sup> PPP = purchasing power parity. PPP controls for differences in purchasing power, which means that a dollar may have more value in terms of consumption in one country than in another.

<sup>b</sup> When both direct and indirect costs have been calculated in the same study, the total cost as percentage of gross domestic product (GDP) is the sum of both direct and indirect costs.

<sup>c</sup> NA = not available.

Fig 3.1. Costs of prescriptions for anti-obesity drugs in England, 1998–2002



Source: adapted from House of Commons Health Committee (8).

study is interesting: while the prevalence of obesity is relatively low, the associated costs approximated the average costs in other countries.

Other studies have estimated the additional health care use and cost per obese person. Sturm (22), Finkelstein et al. (18) and Thorpe et al. (23) all found health care costs for obese people to be around 35% higher, mainly because of higher medication use and costs.

The costs of different obesity treatment regimes have also been considered. Narbro et al. (24) studied the consequences of surgical and conventional obesity treatment and found, after six years, no significant change in total medication costs for obese people. Wolf (25) added that the long-term effects of treatment contain a large amount of uncertainty, and there is thus no clear evidence on the economic consequences of obesity treatment.

The studies mentioned all addressed the cost of obesity, mostly measured by a BMI of  $\geq 30$  kg/m<sup>2</sup>. Some also estimated the health care costs of pre-obese people (mostly using a BMI of 25–29.9 kg/m<sup>2</sup>). The relationship between overweight and health care needs and costs is less pronounced (20,24,26), but these costs are likely to be significant, given that the total numbers of pre-obese people in the population are generally at least as high as the numbers of obese people. Quesenberry et al. (15) showed that pre-obese people aged 20–60 years had higher health care costs than normal-weight people, while neither pre-obesity nor obesity was significantly associated with increased costs in the elderly. For all ages, overweight people had increased costs for pharmaceuticals, but not other components of outpatient services, such as minor surgery and radiology.

### Case study: health care costs of overweight in the Netherlands

The Netherlands has built up a tradition in cost-of-illness research. Cost-of-illness figures for 2003 were assigned to lifestyle and risk factors using population attributable risks for the Dutch population aged 20 years and older (27).

Table 3.3 shows that the largest contributors to health care costs in the Netherlands are smoking, high blood pressure and overweight (BMI over 25 kg/m<sup>2</sup>). Overweight was associated with 2.0% of total health care costs, or about €1 billion; the total health care budget was €59.5 billion. The numbers in Table 3.3 should not be added together. First, adding up the population attributable risks would result in double counting, because these risks overlap. Second, the various individual risk factors and lifestyles, such as physical inactivity and overweight, interact in a variety of ways.

Fig. 3.2 shows the distribution of smoking- and overweight-related health expenditure for different

**Table 3.2. Estimated cost of obesity in England, United Kingdom, 1998 and 2002**

Cost category	Cost (£ millions)	
	1998	2002
<b>Treating obesity</b>		
GP consultations	6.8	12.0–15.0
Ordinary admissions	1.3	1.9
Day cases	0.1	0.1
Outpatient attendances	0.5	0.5–0.7
Prescriptions	0.8	31.3
Total	9.5	45.8–49.0
<b>Treating obesity's consequences</b>		
GP consultations	44.9	90–105
Ordinary admission	120.7	210–250
Day cases	5.2	10–15
Outpatient attendances	51.9	60–90
Prescriptions	247.2	575–625
Total	469.9	945–1075
<b>Indirect costs</b>		
Lost earnings due to attributable mortality	827.8	1050–1150
Lost earnings due to attributable sickness	1321.7	1300–1450
Total	2149.5	2350–2600
<b>Total cost of obesity</b>	<b>2628.9</b>	<b>3340.8–3724.0</b>

Source: adapted from House of Commons Health Committee (8).

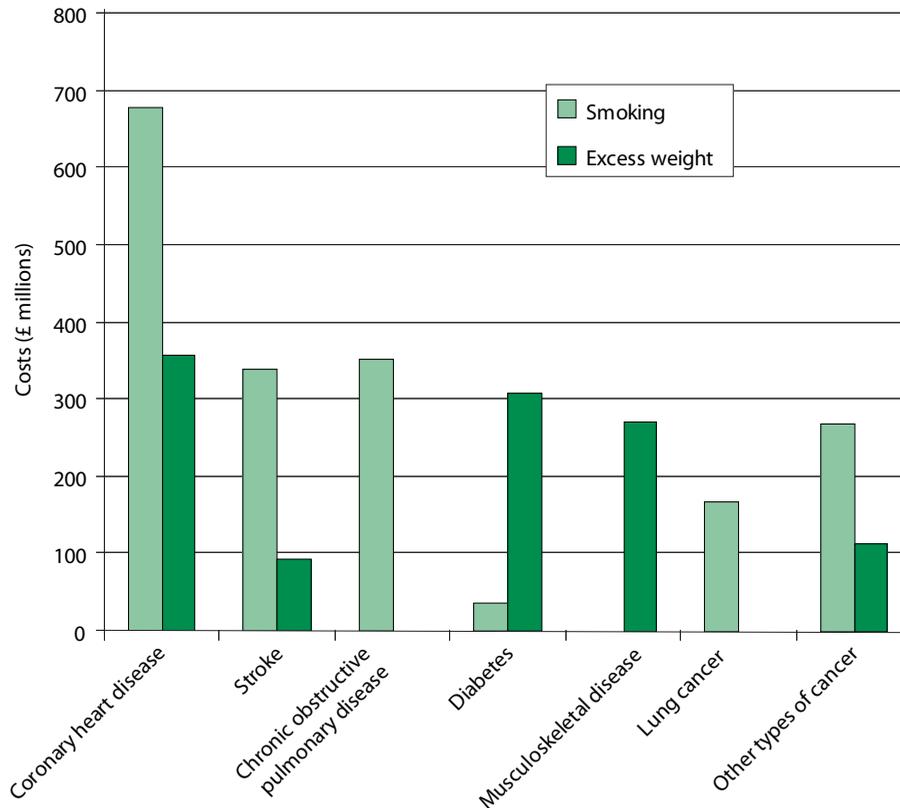
**Table 3.3. Health care costs due to selected risk factors in the Netherlands**

Risk factor	Share of total health care expenditure (%)	Cost (€ millions)
Smoking	3.7	2129
Overweight (BMI > 25 kg/m <sup>2</sup> )	2.0	1151
Physical inactivity	1.4	805
Alcohol consumption	0.4	230
<b>Nutrition</b>		
Excess fat consumption	0.2	115
Insufficient fruit consumption	0.8	460
Insufficient vegetable consumption	0.3	173
Insufficient fish consumption	0.9	518
Cholesterol	0.7	403
High blood pressure	3.3	1898

Source: Baal et al. (27).

diseases in the Netherlands. By far the largest amounts were spent on coronary heart disease, stroke and chronic obstructive pulmonary disease, the latter being particularly due to smoking. In addition, overweight resulted in substantial costs for diabetes and musculoskeletal disease.

Fig. 3.2. Health care costs of smoking and overweight (BMI over 25 kg/m<sup>2</sup>) by specified disease in the Netherlands, 2003



Source: Baal et al. (27).

The high costs associated with obesity and unhealthy lifestyles demonstrate that savings may result from health promotion and prevention, at least in the short term. An important caveat, however, should be made. People who adopt healthier lifestyles will gain health and in general add years to their lives. In the short term, they will be healthier and, since they will need less health care, these costs will decrease. In the long term, they will live longer and suffer from other diseases (such as dementia) later in life, some of which are associated with frequently used and costly care. The effect of prolonging life eventually results in more costly diseases, so the later costs may surpass the initial savings. This analysis illustrates the importance of a dynamic approach that includes the whole life-course.

### Indirect costs

While several studies have estimated the direct costs of obesity, very few have estimated the indirect costs. Most of these, have estimated the number of work days lost, and either omitted or roughly estimated the monetary value (26,28–32). The most important lesson from all these studies is that obese people have a higher risk than others of being absent from work. The real effect of this higher absence, however, depends on:

- the situation in the labour market, because absent employees might be replaced by unemployed people, thereby reducing indirect costs (friction cost approach); and
- the structure of the social security system, such as employers' payments to employees during illness.

Estimates in the United Kingdom suggest that the indirect costs considerably exceed the direct costs. Table 3.2 combines all the estimates of the cost of obesity in England for 2002 (£3.3–3.7 billion) and compares them to the 1998 figure (£2.6 billion). Part of the increase was due to the recognition of new co-morbidities in the analysis and part due to increased drug costs, drug take-up and availability, higher medical staff costs and higher earnings in the economy as a whole, as well as an increase in the number of obese people.

Figures from Sweden show a similar pattern, with indirect costs three times the direct costs (Table 3.1). Estimates for Germany and the United States, however, do not show such large differences, possibly because the organization of the health services leads to higher costs in these countries.

The total direct and indirect annual costs of obesity in 2002 in the 15 countries that were EU members before May 2004 were estimated to be €32.8 billion (9). Including pre-obese adults and the health consequences of increased BMI in children and adolescents would increase this figure.

Table 3.1 also indicates costs expressed as a proportion of the gross domestic product (GDP). The total costs of obesity (direct and indirect) have been estimated to be as high as 0.9% of GDP among countries in the EU, 1.2–1.4% in the United States, 1.1% in India and 2.1% in China, thus suggesting that the effect may be more pronounced in low-income economies (33).

## Conclusion

This overview shows that:

- the estimated health care and employment costs of obesity vary widely; and
- methodological issues matter, since different approaches lead to different estimates.

For example, one approach assesses and values all health care uses for a specific disease or risk factor, while another assesses the health care uses by groups of people with different BMIs. The disease-based approach can lead to overestimation of costs through double counting and thus an over-optimistic prediction of the savings to be made through obesity prevention. Care must be taken with the individual-based approach, because the cohort's characteristics may have a significant effect on treatment and because the data are strictly time limited, while treatment practices evolve rapidly and the cohort ages as it is followed.

Other issues need attention. The definitions of overweight and obesity and degrees of extreme obesity need to be standardized. The various costs to the health service need to be elaborated, assessed under different types of treatment outcome (such as weight loss, modest weight gain, treatment failure or early death, and possibly the lowest direct cost) and compared across different categories of patient (differentiated by age, socioeconomic status and gender).

A recent article by Flegal et al. (34) illustrates the importance of a suitable and improving methodology. The authors estimated the relative risks of mortality for different weight levels, and demonstrated that small differences in relative risks can result in a substantially different number of deaths attributable to obesity, as well as influencing estimations of lifetime costs. They also used and promoted a correction for confounding factors, such as age and healthy behaviour.

Abundant evidence indicates that obesity and other risk factors have economic consequences. Obesity is associated with higher health care costs, at least in the short term, and a higher risk of absence from work and subsequent productivity losses.

The prevention of overweight and obesity can lead to short-term health care savings and potentially to larger savings resulting from economic productivity. The long-term health savings are not known; prevention will result in the postponement or replacement of disease, not its elimination. Nevertheless, obesity prevention programmes will almost certainly lead to both short- and long-term gains in economic productivity.

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## 4. Physical activity, sedentary behaviour, physical fitness and obesity

### Main messages

- At least two thirds of the adult population of the EU countries are insufficiently physically active for optimal health benefits.
- The health benefits of regular, moderately intense physical activity, such as decreased risk of mortality from cardiovascular diseases, seem to apply to all people, regardless of their weight.
- There is only moderately strong evidence that lower physical activity levels and increased sedentary behaviour are associated with greater body weight gain over time.
- Current recommendations on physical activity that enhances health suggest that half an hour of moderately intense physical activity on most days of the week yields major health benefits for inactive populations. For effective prevention of overweight and obesity, at least an hour of daily activity is recommended.

### Definitions and assessment

#### Physical activity

Physical activity is usually defined as “any body movement produced by skeletal muscles that results in a substantial increase over the resting energy expenditure” (1). It usually refers to the movement of large muscle groups, as when moving the whole body. Physical activity’s main characteristics are intensity, duration and frequency and its main settings are leisure, work, home and transport.

At the population level, habitual physical activity is usually assessed using questionnaires, because these can be administered to large numbers of people at a relatively low cost. Such questionnaires can be administered by the subjects or by trained interviewers in face-to-face meetings or by telephone. Questions pertain to predefined categories of physical activity based on the setting or intensity (moderate, vigorous). The data collected concern the so-called usual level of activity or the activity performed in the past 7 days or 12 months. To translate data on physical activity into energy-expenditure values, compendiums of energetic cost for various activities are used (2). The results are often expressed in metabolic equivalents (METs) – that is, multiples of resting energy expenditure (1 MET is about 3.5 ml/kg/min oxygen).

#### Physical exercise and physical fitness

Exercise is defined as “a subset of physical activity that is planned, structure[d], and repetitive, done to improve or maintain one or more components of physical fitness” (1). Physical fitness is “a set of attributes that people have or achieve that relates to their ability to perform physical activity” (1) or a physiological state; it is clearly distinguished from physical activity and exercise, which are different types of behaviour. Health-related fitness includes morphological, muscular, motor, cardiorespiratory and metabolic components (1). Cardiorespiratory fitness relates to the ability of the respiratory and circulatory systems to provide the muscles with oxygen during physical activity. Cardiorespiratory fitness is a direct measure of overall physiological performance and the ability to adapt to physical stress. Muscular strength is another overall measure.

Cardiorespiratory fitness, cardiovascular fitness, aerobic fitness, aerobic capacity, aerobic power, maximal oxygen consumption ( $\text{VO}_2 \text{ max}$ ) and fitness all refer to the same concept. This chapter uses the term cardiorespiratory fitness. Cardiorespiratory fitness can be expressed in terms of subject weight (ml/kg/min), according to fat free mass (ml/min/fat free mass), in absolute terms (l/min) and with a correction factor (ml/min/kg<sup>0.7</sup>), or in METs.

Thus, people with a cardiorespiratory fitness of 42 ml/kg/min also have an energy expenditure capacity of 12 METs: that is, they can increase their resting energy expenditure twelvefold. Although laboratory tests are very accurate, they have low feasibility in large population studies, owing to the need to test instruments and

have qualified staff, and the costs and time involved. Many field tests based on performance in walking have been developed, especially for middle-aged and elderly populations. The 2-km UKK Walk Test, which involves a brisk walk on a hard, even surface, has been shown to be reliable, valid and feasible for population assessment (3).

### Physical inactivity and sedentary behaviour

Physical inactivity and sedentary behaviour are less clearly defined than habitual physical activity and health-related fitness. Physical inactivity refers to low levels or the absence of physical activity. It represents the lower end of the activity spectrum. Sedentary behaviour includes a number of occupations that have in common too little energy expenditure. Watching television or videos – that is, time spent in front of a screen or, more generally, time spent sitting daily – is a commonly used indicator of sedentary behaviour. A sedentary lifestyle may include one or more weekly sessions of intentional exercise, which may be more common among people with more education. Thus, sedentary behaviour does not represent the opposite of physical activity, but corresponds to a complementary dimension of behaviour. The distinction between physical activity and sedentary behaviour has implications for both assessing and preventing obesity and related diseases (4).

### Global trends: minor changes, large effects

The gradual increase in body weight that leads to overweight and obesity is the long-term consequence of a sustained positive energy balance: when energy intake exceeds expenditure. Changes in energy balance can result from changes in food intake and/or levels of physical activity. Even minor changes in activity and/or intake can have appreciable effects on body weight and the prevalence of obesity (5). Identifying which specific physical activity (and diet) patterns contribute to the risk of weight gain and subsequent overweight and obesity in the population, however, is a challenge. These patterns and their changes over time may be difficult to capture with existing survey methods used at the population level.

### Societal trends

Although changes in patterns and levels of physical activity have been difficult to assess, large shifts are generally understood to have occurred in physical activity, food intake and meal patterns, particularly in the last two decades. In general, these rapid and global changes include (6):

- a shift away from energy-intensive occupations, such as agriculture, towards service-sector occupations;
- concurrent reductions in the level of physical activity in each occupation; and
- changes towards reduced energy expenditure in the type of transportation used and leisure activity patterns.

Economic analyses of time allocation in the United States over the past four decades indicate that people spend more time in leisure and travel or transportation and less in productive activities, whether at work or at home (7). Interestingly, these data show that leisure-time industries outpaced GDP growth for both active (such as sporting goods and gyms) and sedentary (such as spectator sports and cable television) industries, although industries associated with sedentary lifestyles displayed the fastest growth (7).

### Importance of the asymmetry in appetite control

Physical inactivity alone does not cause obesity, but weight gain occurs when energy intake is not reduced to match the low energy needs of an inactive or sedentary lifestyle. Physiological research gives evidence of a powerful interaction between inactivity and energy-dense diets that produces a gain in body weight. Prentice & Jebb (8) suggest that physically active people are more likely to have energy needs above the so-called normal food supply, and their energy homeostasis relies on efficient hunger signals; inactive people, however, tend to have energy needs below the norm for food consumption, so their energy homeostasis relies on physiologically inefficient satiety signals. In relation to weight control, the importance of physical activity and sedentary behaviour must be viewed from the perspective of this asymmetry in appetite control, which favours passive overconsumption of energy-dense diets (8).

## Physical activity recommended for health

### Cardiorespiratory fitness, physical activity and common noncommunicable diseases

Cardiorespiratory fitness has been established as one of the most important independent predictors of all-cause mortality and, in particular, of cardiovascular death, irrespective of body weight. This has been reported both for healthy people and those with cardiovascular diseases (3,9).

Physical activity patterns over recent weeks or months partially determine cardiorespiratory fitness. Constitutional factors are also determinants, however: about 40% of the variation in cardiorespiratory fitness has been suggested to be attributable to genetic factors (10). Nevertheless, regular moderate-to-vigorous physical activity can lead to improvements in cardiorespiratory fitness at any age.

A large body of evidence documents the effects of regular physical activity on health, which include decreases in mortality from all causes, cardiovascular mortality and morbidity (including coronary heart disease), and the risks for colon and breast cancer and type 2 diabetes (9,11,12). This evidence-based knowledge has led to public health recommendations on physical fitness.

### Recommendations on fitness

The American College of Sports Medicine (ACSM) has issued several recommendations on exercise to improve fitness. A 1978 position statement (13) recommended the following characteristics of exercise for the development and maintenance of cardiorespiratory fitness in healthy adults: “intensity of 60–90% of maximal heart rate reserve ..., or 50–85% of maximum oxygen uptake ( $VO_2$  max), with a frequency of 3–5 days/week, a duration of 15–60 min per session, and activities requiring the involvement of large muscle masses”. ACSM updated this statement in 1990 (14), recommending a similar intensity, frequency and mode of exercise, but slightly increasing the duration to 20–60 min per session. The new statement also recommended the development of muscular strength and endurance, and pointed out that health benefits could be obtained from exercise performed more frequently and for a longer duration, but at lower intensities than prescribed for cardiorespiratory fitness.

ACSM issued its most recent recommendation for maintaining and developing cardiorespiratory and muscular fitness and flexibility in 1998 (15). It calls for continuous or intermittent aerobic activity 3–4 times a week, at an intensity of 55–65% to 90% of maximum heart rate and for a duration of 20–60 min.

### Recommendations on enhancing health

While the ACSM recommendations were designed primarily to maintain and develop cardiorespiratory and musculoskeletal fitness, recommendations designed to strengthen health began to emerge during the 1990s.

In 1995, the United States Centers for Disease Control and Prevention (CDC) and the ACSM issued a joint recommendation (16): “Every US adult should accumulate 30 minutes or more of moderate-intensity physical activity on most, preferably all, days of the week.” The main points of this landmark recommendation were adopted almost verbatim in the United States Surgeon General’s report in 1996 (9):

The most recent recommendations advise people of all ages to include a minimum of 30 minutes of physical activity of moderate intensity (such as brisk walking) on most, if not all, days of the week. It is also acknowledged that for most people, greater health benefits can be obtained by engaging in physical activity of more vigorous intensity or of longer duration.

WHO and the International Federation of Sports Medicine (17) soon endorsed these recommendations:

Adults should be encouraged to increase habitual activity gradually, aiming to carry out every day at least 30 minutes of physical activity of moderate intensity, e.g., brisk walking and stair climbing. More strenuous activities such as slow jogging, cycling, field and court games (soccer, tennis, etc.) and swimming could provide additional benefits.

These early recommendations of health-enhancing physical activity differ – in terms of intensity, frequency and daily activity pattern – from the previous recommendations focusing on fitness. For example, the recommended moderate intensity – that is, 50–69% of maximal aerobic power – is relatively low and includes brisk walking for most inactive individuals. It also has an upper ceiling, which aims to prevent injuries and other

health risks due to very intense activity. Further studies have shown that most types of walking, from casual walking to work to fast exercise-type walking, improve aerobic fitness and yield metabolic health benefits among previously inactive middle-aged men and women.

Another distinctive characteristic of health-enhancing physical activity is its high frequency. While the fitness-oriented prescription includes rest days in between exercise days to allow proper recovery from bouts of exercise, the physical-activity recommendation calls for daily activity. Still another special feature is accumulation: the total daily activity, which can be broken into several bouts. The evidence for this is still developing, but several studies suggest that the half hour of daily activity can be divided into two or three shorter bouts (18).

The new moderate-intensity concept of health-enhancing physical activity incorporates physical activity into the lifestyle, taking place not only during leisure time but also during occupational and domestic work and transportation. This lowers the threshold for inactive people to become active and extends the potential for increased activity and the concomitant health benefits to wider segments of the population, beyond those interested and capable of vigorous exercise and sports.

### Levels of physical activity across Europe

Bodies such as WHO have recommended the development of comparable national physical activity surveillance systems to monitor trends within and between countries. Measuring health-related physical activity at the population level, however, is difficult. Until now, the lack of well-standardized measurement instruments has impeded these efforts, but new methodologies have been developed, such as the International Physical Activity Questionnaire (19,20).

### Eurobarometer study, 2002

A Eurobarometer study collected data on the 15 EU countries in 2002, using the International Physical Activity Questionnaire (19,20). It repeated the survey for the 25 EU countries in 2005 although data were not available at the time this book was written. Comparable data on other European countries, including newer EU countries, are therefore still lacking.

Table 4.1 uses data from the first study to show the prevalence of so-called sufficient total activity, based on the recommendations on health-enhancing physical activity, frequent walking and sitting. The study used the amount of time spent sitting per day as a proxy measure of sedentary behaviour. Table 4.1 shows that nearly

Table 4.1. Prevalence of sufficient total activity, walking and sitting time across EU countries, 2002

Country	Prevalence (%)		
	Sufficient total activity (95% CI) <sup>a</sup>	Walking for 30 minutes 5 times a week (95% CI)	Sitting for 6 hours a day (95% CI)
Austria	26.2 (23.4–29.1)	35.2 (32.2–38.3)	36.8 (33.6–40.0)
Belgium	25.0 (22.4–27.7)	25.3 (22.6–28.0)	41.2 (38.2–44.3)
Denmark	34.1 (31.1–37.1)	47.6 (44.4–50.8)	55.6 (52.4–58.7)
Finland	32.5 (29.6–35.4)	43.0 (39.9–46.1)	48.5 (45.4–51.6)
France	24.1 (21.5–26.7)	30.2 (27.4–33.1)	33.9 (30.9–36.8)
Germany	40.2 (37.9–42.4)	42.0 (39.7–44.2)	43.4 (41.2–45.7)
Greece	37.0 (33.9–40.0)	34.7 (31.7–37.6)	36.5 (33.5–39.5)
Ireland	29.0 (26.2–31.8)	40.3 (37.2–43.3)	33.4 (30.4–36.3)
Italy	25.8 (23.0–28.6)	39.7 (36.6–42.9)	47.2 (44.0–50.3)
Luxembourg	36.3 (32.3–40.3)	35.6 (31.6–39.7)	42.8 (38.7–46.9)
Netherlands	44.2 (41.1–47.3)	26.6 (23.8–29.4)	48.2 (45.1–51.3)
Portugal	33.1 (30.1–36.2)	28.7 (25.7–31.7)	23.5 (20.8–26.2)
Spain	25.2 (22.4–28.1)	51.3 (48.0–54.5)	36.3 (33.1–39.3)
Sweden	22.9 (20.2–25.5)	34.6 (31.6–37.6)	48.1 (45.0–51.3)
United Kingdom	28.7 (26.3–31.2)	33.9 (31.3–36.4)	33.9 (31.3–36.4)
<b>All</b>	<b>31.3 (30.6–32.1)</b>	<b>36.8 (36.0–37.5)</b>	<b>40.6 (39.8–41.4)</b>

<sup>a</sup> CI = confidence interval.

Source: adapted from Sjöström et al. (20).

69% of the EU are at the low end of the physical activity scale, thus inactive. The most active countries were the Netherlands and Germany, and the least active, Sweden. Further, Table 4.1 shows that regular walking was most prevalent in Spain, Denmark, Finland, Germany and Ireland. The prevalence of sitting for six hours or more a day was highest in Denmark (56%) and lowest in Portugal (24%). Of the seven most active countries, based on the prevalence of sufficient activity (the Netherlands, Germany, Greece, Luxembourg, Denmark, Portugal, Finland), five showed relatively high rates of sitting.

The Eurobarometer study also provided important information on sociodemographic variables related to levels of physical activity in EU Member States (Table 4.2). For example, males were 1.6 times more likely than females to be sufficiently active, according to total weekly activity, and slightly more likely to sit for at least six hours a day. There was no gender difference in regular walking.

The relationship between age and sufficient physical activity varied across the outcome measures examined. The likelihood of sufficient activity decreased with age, while that of sitting for six hours or more a day was highest in the middle-aged group. There was no age relationship with regular walking.

**Table 4.2. Association between sociodemographic variables and physical activity (adjusted odds ratios (OR) with 95% CI) in the EU, 2002**

Sociodemographic variable	Sufficient total activity		Sedentary		Walking for 30 minutes 5 times a week		Sitting for 6 hours a day	
	Adjusted OR	95% CI	Adjusted OR	95% CI	Adjusted OR	95% CI	Adjusted OR	95% CI
<b>Gender</b>								
Female	–	–	–	–	–	–	–	–
Male	1.57	1.46–1.68	0.82	0.76–0.88	0.97	0.91–1.04	1.17	1.09–1.25
<b>Age</b>								
15–29 years	–	–	–	–	–	–	–	–
30–54 years	0.78	0.72–0.85	1.26	1.14–1.38	1.02	0.94–1.11	0.64	0.59–0.70
> 55 years	0.42	0.37–0.46	1.99	1.79–2.21	1.03	0.93–1.13	0.88	0.80–0.97
<b>Education</b>								
≤15 years	–	–	–	–	–	–	–	–
16–19 years	1.18	1.06–1.30	0.76	0.69–0.84	1.13	1.03–1.24	1.11	1.01–1.22
≥ 20 years	1.03	0.92–1.15	0.76	0.68–0.84	1.08	0.98–1.20	1.68	1.51–1.86
<b>Location</b>								
Small town	–	–	–	–	–	–	–	–
Town	0.95	0.86–1.05	0.96	0.87–1.06	1.18	1.07–1.30	1.09	0.99–1.20
Large town	0.83	0.74–0.92	1.05	0.95–1.17	1.13	1.02–1.24	1.42	1.28–1.57
City	0.93	0.84–1.02	0.87	0.78–0.95	1.25	1.14–1.38	1.63	1.49–1.79
<b>Country</b>								
Belgium	1.07	0.87–1.33	2.83	2.30–3.48	1.00	–	1.95	1.59–2.40
Denmark	1.75	1.43–2.15	1.24	0.99–1.55	2.72	2.24–3.31	3.04	2.47–3.74
Germany	2.27	1.89–2.72	1.31	1.08–1.59	2.10	1.77–2.49	2.08	1.72–2.50
Greece	2.00	1.63–2.45	1.89	1.53–2.35	1.59	1.31–1.94	1.61	1.31–1.98
Italy	1.14	0.92–1.41	2.22	1.80–2.75	1.98	1.63–2.41	2.68	2.19–3.28
Spain	1.09	0.87–1.35	1.82	1.46–2.26	3.20	2.63–3.89	1.61	1.31–1.98
France	1.01	0.82–1.25	3.37	2.74–4.15	1.26	1.03–1.53	1.31	1.06–1.62
Ireland	1.23	1.00–1.52	2.34	1.89–2.90	2.02	1.67–2.45	1.39	1.13–1.72
United Kingdom	1.31	1.08–1.60	2.49	2.04–3.04	1.50	1.25–1.81	1.47	1.21–1.79
Luxembourg	1.92	1.51–2.43	1.40	1.09–1.81	1.75	1.39–2.20	2.19	1.74–2.76
Netherlands	2.62	2.14–3.20	1.00	–	1.11	0.91–1.36	2.55	2.08–3.13
Portugal	1.59	1.28–1.98	1.58	1.26–1.97	1.30	1.06–1.60	1.00	–
Finland	1.61	1.31–1.97	1.30	1.05–1.62	2.25	1.86–2.73	2.44	1.99–2.99
Sweden	1.00	–	2.10	1.70–2.60	1.57	1.29–1.91	2.32	1.89–2.85
Austria	1.12	0.90–1.39	2.27	1.83–2.81	1.69	1.39–2.06	1.76	1.43–2.17

Note. Rows with missing data are the reference groups. In the country analysis, the reference country was the one with the lowest prevalence for each activity measure.  
Source: adapted from Sjöström et al. (20).

In addition, intermediate educational level was related to a higher likelihood of being sufficiently active physically than was low and high educational level. The size of the residential community was related to all activity measures. People living in large towns were less likely than those living in small towns, towns and cities to be sufficiently active. Regular walking increased with increasing size of towns, and sitting increased in a dose–response manner with the size of town.

In summary, the Eurobarometer study provides unique cross-country comparisons of population levels of health-enhancing physical activity by using a new measurement tool designed for the purpose. The findings suggest that two thirds of the adult populations of EU countries in 2002 were insufficiently active for health benefits. Countries vary widely, however, with about three quarters of the population being insufficiently active in several. These observations indicate a need for urgent action to promote health-enhancing physical activity across Europe, and particularly in the least active. The lack of EU-wide data on health-related fitness is also remarkable. Suggestions have been made to include cardiorespiratory fitness in the European health monitoring system for the adult population (21).

### Health Behaviour in School-aged Children study

Since 1982, the WHO Regional Office for Europe has sponsored Health Behaviour in School-aged Children (HBSC), a cross-national, school-based study of young people's health-related attitudes and behaviour. Its first objective is to monitor risky behaviour and attitudes over time, to provide background and identify targets for health promotion initiatives, particularly for physical activity. It uses a questionnaire, which is periodically revised.

The 1997/1998 HBSC survey included a question on how many hours a week and how often young people had strenuous physical activity in their free time. The 2001/2002 survey introduced revised questions that focused on physical activity of at least moderate intensity for at least 60 minutes, carried out at school and/or in free time, in the previous and in a usual week. This screening measure (moderate-to-vigorous physical activity) represents a more reasonable method of assessing participation in overall physical activity and the achievement of the current guidelines (22). The survey (22) showed that young people are active for an hour or more for 3.8 days a week on average. Rates of physical activity were highest in Austria, the United Kingdom (England), Ireland and Lithuania and lowest in Belgium (Flemish), France, Italy and Portugal. Boys were active more often than girls: on average, 4.1 days and 3.5 days per week, respectively. About a third of all young people (34%) did not meet the current recommendation of one hour or more of at least moderate-intensity physical activity on five or more days a week. More boys (40%) than girls (27%) met the recommendation. In addition, the frequency of physical activity and the proportions meeting the current guidelines declined with age, particularly among girls. Harro et al. (23) recently summarized HBSC data from the Baltic countries and Finland.

## Health effects of physical activity and fitness

### Effects on body weight

#### Ecological, European and longitudinal studies

Ecological data are scarce. In one widely cited study (24), the increasing prevalence of obesity in the United Kingdom from 1950 to the mid-1990s was observed in parallel with increasing levels of indicators of sedentary behaviour, such as the number of cars per household or hours spent viewing television. Limited causal inference can be drawn from this type of data, however.

Very few EU-wide population surveys have assessed physical activity/inactivity levels in relation to weight outcomes. In a series of papers from a pan-European survey, which included representative samples of about 1000 adult subjects from the fifteen-member EU, low participation in leisure-time physical activity was inversely associated with the prevalence of obesity, while the amount of time spent sitting during leisure was positively associated with BMI, independent of leisure-time physical activity (25). Two different definitions of sedentary lifestyle were used:

1. spending less than 10% in leisure activities over 4 METs; and
2. no leisure-time physical activity reported and being over the median (6 hours a week) for time spent sitting during leisure.

Both indicators of sedentary behaviour were positively associated with obesity (26). The number of hours spent sitting at work was also found to be positively associated with obesity (27).

In various population groups, a large number of cross-sectional studies show an inverse (and expected) association between habitual physical activity and indicators of obesity (28–31). People who are overweight or obese display lower levels of cardiorespiratory fitness than those of normal weight (32). The few longitudinal cohort studies (28–31) suggest that higher levels of physical activity may attenuate weight gain over time. In quantitative terms, one additional hour of brisk walking per day was associated with a decrease of about 25% in the risk of obesity (BMI over 30 kg/m<sup>2</sup>), as indicated by a six-year follow-up of women from the Nurses' Health Study (33). Considering activities from daily living, a five-year follow-up study in men showed an inverse association between walking or cycling to work and weight gain over time (34). Whether there is a gender difference in the relationship between low levels of physical activity and body weight, however, gain remains insufficiently documented (30).

### Inactivity and weight gain: no simple relationship

Although thinking that physically inactive people are more likely to gain weight over time is intuitively appealing, the direction of causality can be questioned, as overweight people may find physical activity to be more difficult, uncomfortable or embarrassing. A Danish study recently documented that increases in body weight preceded an increase in leisure-time physical inactivity (35). The direction of the relationship between physical activity and weight gain is therefore less easy to demonstrate than might commonly be thought. In addition, very few studies have used an objective assessment of physical activity, such as that provided by accelerometers or heart-rate recordings. Such measures would indeed be needed to address in more detail the issue of dose (of physical activity) and response (weight gain) (31).

Few studies of obesity and physical activity levels have taken account of dietary intakes (4,36). A six-year prospective study of Swedish women demonstrated an interaction between habitual physical activity and energy or fat intake, with greater weight gain being associated with greater energy or fat intake only in the less active group (37). The amount of physical activity needed to prevent gaining or regaining weight obviously depends on the habitual food intake among the population in question. This means that the nutritional context must be considered. Recommendations made, for example, for North American populations might therefore not be directly applicable to Europeans. This is not because the physiology of exercise would differ between different populations, but because energy output takes place at a different level of intake.

Evidence from prospective studies documents the importance of the amount of time dedicated to sedentary occupations, as a separate behaviour from physical activity or inactivity, in relation to weight gain. A recent report from the Nurses' Health Study showed that two hours of additional television viewing was associated with a 25% increased risk of becoming obese during six years of follow-up (31). This association was independent not only of habitual physical activity but also food intake. Part of the influence of sedentary behaviour on body weight gain, however, is likely to be mediated through associations of sedentary pursuits with other health behaviours, such as smoking and alcohol intake, which tend to cluster.

### Children and adolescents

High cardiorespiratory fitness during childhood and adolescence has been associated with a lower percentage of body fat and a healthier cardiovascular profile (38,39), while childhood adiposity is associated with an unfavourable lipid profile (40). A recent review of the available evidence (41) indicated that data from prospective studies suggest that increased physical activity and decreased sedentary behaviour protect against weight gain in childhood and adolescence. The magnitude of the effects identified, however, was considered small. Interestingly, there is some indication that physical activity in childhood and adolescence may be associated with body composition in adulthood (31). Some longitudinal studies have suggested that low cardiorespiratory fitness during childhood and adolescence is associated with later cardiovascular risk factors, such as hyperlipidaemia, hypertension and obesity (42).

All these findings suggest that preventive measures should begin early in life.

## Effects independent of body weight: prevention

### Type 2 diabetes

A major health consequence of obesity is type 2 diabetes. A comprehensive lifestyle intervention, including advice for regular physical activity, has been shown to delay the onset of type 2 diabetes in people at risk (43). A more recent analysis of this intervention study indicated that moderate physical activity alone is associated with a substantial reduction in the risk of diabetes (44). These findings suggest that an increase in lifestyle physical activities can substantially reduce the disease burden on populations.

Low cardiorespiratory fitness was recently shown to be a strong and independent predictor of new cases of metabolic syndrome in both men and women (45), which could be one of the mechanisms for an increased risk of cardiovascular disease with low fitness level. Moreover, cardiorespiratory fitness seems to be associated with decreased mortality, regardless of the level of body weight or the presence of metabolic syndrome, in men (46).

### Cardiovascular diseases

The health benefits of at least moderate-intensity physical activity seem to apply to all people, regardless of their weight (47,48). Data from several studies indicate that overweight or obese people who are physically active or have moderate-to-high levels of fitness have decreased risks of death from all causes and cardiovascular diseases, compared with those who are inactive and unfit. Regular physical activity may thus increase longevity in overweight or obese people, independent of their weight status or loss.

### Effects on the management of overweight

Weight reduction is primarily a clinical issue. From a public health perspective, the focus should be on preventing of weight regain after weight loss (5,29). Physical activity is recognized as a major component of the management of overweight or obesity. The importance or magnitude of the beneficial effects of physical activity in this context differs according to the outcome examined.

Physical activity appears essential for weight maintenance after diet-induced weight loss, rather than for weight loss per se. It is also important for the preservation of fat-free mass during weight loss. Physical activity has beneficial effects on fitness and reducing obesity-related complications, such as cardiovascular diseases and diabetes. Most data suggest that total volume of physical activity, rather than its intensity, is important for managing weight.

## Amount of physical activity needed to prevent obesity

### Primary prevention: preventing weight gain

There is no definite consensus on the amount of physical activity required to prevent weight gain at the population level, and the shape of the dose–response curve is not clear. This is a complex issue, especially in view of the difficulty of matching energy intake with energy expenditure in times of readily available food and low levels of habitual physical activity (47).

Rather than addressing weight management specifically, the recommendation of the United States Surgeon General (9) and CDC/ACSM (16) of 30 minutes of moderately intense physical activity on most days of the week focuses on the dose that would reduce the risk of several noncommunicable diseases (47). A 2003 consensus statement by the International Association for the Study of Obesity (30) acknowledged the important contribution of 30 minutes of moderate daily physical activity to health, even in overweight or obese people. Nevertheless, this dose might be insufficient to prevent weight gain over time by some people. For them, additional physical activity (with increased duration and/or intensity) or decreased energy intake is recommended (29,30).

### Secondary prevention: preventing weight regain

While consensus is lacking on the amount of physical activity needed to prevent weight regain, there is an indication that adults would need 60–90 minutes of moderately intense activity, or smaller amounts of vigorously intense activity, to avoid regaining weight (29,30).

## Monitoring physical activity and obesity: the next steps

Monitoring physical activity at the population level is a major part of the public health response to current

concerns about the obesity epidemic. Standardized methods of surveillance are required, however, to make better assessments of current physical activity levels and trends over time, better plans for public health interventions using physical activity and better monitoring of their effects in preventing and controlling obesity. Such monitoring systems should allow the identification of vulnerable groups, such as people of low socioeconomic status, that are at increased risk of low cardiorespiratory fitness, low physical activity levels and increased rates of obesity.

In addition, environmental factors that encourage greater physical activity must be better understood and described. Large-scale use of objective monitoring of physical activity needs to be further explored, for the better delineation of the dose–response curve of body weight outcomes. Moreover, research is required to define the value of implementing a health-related fitness assessment in the framework of European health monitoring systems. Finally, steps should be taken to provide comparable data on food intake and physical activity levels, given the evidence that both contribute to the obesity epidemic, so that the interaction between the two can be assessed in more detail.

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## 5. Dietary determinants of obesity

### Main messages

- Dietary intake is a critical determinant of body weight, but methodological difficulties in accurately assessing habitual intake confound the analysis of specific dietary determinants of obesity.
- Excess weight gain only occurs when energy intake exceeds energy expenditure over a prolonged period.
- Data from diverse sources suggest that diets with high energy density (high in fat or sugar and low in fibre), sugar-rich drinks and large portion sizes each increase the risk of consuming excess energy.
- Breastfeeding in infancy and consuming a traditional diet such as the “Mediterranean diet” may be associated with a decreased risk of obesity, while regular consumption of fast food may increase the risk of weight gain.
- Strategies for preventing obesity are consistent with dietary recommendations for preventing many chronic diseases.

### Introduction

People’s energy intake must exceed their energy expenditure over a prolonged period of time for them to become obese. The relative importance of intake versus expenditure is much debated, and may vary between individuals and at different stages of life. Nevertheless, in practice the relationship between intake and expenditure is crucial (1). People may be in energy balance at high or low levels of activity, but only if energy intake is accurately regulated to match energy requirements. Understanding the dietary determinants of obesity therefore requires identifying the dietary factors that hinder the body in achieving energy balance at any given level of energy expenditure.

Methodological problems confound observational analysis of the links between diet and obesity. Most self-reporting dietary surveys consistently underreport energy intake and, by implication, other nutrients, and the magnitude of the error is significantly greater among obese people (2). To address this problem, many studies adjust for differences in energy intake between individuals. As a result, relatively few report the relationship between total energy intake and the risk of obesity, although this variable is clearly important in causing weight gain.

Identifying the role of a specific nutrient or food is difficult since many dietary factors are highly correlated and physical activity or other lifestyle traits may provide additional confounding. Cross-sectional studies are confounded by post hoc effects, in which dietary differences between individuals arise as a consequence of obesity, rather than causing it (sometimes called reverse causality). Body weight is the integrated product of a lifetime’s diet and exercise habits, and nutrients, food or broader dietary habits measured on a few occasions may therefore not be related to the longer-term development of obesity. Unfortunately, dietary intervention studies to verify putative causal links are also challenging, and there are few large, well-controlled, randomized trials.

Developing a dietary strategy for preventing obesity must therefore draw on evidence from diverse sources, including prospective observational studies, evidence of plausible mechanisms, efficacy and effectiveness trials and, ultimately, rigorous evaluation of policy implementation and outcome (3).

This chapter provides an overview of the main research findings on the dietary determinants of obesity. A full systematic review of the literature with more detailed information on individual studies was recently prepared as part of the second expert report of the World Cancer Research Fund International (4). This chapter focuses mainly on prospective observational studies linking nutrients, food types or dietary patterns to weight change or obesity risk. Cross-sectional associations have largely been excluded, given the potential for reverse causality. Few intervention studies are available. Of these studies, this chapter focuses on the more highly controlled interventions that seek to provide evidence of the efficacy of dietary interventions, rather than the broader effectiveness. Chapter 13 provides further details on effectiveness. Data from mechanistic studies are provided where they give supportive evidence to explain associations between dietary factors and obesity.

## Nutrients

### Energy (including energy density)

Basic physiological principles state that habitual energy intake must exceed expenditure for weight gain to occur. Nevertheless, relatively few cross-sectional or prospective studies have demonstrated that higher absolute energy intake is related to an increased risk of weight gain (5). This probably results from the widespread underreporting of energy intake and a failure adequately to account for differences in energy needs. Curtailing excess energy intake overall is still a critical issue for developing policy in relation to preventing and treating obesity.

In recent years, attention has focused on the energy density of the diet: energy per unit of weight. Short-term experimental studies have consistently shown that covert increases in the energy density of the diet lead to increases in spontaneous energy intake (6,7). The mechanism of this effect is unclear but may operate at all levels of the appetite-control system, including early gastric distension, the modulation of gut hormones and post-ingestion metabolic effects. There are few large surveys of the relationship between energy density and weight gain. Although some cross-sectional studies have found links between energy density and obesity (8), others show no such relationship (9). There are only two prospective studies. The first, in adults, found no association between energy density and weight gain (10), but a study among 7-year-old children has shown that an increase in dietary energy density of 1 kJ/g increased the odds of being overweight two years later by 23% (11).

### Fat

Dietary fat provides about one third of total energy intake in most high-income countries, and there has been considerable debate on its role in causing obesity (12,13). Dietary fat is readily stored as body fat with minimal energy costs of conversion. Fat is less satiating than isoenergetic quantities of other nutrients, and habitual consumption of a high-fat diet may downregulate some elements of the appetite-control system, favouring decreased satiety. Early mechanistic studies noted a phenomenon described as high-fat hyperphagia, in which people on high-fat diets tended to consume excess energy (14). Today this effect is usually ascribed to the higher energy density of these diets relative to carbohydrate or protein, rather than the fat content per se (15,16).

Data from prospective studies are inconsistent (17). Many find no association, while others observe that high-fat diets are associated with weight gain. In practice, the limitations of epidemiological studies may preclude clear associations. A meta-analysis of ad libitum high-fat versus low-fat intervention studies at least two months long has shown modest weight reduction on the low-fat regimen (18). This effect is attributed to a decrease in total energy intake, rather than a specific effect of fat reduction, but may still provide a useful approach for weight control. A recent large dietary intervention study, the Women's Health Initiative, showed that, over 7.5 years, reductions in the proportion of energy derived from fat were associated with reductions in body weight, with a linear dose-response association, suggesting that this is a valuable public health intervention to control body weight (19).

Different types of fat have different metabolic effects, and this may extend to differences in the risk of weight gain (20). There is less research on specific fat types, however, not least because of the difficulties in defining fatty acid intake. Animal studies suggest that saturated fatty acids may be preferentially stored while unsaturated fatty acids are more likely to be oxidized. If this has knock-on effects on appetite control, it may provide a plausible mechanism for effects on weight gain and would imply that saturated and *trans* fatty acids may be a specific risk factor for obesity.

### Carbohydrate

The proportion of carbohydrate in the diet tends to vary reciprocally with fat, since protein intake is small and relatively consistent. Segregating the impact of the total carbohydrate in the diet from that of total fat is difficult. Some studies show a protective effect of a high proportion of carbohydrate (21,22), while many others show no association (23,24), particularly studies in children.

Research on the effects of specific types of carbohydrate on body weight is growing. Many studies have shown an inverse association between fibre intake and weight gain, although the precise definition of dietary fibre is somewhat variable, and intervention studies also show that a high intake of dietary fibre may assist in losing weight (25). This may be related to the incomplete digestion and absorption of energy from this type of carbohy-

drate (26). In addition, the bulky nature of high-fibre food, with increased demands on chewing and subsequent gastric distension, may increase satiety and curtail energy intake. High-fibre food may also enhance satiation through delayed gastric emptying and the attenuation of postprandial glucose and insulin responses. It may also affect other gut hormones involved in appetite regulation, such as cholecystokinin. Increases in the intake of whole grains, primarily from food such as wholegrain breads and breakfast cereals, have also been associated with reductions in weight gain (27,28). This effect may be partly mediated by the fibre content of wholegrain food.

There is currently particular interest in the glycaemic index of the diet. One small prospective study of 572 people has reported a positive association between a high glycaemic index and weight gain (29). Experimental studies show that food with a low glycaemic index is associated with increased satiety and short-term reductions in energy intake (30), but longer-term intervention studies have failed to find differences in weight change on diets with a high or low glycaemic index when other dietary factors are well controlled (31).

The evidence relating the intake of sugar per se to weight change is inconsistent (32). This may be due in part to the various sources of sugar in the diet, including fruit and milk, as well as so-called added sugar. Analysis of food groups has suggested that high consumption of cereal products predicts weight loss in women (33) and a reduced rate of increase in BMI in children (34).

### Protein

In general, no association has been observed between protein intake at baseline and subsequent weight change in adults (21,22). In children the findings are mixed (35) and data are more difficult to interpret because protein may also have effects on growth with consequent changes in body composition. There are no data on the relative impact on body weight of consuming protein from animal or vegetable origin.

In experimental studies, protein preloads are associated with reductions in subsequent intake relative to iso-energetic quantities of other macronutrients, suggesting that protein may act as a satiety cue (36). The observation that protein is a critical determinant of food intake in insects and given priority over energy requirements has led to the protein-leverage hypothesis, which is currently being tested in humans (37). Increases in satiety, which promote improved compliance with a hypoenergetic diet, may in part explain the greater early weight loss associated with an increased proportion of protein in the diet in intervention studies for the treatment of obesity. The impact of different types of protein is unclear.

### Food groups

#### Fruit and vegetables

Given the emphasis placed on fruit and vegetables in dietary recommendations, surprisingly few studies have reported the relationship between fruit and vegetable consumption and weight change (38). Fruit and vegetables tend to have low energy density and are high in fibre, which may enhance satiety.

One large prospective study has observed that increasing fruit and/or vegetable intake was associated with a reduced risk of major weight gain ( $\geq 25$  kg) or becoming obese ( $\text{BMI} \geq 30 \text{ kg/m}^2$ ) (39). This is the only prospective study to identify an association with fruit alone. Another prospective study also found that increased consumption of vegetables was associated with a lower risk of obesity (40), but two found no such relationship (33,41). Only one prospective study focused on children; they were aged 9–14 years at baseline and followed for three years (42). In 8203 girls there was no association between obesity and the consumption of fruit or vegetables. In boys, vegetable intake was inversely related to changes in BMI z-score, but the effect was no longer statistically significant after adjustment for energy intake.

#### Nuts

Cross-sectional studies have suggested that the people consuming the greatest quantities of nuts have the lowest body weight, but prospective cohorts have not reported significant effects on weight change. Experimental studies involving the addition of small quantities of nuts to the diet do not result in weight gain, suggesting that there is good compensation for the additional energy consumed (43). This may reflect the satiating properties associated with the high protein content of nuts. It has also been suggested that nuts may be poorly digested, with significant unavailable energy.

## Meat

Two prospective studies found a positive association between meat consumption and weight gain (33,40), while two others found no such association (41,44).

## Milk and other dairy products

In recent years there has been some interest in the relationship between the consumption of milk and other dairy products and weight change. It has been hypothesized that dairy products may exert a protective effect on body weight either by calcium binding fat in the gut or by reducing circulating calcitriol and inhibiting lipolysis. Other bioactive compounds in dairy products are being investigated further.

Several prospective cohort studies have considered the relationship between milk and other dairy products on weight change, but only one has observed a relationship in adults. In a cohort of 17 369 adults in Germany, both men and women who lost weight over a two-year period reported a higher intake of milk and milk products than those who maintained their weight (33). Among women, however, weight gainers also consumed more dairy products than those of stable weight. There is similarly little evidence of a relationship in children, although a small study of 53 aged 2 years at baseline showed that mean intake of calcium over several periods of dietary assessment was inversely associated with body fat approximately three years later (45). A review of randomized controlled trials involving increased consumption of dairy products or calcium supplementation found little evidence to suggest a specific effect on body weight (46).

## Sugar-rich drinks

There has been interest in the consumption of sugar-rich beverages as a specific risk factor for obesity, since experimental studies suggest relatively poor compensation for energy consumed as drinks as opposed to solid food (47). In short-term intervention studies, energy consumed in liquid form appears to supplement habitual food intake, leading to increases in body weight (48–50).

A large prospective study among women in the United States that carefully questioned the type of beverage consumed showed significantly greater weight gain among women who increased their consumption of sugar-sweetened drinks from less than 1 to more than 1 serving per day (multivariate adjusted means 4.7 kg from 1991 to 1995 and 4.2 kg from 1995 to 1999) compared with those who decreased their intake (1.3 kg and 0.15 kg, respectively) (51). Increases in fruit juice consumption were also associated with weight gain relative to decreased fruit juice consumption. In contrast, increases in so-called low- or no-calorie drinks were associated with a reduction in weight relative to the subjects who decreased their intake of these drinks. Similar results were seen in a much smaller cohort of 548 adolescents followed for 19 months (52).

The data from two other prospective studies, however, are less clear. A study in Germany showed that men who either gained or lost large amounts of weight had higher intakes of soft drinks than the weight-stable group, but it included a diverse group of beverages including sugar-sweetened drinks, low- or no-calorie (“diet”) drinks containing artificial sweeteners, fruit juice and tap or mineral water. In the second study, among 1345 children aged 2–5 years with a relatively short eight-month follow-up period, no type of beverage was significantly associated with weight change (53). The consumption of sugar-sweetened and other types of beverages was inversely related, however, which is consistent with other studies suggesting that sugar-sweetened beverages may displace more nutritious fluids, such as milk, in the diets of young children (54).

## Alcohol

Many prospective studies examining the health effects of alcohol have considered its relationship with weight. In most cases alcohol intake and weight change are not associated (55). These epidemiological data remain controversial, given the parallels with sugar-rich drink consumption in terms of the poor satiating power of liquid energy, along with the disinhibitive and positive hedonic properties of modest quantities of alcohol.

These data may be less reliable than other associations between diet and obesity because of the known errors in acquiring information on alcohol consumption and the confounding caused by differences in other lifestyle traits (such as smoking and physical activity) between people who consume large, moderate or small quantities of alcohol.

## Dietary habits and behaviour

### Infant feeding practices

Substantial evidence indicates that breastfeeding offers a small but significant protective effect against later childhood and adolescent overweight (see also Chapter 6). Large-scale studies have shown elevated levels of overweight among children at school entry age (5 or 6 years old) who had been formula-fed as infants compared with the breastfed (56), with a dose-dependent effect according to the duration of breastfeeding. A sample of 32 000 preschool children showed lower prevalence of obesity among those who had been breastfed after adjusting for socioeconomic status, birth weight and gender (57). A longitudinal study found an elevated likelihood of obesity among children aged 2–6 years who had been bottle-fed; although mothers' smoking behaviour, BMI and socioeconomic status strongly influenced the risk of their children's being overweight, the difference between bottle- and breastfed babies remained after controlling for these factors (58).

There are several possible reasons for the link between feeding method and later adiposity: bottle-feeding may discourage appetite self-regulation, especially if the mother expects the standard bottle portion to be fully consumed at a feeding session. In addition, weaning practices from milk onto solid food may differ between mothers who breastfeed and those who bottle-feed, with earlier weaning and more energy-dense weaning food being introduced for the bottle-fed infant. Further, the nature of the weaning food may differ: there is some evidence that infants given formula may be less likely to consume vegetables and fruit and more likely to consume commercial infant drinks compared with infants who were breastfed (59).

### Eating patterns

In recent years, new statistical approaches have sought to define the overall nutritional features of the diet. Some dietary patterns can be linked to weight change; those characterized by food high in fat or sugar and relatively low in fibre have been associated with greater weight gain (60–62). There is some evidence that a specified dietary pattern characteristic of the Mediterranean diet – which includes high intake of vegetables, fruit, legumes, nuts and olive oil and moderate red wine consumption along with a reduced intake of meat and meat products and full-fat dairy products – may be associated with reduced weight gain (63,64), although the effect is not wholly consistent (65).

Conversely, dietary patterns characterized by fast food<sup>2</sup> may be linked to an increased risk of obesity. A few prospective studies have shown a consistent association between fast-food habits and increases in body weight (66–68). In the largest study – of 3031 people aged 18–30 years followed over 15 years – those reporting more than twice-weekly visits to a fast-food outlet gained an extra 4.5 kg compared with those reporting visits less than once a week (66).

Several mechanisms have been proposed to explain this association, especially the high energy density and large portion sizes of many items. These association studies are usually based on the frequency of visits to these outlets, however, rather than the actual food consumed. As such, they may indicate a broader lifestyle rather than representing a specific dietary risk factor, especially given the increasing diversification of food choices.

### Portion size

Dietary surveys provide no clear evidence that portion size is an important determinant of the risk of becoming obese. Portion size is difficult to judge, however, since the dietary assessment in many large cohorts relies on food frequency records rather than food diaries with individual estimates of portion size.

Short-term experimental studies have shown that larger portions of energy-dense food are associated with increased energy intake (69). Specifically, they have shown that both children and adults consume more at a single eating episode when offered larger portions of energy-dense food. Subjective reports of hunger and satiety are usually unaltered despite the higher energy intake, and people do not compensate completely at the next meal for the excess energy consumed. Conversely, a larger portion of a food with low energy density, such as a salad served at the start of a meal, can reduce overall energy intake at the meal (70). Taken together, these studies suggest that portion size is an important determinant of overall energy intake.

<sup>2</sup> Defined here as food such as hamburgers, pizza and fried chicken eaten outside the home in self-service outlets.

## Eating frequency

Many cross-sectional epidemiological studies suggest that more eating occasions are associated with lower body weight (71), but few prospective studies have considered this issue and the results are inconclusive (72,73). Experimental studies using isoenergetic diets have shown that eating frequency does not affect energy expenditure (74). The effect on body weight probably depends on the nature of the food consumed, rather than the number of eating occasions per se.

## Conclusion

Information from prospective cohort studies on the specific dietary determinants of obesity is limited. Basic physiological facts indicate that energy intake must exceed energy expenditure to result in obesity. Methodological limitations in the data mean that this fundamental point is often not identified within dietary data sets, but it is a critical issue for developing policy on preventing and treating obesity. Nevertheless, the evidence shows a clear trend towards a protective effect of diets containing a lower proportion of fat and a higher proportion of carbohydrate, especially those with more fibre. The magnitude of this effect is difficult to quantify because of limitations in the quality of the dietary data and variability across studies.

No conclusive evidence implicates any specific food group, although growing evidence suggests that breast-milk in infancy may moderately protect against overweight in childhood, while sweetened beverages and fast food may represent specific risk factors in children and adults. Plausible mechanistic data support these observations, since sugar-rich drinks tend to supplement rather than substitute for food energy, and fast food frequently has a high energy density that is associated with excess consumption. Sweetened beverages and fast food, however, may also indicate a broader dietary pattern or general lifestyle that is associated with obesity.

Data from studies of dietary patterns concord with these broad conclusions in terms of food and nutrient composition. In addition, large portion sizes of energy-dense food increase the risk of excess consumption, while the frequency of eating has not been shown specifically to contribute to weight change, independent of dietary composition.

These dietary determinants of obesity imply prevention strategies that are consistent with the strategies for preventing other chronic diseases such as cancer, cardiovascular diseases and diabetes. More highly controlled experimental intervention studies, however, are needed to assess the efficacy of dietary change on body weight and health. Further research is also required to examine the effectiveness of specific dietary interventions in wider population studies. Ultimately, the most effective strategies will need to balance the magnitude of the predicted effect on body weight and health with the probability of achieving dietary change, using the full range of instruments available to policy-makers.

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## 6. Effects of early nutrition on development of obesity

### Main messages

- Early undernutrition followed by relatively rapid growth predisposes children to central adiposity, which in turn is a major risk factor for heart disease and diabetes.
- Childhood adiposity carries through to adult adiposity, especially if the parents were also overweight.
- The period from preconception to around 24 months of age is critical to setting the foundation for lifelong health.
- Interventions should include measures to improve the nutritional status of women before and during pregnancy, especially for those of lower socioeconomic status.

At any stage of a person's growth and development, the height and weight achieved represent both aspects of previous nutritional history and the body's ability to respond to and cope with a range of environmental stressors. Disproportionate growth represents structural abnormality and marks the potential for abnormal function (1). The relationship between adiposity and ill health is better defined for adults than for children. At the extreme of weight for height in childhood, however, there is an increase in pathology – such as type 2 diabetes, high blood pressure and risk markers for vascular disease – that raises considerable concern (2–4). Also, the increasing evidence for tracking of BMI (the increasing propensity for obesity to persist as children grow older) and other markers of health risk have increased the confidence that this important relationship exists and has a use in identifying risk. This chapter traces the links between various nutritional factors early in life and the later development of obesity

### Three factors in the predisposition to obesity

Studies on three topics illustrate important factors that must be comprehended to understand the predisposition to obesity in the context of life-course events:

- the critical period of early pregnancy;
- intergenerational aspects of body composition and growth patterns in metabolic behaviour; and
- pregnancy during the early teenage years.

First, during the famine in the Netherlands in 1943/1944, called the winter of hunger, women exposed to hunger early in pregnancy had babies of normal size, while those exposed late in pregnancy had small babies. During adult life, however, the babies exposed early in pregnancy were more likely to develop obesity and other sequelae associated with metabolic syndrome than those exposed during later pregnancy (5,6). Exposure to a harsh nutritional environment at a critical stage during early development created a metabolic response in the unborn fetuses that predisposed them to increased risk of metabolic syndrome later. Thus, size at birth was indicative of most recent nutritional exposure and was not necessarily informative about nutritional exposure during a critical earlier period.

Second, it was possible to follow up 3033 men born in Helsinki during 1923–1933 and with excellent records on their mothers and their own health (7). Men who were thin at birth had a high risk of death from coronary heart disease. Moreover, those whose mothers had a high BMI had the greatest risk, but this effect was most evident for the sons of shorter women. Thus, men who were thin at birth and the sons of shorter, fatter women had the greatest risk of dying of heart disease: about five times that of the men larger at birth with thinner mothers (7).

The evidence from the studies in the Netherlands and Finland indicates that intergenerational aspects of body composition may be of great significance and that these patterns of growth reflect aspects of metabolic behaviour that are set early in the life-course (6,7).

Third, women who become pregnant in their early teens have not yet completed their own growth when they face the challenge of satisfying the demands of the growing fetus. Thus, there are competitive demands for meeting the mothers' needs and those of their babies. This competition embraces energy, such macronutrients as amino acids and essential fatty acids, and minerals and vitamins. Weight gain during pregnancy is an important determinant of fetal growth (8,9). To have babies of equivalent size to those of adult mothers, younger adolescent mothers must gain an additional 4 kg in weight, and in part this comes at the expense of gain in height (10–14). The weight gained is predominantly adipose, which is particularly difficult to mobilize after pregnancy, increasing the likelihood of obesity during adulthood.

In this situation, the demands for maternal growth represent a nutritional stress, but other competitive demands for nutrients may operate during pregnancy and make the partitioning of nutrients to the placenta and fetus difficult. These may be behavioural (such as alcohol consumption or smoking), social (such as social deprivation) and environmental (such as exposure to an infective environment) (15).

### Parental size and adiposity in offspring

In a healthy population, larger parents have larger babies, who in turn grow to become larger adults (16). Greater adult stature is generally associated with better health. In a less healthy situation, women with either low or high BMI tend to have smaller babies (17–19). In a frankly pathological situation, overweight women with poor glucose control or diabetes give birth to inappropriately large babies that suffer from fetal macrosomia: arbitrarily defined as a birth weight of more than 4 kg. Here an excess of adipose tissue, with a possible limitation in lean tissue growth, can account for babies' greater weight (20,21).

In general, the relationship between parental size and offspring's size during childhood is strong, but may weaken progressively during adolescence and middle age. Also, obesity is more common in people of lower socioeconomic status, where parental fatness is related to smaller size at birth (22). This raises the question of the extent to which the important factors are determined by shared genes, a shared environment or an interaction of the two. Within a life-course perspective, there is the added dimension of time and intergenerational or secular changes.

### Size at birth and later obesity

In this area of investigation, randomized controlled interventions are not carried out for ethical reasons. Most studies are observational, and size at birth is usually captured as birth weight, as there are too few other measures. Some unique data sets, however, such as those in Finland (see below), include much greater detail, which allows much more detailed characterization.

The evidence suggests a relationship between birth weight, BMI attained and levels of obesity in childhood and young adulthood, with the relationship being less strong during middle age (23,24). This relationship is often found to be linear and positive, but may be J or U shaped, indicating altered risk at the extremes (24). Also, birth weight is associated positively with lean body mass and negatively with relative adiposity. Thus the relationship between birth weight and overweight or BMI does not necessarily reflect an association with adiposity at higher levels of BMI. When the data are adjusted for aspects of current body size, fairly consistent evidence indicates a negative association between birth weight and central fat distribution; those of lower birth weight appearing disproportionately adipose and a greater proportion of this adiposity being centrally located (25).

### Infant feeding and later growth

#### Breastfeeding: selection and confounding by social class

Many authors have recently reviewed the data on patterns of infant feeding and later growth. Dewey (26) identified 11 studies of overweight in children older than 3 years, with more than 100 subjects in each feeding group. After controlling for potential confounders, children who had been breastfed were found to have a lower risk of overweight. Of the negative studies Dewey identified, many lacked information on the exclusivity of breastfeeding. Also, she found some evidence for a dose–response relationship for the duration of breastfeeding, but the biological effect appeared small. Arenz et al. (27) investigated the relationship between breastfeeding and childhood obesity through a systematic review of the literature and meta-analysis of 9 studies with more than 69 000 participants who met inclusion criteria. They found that breastfeeding reduced the risk of obesity by over 20%,

and four studies reported a dose-dependent effect, with breastfeeding appearing to confer a small but consistent protective effect against obesity.

Owen et al. (28) identified 70 eligible studies for systematic review. Breastfeeding was associated with a slightly lower mean BMI than formula feeding, with the mean difference being larger in 15 smaller studies (less than 1000 subjects) than in the larger studies. In 11 studies, however, the effect was abolished after adjustment for socioeconomic status, maternal smoking in pregnancy and maternal BMI. The authors concluded that, although breastfed babies have lower mean BMI, the difference is small and likely to be influenced by publication bias and confounding factors; thus, the promotion of breastfeeding is not likely to reduce mean BMI. Others have criticized this view, however, including Harder et al. (29,30), who carried out a meta-analysis of the duration of breastfeeding and risk of overweight based on 17 studies that met their inclusion criteria. Based on a meta-regression, the duration of breastfeeding was inversely associated with the risk of overweight, and a categorical analysis confirmed a graded relationship, with an OR ranging from 1 (for breastfeeding less than 1 month) to 0.67 (for 7–9 months' breastfeeding). Thus, each month of breastfeeding was associated with a 4% decrease in the risk of overweight.

Still another study of infant feeding and later growth followed repeated surveys, from 16 weeks' gestation to 8 years in a recent longitudinal birth cohort of 2087 subjects in Australia. At 1 year, infants breastfed more than 12 months were the leanest group. From 1 to 8 years, children breastfed less than 4 months had the greatest risk of overweight and the highest prevalence of maternal obesity, smoking and lower education. The authors that followed this cohort concluded that family factors may modify associations between breastfeeding and adiposity beyond infancy (31).

Finally, Salsberry & Reagan (32) sought to determine the dynamic processes that drive the development of childhood overweight. Using data on 3022 children, they explored the effect of prenatal characteristics and feeding in early life on weight at 7 years of age. The results indicated that, through an early tendency towards overweight, prenatal characteristics, race, ethnicity, maternal smoking during pregnancy and maternal obesity before pregnancy influence the child's weight.

### Rate of weight gain

Baird et al. (33) carried out a systematic review trying to differentiate the effect of feeding pattern on weight achieved from the effect on the rate of weight gain. They assessed the effect on subsequent obesity of size attained during infancy or growth, using the change in size during the first two years. Twenty-four studies met the inclusion criteria, of which twenty-two were cohort studies and two were case-control studies.

Eighteen studies assessed infant size; they showed that, when compared with non-obese infants, infants defined as obese or at the highest end of the distribution for weight or BMI had a relative risk of subsequent obesity ranging from 1.35 to 9.38. Of these 18 studies, most of the 10 studies where infant growth could be assessed showed that infants who grew more rapidly had an increased relative risk for developing obesity, ranging from 1.17 to 5.70. These associations were consistent for obesity at different ages and for people born over a long period, between 1927 and 1994. The authors concluded that infants who are at the highest end of the distribution for weight and BMI, or who grow rapidly during infancy, are at increased risk of subsequent obesity.

### Size in childhood and adult obesity

If obese adults tended to be obese earlier in their lives, those destined to become obese would be expected consistently to be among the most adipose at earlier ages. There is evidence for tracking of BMI for children and teenagers (BMI for age) into adulthood, but it is less strong for younger than for older children.

Whitaker et al. examined the probability of obesity (BMI > 30 kg/m<sup>2</sup>) in adults aged 25 years in relation to the presence or absence of overweight or obesity at different ages during childhood (34). In children aged 10–15 years, only 10% of those with a BMI for age below the 85th centile were obese at age 25, while 75% of those with a BMI above the 85th centile (and 80% of those with a BMI above the 95th centile) were obese as young adults. The predictive value of obesity was less in younger children; the proportion of children with a BMI for age above the 95th centile who were obese as young adults increased from 17% at birth, to 26% at 1–3 years, 52% at 3–6 years and 69% at 6–10 years.

Predictive power increases when parental obesity is taken into account (34). Thus, among obese children, the

likelihood of obesity as an adult was 8% for those aged 1–2 years without obese parents, but 79% for those aged 10–14 years with at least one obese parent. After adjustment for parental obesity, the ORs for obesity in adulthood associated with childhood obesity ranged from 1.3 for obesity at 1–2 years to 17.5 for obesity at 15–17 years. After adjustment for the child's obesity status, the OR for obesity in adulthood associated with having one obese parent ranged from 3.2 at 1–2 years of age to 2.2 at 15–17 years.

Other studies, conducted in differing racial groups and settings (35–42), support this pattern of obesity. This has led to the consensus view that, although a high BMI for age marks a risk of becoming obese as an adult, the risk increases proportionally with age, with the greatest risk observed in adolescents above the 95th centile of BMI for age. Children aged less than 3 years who have a BMI for age above the 85th centile (and who do not have obese parents) have a relatively low risk of obesity in adulthood. Among older children, however, a high BMI for age is an increasingly important predictor of adult obesity, regardless of whether the parents are obese. Parental obesity more than doubles the risk of adult obesity among both obese and non-obese children less than 10 years of age. There is some evidence that the effect of tracking may be more marked in girls (35,41) and African Americans (41,42). Nevertheless, many overweight or obese adults may have had a BMI for age below the 85th centile (or even the median) during childhood. Taken together, these observations suggest that, while it is important to consider interventions that may limit weight gain throughout the preschool and school years, particular care is required in applying a selected cut-off value of BMI for age in identifying either the risk for or the need for intervention in any individual child.

Power et al. (43) reviewed the literature that associated child fatness with adult fatness and identified a consistent pattern, and increasing numbers of studies identify the long-term health risks of child and adolescent adiposity (3,4,44,45). To an extent the issue is confounded by relative growth in height and weight and its relationship to the timing of puberty. Moreover, an impoverished environment is associated with a slower overall tempo of growth, delayed adolescence and later achievement of final adult size. For societies in transition, the factors that influence early growth lead to smaller size at birth and during infancy; during childhood, however, the relative abundance of food predisposes children to increases in body weight, without the commensurate increases in height. This tends to lead to shorter, fatter people, who are more likely to enter puberty of shorter duration at an earlier age. This also tends to lead to shorter, fatter adults with an increased risk of obesity if they become pregnant as teenagers, before completing their growth (46,47).

The complexity of these interactions challenges an understanding of the life-course approach, which conceptualizes health development as a lifelong, dynamic process in which genetic, biological, social and environmental factors interact to produce healthy states. Appropriate models are needed to study these dynamic effects (32) and to link prenatal characteristics with overweight development from birth, through childhood and adolescence, to adult life.

### **Diet in infancy and childhood as a cause of later adiposity**

Greater consumption of protein in earlier life has been suggested to predispose people to later adiposity. In France, for 151 children followed from 1 month to 16 years of age, adiposity increased during the first year and then decreased with a renewed increase at a later age, called the age of adiposity rebound. The rebound age related to final adiposity, with an earlier rebound being associated with greater later adiposity (48). When the growth of 112 French children was followed from 2 to 8 years, protein intake at the age of 2 was positively correlated with BMI and subscapular skinfold thickness at age 8. Rolland-Cachera et al. concluded that a high protein intake increased body fatness at 8 years of age, which was mediated through an earlier adiposity rebound (49).

A study in Iceland followed 90 healthy newborn babies up to 6 years of age. More rapid growth during infancy was associated with increased BMI at age 6 years, and, in boys, those with the highest protein intake had the highest BMI (50). A cohort study of 889 English children from birth to age 5 found no relationship between dietary protein (or any other aspect of the diet) and age of adiposity rebound. Parental obesity, however, was associated with an earlier rebound (51). In 142 Danish children, although protein intake at 9 months of age was associated with greater growth in length and weight, there was no relationship with adiposity or with the percentage of body fat at age 10 (52).

Metges (53) concluded that there is only weak epidemiological evidence that dietary protein in early postnatal life influences the development of adiposity in later life. The European early childhood obesity programme, in

a randomized double-blind intervention trial in 1150 infants in five centres, is testing the hypothesis that high early protein intake enhances the risk of later obesity (54).

### Evidence from Finland used to develop life-course models

Important retrospective cohort studies examined people born in Finland between 1924 and 1944 (55–64). They used detailed routine data of high quality that were kept on mothers and babies born in the university central hospitals and school health records preserved with detailed regular anthropometry, and these data were linked to the records maintained in the national database for all adults. This unique resource enabled the development of dynamic life-course models that relate patterns of growth to disease outcomes and the determination of the pathways of growth and development that differentiate people who later develop specific health problems. These investigations show that particular pathways of growth can be characterized that are distinctive and relate patterns of structural development to the risk of obesity, coronary heart disease, type 2 diabetes, hypertension and stroke.

By adulthood, the cumulative incidence of obesity in this population was 34.2% for men and 33.6% for women. The main variables that explained these figures were size at birth and childhood growth in height, weight and BMI. The incidence of obesity was greatest in those with the highest birth weight and the highest ponderal index (an index of body mass: 100 times the weight (in g) divided by the square of the height or the crown-to-heel length in newborn babies (in cm)) at birth. The childhood weight of those who later became obese exceeded the average at all ages, from 6 months to 12 years (55,56).

BMI in childhood was strongly related to maternal BMI, and males who had a BMI higher than average from 7 to 15 years, had an increased risk of death from coronary heart disease (57). Both men and women at risk of coronary heart disease were born small, grew poorly during the first year of life and tended to be thin at 2 years of age. During later childhood, however, they grew faster than expected, and the rate of gain in BMI during childhood was related more strongly to the risk of a coronary event than simply to the BMI attained (55,57–63). Females at risk of coronary heart disease as adults tended to be short at birth and to catch up in height during the first year, with a rapid increase in BMI during childhood (57,60,61). Males at risk as adults tended to have low birth weight, because they were thin at birth, and low weight, height and BMI at 1 year. Later, rapid weight gain, especially in those who were thinnest at birth, related to the risk of later coronary heart disease (55,58,59). Also, low weight at 1 year was a stronger predictor of risk than low birth weight (62).

The cumulative incidence of type 2 diabetes in the cohort was around 8% for men and 5% for women (64). The incidence increased with decreasing birth weight, birth length and ponderal index at birth. At 7 years, however, those who later developed diabetes had higher mean height and weight than the average, with accelerated growth to age 15. Children of both sexes whose mothers had a high BMI during pregnancy had more rapid growth during childhood and an increased risk of diabetes.

Together, these data indicate that, although higher birth weight is a predictor of higher adult BMI, it is associated with a lower risk of type 2 diabetes and coronary heart disease, compared with those who were born small or thin, grew poorly during the first two years of life and subsequently became overweight.

### Visceral adiposity as a risk factor

Low birth weight is very common in South-east Asia (15,65,66) and is associated with very high rates of type 2 diabetes and coronary heart disease, with a higher risk than for other population groups with the same BMI. In part, this has been attributed to BMI for this population's representing a different body composition: proportionately more adipose (particularly centrally adipose) and less lean tissues (especially muscle) (67). These differences are evident at birth and mark altered metabolic function from childhood. In a prospective population study of about 1500 people in India, in which growth measurements were taken frequently from birth, the prevalence of impaired glucose tolerance was 11% and that of diabetes was 4.4% at age 30. Those with impaired glucose tolerance typically had been thin up to age 2 years and had an accelerated increase in BMI, compared with the rest of the population, to age 12, although none was obese at 12 (68). This has been called the thin-fat phenotype, because of a disproportionate increase in relative adiposity, although the BMI may be within the range accepted for health in other populations (67).

This phenomenon may have implications for populations outside South-east Asia. Remarkably similar observations are found in men about 70 years of age from Hertfordshire, England, within the normal range of birth

weight. Those who were lighter at birth had increased later adiposity than those who were heavier at birth, and, when adjusted for height and weight, greater central adiposity (25). Although BMI has been a valuable marker of adiposity, it is not specific; measures of central fat deposits appear to be more specific indicators of the risk of noncommunicable disease.

Visceral adiposity, as marked by waist circumference, is a major risk factor for coronary heart disease and type 2 diabetes (69–71). The strong association between birth size and waist circumference in studies from India and the United Kingdom suggests that waist circumference may be a more appropriate marker than BMI alone for the life-course risk of ill health associated with adiposity. Worldwide, there is a graded and highly significant association between the risk of myocardial infarction and waist circumference. This association was sustained across a very wide range of BMI categories, from less than 20 kg/m<sup>2</sup> to more than 30 kg/m<sup>2</sup> (72).

## Conclusions

A convincing body of epidemiological data now shows that people who develop noncommunicable diseases grew differently from other people in utero and during childhood (60). Their likelihood of eventually developing coronary heart disease, hypertension or type 2 diabetes falls with increasing birth weight and rises with increasing BMI during childhood. Thus, although the body size achieved is important in marking the current state of health, the rate of growth that allows this state to be reached is of critical importance.

Compensatory growth after birth is indicative of a drive to achieve a person's genetic potential, but there are complex interactions between genotype and the nutrient environment that enables the acquisition of a particular phenotype. A person who fails to achieve adequate linear growth in utero or in early infancy has a higher risk of acquiring central adiposity. As nutritional considerations interact with behavioural, social and environmental factors to determine the force of their aggregate effect on health, so multiple factors interact to produce adverse effects in the most disadvantaged people.

The double burden of malnutrition – in which undernourishment early in life predisposes people to adiposity later in life – is clearly a feature of all societies to some degree (73). The evidence strongly indicates that obesity marks a metabolic state that has its roots early in life, and must be considered as part of an intergenerational response to substantial environmental change.

The policy implications of these observations are profound: the roots of causation are deep and sustained effort over extended periods will be required to achieve the best health possible for the greatest number of people. Not surprisingly, the people at greatest risk are the most disadvantaged in society.

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## 7. Dietary patterns in Europe

### Main messages

- In the last 40 years, food supplies have constantly increased throughout the WHO European Region, with a transient reduction in eastern countries in the mid-1980s.
- The proportion of energy derived from fat is higher than recommended in most countries and all age groups, while the availability of fruit and vegetables and the intake of dietary fibre are largely insufficient. This indicates an overall pattern of energy-dense diets throughout the Region.
- Groups with low socioeconomic status are likely to have an increased occurrence of dietary risk factors for obesity.

Knowledge of dietary patterns and their changes over time may help provide guidance on relevant interventions for tackling obesity. As noted in previous chapters, energy intake in excess of energy expenditure results in weight gain and ultimately leads to overweight or even obesity. This conclusion is in accordance with the WHO review (1) of dietary contributors to noncommunicable disease, which identified a range of health problems associated with diets rich in energy-dense foods, poor in dietary fibre and low in fruit and vegetable intake. This chapter focuses on the foods most closely identified with fostering obesity – fats, oils and sugars – and on those that counter it – fruit, vegetables and breast-milk for infants. Chapters 8 and 9 discuss environmental determinants of diet.

Three types of evidence are available for comparing food consumption patterns: nationwide surveys of individuals, household-based food availability data and national food supply data (Table 7.1).

### Comparing dietary patterns: three sources of data

The most readily interpretable and therefore valuable data sources are nationwide surveys of individuals, which provide data on food consumption and nutrient intakes by age and gender. Such data may stem from specific food consumption surveys, which usually employ dietary records or recall.

In addition, results from national food consumption surveys in 13 EU Member States, which collected information from children, adolescents, adults and the elderly, have been summarized (2). For adults, this information was supplemented by national sources from the literature (3–6) and for children, by a recently published inventory based on various local, regional and national surveys (7). Specific dietary indicators for children and adolescents are available from the 2001/2002 survey of the HBSC study, a cross-national WHO collaborative study (8). Information on breastfeeding rates is available from the European health for all database (9) and the EU Project on Promotion of Breastfeeding in Europe (10), which provides additional information from monitoring breastfeeding rates in 30 countries: the 27 now belonging to the EU, and Iceland, Norway and Switzerland. Further, large epidemiological studies that include populations from various European regions or countries may provide useful individual data. An important source is the European Prospective Investigation into Cancer and Nutrition (EPIC) study, which contains dietary data for populations in 10 European countries (11).

Household-based food availability data, stemming from household budget surveys, provide a second valuable source of information. The data food networking (DAFNE) project (12,13) works to harmonize the data collected in these surveys. The project has created a regularly updated food databank of comparable data from 16 European countries.

Third, national food supply data can be obtained from the food balance sheets compiled by the Food and Agriculture Organization of the United Nations (FAO) (14). These food production statistics are currently available from 1961 to 2003, although only recent data (from 1993 onwards) are available for some European countries. Supply data do not reflect actual intakes because supplies are considerably higher than actual consumption, but they provide some insight into food availability and its changes over time. For some countries, food balance sheets are the only data source available.

**Table 7.1. Advantages and disadvantages of three data sources for the evaluation and comparison of food consumption in the WHO European Region**

Data source	Advantages	Disadvantages
Individual surveys	Best reflection of individual consumption Data available on different sociodemographic population groups	Underreporting of energy intake Lack of standardization across countries, hindering comparisons Recent data not available for all countries
Household-budget surveys	Nationally representative and comparable data available for several countries Trend data available Data available for different sociodemographic population groups	Data at household level require individualization models to estimate age and gender differences Lack of data on eating out Lack of information on food wasted, left on the plate or given to pets
Food balance sheets	Data available on a yearly basis, showing trends in supply of foods	No reflection of food wasted at household level No differentiation between population groups, for example, by age or gender Because data for each country are collected differently, comparisons between countries need to be made with caution

## Food supplies

Fig. 7.1 shows long-term trends in overall food supply in western and eastern Europe and the newly independent states (NIS) of the former USSR (14). It shows that western Europe has experienced a net increase of about 1.7 MJ (400 kcal) per person per day in the supply of total food energy since the 1960s, much of which can be attributed to the rise in fats and oils, especially vegetable oils, during this period. Eastern Europe experienced an increase, in parallel with western countries, followed by a drop in the mid-1980s as a result of economic crisis and then another increase in the last 10 years. This increase is not clearly attributable to fats and oils or to sugar alone. For both regions, the supply of fruit and vegetables showed a marked increase, although the figures include fruit being extracted into syrups and concentrates for flavouring. Data for the NIS are only available for the last decade, during which time a clear trend is not discernable.

Table 7.2 indicates the daily per person supply of fat and oils, sugar, fruit, vegetables and total energy in countries. These data are not strictly comparable between countries, as the methods of collection can differ.

## Food availability and consumption

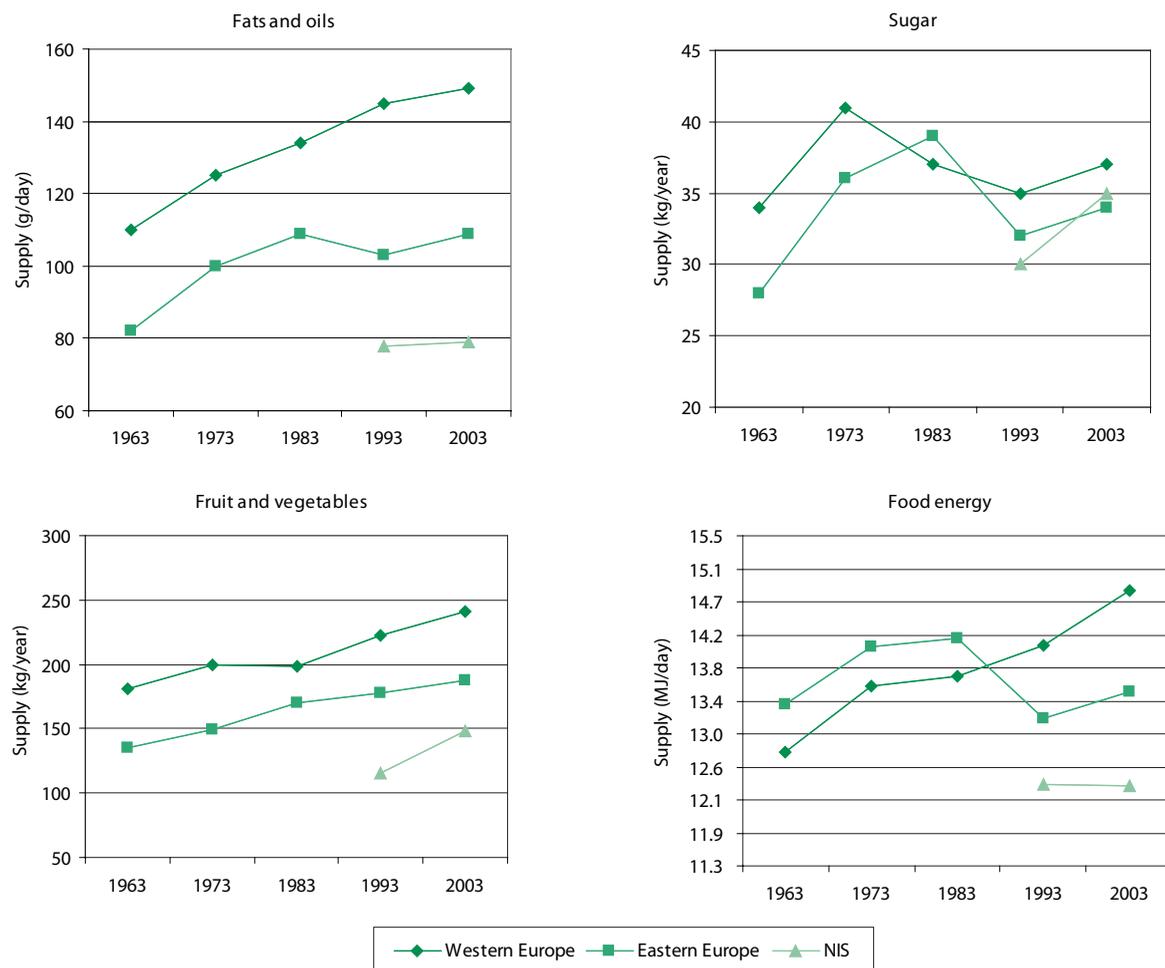
Using data on household food availability from the DAFNE project (15), Fig. 7.2 shows that, in all countries except Germany, Greece and Sweden, soft drink availability within the household has increased in the last decade. Nevertheless, one should note that this product group also contains so-called light drinks: those in which low-energy sweeteners replace sugar. Data from the EPIC study (16) indicate that the actual consumption of soft drinks is lower in southern Europe and considerably higher in males than females (Fig. 7.2).

Data from the HBSC study show a different regional pattern for children (Table 7.3). Among 11-year-olds, more than a third of boys and girls in England, Israel, Malta, Scotland and Slovenia report consuming soft drinks daily, while less than a tenth do so in many northern countries (8).

In many countries, the amounts of fruit and vegetables available at the household level are far below the recommended minimum of 400 g per day (1,16). In Finland, Ireland, Sweden and the United Kingdom, total availability of fruit and vegetables is less than 300 g per day, in contrast to Greece and Italy, where availability exceeds the WHO-recommended levels. The EPIC study also documents low consumption levels for some northern and western European countries (Fig. 7.3).

As to children, data collected through the HBSC study show that over 50% of girls and 40% of boys aged 11 years reported eating vegetables daily in Belgium, France, Israel and Ukraine (Table 7.3), in contrast to less than 20% of 11-year-old boys and girls in Hungary and Spain. In southern European countries (except Italy) and

Fig. 7.1. Food supply per person in the WHO European Region, calculated from food balance sheets, 1963–2003



Source: FAOSTAT [online database] (14).

Israel, more than half of the boys and girls indicate eating fruit on a daily basis, while only a quarter of the children indicate doing so in some northern countries (8).

A compilation of food consumption surveys allowed the estimation of individual intakes of fat and fibre by adults (aged 25–65 years) and adolescent and young girls (aged 15–18 and 8–9 years, respectively) in the European Region (Fig. 7.4 and 7.5). Since the reports used different age categories, the age ranges used in Fig. 7.4 and 7.5 represent the areas of overlap between studies.

Fig. 7.4 shows that the proportion of energy derived from fat in the diet of adults ranges from around 30% to more than 40%, while 15–30% is recommended (1). The highest proportions of energy from fat for adults were reported in Belgium and Greece, and for adolescent and young girls, in Greece and Spain. The lowest proportions of energy from fat for adults were reported from Norway, Portugal and Sweden, and those for adolescent and young girls, from Norway, the Russian Federation and Sweden. As scientific evidence accumulates on the differential impact of types of dietary lipids (saturated, monounsaturated, polyunsaturated and *trans* fatty acids) on health, informed policy decisions should consider the further insight gained from evidence on the type of lipid consumed in each country.

The WHO dietary recommendation for fibre is 25 g per day (1). With an average energy intake of about 10 MJ a day for men and 8 MJ a day for women, the recommended fibre intake is 2.5–3.1 g/MJ. Fig. 7.5 shows that, on average, fibre intake falls short of these amounts in most of the countries surveyed.

Table 7.2. Food supply per person per day in the WHO European Region, 2003

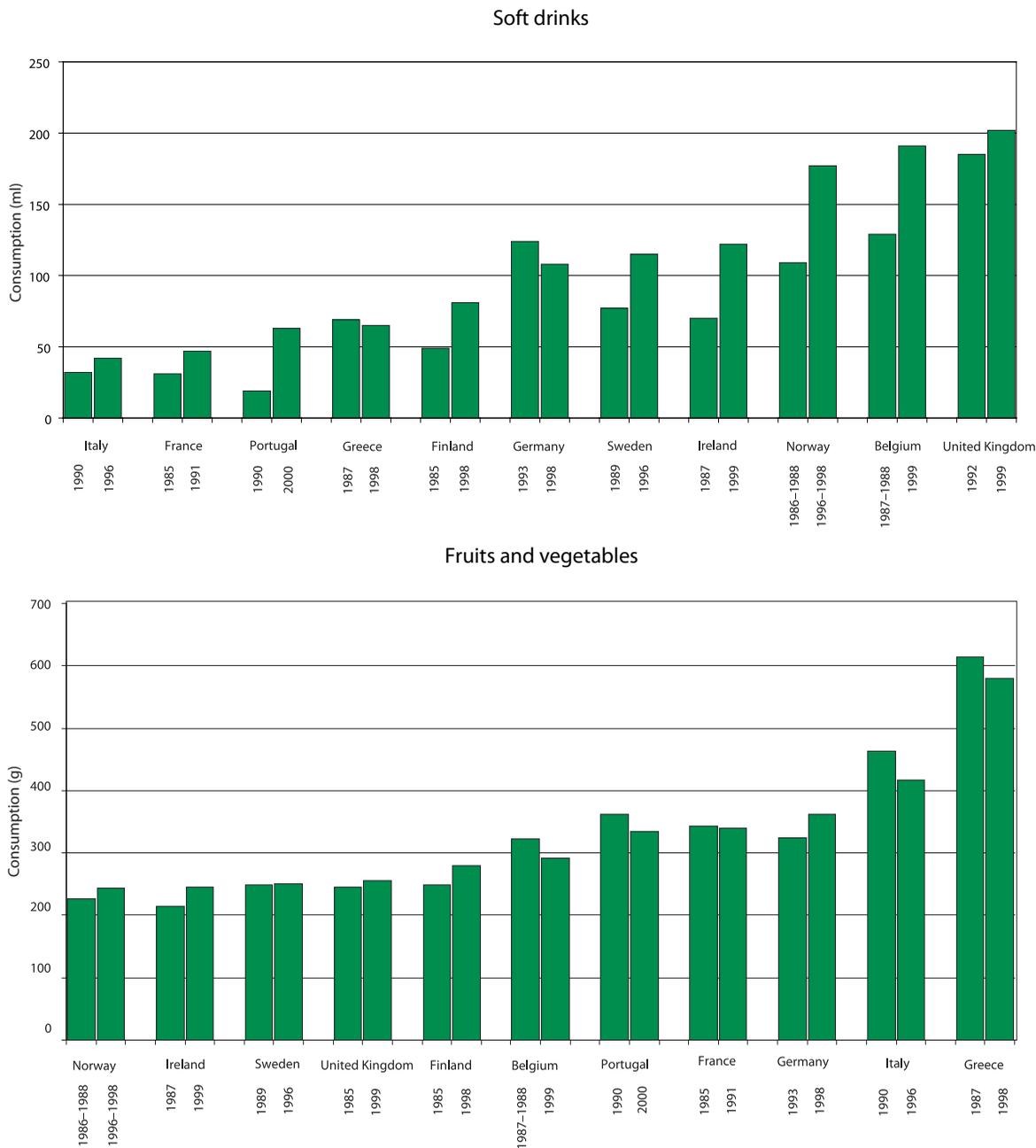
Country or region	Fruit (g)	Vegetables (g)	Sugar and sweeteners (g)	Total fat (g)	Total energy (MJ(kcal))
Albania	249	476	68	87	12.0 (2874)
Armenia	143	508	58	51	9.9 (2357)
Austria	376	248	125	161	15.6 (3732)
Azerbaijan	148	378	46	42	11.4 (2727)
Belarus	127	297	91	95	12.1 (2885)
Belgium	188	358	152	163	15.2 (3634)
Bosnia and Herzegovina	156	461	74	53	11.2 (2668)
Bulgaria	124	396	81	96	12.1 (2885)
Croatia	244	304	165	89	11.7 (2795)
Czech Republic	218	196	143	115	13.8 (3308)
Denmark	401	280	160	139	14.5 (3472)
Estonia	202	275	168	98	13.5 (3222)
Finland	252	194	94	126	13.2 (3143)
France	262	392	111	168	15.2 (3623)
Germany	310	248	124	142	14.6 (3484)
Georgia	162	227	92	53	11.1 (2646)
Greece	403	755	96	145	15.3 (3666)
Hungary	195	321	125	152	14.9 (3552)
Iceland	289	156	155	133	13.7 (3275)
Ireland	377	225	118	137	15.6 (3717)
Israel	316	607	106	142	14.9 (3553)
Italy	359	488	87	156	15.4 (3675)
Kazakhstan	43	359	73	82	12.0 (2858)
Kyrgyzstan	71	363	41	55	13.3 (3173)
Latvia	147	273	95	111	12.6 (3014)
Lithuania	181	281	108	105	14.1 (3372)
Malta	288	378	133	110	14.7 (3521)
Netherlands	499	201	144	140	14.5 (3495)
Norway	341	181	122	145	14.7 (3511)
Poland	130	275	125	111	14.1 (3366)
Portugal	318	496	93	142	15.7 (3747)
Republic of Moldova	192	229	84	56	11.4 (2729)
Romania	178	492	73	105	15.0 (3582)
Russian Federation	133	264	122	86	13.1 (3118)
Serbia and Montenegro	325	289	84	119	11.3 (2703)
Slovakia	163	192	88	103	11.6 (2779)
Slovenia	392	199	42	106	12.4 (2954)
Spain	309	393	94	157	14.3 (3421)
Sweden	316	215	130	127	13.4 (3208)
Switzerland	285	266	166	158	14.8 (3545)
Tajikistan	8	223	44	40	8.0 (1907)
TFYR Macedonia <sup>a</sup>	217	429	97	94	11.9 (2852)
Turkey	295	632	68	91	13.9 (3328)
Turkmenistan	133	240	29	73	11.9 (2840)
Ukraine	100	318	123	82	12.8 (3054)
United Kingdom	318	251	114	135	13.4 (3450)
Uzbekistan	83	318	12	64	9.7 (2312)
<b>Eur-A</b>	<b>243</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>14.8 (3531)</b>
<b>Eur-B + Eur-C</b>	<b>186</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>12.9 (3076)</b>

<sup>a</sup> The former Yugoslav Republic of Macedonia.

Sources: data from the European health for all database [online database] (9) and FAOSTAT [online database] (14).

The amount of fibre in the diet is in general higher for women than for men. Women's fibre intake per MJ was highest in Finland and Portugal, but lowest in Denmark and Sweden. In Bulgaria, Estonia and Finland, adolescent girls had relatively high fibre intakes.

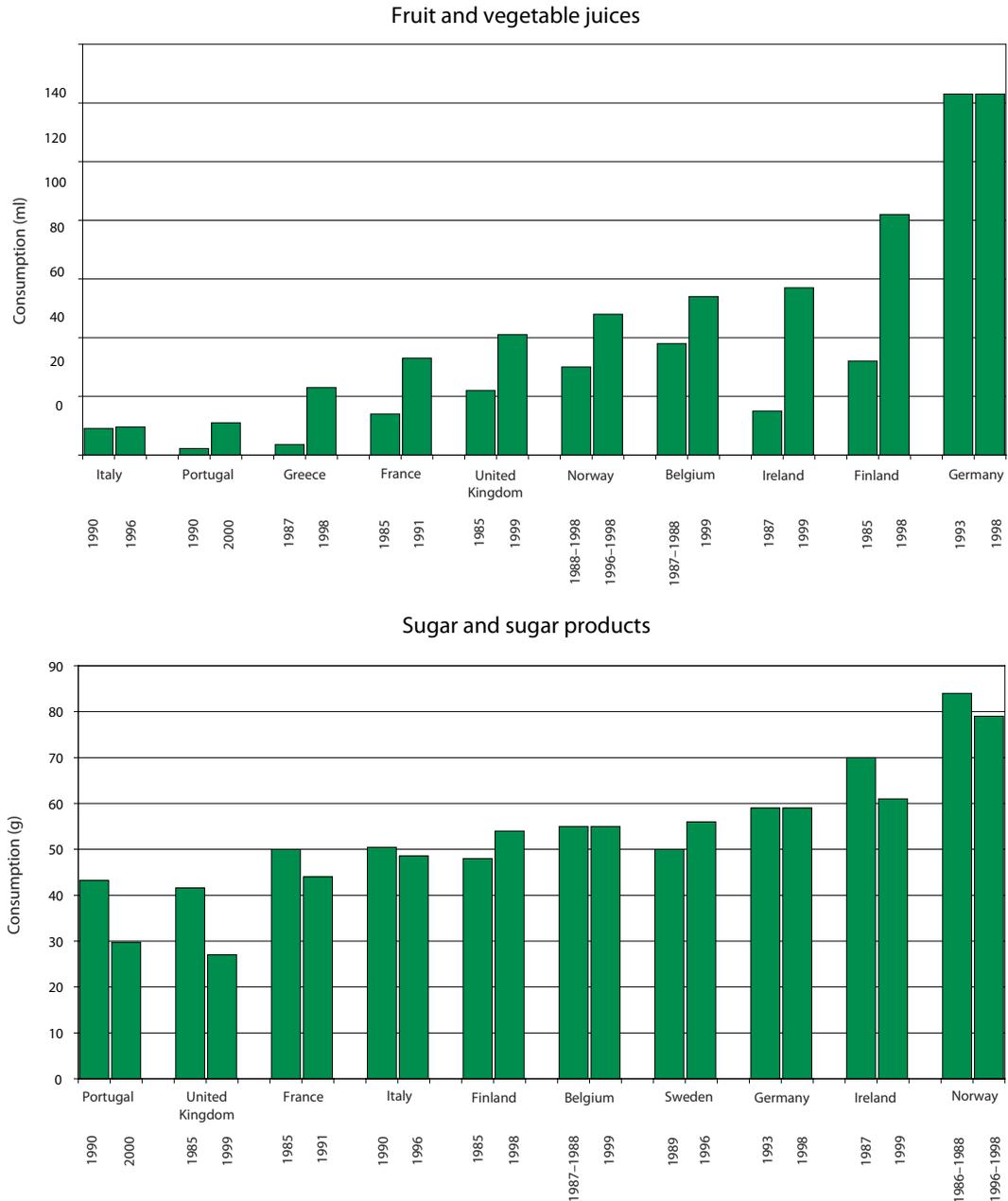
**Fig. 7.2. Trends in the mean daily household availability of selected foods and beverages per person per day in selected European countries participating in the DAFNE project**



### Infant feeding

Growing evidence supports the role played by breastfeeding in protecting against weight gain in childhood and even in later life (20–22). Breastfed infants and children demonstrate a lower risk of obesity than those fed on formula. The duration of breastfeeding is also an important factor, since children breastfed for longer periods have greater protection against weight gain (21).

Fig. 7.2. (contd)



Source: DAFNE (15).

Data on breastfeeding rates in the European Region are incomplete (10). In addition, comparisons between countries should be made with caution, since definitions of breastfeeding and methods of data collection usually vary. Fig. 7.6 illustrates the proportion of children who are breastfed at the ages of 3 and 6 months. Breastfeeding rates decrease strikingly at 6 months of age in almost all countries, and the goal of exclusive breastfeeding for the first six months of every child's life (22) seems far from achievement.

Table 7.3. Daily consumption of fruit, vegetables and soft drinks by 11-year-olds in the HBSC study, 2001/2002 survey

Country	Girls (%)			Boys (%)		
	Vegetables	Fruit	Soft drinks	Vegetables	Fruit	Soft drinks
Austria	21.8	52.6	12.5	17.5	39.9	18.3
Belgium (Flemish)	55.6	32.6	27.1	47.4	27.3	38.0
Belgium (French)	44.2	44.5	32.0	40.3	39.4	37.8
Croatia	34.4	43.5	31.2	32.2	40.5	32.9
Czech Republic	35.1	54.1	23.3	28.4	41.6	27.1
Denmark	34.5	42.6	5.7	30.4	33.5	9.0
England (United Kingdom)	29.2	30.3	37.8	25.6	28.4	36.4
Estonia	20.6	26.8	7.8	18.4	20.9	13.0
Finland	27.5	25.9	4.6	21.0	21.0	7.5
France	51.8	39.1	24.9	45.8	40.5	30.4
Germany	40.2	51.0	22.5	28.1	43.3	30.7
Greece	25.6	47.6	11.5	21.8	41.7	18.4
Greenland	30.0	19.1	25.8	35.0	28.9	28.1
Hungary	18.7	38.2	28.6	16.3	37.7	33.4
Ireland	42.7	41.3	27.9	35.4	31.5	31.5
Israel	52.7	56.2	49.3	47.4	52.1	54.6
Italy	22.7	40.1	20.0	18.1	37.9	27.1
Latvia	35.8	27.1	9.2	26.8	23.4	14.1
Lithuania	34.7	24.8	7.4	33.5	24.1	12.8
Malta	24.5	59.4	38.8	19.2	47.7	36.5
Netherlands	42.9	32.8	32.9	39.9	31.5	40.9
Norway	29.9	40.5	10.9	22.0	28.0	16.1
Poland	46.6	54.9	20.6	34.5	44.0	30.1
Portugal	36.3	58.3	32.1	27.5	51.5	39.5
Russian Federation	40.1	31.0	17.5	34.4	30.5	25.7
Scotland (United Kingdom)	39.5	45.3	40.4	29.0	37.1	47.3
Slovenia	30.9	50.8	33.7	24.6	39.3	39.0
Spain	13.4	42.2	22.5	14.1	42.1	30.5
Sweden	35.8	36.8	6.0	33.0	34.7	11.9
Switzerland	39.7	43.5	25.2	32.5	35.6	32.5
TFYR Macedonia <sup>a</sup>	36.6	48.1	30.2	34.1	44.1	33.4
Ukraine	51.5	28.6	16.1	48.0	27.2	18.2
Wales (United Kingdom)	21.7	30.6	32.4	18.8	22.7	32.8

<sup>a</sup>The former Yugoslav Republic of Macedonia.

Source: data from Currie et al. (8).

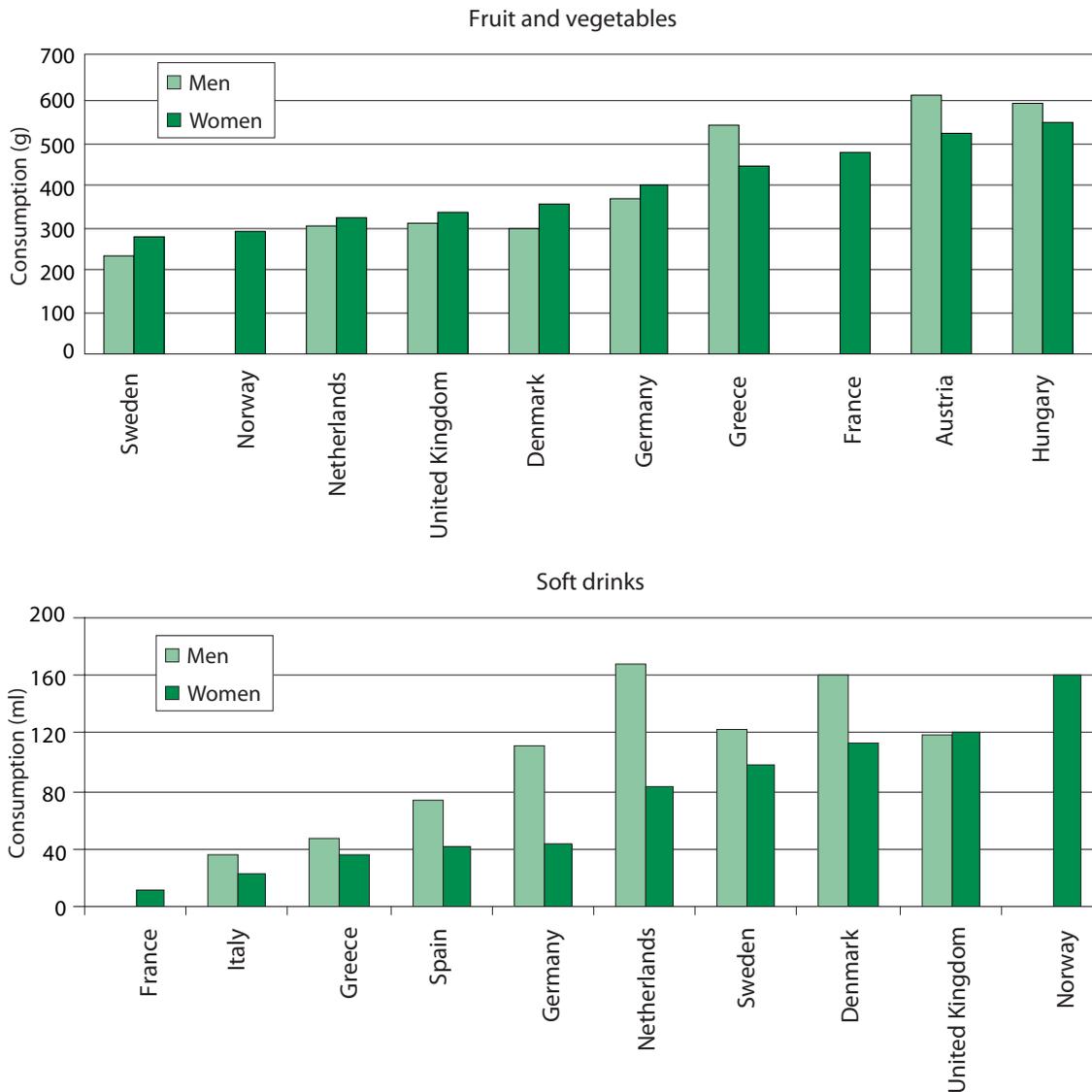
## Eating patterns

Increasing numbers of people in the European Region have the opportunity to eat away from home, especially in fast-food restaurants run by multinational branded chains that offer foods served quickly from a limited menu. A review of the dietary habits of adolescents concluded that the frequency of eating in such restaurants is much lower in southern Europe than in France, some Nordic countries and the United States (23). Overall, there is a paucity of studies on snacking and eating in fast-food restaurants in European countries.

Little comparable information is available on portion sizes in Europe. A study from Denmark (24) indicates that:

- the portion sizes of commercial energy-dense foods and beverages and fast-food meals seem to have increased over time, particularly over the last 10 years;
- the number of super-sized food items available in grocery stores and supermarkets seems to have increased substantially; and
- conventional and fast-food restaurants serve larger so-called value meals and offer all-you-can-eat buffets in the competition for customers.

Fig. 7.3. Mean consumption of fruit and vegetables and soft drinks per person per day for adults in all centres participating in the EPIC study in 10 European countries, 1995–2000



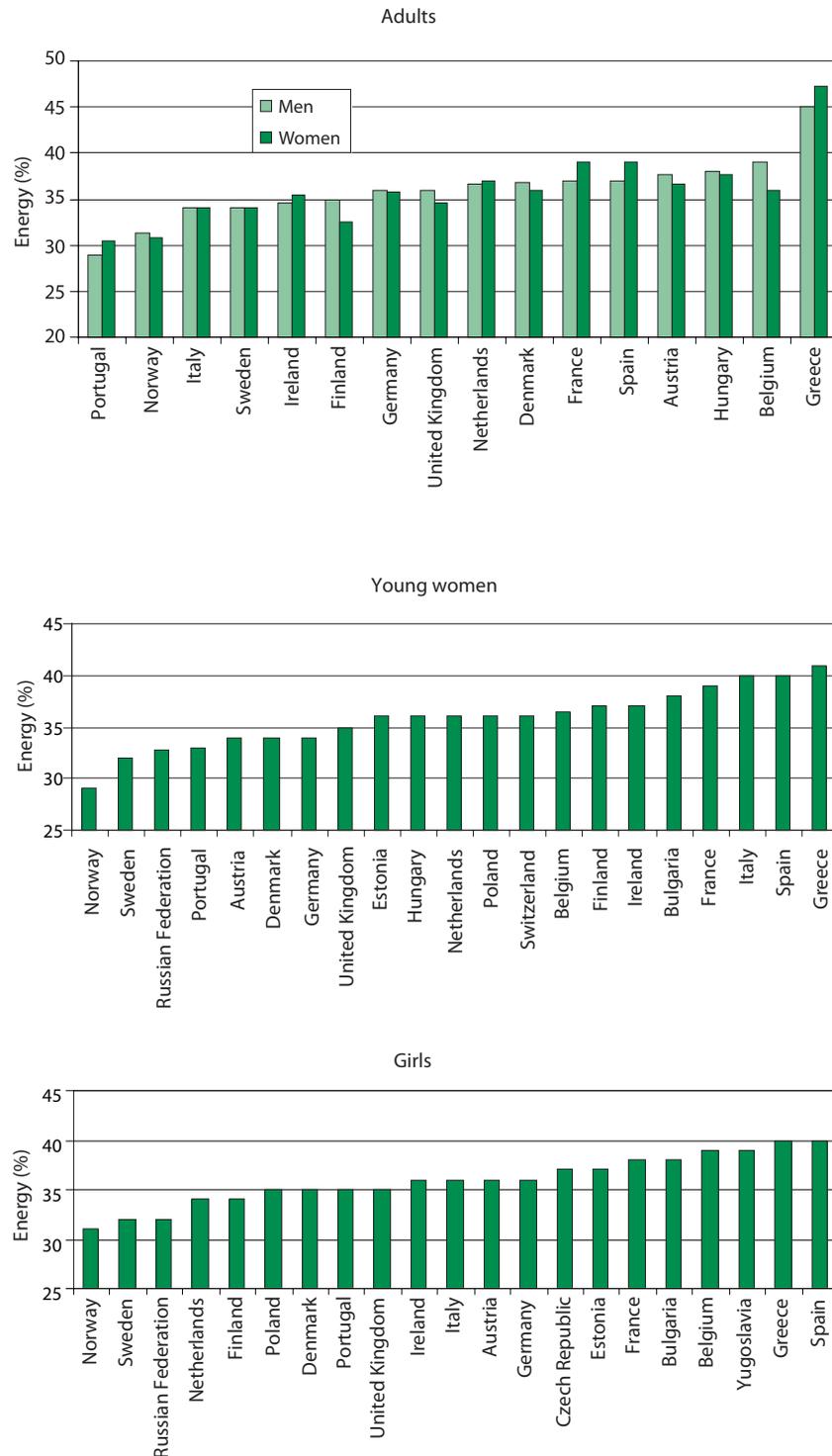
Sources: Wirfalt et al. (17), Agudo et al. (18), Astrup et al. (19).

### Dietary patterns and inequalities

No pan-European survey has been able to show variations in dietary patterns according to household income, although the DAFNE project household purchase surveys provide data for comparing households with different levels of educational attainment by the head of household in several countries. In general, the DAFNE project results indicate that the availability of foods varies more between countries than educational groups; as a rule, however, groups with lower educational attainment tend to have more meat, fat and sugar (and less fruit or vegetables) available than groups with higher attainment. Fig. 7.7 gives an example of these relationships: the educational gradient in fruit availability is apparent in both Ireland and Portugal, despite the large difference in average availability between the two (25).

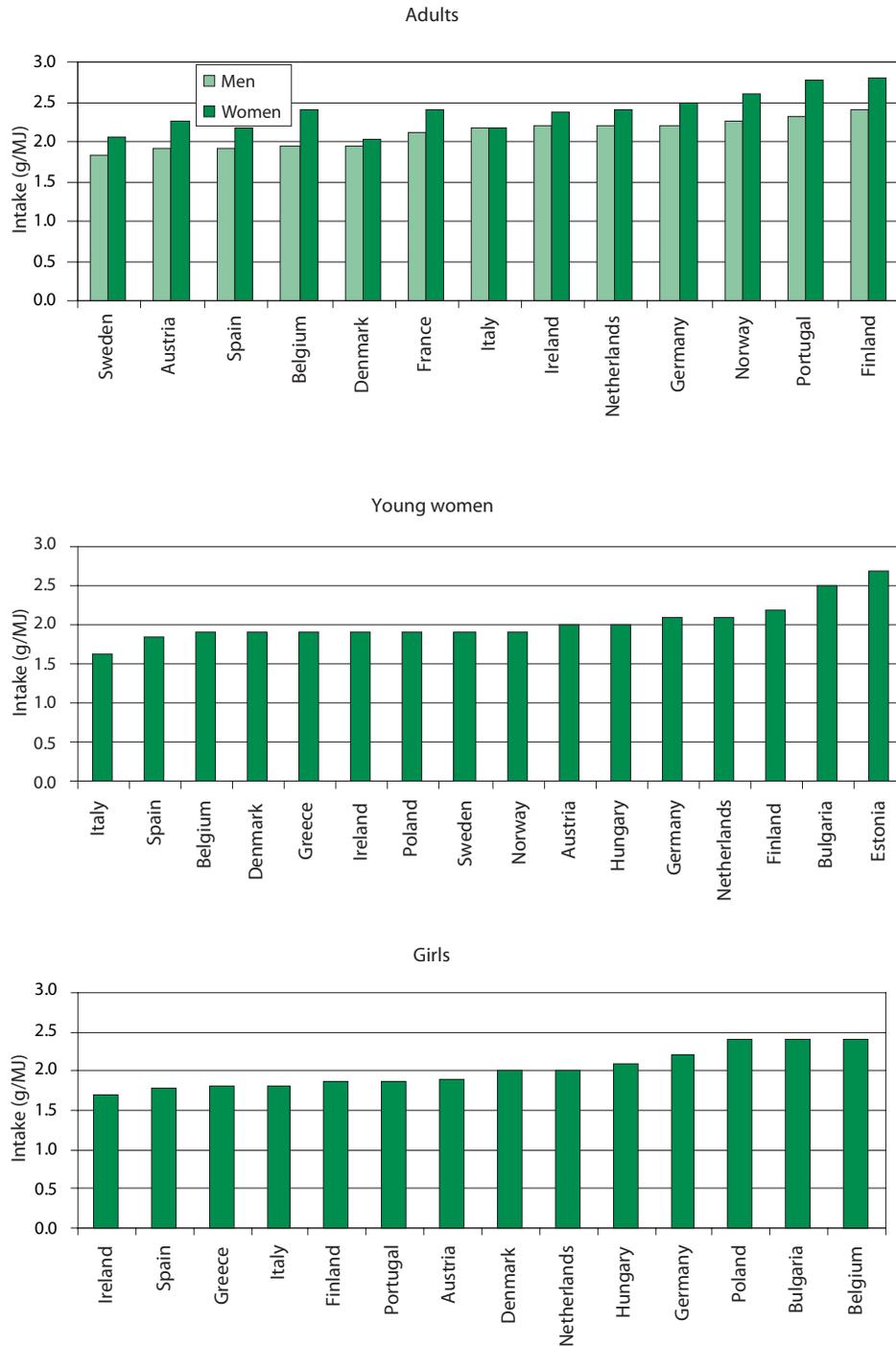
Similarly, total dietary intake surveys in the United Kingdom found that deciles of net family income are closely related to consumption of fresh fruit and vegetables. Consumption per person per day ranged from less

Fig. 7.4. Proportion of energy derived from fat among adults, young women and girls in selected European countries from individual-based surveys



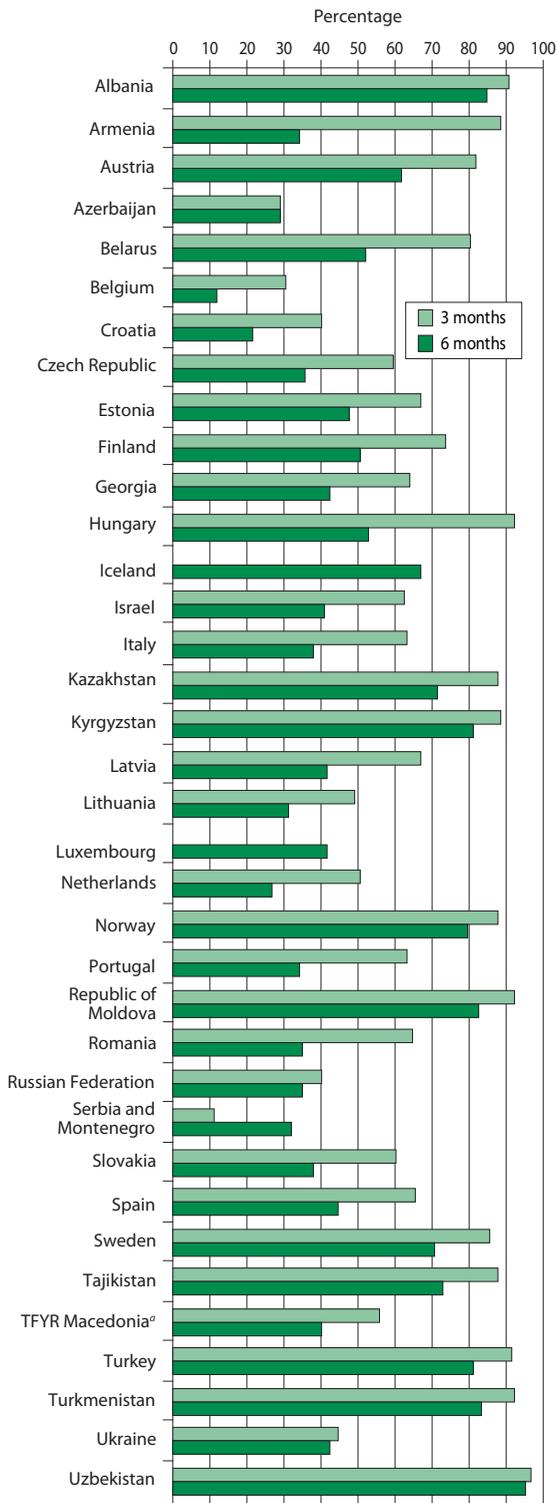
Sources: Elmadfa et al. (2), Galvin et al. (3), *The development of a healthy nutrition programme in the CINDI regions of Russia* (4), Harrington et al. (5), *Zoet Nederland 1998* (6), Lambert et al. (7).

Fig. 7.5. Fibre intake for adults, young women and girls in selected European countries from individual-based surveys



Sources: Elmadfa et al. (2), Galvin et al. (3), *The development of a healthy nutrition programme in the CINDI regions of Russia* (4), Harrington et al. (5), *Zo eet Nederland 1998* (6), Lambert et al. (7).

**Fig. 7.6. Most recent percentage of children breastfed at ages 3 and 6 months in European countries, 1995–2004**



<sup>a</sup> The former Yugoslav Republic of Macedonia.  
Source: European health for all database (9).

than 120 g among those in the lowest decile of income to over 300 g among those in the highest (26).

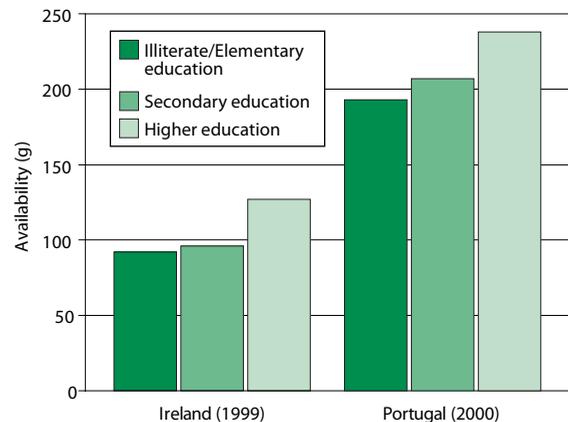
Only limited information is available on socioeconomic status and breastfeeding rates. In the United Kingdom, both the prevalence and duration of breastfeeding tend to be greater in families with higher socioeconomic status. Groups with high or low socioeconomic status can show remarkable differences; in a study of groups defined by employment status, most of the lowest-status mothers (60%) abandoned breastfeeding within the first week, while most of the highest-status mothers (56%) maintained it for at least four months (27).

### Conclusion

Given the importance of energy balance to the risk of obesity, the current lack of high-quality, comparable information on energy intake in the WHO European Region limits the feasibility of evaluating relevant dietary patterns. Of the dietary factors discussed, the high proportion of energy obtained from fat in many European countries may be the most striking. Nationally representative and comparable dietary data of good quality need to be available for all countries in the European Region, as a basis for advice and the evaluation of dietary policies.

For most countries, fruit and vegetable intake is below recommended levels, which is unfavourable for the energy density of the diet. The increased supplies in some countries may indicate a higher consumption of processed fruit or vegetable extracts, such as juices and syrup concentrates, which usually have a higher energy density than the less processed fresh alterna-

**Fig. 7.7. Availability of fruit per person per day in Ireland and Portugal, according to educational status of the head of household**



Source: Trichopoulou & Naska (25).

tives. In addition, as fibre intake is also low throughout the Region, consumption of more satiating foods – for example, wholegrain foods – should be encouraged as an additional measure to reduce the energy density of the diet.

Sweetened beverages have made inroads, as shown by the significant increases in the consumption of soft drinks in many countries. To prevent obesity, efforts are therefore needed to reverse this trend. Similarly, attention should be given to increasing the rates and duration of breastfeeding.

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## 8. Microenvironmental determinants of dietary patterns

### Main messages

- Parents' food preferences can influence their children's preferences for both healthy and unhealthy food, through role modelling and controlling the availability of specific types of food.
- Children in families with less education and lower socioeconomic status show less healthy food choices than those in families with more education and higher status.
- A family environment in which parents strongly control children's food intake reduces the children's ability to self-regulate their eating behaviour. A higher occurrence of family meals and a better meal environment are essential to better dietary habits.
- The school can influence children's diets through providing meals, controlling the availability of food and drinks and providing nutrition education.
- In the workplace, the presence of a canteen seems to facilitate healthy dietary behaviour.
- The accessibility and affordability of food in local communities influences dietary choices.
- Moderate evidence indicates that frequent eating in fast-food outlets is associated with less healthy eating habits and obesity.

### Impact of settings

Although obesity has a range of causes – biological, individual and environmental – the environment is a key factor in its rapid rise. This chapter examines the microenvironmental factors that influence the dietary choices that contribute to the development of obesity, and the next considers the wider environmental or macroenvironmental contributors.

A microenvironment is a setting in which groups of people gather for specific purposes that often involve food, physical activity or both. The same person can be part of several microenvironments during daily life, depending on age, sex, work, lifestyle and other factors. Microenvironments are usually geographically distinct and relatively small, and are potentially influenced by individuals who bring their own experiences from one microenvironment into another, transferring their beliefs, attitudes and habits. This chapter focuses on the impact of physical settings at the microenvironmental level on dietary choices and the development of obesity. The microenvironments considered are the home, school, workplace, food retailers and food outlets. The aim is to identify and discuss the influence of microenvironments on obesity.

### Methods

The databases PubMed, the Cochrane Library and Web of Science (Social Sciences Citation Index database) were searched using keywords and medical subject headings such as “diet”, “food”, “nutrition”, “eating habits”, “food preference”, “obesity” and “school”, “residence characteristics/”, “restaurants/”, “choice behavior/”, “health behavior/”, “socioeconomic factors/”, “social environment/”, “work”, “occupation”, “employee”, “job” and “stress”. The search covered the period 1981–2007, with older publications included if they were in the reference lists of more recent documents. Publications in English, French and Italian and the English abstracts of other papers were consulted. Most of the evidence for this chapter was obtained from observational studies and reviews of observational studies. Although this chapter is not a fully comprehensive systematic review, it provides an overview of key findings related to the influence of the microenvironments considered on dietary choices and the development of obesity.

### Home and family

The influence of the home environment is critical to the development of eating habits. Unhealthy habits become an important factor in the development of childhood obesity (1–4).

As parents provide environments for their children's experiences with food and eating, they significantly influence their children's dietary practices (5,6). Dietary practices that can favour the development of obesity can act directly through the type of food available and provided to the child and indirectly through other environmental factors that comprise the basis for food choices, such as family structure, family and parents' socioeconomic status and level of education, and parents' personal weight, attitudes and food preferences (1,4–6).

### **Socioeconomic status, educational level and family structure**

In Europe and in the United States, overweight and obesity are more frequent among people with lower socioeconomic status (7). In countries with economies in transition, obesity is more frequent in affluent families (8). Food choices and intake can differ among families with different educational levels. In the United Kingdom, a survey conducted among the parents of 564 children aged 2–6 years who attended 22 nursery schools in London showed that the child's vegetable intake was positively associated with the mother's education level (9). A cross-sectional study of a cohort of 404 11-year-olds in Finland showed that high family socioeconomic status was associated with healthier food choices by children (10).

A prospective cohort study in the United States among 2931 children aged 0–8 years found that those who lived with single mothers were significantly more likely to become obese by the six-year follow-up, as were children who were African American, had parents who were not employed or had mothers who did not complete secondary school (3).

A 1973 survey in the United States of 113 mothers of children aged 1–4 demonstrated that a mother's negative attitude towards being a mother and a homemaker can negatively influence the quality of the child's diet (1). This indicated that a mother who does not like motherhood or a specific child can hide her feelings behind the over-protective behaviour of overfeeding the child and thus induce obesity (11).

### **Parents' BMI and dietary pattern**

Parental obesity is a risk factor for obesity in offspring. Genetics can explain 25–40% of the individual difference in adipose tissue (12). Children share with their parents not only the genetic background but also the environment in which they live and behave. Thus, part of the similarity in weight between parents and children can be due to sharing the same environment. Parents can influence their children's weight with their own behaviour, which comprises factors that have led to their own weight.

A prospective cohort study in the United States compared 92 children 4.5 years old with overweight parents with 95 children of the same age with normal-weight parents. Children in both groups weighed the same when the study began, but after one year of observation children of overweight parents had higher fat intake and gained more weight than the others (13).

An observational study in the United States measured the food intake of 18 children aged 3–5 and with overweight parents during six thirty-hour periods of observation. The results indicated that children's preference for high-fat food was significantly related to parental adiposity (2).

The link between the food preferences of parents and children has been extensively studied, mostly by a group of scientists in the United States. A longitudinal study in the United States among 192 5-year-old girls and their mothers showed that girls with high fat intake had mothers with high intake of fat-rich food (14).

The authors studied other outcomes in the same sample, such as parents' and children's preference for and intake of fruit and vegetables (15). The study provided good evidence that girls' fruit and vegetable intake was positively related to their parents' reported intake. Parents who consumed less fruit and vegetables tended to put greater pressure on child feeding and had daughters who consumed less fruit and vegetables. This research demonstrates that parents' own fruit and vegetable intake may encourage intake in their daughters and, conversely, that pressure to eat fruit and vegetables may discourage intake among young girls (15). The sample of this study was limited to white, two-parent families, however, and thus cannot be generalized to other ethnic or socioeconomic groups. Other limitations were the use of two different questionnaires to assess the nutrient intake of mothers and daughters and the determination of reported intakes of parents and daughters over different time periods.

A survey in Norway investigated the correlations of fruit and vegetable intake between parents and children among 1647 pairs of parents and their children aged 10–12 (16). The association between the children's and their

parents' intake, measured by a food questionnaire, was statistically significant, although the correlation was low ( $r = 0.23$ ).

In the 564 children in 22 nursery schools in London, United Kingdom, parents' reported intake of fruit or vegetables was the strongest predictor of their children's intake (9). The sample mainly comprised white, middle-class and highly educated people.

In the United States, Skinner et al. (17) assessed the concordance between the food preferences of 70 pairs of mothers and children in a longitudinal study. Children liked the same types of food as their mothers, and shared many dislikes of food. Interestingly, many types of food that the children had never tasted were those their mothers disliked. Skinner et al. conclude that mothers probably do not introduce their children to food that they dislike. Mothers can influence their children's food preferences both through their own preferences and thus their role modelling and through the food they make available at home (17).

Most studies of parents' influence on their children's food preferences and intake have examined the role of both parents or the mother; only two old studies focused mainly on the father's role. Fathers' food preferences can also influence their children's eating habits. A 1958 survey in the United States on 61 pairs of fathers and children aged 11 months to 4 years found that 89% of wives did not buy, cook and serve a food if their husbands disliked it (18). In 1978, Burt & Hertzler (19) achieved the same results in 46 families with children 4–5 years old. The "father's food likes" were the most important factor in menu planning for the family (19). Thus, the father's food preferences can influence the child's eating pattern in at least two ways: through the availability of food in the home (that is, the physical setting) and their role modelling in preferring and eating specific types of food.

The results of these studies indicate that parents' food preferences influence their children's preferences and intake, but more studies are needed to clarify the extent of the influence and whether the influence works only on daughters or also on sons.

### Parents' attitudes on feeding practices

Attitudes on feeding practices can be defined as a relatively stable and enduring predisposition for certain food choices and for providing, discouraging or prohibiting certain types of food based on people's perceived personal and/or nutritional values, which are highly influenced by cultural and socioeconomic background. One research team in the United States has conducted most of the research on this aspect of the development of eating habits in childhood.

After the age of 2 months, infants adjust their food intake in response to the varying energy density of the food and to their energy requirements (20). As they grow older, they slowly lose their ability strictly to regulate their intake according to their needs, and tend to rely more on external than internal stimuli as means of control. Parents' inappropriate feeding practices often produce this behaviour. A trial in the United States observed the eating behaviour of 22 preschool children in two different contexts to assess their capacity to rely on their personal feelings of hunger and satiety (21). The children were first offered a high- or low-energy-density preload and then snacks. Half of the children were invited to eat all the snacks provided and were offered rewards for "cleaning up their plate" and eating more food. Only the children who did not receive these external cues were able to adjust their energy intake according to the low- or high-energy preload; those receiving external cues increased ad libitum snack intake regardless of the preload energy content (21).

A study examined how parents modulate their child-feeding practices for 42 children aged 7–12 years (22), and showed that parents usually try to control their children's behaviour in the domains in which the parents have problems in regulating their own behaviour. The parents perceive that the child is at risk of developing behaviour that will lead to problems, and the child demonstrates a lack of self-regulatory behaviour. Specifically, this study showed that parental restraint of a child's food intake (conscious restriction of food intake to control body weight) is significantly associated with the percentage of overweight in daughters but not in sons (22).

Feeding techniques that parents use to attempt to prevent overweight, including pressure and restriction, can actually promote children's overeating, training children to eat relying on external stimuli and not on internal cues such as hunger and satiety.

A within-subject design experiment on 71 children attending a public kindergarten in the United States (23) showed that restricting access to palatable foods can cause a short-term increase in the children's desire for and

attempts to obtain them. This behaviour is common if the restricted food is in the child's usual eating environment and is thus "seen" by the child (23).

A study in the United States assessed the ability of 77 children aged 2–4 (46 girls and 31 boys) to self-regulate energy intake in relation to their own weight and to their parents' feeding style. On two different days, all the children consumed two juice preloads of similar colour and flavour but different carbohydrate and energy content. The preload was followed by a standard meal with several types of food, at which the children were free to choose which and how much food they wanted. Food intake was measured by weighing all food offered before and after the children ate. The parents' feeding style was assessed by a questionnaire, and the children's weight and height were measured. The children with highly controlling parents were less able to self-regulate their energy intake; the same study showed that controlling mothers end up with daughters, but not sons, less sensitive to energy-density cues in food (24).

Other research in the United States, by the same team of researchers, among 197 white non-Hispanic families with 5-year-old daughters showed that the mothers with strong cognitive control over their food intake had daughters who showed the same behaviour (25). A clinical trial with 75 children (40 boys and 35 girls) aged 3–6 years showed that maternal disinhibition (abandoning control of food intake in the presence of certain external food cues) accounted for 35% of the variance in the daughters' overweight, but no associations were observed between mothers and sons or fathers and daughters or sons (26).

These studies, however, were performed in very controlled environments; the results have not been replicated in larger samples of people living in the community. Robinson et al. (27) conducted a survey in 1996 on 792 9-year-olds of various socioeconomic and ethnic backgrounds in 13 public elementary schools in California, using the questionnaire developed by Johnson & Birch (24). The study could not confirm the previous result: that strong parental control over food intake among children aged 3–5 could reduce the children's ability to regulate their food intake. Parents reporting greater control over food intake had daughters with less overweight, while parental control and overweight among boys were not associated. Overweight parents reported exerting significantly less control over their children's food intake, and household educational level was not associated with parental control over children's food intake. Using a different questionnaire (the Preschooler Feeding Questionnaire), a survey in Kentucky of 634 families with children aged 2–5 indicated that no aspect of the parental feeding style was associated with overweight in young children (28).

A study in Belgium among 28 families with an overweight child and 28 families with a normal-weight child (aged 7–13 years) observed parental control and family functioning during mealtime, classified according to three styles: permissive (children allowed to eat whatever, whenever and how much they want), authoritative (children positively encouraged to eat healthy food but still retaining some choices about eating options) and authoritarian. In addition, parents made self-reports. Based on the results obtained using the Children Feeding Questionnaire (24), mothers of overweight children reported using more restrictive strategies, consistent with the theory of Birch et al. of association between such strategies and children's increased BMI. In contrast, taped observations at mealtime showed that, in the overweight group, the permissive and authoritative styles were equally prevalent (46%), while the authoritarian was less present (7%). In the families with normal-weight children, the authoritative was most prevalent (71%), followed by the permissive (25%) and the authoritarian styles (4%) (29).

A study was designed in a community sample in England, to assess whether obese mothers of young children used different feeding styles than a matched sample of normal-weight mothers (30). The study used two validated questionnaires to assess four aspects of feeding style: emotional feeding (using food in response to emotional distress), instrumental feeding (using food as a reward), prompting or encouraging children to eat and controlling eating. The 114 mothers of normal weight and the 100 obese mothers did not differ in offering food to their children to deal with emotional distress, in using food as a reward or in encouraging the child to eat more food. The obese mothers, however, reported significantly less control over their children's food intake. No aspect of the parental feeding style was associated with the child's weight (30).

Also in the United Kingdom, a study on a community sample of 439 children aged 3–6 and attending 12 primary schools representing a range of socioeconomic deprivation (31) used several existing parental feeding questionnaires to examine associations with adiposity. The results show that parents of leaner children are more likely to encourage their children to eat, while other feeding strategies are negligibly associated with children's BMI z-scores (31).

As most of these studies had a cross-sectional design, one cannot state that children's eating habits result from the parents' feeding style. A different way to look at these results could be that the parents' feeding behaviour is a response to a certain child's eating behaviour. In this case, parents perceiving that a child is too thin and/or eats too little could apply pressure to eat, while restriction could be a response to a child perceived as being or at risk of becoming overweight.

In conclusion, several studies show that parents who use inappropriate techniques to try to control and modify their children's eating behaviour may actually promote the development of unhealthy eating styles and childhood overweight (4). These studies also seem to show that a family environment in which parents strongly control their children's food intake would reduce the children's ability to self-regulate their eating. Nevertheless, the cross-sectional design of most of the research, the different results obtained by the use of different questionnaires and the lack of studies performed in most European countries, as well as in many other countries, do not allow any firm conclusion on which specific types of parental behaviour can result in children's developing obesity.

### Frequency and environment of family meals

In 2000, a large cross-sectional study of the children (7525 sons and 8677 daughters aged 9–14 years) of registered nurses in all 50 states of the United States used mailed questionnaires to examine the associations between the frequency of eating a family dinner and measures of diet quality (32). A high frequency of family meals was associated with a healthy diet and lower consumption of saturated fat, *trans* fat, fried food and soft drinks. The association with a healthy diet may be due to a reduction in the number of ready-made dinners consumed, which would result in a higher-quality diet (32). The study had already investigated the frequency of eating family dinners and overweight among 7784 girls and 6647 boys in 1996–1998. The frequency of eating family dinners was inversely associated with the prevalence of overweight at baseline but not with the likelihood of becoming overweight in longitudinal analysis (33).

In 2003, a study among 18 177 adolescents participating in the National Longitudinal Study of Adolescent Health in the United States showed that parental presence at the evening meal was associated with a lower risk of poor consumption of fruits, vegetables and dairy food, and likelihood of skipping breakfast (34).

Assessing the role of family meals in children's eating habits and the development of obesity also requires the evaluation of meal composition and its perceived importance in family life. A study of 902 middle- and high-school adolescents and their parents participating in Project EAT (Eating Among Teens) in the United States assessed the frequency of buying fast food for family meals and family eating habits.

Parents purchasing fast food for family meals at least three times per week were significantly more likely to report the availability of soft drinks and crisps in the home than those buying fast-food meals less often. Fast-food purchases for family meals were positively associated with the intake of fast food and salty snacks by both parents and adolescents and with weight status among parents, and negatively associated with parental vegetable intake. Adolescents in homes with fewer than three fast-food family meals per week were significantly more likely than those with more fast-food family meals to report having vegetables and milk served with meals at home (35).

A different study using the same sample examined the family mealtime environment from the perspectives of both adolescents and parents. Parents were more likely to report eating five or more family meals per week, the importance of eating together and scheduling difficulties. Younger adolescents more frequently reported eating five or more family meals per week, a higher importance of eating together and more rule expectations at mealtime than older adolescents, while older adolescents were more likely to report scheduling difficulties. Both adolescents and parents, however, perceived family meals positively (36).

A survey in the United Kingdom among 564 families with children 2–6 years old that investigated predictors of children's fruit and vegetable intake found that more family mealtimes were associated with a higher intake of vegetables but not of fruit (9).

Researchers have considered the broad environment during meals in searching for factors that could influence the eating habits of children and their families. A study in the United States among 22 pairs of children and mothers (37) observed and taped them, without their knowledge, while eating lunch in a laboratory setting. The more obese children and their mothers ate more food in less time than the thinner children and their mothers; the fatter children and their mothers also displayed less social and verbal interaction during meals and non-eating situations (37).

A study in Nebraska on 427 families with children 2–5 years old and medium-to-high education level (38) showed factors in the family environment that were associated with higher dietary quality: asking the child to cooperate in preparing food and laying the table, giving small portions when introducing a new food, persuading the child to eat using discussion, forcing the child to eat a few bites of a new food, allowing the child to decide about the types of food eaten and praising the child for eating healthy food. The social and emotional environmental factors related with higher dietary quality were: having companionship at mealtime (parents, siblings or both) and a positive home atmosphere. This study focused only on the nutritional quality of preschool children's diet and did not show any data on children and parents' weight.

A small survey of 91 families with children about 10 years old recruited voluntarily in Maryland (39) found that the children in families that had the television on during meals had lower fruit and vegetable intake. Having the television off during meals was associated with better eating habits. The association between television and positive or negative eating habits remained statistically significant after being controlled for other covariates and socioeconomic factors.

In conclusion, the studies considered indicate that, although a higher occurrence of family meals is associated with better dietary habits, the quality of such meals and the circumstances in which they are consumed also play a role. This conclusion, too, is affected by the fact that most of the studies have been performed in the United States, often in small or medium-sized samples or convenience samples, with a cross-sectional design.

## School

Schools' aim is education and they reach almost 100% of children of school age in the high- and medium-income countries in the WHO European Region. In addition, most primary and secondary schools serve at least one meal every school day, according to the country's law and tradition. Schools therefore represent an ideal setting to provide healthy nutrition and correct nutrition education.

### School meals

In the United States, two large surveys of the nutritional content of school lunches and breakfasts have shown that they often fail to meet the national nutritional recommendations (40,41). The American Dietetic Association, the Society for Nutrition Education and the American School Food Service Association therefore published a position paper in 2003 on nutrition services as an essential component of comprehensive school health programmes (42).

A survey in 26 European countries showed a great variety of school food services that can influence children's and adolescents' food habits and choices and that could be one of the environmental factors leading to the differences in obesity rates among European countries (43).

School meals, from nursery school to secondary school, are often nutritionally imbalanced (44,45). In a study in kindergartens in Poland, the energy and nutrient content of meals exceeded requirements (44). In a survey in two secondary schools in southern England and one junior school in northern England (45), the standard breakfast provided was too high in salt, fat, saturated fat and percentage of energy.

In conclusion, the available studies suggest, with moderate evidence, that nutritionally imbalanced school meals can promote unhealthy eating habits that favour the development of obesity among students.

### “Competitive food”

The most negative influence on children's and adolescents' eating habits and the development of obesity is linked to the presence in the school environment of unhealthy “competitive food” sold through such channels as cafeterias, vending machines, à la carte meals and tuck shops or kiosks. Data from the United States show that about 10% of primary schools and 76% of secondary schools have vending machines, snack bars and canteens selling food and drinks; 90% of the schools have an à la carte programme at lunchtime (46). A survey shows a similar situation in Europe (47).

Several studies, mostly surveys, have shown that the presence of competitive food in the school environment causes higher consumption of non-healthy food rich in energy, fat and sugar, and lower intake of fruit, vegetables and milk (48–50). A cross-sectional study on 312 fourth-graders and 282 fifth-graders in Texas showed that fifth-grade students who ate only snack-bar meals consumed significantly less total fruit, juice and vegetables than

those who ate the school lunch (47). In the same sample of students, during two years, a different analysis showed that fifth-graders with access to school snack bars consumed more competitive food, such as high-fat vegetables and sweetened beverages, than fruit, milk, and non-fried vegetables compared with the previous school year, when they were still in primary school and had access only to the school lunch (49). A survey on the eating habits of 598 students in 16 high schools in Minnesota (50) showed, through a single 24-hour recall interview, that:

- à la carte meals are inversely associated with fruit and vegetable intake and positively associated with total and saturated fat intake; and
- the number of snack vending machines present in a school is negatively associated with fruit intake in adolescents.

One study among 504 students aged 12–15 from three schools in southern and northern England, using a specifically prepared lifestyle questionnaire, did not show any association between the consumption of unhealthy food purchased from vending machines and poor dietary practices (51). The authors acknowledged the lack of a control school without vending machines, however, which would have been important in comparing two different environments.

In conclusion, the available data give moderate evidence that the presence of competitive food in school can negatively influence students' eating habits, and thus favour the development of obesity.

### Soft drinks

The role of consuming sweetened beverages in the development of obesity deserves special consideration, since Harnack et al. (52) have shown that soft drink intake has significantly increased among children and adolescents and that soft drinks are one of the items most often offered in school vending machines. Large cross-sectional studies have examined the association between soft drink intake and obesity (52), but little research has been conducted in particular microenvironments. Data are available for children of different ages.

A clinical trial among 135 children aged 18–66 months attending a kindergarten in the United States (53) compared the eating behaviour of children having meals including sugar-sweetened drinks with those having meals with artificially sweetened drinks. The drinks offered were plain milk, sucrose-sweetened chocolate milk or aspartame-sweetened chocolate milk. The children drinking normal sugared soft drinks did not show a reduction of food intake at the meal, thus having higher energy intake than the children consuming artificially sweetened drinks. The children drank significantly more chocolate milk than plain milk during all meals, and consequently consumed significantly more energy during the meals in which it was served. Older children consumed significantly more milk and more energy per lunch than younger ones, but no other consistent age-related differences were observed. These findings suggest that young children do not reduce the intake of other food items at a meal to compensate for the increased energy intake that results from excessive sucrose-sweetened milk consumption.

A longitudinal study among 548 ethnically diverse schoolchildren (mean age 11.7 years, SD 0.8) in public schools in four Massachusetts communities (54) showed that increased soft drink intake was linked with weight gain and obesity during 19 months of follow-up. The OR of becoming obese was 1.6 for each additional daily serving of soft drink consumed (54).

Following this, a study using data collected in 1994 and 1996 from a convenience sample of 164 9-year-olds (55) showed no association between consumption of sugar-sweetened drinks and the development of obesity, only an association between diet soda intake and weight gain. The data were collected long ago and from one weekday only, excluding the weekend days, and the convenience sample comprised mainly white children from one rural area, which limits the generalization of this study.

In 2004, a randomized controlled trial among 644 children aged 7–11 years in southwest England assessed the results of a school-based educational programme aimed at reducing the consumption of carbonated drinks to prevent excessive weight gain among children (56). The project protocol lasted one school year and, besides nutrition lessons, used music, games and a web site to discourage the children from drinking sweetened and unsweetened fizzy drinks. The study showed that a modest reduction in soft drink consumption was associated with a reduction in the number of overweight and obese children in the intervention group, while in the control group the observed increase in the consumption of carbonated drinks was associated with an increase of the

percentage of overweight and obese children. This study had methodological limitations, acknowledged by the authors, such as the use of self-collected drink diaries over only three days, the low return rate for the diaries at baseline and the end of the research and, finally, the randomization performed according to classes and not schools; this could have caused contamination between the intervention and the control groups.

In conclusion, following data from epidemiological and experimental trials, and as stated by a joint FAO/WHO expert panel (57), high consumption of sugared drinks is of serious concern because it can promote weight gain.

### Nutrition education

Even though schools are the ideal setting for education, positive long-term results in preventing childhood obesity resulting from nutrition education programmes are still lacking, possibly due to the low intensity of their implementation. In the United States, the mean number of hours per school year dedicated to nutrition education is 13, while the minimum required to affect behaviour is 50 hours per year (42). In Europe, projects intended to increase children's nutritional knowledge are often ineffective (43). Better short- and medium-term results have been obtained, however, applying such tools as psychological strategies to change specific types of behaviour, active learning, family involvement and increasing the intensity and time of contact (42).

There is limited evidence to support the effectiveness of nutrition education in schools that is solely aimed at increasing basic knowledge of nutrition in inducing students to make healthier food choices and in preventing obesity.

### Workplace

Although the relationship between occupation and health is very well documented (58,59), it is not well understood. Little research has examined how work and food choices are related. In England in 1998, obesity accounted for 18 million days of sickness and 40 000 lost years of working life (60). As most people work for most of their adult lives, considering the effect of the working environment on their diet is extremely important.

The working day and the times at which people take breaks and lunch are becoming less standardized, and unhealthy snacking is an unfortunate side effect of missed lunches, limited self-catering facilities and increasing time pressure (61). The design and specifications of catering and cooking facilities can greatly affect the food consumed at work. Vending machines stocked with energy-dense snacks are often the only option for accessing food at work (61).

A questionnaire mailed to employees of the City of Helsinki, Finland in 2001 investigated their food habits and body weight (62); 68% of the 2474 women and 591 men contacted returned questionnaires. The proportion of men among respondents (19%) was similar to the percentage of men among City employees (20%). Of the employees with a staff canteen at their workplace, 54% of men and 48% of women ate lunch there. Those with higher educational level, women with preschool children and men with normal weight more often ate lunch at such canteens, as did those who more often followed dietary recommendations. Employees who ate lunch in the canteen had a healthier diet, and the men were less often overweight. This association did not apply to women, as they may be more health conscious and more aware of what food they eat outside the home (62). Unfortunately, no comparison could be made with the diet of those who brought their lunch from home.

As this study used cross-sectional data, the direction of the association cannot be confirmed. Having lunch at a staff canteen may promote healthier food habits, or those who want to eat healthily may eat lunch at a staff canteen. Nevertheless, the authors concluded that the opportunity for employees to eat lunch at a staff canteen should be promoted, as this is likely to improve the quality of their diets (62).

A study of young adults in Finland also found that eating lunch at an employee canteen was associated with a healthier diet (63). Lassen et al. (64) showed the success of the "6 a day" model in Denmark in increasing the consumption of fruit and vegetables in five workplace canteens. The results indicate a large potential for workplace canteens to influence employees' dietary habits and increase the consumption of fruit and vegetables.

In addition, the type of work affects employees' dietary habits. A cross-sectional study in Australia found that shift work can potentially alter food intake patterns, resulting in less healthy diets (65). Data collected by conducting in-depth semistructured interviews with carpenters, engineers and drivers in Norway showed that different types of work contributed to the differences in health practices and diet (66). The distribution of different

types of meals throughout the day was related to the type of work, and benefits at work were also different, with those in higher positions receiving mostly healthy benefits such as fruit baskets and healthy lunches (66).

Overgaard et al. (67) found that the evidence did not support any association between psychological pressure in the workplace and either general or abdominal obesity. Evidence published since this review, however, found a weak association between a high BMI and lower job control, higher job strain and higher imbalance between effort and reward (68). Since this was a cross-sectional study, further controlled studies are required before a causal relationship can be established. A survey conducted in Finland also found that work fatigue and working overtime were associated with weight gain among both men and women (69). Qualitative interviews with multiethnic, urban, low- and moderate-income adults living in upstate New York found that younger and lower-income workers, workers in lower-status occupations and workers with greater job strain tend to make less healthy food choices (70).

In conclusion, the presence of a workplace canteen seems to facilitate healthier dietary behaviour, although the nature of employment and workplace dynamics also influence such behaviour.

### Local community

The first reports linking diet, physical activity and body weight to the area of residence came from the United Kingdom in the early 1990s (71). Studies indicated that poorer neighbourhoods provide fewer opportunities for healthy diets and physical activity than more affluent ones. Studies from both Australia and the United States have demonstrated that fast-food restaurants tend to accumulate in low-income communities and areas (72). A study from Chicago showed a clustering of fast-food restaurants within short walking distance from schools, exposing children to poor-quality food environments in their school neighbourhood (73). A study in England and Scotland showed a higher number of fast-food restaurants per 1000 inhabitants in some deprived neighbourhoods, providing support for environmental explanations for the higher prevalence of obesity in poor neighbourhoods (74).

### Food retailers

Food retailers include small local shops, farmers' markets and supermarkets. Poor communities, where the restricted selection of food products offered limits food choices, have been called "food deserts" (75).

Living in an area with a supermarket offering a selection of healthy food at reasonable prices correlated with a significantly higher intake of fruit and vegetables and a lower intake of total and saturated fat. These observations were less pronounced for white people, which could be explained by their greater access to private transport and lesser reliance on the immediate neighbourhood.

Studies among poor families in Great Britain have shown that the availability of fruit and vegetables was lower and the price about 30–40% higher in rural than in urban areas (76). Further, healthier meat and fish products, wholegrain products and low-fat dairy products were less available than similar unhealthier products. Local governments in the United Kingdom have reacted to these findings and decided to improve the availability of healthy food in areas described as having poor access to retail food.

A survey in the United States found that people's diets are linked to the supply of food in nearby grocery stores (77). Other studies in the United States found that increased distance to supermarkets and convenience stores was associated with a poorer quality of diet (77,78).

A study by Wrigley et al. (79) examined the food consumption patterns in a highly deprived area of a city in the United Kingdom; food retail access had previously been poor, but changed suddenly and significantly as a result of the opening of a large food superstore: fruit and vegetable consumption increased significantly. A controlled study is required, however, before the change in diet can be attributed to the new supermarket.

A cross-sectional postal survey carried out in the United Kingdom (80) found no association between access to supermarkets and consumption of fruit and vegetables, and a study in Glasgow did not show a higher density of out-of-home eating outlets in poorer areas (81). Cummins & MacIntyre (82) conclude, in a recent overview of food environments and obesity, that good evidence for a contextual effect of the food environment is really only evident in North America. Studies from other countries and regions are warranted to cast more light on the issue, but various community settings are clearly promising venues for environmental intervention to increase fruit and vegetable intake (83).

A study in England that explored the cost of a healthy diet found that, in 1994, healthy eating cost less for shoppers in supermarkets than for those in smaller, local shops (84). People on low incomes, however, are likely to purchase food from small, local shops to eliminate travel costs, and are therefore unlikely to be able to take advantage of the economies of scale offered by supermarket shopping (84).

Another study analysed the distribution of food stores and outlets in the United States by the incomes and ethnic characteristics of different neighbourhoods; it indicated that poor and ethnic-minority communities have poorer access to a range of healthy food than non-ethnic-minority and affluent communities (85).

In addition, the way goods are displayed in shops substantially influences purchases (86). Retailers are taught by their organizations how to place products in shops to promote sales (see Chapter 10). The placement of sweets within children's reach and close to checkout points is just one example in which commercial and public health interests clash. Another important way of increasing sales is to make larger pack sizes. The main driver behind the steep rise in the consumption of sweetened soft drinks in Scandinavia after 1991 was the change in bottle size, from 330 ml in 1990 to 1500 ml in 1991.

In conclusion, the accessibility and affordability of food seem to influence people's dietary choices, although more controlled studies are needed to support policy options to act on these observations (87).

### Food service outlets

Food service outlets, providing food that is prepared away from home, include restaurants, fast-food outlets, convenience stores and delicatessens.

The frequency of eating away from home has increased since the late 1970s. In the general population in the United States, eating away from home increased from 6% of all meals and snacks in 1977–1978 to 19% in 1995 (88). Similarly, data collected in 1990 for a survey of adults in Great Britain found that 29% of meals were consumed away from home (89). The share of total food expenditure (including non-alcoholic beverages) devoted to food eaten away from home varies between 30% and 60% in the WHO European Region (90). This increasing trend in eating away from home (88,91,92) is expected to continue in most high-income countries (93).

Although the food prepared outside the home varies widely between countries, increased homogeneity has appeared as a result of globalization. Such changes have become more apparent in the last two decades.

A study using data from 3500 people 15 years and older collected in the 1977–1978 Nationwide Food Consumption Survey in the United States (94) found that the nutrient density of food eaten outside the home was lower than that of food eaten at home, but the people studied did not eat out often enough to influence the adequacy of their diets significantly. More recent studies (88,93,95,96) have shown that the meals served in food service outlets have a higher content of fat, saturated fat and sodium, and a lower content of fibre, iron and calcium than home-made meals.

Studies on the association between eating outside the home and obesity have only been performed for a few years. Most have been carried out in the United States and their results cannot always be considered applicable to countries in the European Region.

In the United States, a one-year longitudinal study of 1059 people assessed the frequency of eating at fast-food outlets, and its association with dietary behaviour and BMI (95). Fast-food meals were positively associated with energy intake and BMI among women, but not men. McCrory et al. (97) assessed the frequency of consuming food from seven different restaurant types in 73 healthy men and women aged 19–80 years. They used a questionnaire to assess food frequency, physical activity and other lifestyle parameters. After the study controlled for age and sex, the frequency of consuming restaurant food was positively associated with body fatness, and did not change after controlling for education level, smoking status and alcohol intake. The association increased after additionally controlling for physical activity. Total daily intake of energy, fat and fibre were significantly associated with the frequency of consuming restaurant food (97).

The available data affirm that the frequency of eating in fast-food outlets is positively associated with increased energy intake in adults but more longitudinal studies should be performed to confirm the effect on energy balance (95,98–103).

The association between frequenting fast-food outlets and eating habits and nutritional status has been fairly well analysed among adults, but studies among children are much more sparse. A cross-sectional study has not found any association between children's overweight and eating in fast-food outlets (57). No longitudinal study

has been published on the effects of frequenting fast-food outlets on children's body weight. More studies are available for adolescents. French et al. (96) surveyed 4764 adolescent students from 31 secondary schools in a large metropolitan area in Minnesota, using a self-filled questionnaire on behavioural variables and frequency of eating in fast-food outlets, and measuring participants' height and weight. Eating in fast-food outlets was directly related to age among boys, but not girls, in grades 7–12. Adolescents who reported eating at fast-food outlets three times or more during the past week had an energy intake about 37% higher than that of peers who ate no such meals. As to food intake, adolescents using fast-food outlets had higher intake of soft drinks and lower intake of basic food groups such as fruit, vegetables, grains and milk; nevertheless, frequent use of fast-food outlets was not associated with overweight (96).

A 2001 cross-sectional study in the United States among children aged 4–16 years (91 obese and 90 of normal weight) showed that the obese children consumed food away from home more frequently. This study was cross-sectional, however, and therefore cannot determine whether eating out causes obesity. Another limitation is that the non-obese children were not recruited randomly, but on a voluntary basis, and thus could not be representative of all such children (104).

The data on the influence of the proximity of fast-food outlets to homes and/or workplaces on promoting obesity are still insufficient. In England and Scotland, a study indicated that fast-food outlets were more numerous in deprived neighbourhoods (105). A cross-sectional study in Australia, however, suggests that the availability of take-away outlets is not related to obesity (106). A cross-sectional study in the United States also failed to demonstrate an association between distance from fast-food outlets (107) and the prevalence of obesity in children aged 3–5 in low-income families.

In conclusion, moderate evidence indicates that frequent eating in fast-food outlets is associated with less healthy eating habits and obesity in adulthood. The same moderate relationship has been demonstrated among male adolescents, but not among children, because very few studies have been performed in this age range.

The relationship between the availability of fast-food outlets and obesity needs to be studied in much more structured protocols, precisely defining proximity, the kind of food served in the outlets and the socioeconomic level of the district, and using a longitudinal design. This deserves more attention because fast-food outlets are spreading all over the world, and children are becoming more independent in food choices and have access to money at increasingly younger ages.

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## 9. Macroenvironmental determinants of food consumption

### Main messages

- Increased food supply and the associated decline in prices, along with rising incomes, have led to worldwide changes in dietary patterns that are believed to be the main drivers of the obesity epidemic. This process is facilitated by multinational food corporations, the industrialization of agriculture and an increased dependence on purchased food, which is more and more controlled by multinational retailers.
- In the EU, the Common Agricultural Policy has led to overproduction of food and alcohol.
- Consumers' food choices are influenced by the mass media, education and information conveyed through product labelling.
- Country policies that affect food pricing and availability and consumers' knowledge may influence dietary patterns.

In 1998, Hill & Peters (1) said: “Our genes have not changed substantially during the past two decades. The culprit is an environment which promotes behaviours that cause obesity. To stop and ultimately reverse the obesity epidemic, we must ‘cure’ this environment.”

The key lesson learned from the community health promotion interventions implemented since the 1970s is that health promotion and disease prevention should not focus solely on educating people about risk behaviour and developing their behavioural skills. Promotion and prevention should also include the environmental factors beyond individual control that determine diets, plus an understanding of the barriers preventing behaviour change (2). Egger & Swinburn (3) have called for an ecological or structural approach to fight the obesity pandemic and coined the expression “an obesogenic environment”. Environmental approaches have played a key role in reducing alcohol and tobacco consumption and improving health (4).

This chapter aims to identify the environmental or upstream determinants of food consumption on both the supply and the demand sides. This knowledge can enable more effective interventions to improve the diet of the entire population. Documenting the environmental determinants of dietary habits in the population is much more difficult than studying individual behaviour, however, because such influences are difficult to define, measure and study experimentally.

Studies have shown that people with more education are more likely to try to eat healthily than those with less education (5). Targeting environmental determinants – such as food availability, quality and price – can reduce inequality in health and support socially disadvantaged people in choosing healthier foods and being physically active (6–8). Lowering environmental barriers to healthy eating and physical activity will also increase the efficiency of health education campaigns.

Food markets provide the framework in which consumers can make dietary choices. Food producers, like any other segment of private enterprise, want to maximize profits. There is a fundamental conflict between the need to consume less sugar, fat and alcohol to prevent obesity and noncommunicable diseases and the drive of food and beverage producers to sell more of these products. Lang & Heasman (9) have termed this conflict “food wars”, and Nestlé (10) has discussed this extensively.

This chapter mainly focuses on factors governing food availability, price and labelling. Chapter 7 discusses food availability and consumption patterns, and Chapter 10, concerns with the marketing of food using advertising and other promotional methods.

### Availability of food

Strong growth in agricultural productivity has given humanity access to more and better food at declining real prices, the lowest in history (11). Owing to general improvements in agricultural productivity, the dietary energy supply has increased in all regions of the world and could adequately cover the dietary needs of everyone living

on earth. Per capita food availability on a global basis increased from about 9.6 MJ (2300 kcal) per day in 1961 to 11.7 MJ (2800 kcal) per day in 1998 and is expected to pass 12.5 MJ (3000 kcal) per day in about 2015. (Chapter 7 shows the trends in Europe.) An adult woman requires 8.1–10.4 MJ (1900–2500 kcal) daily energy and an adult man 10.4–13.3 MJ (2500–3200 kcal), depending on the level of physical activity (12). The reason why 850 million people in the world are malnourished is not a global lack of food but inequity in food availability (11). The factors driving changes in global food consumption are of key interest not only to the public health sector but also to all sectors of the food chain.

Worldwide, the dietary pattern is changing as a result of rising incomes and an increasing food supply: the nutrition transition (13–15). Most countries in the WHO European Region have passed through this transition, which is characterized first by an expansion of the diet with inexpensive foodstuffs of vegetable origin, followed by a substitution of energy from carbohydrate-rich staples with foods from animal sources, plus plant oil, fruit and vegetables, and sugar. A general trend is that consumption of meat, milk and eggs increases, resulting in rising intake of cholesterol and saturated fat. These dietary changes are now taking place in low- and medium-income countries and in the countries in the eastern part of the WHO European Region, but at a faster rate than previously experienced by high-income countries (14,16). Multinational food corporations are contributing to and accelerating the nutrition transition by entering markets in low- and medium-income countries and the countries with economies in transition by purchasing large shareholdings in local food producers, wholesalers or retailers (17).

This has resulted in both positive and negative changes in diets relative to the recommendations. The number of countries with national averages exceeding the recommended upper limits of 30% of energy intake from fat has increased during the past 40 years. In China, the rapid rise in income has meant a shift away from the traditional healthful diet towards a high-energy, high-fat and low-fibre diet, particularly among poor people (16). High-income groups may be better able to choose healthier diets and get the full benefits of the nutrition transition, with widening health disparities as a result.

Trade provides access to all kinds of foods all year round, which has contributed to increased consumption worldwide. Food now accounts for 11% of global trade (18), and the World Trade Organization (WTO) plays a central role in facilitating this process. The Codex Alimentarius standards on recommended codes of practice and guidelines on food safety, administered by WHO and FAO, set the standards that govern food trading. The Codex Alimentarius could therefore be a valuable international mechanism for producing standards and guidelines relating to overnutrition.

### Urbanization and the concentration of supply: role of retailers

Urbanization is closely linked to economic development (19). It can lead to changes in agricultural supply and food consumption patterns for several reasons. First, urban people live a more sedentary life, requiring less energy than those living in rural areas. Second, owing to higher income and education levels, urban people demand more meat, oil, sugar, fruit and vegetables. Since animals reared for meat and dairy products are fed on feed grains, urban diets actually require more cereal crops (for animal feed) than diets based on direct cereal consumption. Third, urban people buy most of their food, while rural households grow a larger proportion themselves. Fourth, higher proportions of adults in urban areas, especially women, work outside the home; this spurs the demand for convenience foods, which are more often processed and contain more sugar, salt and fat.

The largest changes to the diet occur at the beginning of the urbanization process, and the contrasts between urban and rural eating patterns are more marked in lower-income countries (14). In higher-income countries, market penetration into rural areas is common, due to the existence of integrated food distribution systems.

Supermarkets enter the food retailing system, beginning in capital cities, then spread to intermediate cities and finally to small towns (20). For farmers and food manufacturers, retailers' purchasing offices are of critical importance, as they determine quality and safety standards, giving retailers strong influence over food producers (9). Multinational retailers develop global brand names and marketing strategies with adaptation to local tastes, and in this way shape consumers' preferences (producer-induced demand). Producers take advantage of people's liking for sweet and fatty foods and their tendency to overeat when consuming energy-dense foods low in water and dietary fibre (21,22). Global marketing and the systematic moulding of taste by corporations are central to the globalization of the food industry (17). In Europe, 50–80% of food is now bought in supermarkets, and this proportion is rising (23).

Once most of a population is urban, further changes in food consumption associated with urbanization become less important, and income changes continue to affect consumption. The percentage of the population living in rural areas in the western part of the European Region varies from 0% in Monaco to 45% in Portugal (24). In the eastern part of the Region this percentage is much higher, varying from 30% in Bulgaria to 76% in Tajikistan. It has been estimated that, over the next decade, about 10% of the population of the western part of the Region and 25% of that of the eastern part of the Region will move from rural areas into cities (25), while small farmers leave their land as a result of pressure to increase efficiency in agriculture. The effect of urbanization on diets is therefore likely to continue to play a significant role in the Region in the years to come, with accompanying changes in morbidity and mortality.

### **Novel foods and changes in food processing: role of the food industry**

The declining real price of food in a relatively saturated European market means lower growth in revenue for farmers and the food industry. In an effort to maintain growth, the industry has responded by producing value-added foods (10). Cereals, for example, are converted to more expensive processed breakfast cereals, often containing appreciable amounts of sugar and fat. Food companies are also putting considerable effort into developing therapeutic or functional foods (10).

A major change in food processing has been the shift to refining grain flour through modern milling techniques. This has resulted in a loss of important nutrients, even though consumers may find the products more palatable (26). Markets for a large variety of baked goods, based on white flour, are expanding rapidly in low- and medium-income countries, even where cereals are not the traditional staple food. The increased consumption of bread has become a key characteristic of a diet increasingly prevalent in high-income countries: high in saturated fat, sugar and salt and low in fibre, with consequent rises in BMI, blood lipids and blood pressure. At the same time, legumes have been reduced to a marginal role despite their high nutritional quality. The reasons for this include longer cooking times and problems with digestion, making this food group less attractive as a protein source compared with animal sources.

The retreat from complex carbohydrates eaten as cereals, tubers and legumes has been accompanied by growth in the consumption of simple sugars such as sucrose (13). At the beginning of the 20th century, before the widespread cultivation of sugar beets and imports of sugar from cane, per capita intake in Europe was below 5 kg per year, versus 40–60 kg per year in parts of Europe today. In addition, the use of starch-based sweeteners has increased drastically (26). The rise in global sugar production and processing provides the basis for the worldwide increase in soft drink manufacture and consumption, promoted by aggressive marketing (10).

Food additives designed to enhance flavour, colour, texture and taste have been suggested to contribute to excess consumption (27). In the United States, about 10 000 new processed food products are introduced every year, and almost all contain additives.

The food industry has enormous potential to improve the composition and reduce the energy density of foods by lowering the amount of fat, sugar and additives in foods. Progress has already been made: for example, the cooperation between the United Kingdom Food Standards Agency and parts of the food industry to reduce salt, fat and sugar intake by reformulating processed foods and reducing portion size.

### **Industrialization of agriculture: role of farming**

Despite huge improvements in agricultural productivity, there are still considerable inefficiency in global food production and many opportunities to improve the use of resources and reduce environmental degradation while still being able to feed the world (13). Breeding of cereal varieties giving higher yields, more efficient use of fertilizers, biofixation of nitrogen and improvement in irrigation systems have led to ever increasing agricultural outputs of crops, and there is room for further improvement.

The industrialization of grain production has produced yields sufficient to feed larger numbers of animals than could be raised on grass and other traditional sources of forage. This in turn has facilitated the increased meat consumption that is now seen worldwide and linked to a higher intake of saturated fat.

Industrial methods of producing and processing animals for food are now well established for poultry, pork and beef in Europe and the United States (28). This system uses substantial fertilizer, antibiotics and pesticides and results in environmental pollution. This type of production system carries externalities, which means that

producers do not account for the external costs of environmental degradation and other costs and consequently do not include them in the retail price of meat (28). Consequently, consumer demand for meat is higher than it would otherwise be. A high-meat diet also consumes many more resources than a plant-based diet. High-income countries feed over 60% of grain to livestock, while people in low- and medium-income countries still consume most grain directly. This balance is changing, however, as demand for meat increases in low- and medium-income countries.

### Transport technology

Advances in transport technology explain part of the shift in exports around the world from bulk commodities, such as wheat and soy, to perishable products (29). This enables producers to deliver perishable products to purchasers on the other side of the globe, with no substantial loss in freshness or quality, at lower and lower cost. Packaging innovation, fruit and vegetable coatings and other techniques that reduce the deterioration of food products have expanded the market for meat and horticultural products and made them available to more people. Advances in information technology, such as on-ship remote container monitoring, as well as advances in transport technology, especially ocean shipping, are also facilitating long-distance food transport.

The drawback is more and more food miles, the travelling distance of food, which means externalized costs for environmental pollution not included in the price (9).

### Availability of food in local environments

Chapter 8 indicates how the dynamics of the retail system and the availability of food in schools and workplaces help to determine food intake. Taken together, the rise in the availability of food in general is likely to be the prime driver of the increase in obesity worldwide. Food availability in communities has been shown to be a determinant of food consumption mainly in North America, while the evidence in European countries is less clear. Nevertheless, availability in confined settings such as schools and workplaces is a strong determinant of consumption.

The complex interplay between food supply and food demand is driven by changes in income, urbanization, the globalization of the food industry and retailers, and the industrialization of agriculture, and has led to rising intakes of food energy, fat, sugar and alcohol. Large-scale interventions are needed to analyse whether obesity can be stopped by limiting the availability of energy-dense and nutrient-poor foods and drinks and increasing the availability of healthy foods.

### Income and price as determinants of food intake

Since the time of food scarcity, human beings have assumed that an inexpensive and abundant supply of food would automatically deliver health. The epidemic of obesity and other noncommunicable diseases worldwide shows that this view needs to be modified. Today, people on a typical diet in high-income countries receive more than half their daily energy from sugar, fat and alcohol, and the energy balance is positive for most of the population. Food has never been so abundant and so cheap, and households spend less and less of their income on it, which means that food demand is less sensitive than before to prices and incomes. The real price of rice, wheat, maize, fat and sugar fell by about 60% between 1960 and 2000 (11). With low prices as a consequence of an abundant food supply, even poor people can afford more fat and meat (16).

In a pan-European study of determinants of food choice (5), the four most important factors were “quality or freshness”, “price”, “taste” and “trying to eat healthy”. The influence of price was particularly important for unemployed and retired people on low incomes. Raising the price by taxing unhealthy food – either commodities (sugar and fat) or energy-dense and nutrient-poor foods – to reduce energy intake is now being discussed as a potential strategy for reducing obesity in several countries (30). Such taxes are regressive: they will hit the poor harder in the short term if people do not change their diets.

Food prices play an important role in food selection (14), and some researchers say that relative food prices can explain why poorer people have less healthy diets (31). The price elasticity for most foods in medium-to-high-income countries is between  $-0.1$  and  $-1$  (32), which means that a 10% increase in price will lead to a 1–10% decrease in consumption.

### Household income, income elasticity and food consumption

Income change is a major structural driver of dietary change around the world (33). As mentioned, diets change noticeably as countries move up the income scale: the nutrition transition. People in low-income countries are mainly concerned with meeting their energy needs by consuming inexpensive carbohydrate-rich cereals. As income rises, demand increases for meat, fruit and vegetables, and convenience foods. At even higher income, demand increases for products of high quality and those consistent with social values, such as animal welfare and environmental concerns.

As incomes have grown, the share spent on food in countries in the Organisation for Economic Co-operation and Development (OECD) has declined on average from 25% a generation ago to 13% today (23). Absolute expenditure on food has risen as diets have become more varied and include more prepared and processed foods. Table 9.1 shows the budget share and income elasticity of food categories in low-, middle- and high-income countries. Income elasticity measures the responsiveness of the quantity demanded to a unit change in income (33). For example, if income increases by 10%, the money spent on food will increase by 7.3% in a low-income country but only 3.4% in a high-income country.

**Table 9.1. Budget share and income elasticity of food categories in low-, middle- and high-income countries**

Consumption category	Budget share			Income elasticity		
	Low-income	Middle-income	High-income	Low-income	Middle-income	High-income
Food total	0.53	0.35	0.17	0.73	0.60	0.34
Cereals	0.27	0.18	0.12	0.53	0.37	0.17
Meat	0.15	0.18	0.18	0.78	0.64	0.36
Dairy	0.08	0.11	0.10	0.86	0.69	0.38
Fruit and vegetables	0.20	0.18	0.14	0.64	0.51	0.28
Beverages and tobacco	0.09	0.14	0.26	1.25	0.84	0.44

Source: Seale et al. (34).

When prices change, consumers in low-income countries are likely to substitute lower-priced products within a food group, such as exchanging corn for wheat. Middle-income consumers may be more likely to switch to products outside the cereal group, such as meat, fruit and vegetables. For high-income consumers, food is such a small part of the total household budget that price changes may lead to only minor adjustments in the composition of food consumed (35). Even small changes, however, could be significant for health.

As mentioned, the change in food choice with increasing income means a shift towards a diet high in saturated fat, sugar and salt and low in fibre, with consequent rises in BMI, blood lipids and blood pressure. Using data from 100 countries in an ecological study, Ezzati et al. (15) found that mean population BMI and blood cholesterol increased in relation to national income, then flattened and eventually showed a small decline among the highest-income countries (excluding the United States). Mean BMI and cholesterol were also strongly and positively related to the degree of urbanization in countries, with the curve flattening at 60% of the population being urban. Possible explanations for the decline in blood cholesterol at higher incomes are the change in diet towards a higher intake of fruit and vegetables, and lower salt intake, as well as pharmaceutical interventions. This study indicates that preventing obesity should be a high priority, especially during economic growth and urbanization, when the rise in the prevalence of obesity is steepest. Attention should be paid to the poorest groups in society, which seem to be more vulnerable to the effects of income change, because they spend extra income on higher-fat diets.

### Price and price elasticity of food

The price elasticity of food measures the responsiveness of the quantity demanded to a unit change in price. The price elasticity of various foods decreases with increasing income, which means that as consumers become more affluent they respond less to price changes in food (33). Price elasticity can be determined from household budget surveys. Price elasticity varies considerably with both the type of food and the country (32). In general, at

the income levels in Europe and the United States, demand for food is relatively price inelastic (elasticity between  $-1$  and  $+1$ ) compared with other consumables such as recreation, transport and health care. Soft drinks have a price elasticity of  $-0.4$  to  $-0.7$  (36), the same range as tobacco and wine, and most countries successfully use taxes to lower consumption.

Taken together, food is relatively price inelastic in middle- and high-income countries. Because the cost of sugar and fat make up such a small part of the retail price of processed foods, taxes in these countries would have to be substantial (similar to those for alcohol) to be effective in lowering consumption.

### Price of food and inequality in health

Studies are beginning to link the low cost of foods with the obesity epidemic, especially that of energy-dense foods. Drewnowski (37) claims that purely economic variables account for most of the social inequality in obesity rates. Diets based on refined grains, added sugar and added fat are more affordable than the recommended diets based on lean meats, fish, fresh fruit and vegetables. Low-income households consume the less-expensive diets to a greater extent. Such diets are also more energy-dense, leading to higher energy intake and obesity. For example, in Sweden the cost of strawberries is about the same as that of sweets by weight (about €6.4–7.5 per kg) but 10 times more expensive per unit of energy.

A recent study from Sweden, a high-income country, showed that a healthy diet is not necessarily more expensive than a less healthy one. The calculations showed that the average consumer spends about €2200 per year on food. The share of foods with a low nutrient content – such as coffee, tea, alcohol, mineral water, snacks, sweets, cakes, high-fat cheese, etc. – constituted 42% of the total food budget, corresponding to €900 per year. If purchases of these foods were halved and purchases of fruit and vegetables doubled, the healthy food basket would be cheaper than the average basket (38). This indicates that, at least in Sweden, consumers spend a lot on energy-dense, nutrient-poor foods and that a healthy diet is not necessarily more expensive than an unhealthy one. People need knowledge and resilience to marketing powers to avoid nutrient-poor foods, however, which can be a real challenge, especially for children.

### Taxes and subsidies on food

According to the economic theory of welfare, government intervention in a market, such as imposing taxes and subsidies on food, is justified if there is a market failure, such as the agents in the market having incomplete information and/or externalities (39). For obesity, both information asymmetry and external costs (on taxpayers) are present, thus providing the rationale for the use of economic instruments (40). The imbalance of information between the massive promotion of unhealthy foods and people's knowledge on healthy foods, such as through health education, causes the information asymmetry (39). The marketing of unhealthy foods and beverages containing much sugar, fat and alcohol can encourage consumers to disregard information about the negative health effects of these highly palatable products. External costs are present due to the direct and indirect costs of diet-related diseases and obesity borne by taxpayers as a group.

Taxes on food and beverages, also called excise taxes, are common throughout Europe and United States, but in all countries in the Region (except possibly Norway) their purpose is not to promote public health but to raise revenue (30). Soft drinks and/or sweets are selectively taxed in some countries (Denmark, Finland, France, the Netherlands and Norway), 19 states and cities in the United States, and several provinces in Belgium and Canada. Denmark and Norway have the highest taxes on soft drinks in Europe (€0.21 per litre). Lower domestic sales have followed increasing tax rates in Denmark (41), but imports from neighbouring countries have increased, leaving total consumption unchanged (42).

### Effects of labelling, health claims and nutrition profiles on food choice

Consumers today are exposed to information on food from several sources, including television, print mass media, packaging (nutrition labels and health claims), education, the Internet and advertising. Nutrition labelling, besides complying with consumers' right to information, is also a potentially important element in the overall strategy for combating noncommunicable diseases. In an environment with a high availability of food, cognitive control of body weight is required (8), and adequate labelling of food could be one way of ensuring that everyone has the information and tools needed to cognitively manage energy balance and improve health.

## Nutrition labelling

Nutrition labelling is defined as a list of nutrients on a food label accompanied by some form of quantification. Under EU legislation, nutrition labelling is not compulsory on a food package unless a nutrition claim is made (43). A survey in four EU countries showed that 56% of the 2954 products surveyed include tabular nutrition labelling (44). Labelling was most comprehensive in the United Kingdom (75% of all products), Spain (54%), Germany (50%) and Poland (41%). The most frequently labelled food categories were breakfast cereals, margarine, soups and frozen vegetables. The most commonly used types of labelling list either four (energy, fat, carbohydrate and protein) or eight nutrients (with the addition of saturated fat, sugar, sodium and fibre).

In the United States, the Nutrition Labelling and Education Act, passed in 1990, had the express purposes of heightening people's awareness of the nutritional content of foods and encouraging food manufacturers to improve the nutritional attributes of their products. The resulting nutrition labelling regulations, which became fully effective in 1994, provide consumers with an unprecedented amount of nutrition information by mandating nutrition labelling on virtually all processed foods. The content of the nutrition facts panels, regulated by the United States Food and Drug Administration, are specific to the food product or food product category and specify the number of servings per container and the key nutrients of a serving in a diet totalling 8.3 MJ (2000 kcal) per day (expressed as percentage of the daily value). Serving sizes on the label are standardized so that consumers can compare nutritional information between products. Since the United States introduced compulsory labelling, food producers have responded by creating healthier foods; more than 6500 reduced-fat foods were introduced between 1995 and 1998 (45).

The European Commission is revising the EU nutrition labelling directive; a proposal is expected during 2007. The issues being discussed as part of the amendment process include voluntary versus mandatory nutrition labelling, the number and nature of nutrients to be included, the format to use in presenting the information (expressing nutritional content in units and/or percentage of a value to be determined), linking with recommendations on healthy diets (which could include the potential negative impact of certain food ingredients) and the most appropriate reference quantity for nutritional declaration, such as information given per serving (46).

## Effects of nutrition labelling

A joint WHO/FAO consultation (47) established that a high dietary intake of energy-dense, nutrient-poor foods increases the risk of weight gain and obesity and that a high intake of fibre decreases the risk. Knowing the effects of nutrition labelling on consumers' choice of foods is important for policy-making. So far, studies on the effects of nutrition labelling have focused on determining how much consumers use nutrition labelling and how well they understand the information. Little is known about the effects on consumers' food choices and their overall diet, and virtually nothing is known about the effects of nutrition labelling on energy intake in the population.

Three major reports form the core of this review, and base their conclusions on essentially the same studies. The European Heart Network has published the only systematic review on consumer understanding of nutrition labelling to date (48). WHO published a report on the global regulatory environment of nutrition labels and health claims, including a section on the effect of nutrition labelling on food choice and diet (49). European Advisory Services conducted an impact assessment on nutrition labelling on behalf of the European Commission (44).

Of the 129 studies included in the European Heart Network review (48), only 5% were considered of high quality. Only about a third of the studies included took place in realistic settings, where people actually made food-purchasing decisions. Many studies relied on self-reported measures or used samples of volunteer participants, whose views may not be typical of the general population. Mainly white populations were included, and more women than men participated. Four papers reported studies focusing on low-income populations.

Women and people with higher income and education levels were most likely to look at labels. Readers reported using nutrition labels to avoid certain nutrients and to assess the specific nutrient content (particularly fat, energy and sugar) of certain products. Although participants reported high use of nutrition labels, more objective measures suggest that their actual use during food purchasing may be much lower. Those with a special interest in or positive attitudes towards diet and health reported higher levels of label reading. Reasons for not reading labels included lack of time, the size of the print on packages, lack of understanding of terms and concerns about the accuracy of the information.

The report commissioned by the European Commission (44) concluded that existing research cannot lead to quantifying or drawing strong conclusions on the health benefits associated with nutrition labelling alone. The available studies support the assumptions about the benefits of labelling, but more targeted research is required. Nevertheless, failure to provide clear and understandable nutrition information may seriously undermine other initiatives undertaken to improve consumer diets and to reduce the health costs related to poor nutrition.

Surveys in the United States suggest that label use affects the food choices of a significant proportion of consumers. In a survey conducted in 1994 after nutrition labelling became mandatory (49), 54% of consumers said that they had changed a decision to buy or use a food for the first time because they had read the new label, and 27% said they no longer purchased certain products. The level of fat was the most frequent cause of these changes. Label use explained 6% of the variance in fat intake among residents of the state of Washington (50). Consumers who used nutrition labels obtained a lower percentage of their total calories from total fat, saturated fat, cholesterol and sodium, and had a higher intake of dietary fibre (51). Another study showed that label use appeared to be associated with diets higher in vitamin C and lower in cholesterol, but not with any other food component (52).

In the spring of 2005, the European Consumers' Organisation (BEUC – a Brussels-based federation of 40 independent national consumer organizations from the EU, candidate countries and European Economic Area countries) commissioned research into consumers' understanding of nutrition and food labelling (53). The study was carried out in Denmark, Germany, Hungary, Poland and Spain, reflecting European diversity (northern Europe, central and eastern Europe and southern Europe). The participants in the study were consumers responsible for doing the household shopping; 75% of the 3000 interviewees were women. Just over half of the respondents were classified as having normal weight (BMI of 18–25); 35% were overweight and 12% obese.

The interviews took place in the home, where the interviewees were shown various product samples. The interviewees showed great interest in but low knowledge of nutrition; for example, 66% believed that a product with a very high carbohydrate and sugar content had rather good or very good nutritional quality. Also, 81% wanted nutritional information on the label concerning fat, sugar, vitamins, cholesterol, carbohydrate, minerals, energy value, protein, fibre, sodium or salt, and saturated and unsaturated fatty acids. The interviewees did not in general read the nutritional information, however; they most frequently read information about price, “best before” date or “use by” date and brand name. Their main sources of nutrition information were television and print media. Further, 77% of those who believe nutritional labelling should be improved would like to see an indicator on food packaging to highlight its nutritional quality. They agreed to a simplified labelling system to indicate whether fat, sugar or salt levels are high, medium or low on the front of the pack. Even consumers who said they were not interested in nutrition would like to see this type of simplified labelling system on food packaging.

In the United States, the Institute of Medicine of the National Academies has published several recommendations on preventing childhood obesity, recommending that the United States Food and Drug Administration revise the nutrition facts panel to prominently display the total energy content for items typically consumed at one eating occasion, in addition to the standardized energy serving and the percentage daily value of a standard diet of 8.3 MJ (2000 kcal) per day (54).

More research is needed on consumer understanding and use of nutrition labelling, such as understanding and using labels in real-life situations, refined methods for assessing the understanding and use of labels, what motivates people to use nutrition labels, what measures would encourage the use of labels and associations between reading labels and the quality of the diet (55).

In summary, existing research does not justify quantifying or drawing strong conclusions on the health benefits associated with nutrition labelling as a stand-alone measure. Most consumers find the current nutrition label format confusing but find short, simple information easy to understand. Failure to provide clear and understandable nutrition information may seriously undermine other initiatives undertaken to improve consumer diets.

### Health claims by food manufacturers

Health claims describe a relationship between health and a food category, product or constituents. In the EU, Regulation (EC) No 1924/2006 of the European Parliament and of the Council of 20 December 2006 on nutrition and health claims made on foods (56) “harmonises the provisions laid down by law, regulation or administrative

action in Member States which relate to nutrition and health claims”. The Regulation mandates an evaluation of the highest possible scientific standard by the European Food Safety Authority for health claims, nutrition labels on all foods with nutrition or health claims and that the average consumer can understand the claims. The Regulation prohibits general or nonspecific claims of overall good health and well-being; claims made for benefits to behaviour and psychological functions; claims referring to weight loss; claims suggesting that health could be affected by not consuming the food; health claims on alcoholic beverages; “percentage fat-free” claims; and claims made on foods with certain nutrition profiles to be established. Claims that the disease risk is reduced may be made if the European Food Safety Authority authorizes them.

In the United States, the Food and Drug Administration has approved 14 different health claims that may be used on food packages to emphasize both risks and benefits, such as the relationship between heart disease and saturated fat, cancer and fruit and vegetables, and coronary heart disease and fruit, vegetables, grains and soluble fibre. In 2000–2001, about 4% of products sold had a health claim on the food package (54). The United States Food and Drug Administration must authorize health claims and nutrient claims before they are used in food labelling.

### Effects of health claims

Health claims appear to catch consumers’ attention and influence their behaviour. In the 2005 BEUC survey, almost 60% of interviewees said that claims always or often caught their attention (53); 80% indicated that claims were easy to locate (health claims are often placed in very prominent positions on packages) and 70% believed that they were easy to understand. Consumers prefer short, succinct wording, rather than long and complex claims. On average, 50% of the interviewees said that they trusted claims, but the spread is very large. In Denmark, where claims (and fortification of products) have been strictly regulated, only one third answered that they trust nutritional claims, in contrast to 70% in Germany.

Most consumers say they do not have good knowledge of nutritional concepts, but trust the claims because they trust the brand. The survey results indicate that claims are the single most influential nutritional factor in consumer choice at the point of purchase. More than half of consumers say that claims lead them to buy a product and one third that they lead them to consume more of the product (57). As mentioned, a pan-European survey identified “quality and freshness” as the most important factor in food choice (5). A health claim might be taken as a quality indicator sought by consumers.

One troublesome aspect of the effects of health claims is that their benefits are likely to be restricted to health-conscious, affluent groups, who are willing to pay for products with health claims and added functional benefits, and exclude consumers unable to afford premium prices for these products. Another problem is that health claims may encourage excessive intake of certain foods by implying that the consumption of the nutrient for which the claim is made leads to good health (53). Health claims give a product a halo effect, which may discourage people from seeking further nutrition information.

Hawkes (49) drew the following conclusions on health claims:

... to date, there is insufficient evidence concerning their effect on diet and public health. While some evidence suggests that consumers will be drawn to more healthful products if they carry health claims, the positive or negative influence of health claims in the overall diets of individuals (and populations) is unclear, as are the relative effects of different types of claim. Too little is understood about the role health claims play in nutrition education, food choice and a balanced diet. Nor is it clear who should take responsibility for the nutrition education required to maximize the benefits of health claims, or for monitoring their effects on public health. Regulations can play an important role here by setting out a framework and clarifying which claims are appropriate and which should be prohibited.

The European Heart Network believes that there are sound health reasons for permitting valid nutrition and health claims that reflect public health needs (58). Nevertheless, there is a danger that, because of competitive pressures in the food industry, more and more claims will be used that are not scientifically valid or that focus on minority or trivial health issues. The Network therefore recommends that nutrition and health claims be allowed only if they are scientifically valid, relevant to public health and worded so as to ensure that they are not confusing to the public.

Health claims should be consistent with public health objectives. Health claims for foods with an undesirable nutritional profile (see below), such as sweets and high-fat and salty snacks, could otherwise undermine healthy eating messages. Nutrient profiles for foods are used in countries outside Europe. Australia, Canada, New Zealand and the United States have or will have nutritional or food-related restrictions for health claims and the addition of vitamins and minerals (59).

Article 4 in the EU Regulation on nutrition and health claims on foods (56) addresses the nutritional profile of food: “The nutrient profiles for food and/or certain categories of food shall be established taking into account in particular: (a) the quantities of certain nutrients and other substances contained in the food, such as fat, saturated fatty acids, trans-fatty acids, sugars, salt/sodium; ...”. Article 4 thus strengthens public health and consumer protection by stating that, in order to qualify for a health and nutrition claim, the overall product must meet certain nutritional criteria to ensure that it genuinely contributes towards a healthy and nutritious diet.

In summary, evidence on the effects of health claims on public health is insufficient; too little is understood about their role in nutrition education, food choice and a balanced diet.

### Nutrition profiling schemes and symbols

Nutrition profiling can be defined as the science of categorizing foods according to their nutritional composition and can be used, for example, to regulate nutrition and health claims, restrictions on the marketing of foods to children and compositional standards for foods sold in schools. Many nutrition profiling schemes are in place or being proposed both in Europe and elsewhere, such as Health Check in Canada, Pick and Tick in Australia and Snack Wise Nutrition (guide for school vending) in the United States (60). The Food Standards Agency in the United Kingdom has developed a system for nutrient profiling that gives points according to the level of energy, saturated fat, total sugar and sodium in the product and subtracts points for protein, fibre and content of fruit and vegetables. Based on the scoring system, foods can be classified as “high in saturated fat, salt or sugar”, “intermediate product” or “healthier choice” (61).

A few nutrition-profiling schemes and the symbols used to indicate profiles are presented here.

### Sweden’s Green Keyhole

The Green Keyhole was introduced as a food label during the 1980s as part of a regional health promotion project to reduce coronary heart disease in northern Sweden. In 1989, Sweden’s National Food Administration added the symbol into the Swedish Code of Statutes. It is used on a voluntary basis, and the National Food Administration sets the criteria for labelling.

The criteria for Keyhole labelling were revised in 2004 and now include the total amount of fat, type of fat (saturated fat plus *trans* fatty acids), added refined sugars or total sugars, salt as sodium chloride and fibre. For ready-made dishes, the (minimum and maximum) required amount of energy and a minimum for vegetables (80 g) have been established. Products excluded from the label are ice cream, skimmed-milk powder, whey-cheese and biscuits. The Keyhole scheme is a relative and not an absolute scheme, comparing levels of nutrients within a given product group (62).

The health promotion project for which the symbol was designed attempted to evaluate the impact of the Keyhole on health in the population. This has proven very difficult, however, since information about the symbol has spread outside the intervention region and there was thus no clearly defined control region (63). A nationwide survey in 1995 showed that 6% of the population always chose products carrying the Keyhole symbol, 32% often, 25% occasionally and 36% never (63).

In 1996, a study was carried out among women in south-western Sweden to determine whether knowledge of the symbol was associated with intake of dietary fat and fibre: 62% of the women adequately understood the symbol’s meaning. Mean BMI was significantly higher among the women with more knowledge of the symbol, but there were no major differences in total fat or fibre intake between groups. The conclusions were that the participants understood the campaign but their dietary behaviour did not appear to conform to the low-fat message (64). A similar study a few years later showed that 53% of men and 76% of women understood the meaning of the symbol and that men and women with knowledge of the symbol seemed to have adopted its low-fat message (65). Certain subgroups, particularly people with less education, however, appeared not to associate the message of the symbol with their dietary practices.

According to a study performed by Statistics Sweden in 2003 (before the criteria had been revised), Sweden's population was highly aware (69%) that the Keyhole stands for low-fat products, but less aware (24%) of the high-fibre message. Some 37% thought the symbol stood for a "calorie-free" product (66).

### Finland's Heart Symbol

In 2000, the Finnish Heart Association and Finnish Diabetes Association launched the Heart symbol, which signals a better choice in a certain product group regarding fat (total fat and quality of fat), sodium, cholesterol (in some product groups) and fibre (in one product group). Product groups include milk and dairy products, fat and oil, processed meat, bread and cereals, convenience food, semiprocessed food, meal components, spices and seasoning sauces. In October 2005, 247 products from 29 companies were entitled to use the symbol. The symbol has been heavily promoted through television, radio, the Internet, shopping carts, periodicals, fairs and journals (67). Target groups for marketing are enterprises in the food sector, consumers, food marketers or retailers, the health care sector and interest groups.

Regular market research studies the use of the symbol. Data from December 2005 show that 82% of the population recognized the symbol (89% of women and 76% of men). More than 40% used it as a guide to healthier choices in purchasing. The symbol has not been evaluated for its effects on diet composition or energy intake (personal communication, Mari Olli, project secretary, Finnish Heart Association).

### Signposting in the United Kingdom

The Food Standards Agency in the United Kingdom is reviewing the performance of different approaches to nutrition labelling in terms of consumer understanding and ease of making healthy choices. It is considering two main schemes: its proposals for a colour-coded traffic-light scheme indicating absolute levels of key nutrients (fat, saturated fat, sugar and salt) and a scheme proposed by sections of the food industry that presents guideline daily amount values for these nutrients and additional nutrients at the discretion of the manufacturer.

Consumer organizations and health NGOs in general support the traffic-light scheme, and some of the food industry has adopted this approach, while other elements of the industry remain supportive of a guideline daily amount scheme. Results of research involving over 2600 people in the United Kingdom indicated that front-of-pack nutritional signposting helped consumers quickly and accurately assess the nutritional quality of food. Consumers particularly wanted signpost labelling on complex processed foods. Sales data from food companies using signposting indicate the consumers switch to healthier products in the same food categories (68).

In conclusion, little is known about the effects of food symbols on dietary behaviour, obesity and public health. Most consumers recognize such symbols and seem to understand what they stand for and the campaigns associated with them.

### Role of agriculture and trade policies in food consumption in Europe

The basic aim of agricultural policy, including the EU Common Agricultural Policy, has been to provide food security for the population. Today, the role of agriculture policy become much more complex, although the EU has not changed its objectives since 1962.

Nevertheless, agriculture policies profoundly affect food consumption patterns because they give incentives for producing certain foods by providing market support. Together, OECD countries plough almost US\$ 1 billion per day into agricultural subsidies (69). This is paradoxical considering the huge food surpluses in high-income countries today. Another paradox is that subsidizing agriculture makes food more expensive for consumers, owing to loss of efficiency in production (70), which inherently limits consumption. Food surpluses are either exported with subsidies (the EU accounts for 90% of all export subsidies applied by OECD countries) or sold with consumption aid to domestic food and feed industries, ending up in the food chain of Europeans (71). Lang & Heasman (9) termed this food system the "productionist paradigm". This term describes the industrialization of food production, in which quantity is the most important aspect.

International trade increases the array and the availability of food to consumers worldwide (72). Trade provides access to fresh fruit and vegetables all year round, which has led to an increase in consumption worldwide (73). Trade policies are fundamentally linked with agriculture policies because they are often necessary to keep domestic agriculture support programmes in place (70). A central instrument of trade policy is the use of import

tariffs to protect domestic markets. Tariff rates vary substantially for different commodities. In Europe, tropical products such as coffee beans tend to have lower levels of protection, while commodities that compete directly with domestic production – such as rice, wheat, meat, fruit and vegetables and dairy products – may have much higher barriers. In some cases, reducing trade barriers affects trade, but may not alter consumption if consumers directly substitute domestically produced goods for imported goods. In other cases, changing tariff barriers can greatly affect consumption.

Agriculture and trade policies have complex effects on nutrition and health. Owing to the individual regulations for each commodity, the effects must be analysed separately.

The EU Common Agricultural Policy dominates the agricultural sector in the WHO European Region, through countries' membership in or trade agreements with the EU. The Policy was created in 1962, when Europe still suffered from still food shortages following the Second World War. Farmers received economic incentives to stay on their land, which is reflected in the Policy's five objectives (74). Maintaining income support to farmers has become the dominant objective, which leads to conflicts with health, consumer, environment and development policy (75–78). The next section gives several examples of how the EU Common Agricultural Policy affects food patterns and how this hinders the achievement of public health and nutrition goals.

### Fruit and vegetables

Increasing the intake of fruit and vegetables to 400–600 g per day, requiring at least a doubling of current intake in most European countries, would decrease the incidence of various types of cancer, heart disease, stroke and obesity (79,80). The market organization of fruit and vegetables includes a withdrawal measure aimed at keeping prices up by limiting availability in times of seasonal overproduction, to protect European farmers from competition. The withdrawal of high-quality produce receiving economic compensation has been reduced during the past decade, but 80% of withdrawn produce is still destroyed, even though the regulation stipulates that it be used for human consumption as a first option. A modelling study in the Netherlands showed that, if all withdrawn produce were marketed and consumed by human beings, this would result in a modest increase in life expectancy (2–6 days) (81).

Further, widely varying import tariffs, from 10% to 140% of the border price depending on the product and the season, are added to protect the domestic market. Consumer prices increased by, for example, 10% owing to import tariffs would decrease consumption by 5% on average, assuming price elasticity of  $-0.5$ . This drop in consumption is three times that caused by the withdrawal measure. The consumption-lowering effect is even more pronounced for low-income people, who are more price sensitive (see the section on income and price as determinants of intake) and have the lowest intake. In this way, higher fruit and vegetable prices in the EU due to policy may increase inequality in health, an issue that may be addressed in the reform of the sector.

### Dairy products

In Europe, more than 90% of the population exceeds the WHO recommendation for maximum dietary total and saturated fat (25). Milk fat and fatty meat are rich sources of saturated fat, and reduced intake of these foods is generally recommended.

On the EU market, production exceeds domestic demand by around 20%, which previously led to butter mountains in intervention cold stores. Today, the EU common market organization for milk grants export subsidies and consumption aids to the food industry, which uses surplus butter in ice cream and pastry (80). In this way surplus butter finds its way into the food chain and contributes to cardiovascular diseases, diabetes and obesity among Europeans. Further, this level of production is expected to increase by 1–2%, owing to the extension of milk quotas (national reference amounts eligible for support) until 2015 (82). Experience from Finland, Norway and Poland (see the country studies below) shows that lowering saturated fat intake from animal sources played a significant role in the dramatic decrease in cardiovascular mortality in these countries, although this move initially created considerable opposition from the agricultural sector.

### Sugar

The EU is the world's third largest sugar producer, after Brazil and India. It has the highest cost but is the second largest sugar exporter because of export subsidies. EU market support to the sugar sector results in less efficient

production, because EU sugar beet farmers have higher production costs than sugar cane farmers in tropical countries. The EU sugar price is therefore three times the world market price, which tends to reduce consumption within the EU, and EU sugar farmers have to be protected by import tariffs.

Even though consumption is increasing worldwide, sugar stores constitute 50% of one year's global consumption, indicating overproduction (83). Irz & Srinivasan (84) calculated that adherence to WHO norms worldwide, with a maximum 10% of energy intake, would imply a reduction in human consumption of about the same magnitude as the total European production. Without sugar subsidies, there would probably be no production of sugar in the EU and world market prices would increase by around 20%. Sugar subsidies therefore lead to overproduction, which in turn lowers the world market price, which eventually increases consumption worldwide.

Following commitments by the EU in multilateral WTO negotiations to lower export subsidies, reform of the sugar sector was unavoidable. The reform agreed in the EU in February 2006 implies a 36% cut in the guaranteed minimum sugar price, compensation for farmers and a restructuring fund to encourage uncompetitive sugar producers to leave the industry. EU production is expected to fall by one third (6–7 million tonnes) in the next few years. From a public health perspective, this is a step in the right direction, but the remaining support to the sector (€1.7 billion per year) is not justified from a public health viewpoint. Nevertheless, the situation on the sugar market may change dramatically in the future, when more and more sugar is used for producing biofuel.

In conclusion, subsidizing agriculture in the EU has led to overproduction of food and alcohol and paradoxically to an inadequate supply of fruit and vegetables. Adopting nutrition goals and recommendations at the EU level would have important implications for agricultural production, trade, processing and marketing, especially with regard to sugar, fat, alcohol and fruit and vegetables.

## Country studies

The three countries chosen as case studies have all gone through major changes in their food supply and pricing, which have significantly affected consumption and lowered cardiovascular mortality. While the changes resulted from deliberate nutrition policy in Norway and Finland, based on nutrition recommendations, Poland experienced a political and economic revolution after 1989, which affected food production systems. These case studies have important implications for preventing obesity.

### Norway

Norway set up a National Nutrition Council in 1946, which has been instrumental in developing the successful national food and agriculture policy. The Council comprises 23 independent experts with competence in various relevant areas, making it an intersectoral body, and its main role is to advise the Government on nutrition and health issues.

The first dietary guidelines appeared in 1954. In 1963, a government expert committee recommended that fat intake be limited to 30% of total energy intake (85). Not until 1975, after the 1974 World Food Conference in Rome, was a white paper on Norway's nutrition and food policy presented to the Storting (parliament) advocating a strong role for government. The paper focused on healthy diets, especially fat intake, vulnerable groups and self-sufficiency in the food supply. The population goal for fat intake was set at 35%, which was a compromise between the National Nutrition Council and the agricultural lobby, which feared that a lower target would lead to reduced consumption of meat and dairy products. The main measures proposed focused strongly on the use of health education through television and other media; taxes and subsidies on food; and regulations on food provision by retailers, street vendors and institutions, and on food processing and labelling. The policy was implemented slowly in the beginning, owing to opposition from the dairy and meat industries. After the publication of the results of the Oslo study (86), showing that a change in diet reduced coronary heart disease in middle-aged men with high blood cholesterol levels, however, both the population and politicians were convinced of the policy's public health benefits. The Government encouraged farmers to produce foods with lower fat levels and to avoid overproduction.

The policy has increased knowledge on nutrition and health in the population. The main changes in the diet from 1975 to 1993 were a reduction in consumption of fat, mainly saturated fat, and an increase in the consumption of vegetables, fruit and cereals. Concomitantly, the mean blood cholesterol in the population has decreased

by 10%, which is thought to have contributed significantly to the large reduction in coronary heart disease mortality in Norway.

In 1993 the nutrition and food policy was integrated into Norway's public health policy. The National Nutrition Council and the National Food Control Authority are responsible for implementing the nutrition and food policy. The main objectives related to nutrition now focus on dietary recommendations, breastfeeding, social inequality in health and the role of primary health care. The regulatory requirements are embedded in the consumer policy operating with differentiated prices, food availability, food labelling and claims and information and marketing. The new policy also emphasizes the need for sustainable development in food production and consumption.

Even though Norway is not an EU member, it is bound by trade agreements with the EU and within the WTO. This has increasingly created difficulty in manipulating prices according to public health criteria (85). Diet and meal patterns are changing rapidly, especially among the younger generation, and public health campaigns are losing ground to aggressive marketing of foods high in fat, sugar and salt. Even though heart disease has been almost halved during the past three decades, the share of adult obesity in Norway is now as high as in the rest of Scandinavia: about 10%.

A 2003 report to the Storting (87) concluded that, although the intake of fat has declined and those of cereals, fruit and vegetables have increased, the consumption of fat, sugar, salt and alcohol is still a considerable nutritional problem. Further, the prevalence of ischaemic heart disease and obesity among adults and children shows significant social inequality. The Government declares that education campaigns are the most important instrument in nutrition policy but that, in the future, more emphasis will again be placed on structural measures such as regulating unhealthy foods, increasing the availability of healthy foods and issuing guidelines for catering services.

## Finland

Finland has a long tradition of nutrition policies, with the first nutrition committee dating back to 1936 (88). A National Nutrition Council was established in 1954 consisting of representatives from various interest groups from agriculture, the food industry, health care, education, research and consumer organizations. At that time, its main purpose was to ensure food security and increase food consumption, which explained how common goals could be agreed in this intersectoral group of stakeholders. In the following two decades, however, conflicts of interest started to emerge between the public health and the agricultural sectors when the former, on the basis of new scientific findings, started to argue for a reduction in saturated fat intake, which was more than 20% of energy intake at that time. This conflict appeared in the Council's inability to give practical guidelines on the use of margarine and vegetable oil versus butter (88).

The growth of nutrition science and knowledge of disease prevention, however, led to the adoption in 1978 of Finland's food and nutrition policy, including dietary guidelines for the population as a whole and eventually also for specific target groups, as well as special dietary guidelines for schools, hospitals and workplaces. In the subsequent implementation phase, stretching from 1978 to 1992, measures were suggested on the production and marketing of food, legislation, monitoring, pricing, catering, nutrition education and research.

Finland's struggle with the highest prevalence of cardiovascular disease in the world, in the 1960s and 1970s, was the impetus for the famous North Karelia project, starting in 1972 (89). The project became the first major community-based intervention project to prevent cardiovascular diseases, but later its goal broadened to include other chronic diseases and health promotion in general. Intermediate objectives were to reduce the level of risk factors, with a special emphasis on smoking and diet. Comprehensive activities were used, including mass-media campaigns, activities by health services (especially within primary care) and community organizations, and environmental and policy changes. Over 25 years, the prevalence of smoking among men fell from 52% to 31%, the use of butter fell from 90% to 7% of the population and the mean serum cholesterol fell by 17%. Butter was replaced by locally produced rapeseed oil, which contributed to the acceptance of the substitute. In addition, elevated blood pressure has been brought well under control and leisure physical activity increased. Women experienced similar changes in dietary habits, cholesterol and blood pressure levels. Smoking among women increased somewhat, but from a low level.

Cardiovascular mortality decreased more rapidly in North Karelia than in other areas of Finland. Between 1982 and 1997, coronary heart mortality rates declined by 63% (90). Improved treatment explained about 23% of

the mortality reduction, and changes in risk factors (smoking, serum cholesterol and blood pressure) explained 53–72%. The biggest single risk factor contribution was from the large decline in total cholesterol levels due to the promotion of more healthy diets. At the same time, lung cancer mortality decreased by more than 70% in North Karelia and nearly 60% in all of Finland. As a result, life expectancy has increased by seven years for men and six years for women.

Finland's experience illustrates many key factors for success, including that: “[a] major emphasis and strength of a community intervention programme should be attempts to change social and physical environments in the community more conducive to health and healthy lifestyles” (89), consistent with an ecological approach to health promotion. The good results and methods of the North Karelia project later spread to the whole country, showing that a major national demonstration project can be a strong tool for favourable national development. The positive publicity for the project increased awareness of healthy diets and paved the way for national policy decisions and legislative changes. Finland has demonstrated a success story in improving diet, despite major initial resistance to change from the agricultural sector. Today, however, obesity has become a major problem.

### Poland

As in Finland, cardiovascular mortality was very high in Poland, although the dramatic rise occurred later, between 1960 and 1991, after which it started to fall dramatically. This fall has been faster than previously observed in any other country in peacetime (91).

One explanation was a major change in diet: a reduction in the intake of saturated fat, through a switch from animal to vegetable fat, and an increase in fruit consumption. This was not the result of a deliberate nutrition policy, however, but an unplanned experiment resulting from the political and economic transformation that began in the late 1980s. Other potential factors that could have led to the decrease in cardiovascular disease mortality – such as improvement in health services or smoking, alcohol consumption or stress levels – were not considered to have changed enough to explain the effects.

The change in fat consumption was ascribed to changing market conditions. General purchasing power in Poland fell after 1989, and the withdrawal of large consumer subsidies, especially for butter and lard, led to a sharp reduction in sales of these foods. This created an opportunity for vegetable fat producers, who made margarines widely available at prices 40% lower than butter, which increased sales dramatically.

Mortality trends have continued to fall in Poland and are 38% lower among middle-aged men in 2002 and 42% lower among middle-aged women compared with 1990 (92). Saturated fat consumption has decreased by 7% and that of polyunsaturated fat, mainly rapeseed and soybean oil, has increased by 57%. This has resulted in a 70% lower ratio of saturated to unsaturated fat in the diet. This is believed to be the major single explanation for the decline in heart disease in Poland, with only a slight contribution from fruit imports and reduced smoking.

Poland's example shows that changes in agriculture and economic policy, rather than health policy, can lead to significant changes in population diets, in this case with a highly positive outcome for cardiovascular mortality. This demonstrates the usefulness of a multisectoral approach.

Taken together, these country studies demonstrate that interventions at the national level that combine changes in the availability and price of food with health campaigns can achieve favourable and stable changes in diets. Much can be learned from this successful strategy against cardiovascular disease, but the fight against obesity is different and more difficult and requires firm action from governments, which will provoke strong reactions from food producers.

### Conclusions

This chapter has reviewed information from a variety of sources, including scientific papers, reports from governments and international organizations and information on the web sites of various organizations on nutrition, public health and food supply policies. This review leads to the following conclusions.

#### Food availability

- The rising food availability worldwide is believed to be a prime driver of the obesity epidemic.
- As incomes rise and populations become more urban, societies enter into nutrition transition characterized by a shift from traditional to diets with a high proportion of fat, saturated fat and sugar.

- Changes in food production systems, processing, packaging and transport facilitate high consumption of energy-dense and nutrient-poor foods but also higher consumption of fruit and vegetables.
- Multinational retailers mediate the nutrition transition by entering into new markets and by developing global brand names and marketing strategies, resulting in producer-induced demand.
- Food availability in local settings such as schools, workplaces, shops and communities strongly determines dietary habits and may be linked to obesity and social inequality in health.

### Food prices

- The real price of food is the lowest in history and accounts for a falling share of household budgets.
- People on low incomes are more price sensitive than those on higher incomes and therefore react more strongly to price manipulation to improve dietary quality.
- The economic theory of welfare supports the use of taxes and subsidies on food to improve dietary habits, which could also have important signalling power for consumers and food producers.

### Food labelling

- Consumers find current nutrition label formats confusing, but respond well to brief health claims and nutrition symbols on foods.
- Mandatory and EU-wide nutrition labelling could help to improve dietary patterns; the nutrients labelled should be those of most significance to public health.
- The use of health claims is likely to be restricted to health-conscious, affluent groups willing to pay for products with added value.

### Agriculture and trade policy

- Regulations in the EU Common Agricultural Policy contribute to the oversupply of food and alcohol and inadequate supply of fruit and vegetables.
- Food surpluses lead to excess domestic consumption and distortions of international trade with negative health effects in both high-income and medium- and low-income countries.
- Country studies have shown that major shifts in food availability and price can lead to major changes in food consumption and disease patterns.

### Implications for policy and practice

- Determinants of food consumption at the societal level affecting both supply and demand should be addressed because they can potentially reach the whole population and lead to sustainable changes in diet.
- Production subsidies on fat, sugar and alcohol granted through agriculture policy contribute to overproduction and should be reconsidered.
- The food industry is of central importance in reducing the amount of salt, sugar and fat in foods, thus improving the quality of the diet and promoting public health.
- Food availability in local settings, especially schools and workplaces, is a promising target for preventing obesity.
- Large intervention studies should evaluate the potential for food and/or commodity excise taxes as a measure to change consumption patterns in different socioeconomic groups.
- Consumers want informative nutrition labelling, which provides an incentive to the food industry to develop healthier products.
- The use of nutrition symbols is a promising tool to facilitate healthier food choices and to contribute to nutrition education.
- Governments need to make agriculture policy more consistent with public health objectives.
- Adopting nutrition goals and recommendations at the EU level would have important implications for agricultural production, trade, processing and marketing, especially for sugar, fat, alcohol and fruit and vegetables.

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## 10. Promotional marketing of food

### Main messages

- Children are vulnerable to commercial food promotion, which includes a wide range of methods that go beyond television advertising and can bypass parental control.
- Most food and drink marketing promotes energy-dense products. Marketing follows trends in capital investment in production: for example, the recent rise in marketing of energy-dense foods in eastern Europe follows a decade of investment in their production in the region.
- Voluntary controls on promotional marketing are limited in their range and depth, and may not be sufficiently monitored or carry sufficient sanctions to be effective. Regulatory controls are now being introduced in some countries, but a pan-European strategy may be preferable.

Addressing the Fifty-fifth World Health Assembly in 2000, then WHO Director-General Gro Harlem Brundtland said (1), “Marketing approaches matter for public health. They influence our own – and in particular our children’s – patterns of behaviour. Given that they are designed to succeed, they have serious consequences for those at whom they are targeted.”

For both adults and children, healthy lifestyle choices depend on a range of external factors, including price, availability and adequate information about the products, as well as individuals’ personal preferences and cultural values. Food marketing can influence all these factors:

- price: for example, through special offers and discounts;
- availability: for example, through positioning at the checkout;
- information: in general through food advertising and specifically through, for example, health claims;
- personal taste: for example, through the use of colouring or flavouring additives in foods; and
- cultural values: for example, through the use of celebrities and sports personalities in product promotion.

The purpose of marketing techniques is to increase product sales in competition with similar products, but it is increasingly accepted that marketing can also increase the sales of the entire product category. The most extensive scientific review of the use of these techniques on children, conducted for the United Kingdom Food Standards Agency, concluded the following (2):

Overall, there is evidence that food promotion causes both brand switching and category effects, with stronger support for the latter effect. Although no study provides a thorough comparison of the strength of both types of effect, both types of effect have been examined independently, and there is reasonably strong evidence that both occur. In other words, the effects of food promotion are not limited to brand switching.

A review by the United States Institute of Medicine (3) found strong evidence that advertising had an impact on overall diet in the short term for children aged 2–11 years, but the evidence for older children was insufficient. There was also moderate evidence of long-term effects on children aged 6–11, but the evidence of long-term effects on younger children was weak, as was that for no effect in older children. The review also noted strong statistical evidence that linked higher exposure to television advertising and obesity in children aged 2–11 and in young people aged 12–18.

The food industry is aware that brand advertising can in general promote the overall growth of a food category. A report from the International Cocoa Organization in 2000 noted (4), “The growth [in chocolate sales] has been attributed to strong brands, constant innovation and an increase in impulse snacking by consumers. Advertising and promotion [are] crucial in maintaining these factors.”

Similarly, interventions in schools promoting the consumption of particular fruits and vegetables by using marketing techniques (such as videos, cartoon characters and small prizes) found the effects of these interventions were generalizable (5):

Changes were thus very large and long lasting. In addition, there was clear evidence that these effects “generalised” right across the fruit and vegetable categories; that is, consumption of fruit and vegetables not explicitly targeted in the intervention also increased.

The promotion of foods that undermine healthy choices, such as energy-dense, nutrient-poor foods, thus represents a major threat to healthy lifestyle choices. WHO (6) considered the evidence on the nature and strength of the links between diet and chronic diseases and classified as probable or convincing the adverse effect of:

- a high intake of energy-dense, low-nutrient foods
- a high intake of sugar-sweetened beverages
- heavy marketing of energy-dense foods and fast-food outlets.

Then followed the WHO Global Strategy on Diet, Physical Activity and Health, endorsed by the World Health Assembly in 2004 (7), which explicitly stated that food advertising influences dietary habits and that “messages that encourage unhealthy dietary practices or physical inactivity should be discouraged, and positive health messages encouraged”. It urged governments to work with stakeholders to develop “multisectoral approaches to deal with the marketing of food to children and to deal with such issues as sponsorship, promotion and advertising”.

A 2005 WHO expert committee on child obesity (8) supported the Global Strategy’s call to ensure that the promotion of food products is consistent with a healthy diet and called for an international code for marketing food and beverage products. This view was further endorsed by a WHO technical meeting in 2006 (9), which called for an international code on the promotion of food and beverages to children in conjunction with national codes that preferably have statutory backing. In 2007, the Sixtieth World Health Assembly asked WHO to promote responsible marketing, including the development of recommendations on the marketing of foods and non-alcoholic beverages to children, as part of the implementation of the Global Strategy.

This chapter considers the range of promotional methods used to market food and beverage products, the type of products and the quantity of advertising, and the policy steps that may be required. It focuses on marketing to children. Although one may argue that adults have sufficient competence to make healthy lifestyle choices when such options are available and have the capacity to resist marketing when it may affect their health, children are generally accepted not to have such competence or capacity. One should not assume, however, that adults’ competence and capacity will fully protect them.

## Promotional methods

Food products are promoted to children in a variety of ways and many different settings. Parents are among the first to supply food messages, and these continue to be significant throughout childhood. Messages from schools are also important and carry cultural significance, as they are effectively endorsed by the schools’ staff and governing bodies and the educational authorities. Messages from peers become increasingly influential as children mix socially and develop networks of friends and group loyalties.

In addition, food producers deliver messages as part of their general marketing strategy. Table 10.1 gives examples of the various ways in which commercial messages about food and beverage products may be delivered.

## Nature and extent of marketing

A full review of the various forms of marketing, their extent in the various European-Region-wide, national and local markets, and the nature of their content is not possible here. Indeed, the figures are not easily obtained, being commercially sensitive, and are liable to become outdated relatively quickly. Further, data available for the United Kingdom, possibly because many of the world’s leading advertising agencies have their headquarters in London, are not easily obtained for other countries. To illustrate the issue, this section gives examples of the nature and extent of marketing.

## Broadcast marketing

Estimates of children's exposure to television advertising vary between countries and over time, as increasing numbers of commercial television channels are made available. On average, children and adolescents in the United Kingdom watch an estimated 3.8 hours of television (which includes playing computer games) a day, amounting to over 1200 hours a year (10). They spend about 860 hours a year in school classrooms (10).

Remarkably few published international surveys show children's exposure to television advertising. One such survey (11) found children's television in Australia contained the highest number of advertisements per hour of programming, followed by the United States, and the United Kingdom had the highest number in Europe. Food products constituted the single largest category of commodity marketed in 13 of the 15 regions analysed, with children being exposed to as many as 12 food-related advertisements an hour (Table 10.2).

A survey found that fast-food restaurants, confectionery and sweetened breakfast cereals were most frequently advertised (Fig. 10.1) (12). Nordic countries, which have some degree of legislative control on advertising to children, typically showed fewer than 5 advertisements for fast-food restaurants in a twenty-hour period of commercial children's television viewing, while Australia showed over 40 and the United States showed about 60 such advertisements in a similar time. Breakfast cereals were the most heavily advertised product category in the United States, at 71 advertisements per 20 hours of programmes. Only Finland showed advertisements for fruit and vegetables: 15 per 20 hours of programmes (11). On the basis of these figures, if a child in the United Kingdom watching commercial television for two hours a day would be exposed to over 7000 com-

Table 10.1. Examples of media and methods used to market food and beverages

Location	Marketing method
Broadcast media	Television and radio advertising Television and radio programme sponsorship Television programme product placement
Other media	Cinema advertising Film product placement Posters and advertising boards Print media, such as magazines and comic books Branded books, such as counting books for preschool children Internet: e-mail clubs, chat rooms and free ring tones Web sites, providing puzzles and interactive games Promotional sales by telephone Text messaging to mobile telephones Direct marketing, such as home catalogues, mail shots and leafleting Sponsorship of events, venues, teams and sports heroes Cross branding of logos on household goods Branded toys, such as a playhouse designed as a fast-food store Branded computer games and product placement in computer games
Stores	On-shelf displays Displays at checkout tills Special offers and pricing incentives Purchase-linked gifts, toys and collectables Free samples and tastings
Product packaging or content	Product formulation, such as colour and shape Product portions, such as king size In-pack and on-pack promotions, such as gifts, games, puzzles and vouchers Packaging design, such as imagery, colours and playshapes
In school	Sponsorship of educational materials and equipment Vending machines in schools and youth clubs School participation in promotion and sampling schemes

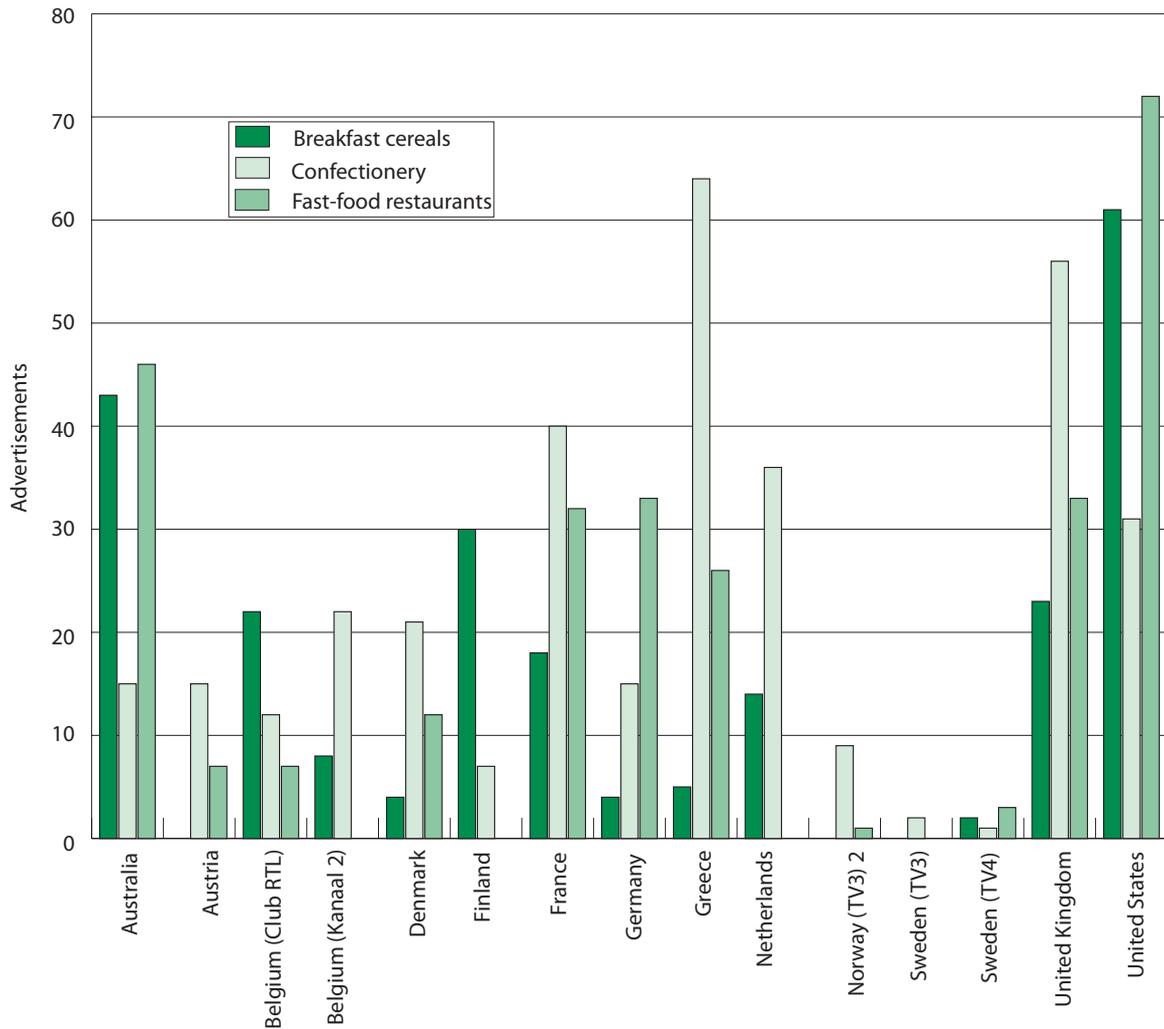
Table 10.2. Number of advertisements shown per hour of programming for children on commercial television

Country (channel)	Advertisements per hour	
	Total	Food-related
Australia	29	12
United States	24	11
United Kingdom	17	10
France	16	8
Germany	14	6
Greece	12	7
Finland	12	6
Denmark	12	5
Norway (TV3)	7	2
Netherlands	5	4
Belgium (Kanaal 2)	4	2
Austria	4	1
Belgium (Club RTL)	3	2
Sweden (TV4)	2	<1
(TV3)	1	<1
Norway (TV2)	0	0

Note. The average number of advertisements per hour is based on about 20 hours of children's television programmes over a seven-day period, for January and February 1996.

Source: adapted from Dibb (11).

Fig. 10.1. Number of television advertisements for fast-food restaurants, confectionery and breakfast cereals per 20 hours of children's programmes in selected countries



Source: Lobstein (12).

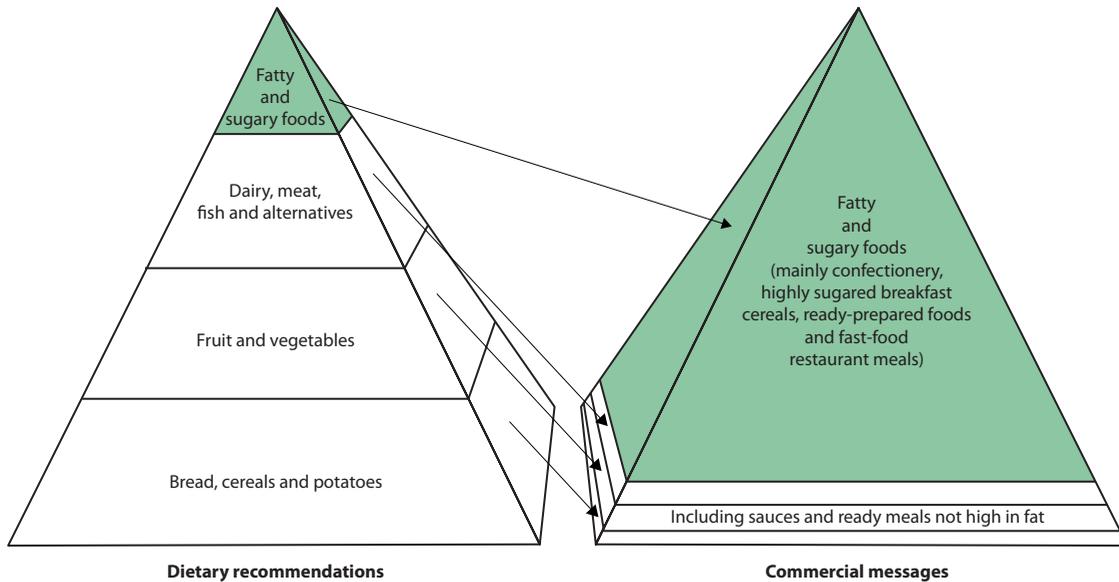
mercial food advertisements each year, totalling nearly 100 000 advertisements between the ages of 3 and 16 years.

A lack of nutritional information about products hampered attempts to analyse the nutritional profiles of the foods being advertised. In Greece, for example, several manufacturers claimed that the levels of fat, salt and sugar were commercially confidential (11).

Advertisements aimed at children in the United Kingdom were analysed more successfully. Of the 170 food products promoted in a sample of advertisements on children's television, 62% were as high in fat (over 30% energy from fat), 50% were high in sugar (over 20% energy from sugar) and 61% high in salt (over 2.36 g sodium per 10 MJ). In total, 95% of the products were high in either fat, sugar or salt.

Fig. 10.2 illustrates the distortion between the volume of advertisements for foods high in fat, sugar and salt and the generally recommended dietary intake. Fatty and sugary foods should be eaten infrequently and in small amounts, but are heavily advertised. This has raised considerable concern in policy-makers in several European countries and within the European Commission. Controls and policy initiatives are discussed at the end of the chapter.

Fig. 10.2. Food guide pyramid recommendations and proportion of commercial food messages on United Kingdom children's television



Source: Dalmeny et al. (13).

## Marketing in other media

As indicated in Table 10.1, non-broadcast commercial advertising takes a range of forms. No analysis appears to have been made of the volume of such advertising, children's likely exposure to it or its content in terms of food and beverage products. Leading sports personalities have been strongly linked to potato snacks (14) and soft drinks (15). Also, fast-food and beverage companies comprised 2 of the 15 official sponsors of the 2006 FIFA (Fédération Internationale de Football Association) World Cup (16). Moreover, the Olympic Games organization gains over a third of its revenue from commercial sponsorship (worth US\$ 1.4 billion for the 2004 Summer Olympics) (17), and of the 11 official partners, 2 are fast-food and beverage companies (18). One has been a sponsor since 1976 and the other, since 1928.

Advertising also occurs on Internet sites and through mobile telephone text messages. Internet advertising is a rapidly expanding area for commerce, and advertising to children incorporates a range of technologies, from flash-animated games to online chat rooms, game playing and integrated text messaging incorporated into on-line promotions. Spending on online advertising in the United Kingdom alone was estimated to exceed £1 billion (US\$ 1.6 billion) in 2005, up 62% from 2004, which in turn was up 60% from 2003 (19).

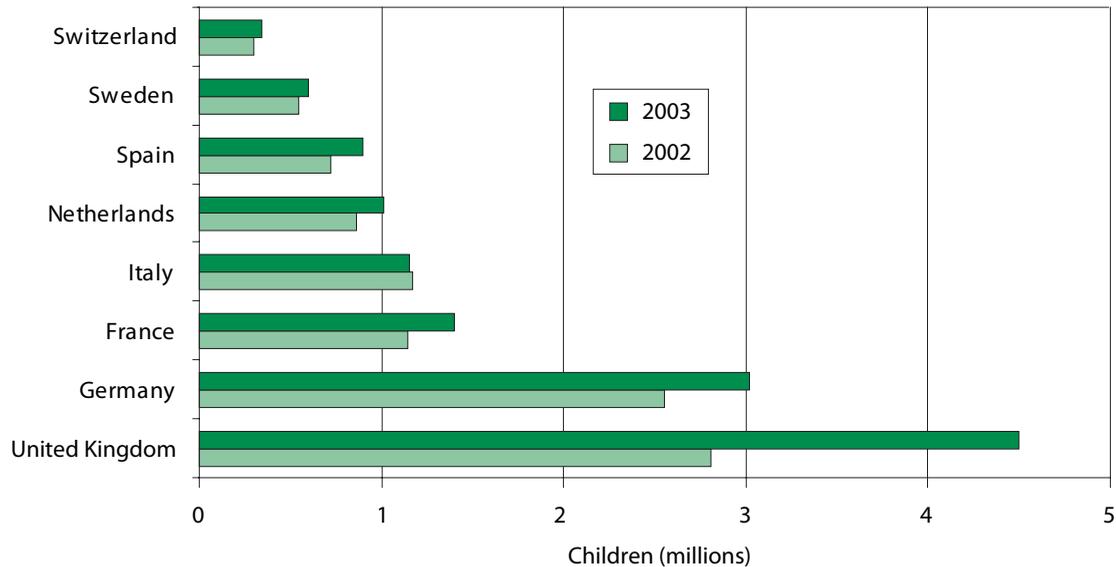
In 2003, over 13 million children in the EU were estimated to be regularly using the Internet, including 4 million aged under 12 years (20). At the time of the survey, the potential audience was reported to be growing by 10–30% a year. There are few data on what sites children visit, although all major food brands have web sites, and many have sites designed to attract children as young as 6 years (21). Fig. 10.3 shows the numbers of children in eight countries who accessed the Internet on a regular basis in 2002 and 2003 (20).

## In-store marketing

The location of products within a store can strongly influence sales, especially of products that customers may not have planned to purchase but are prompted to buy by a strategically placed, eye-catching display, special offer or promotion. Snacks, confectionery and drinks are largely so-called impulse items, and trade magazines frequently discuss the upswing in sales if these products are properly positioned and promoted in a retail outlet.

While such promotional techniques are not always used to prompt children to purchase or ask for products, children are sometimes the target market. The National Consumer Council in the United Kingdom (22) and

Fig. 10.3. Children accessing the Internet on a regular basis, August 2002 and 2003



Note. At home and work data are for France, Germany, Italy and the United Kingdom; at home data only are for the Netherlands, Spain, Sweden and Switzerland.

Source: 13 million kids using the Internet across Europe (20).

the “Chuck snacks off the checkout!” consumer campaign (23) have highlighted supermarket checkout displays as targeting young children, especially those for low-cost or child-friendly confectionery positioned at a child’s height. As one food company expressed it, “With 70% of confectionery bought on impulse, retailers should aim to put temptation directly within shoppers’ reach.” Another stated, “By organising the layout so that consumer favourites are sited in the ‘hot spot’ sales areas, retailers could take £210 million extra confectionery sales.” (24).

A survey of supermarket practices in the United Kingdom in 2004 highlighted the extent of this problem, showing the percentage of checkout tills with displays for sweet or fatty snacks or sugary soft drinks (22). The results (Fig. 10.4) show a wide range of practices, with some chains using every checkout to sell these types of product. Many of these are at a low level, to attract children’s attention, and promote confectionery brands that feature cartoons on the packaging.

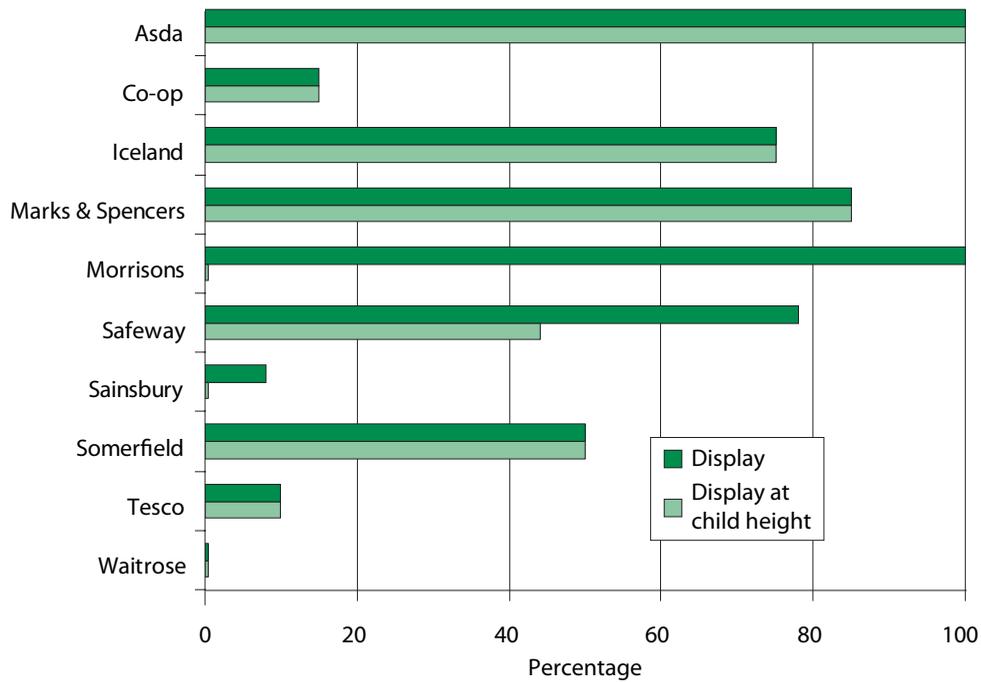
Other aspects of supermarket behaviour have been measured. One estimate of the healthiness of the products they promote is the relative display spaces devoted to fruit and vegetables and to less healthy items, such as snacks and confectionery. Survey results show a wide variation between supermarket chains, with a high level of correlation between the amount of fruit and vegetables displayed and the higher social-class distribution of the clientele (22).

Further, special offer price promotions – such as “three for the price of two” or “buy one, get one free” – may indicate the healthiness of products promoted by supermarkets: a recent survey of supermarket chains’ use of these special offers found that fatty and sugary foods were featured more than twice as often as fruit or vegetable products (25). Fig. 10.5 shows price promotions for fruit or vegetables, fatty or sugary foods, and all other foods for nine leading supermarket chains in the United Kingdom, sampled in 2005.

### On-product and in-product marketing

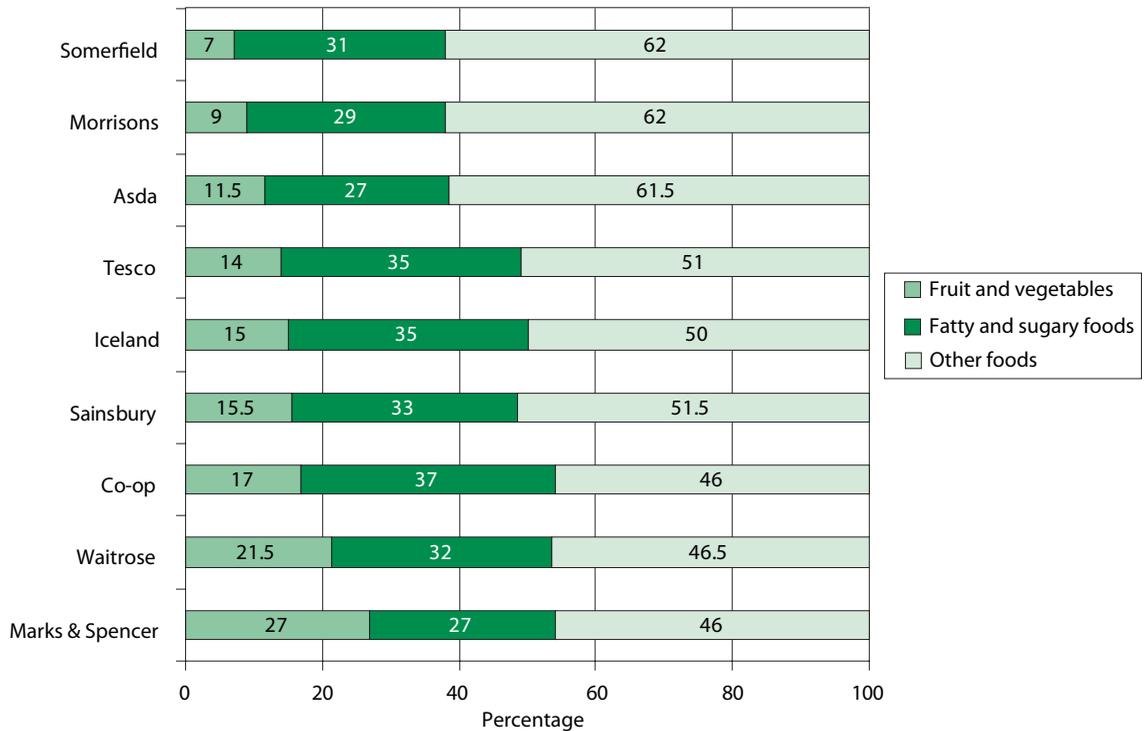
Part of the shopping experience involves examining food products and becoming familiar with their contents. There are marketing opportunities both on the labels and inside the packaging, including the food itself. These include attractive images, cartoons, personalities, television characters, competitions, prizes, gifts, coupons, rewards and other inducements; all of which can be designed to affect a child’s preferences.

Fig. 10.4. Proportion of checkout tills in leading supermarket chains that displayed fatty or sugary confectionery and snack products, United Kingdom, 2004



Source: Dibb (22).

Fig. 10.5. Price promotions for fruit or vegetables, fatty or sugary foods, and all other foods in nine leading supermarket chains, United Kingdom, 2005



Source: Dibb (25).

An analysis of food products marketed to children that used these labelling and packaging methods to attract a child's attention, found the nutritional quality of the foods sold to be poor (26). The survey was undertaken in United Kingdom supermarkets during the period 1999–2000 and identified 358 products sold explicitly as children's products. It excluded soft drinks, snacks and special treats, such as birthday cakes, as these are foods that parents would expect to be of poor nutritional value. Of the remaining products designed to be attractive to children, most (77%) had high levels of fat, saturated fat, sugar and/or sodium (see Table 10.3):

- 16% were high in fat (over 20 g per 100 g);
- 30% were high in saturated fat (over 5 g per 100 g);
- 46% were high in sodium (over 0.5 g per 100g); and
- 57% were high in sugar (over 10 g per 100 g).

In addition, food messages are directed at children when eating away from home. For example, fast-food restaurants offer collectable models, toys, puzzles and child-attractive food packages designed to influence the child's choice. In 1999, a promotion in the United States, using a series of collectable Teletubbies dolls increased the sales of children's meals by 50 million in six weeks, doubling the normal sales of these meals (27,28). Although designed to appeal to young children, such schemes can have a multiplier effect on customers: the corporation's marketing vice-president, stated in a press release, "Kids don't come into restaurants by themselves; they bring their parents and brothers and sisters. As a result, average checks are in the \$8–10 range for families with children at [restaurants in this chain]." (29).

Part of the message embedded in food is the appearance, taste and "mouth-feel" of the product (sensual characteristics called the organoleptic qualities of the food). Food can be coloured, flavoured and shaped using a variety of additives to enhance the product's attractiveness, altering the message being given about the inherent nature of the food. Food companies acknowledge that the use of such additives can increase the sales of a product. According to one major food company, such additives make "an important contribution to the attractiveness of the finished product, and the pleasure people derive from it" and, without added colouring, "many products would not exist" (30).

The 2004 United Kingdom survey of supermarket practices in relation to children's foods found that 68% of the products packaged to attract children contained additives to enhance the products' colour or flavour (26). Another survey of children's food products (31) found that colouring agents were used in:

- 78% of children's desserts
- 42% of children's milkshakes
- 93% of children's sweets
- 23% of children's cereals
- 41% of children's drinks
- 32% of crisps and savoury snacks.

In a more general survey of the use of additives, three quarters of foods that contained high levels of sugar, fat and saturated fats also contained cosmetic additives (colourants, flavourings or flavour enhancers) (32).

### In-school marketing

Advertisers increasingly target children at school with their marketing messages. The methods used are probably most well developed in the United States, where the government's General Accounting Office noted a number of commercial activities in schools that raised concern (33). Schools entered a wide range of commercially related activities, from non-controversial approaches (such as grants and gifts) to highly controversial activities (such as market research), as well as nutritionally questionable practices (such as contracts between school boards and beverage companies, giving the companies exclusive "pouring rights" in schools in return for donations). Table 10.3 lists examples of the different activities linked to food.

There appear to be no survey data that show the extent of use of the techniques shown in schools in European countries or, if they are used, of the nature of the foods and beverages promoted. Various school-linked mar-

Table 10.3. Examples of school-based commercial activities, United States

Activity	Examples
<b>Product sales</b>	
Product sales	Exclusive contracts to sell soft drinks on school grounds Contracts to sell food on school grounds
Credit rebate	Credit awarded for coupons collected by schools or children Internet sales from which a percentage is given to a school Fund raising through sales of, for example, confectionery and cookies
<b>Direct advertising</b>	
Advertising	Advertising in school corridors, on school buses Product displays in schools Corporate logos on school furniture and equipment, posters, book covers and work books
Publications	Advertisements in sports programmes, yearbooks and school newspapers
Media	Televised advertisements in educational programmes Computer-delivered advertisements
Samples	Free snack food
<b>Indirect advertising</b>	
Education	Materials on issues associated with food companies Materials that promote industry goals, such as nutritional information produced by dairy or meat associations
Incentives	Poster contests, book programmes
Corporate gifts	Gifts to schools, with commercial benefit to the donor
<b>Market research</b>	
Surveys or polls	Student questionnaires or taste tests
Internet panels	Use of the Internet to poll students' responses
Internet tracking	Tracking students' Internet behaviour

Source: adapted from *Commercial activities in schools* (33).

keting campaigns have been undertaken in the United Kingdom, such as that in which vouchers on packets of fried potato snacks are collected to assist schools in purchasing books and that in which vouchers on chocolate confectionery products are collected to obtain sports equipment. Also, branded vending machines are permitted in secondary schools in many European countries. Moreover, schools have been used to distribute free samples (34), and school workbooks that contain advertising for soft drinks and snack food brands have been distributed widely throughout the United Kingdom (35).

Preschool children may also be targets. In 2005, an advertising agency offered advertising space in 1000 secondary schools and to help food companies gain access to 300 preschool play areas. It claimed it could turn children's parties into a "communication opportunity" that provided "brand experience for kids" (36). In response to consumer concerns, the agency promised that it would market to toddlers "responsibly".

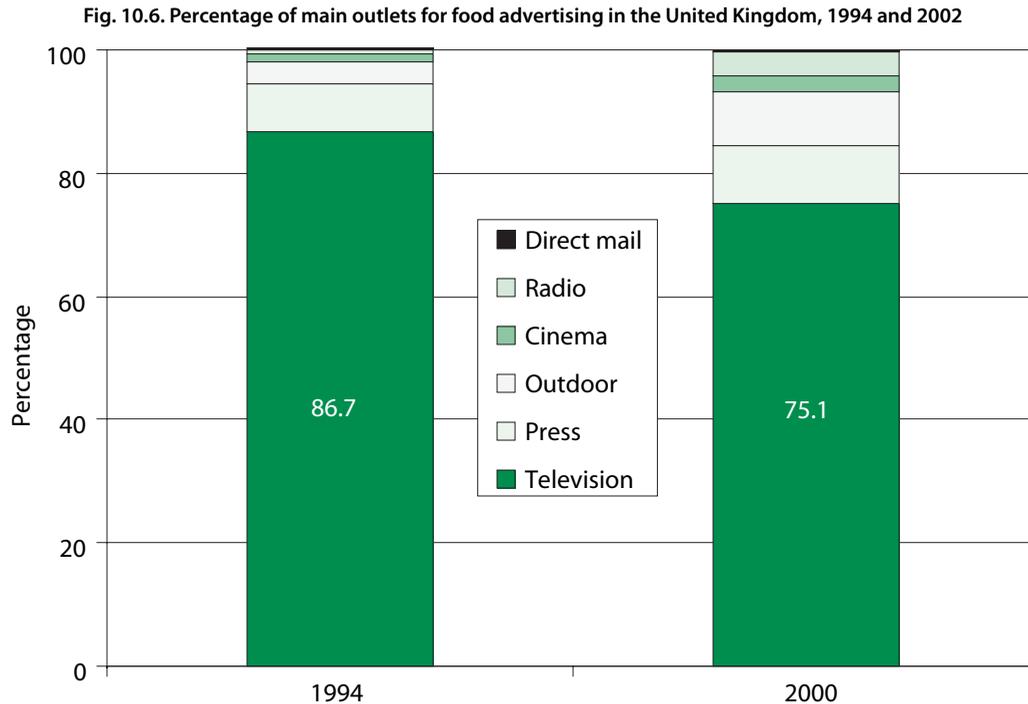
## Trends in advertising

### Changing technology

Marketing technology is a rapidly developing area. Marketing campaigns – especially those targeting children and young people – are likely to become ever more integrated across different media, linking television, the Internet, game playing and text messaging.

Television advertising is showing a decline in some high- and middle-income economies. Recent data from the United Kingdom show that television advertising for food brands has declined significantly in the last decade (Fig. 10.6). In the last five years, spending on marketing through the Internet has increased from zero to sums exceeding those spent on radio advertising, and these amounts are set to grow considerably through the next decade. Global figures showed that total advertising on the Internet was expected to grow to the level of 15% of global television advertising by 2007 (37).

New developments in television advertising, however, may halt this trend. For example, a car manufacturer has been granted a licence in the United Kingdom to run its own digital television channel, which is now available



*Note.* The percentages exclude the Internet, which was not a medium for advertising in 1994.  
*Source:* Ad growth sustained by emerging markets (37).

daily (38). The digital firm reaches 7.6 million homes and the manufacturer's channel will soon be available on cable television and by direct stream from the manufacturer's web site. Annual operating costs are estimated at under £2 million, well within the reach of major food brands. Although not starting its own channel, a beverage company made its own reality television series, which included the company's branded content and aired in 12 countries before the 2006 World Cup (39). The programmes featured football stars sponsored by the company, backed by a budget of £4 million and supported by several major professional clubs. The television series targeted teenage boys, offering them the chance to compete for the opportunity to join a football team and win £50 000.

The following are examples of other new approaches to marketing.

### New directions

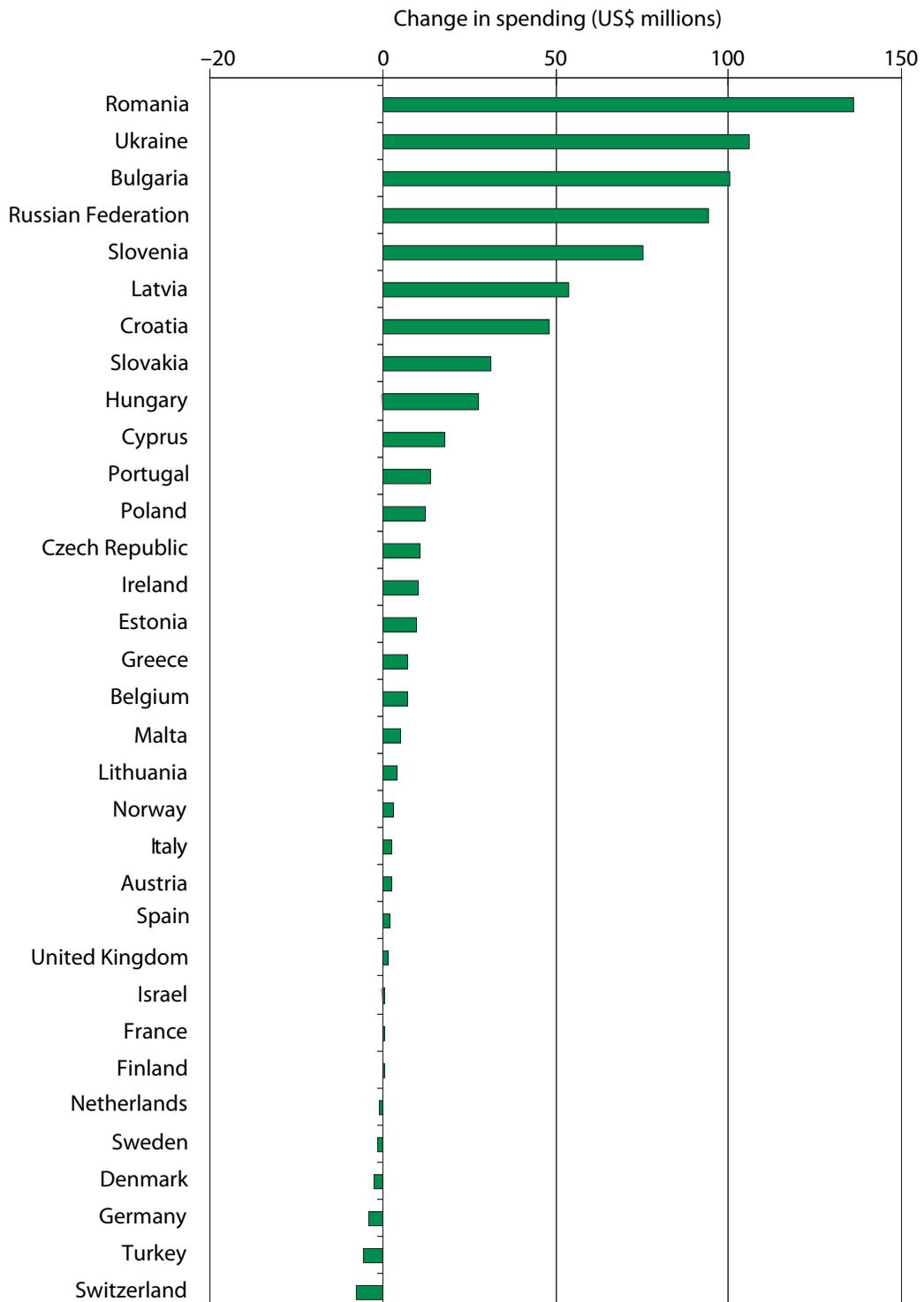
Trials of **on-screen advertising in buses and trains** have already been made in several locations in Europe and the United States. Screens are positioned to catch the attention of passengers and may be backed up with audio messages over a loudspeaker system. External screens have been installed on the sides of buses.

Supermarkets are exploring digital options for **on-screen advertising in stores**, conveying information and marketing messages on shelf edges, at the ends of aisles and at checkout tills. These options may include messages targeted at young people (such as cartoons, film images and music). Also, an electronics company announced in December 2005 that it was developing disposable flat-screen technology that could display animation on product packaging.

**Hypertag technology** allows mobile telephone users to download material directly to their handsets and personal data assistants (handheld computers) from electronically chipped posters or advertisements in trains or buses, at stations or in shops. The user receives a phone number, reminder prompt, game, logo, picture or ring tone.

Large **interactive digital billboards** are equipped with the resolution of a cinema screen and can use built-in cameras to interact with people on the ground. The billboards can recognize colour and movement and can adapt messages to the weather by using special sensors that recognize rain, wind and heat.

Fig. 10.7. Average annual increase in advertising expenditure in 33 European countries, 1998–2003



Source: European Advertising & Media Forecast [web site] (43).

A **chatbot** (also known as chat bot and chatterbox) is an artificial intelligence software program that attempts to maintain a conversation with a person. Most chatbots do not attempt meaningful dialogue, but instead pick up cue words or phrases from the user, allowing them to use prepared or calculated responses to move the conversation in an apparently meaningful way without requiring them to know what they are talking about. Wikipedia notes that “malicious chatbots are frequently used to fill chat rooms with spam and advertising, or to entice people into revealing personal information, such as bank account numbers” (40). Many companies have begun using chatbots on their web sites or to build them into automated telephone services (41).

**Blogs** (user-generated web logs) are web sites used to present information, news and comment of special interest to users. They are becoming a tool of potential interest to marketers: a firm that markets soft drinks launched a blog to promote a flavoured milk brand and offered promotional items, samples and gift certificates to other blogs that referred to the company site (42).

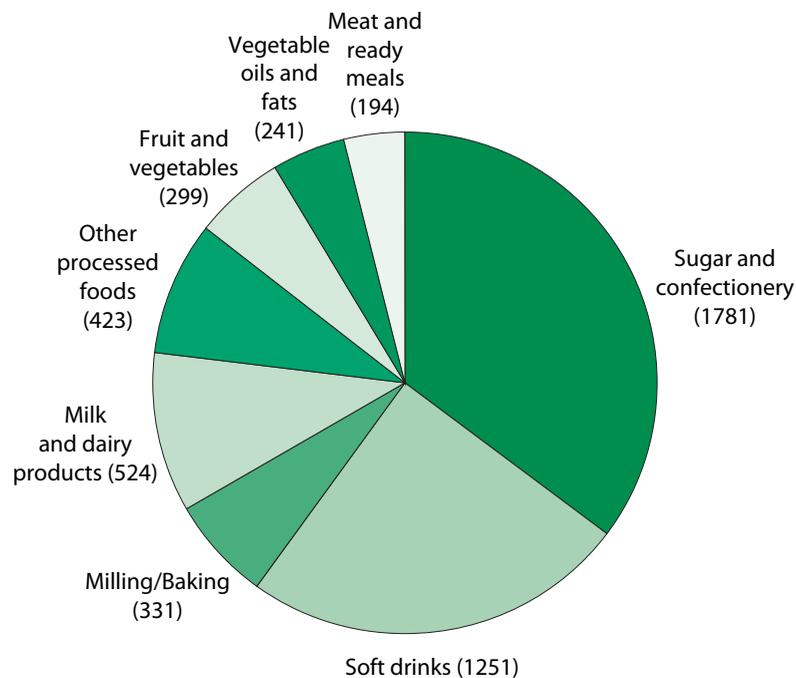
### Moving eastwards

While spending on advertising ran at about US\$ 150–300 per person per year in western Europe, that in eastern Europe was in general below US\$ 100 per person per year in 2002–2003. Expenditure was below US\$ 30 per person per year in the Russian Federation and below US\$ 10 in Ukraine (43).

This picture is changing, however. Most of the new marketing opportunities appear to be in the NIS, with annual growth rates for advertising expenditure exceeding 50% (see Fig. 10.7) and growth in the Russia Federation alone in 2005 reported to have exceeded US\$ 1.2 billion (37).

Advertising is an integral part of the development of markets. An OECD analysis of food and agriculture industries in eastern Europe during the 1990s showed a significant investment by foreign companies in confectionery and soft drinks (Fig. 10.8) accounting for some 60% of the food sector investment (44). The amounts invested per capita were largest in the Czech Republic, Hungary and Poland.

Fig. 10.8. Foreign investment (US\$ millions) in agrofood production in eastern Europe, 1990–1997



Note. The figures are for Albania, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Lithuania, Poland, Romania, the Russian Federation and Ukraine. They exclude alcohol and tobacco.

Source: Adapted from *Impediments to efficiency in the agro-food chain in Bulgaria, Romania and Slovenia* (44).

The purpose of this investment is to encourage consumption of particular foods. In Poland, for example, chocolate confectionery sales rose 26% in the period 1999–2004, while sales of sugar confectionery rose 22% and soft-drink consumption rose over 50% (45,46). The degree to which marketing and advertising techniques drive such increases is not known, and research is urgently needed.

In the Russian Federation, the market for snacks is reported to be growing rapidly: it grew from 66 000 tonnes in 1998 to 200 310 tonnes in 2000, and then a further 85% in 2001 (47). The snack industry's advertising budget in the Russia Federation grew by 260% in 2001: from US\$ 18.5 million in 2000 to US\$ 67 million in 2001. In addition, Russian children's diet is changing. Surveys of the practices of Moscow mothers in 2002 and 2005 showed a 49% decline in the number of mothers making traditional kasha porridge for their infants and a 52% decline in the number making fruit purees (48). Market research showed that 5-year-olds were rapidly adapting to western foods: they regularly consumed potato crisps (81%), chocolate (78%), chewing gum (70%) and carbonated drinks (66%) (49). In 2005, the food market for children was estimated to be worth US\$ 150 million and was predicted to rise to US\$ 400 million. Also, schoolchildren's pocket money was estimated to be worth US\$ 65 million in 2000 and to rise to US\$ 160 million in 2004 (48).

### Effects of advertising

Several studies have indicated that food advertising and marketing are associated with children's showing more favourable attitudes, preferences and behaviour towards the products advertised (50,51). Even exposure to advertisements as brief as 30 seconds can significantly influence the food preferences of children as young as 2 years (52).

In a recent systematic review of studies on the effects of promoting food to children, Hastings et al. (2) identified over 29 000 relevant papers and, after eliminating those of insufficient quality, concluded that food promotion has an effect on children's preferences, purchasing behaviour and consumption and that this effect is independent of other factors and operates at both a brand and category level. The report added that, although the evidence reviewed did not amount to proof that advertising had a direct effect on children's diets, "in our view [it] does provide sufficient evidence to conclude that an effect exists".

The Hastings report was commissioned by the United Kingdom's Food Standards Agency. Following criticism from industry and industry-sponsored sources, the Agency mounted an open peer review in October 2003, which found that the report's conclusions were justified (53). The peer review panel added:

...if further research were to be undertaken in this area it would be helpful to consider an alternative methodological approach, which took account of the social, economic and cultural context within which advertising operates. ... That said, it was not felt that further research was necessarily required as, on the balance of evidence, the Hastings review had provided sufficient evidence to indicate a causal link between promotional activity and children's food knowledge, preferences and behaviours.

On behalf of the United States Institute of Medicine, the Committee on Food Marketing and the Diets of Children and Youth made a review that reached similar conclusions on dietary behaviour, at least in younger children (3). It also concluded the following.

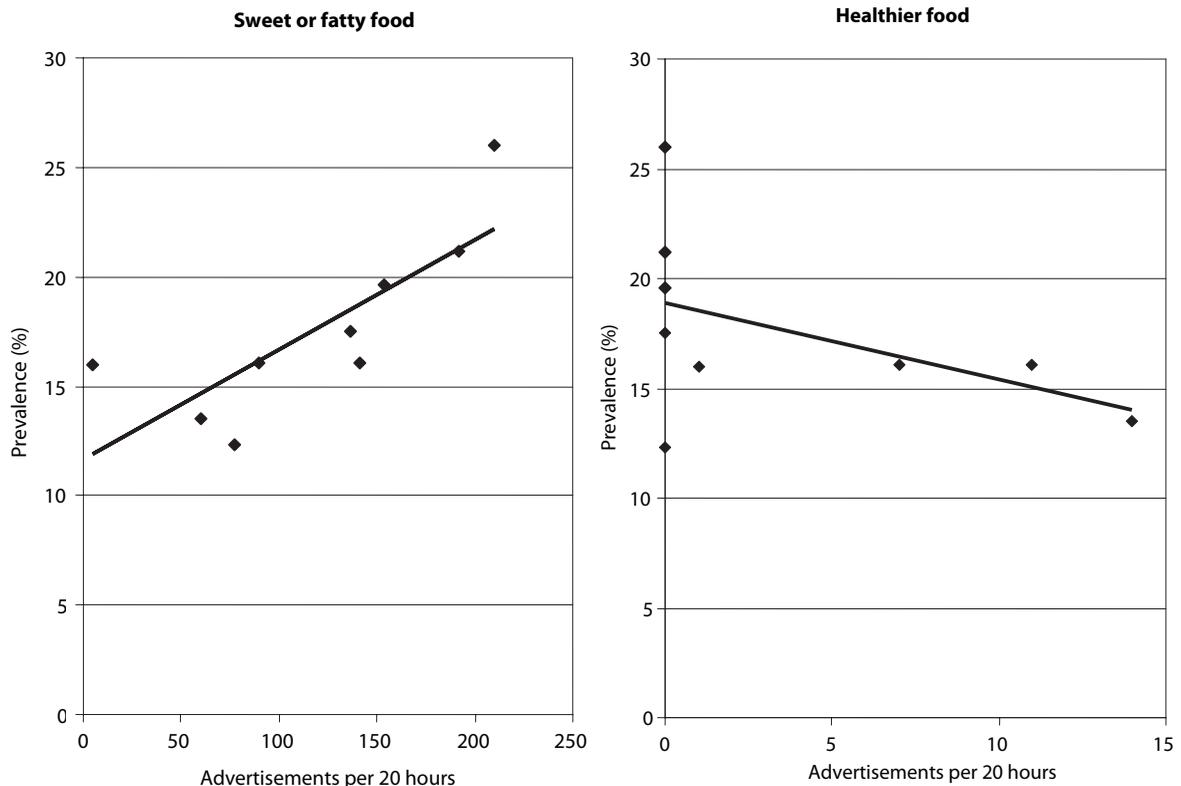
Statistically, there is strong evidence that exposure to television advertising is associated with adiposity in children ages 2–11 years and teens ages 12–18 years.

The association between adiposity and exposure to television advertising remains after taking alternative explanations into account, but ... the evidence is not sufficient to arrive at any finding about a causal relationship from television advertising to adiposity. It is important to note that even a small influence, aggregated over the entire population of American children and youth, would be consequential in impact.

The review also noted that other health problems may be linked to exposure to television advertising. In line with this, a study in Belgium (54) showed an effect of television viewing on cardiovascular risk factors in children, but the relationship could be accounted for by the raised adiposity.

Several of the studies that support the Institute of Medicine's conclusions were based on total exposure to television rather than exposure to advertising. Since the Institute of Medicine undertook the review, other data have emerged to support its conclusions. They show a specific link between overweight in children and certain types of advertising. Using the data collected in a survey of television advertising aimed at children (11), Lobstein & Dobb (55) compared the prevalence of overweight among children in nine countries (seven EU members, Australia and the United States) with the extent of advertising of both energy-dense and healthier foods. As shown in Fig. 10.9, there was a significant positive correlation between the prevalence of overweight and the promotion of energy-dense foods and a weaker negative correlation between the prevalence of overweight and the promotion of healthier foods.

Fig. 10.9. Association between the prevalence of overweight children and the numbers of advertisements for sweet or fatty food and for healthier food



Note. The analysis was based on data from seven EU countries, Australia and the United States. For sweet or fatty food, the correlation was  $r = +0.86$ ,  $P < 0.005$ . For healthier food, the correlation was  $r = -0.56$ ,  $P < 0.01$ .

Source: Lobstein & Dobb (55).

This correlation between advertising and overweight is associative, and causal evidence remains to be found. The correlation may be due to other factors: a high level of advertising for energy-dense foods and beverages may occur in societies where other environmental factors encourage children to become overweight, while societies in which healthier foods are advertised may have other health promoting qualities that affect children's weight. The study may also indicate that advertisements for healthier foods can have some effect on improving children's health, indicating a potential benefit for social marketing programmes that aim to reduce overweight. Social marketing is further discussed at the end of this chapter.

Table 10.4. Children's television controls that affect food advertising in selected European countries

Country	Controls
Austria	Industry self-regulation (Austrian Advertising Council's 1995 Code) No advance vetting of advertisements
Belgium (Flemish)	Broadcast advertisements prohibited 5 minutes before or after programmes aimed at children less than 12 years of age. Otherwise as for the Belgian French community.
Belgium (French)	Industry self-regulation (Advertising Ethics Board Code, based on the International Chamber of Commerce (ICC) International Code of Advertising Practice (57)) No advance vetting of advertisements
Denmark	Proposed ban on advertising 5 minutes before and after children's programmes became a voluntary agreement with one public service channel. Danish Broadcasting Act prohibits in children's advertising the use of people, characters, puppets and the like that appear in children's programmes. Advertisements for confectionery, soft drinks or snacks should not imply they can replace a meal. Otherwise, the government's Consumer Ombudsman guidelines are based on the ICC Code. No advance vetting of advertisements
Finland	Advertisements for food should not refer to health. The government's Consumer Ombudsman guidelines state that advertisements to children should: be distinct from programming, not be sponsored, not interrupt programmes of less than 30 minutes, contain no persuasion to purchase a product, not use animation if it interrupts a cartoon-based programme and not use characters broadcast in programmes. Advertisements for confectionery, soft drinks or snacks should not imply they can replace a meal. Industry self-regulation (Board of Business Practice uses ICC Code). No advance vetting of advertisements
France	Industry self-regulation (codes of marketing issued by the Bureau de Vérification de la Publicité) (57) Advertisements should not contradict healthy eating principles, and they should not imply that consumption of a product would lead to success in art, school or sport. Advertisements for processed foods should carry specified health messages, or 1.5% of the advertising budget for the foods should be paid to the national health promotion and education body, according to French public health law. No advance vetting of advertisements
Germany	Public service channels may not carry advertisements during school holidays. Programmes for children may not be interrupted by advertising. Guidelines state that products shown in programmes should not be advertised before or after them, and advertisements should not imply that children should buy a product. Industry self-regulation (German Council for Advertising codes, based on ICC Code) No advance vetting of advertisements
Greece	A 1989 consumer protection law prohibits the advertising of toys before 22:00. Industry self-regulation (Greek Association of Advertising Agencies' codes, based on ICC Code) No advance vetting of advertisements
Iceland	Children's programmes may not be interrupted by advertising. Advertisements that could harm the "physical, mental or moral development" of children are banned during the hours children are likely to be watching. Industry self-regulation (Society of Icelandic Advertising Agencies' codes, based on ICC Code) No advance vetting of advertisements
Ireland	Industry self-regulation (Advertising Standards Authority for Ireland codes, based on ICC Code). Advertising should not encourage unhealthy eating habits; snack foods should be clearly represented as such. The use of celebrities in advertising to children has restrictions. No advance vetting of advertisements
Italy	Draft proposals to ban advertising during children's television have been tabled in the Senate, but not approved Advertisements using cartoons must not be shown before or after programmes that feature the same cartoon characters. No advance vetting of advertisements
Liechtenstein	No apparent industry self-regulation No advance vetting of advertisements
Luxembourg	Industry self-regulation (Luxembourg Commission for Ethics in Advertising implements the ICC Code) No advance vetting of advertisements

Table 10.4. (contd)

Country	Controls
Netherlands	Advertising is subject to joint consumer–industry regulation through a code. Programmes for children may not be interrupted by advertising on public service channels or on commercial channels if the programmes last 30 minutes or less. Product placement and sponsorship are forbidden in programmes for children under 12 years. Confectionery advertising is restricted and must show a toothbrush. No advance vetting of advertisements
Norway	General prohibition of advertising directed at children No advertising for 10 minutes before or after children's programmes No advertising using people or characters from children's programmes Programmes for children must not be sponsored. No advance vetting of advertisements
Portugal	No interruption of children's programmes of less than 30 minutes' duration Industry self-regulation (Instituto Civil da Autodisciplina da Publicidade implements the ICC Code) No advance vetting of advertisements
Romania	Advertising should not encourage or justify excessive consumption of food. Comparisons of foods should not disparage essential foods, such as fruit and vegetables.
Spain	Industry self-regulation (Asociación de Autocontrol de la Publicidad Code, based on ICC Code) No advance vetting of advertisements
Sweden	Prohibition of all advertising directed at children under 12 years No advertising directly before, during or after programmes for children No advance vetting of advertisements
United Kingdom	No advertising on public service channels Licensed commercial channels must follow the Ofcom Code, which limits the scheduling of advertisements for merchandise based on children's programmes and those that use personalities and characters from children's programmes to endorse children's products. The Code also prohibits the encouragement of excessive consumption and the disparagement of good dietary choices, such as fruit and vegetables. Industry self-regulation through the Code of Advertising (56), which states that children should not be encouraged to pester their parents, to eat or drink at or near bedtime, to eat frequently throughout the day or to replace main meals with snacks or confectionery. Advertisers can request advance vetting of their advertisements from the Broadcast Advertising Clearance Centre.

Sources: Study of the impact of television advertising and teleshopping on minors (58) and Hawkes (59).

## Policy development

### Current controls and consumer concerns

Recognizing that children may be unduly influenced by advertising, several countries in the WHO European Region have instituted legislative controls over what can be shown and when. Table 10.4 shows current or recent regulations in various countries; most European states for which information is available appear not to have strong controls on advertising to children, but rely on industry-agreed codes of practice.

For example, the Confederation of Food and Drink Industries of the EEC (CIAA) has issued principles for the advertising of food and beverage products that call for an accurate presentation of the advertised material, the mention of nutrition and health benefits of a product only if a scientific basis is present, the presentation of a product in the context of a variety of foods that indicates a healthy diet, and indicate that advertisements should not promote excess consumption, indicate that the promoted food can replace a meal or generally undermine the promotion of a healthy lifestyle (60). In addition, CIAA gives the following principles on advertising for children (60).

1. Advertisements should not mislead about potential benefits from the consumption of a product.
2. Food product advertisements should not undermine the role of parents and other appropriate adult role models in providing valuable dietary guidance.
3. Advertisements should not include any direct appeal to children to persuade their parents or other adults to buy advertised products for them.

4. Advertisements directed toward children should not create a sense of urgency.
5. While fantasy, including animation, is appropriate in communication with younger as well as older children, care should be taken not to exploit a child's imagination in a way that can encourage poor dietary habits.
6. Products derived from or associated with TV program content primarily directed to children should not be advertised during or adjacent to that program.
7. Broadcast or print media personalities (live or animated) should not be used to sell products, premiums or services in a way that obscures the distinction between program or editorial content and commercial promotion. For example, commercials or advertisements featuring characters from programs or publications primarily directed to children's should not be adjacent to programs or articles in which the same personality or character appears.

Industry-agreed codes typically focus on the content of individual advertisements. They do not address the problems of volume: the cumulative impact of promoting a range of different brands within a food category, such as sweetened cereals, or of repeated advertising for a given product. In addition, the practice of advertising a product more than once in a single commercial break is increasingly common.

Further problems arise if adjudicating bodies, such as the television licensing authorities or trade compliance agencies, are unable to act against advertisers until after the advertisements have been broadcast. Some bodies cannot act unless they receive a complaint about an advertisement and, by the time this has been considered, the advertising campaign may have ended and the advertisement no longer be broadcast or published.

In addition, when an adjudicating body finds that an advertisement has infringed the relevant code, it may then have few sanctions available for punishment and may not be in a position to prevent a similar problem arising. The available sanctions are unlikely to be in proportion to the sales advantages gained by advertisers, especially if they are administered after the advertising campaign has been completed.

Consumer organizations have called for stronger regulation of advertising aimed at children, some preferring a ban on advertising of energy-dense foods. They have proposed that the tax advantages available to advertisers should be reviewed, with advantages going only to the promotion of healthful foods (13). Table 10.5 shows consumer organizations' concerns about current voluntary controls.

The continued finding of violations of the WHO/United Nations Children's Fund (UNICEF) International Code of Marketing of Breastmilk Substitutes, despite industry assurances that such violations do not occur,

**Table 10.5. Consumer concerns about current voluntary controls on advertising to children**

Category	Concern
Focus on television	Codes tend to focus on television and therefore do not reflect the nature of the modern advertising environment. They rarely consider newer technologies of advertising, such as Internet marketing.
Compound effects of advertising	Codes refer to individual advertisements, not compound effects. They do not consider the effect of repetition of advertisements or the cumulative effects of advertisements having similar messages or promoting similar types of food. The ICC code (57) does not: <ul style="list-style-type: none"> <li>• prohibit the advertising of any specific product type;</li> <li>• prohibit or control advertising aimed at any particular age group;</li> <li>• control the frequency volume of advertising;</li> <li>• control the timing of advertisements in children's programming.</li> </ul>
Lack of sanctions	When marketing companies self-regulate, they act as prosecution and defence, judge and jury, and the likelihood that they will administer strong sanctions against their own fee-paying voluntary members is low.
Retrospective control	Unless there is an advance-vetting scheme in operation, which few countries appear to have, any complaints are dealt with after the advertisement has been broadcast. Many may not be adjudicated until the campaign has finished, weakening the effect of sanctions. Inappropriate or misleading nutritional messages may already have been broadcast, accepted and acted on.
Leaky borders	Both self-regulatory codes and statutory regulation have problems dealing with advertising originating from sources outside a national jurisdiction. This has already happened in Sweden, where external sources (such as cable and satellite television) have undermined the national ban on advertising to children.

Source: adapted from Dalmeny et al. (13).

heightens concerns over industry self-regulation (61). Examples of apparent Code violations come from many countries in the Region: Armenia, Bulgaria, Finland, France, Germany, Georgia, Latvia, Lithuania, Luxembourg, the Netherlands, Poland, Romania, the Russian Federation, Serbia, Switzerland, The former Yugoslav Republic of Macedonia and the United Kingdom. As breastfeeding is increasingly regarded as a protective measure against later obesity (62) (see also chapters 5 and 6), the Code is a valuable weapon in the armoury of obesity prevention. Nevertheless, most of the world's companies that make baby foods are cited as having violated the Code during the period 2001–2004 (61).

In addition, some European countries have guidance on marketing in schools, restrictions on product placement in television programmes or regulations on the use of the Internet for marketing to children (Table 10.6 and 10.7).

### Policy developments in the EU and five countries

The subject of children's diets, health and the role of advertising is currently high on the policy agendas of the European Commission and most EU Member States. Food producers, advertising agencies and mass-media companies are resisting stronger controls on advertising. For example the chief executive of Europe's largest television conglomerate has called for greater "flexibility" for commercials, arguing that the restriction on advertising during news broadcasts and children's shows might threaten the making of such programmes (63).

#### EU: draft directive

The European Commission has completed drafting new regulations to replace the "Television without Frontiers" Directive (Directive 89/552/EEC). According to the industry, "the text is, to a great extent, in line with the views defended by the advertising industry" (64). In particular, the draft authorizes the use of product placement in television programmes across the EU, and assumes continued self-regulation by the industry. Moreover, it maintains the country-of-origin rules, whereby only one Member State – the one in which the head office of the broadcaster is located – has jurisdiction over a media service provider. Thus, only that country's rules on advertising would apply, no matter in what other countries it is broadcast.

Further proposals in the draft include the abolition of current daily limits for advertising and teleshopping, but the restriction of advertising levels to an average of 12 minutes per hour. Films can be interrupted with advertising breaks every 40 minutes and children's programmes and news, every 20 minutes. The draft also proposes to limit the introduction of lucrative "isolated spot commercials" to sports events only: for example, screening these only during natural breaks, such as during a corner kick in a football game.

Product placement is likely to be a major obstacle for consumer groups. The draft states that sponsors must be identified at the start of a programme, and that placements should not directly encourage the purchase of the products shown or occur in children's programmes or during news or documentaries.

Also at the European Commission level, a 2004 roundtable on obesity led to the launch of a European Platform for Action on Diet, Physical Activity and Health. It consists of stakeholder groups – primarily commercial, consumer and health organizations – "capable of committing themselves to action" (65). The stakeholder organizations work under the Commission's leadership to reverse the trend in obesity, by offering increasing resources and effort against a 2004 baseline. The Platform was launched after a statement by Markos Kyprianou, the European Commissioner for Health and Consumer Protection, which indicated that, unless voluntary steps were taken to limit advertising to children, the EU would introduce legislation (66). The Platform's programme is designed to integrate with work carried out under the European Network on Nutrition and Physical Activity, to develop strategic goals at the EU level to reverse the trend in obesity.

The European Commission issued a white paper detailing a strategy for Europe on nutrition, overweight and obesity-related health issues (67), as the result of public consultation. In advocating policy coherence at the EU level, it calls for better information for consumers, provided through improved nutrition labelling and the regulation of nutrition and health claims on food. The white paper (67) acknowledges that "there is evidence that advertising and marketing of foods influence diets, and in particular those of children". The Commission prefers a voluntary approach at the EU level, but commits itself to assessing the approach in 2010, to see whether others are also required.

Table 10.6. Examples of national guidelines on marketing in schools

Country	Regulatory and self-regulatory restrictions
Belgium (French)	All commercial advertising for products or services is banned in schools. Sponsorship should be applied to the least possible extent to educational materials and other materials used in connection with education.
Denmark	<p>Advertisers and marketers should follow certain principles when dealing with sponsorships involving schools, day-care institutions and the like, including the following.</p> <ul style="list-style-type: none"> <li>• The name and logo of the sponsoring business should be used sparingly on teaching material, toys and other sponsored material, and these materials should not contain advertisements.</li> <li>• Parents should give their consent to small children participating in activities and tuition offered by advertisers and marketers.</li> <li>• Teaching material and tuition or other activities should not appeal (directly or indirectly) to children/young people to buy or use the products of the sponsors or other products or services. This includes appeals to parents to buy or use a product.</li> <li>• Statements included in teaching material or tuition or other activities that may be interpreted as goods and services offered by certain companies should be avoided or at least be documented.</li> <li>• The authority of the teachers and school or institution should not convey the impression to children or young people and parents that children or young people will be less privileged or exposed to contempt or ridicule if they do not buy or use the product or services sold by sponsors or others.</li> <li>• Children or young people and teachers should be free to assess sponsors and their products critically. Marketing in schools and day-care institutions (such as hanging up posters, displaying brochures and handing out samples) should only take place if the school board or management of the institution has given its permission. Marketing in the form of samples and the like should not be sent directly to children or young people.</li> </ul>
Finland	<p>Advertisements and other marketing material may not be distributed in schools and day-care centres, without the advance consent of parents, obtained at parent–teacher meetings, for example. This risks labelling the material in question as semi-official.</p> <p>Teaching material must not contain advertisements.</p> <p>Advertising may only be used for educational purposes.</p>
France	<p>In-school marketing is forbidden, except when the head teacher believes it has an educational objective.</p> <p>Direct and indirect in-school marketing is subject to country or area regulatory and self-regulatory restrictions and statutory restrictions.</p>
Germany	Rules on advertising and sponsorship vary among the <i>Länder</i> . Some, such as the Free State of Bavaria, permit advertising for commercial purposes. Others permit advertising and/or sponsorship in schools only with the school's permission.
Greece	In-school marketing is forbidden, except when has an educational objective.
Hungary	<p>Advertising in a public educational institution may be carried out only with the permission of the institution's principal.</p> <p>The obligation to obtain such permission applies to the character of the product and service advertised, the substance of advertisement, the method of advertising and the place of publication.</p>
Ireland	Marketing promotions are undesirable practices and should be eliminated. Schools should formulate policies on commercial promotions.
Latvia	School shops and cafeterias are not allowed to sell soft drinks, candy bars, crisps or chewing gum.
Luxembourg	In-school marketing is forbidden, except when the head teacher believes it has an educational objective.
Netherlands	<p>Schools can accept sponsorship on school notice boards, teaching materials and the like and for events, but they must handle it in a serious and responsible manner.</p> <p>Advertising must not appear in study materials, must not encourage children to behave unhealthily or ask their parents to buy the sponsored product, or reward children for their achievements with the products of the sponsor.</p> <p>Self-regulation of in-school marketing is practised.</p>
Portugal	In-school marketing is forbidden.
United Kingdom	<p>Commercial activities in schools should be relevant and add educational value to teaching.</p> <p>Material should not encourage unhealthy, unsafe or unlawful activities. Explicit sales messages should be avoided where possible, but may be unavoidable in the context of a collector scheme (in which vouchers can be collected/exchanged for educational materials or other equipment).</p> <p>The level of branding should be appropriate to the activity.</p> <p>Sponsorship of sports in schools should ensure that:</p> <ul style="list-style-type: none"> <li>• the education and well-being of pupils of the sponsored school are of overriding importance at all times;</li> <li>• the purchase by pupils or parents of the sponsor's products or services is not a condition of the sponsorship;</li> <li>• any marketing campaigns based on the sponsorship are in good taste and comply with all relevant codes and guidelines that relate to children.</li> </ul>

Source: adapted from Hawkes (59).

Table 10.7. Countries with restrictions on product placement in television programmes and on Internet advertising

Type of restriction	Country
<b>Product placement</b>	
Explicit ban	Austria, Belgium (Flemish), Ireland, Norway and United Kingdom
Ban on surreptitious advertising interpreted to restrict product placement	Czech Republic, Denmark, Estonia, Finland, Germany, Greece, Iceland, Italy, Liechtenstein, Netherlands, Slovenia, Sweden and Switzerland
<b>Internet advertising</b>	
General guidelines	
Statutory	Finland
Self-regulatory	Austria, France, Italy and Spain
Data collection guidelines	
Statutory	Denmark, Finland, Norway and Sweden
Self-regulatory	Spain
Statutory guidelines on:	
• Internet sales	Denmark, Finland, Norway and Sweden
• links to other web sites	Denmark, Finland, Norway and Sweden
• children's clubs	Finland

Source: adapted from Hawkes (59).

### Examples from five countries

Several European countries have launched initiatives to combat obesity or to promote healthy nutrition and physical activity, but only a few of them explicitly consider the issue of marketing. Five examples are given here.

A report to the Government of **Sweden** by the Institute of Public Health (68) identified 79 actions to combat obesity, three of which concerned the control of marketing activities.

1. The prerequisites for restricting food marketing activities targeted at children should be examined, for example, with respect to existing legislation. Trends in marketing should be continually monitored.
2. A collaborative group for responsible marketing should be created. Consumer organizations should be able to apply for funding from the Swedish Consumer Agency for monitoring and publicizing developments in the marketing of soft drinks, sweets, crisps, cakes, cookies and ice cream to children, and to initiate a debate on such marketing.
3. Municipalities and schools should adopt a food sponsorship policy. The guide developed by the Swedish Consumer Agency, the Swedish National Agency for Education and the Swedish Association of Local Authorities should be used as a starting point.

Support measures included assessing the health impact of changes in marketing, price and other factors, collecting data on food supply and marketing of certain food groups, and ensuring that children learn about the general nature and purpose of mass media, and the nature of its content, in school.

Commissioned by the Department of Health and Children in **Ireland**, a report by the National Task Force on Obesity (69) recommended the following.

- Ireland should advocate the reform of policies on healthy eating and active living to those in the EU who govern activities related to global trade and the regulation of food marketing and advertising to children.
- In Ireland, the Department of Enterprise, Trade and Employment and the Department of Health and Children, along with the private sector and consumer groups, should immediately take multisectoral action on the marketing and advertising of products that contribute to weight gain, particularly those aimed at children.
- The Department of Enterprise, Trade and Employment, the electronic leisure industry and consumer groups should review the design, production and marketing policies for products that affect healthy eating and active living, particularly in relation to children.

This Ministry of Health and Consumer Affairs of **Spain** produced the national strategy for countering obesity (70). It involves, among other measures, a series of agreements to be signed by industry and other sectors: these are voluntary but, after signing, the participant's activities will be externally monitored and results published. Measures that relate to marketing include the following.

- The food industry has developed a self-regulating code on the marketing and publicizing of food and drink aimed at children aged under 12 years in the first quarter of 2005, immediately applicable. The code regulates publicity and marketing, the hours when they can be transmitted, the mode of product presentation, and the promotion, information and nutritional education that can be made.
- Vending machines are being removed from areas easily accessible to preschool and primary-school children. Advertising is being removed from the machines to avoid encouraging the consumption of certain products, and replaced by stickers with messages promoting a healthy diet.
- The Ministry of Health and Consumer Affairs has set up a mechanism to evaluate the potential impact of these self-regulating mechanisms.

In **France**, an expert committee, supported by the Institut national de la santé et de la recherche médicale (INSERM) (71), recommended and noted the following.

- Children are particularly susceptible to advertisements that invite them to consume attractive products. The competent authorities should rigorously control advertising messages about food products and possibly prohibit messages aimed at children. Certain messages announce energy or nutritional equivalents that are incomplete or equivocal.
- In addition, parents should be informed about the nutritional value of food products for children; rigorous, comprehensible nutritional labelling is needed. Misleading allegations about certain health aspects should not be tolerated. Teaching children to become well-informed, critical consumers is an important educational objective for families, schools and health professionals.

A 2004 white paper from the Government of the **United Kingdom** (72), stated:

On television, we will work with the broadcasting and advertising sectors on ways to help drive down levels of childhood obesity. In particular we will look to Ofcom [the Office of Communications, which regulates broadcasting] to consult on proposals on tightening the rules on broadcast advertising, sponsorship and promotion of food and drink and securing their effective implementation by broadcasters in order to ensure that children are properly protected from encouragement to eat too many high fat, salt and sugar foods – both during children's programmes and at other times when large numbers of children are watching. It should also include options for broadcasters and advertisers to participate in healthy living promotions.

.....  
 We will work with industry, advertisers, consumer groups and other stakeholders to encourage new measures to strengthen existing voluntary codes in nonbroadcast areas, including:

- setting up a new food and drink advertising and promotion forum to review, supplement, strengthen and bring together existing provisions; and
- contributing funding to the development of new health initiatives, including positive health campaigns.

.....  
 The Government is committed to ensuring that measures to protect children's health are rigorously implemented and soundly based on evidence of impact. We will therefore monitor the success of these measures in relation to the balance of food and drink advertising and promotion to children, and children's food preferences to assess their impact. If, by early 2007, they have failed to produce change in the nature and balance of food promotion, we will take action through existing powers or new legislation to implement a clearly defined framework for regulating the promotion of food to children.

.....  
 In addition, there are a range of creative ways for positive campaigns to promote healthy lifestyles in order to counteract the impact of advertising of high fat, sugar and salt foods, and Government is keen to see these used by indus-

try. We will look to the broadcasting and advertising sectors, including Ofcom, to consider how they could have a positive impact on children's food choices.

### Social marketing

Interest is increasing in using advertising techniques for socially beneficial purposes (social marketing). This follows evidence that such approaches can successfully encourage greater consumption of fruit and vegetables among schoolchildren (5). Such social marketing could be funded by food manufacturers or food advertisers, based on revenue levied in proportion to their sales: this model was adopted under the 1990s California legislation that used taxes on tobacco sales to fund antismoking advertising on television and anti-tobacco measures in schools (73).

In its most basic formulation, social marketing provides health-related information that uses conventional advertising techniques. It is aimed either at the general population or at at-risk target groups, on the assumption that the recipients of the message will be persuaded to change their lifestyles and make healthier choices. This view is encapsulated in the definition of social marketing adopted by the United Kingdom's National Social Marketing Centre for Excellence: the "systematic application of marketing concepts and techniques to achieve specific behavioural goals relevant to a social good." (74).

In a more ambitious formulation, social marketing is an attempt to change cultural values by using the full range of marketing techniques, aimed not only at the at-risk or general population but also specifically at sections of the population that are responsible for contributing to the culture in which choices are being made: producers and commercial interests, politicians and professionals, and the mainstream media. This follows Kotler & Zaltman's definition (75) of social marketing as "the design, implementation and control of programs calculated to influence the acceptability of social ideas and involving consideration of product planning, pricing, communication, distribution and marketing research". This approach includes the expectations that the target of social marketing is an active participant whose views will influence programme development and that the process is a continuing one, rather than a one-off campaign that includes the need to address factors that compete with or undermine the desired change (76).

This latter view of the role of social marketing is in better agreement with the broader principles of health promotion expressed in the Ottawa Charter (77) and subsequent charters: that is, "Health promotion is the process of enabling people to exert control over the determinants of health and thereby improve their health", not only individually but also through, for example, education, economic advancement and the development of social capital to create health supportive environments. The Charter (77) continues:

Health promotion policy combines diverse but complementary approaches including legislation, fiscal measures, taxation and organizational change. It is coordinated action that leads to health, income and social policies that foster greater equity. Joint action contributes to ensuring safer and healthier goods and services, healthier public services, and cleaner, more enjoyable environments.

The follow-up recommendations (78) declared that, although governments played an important role in health protection and promotion:

... [health] is also influenced by corporate and business interests, nongovernmental bodies and community organizations. Their potential for preserving and promoting people's health should be encouraged. Trade unions, commerce and industry, academic associations and religious leaders have many opportunities to act in the health interests of the whole community. New alliances must be forged to provide the impetus for health action.

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# 11. Macro- and microenvironmental determinants of physical activity

## Main messages

- Most people's daily living environments – including transport, housing and occupational, school and leisure settings – have become less supportive of physical activity and, as a result, more obesogenic.
- Each of these settings has great potential for promoting more physical activity.
- More effective ways need to be developed to engage other sectors to take full advantage of this potential, showing policy-makers the economic benefits of investing in physical activity and identifying shared goals that they can easily adopt.

In 1996, Hilary Bower (1) was the first to use the term obesogenic environment:

Our environment is obesogenic. The level of physical activity it encourages is extremely low, so we don't burn as much energy. Parents are loath to allow their children to play outside because it's dangerous, riding a bike is suicidal and trying to find the stairs in a building is an exercise only in ingenuity. On the other side of the equation our food supply has gone from low energy, high roughage to being dominated by fat.

Nevertheless, the developments that led to the environment becoming more and more discouraging for physical activity started much earlier. This chapter describes these main determinants in more detail. Using an ecological model, it focuses on institutional, community and public policy factors describing the main macro- and micro-environmental determinants associated with the level of physical activity.

First, it presents the transport system and its various links to opportunities for physical activity. Then it outlines the macroenvironmental factors of urban planning influencing physical activity followed by the microenvironmental neighbourhood and housing aspects. Third, it discusses opportunities from leisure and sport settings, followed by the macro- and micro-level aspects of the school setting. The last section describes determinants in the occupational setting. For each setting, the chapter addresses physical, economic, policy and sociocultural aspects to the extent possible.

Although the chapter focuses on changes that have occurred in the environmental determinants of physical activity, societal factors such as family structures and time-activity patterns also influence opportunities for physical activity. This is particularly evident in relation to informal activities that are built into daily life, such as playing in courtyards and choosing walking and cycling for transport or recreation.

Another factor plays an important role in many of the associations described in this chapter: socioeconomic status. For example, car ownership and subsequently car use in Europe increase as the average disposable income increases (2). Socioeconomic inequality also plays an important role in the housing environment, as briefly presented in the section on urban development, neighbourhood and housing. Chapter 12 provides more detail on socioeconomic aspects.

## Transport and physical activity

### Physically active transport

In western European countries (for which numbers are more readily available than other countries in the WHO European Region), the growing demand for mobility in recent decades has largely been satisfied by the increased use of private cars, leading to a growth in car passenger transport of almost 150% since 1970, while the use of public transport increased far less. About 80% of journeys are by car (3), and the distance travelled per person doubled between 1975 and 1995 (4). Thus, people became more mobile but they used mainly motorized means for the additional passenger-km. The number of passenger-km by private car has increased steeply in recent decades, while those travelled by public transport increased far less and those by bicycle and on foot remained

largely level, having been at historically low levels since the early 1970s (4). In fact, the largest decrease in human-powered mobility took place between the 1950s and early 1970s, reflecting the boom in private transport and the related urban and environmental changes (5). The ability to travel long distances has in turn also played an important role in promoting urban sprawl, thus creating an even greater dependence on motorized transport to access commercial centres, jobs and other amenities (see the section below on urban development and housing).

On average, people in western Europe spend almost 1 hour travelling every day (6). They cycle about 0.5 km and walk about 1 km while travelling 27.5 km by car. Only in a few countries, such as Denmark and the Netherlands, does cycling account for a more sizable share of daily mobility (4). Nevertheless, cycling and brisk walking, which are associated with an energy expenditure of about 3–5 METs (energy expenditure relative to sitting quietly) (7), could be efficient and effective ways to provide the recommended level of physical activity: at least 30 minutes per day of at least moderate-intensity activity. There is great potential for more trips being made on foot or by bicycle. Regardless of the increasing total amount of motorized transport, more than 50% of trips currently made by car are shorter than 5 km, a distance that could be covered by about 15–20 minutes of cycling. More than 30% of the trips by car are even less than 3 km long and could be covered conveniently in about 30–50 minutes' brisk walking (6). Cycling and walking could replace at least half these short car trips (8).

### Road safety as a determinant of physical activity

Several barriers prevent people from choosing cycling and walking as a regular physical activity, including the perceived or real level of safety (9). Speed is the main determinant of the risk of being seriously injured or killed in a road crash. For example, the risk of a pedestrian being killed in a collision with a vehicle is eight times higher if the vehicle is travelling at 50 km/h compared with 30 km/h (10). The health benefits of regular cycling, however, by far outweigh the risks of vehicle collision (11).

Children have a higher risk of being injured in road traffic, and road traffic injuries are the leading cause of death among people aged 4–29 years in Europe (10). In addition, children in lower social classes are 3–4 times more likely to die from injuries than those in higher classes (12). Although road traffic injuries represent a relatively less frequent cause of death among elderly people, they are especially vulnerable due to a gradual decline in their ability to cope with difficult road situations and an increase in physical frailty. Many elderly people therefore tend to avoid road traffic, thus reducing their mobility and the scope of their social life (see the section below on urban development and housing). The projected increase in the proportion of older people in most European countries adds importance to this problem (10).

Addressing the risks related to road traffic injuries for vulnerable road users therefore appears to be an important prerequisite to making the choice of cycling or walking easier. An example from Finland shows the benefits that can be achieved.

Finland's first National Cycling Policy Programme was adopted in 1993 (13). Its main objectives were to double the level of bicycle use and to halve cycling fatalities by 2000. A general economic assessment in 1993 estimated that the net benefits of doubling cycling would exceed the investment costs by about €100–200 million per year through reductions in injuries and other positive health effects. The Programme contained 85 measures; an evaluation in 2000 showed the following (14).

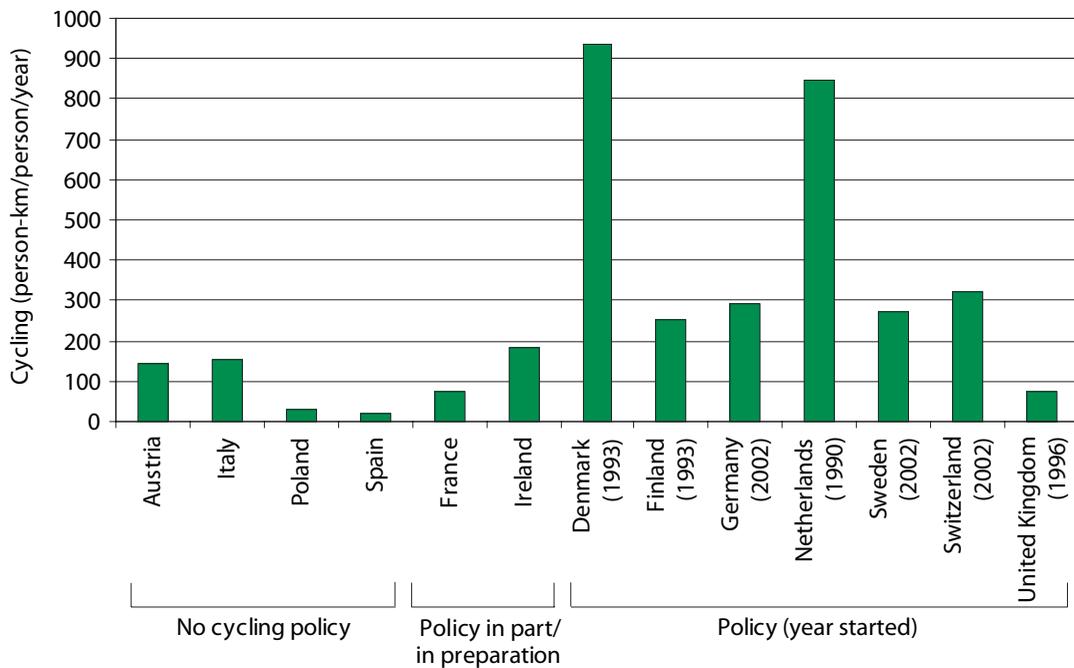
1. Cycling had become an important and integrated part of the transport system, policy and planning.
2. The number of passenger-km travelled by bicycle returned to the level of the early 1980s (about 1.6 million).
3. The number of cycling fatalities was halved (from 101 in 1990 to 53 in 2000).
4. The improvements included better networks of cycle paths, the publication of maps and development of initiatives such as cycling police, bicycle rental and storage, weekly cycling tours and cycling promotional campaigns.

An updated programme to promote cycling was presented in 2001, aiming to double cycling by 2020 and improve safety. The positive development in road safety continued, and there were only 26 cycling fatalities in 2004, a further reduction of 50%, attributed mostly to the Programme, despite reduced cycling due to poor weather in 2004 (13).

## Policy environment

Fig. 11.1 presents an overview of the level of cycling in selected European countries, using person-km as a proxy for the associated level of physical activity. Fig. 11.1 shows that the level of cycling tends to be higher in countries that have a more cycling-friendly policy environment, for which the existence or preparation of a cycling policy was taken as a proxy. It also shows that, among the examples presented, the two countries with the highest levels of cycling – Denmark and the Netherlands – are also those that have a longer tradition of cycling-friendliness, which includes the earlier development of a dedicated policy document. This simplified presentation is supported by a quantitative analysis carried out in a European research project, which also found the existence of cycling policies to be significantly associated with the level of cycling (15). Most of these policies were not developed under the leadership of the health sector, but by other sectors, most often the transport sector. This underlines the need for intersectoral collaboration to harness the full potential of human-powered mobility (16). For example, even in Denmark, one of the countries with the highest levels of cycling, the promotion of human-powered mobility seems to be mainly an activity of the transport sector, and the health sector has not yet fully recognized cycling as a means to promote more exercise and to reduce obesity (17).

Fig. 11.1. Cycling-friendliness of the policy environment and cycling in selected European countries



Sources: *Energy & transport in figures 2002* (4), Krag (17), Schollaert & Coppieters (18), *Energy & transport in figures 2000* (19) and *Verkehrsaufkommen und Verkehrsleistung im Personenverkehr* (20).

Fig. 11.1 also illustrates the complexity of the association between policies and the level of cycling. The higher levels of cycling in the Netherlands and Denmark are unlikely to be explained solely by the existence of a cycling policy. The level of investment in cycling and walking in these countries has historically been high, and other factors may also influence the perception and willingness to travel by bicycle or on foot, such as weather, quality of infrastructure, security considerations (such as theft or assault) and the flatness of the terrain.

In addition, in Finland, which has also had a policy since 1993, the cycling level did not seem to increase as much as might be expected, given the existence of a favourable policy context (21). The example of the United Kingdom also shows that the mere existence of a policy document is not enough: the Government recently had to admit that the first cycling policy did not affect the level of cycling significantly (22). Long-term investment might be needed to increase historically low levels of cycling, to change attitudes and perceptions and to build up new alliances between sectors.

### Investment and price signals for sustainable transport

In most countries in western Europe, transport decision-making has in general marginalized cycling and walking; this is also reflected by the low share of investment (less than 10%) (6), while about two thirds of investment goes into road infrastructure and about a quarter into rail infrastructure. Correspondingly, the fastest growth has been in the motorway network (23). While related data on the eastern part of the Region are not readily available, the situation is unlikely to be considerably different.

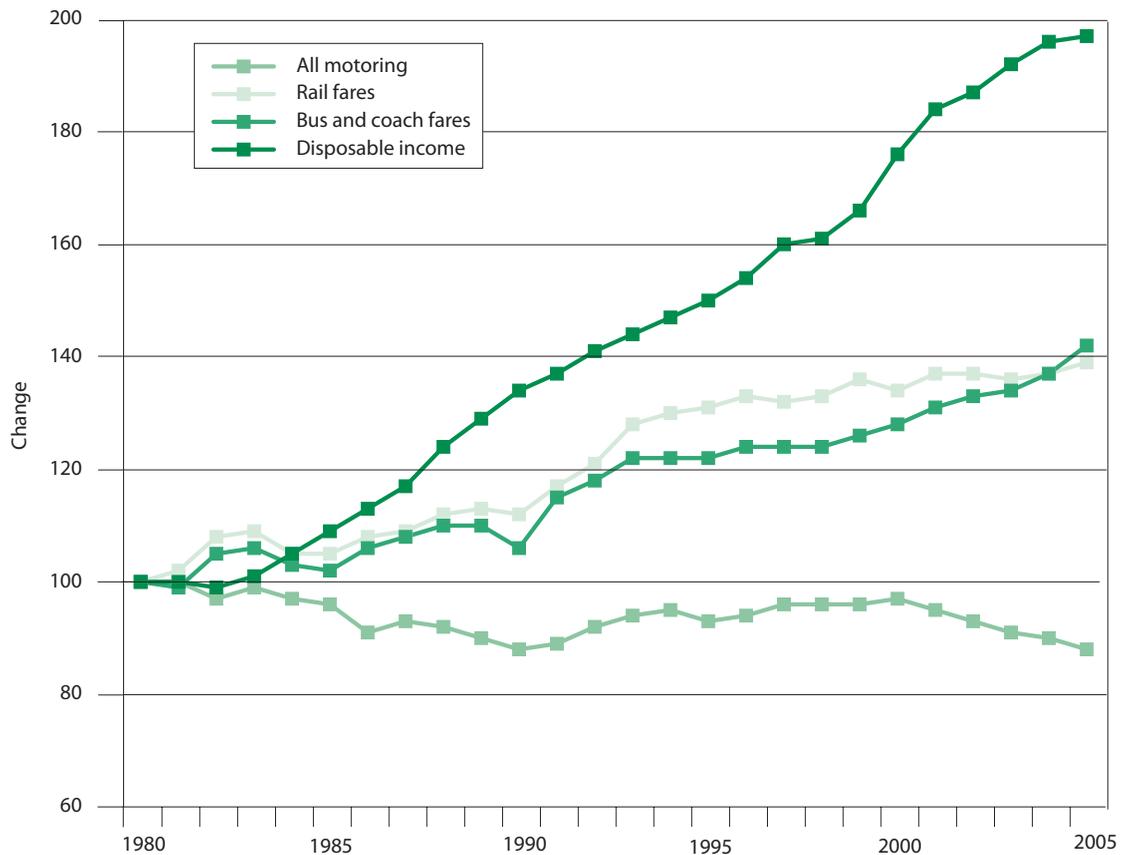
Unfortunately, no reliable data are available to compare investments in cycling and walking across different countries. Communities with a higher level of trips using public transport, walking or cycling in general, however, seem to have been more efficient in using resources to provide for the mobility needs of their inhabitants (24).

Further, price structuring favours the use of the car instead of other modes. Fig. 11.2 shows that, over the last 25 years, the use of passenger cars became relatively less expensive compared with public transport in the United Kingdom (25).

### Urban development, neighbourhood and housing

Urban design and the urban physical environment can facilitate or constrain physical activity and active living. Design elements in the built environment – such as street layout, zoning, the location of recreation and shopping facilities and services, parks and buildings and the transport system – can either encourage or discourage active living (26). During the past few decades, the process of urbanization has continued across the WHO European Region. By 2004, the percentage of the population living in urban areas was 80% in the high-income countries and 64% in the medium- and low-income countries of the Region (27).

Fig. 11.2. Real change in the price of using different transport modes in the United Kingdom, 1980–2005 (Index (1980=100))



Source: *Transport trends, 2006 edition* (25).

From an urban and neighbourhood development perspective, two main driving factors influence the level of physical activity in the Region. The increasing geographical separation of living, working, shopping and leisure activities results in an increasing demand for motorized transport and reduces the opportunities for physically active use of the neighbourhood. In addition, the quality of the neighbourhood environment affects residents' opportunity and willingness to actively use common spaces.

### Accessibility of facilities and opportunities for activity

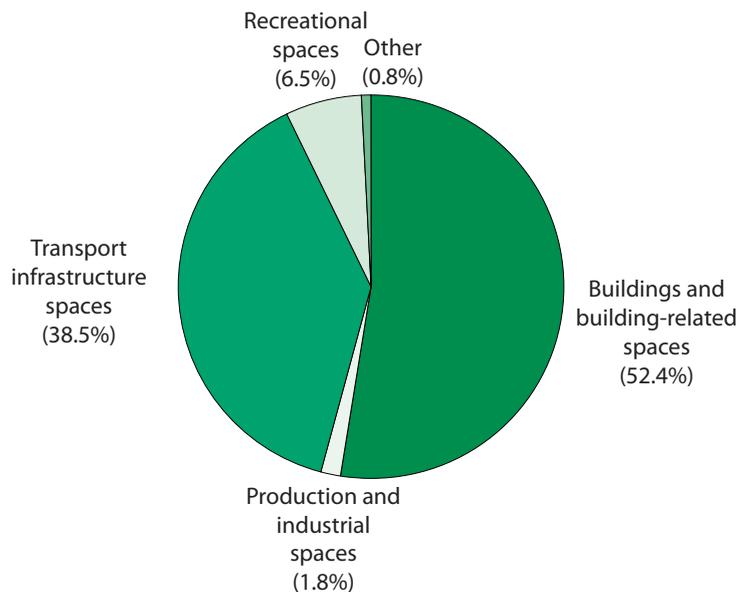
Urban sprawl and long distances within cities lead to more motorized transport (28). In addition, the focus on motorized transport in urban planning has made many residential environments less cycling and walking friendly. Nevertheless, the recent trends in urban development show a decrease in suburbanization and a return to urban living. In many cities, empty lots are being filled and residential density is increasing. Although this is positive in decreasing distances within cities, depending on the type of neighbourhood, the proportion of sealed spaces in residential neighbourhoods can be as high as 60%, leaving little of the open space that is most attractive for recreational and leisure activities.

In Germany, for example, more than 52% of urban land is covered by buildings and building-related spaces, most of which are not usable for recreational activities, 38% by transport infrastructure and only 6.5% by recreational spaces (Fig. 11.3) (29). At the city level, for example, in Amsterdam, in 2001 only two thirds of the population had access to green spaces within 15 minutes' walk; these shares were as low as 56% in Bologna, 40% in Bratislava and 36% in Warsaw (30).

Urban layouts that reduce opportunities for physical activity and limit walking or cycling are often characterized by a lack of access to sports facilities, playgrounds, parks and open spaces; and lack of pavements, bicycle paths and lanes, and street connectivity (31).

In western European countries, increased residential opportunities for physical activity are associated with better self-rated health and more physical activity, regardless of people's age, sex or income (32). Neighbourhoods characterized by higher residential density, land-use mix, street connectivity and green and open spaces for recreation are considered more walkable. Residents of such neighbourhoods had 70 minutes' more physical activity per week and showed a lower prevalence of obesity than residents of less walkable neighbourhoods (31,33–38).

Fig. 11.3. Land use in urban areas in Germany, 2004



Source: Siedlungs- und Verkehrsfläche nach Art der tatsächlichen Nutzung 2004 (29).

Overall, the built environment can influence physical activity in different settings: home, workplace, school, travel, neighbourhood and leisure. There is convincing evidence of the link between the built environment and physical activity (39,40). In addition, the internal layout of buildings affects physical activity. The process of re-generating European cities in the 1970s and the often enormous rises in rent have led to increasing numbers of high-rise buildings. These buildings require lifts, which reduce the use of staircases (26,41).

### Aesthetics and fear of crime

In addition to the opportunities for physical activity in the residential environment, empirical evidence from recent years has shown that aesthetics (environment perceived as pleasant, attractive and friendly and not noisy or polluted) and safety perception (including crime, type of neighbourhood, street lights and danger from traffic) can affect people's likelihood of being physically active in their residential environment (31,42–44).

Table 11.1 illustrates the increasing likelihood of being a neighbourhood walker or to use walking for exercise in relation to a higher satisfaction with the neighbourhood aesthetics (45). Men with the most positive perception of the aesthetic nature of the environment were more than seven times more likely to be neighbourhood walkers and four times more likely to walk for exercise.

The rapid privatization of the housing stock in the countries in the eastern part of the European Region in the 1990s has been an important factor in determining the quality of neighbourhoods. In Germany, for example, only 45% of the houses are inhabited by their owners, while in Lithuania this share is as high as 96%. In all eastern European countries, privatization has shifted the burden of operations and maintenance from the state to the new owners, who often find themselves unable to keep up with the related expenses. Many of these buildings need repairs and are poorly maintained (46). The aesthetics and maintenance levels of the residential environment, however, are strongly correlated

with the perceived safety of the area of residence and the likelihood of physical exercise. For example, self-reported neighbourhood walking is significantly related to the perception of safety while walking (47–49).

Case studies of housing and health in eight European cities in 2002–2003 (50–52) showed the following.

- An area that is pleasant, with substantial greenery and few problems such as litter and graffiti, encourages people to take exercise.
- In some cities, the risk of higher BMI increases with the amount of incivilities (uncivil and rowdy behavior, delinquent acts and lack of property and facilities maintenance) and may also be affected by the amount of greenery in the residential area.
- Links between the fear of crime and physical activity show an independent association between perceived safety and the likelihood of exercise.
- Living in large multifamily housing estates is associated with a lower perception of safety. Housing estates with little provision of green spaces, poor visibility and insecure entryways reduce perceived safety.

Street lighting is another major determinant of neighbourhood safety, which also affects residents' willingness to walk, cycle or exercise in their residential environment. For example, experience from interventions in the United Kingdom shows that introducing street lights can increase the number of people using the streets (49).

### Social and economic dimension

Socioeconomic status largely determines the opportunities for physical activity in leisure time. Environmental and residential conditions are one mechanism by which socioeconomic status affects health and well-being (53–55). The spatial separation of social groups based on economic criteria and the quality of settlements, including their location, have serious implications not only for urban cohesion but also for access to environments enhancing physical activity (46).

**Table 11.1. Increasing likelihood of men being neighbourhood walkers**

Aesthetic quality	Men's likelihood of being walkers	
	Neighbourhood walking (OR (95% CI))	Walking for exercise (OR (95% CI))
Low	1.00	1.00
Moderate	1.92 (0.63–5.86)	2.06 (0.68–6.26)
High	7.43 (1.92–28.82) <sup>a</sup>	3.86 (1.03–14.46) <sup>b</sup>

<sup>a</sup>  $P < 0.01$ .

<sup>b</sup>  $P < 0.05$ .

Source: Humpel et al. (45).

Evidence suggests that people from neighbourhoods with lower socioeconomic status may have limited ability to determine their physical activity in the face of inaccessible environments. A study from the Netherlands (56) found that residents living in the most socioeconomically disadvantaged areas were more likely to cycle or to walk to their work or to shops, but were less likely to cycle, walk or participate in sporting activities in leisure time than residents of the least disadvantaged areas. The results showed that the reduced likelihood of participating in leisure activities was mediated by neighbourhood characteristics, including poorer design and quantity of facilities (56–59). Data from the United States (37) show that the perceived neighbourhood characteristics and access to places for physical activity are strongly associated with race, education and income.

Besides socioeconomic status, the social environment strongly predicts whether people are physically active. In Belgium, Finland, Germany, the Netherlands, Spain and Switzerland, the social cohesion obtained through friends and family support influences levels of physical activity (60).

### Policy options

Modifying only the built environment is unlikely to solve the public health problem of insufficient physical activity. This should be complemented by strategies addressing the individual, social and environmental determinants of physical activity. The Region has no common regulatory approach to maintaining the environment and promoting healthy lifestyles at the residential level. Of six countries reviewed (Germany, Italy, Hungary, Lithuania, the Netherlands and the United Kingdom) (61), only Italy and Lithuania had national requirements stipulating the minimum amount of green space according to the size of the city, the number of its inhabitants or the size of the condominium. None of these countries regulated the distance between a dwelling and a park or leisure area. An appropriate neighbourhood in which pedestrian transport is safe is also a way to develop healthy lifestyles, but only Germany mandated that any street should be provided with a pavement (61).

### Leisure time and sport

Although integrated physical activity programmes are relatively new, some European countries have a tradition of sports clubs and associations, as well as movements for sport for all, that go back as far as 150 years. Participation in some traditional sports has declined in recent years, and some sports clubs tend to complain about a lack of young members (62). These observations can often be explained, however, by demographic changes, the great increase in the number of sports and the tendency to recruit ever-younger club members. In addition, commercial activities such as fitness clubs, activities organized outside traditional club structures (such as night skating events and individual exercise) have developed.

Determining participation in sport depends on the monitoring methods used and seems to vary not only between age groups and sexes but also between countries. These differences in historical and cultural background are reflected in the project on co-ordinated monitoring of participation in sports in Europe (63), which found regular sports participation in the nine participating European countries varying between 15% and 71% in adults. Few countries have been able to show a recent increase in physical activity levels, often attributable to sport or leisure activities (64), while change in everyday life seems to be difficult to achieve (65).

Countries that have already undergone a strong sports-for-all development in the past will emphasize maintaining the high participation rates, the easily accessible infrastructure and the elaborate system of volunteer work that is usually behind it. In countries with a different cultural and historical background, real growth and a substantial additional contribution of sport to promoting physical activity seems possible. Sport competes with other leisure activities, some with and some without physical activity. As people differ, even the greatest diversity of sports will never reach everybody in a population, especially those who, even though they like sport, are less motivated and cannot find the time to participate every day; physical activity in these people's daily lives is even more important.

### Educational system and school setting

Children and adolescents spend more time in institutions than before. This is a combined effect of more use of kindergartens, an increase in compulsory school time and more widespread offers to extend the normal school day with school-based day care (66). These institutions often have educational objectives largely based on principles stipulating that children have to follow the teaching or study on their own in a sedentary way. This increased

sedentary institutionalization of children is probably contributing to a childhood consisting of less overall physical activity. The introduction of computers as a tool in education may also have contributed to this.

Physical education is meant to be an arena for learning physical activity and sport skills as a base for lifelong interest in being physically active. Extended and better physical education can also contribute to a better balance in children's activity level. Unfortunately, physical education has had low priority during the past decade (67). Hardman & Marshall (68) found that the average time for physical education has been reduced in primary and secondary school, while more priority is given to academic disciplines. Increasing pressure for academic time may also lead to reducing time for unstructured physical activity during recess and the lunch break (69). Evidence suggests, however, a relationship between physical activity and children's cognitive capacity: for example, a new study of 1 million children aged 10–14 years in the United States found that higher cognitive achievement was associated with higher levels of fitness for each grade studied (70).

In addition, students are significantly less physically active in school recess time in intermediate (lower secondary) school than in primary school. One explanatory factor seems to be a lack of sufficiently motivating facilities and outdoor environments in intermediate schools (71). The decrease is most marked in girls, who are significantly less active than boys of the same age. One reason may be that school playgrounds and physical education lessons seem to be more adapted to and motivating for boys' activities.

Further, many countries are reporting less cycling and walking to and from school (Fig. 11.4) (72). The real or perceived danger of traffic is an important barrier for children's independent walking or cycling to school. About 90% of parents worried about traffic hazards on their child's journey to school (73), and parents' concerns about traffic were an important determinant of whether children walked to school (74).

This is a vicious circle, leading to even more motorized and less active transport, if traffic is not limited or regulated along the routes to and from schools. Thus, it reduces the importance of a very significant source of daily physical activity for children.

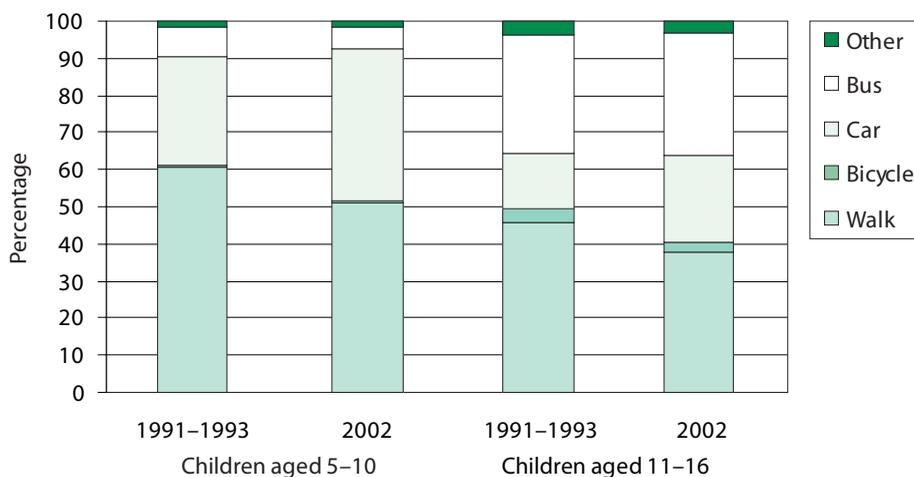
In addition, children who walk to school have significantly higher levels of moderate-to-vigorous physical activity outside school hours than those who are driven to school (75).

Although regulations govern the health-related conditions of indoor environments, national standards for outdoor spaces and school playgrounds that promote physical activity, as well as safe school routes, are often lacking.

## Workplaces

Not only have transport systems and neighbourhoods become increasingly unfavourable for physical activity, but in recent decades important changes have also taken place in the economy. In particular, the proportion of

Fig. 11.4. Trend in children's means of transport to school in the United Kingdom, 1991–1993 and 2002



Source: National travel survey (2002 update) (72).

the working population employed in the service sector has increased continually compared with the agricultural and the industrial sectors in most countries (76). This overall trend often leads to a lower level of occupational physical activity since many jobs in the service sector are sedentary; in the United States between 1950 and 2000, for example, the percentage of the labour force in high-activity jobs fell from about 30% to nearly 20%, while the percentage of workers in low-activity jobs rose from over 20% to over 40% (77). The association between occupation, income and physical activity, however, is quite complex. For example, people with higher education (who also more often work in the service sector) are more likely than unskilled manual workers to take part in sports or other leisure physical activities. More people in low-wage jobs (and thus more likely working in the industrial or agricultural sectors), however, do not own cars but walk, cycle and use public transport (78).

In addition, technological progress leads to more labour-saving devices. Although this saves employees from having to carry out monotonous and repetitive activities (which can be a health risk), the automation also reinforces the trend of less physical activity in many workplace settings. In 2002, half the respondents in a European survey said they undertook little or no physical activity at work; 22% reported some physical activity, and 20% stated that they undertook considerable physical activity at work, men and those aged 26–44 years slightly more often than others. More than one quarter of the respondents spent more than 5.5 hours per day sitting (79).

Further, according to a survey on the working conditions in the EU, almost 30% of employees report stress at work, and the intensity of work seems to have increased (80). In this context, physical activity can play a useful role in helping to cope with work-related stress.

### Policy and sociocultural environment

Although the workplace environment can provide opportunities for activity (either in the work itself or by providing, for example, fitness centres), classical health promotion approaches often do not reach all employees (81). The policy and sociocultural environment provided by the employer is therefore an important determinant. For example, the general policy of providing a free parking space at work significantly influences the mode of transport employees use, favouring motorized transport (Table 11.2). National laws can influence a company's willingness to promote active travelling among their employees. For example in Belgium, the state compensates companies for paying their employees an allowance for using a bicycle for commuting. According to a survey of 89 companies, about 80% participated in this reimbursement system (82).

On the other hand, policies that give financial incentives to provide cars as fringe benefits to executives and other high-level employees may hinder physical activity by reinforcing the perception that power, affluence, status and driving cars are positively associated. Although fiscal reforms in this field have concentrated on promoting cleaner and more fuel-efficient cars and eliminating the incentive for drivers of company cars to drive unnecessary extra business miles for tax purposes (84), they have stopped short of providing greater incentives for active transport.

### Conclusions

Most micro- and macroenvironmental determinants have become less conducive to physical activity.

Although many of the trends in transport in recent decades have not encouraged physically active travel to counteract obesity, there are potential opportunities for change. Much needs to be done, however, to modify social attitudes towards cycling and walking, which, along with the use of public transport, too many people still perceive associated with low social status and prestige. A statement made in 1986 exemplifies such attitudes: "A man who, beyond the age of 26, finds himself on a bus can count himself as a failure" (85). Such views should definitely belong to the past.

On an urban level, existing neighbourhoods and residential environments need to be made walking- and cycling-friendly for residents. Housing policies should promote exercise by improving the conditions of residential areas, building housing settings that promote green spaces and avoid dark and inse-

**Table 11.2. Proportion of people with a reserved parking space at work and using a private car for commuting in Switzerland, 2000**

Mode of transport used	Parking space (%)		No reserved parking space (%)	No response (%)
	Free of charge	Available for a fee		
Private car	54.6	11.7	33.5	0.2
Other	19.8	4.6	75.4	0.1

Source: *Mobilität in der Schweiz* (83).

cure entryways and improving the maintenance levels of housing units, leading to safe, walking- and cycling-friendly environments.

In the educational system and school setting, a combination of factors – higher academic demands and less importance attached to physical education, longer times spent by children and adolescents in school institutions, more time spent indoors and less active travel to schools – has overall led to less physical activity among children, which coincides with increasing levels of obesity. Many opportunities exist to counteract these trends.

Participation in some traditional sports has declined in recent years. This is at least partly due, however, to demographic changes and the increase in the variety of sports. At the same time, commercial options have developed, but all population groups may not have the same access to them. Countries differ substantially in sports participation across the European Region. In addition, sport also competes with other leisure activities, some with physical activity and some – such as the increasingly widespread screen-based ones – without physical activity.

In addition to a shift towards a larger share of sedentary jobs in most countries, technical developments in the working environment have led to less physical activity during work. The policy and sociocultural environment provided by employers is an important determinant of employees' physical activity behaviour. This includes providing opportunities for physical activity in the occupational setting itself, as well as, for example, parking and fringe-benefit policies.

In conclusion, policy-makers have many opportunities to intervene to make people's environments less obesogenic. Making full use of the potential of supportive environments for active living requires long-term strategies and investment. Sizable long-term gains can be achieved for individuals and societies at large, especially when stronger partnerships between sectors are built to maximize the effects of policy. More effective ways and arguments therefore need to be developed to win the support of other sectors by making them more aware of the role they can play in facilitating and promoting physical activity. For example, these may include developing tools to estimate the economic benefits for non-health sectors of investing in physical activity. Other opportunities may be provided by identifying shared goals they can easily adopt, such as the opportunity for the transport sector to achieve goals for air quality or climate change through transport policies that encourage cycling and walking or fewer days of sick leave for more physically active workers.

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## 12. Socioeconomic inequality in obesity in Europe: issues and policy implications

### Main messages

- Major socioeconomic inequality in obesity has been reported in many countries in the WHO European Region but, overall, very little has been done to tackle this specifically.
- Socioeconomic inequality in diet and sedentary lifestyles are probably involved in explaining socioeconomic inequality in obesity.
- An emphasis on changing the environment that promotes or prevents obesity is warranted, especially because of its potential for preventing obesity among disadvantaged groups.
- Future interventions and policies need to be systematically evaluated for their effect on disadvantaged groups.

Obesity is a major public health problem in the WHO European Region that is accompanied by a significant health and economic burden. Important recent public health initiatives from WHO and other organizations have confirmed the need to reduce the worldwide burden of obesity, but few have focused on ways of tackling growing socioeconomic inequality in obesity. Such inequality has been observed throughout the world and is reported to be increasing in several European countries, thus fuelling greater inequality in health (1).

To understand the importance of tackling inequality in Europe, this chapter describes variations in and the reasons for socioeconomic inequality in obesity, and discusses ways of addressing it.

Occupation, education and income have traditionally defined socioeconomic status (2). Nevertheless, researchers increasingly recognize that a comprehensive understanding of a person's socioeconomic status in today's complex societies must go beyond these dimensions to include such issues as ethnicity, sex, residence, community and religion (3).

Further, the various socioeconomic and demographic determinants of health interact. Sex, for example, influences how socioeconomic status affects obesity (and health in general). Similarly, the availability of healthy choices differs substantially by ethnicity, and religious beliefs also determine lifestyle and risk factors. Although this chapter focuses on the three traditional markers of socioeconomic status, simply because most of the literature still focuses on them, they are interconnected with other socioeconomic and demographic variables.

### Socioeconomic inequality in obesity

A large body of evidence suggests that socioeconomic differences in obesity exist throughout the world (4–7). The relationship between socioeconomic status and obesity is anything but static, and variation among regions and population subgroups and over time has been reported. This has major implications for the Region, which comprises an extremely diverse population in geography, culture, lifestyle and level of economic development.

This chapter defines socioeconomic inequality in obesity as differences in the prevalence of obesity between people of higher and lower socioeconomic status (adapted from Mackenbach & Kunst (8)). This definition should always be considered in light of the fact that socioeconomic inequality in obesity can be experienced differently at the community, household or individual levels and by different population subgroups, such as men and women, older and younger age groups, ethnic minorities, migrants and refugees (9,10).

### Variation among populations

#### Population data

A few studies have examined the prevalence of obesity in relation to economic development and inequality in national income. Comparing national economic data with estimated average adult BMI in more than 100 countries, Ezzati et al. (11) observed that BMI increased rapidly and then flattened and possibly declined with increasing national income. The decline was clearer for women, which is consistent with other reports from population-

based studies of an inverse relationship between socioeconomic status and obesity among women from upper- and upper-middle-income countries (4,5). In a study of 21 of the 50 countries with the highest gross national income per capita, Pickett et al. (7) found that the countries with the greatest inequality in income had the highest levels of obesity among both men and women. Similar findings had been reported previously in the United States in studies showing an association between states' inequality in income and either mean self-reported abdominal weight gain (12) or self-reported BMI, particularly at low income levels (13).

These findings suggest that the increase in inequality in income recently observed in many countries – including Bulgaria, Poland, Romania and the Russian Federation (14) – may be associated with an increase in the burden of obesity.

### Individual-level data

Many studies have examined the relationship between socioeconomic inequality and obesity in upper-income countries using various markers of socioeconomic status (including income, education, occupation or other measures) and relative body fatness. One of the first to have highlighted socioeconomic differences in obesity was the Midtown Manhattan Study, published in 1965, which found that obesity was six times more prevalent among women of lower socioeconomic status than those of higher socioeconomic status (15). A landmark review by Sobal & Stunkard in 1989 (4) confirmed this finding by reporting a consistent inverse relationship between socioeconomic status and obesity among women from several high-income countries (Table 12.1). Findings for men and children were more contradictory: among men, about 56% of studies showed an inverse association and 21% a direct association, with higher income linked to higher obesity prevalence. Among children and adolescents, 36% of the studies showed an inverse association with socioeconomic status and 26% a direct association.

In medium- and low-income countries, a different pattern emerged (Table 12.1). Data from nearly 90% of the studies showed a positive relationship between socioeconomic status and obesity in men, women and children, and no study showed an inverse relationship (4). This suggested that, at least before the late 1980s, obesity in lower-income countries mainly affected people with higher socioeconomic status.

**Table 12.1. Types of reported association in studies<sup>a</sup> of socioeconomic status and obesity in adults and children, 1989**

Study group and type of association	Number of studies	
	Females	Males
Adults from several developed societies <sup>b</sup>	24	39
Inverse association	18	22
No association	5	8
Direct association	1	8
U-shaped association	–	1
Children and adolescents from developed societies <sup>c</sup>	32	34
Inverse association	13	11
No association	11	14
Direct association	8	9
Adults from developing/non-western societies <sup>d</sup>	11	14
Inverse association	0	0
No association	1	2
Direct association	10	12
Children and adolescents from developing/non-western societies <sup>e</sup>	14	15
Inverse association	0	0
No association	2	2
Direct association	14	13

<sup>a</sup> Some studies were conducted only in males or in females.

<sup>b</sup> This group comprised Britain (n = 21 studies), Holland (n = 4), Belgium and Sweden (both n = 3), Canada, Denmark and New Zealand (all n = 2), and Czechoslovakia, Germany, Norway, Scotland and Wales (all n = 1).

<sup>c</sup> This group comprised the United States (n = 17), Britain (n = 8), Canada (n = 3), Sweden (n = 2) and Israel, Italy, Australia, France, Netherlands (all n = 1).

<sup>d</sup> This group comprised India (n = 4), Colombia and Samoa (n = 2), De Cunha Islands, Pakistan, South Africa, Nigeria (all n = 1), and the following groups: Australian aborigines and the Apache, Comanche and Kiowa in the United States (all n = 1).

<sup>e</sup> This group comprised Guatemala (n = 4), Colombia (n = 2), India (n = 2), and Brazil, China, El Salvador, Nigeria, Nepal and South Africa (all n = 1), and the following groups: Australian aborigines and the Navajo in the United States (n = 1).

Source: adapted from Sobal & Stunkard (4).

With the increasing prevalence of obesity worldwide and the need for targeted action, numerous studies on the relationship between socioeconomic status and obesity have suggested that the scenarios presented in 1989 might not still apply. For example, a review of 14 studies of adults covering 1989–2003 (5) suggested that obesity in low- and medium-income countries is no longer reserved for the socioeconomic elite. Among men, half the studies reported an inverse relationship between socioeconomic status and the prevalence of obesity and the other half, a direct relationship. In women, seven studies showed an inverse relationship between socioeconomic status and obesity; two studies, a direct relationship and two others, no significant association.

The burden of obesity not only tends to shift towards groups of lower socioeconomic status as countries' GNP increases but also to do this at earlier stages of economic development among women than men. Women of low socioeconomic status cross over to higher rates of obesity once GNP per capita reaches about US\$ 2500, the mid-point value for low- and middle-income countries (5).

This tendency is also apparent among the countries in the eastern part of the European Region (16) (personal communication, Joceline Pomerleau, London School of Hygiene and Tropical Medicine, 2005). Obesity is still a disease of affluence among both men and women in such lower-income countries as Azerbaijan and Uzbekistan. For example, the prevalence of overweight and obesity among women in Uzbekistan aged 15–49 years increases steadily with educational achievement, from 23% among those with primary education to 35% among women with more than secondary vocational education. Other countries with relatively low income – such as Armenia, Georgia, Kazakhstan, Kyrgyzstan, the Russian Federation and Ukraine – have a higher BMI or likelihood of obesity with higher educational achievement among men, but BMI and obesity prevalence are lower with higher education among women in Belarus, the Russian Federation and Ukraine. The extent to which the burden of obesity falls on poor people as countries increase their GNP remains open. In countries such as the Czech Republic, Estonia, Latvia, Lithuania and Poland, and a highly urbanized area of Albania, the greater risk of obesity appears to have largely shifted to those with lower socioeconomic status, particularly among women, with most countries having an inverse relationship between education and obesity among women but no significant association among men (16–18).

Finally, recent investigations in the high-income countries of western Europe also suggest that the pattern described in earlier reviews might be changing and that the relationship between socioeconomic status and obesity among men is becoming closer to that observed among women, at least in some countries (19,20). For example, research conducted in the Netherlands, Spain, Sweden and the United Kingdom, and a pan-EU survey, reported an inverse relationship between education and either BMI or obesity among both men and women (20–24). Some cross-sectional and cohort studies have also suggested that low socioeconomic status during childhood could be a determinant of obesity in adulthood (25), even independent of adult socioeconomic status (26–30).

### Observations among children

Although obesity in children is becoming a major public health concern, relatively few studies have examined socioeconomic inequality in obesity. Similarly to that of adults, the relationship between obesity and socioeconomic status in children seems to vary between countries and with country income. Sobal & Stunkard (4) reported that about 40% of the studies conducted on children in high-income countries showed an inverse relationship between socioeconomic status and obesity, but 25% reported a direct relationship, finding similar results in boys and girls. Conversely, most studies performed in low- and medium-income countries showed a positive relationship between socioeconomic status and obesity among children and adolescents (4).

More recent surveys in high-income countries, such as the United Kingdom and the United States, suggest that lower socioeconomic status is associated with a higher prevalence of obesity in children. In the United States, for example, McMurray et al. (31), Goodman et al. (2) and Wang (32) have suggested that groups of adolescents of low socioeconomic status (measured using parental education, household income or subjective social status at school) have a higher risk of being overweight or obese. In Scotland, obesity among 3-year-olds was more common in more deprived families (assessed using the Carstairs deprivation index) (33). In England, the prevalence of obesity among children aged 2–10 tended to increase with increasing area deprivation, although no consistent gradient was found, and decreasing household income. Obesity was lowest among “managerial or professional households” (12%) (based on the current or former occupation of the head of household) and highest among “semi-routine and routine households” (17%) (34). In addition, the increase in child obesity between 1974 and

2003 in the United Kingdom appeared to be more marked among children of lower socioeconomic status (35). Similarly, a survey conducted in the Czech Republic suggested that schoolchildren who have parents with lower educational achievement are twice as likely to be obese as those whose parents have higher achievement (36).

In the Russian Federation, the prevalence of overweight and obesity appears to have decreased between 1992 and 1998 among children in all groups: from 15% to 9% in low-income households, from 15% to 7% in medium-income households and from 17% to 10% in high-income households; the prevalence of obesity is now lowest, however, among children from medium-income households (32,37).

### Ethnicity or country of origin

The prevalence of overweight among people living in the same country often varies greatly by ethnicity or country of origin. For example, Roma populations, mainly in central European countries, suffer particular strains on health, as they are often stigmatized; most have low socioeconomic status and higher rates of obesity than other groups in their country of residence (38–40). Another example is the complexity of the variation in obesity by race in the United States (41).

Some researchers, however, have suggested that ethnic or racial differences in obesity within a country can be explained by socioeconomic differences, not ethnicity. In Germany, for example, the prevalence of obesity among preschool children of Turkish descent was almost three times higher than that of German nationals, but socioeconomic status accounted for much of this difference (42).

### Variation over time

Socioeconomic inequality in health has been reported to increase for various health indicators in several European countries during recent decades. This appears to apply to inequality in obesity (43–45), even though few data are comparable over time. Results from the WHO MONICA (monitoring trends and determinants in cardiovascular disease) longitudinal study, for example, showed a widening gap between social classes in about two thirds of the participating countries between 1979 and 1996 (46). Similar trends might be occurring among children, as suggested by data from England, where the prevalence of overweight and obesity has increased proportionally more during the last decade among children with lower socioeconomic status (34,35).

### Contributing factors

Studies of socioeconomic inequality in obesity often say that socioeconomic status causes obesity, but some researchers have suggested a reverse causality: that obesity can adversely affect socioeconomic status. A third possibility – much less discussed in the literature – is that external factors may influence both socioeconomic status and obesity simultaneously (4,6). Further, all these possibilities may be acting concurrently.

Assuming that the first explanation is the most likely – that socioeconomic status causing obesity accounts for most of the association between the two – the need remains to explore the exact mechanisms. Mediating factors include diet, sedentary lifestyles, physical activity, psychosocial factors and inheritance. Thus, socioeconomic inequality in obesity could be driven by complex relationships between micro- and macroenvironmental influences. For example, whether a particular woman breastfeeds her child is influenced by a combination of factors, including her personal beliefs, access to health care, level of education and cultural environment, and marketing by baby-food companies. People in different social strata are influenced differently, with some likely to be more exposed to an obesogenic environment containing many or all of these elements (47,48).

The following sections discuss in more detail four mechanisms that may bring about the socioeconomic distribution in obesity:

1. diet and nutrition
2. lifestyles and physical activity
3. socioeconomic consequences of obesity and social mobility
4. inheritance.

### Diet and nutrition

Population groups' dietary choices are often related to socioeconomic considerations. Some tend to eat less healthily than others, starting when the future child is a fetus, and with major potential effects on the risk of

obesity in adulthood (19,49,50). A poor diet during pregnancy is a risk factor for low birth weight, which in turn has been associated with abdominal obesity in adulthood (51). In addition, breastfeeding, which is often more frequent among people of higher socioeconomic status in high-income countries (19,49,52,53), has been associated with a reduced risk of obesity in some populations. Conflicting results exist (54,55), however (see Chapter 6). For example, a retrospective cohort study of a population of children with low-income parents showed that breastfeeding (sustained for at least 16 weeks without concurrent formula or for at least 26 weeks with concurrent formula) was associated with a reduction of about 30% in the risk of obesity at 4 years of age (56).

Among children and adults in high-income countries, lower education level and socioeconomic status have been associated with different markers of poor diet potentially associated with obesity, including lower consumption of fresh fruit and vegetables and higher intake of sugar, fat and meat (49,57–60), a higher level of snacking (for example, bakery products, sweets, salty snacks and soft drinks) (61) and irregular meal patterns (62).

Nevertheless, European countries vary. For example, information from cross-sectional dietary or health surveys or household budget surveys has suggested that people with more education tend to consume more fruit and vegetables in northern and western Europe, while the reverse has been reported in some southern European countries, where traditional dietary patterns include high intake of these foods (63,64), at least among older adults. Roos et al. (63) suggest that this could be linked to regional variation in the availability of fresh fruit and vegetables, with southern Europeans with lower socioeconomic status having better access to inexpensive fruit and vegetables or being more likely to grow their own or acquire them through unofficial channels.

### Factors influencing food choices

Major factors influencing food choices include affordability, accessibility, availability, attractiveness, appropriateness and practicality (19,65,66). As concluded in a recent Pan American Health Organization report on obesity and poverty, “the poor do not eat what they want, or what they know they should eat, but what they can afford” (67). The cost of food may thus be one barrier to adopting healthier diets, especially among low-income households. Studies have suggested that energy-dense and nutrient-poor foods – some of which are high in refined grains, added sugar and added fat – provide dietary energy at lower cost than do lean meat, fish, fresh vegetables and fruit (68,69). The relatively low cost of these foods, combined with their high palatability and low satiating power, high convenience and increased prevalence of marginal cost pricing (super-sizing) may have resulted in an increase in energy-dense food consumption between meals and in higher amounts of food consumed at each meal (larger portion sizes) (68,70,71), thus contributing to the obesity epidemic (47). Cross-sectional studies in the United States and western Europe (65,66) have reported that taste is another key determinant of food choices by low-income households and unemployed people.

Research has also found that food is increasingly eaten away from home in many areas of the world and that these meals, especially fast food, tend to have higher energy density and larger portion sizes than food consumed at home and that fast-food outlets are more common in lower-income urban neighbourhoods (71–74) (see Chapter 8).

Another issue contributing to people’s difficulty in making healthy choices, particularly when their resources and education are limited, is the “constant and often contradictory flow of information” giving rise to “both a shortage and a plethora of reference points” (75). Food that dietary recommendations usually classify as “eat-at-least” food – such as energy-dense, micronutrient-poor food and beverages – is generally most heavily marketed in the mass media, especially on television (47) (see Chapter 10). This is true not only in the United States and western European countries (76) but also in central and eastern Europe. A survey of television advertising in Hungary, Poland, Slovakia and Slovenia found that the four most commonly advertised types of food were confectionery, sweetened breakfast cereals, savoury snacks and soft drinks, accounting for more than three quarters of total food advertisements (77).

Such marketing campaigns often target children, presenting mainly snack, convenience and fast food and sweets, and using multiple techniques and channels to foster brand building and influence food purchasing behaviour (78). In addition, both the quantity of advertising on children’s television and the content of the advertising could be related to the prevalence of excess body weight (79) (see Chapter 10).

It is not clear whether the effects of marketing campaigns could influence socioeconomic inequality in obesity. In the United States, where African Americans tend to have lower socioeconomic status and more obesity, a recent

survey of food advertisements appearing on prime-time television compared advertisements during programmes targeting African Americans and those targeting the general market (80). The study found that programmes targeting African Americans showed more food advertisements, and these advertisements were more likely to be for fast food, candy, soda or meat, and less likely to be for cereals, grains and pasta, fruit and vegetables, dessert or alcohol. Of all the food advertisements reviewed in all programmes, 15% made a weight-related nutritional claim; more claims related to fat content were shown during programmes targeting African Americans, while programmes targeting the general market made more claims that products were light and lean.

Another factor that could influence socioeconomic differences in obesity is variation in attitudes towards weight gain and differences in weight-control practices. For example, analyses from the monthly Omnibus Survey of the United Kingdom Office of National Statistics in March 1999 showed that respondents with lower socioeconomic status tended to have lower levels of perceived overweight, monitor their weight less closely, were less likely to be trying to lose weight and less frequently used restrictive dietary practices than those with higher socioeconomic status, after adjusting for sex, age and BMI (81). A survey in Canada found that, at any given level of body weight, women living in highly affluent neighbourhoods were more likely to be dissatisfied with their weight than women from neighbourhoods of average affluence, independently of the woman's individual affluence (82). The authors suggest that this is due to variation in sociocultural standards or social norms for body weight and thinness and to the availability of certain material features, such as the easy availability of fashion magazines depicting thin models, high numbers of weight loss centres or fitness centres and clothing stores that cater to a young, slim female population.

### Evidence from central and eastern European countries

Most of the data presented above concern high-income economies, as most of the research in this area has originated from the United States, western Europe and Australia. Data from central and eastern European countries, however, also reveal unfavourable trends. Recent economic changes in these countries may have reduced the intake of nutrient-dense foods, especially among poor people (83). Further, vulnerable groups in the countries may be at special risk of poor dietary patterns: Roma children in the Czech Republic consume far less fruit, vegetables and milk products and over four times as much high-fat and high-sugar snack foods as their Czech counterparts (84); these children also have higher rates of obesity (85).

### Sedentary lifestyles and physical activity

Differences in physical activity among socioeconomic groups represent an important potential factor explaining socioeconomic inequality in obesity (5,71). First, a sedentary lifestyle and its associated low energy expenditure are a known risk factor for obesity (86–88). Second, surveys in high-income countries have shown that adults and children with lower socioeconomic status tend to be less regularly active and more sedentary than those with higher socioeconomic status (19,87,89,90) (see Chapter 11).

The lesser socioeconomic difference in obesity by occupation among men may be due to high levels of work-related physical activity in lower than in higher social classes (19), but strenuous occupational physical activity among people of lower socioeconomic status is gradually decreasing in most societies, except in some low-income countries, where lower socioeconomic status frequently remains associated with high energy expenditure (4,5). The recent increase in the mechanization of labour has homogenized work-related physical activity among all social groups, even in the poorer population subgroups, in countries that have reached a certain stage of economic development (5). Recent socioeconomic differences in overall physical activity are thus more likely to result from variation in leisure-time physical activity than from variation in work-related activities.

Several potential reasons could explain why people with higher socioeconomic status tend to be more physically active than others. One may be the reported inequitable distribution of facilities (such as school sport facilities, youth organizations and parks), programmes and opportunities for physical activity, with poorer populations having fewer affordable resources (71,91,92). In the United States, many public schools in communities with low socioeconomic status cannot afford to purchase equipment to meet the needs of physical education classes (93).

People with higher socioeconomic status may have both higher incomes to pay for costly activities and more leisure time and hence greater opportunity to use free and paid-for recreational activities; they may also experience more social pressure to exercise (4). Such people may also be more knowledgeable or have more positive

attitudes about the benefits of exercise (19,94). Women of higher socioeconomic status report much higher levels of exercise (89), possibly as a deliberate effort to control weight (95). Conversely, adults in six western European countries who have lower income and are less physically active report fewer community-based opportunities for physical activity in their environment (96).

Finally, socioeconomic differences in physical activity levels include sedentary and related behaviour, which has been reported to be higher in lower socioeconomic groups (19,90). Among these, the use of personal cars (which many people consider a symbol of achievement) as well as the dramatic increase in total screen-watching time (spent in front of the television, computer, video games and other mass-media devices) has contributed to more sedentary lifestyles and concomitant risk of weight gain (68). Although total screen time has not always been directly associated with obesity, some intervention studies have suggested that reducing screen time may be a promising, population-based approach to preventing childhood obesity (97–99).

### Socioeconomic consequences and social mobility

Some evidence indicates that obesity has mental and economic effects. For example, reports indicate that factors such as bias and discrimination (for example, at work and for work opportunities) as well as bullying and teasing (for example, at school) can be both causes and effects of weight gain. Socioeconomic inequality in obesity could arise at least partly because obesity can affect socioeconomic status.

Overweight or obese people experience stigmatization and discrimination in many societies and, evidence suggests, in at least six settings (100): the workplace, schools, health care, housing, marital relationships and the mass media.

In the workplace, hiring prejudice and wage penalties have been reported (101) as well as fewer opportunities for health benefits such as workplace health insurance. Some researchers have proposed that the negative relationship between wages and body weight observed in some studies could be explained by the fact that higher body weight could lead to reduced productivity (due to increased obesity-related health problems) or employers' weight-related discrimination and thus to lower wages (68,102–108). In schools, the early stigmatization of overweight children could explain lower self-esteem, greater shame and perceived teasing compared with their non-obese peers (109,110). Obesity has also been reported to be associated with poorer performance at school (111). In health care, negative attitudes and relatively more severe assessment of an obese patient's mental functioning (compared with people of normal weight) have been reported. Weight discrimination may also exist in housing opportunities and marital relationships (112). Finally, strong stigmatization and damaging stereotypes based on body weight exist in the mass media; in marketing images and television characters, obesity is associated with specific negative characteristics (113).

A few longitudinal studies have examined the socioeconomic consequences of excess body weight in childhood or young adulthood. Sargent & Blanchflower (114) reported that women, but not men, in Great Britain who had been obese at age 16 earned 7% less than their non-obese peers by the age of 23. Gortmaker et al. (115) reported similar findings: women, but not men, in the United States who had been overweight in later adolescence had lower incomes seven years later. In addition, women and men who had been obese in later adolescence were less likely to be married seven years later than their non-obese counterparts. Gortmaker et al. explained their findings as the result of the intense stigmatization of obesity. A more recent investigation, using data from the participants of a 1970 birth cohort in Great Britain followed up at ages 10 and 30 years, found that women with obesity persisting from childhood to adulthood were half as likely to be gainfully employed and to have a partner than women who were not obese (116). Among men, however, obesity was not associated with any adverse social outcomes. This study also found that obesity that was limited to childhood had little impact on adult outcomes for either gender.

Another factor that has been shown to modulate the association of socioeconomic status and adult obesity is social mobility: the upward or downward change in social status from one generation to the next (4,28). Longitudinal studies have shown that people, especially women, who experienced upward social mobility had lower levels of adult obesity than those who remained in the same social class as their parents or father, or those whose socioeconomic status declined. This suggests that the long-term influence of childhood socioeconomic status on obesity may be partly reversible. Potential pathways for this phenomenon include marriage and occupation, two situations in which weight-related discrimination is known to occur.

## Inheritance

A fourth factor that could mediate the relationship between socioeconomic status and obesity is inheritance. Previous studies have shown that obesity is a heritable trait, at least in part (117,118), and a genetic component appears to underlie socioeconomic differences as measured by educational attainment (119–121). Some of the genetic factors predisposing to higher BMI may also account for genetic variation in educational attainment. Although understanding these genetic influences is important, their discussion is beyond the scope of this chapter.

## Evidence-based interventions and policy initiatives

This section presents a very brief overview of existing evidence on interventions and policies to reduce socioeconomic inequality in obesity. This is not an exhaustive list, however. Chapters 13–15 review general interventions for preventing and treating obesity.

This section also briefly reviews some of the most relevant existing policy initiatives that, although not always primarily focusing on obesity, address some of the drivers of socioeconomic inequality. Further policy development should build on these efforts and frameworks, rather than add yet another separate institutional process.

## Interventions

Few studies have examined the effectiveness of interventions and policies specifically tackling socioeconomic inequality in obesity. Existing interventions are often carried out on a small scale and are poorly or not evaluated; thus, assessing their effectiveness and transferability is difficult. Documenting some examples despite their shortcomings, however, both highlights the fact that socioeconomic inequality in obesity is a complex subject requiring the involvement of diverse sectors and stakeholders and acknowledges through examples that more research is needed to improve overall methods for study design and evaluation.

## Diet-related interventions

A recent publication on reducing inequality in health (122) reviewed policies and interventions to reduce nutritional inequality. Of the 32 interventions reviewed, 5 – 4 from the United States (123–126) and 1 from the Netherlands (127) – directly addressed preventing weight gain among low-income, low-literacy adults. All reported poor or no positive results except one, which showed improvement in nutrition knowledge and attitudes, as well as a reduced percentage of energy from total and saturated fat (124). A six-year school-based intervention on healthy diet and physical activity in children, mostly from deprived families, positively affected their indices of obesity and physical activity, in part due to the high degree of parental participation (128).

Several interventions to improve access (financial, physical or both) to healthy foods exist. In the CHIPS (Changing Individuals' Purchase of Snacks) intervention study on pricing of healthy foods in Minnesota schools and workplaces, purchases of healthy foods almost doubled when their price was halved; when the price advantages were removed, however, the preference for healthier foods disappeared (99,129–131). In Denmark, the 6-a-Day coalition pilot-tested a scheme offering free fruit in the workplace. The results showed a significant increase of fruit intake (70 g per day) for employees at intervention workplaces (132). As a consequence, the number of workplaces in Denmark funding free fruit increased from 623 in 2001 to 4986 in 2003 (133). Such initiatives are important because they help to reduce the proportion of income people must spend on healthy and relatively expensive foods. One component of the Eat Well and Keep Moving intervention in Baltimore, Maryland schools was to link parents with local organizations in the community that offered low-cost nutrition and physical activity programmes (134).

## Physical-activity-related interventions

Several interventions to increase physical activity have been reviewed and are presented in Chapter 15. Many are appropriate for addressing socioeconomic inequality in physical activity. For example, one broad area is the concept of active travel, walking and cycling at the expense of motorized transport. Ogilvie et al. (135) systematically reviewed population-level interventions to promote active travel; 4 of 21 studies summarized effectively promoted a shift from cars towards walking or cycling. Another broad area is focusing on urban design and the built environment to promote areas conducive to physical activity. Reviews on the subject have found positive

associations between physical activity and key factors including perceptions of accessibility, actual accessibility, neighbourhood walkability and aesthetics (136) (see also Chapter 11).

In the United States, the Government-administered Special Supplemental Nutrition Program for Women, Infants and Children (WIC) provides nutrition information, supplemental foods, and health referrals to almost 8 million low-income pregnant women, infants and children (up to the age of 5) (137). WIC launched childhood obesity prevention projects in 1999 that targeted WIC staff, families and the community at large: for example, partnering with local restaurants to encourage higher fruit and vegetable consumption. They found that children's playtime increased and sedentary time decreased and that this behaviour continued beyond the follow-up period (137). Another WIC intervention reduced television viewing among participating families and staff: the proportion of participants who limited their viewing to a maximum of two hours per day increased from 64% to 70% following the intervention (138).

### Existing policy frameworks and initiatives

Although few European health policies have focused on tackling socioeconomic inequality in obesity, several overarching political commitments concentrating on the risk factors for this inequality have been made in the European Region. These include the First Action Plan on Food and Nutrition Policy for the WHO European Region (139) and the national action plans that have been or are being developed and implemented in many Member States. The European Charter on Counteracting Obesity (140) includes inequality in health as a priority, and the second European action plan on food and nutrition policy for 2007–2012 is expected to reflect this priority (141).

At the global level, WHO and FAO jointly launched an initiative in November 2003 to promote the consumption of fruit and vegetables (142) that fits within the framework of the WHO Global Strategy on Diet, Physical Activity and Health (143, 144) (endorsed in May 2004 and discussed in Chapter 21) and the implementation mandate of the WHO global strategy for the prevention and control of noncommunicable diseases.

Other recent policy initiatives and public health actions have confirmed the increased commitment to nutrition, physical activity and the urban environment (including transport) in Europe. This includes the European Commission's recent white paper on nutrition, overweight and obesity (145).

Finally, some overarching political commitments and initiatives aim at reducing inequality in health in Europe. For example, HEALTH21 (146), a Health for All policy framework for the WHO European Region, stated that: "by the year 2020, the health gap between socioeconomic groups within countries should be reduced by at least one quarter in all Member States, by substantially improving the health of disadvantaged groups". Important initiatives include the WHO Commission on Social Determinants of Health, the Tackling Health Inequalities Summit on 17–18 October 2005 within the EU Presidency of the United Kingdom, several other projects led by the European Commission, the WHO Task Force on Research Priorities for Equity in Health and the WHO Equity Team (147), and many other policies summarized by Mackenbach & Bakker (122) and Crombie et al. (45).

### Policy implications and research needs

This section discusses the policy implications of addressing socioeconomic inequality in obesity in Europe, and presents some potential strategies for reducing this inequality, a decision-making framework to tackle this and some areas in which more research is needed.

#### Policy implications

Although people are theoretically able to make personal choices over diet, physical activity and other health promoting action, in practice all actions happen in context (41). Individuals, particularly those in disadvantaged situations, face structural, social, organizational, financial and other constraints in making healthy choices (19, 148), so they may not act in ways that promote their health, even if they are told that they should (148). The responsibility for changing unhealthy lifestyle behaviour related to obesity cannot therefore rest only on the shoulders of individuals.

A population-oriented approach (41, 149) is required that strikes a "better balance between individual and population-wide approaches and between education-based and multisectoral and environmental interventions" (150). Another point in favour of population-based approaches is the fact that people of low socioeconomic status are more likely to suffer from the dual burden of poor nutrition and obesity; this is true particularly in

low- and medium-income countries but also in some high-income countries, including the United Kingdom (33,151,152).

Dowler (19) emphasizes that the key considerations need to be accessibility, affordability and practicality, as well as relevance and motivation. How can participation in and ownership of health promoting activities and practices be enabled when people suffering from inequality focus on the basic issues of survival, whether these be financial (including purchasing food at all, let alone healthy sources) or social (including battling the stigma of poverty and/or overweight and all that is related to it).

Swinburn and colleagues (153,154) have been at the forefront of the work on formulating policy frameworks to prevent and reduce obesity by addressing obesogenic environments: “the sum of influences that the surrounding opportunities or conditions of life have on promoting obesity in individuals or populations.” They suggest that one of the key strengths of focusing on environmental change is its potential impact on disadvantaged groups (154). Specifically, they suggest an environmental or systems-based approach (as opposed to focusing on individual behaviour change) that:

1. addresses the underlying causes and increases the potential for true prevention;
2. becomes structural: for example, embedding local government transport policies into the changes in the infrastructure;
3. helps make healthy choices the standard choices;
4. is most likely to be sustained, especially if action is backed by strong policies;
5. addresses the needs of disadvantaged people who can directly benefit from such initiatives as less-expensive produce, lower-fat fast food and free green spaces and cycling paths;
6. is less language dependent, and thus includes a much wider population than just information and health messages, which are not always understood by or aimed at minority groups, new immigrants and low-literacy groups;
7. addresses inequity by, for example, differentially targeting groups through appropriate programmes;
8. is usually cost-effective (even the expensive strategies, such as improving public and active transport, are cost-effective in the long term);
9. changes default behaviour (for example, food choices change if price, labelling and availability change); and
10. minimizes message distortions, such as reducing the chance of misconstruing the use of foods that are promoted as bringing about weight loss.

### Research needs and future directions

Although many studies have tried to clarify the nature of socioeconomic inequality in obesity in Europe, more information on the distribution and determinants of this inequality is needed in many parts of the Region, including eastern countries.

1. Future studies should be designed to help identify groups that are particularly vulnerable to socioeconomic inequality in obesity in each country and the specific circumstances promoting this inequality.
2. Future studies should aim at developing and using standardized methods of assessing socioeconomic status and excess body weight, to facilitate comparisons between countries. Newly developed data collection instruments should pay attention to gender and cultural specificity, such as the country-specific economic context, financial situation within the household, indicators of social position and cultural constraints specific to women.
3. Repeated surveys would help to show whether the relationship between socioeconomic status and obesity changes over time; this is particularly relevant for low- and medium-income countries undergoing economic transition. Longitudinal studies would provide further information on socioeconomic differences in obesity from a life-course perspective and on whether these change between countries. They would help identify mechanisms responsible for developing socioeconomic inequality in obesity. Both quantitative and qualitative research is needed to understand the complexities of the association between socioeconomic status and obesity.
4. More research is also needed to gain knowledge of the determinants of obesity that are associated with socioeconomic conditions – including dietary intake and physical activity – in the general population and in

highly vulnerable groups. This should include studies of the pathways through which socioeconomic status directly or indirectly affects the development of obesity, including the interactions between various types of health behaviour, including smoking.

5. Research should be undertaken on the particular circumstances – dietary patterns, risk of excess weight gain and other issues – and risk of obesity-related health outcomes of minority groups in Europe for whom few data are available, such as ethnic minorities and migrants.
6. Surveillance systems should be developed. They should include the monitoring of socioeconomic variation in dietary intake, physical activity patterns and diet-related community weight-control practices.
7. Nutrition surveillance systems need to be structured so that conditions and outcomes among households at risk of poverty and inequality can be measured and monitored (19).
8. Interventions and policies aiming at reducing socioeconomic differences in obesity should also be designed and implemented. Processes of consultation, needs assessment, health impact assessment, qualitative research, and project planning, delivery and evaluation are needed to develop effective projects and ensure that they are relevant to their intended audiences; the targeted communities and groups should actively participate in these processes. Planned interventions should target not only individuals but also the environment, and should achieve their intended effects without imposing undue burdens on individuals or society.
9. Interventions should be evaluated for their effectiveness, cost-effectiveness and long-term impact on health-related outcomes. The intervention components that are more effective with various population subgroups should also be assessed.
10. In cooperation with other United Nations agencies, NGOs, the private sector, other key stakeholders and decision-makers and countries that have already gathered best practice guidelines in this area, WHO should provide leadership, evidence-based recommendations and advocacy for intersectoral action to reduce socioeconomic inequality in obesity.
11. Finally, the tobacco control campaigns could be used as an example of how a combination of policies, norms, incentives, banning smoking in public areas and an intensive communication campaign can bring about behavioural change.

## Conclusions

Obesity is dramatically yet unequally affecting the population of the European Region. Major socioeconomic inequality in obesity has been reported in many countries of the Region, but very little has been done to tackle this specifically. Evidence from countries experiencing economic and nutrition transition suggests a pressing need to control the epidemic as economic growth – a highly desirable and necessary goal for any country in transition – might greatly increase obesity prevalence and fuel more inequity in health.

Second, although a precautionary approach should be promoted in light of the limited evidence on interventions, objective, reliable data are key for developing effective and appropriate policies.

Third, each country should develop its own needs-driven portfolio of appropriate and realistic interventions, and involve many stakeholders from all relevant sectors in a transparent and explicit process. Energy should be focused on environmental change, in contrast to individual change, since, as clearly demonstrated by many experts, one key strength of focusing on environmental change is its potential impact on disadvantaged groups. All policies should be analysed for their differential effects on groups with low socioeconomic status.

Finally, much can be gained from examining other public health areas for guidance. For example, the WHO Framework Convention on Tobacco Control (155) highlights the importance of generating a global will to tackle the problem, without which national actions in many areas would be undermined. Further, lessons learned from tobacco show that a global movement – linking international and domestic action, involving national coalitions, NGOs and the mass media, and mobilizing the public – can create sustained pressure for action (5,156,157). WHO, the EU and other intergovernmental organizations have a key technical and advocacy role in bringing about change. Table 12.2 lists a set of potential actions that might prevent and/or reduce obesity, particularly in vulnerable populations.

Table 12.2. Potential interventions to prevent and reduce obesity and the risk of weight gain among vulnerable population groups in the WHO European Region

Settings, sectors and actors	Potential interventions		
	Food and nutrition	Physical activity and sedentary lifestyles	Economic and psychosocial factors
WHO, EU and other intergovernmental organizations	<p>Provide advice and support to countries of the European Region in developing, framing, strengthening, updating and implementing tailored nutrition policies and actions promoting healthy eating, based on multisectoral approaches</p> <p>With governments, examine the role of globalization and agrobusiness in food availability and consumption and the effect of food and beverage taxes</p> <p>Promote the importance of evidence-based, independent research on the role of diet in reducing socioeconomic inequality in obesity</p>	<p>Provide advice and support to countries of the European Region in developing, framing, strengthening, updating and implementing tailored policies and actions promoting an active lifestyle, based on multisectoral approaches</p> <p>With governments, examine the role of globalization on transport and urban planning</p> <p>Promote the importance of evidence-based, independent research on the role of physical activity and sedentary lifestyles in reducing socioeconomic inequality in obesity</p>	<p>Provide advice and support to countries of the European Region in developing, framing, strengthening, updating and implementing policies and action to reduce inequality such as reducing deprivation and discrimination</p> <p>Promote the importance of evidence-based, independent research on the role of economic and psychosocial factors in reducing socioeconomic inequality in obesity</p>
National and local government (intersectoral action from food and nutrition, education, health and welfare)	<p>Increase low-income populations' ability to buy food rich in micronutrients but low in fat and sugar: for example, providing price support for healthy food</p> <p>Develop partnerships with industry to promote the increased production and market supply of healthy foods: for example, by providing economic incentives for supplying healthy foods and disincentives for supplying unhealthy foods and reforming the EU Common Agricultural Policy</p> <p>Improve the nutritional quality of the general food supply by, for example, developing, producing, distributing and promoting food products low in fat and energy</p> <p>Create incentives for better integrated local food production</p> <p>Promote healthy national and local/regional food traditions, such as those of ethnic minorities</p> <p>Promote exclusive breastfeeding for 6 months through baby-friendly hospital initiatives</p> <p>Consider free school milk (low-fat milk) and free fruit schemes by local authorities</p> <p>Regulate advertising and promotion of energy-dense foods to children and adults, for example, on prime-time television</p> <p>Regulate the nutritional labelling of foods</p> <p>Regulate unsubstantiated nutrition claims, such as those by producers of "slimming foods" and commercial slimming groups</p>	<p>Create an active travel fund (for local authorities, voluntary organizations and community groups) to deliver a range of local traffic-reducing schemes such as cycling projects, walking projects, safe routes to school and green transport plans (158)</p> <p>Make neighbourhoods more cycling and walking friendly: liaise with urban planners and the transport sector to build cycling paths in urban areas, rejuvenate inner-city areas and create more safe and attractive green spaces, safer playing areas and safer streets</p> <p>Create clearly linked pedestrian networks for important routes, such as those to school, libraries, sports facilities, shops and hospitals</p> <p>Increase the number of low-cost sports facilities</p> <p>Subsidize after-school sport</p> <p>Stimulate informed action (such as information campaigns in schools) on the role of sedentary activities such as computer game-playing and television watching on physical activity levels</p> <p>Regulate unsubstantiated claims for certain types of physical activities, such as those of some sports clubs and commercial slimming groups</p> <p>Develop or update national physical activity guidelines in accordance with international recommendations for preventing obesity</p>	<p>Promote integrated action to improve social conditions emphasizing economic regeneration of the community; this means gaining local ownership and focusing on strong citizen groups, integrated programmes, priority to employment and alleviating poverty, a sense of partnership, long-term commitment and adequate and protected resources (159)</p> <p>Promote the development of local action to reduce inequality in health in the most deprived areas: multiagency partnerships between the national health system, local authorities, voluntary and business sectors and local communities to address key health priorities, such as obesity, as well as housing, education and employment (159)</p> <p>Liaise with local authorities, NGOs and community leaders on income-generating programmes, such as microfinancing schemes (for example, the Grameen Bank)</p> <p>Liaise with the education ministry to develop anti-bullying policies in schools</p> <p>Liaise with the health and education ministries and all institutions training health professionals to integrate avoiding stigmatization of overweight people into the curriculum</p>

Table 12.2. (contd)

Settings, sectors and actors	Potential interventions		Economic and psychosocial factors
	Food and nutrition	Physical activity and sedentary lifestyles	
	<p>Stimulate informed action on the role of marketing and advertising on the food preferences of the population, especially children</p> <p>Stimulate informed action (such as information campaigns in schools) on the role of sedentary activities, such as playing computer games and watching television, on dietary intake</p> <p>Develop or update national dietary guidelines in accordance with international recommendations for preventing obesity</p> <p>Support action on diet, physical activity and obesity, including programmes such as WIC in the United States</p>		<p>Ensure a welfare safety net to provide a minimum family income by setting minimum wages, pensions and unemployment benefits, particularly for vulnerable groups: low income and unemployed people, refugees, immigrants, migrants and large or one-parent families</p>
Food supply (manufacture, marketing, distribution, retailing and catering)	<p>Help consumers to make food purchase choices, for example, by introducing new and improved nutrition labelling schemes (covering fat, energy and salt) that do not mislead consumers</p> <p>Work with retailers to lay out supermarkets in a more child-friendly way, for example, by removing candy bars (at child height) at tills</p> <p>Increase the visibility and appeal of healthy foods in supermarkets</p>	<p>Help consumers to make choices about high-energy foods and drinks promoted as appropriate for sport, such as sport drinks and protein bars</p>	<p>Encourage more farmers' markets and grocery stores to establish themselves in low-income areas and provide sources of healthy food within walking distance</p> <p>Promote healthy foods accepted and regularly consumed by specific ethnic groups</p>
Mass media	<p>Attract celebrity role models to promote healthy eating</p> <p>Encourage local community mass-media campaigns to, for example, promote consumption of fruit and vegetables or low-fat milk</p>	<p>Ban food and drink advertising at and sponsorship of sporting events</p> <p>Attract celebrity role models to promote physical activity</p>	<p>Reduce the stigmatization of overweight and the idealization of leanness in advertisements and television programmes</p> <p>Promote a healthy lifestyle culture, for example, by incorporating positive behaviour change messages into television programmes and popular magazines</p>
NGOs	<p>Support action on providing dietary assistance and nutrition education to the most vulnerable population groups, including migrants, refugees and transient groups</p> <p>Support local economies, for example, through local agriculture initiatives</p> <p>Support food banks and other free food-supply services as interim solutions</p> <p>Develop programmes teaching low-income households how to prepare healthy meals on a low budget</p>	<p>Increase access to opportunities for exercise for low-income and other disadvantaged groups, including migrants, refugees and transient groups</p> <p>Support action to provide education on the benefits of physical activity</p> <p>Develop programmes for low-income households on how and where to access low-cost physical activity opportunities in the community</p>	<p>Support action to break down the social barriers (such as stigma) related to obesity and vulnerable groups, including migrants, refugees and transient groups</p> <p>Support social cohesion and sense of worth and well-being, for example, through local agriculture initiatives and community physical activity, including walking groups</p> <p>Develop partnerships with professionals with access to hard-to-reach groups, including developing joint projects with social services staff responsible for socially isolated older people and children living on the street</p>

<p>Health care services</p>	<p>Incorporate into medical and nursing school curricula training in dietary counselling for obesity-specific issues</p> <p>Develop criteria to assess excess weight in health care services</p> <p>Screen obese patients' children to allow for preventive action or early therapeutic intervention</p> <p>Develop systems to allow patients to identify their own risk of unhealthy eating and related risk of obesity</p> <p>Consider developing new health personnel trained to screen for unhealthy eating through simple questionnaires and identify those needing referral to general practitioners or nutritionists</p> <p>Encourage health care services to adopt baby-friendly measures, such as encouraging breastfeeding and the appropriate introduction of solid foods</p> <p>Encourage the development of patient support groups and group activities, such as nutrition education at local health care services</p>	<p>Incorporate into medical and nursing school curricula training in physical activity counselling for obesity-specific issues</p> <p>Develop criteria to assess excess weight in health care services</p> <p>Screen obese patients' children to allow for preventive action or early therapeutic intervention</p> <p>Develop systems to allow patients to identify their own risk of sedentary lifestyle and related risk of obesity</p> <p>Consider developing new health personnel trained to screen for low physical activity levels through simple questionnaires and identify those needing referral</p> <p>Encourage the development of patient support groups and group activities, such as education on the benefits of physical activity and exercise groups</p>	<p>Sensitize health professionals to the stigma and discrimination related to obesity and increase their awareness of socioeconomic inequality in obesity</p> <p>Encourage partnerships between health services, social services and local authorities to catalyse increased active community networks to support disadvantaged groups and liaise with existing physical activity and diet initiatives</p>
<p>Education sites (kindergarten, school, further education and community centres)</p>	<p>Integrate nutrition education programmes in the curriculum and link them to the broader school community, including involvement of parents, teachers and food service staff</p> <p>Promote healthy eating through school-based programmes</p> <p>Include in school nutrition policies raising the prices of popular high-fat energy-dense foods to generate revenue to subsidize price reduction on healthier foods</p> <p>Address through school-based food projects food access and food-related skills, for example, through school gardens</p> <p>Improve the nutritional quality of the food served in school cafeterias</p> <p>Remove vending machines</p> <p>Regularly assess the diet of children to identify those at risk of unhealthy eating and obesity</p>	<p>Include in school-based programmes daily physical activity of sufficient duration, frequency and intensity (at least 20 minutes per day) to increase physical fitness</p> <p>Increase opportunities for active transport to school</p> <p>Increase the number of in-school sports facilities</p> <p>Encourage after-school sports</p> <p>Regularly assess students' physical activity level to identify those with low activity and high risk of obesity</p>	<p>Support social cohesion and social capital through community projects</p> <p>Increase the uptake of free school meals by investing in cashless payment systems that remove any stigma attached to the meals</p> <p>Have clear policies on bullying related to body size and shape and be sensitive to this among overweight children</p> <p>Consider alternative ways to promote social cohesion and self-esteem in children, as has been done in The former Yugoslav Republic of Macedonia (160)</p>

Table 12.2. (contd)

Settings, sectors and actors	Potential interventions		
	Food and nutrition	Physical activity and sedentary lifestyles	Economic and psychosocial factors
Workplaces	<p>Encourage the inclusion of healthy food choices in workplace health policies</p> <p>Encourage healthy choices at work and discourage employee reliance on processed foods for lunch by providing appealing and inexpensive food, for example, by subsidizing healthy options in staff restaurants</p> <p>Improve the nutritional quality of the food served in workplace cafeterias</p>	<p>Encourage the inclusion of physical activity options in workplace health policies</p> <p>Increase opportunities for active transport to work, for example, by adding bicycle racks</p> <p>Empower employees to integrate physical activity into the working day, for example, by providing exercise facilities and changing rooms and flexible work schedules (159,161), which can remove the financial and time pressure related to exercise</p>	<p>Include a system in workplaces to deal with harassment and stigmatization related to obesity</p> <p>Put in place measures to reduce hiring discrimination against overweight people</p>
Communities, neighbourhoods, homes and families	<p>Increase low-income groups' access to healthy foods, for example, by setting up neighbourhood garden programmes and food cooperatives</p> <p>Increase access to and consumption of fruit and vegetables (and encourage physical activity) through home gardening projects</p> <p>Promote proactive outreach work, including setting up self-help groups and subsidized nutrition opportunities (such as nutrition education and cooking classes) in venues including religious centres or community centres in deprived areas</p>	<p>Create advocacy groups to promote cyclist- and pedestrian-friendly city centres</p> <p>Promote proactive outreach work, including setting up subsidized physical activity opportunities in community venues such as religious centres or community centres in deprived areas and self-help groups, such as walking or exercise groups</p> <p>Develop councils and groups that take the initiative (such as raising funds) in promoting physical activity</p>	<p>Encourage community leaders to create councils and groups that take the initiative (such as raising funds) to provide guidance and leadership on preventing obesity in their communities</p> <p>Develop peer leadership programmes for healthy lifestyles that can help create a sense of ownership and belonging in local health promoting projects</p>

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## 13. Actions and policies to prevent obesity

### Main messages

- Public health strategies to prevent obesity should attempt to capture the individual, community and policy levels by working through target groups (such as children, adolescents, pregnant women and people on low incomes), settings (such as the home, school and workplace, and the commercial and health sectors) and approaches (such as education, community development, the use of the mass media and environmental, policy and infrastructure change).
- Different types of evidence are needed to develop effective strategies for interventions that tackle the upstream determinants of health behaviour.
- Interventions in such settings as schools and preschool groups need to be integrated across food service, food and health education, physical education, play and sport, and should involve participants in formulating policy.
- Micro-scale interventions are likely to have only small effects, unless supported by macro-scale interventions: for example, in food labelling, pricing and availability.
- An investment approach that acknowledges risk (uncertainty of outcome) and allows for different levels of return (effects of intervention) provides a useful model for policy-making.

In the European Region, obesity and overweight affect 10–40% of the population, and virtually all people have the potential to become overweight or obese. Once established, obesity is difficult to reverse, and treating its comorbidities is expensive. The optimum strategy is prevention. This chapter considers opportunities for different target groups to prevent obesity in different settings.

On the basis of reviews of the evidence cited in Annex 1, which contains summaries of over 100 systematic reviews prepared as background for this chapter, screening populations to identify people at high risk of developing obesity can be counterproductive if effective interventions are not available. This chapter, however, does not look at screening strategies in depth.

The evidence base for identifying effective ways of improving dietary and physical activity patterns is growing rapidly. This chapter summarizes recent literature reviews and expert consultations. The evidence base for interventions at individual, local and community levels (micro-interventions) is more developed than that for population-wide interventions (macro-interventions), such as regulations on food pricing or food promotion. Chapters 14 and 15 review macro-level interventions that employ economic instruments and those that promote physical activity, respectively.

A 2000 report (1) confirmed earlier recommendations; the most effective initiatives:

- are population wide and take an integrated, multidisciplinary, comprehensive and sustainable approach; and
- involve a complementary range of actions that address the individual, community, environment and society.

Providing information alone is ineffective; actions that facilitate and encourage change are needed. To address the needs of the poorest sections of the population, effective interventions need to tackle the broader determinants of health, including social exclusion, social cohesion, and environmental and demographic factors.

This chapter summarizes recent systematic reviews of evidence, providing further details in Annex 1. Also, some evidence on the cost–effectiveness of interventions will be noted. Where evidence is unavailable, expert opinion is essential, and this is reflected in the three consultations organized by WHO in the last decade.

Finally, this chapter considers the evidence base and the steps needed to develop effective public health action to tackle obesity. Interventions at the population level are not amenable to controlled trials, and the evidence base needs to be adapted to assist policy-makers in deciding on the best strategies and the best returns for a given

investment in health promotion. Strategy development is a complex process that requires political support and depends in turn on stakeholders' participation and ownership of the process.

### Interventions: who, where, how

Everyone has a part to play in improving dietary and physical activity patterns in the WHO European Region: health care professionals, schools, employers, farmers, food manufacturers, retailers, caterers, the mass media, local and national governments, the EU and, of course, consumers. A familiar framework for developing public health strategies attempts to capture the individual, community, environmental and policy levels, by working through:

- target groups, such as children, adolescents, pregnant women, minority or ethnic groups or people with low incomes;
- settings, such as workplaces, schools, the commercial sector or the health sector; and
- approaches, such as school education, community development or the use of the mass media, environmental change or policy and infrastructure change.

### Target groups

Following the model given in the WHO Global Strategy on Diet, Physical Activity and Health (2), the target groups can be specified through reference to the life-course: this starts with maternal health and prenatal nutrition and proceeds through pregnancy outcomes, infant nutrition, preschool and school-age children, adolescents, adults and elderly people. Cutting across this sequence are gender and socioeconomic groupings, race and ethnicity, migrant status and income level; these influence the nature of the approaches used and their settings.

The use of the life-course analysis for identifying target groups, however, is limited by the view that interventions should act directly on the group whose health is in question: for example, by encouraging people to improve their diets and increase their physical activity. This interpretation may be too narrow a target for tackling obesity, for it does not consider how to tackle the determinants of individual behaviour: the environmental, economic and cultural influences that need to be changed so that healthy behaviour is easier to adopt. In this respect, the definition of target groups should be widened to include the upstream providers of the determinants of health, such as the providers of health information: the health services, schools, mass media and commercial food producers. It should be widened still further to include decision-makers who shape access to healthy lifestyles through, for example, pricing, distribution and marketing. In this sense, target groups may include shareholders in companies, professional groups, policy-makers and public opinion leaders, including politicians and celebrities.

Jamie Oliver, a celebrity chef, provided an example of the need to widen the definition of target groups for health interventions. His television series exposed the poor quality of food in schools in England and led to a government pledge of money and a programme of raised school-food standards. Although the ultimate beneficiaries are schoolchildren, Oliver's intervention targeted government policy-makers through public opinion.

Two things are worth noting.

1. In another part of the United Kingdom, Scotland, a programme of investment and raised standards had already been instituted two years earlier, without such an intervention.
2. Jamie Oliver did not run a randomized controlled trial or undertake any systematic evaluation, but assumed that health benefits would follow the change in diet.

### Settings

Interventions in health promotion have three classical settings:

- health care services: professionals in family services and specialist clinics, and outreach health workers;
- schools and social care facilities for both educational and practical interventions; and
- the workplace, also for educational and practical interventions.

Added to this are community settings that shape health behaviour, such as those provided by businesses such as shops and restaurants and by planners and designers of roads, parks and buildings, for example.

Health care professionals are in a key position to influence both their patients and the broader community. Mother-and-baby clinics, health promotion programmes and outreach through community health workers – including school and workplace nurses and family health visitors – provide opportunities to monitor the practices of families and individuals and to provide advice and information. Health workers may participate in community activities and demonstrate good practices and surveillance activities: for example, in cookery clubs, workplace activity clubs and school monitoring programmes.

Schools and social care facilities, such as nurseries, kindergartens and centres for the elderly, provide a valuable opportunity to influence people's dietary habits in a collective setting. Although most trials of obesity prevention initiatives have been undertaken in schools, nursery and preschool settings give valuable opportunities to intervene early in a child's development, and have the potential to influence both children and their families, by setting an example of good practice.

The workplace has considerable potential to improve the health of the adult population, because people spend much of their time at work and often eat there. It also can enable breastfeeding women to return to work, if they wish.

Community settings include a range of opportunities to influence individuals and groups at the local level: for example, in the supermarket and women's, residents' and religious groups. Broader community interventions may be undertaken by using television or radio.

Interventions through the commercial sector have not been well researched, at least in academic publications. Better information about the effects of interventions on behaviour and product choices may be available within larger companies, however, and manufacturers and retailers, both large and small, could support health promotion strategies through changes in production, pricing, marketing and labelling of foods. The catering sector also has an important role to play, with the growing tendency of people to eat their meals outside of the home.

The health promoting potential of interventions in the built environment has also been poorly researched. Providing bicycle routes, walkways, and sports and leisure facilities may be beneficial in reducing the prevalence of obesity or cardiovascular diseases in local populations, but there is a need for evidence to show this.

In its broadest sense, a health promotion setting is any place where it is possible to influence policies and practices towards improved health. In this sense, a setting could be a parliamentary hearing, a corporate shareholder meeting or a transport authority board meeting.

Although parliament may not seem a natural setting for health interventions, in the broadest sense it is exactly that. For example, to reduce the quantity of dairy fats marketed and consumed and to increase the amounts of fruit and vegetables available, the Government of Finland proposed a new agricultural support mechanism that would assist farmers in converting from dairy to horticultural production. The parliamentary debate was an opportunity for health promotion through an investment that was not entirely welcome: commercial interests in the dairy farming sector had resisted moves to reduce butter consumption and the cost of providing farm assistance for horticulture was not politically popular among some parliamentarians. The arguments for health eventually prevailed, and the proposed policies were enacted and have come to be recognized as part of a set of integrated measures that are key to the reduction of cardiovascular diseases in Finland.

## Approaches

Approaches to interventions are the methods (or channels) used to bring about change in target groups or settings. Examples include the mass media, written materials, skills training, counselling, partnerships, local projects, community development and advocacy. Several of these approaches focus directly on the intended beneficiaries: for example, educational materials, health messages through the mass media, community development and local projects are all aimed at the health of the target audiences. Also, skills training may involve training health professionals and others to develop their ability to undertake health promotion work or to become advocates. Such advocacy works indirectly, by attempting to influence the decisions made by upstream policy-makers and programme managers.

Community development relates to projects directed at a given community or originating in a group within a community. Although the variety of projects is almost infinite, they can be grouped into three main categories.

1. Projects that have a very specific health focus are often part of a larger health-related initiative.
2. Projects that attempt to address the needs of low-income groups are probably the largest group. They sometimes identify themselves as projects concerned with poverty, or with sustainable communities, but in a broader sense they are able to secure health improvements for the specified population.
3. Projects that arise from food-related environmental concerns, including the way food is grown, distributed and sold, comprise an expanding group. It includes projects concerned with sustainable environment, but their health objectives include the development of thriving local communities and stronger local economies.

Advocacy means acting as an agent for or pleading on behalf of someone or some group, usually through some form of representative or special-interest organization. Advocates for public health may present their case to the mass media, politicians, trade unions and other key organizations and individuals, with the intention of raising an issue on the political and media agenda, to bring about political, social and structural changes.

Advocacy directed at politicians on behalf of commercial interests (often called lobbying) is sophisticated and backed by substantial funding and human resources. Advocates for public health may have significantly fewer resources and may be backed by professionals (such as health professionals), patient organizations or other consumer groups. Advocacy organizations that act on behalf of public interests, such as consumer and environmental groups, usually receive greater trust than commercially supported advocacy organizations or political parties (3).

Protecting traditional, nourishing food sources against competition from less nourishing, commercially produced foods can benefit health significantly, but is likely to be undermined by a lack of market regulation that protects small producers and by economic policies that encourage modernization and a cash-based economy. In this context, advocacy can be one of the few defences of traditional products. An example of this is the protection of breastfeeding undertaken by voluntary groups involving professionals, parents and other concerned people. Their lobbying of governments led to the WHO/UNICEF Code of Marketing of Breast-milk Substitutes and the development of some 20 000 baby-friendly hospitals in 150 countries, which have saved countless lives.

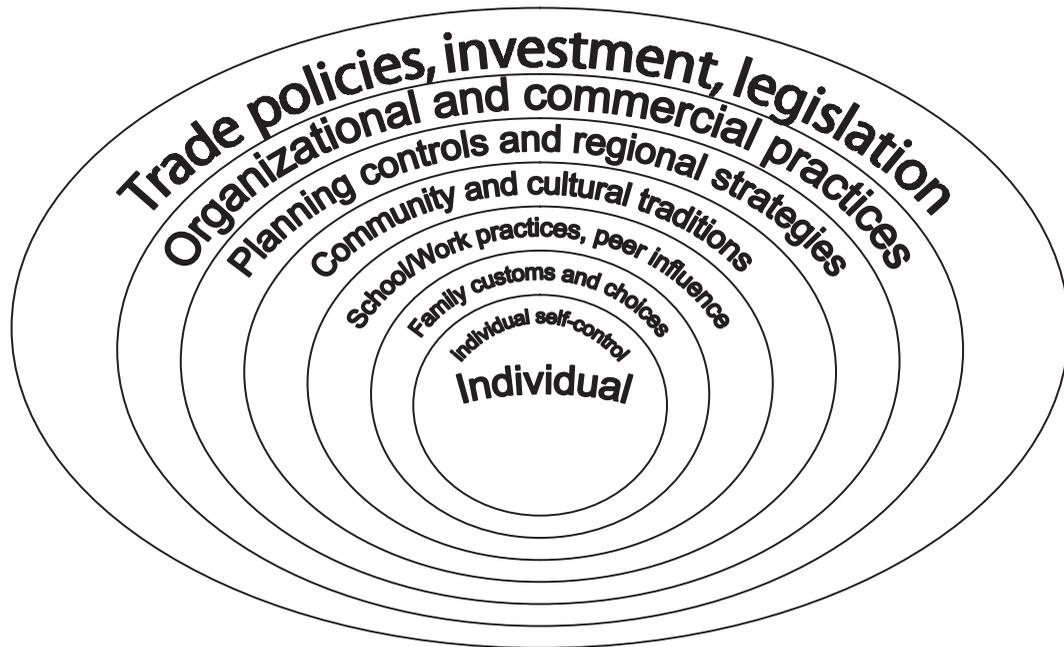
## Levels

The Surgeon General of the United States argues (4):

Many people believe that dealing with overweight and obesity is a personal responsibility. To some degree they are right, but it is also a community responsibility. When there are no safe, accessible places for children to play or adults to walk, jog or ride a bike, that is a community responsibility. When school lunchrooms or office cafeterias do not provide healthy and appealing food choices, that is a community responsibility. When new or expectant mothers are not educated about the benefits of breast-feeding, that is a community responsibility. When we do not require daily physical education in our schools, that is also a community responsibility. ... The challenge is to create a multi-faceted public health approach capable of delivering long-term reductions in the prevalence of overweight and obesity. This approach should focus on health rather than appearance, and empower both individuals and communities to address barriers, reduce stigmatization and move forward in addressing overweight and obesity in a positive and proactive fashion.

Initiatives designed to reduce the risk of overweight and obesity cover a broad spectrum of settings, approaches and target groups, from individual and local group-based initiatives – which tend to be the ones most closely researched – to organizational, national and international policies. Fig. 13.1 gives visual form to this idea, showing how targets and settings are enclosed within a broader context. It indicates individuals' vulnerability to the social and environmental pressures that raise the risk of obesity and thus that they cannot be expected to make all the choices that affect their lives, especially in a hostile environment. Although they can be encouraged to increase their self-control in the face of an obesogenic temptation and they can be given knowledge and skills to help understand the context of their choices, people (especially children and other vulnerable groups) cannot be expected to bear the full burden of responsibility for preventing excess weight gain. The prevention of obesity requires consideration of several settings and approaches. As Fig. 13.1 shows, individuals need support from a range of sources.

Fig. 13.1. Opportunities to influence the obesogenic environment



Source: adapted from Lobstein et al. (5).

1. They need it from the family in making changes: for example at meal times and in food purchases, recipes and activity patterns. This in turn needs support from local structures.
2. They need it from collective institutions, such as preschool centres, schools and workplaces, to support health activities: for example, to ensure that a school has health promoting policies on diet and physical activity and that the policies support peer group beliefs. These in turn require the following.
3. The cultural norms, skills and traditional practices in institutions and local community activities should be conducive to health promotion. The community should provide a supportive environment, such as neighbourhood policies for safe and secure streets and recreation facilities; and it should ensure universal access to health-enhancing food supplies. This in turn requires the following.
4. Municipal and provincial authorities should support community policies – for example, for safe streets, activity-enhancing buildings, improved food access through an appropriate infrastructure, taxes and subsidies – that promote healthier behaviour. This in turn requires the following.
5. National and international bodies should set standards and provide services that support better public health, and commercial practices should consistently promote healthy choices. Such action may require the following.
6. Legislative and regulatory support should be put in place to ensure that strategies for obesity reduction have sufficient resources and are fully implemented and that appropriate control measures are monitored and enforced. In addition, other government policies – for example, in the realm of trade and investment or agriculture support – should not contradict these measures.

This brief overview indicates that government and intergovernmental activities in virtually all sectors – including social welfare, education, agriculture, transport, trade, planning, development and taxation policies – need to be monitored for their health impact and their consistency and compliance with health and nutrition policies.

Also, while approaches and settings that focus on the individual are needed and are perhaps the only way to limit the risk of obesity in the short term, those that encompass a broader public health and policy perspective are needed to make a significant impact on the problem in the longer term. The next section discusses evidence for individual-oriented approaches. In summary, however, such approaches appear to have limited success when undertaken without the support of social and environmental change. In addition, an overreliance on individual

approaches passes too much of the responsibility for health to those at risk and is likely to intensify inequalities in society (6).

Table 13.1 lists some examples of recent or current programmes in a variety of different cultural contexts. These programmes were designed to tackle obesity or to encourage healthy body weight in child populations, and they include control groups and have received some degree of scientific evaluation of their effectiveness. The construction of interventions with control groups is difficult to achieve in communities with open borders, and researchers frequently opt for settings that offer the least risk of contamination between control and intervention groups: in the case of children, this is usually in the kindergarten, school or clinic.

In addition to these examples of structured, evaluated programmes, a remarkable number of initiatives have been launched to prevent obesity in children or encourage a healthy body weight, to prevent chronic disease. The following (including Table 13.2) are some examples of the sorts of intervention undertaken or considered in various countries.

Some uncontrolled interventions may reduce the risk of child obesity (18).

- In Denmark, the “6 a day” programme (19) includes three interventions that have raised fruit consumption in the workplace, provided fruit snacks in school (parent aid) and included catering initiatives at worksite restaurants.
- In Kazakhstan, the number of schools participating in the health promoting schools movement (20) rose from 15 in 1999 to 300 in 2002.
- In Norway, maternal leave to promote breastfeeding (21) has gradually increased in length, and currently lasts for one year with 80% pay, or for 46 weeks with full pay. Working women who are breastfeeding are entitled to two hours’ leave daily; 98% of women leave maternity wards breastfeeding; 90% are breastfeeding at 3–4 months and 75% at 6 months.
- In St Petersburg, Russian Federation, about 15 rooftop gardens contribute significantly to fruit and vegetable supplies for local communities in low-income areas (22).

Table 13.1. Examples of controlled, evaluated obesity prevention trials

Trial (source)	Results
<b>Austria:</b> PRESTO multi-professional school educational intervention with children aged 10–12 years (pilot study) (7)	Improved nutritional knowledge, especially in higher attainment students. No change in BMI measures
<b>Crete:</b> School-based health education prospective study for children aged 6–12 years (8,9)	BMI improvements in intervention group compared with the control group, although BMI levels in both groups rose during the period, with increases in the proportion of children overweight
<b>Denmark:</b> Family counselling, shopping and meal planning (10)	Over a two-year intervention, 21 of 25 children lost weight.
<b>Germany:</b> Kiel Obesity Prevention Study (KOPS): eight-year, school-based intervention with children initially aged 5–7 years (11)	Improvement in knowledge of nutrition and in physical activity. Reduced television viewing. Reduced adiposity indices (skinfold, percentage fat mass) versus controls
<b>Germany:</b> StEP TWO school-based intervention with children aged 7–9 years (12)	Reduced rate of increase in BMI. Reduced systolic blood pressure
<b>Israel:</b> combined, structured, multidisciplinary intervention with children and adolescents (13)	Decreased body weight, decreased BMI and improved fitness, especially if the parents were not overweight
<b>United Kingdom:</b> Be Smart: school and family intervention with children aged 5–7 years (14)	Increase in knowledge of nutrition and in fruit and vegetable intake. No significant change in prevalence of overweight
<b>United Kingdom:</b> MAGIC (Movement and Activity Glasgow Intervention in Children) (pilot study): twelve-week programme to increase physical activity in preschool children aged 3–4 (15)	Increases up to 40% in physical activity. Unknown changes in adiposity
<b>United Kingdom:</b> APPLES (active programme promoting lifestyle education in school) school-based intervention with children aged 7–11 years (16,17)	Some improvements in dietary patterns. No change in physical activity. No change in BMI
<b>United Kingdom:</b> school-based intervention focusing on reduced soft drink consumption with children aged 7–11 (16,17)	Reduced consumption of soft drinks. Reduced prevalence of overweight compared with controls

- In the United Kingdom, “Water is Cool in School” (23). As a key part of the healthy schools programme, several schools have installed water coolers and offer free water bottles to all students. This has helped to reduce disruptions to lessons and increase concentration. In addition, walking buses (24) have developed in many schools. Adults accompany children in a group walking to school along a set route picking up additional “passengers” along the way. Finally, the “Fighting Fat Fighting Fit” television campaign was directed at the whole population (25). It received good awareness ratings, but recall of lifestyle message was poorer among those with lower levels of education and from ethnic minority groups. Participation was low, even among target groups.

Three features of these interventions need to be noted.

1. Their introduction was largely based on precaution, on the assumption that inaction would expose the population to even greater risk than action, even if the evidence is not available to prove the case for a specific action.
2. Their introduction was largely the result of public pressure on the relevant parts of the legislature or voluntary action by school authorities, local businesses or community groups. As a result, the introduction of many of these initiatives was piecemeal. Few of the actions have been or will be rigorously evaluated for their immediate effectiveness or long-term effects on individual adiposity.
3. These interventions should not be assumed to be transferable. A success in one context may be unlikely or irrelevant in another. Also, institutional meal standards are not relevant if meals are not provided; advertising controls are not relevant if no commercial channels are broadcast or if commercial channels are broadcast from outside the country’s borders and controls can be ignored; and school walking buses may be irrelevant if most children already walk or bicycle to school.

**Table 13.2. Further examples of interventions that may help prevent obesity in children**

Intervention	Country
<b>Localized</b>	
Nutrition stands for school food shops	Greece
Ban on school food shops/canteens run by fast-food chains	Greece
Fruit and vegetable consumption to help get school swimming pool	United Kingdom
Vending machines replaced by school milk bar	United Kingdom
Activity areas for children in supermarkets	Sweden
Advice from companies to employees about children’s overweight	Switzerland
Daily fifteen-minute workout for school staff and students	Cyprus
Subsidized use of sports centres for local schools	United Kingdom
Ten-minute delay in releasing children leaving schools in cars	United Kingdom
<b>Population wide</b>	
Nutrition standards for school meals	Scotland, Crete
Monitoring authority for commercial material in schools	Germany
Controls on television advertising to children	Sweden, Greece, Ireland
Tax on television commercials for soft drinks	France
Proposed sales tax on sweet or fatty food	Switzerland
Sales tax on luxury foods	United Kingdom
Ban on vending machines in all schools	France

Source: adapted from Action to tackle child obesity (26).

## Effectiveness of interventions

This section summarizes the reviews of evidence on interventions to prevent overweight and obesity and to promote healthy body weight. It does not consider the various measures available for obesity treatment or for weight loss in clinical patients, although some systematic reviews on these topics are included in Annex 1.

As mentioned, scientific evaluations are most easily undertaken when interventions can be controlled, so that comparable groups of subjects can receive different levels of intervention. The most common settings for controlled trials are schools, where specific inputs – such as educational sessions, food services and physical activity

sessions – can be measured and the experimental designs can ensure that the results have a degree of scientific validity.

This restriction on the types of intervention that can be evaluated reliably has inevitably led to concerns that evidence-based policy will be far too narrow in its focus (27,28). Even within these evaluated trials, there are serious problems with sustainability (few trials report on long-term effects), transferability and resource requirements. These issues are discussed further in next section, on research and policy needs.

### Systematic reviews

The listing of systematic reviews given in Annex 1 includes those that conform to the Cochrane Collaboration criteria – which include a predefined set of procedures for review, a process for peer review of the review, updating procedures, some open access and a lay summary – and are listed in the Cochrane Library (29). The listing also includes other reviews undertaken in a systematic format. The summary of the conclusions of systematic reviews given here are based on the papers identified in Annex 1.

The absence of long-term monitoring after most interventions makes it difficult to evaluate their efficacy for population-wide effects on the prevalence of obesity. Most of the studies were able to show improvements in eating and/or exercise habits, and the large trials used for school-based interventions indicate the feasibility of implementing such programmes for children on a population basis.

There appear to be no systematic reviews of interventions in commercial settings.

### Promoting breastfeeding

Four types of intervention have been shown to be useful in promoting breastfeeding.

1. Peer-support programmes delivered in the antenatal and postnatal periods increase breastfeeding initiation and duration rates among women on low incomes. Such programmes should target women on low incomes who have expressed a wish to breastfeed.
2. Informal, small-group health education sessions delivered during the antenatal period have been shown to be effective in increasing the initiation and duration of breastfeeding among women of all income groups and those from minority ethnic groups
3. One-to-one health education can effectively increase initiation rates of breastfeeding among women on low incomes. It may be more effective than group sessions in increasing initiation among women who have made a decision to bottle-feed.
4. Changes in maternity-ward practices that promote mother–infant contact and autonomy, such as rooming in and breastfeeding support, have been shown to be effective in increasing the initiation and duration of breastfeeding.

A more pronounced effect on both initiation and duration of breastfeeding has been found in studies of the UNICEF/WHO Baby-Friendly Hospitals Initiative, which includes evidence of significant effects in European settings. In addition, several factors may undermine the initiation and duration of breastfeeding: the physical hospital environment and hospital routines – for example, feeding at set times, separation of mother and baby, and the use of infant formula – and the attitudes and expectations of health professionals.

### Family and preschool settings

At the time of writing, there appeared to be no published systematic reviews of family-based interventions that prevent the development of overweight and obesity in preschool children. A review in preparation suggests that the effectiveness of interventions targeting children aged 2–5 years and their families and carers, in terms of helping children maintain a healthy weight or prevent overweight or obesity, is equivocal (30), because three studies showed positive significant intervention effects, and two others failed to show significant improvements. These studies suggest that small changes may be possible, and interventions are more likely to be effective if they focus specifically on preventing obesity (rather than on changing behaviours for diet and physical activity), are intensive, costly (primarily a function of the intensity), targeted and tailored to individual needs. The review (30) notes that an ongoing cluster randomized controlled trial of physical activity for the prevention of obesity among

children in Glasgow (MAGIC) may yield important data for the United Kingdom, although initial results suggest that physical activity levels have little effect on BMI (31).

A review of the effectiveness of interventions to promote healthy eating in preschool settings for children aged 1–5 years found that, while most studies demonstrated some positive effects on knowledge of nutrition, the impact on eating behaviour was less frequently assessed and the outcome was variable (32). There were no data to evaluate the long-term effectiveness on knowledge or behaviour.

In the United States, a focus group of 19 health care professionals in WIC provided some insight into the barriers they face when counselling parents of overweight children (33). The group perceived that mothers:

- focused on surviving the stresses of daily life
- used food to cope with these stresses and as a tool in parenting
- had difficulty setting food limits for their children
- lacked knowledge of normal child development and eating behaviour
- were not committed to sustained behavioural change
- did not believe their overweight children were overweight.

The effectiveness of family interventions that try to help older children maintain a healthy weight or prevent overweight or obesity is also equivocal. Family-based interventions may be less effective in trying to prevent obesity in adolescents. Studies of family-based treatment of overweight have indicated the need to consider the role of parents in the treatment process: one study indicated that treating the mother and child separately appeared to be significantly more effective than treating them together, or treating the child alone. In another study of children aged 10–11, the difference in effects on weight outcomes between treating the parent and child together or separately was not significant (34). Moreover, interventions that link school and home activities appear to influence knowledge, but not necessarily behaviour (35). Family-based interventions tend to be more expensive than child-based interventions conducted in schools.

### School settings

While school-based interventions appear to be able to show gains in children's understanding of nutrition, physical activity or alterations in diet, hardly any interventions appear to be able to demonstrate significant effects on indicators of adiposity. Very few studies last longer than a year, and those that have followed up children for a longer period give evidence that the initial advantages gained by the intervention may be reduced over time (36).

Nearly all the reviews identify multiple approaches to preventing obesity – including education, food services and physical activity – as more successful than single approaches. Also, increased opportunities for physical activity in school and reduced television viewing time appear to be at least as important as classroom health education. Moreover, linking the school-based programme to out-of-school action, through the family and community, may increase effectiveness.

The reviews also raised additional points.

1. Different age groups, ethnic groups and genders required different approaches.
2. For increasing physical activity, the most effective initiatives involved children through the whole school day, including lunch and recesses, as well as class time and physical education lessons.
3. Adults who participated in school-based physical activities as children were more likely to be active in adulthood than those who had not.
4. Breakfast clubs (food provided when children arrive early at school) can have a beneficial effect on behaviour, dietary intake, health, social interaction, concentration, learning, attendance and punctuality. Also, they can reach lower-income families and so address inequalities.
5. School-based physical-activity interventions that appear interesting and innovative to children (such as dance clubs), and interventions that aim to reduce television, videotape and video game use, are most effective.
6. The most successful dietary interventions focus on promoting one aspect of a healthy diet, such as fruit and vegetable consumption. The introduction of nutrition standards for school foods needs to be supported by

measures that ensure that healthy options are selected. Restricting the food choices available to children is associated with healthier eating.

7. A comprehensive school food service policy should include snacks brought to school, vending machines, snack bars and access to local shops during breaks.
8. Children will choose healthier options from vending machines, such as mineral water, pure fruit juice and skimmed milk, even when vending machines for healthy drinks are set alongside the school's usual vending machines. The key to successful vending of healthy drinks is ensuring student involvement, appropriate location of vending machines close to the dining area and continuity of provision: that is, ensuring that the machine is full and in working order.
9. Although schemes for walking and bicycling to school may be effective, no good evidence is available on which to base a recommendation.

A commentary by Lytle et al. (37) noted the limited positive effects found in studies and suggested several factors that may improve success rates, notably ensuring the intervention lasts long enough and ensuring the involvement of all participants, to prevent drop-out. They also noted that heterogeneity – the involvement of participants from diverse cultural backgrounds – is rarely factored into experimental designs; instead, “one size fits all” is the approach taken, and this may compromise the ability to show significant effects. The authors recommended programmes that are more flexible and responsive to the social and cultural environments in which they occur, perhaps inviting the active participation of community members in the design of the intervention. They also noted evidence by Richter et al. that school and community interventions are more likely to succeed if they occur in health promoting environments (38).

### Workplace settings

Strategies that target adults in the workplace take a number of different approaches:

- education on nutrition
- prescriptions for aerobic or strength-training exercises
- training in behavioural techniques
- provision of self-help materials
- prescriptions for specific diets
- group or supervised exercises.

Although the evidence of the effectiveness of workplace efforts to control overweight and obesity is not strong, it still might encourage employers to provide such programmes. The literature supports an emphasis on interventions that combine instruction in healthier eating with a structured approach to increasing physical activity in the workplace (39).

Further observations on the workplace setting include the following.

1. Interventions directed towards adolescents alone or in concert with adults, in workplaces where both can be targeted – for example, in supermarkets and other retail outlets – warrant study.
2. Creative workplace interventions coupled with other interventions – for example, weight loss programmes in community supermarkets or recreational facilities and the provision of pedestrian or bicycling alternatives to driving – warrant study.
3. Programme cost-effectiveness data might increase employer interest.
4. Given the frequency of weight rebound after short-term weight loss, additional research is needed on the most effective means of maintaining initial success.
5. Successful programmes require visible and enthusiastic support and involvement from top management, and employee involvement in the planning and implementation stages.
6. Definable and modifiable risk factors that are a priority for the specific worker group should be chosen.
7. Strategies should not isolate health-related knowledge, values and behaviour from the social and material context in which the targeted employees live.

## Community settings

An analysis of reviews of the evidence on community action to prevent obesity found inconclusive evidence on the effectiveness of community-based interventions – for example, seminars, mailed educational packages and mass-media participation – to prevent obesity and overweight in adults (40). The authors recommended that the effectiveness of community-based education programmes linked with financial incentives should be investigated further.

Examples of more imaginative approaches used in community settings include:

- improved information and access to healthier food choices, such as improved access to major stores, better provision at local shops, and the establishment of food cooperatives, community cafes and growing clubs;
- health promotion activities for improving knowledge and skills, for example, through shopping tours and cook-and-eat classes;
- improved provision and safety of walking and cycling routes; and
- local voucher schemes, for example, for local swimming pools.

Supermarket promotions appear to be effective in improving dietary intakes over the short term, particularly if accompanied by supporting nutritional information. Promotions in restaurants and cafes may have a greater impact than those in supermarkets. Using churches and other religious settings for health education may also have a positive impact on dietary intake (41).

While the general promotion of active travel does not appear to be effective, targeted programmes with tailored advice do appear to change travel behaviour of motivated subgroups. Also, associated action, such as subsidies for public transport, may also be effective. Moreover, promotions that aim to motivate the use of stairs, such as posters and banners, appear to have a weak positive effect. One study suggested that commuters can be forced to use stairs by reducing lift access.

## Cost-effectiveness

For policy-makers considering strategy options, the distinction between effectiveness and cost-effectiveness is critical. If a policy objective is to be pursued with no limitation on spending, then effectiveness is the primary consideration. When cost limitations apply, however, an evaluation of cost-effectiveness is essential to making rational decisions (41).

Although costs are of primary concern to policy-makers and managers in public health, the evaluations and systematic reviews of interventions rarely mention the costs of the programmes they examine, and do not estimate cost-effectiveness. A recent review of workplace and community interventions noted that only two studies that met the criteria for inclusion provided cost-effectiveness analyses of workplace interventions to prevent and control overweight and obesity (39). These two indicated that costs of less than US\$ 1 per employee per year could engage 1% of the population at risk in onsite programmes for weight loss.

For the prevention of child obesity, only one study appears to have considered the costs of the intervention programme: the United States Planet Health Program, a health education programme for schoolchildren (43). This study estimated that the intervention cost some US\$ 34 000 (or US\$ 14 per student per year) and that the programme would prevent an estimated 1.9% of the female students from becoming overweight adults. As a result, society could expect to save an estimated US\$ 16 000 in medical care costs and US\$ 25 000 in lost productivity, indicating a net saving of about US\$ 7000 to society. It is not clear if the costs of such a programme would be favourable in a European context, where the intervention, productivity and medical costs may be different. The Planet Health Program's estimated cost-effectiveness ratio gives a value of US\$ 4305 per quality-adjusted life-year, which compares favourably with such interventions as the treatment of hypertension, low-cholesterol-diet therapies, some diabetes screening programmes and treatments, and adult exercise programmes (44).

Brunner et al. (42) estimated the costs of dietary intervention strategies compared with other measures to reduce cardiovascular diseases in EU Member States. Estimates of the costs per year of life gained were as follows:

- population-based healthy eating: £14–560
- smoking cessation: £300–790

- nurse screening and lifestyle advice: £900 (minimum)
- simvastatin (reductase inhibitor): £6 200–11 300.

Other pharmaceutical regimes varied in cost per year of life gained – from aspirin (£30–320) to alpha-adrenergic blockers (about £36 000). Fish diets and Mediterranean diets were estimated to cost £200–2000 per year of life gained. Brunner et al. (42) noted that cost–effectiveness depends on the underlying level of risk of cardiovascular disease in the target population and the duration of the changes achieved in behaviour and risk factors. Nevertheless, health protection strategies that promote healthy eating are likely to be more cost-effective than strategies that incorporate modern cholesterol-lowering drugs or screening and advice in primary care, and they are comparable to or less expensive per year of life saved than antismoking strategies. The authors warned that, given the considerable diversity in food habits, health care and public health systems among countries in the European Region, careful appraisal of the policy options within each country is desirable, to ensure that the health gain is maximized (42).

More recently, work in Australia sponsored by the Victoria State Department of Human Services (44,45) estimated the cost–effectiveness of different types of intervention for child obesity. It compared costs to the state of interventions with the corresponding likely number of healthy years of life that would be saved. Table 13.3 summarizes the results, and the findings indicate the likely superior cost benefits of controlling marketing to children and of educational programmes that focus on avoiding high-energy foods and drinks and viewing television, compared with some of the activity-related schemes, although these may well have benefits besides those directly linked to preventing obesity. A cost threshold of US\$ 50 000 per DALY would indicate that most interventions were worthwhile, including surgical and pharmaceutical interventions for the small number of children for whom such treatment is considered suitable.

The cost element of an intervention is clearly a highly significant factor in the appraisal of an intervention policy. Details on costs should be collected prospectively and reported explicitly, along with instruments used to obtain data: both direct costs for materials and personnel and indirect costs, such as those for travel time or time lost from school or work. At the very least, intervention trials should report their budgets for the intervention and provide details of the resources required to run the intervention.

### Recommendations of WHO expert groups

Policies are informed by not only reviews of evidence but also expert-group opinions. Indeed, in the absence of extensive, reliable evidence of the success of interventions in preventing obesity, expert opinion provides the most comprehensive guidance available. Expert opinion is also able to consider target groups, settings and approaches that are not amenable to controlled trials but, on the basis of other forms of evidence, are likely to be important in controlling the obesity epidemic at a population level.

Table 13.3. Estimates of the cost–effectiveness of child obesity interventions in Victoria, Australia

Intervention	BMI reduction per child (kg/m <sup>2</sup> )	Population health gain (DALYs saved)	Gross cost per DALY saved (A\$) <sup>a</sup>
Walking school bus schemes	0.03	30	> 120 000
TravelSmart active transport scheme	0.04	50	> 120 000
Active After-school Communities programme	0.08	450	> 50 000
General-practitioner–family programme for overweight children	0.25	510	> 15 000
Multifaceted school-based programme, without active physical education	0.14–0.31	1 600	> 6 000
Orlistat therapy for obese adolescents	0.86	450	> 8 000
Surgical gastric banding for obese adolescents	13.9	12 000	> 9 000
Multifaceted school-based programme, with active physical education	1.1	8 000	> 5 000
Targeted, family-based programme	1.7	2 700	> 3 000
Health education to reduce television viewing	0.45	8 600	> 1 500
Health education to cut soft-drink consumption	0.13	5 300	> 1 000
School programme targeting overweight children	0.52	360	> 1 000
Reduction of television advertising to children	0.17	37 000	< 8

<sup>a</sup>Australian dollars (A\$ 1 ≈ €0.60).  
Sources: ACE-Obesity (45), Haby et al (46).

Most expert reviews reflect the systematic reviews of the sort outlined earlier in this section and detailed in Annex 1, and have indicated that broader policy options will need to be considered to tackle obesity. In the three WHO expert consultations summarized below, the recommendations based on reviews of evidence were similar to those already noted. To conserve space and avoid redundancy, the discussion here is restricted to the recommendations that expert groups have made beyond those that stem from the reviews of evidence and deal with screening or treating overweight people.

### WHO consultation on obesity

A 1997 WHO meeting (47) described strategies for obesity prevention and treatment in different health service systems. The participants urged national governments to develop their commitment to obesity control and to implement food-based dietary guidelines. They also urged that action should be based on the principle of shared responsibilities between sectors (Table 13.4).

Besides this recognition of shared responsibilities, successful public health campaigns require the following features:

**Table 13.4. Responsibilities of various sectors for action to prevent and treat obesity**

Sector	Responsibilities
Government	Advice for industry and trade Consumer education and protection Information gathering and research Food and activity legislation, incentives and enforcement Provision of public health strategies and health services
Consumers	Active consumer groups Discerning and selective consumer choices Healthy practices in the home An educated and knowledgeable public Community participation, attitudes and practices
Industry and trade	Appropriate product availability and promotion Quality assurance Informative labelling and consumer education Training for marketers and managers
Mass media	Responsible advertising Health communication and education Advocacy Publicity for success Exposure of fraudulent claims

- adequate duration and persistence, as programmes may take 10 years or more to show signs of success;
- a staged approach, as a sequence of approaches may be needed to support a transition from awareness, through motivation and experimentation, to sustained change in behaviour;
- legislative action, which may be needed to support educational campaigns, as shown in the cases of seat-belt use and drink-driving;
- education, which should encourage changes be made through participant choice, and can be supported by consistent health messages from the media, health professionals and industry; and
- advocacy from organizations and experts, which can drive public health campaigns and influence all the participants, as it has in antismoking campaigns.

Examples of areas for possible intervention include: urban design and transport policies, laws and regulations (such as those on labelling and marketing), economic incentives (such as those for foods, transport and employers) and education for change (such as that on the need for collective action to improve environments and on the need to avoid victimization of obese people).

### WHO consultation on diet, nutrition and the prevention of chronic disease

A WHO expert consultation on diet, physical activity and the prevention of chronic disease (48) made specific recommendations for nutrient intake goals, including fat, carbohydrate, protein, cholesterol, sodium chloride, fruit and vegetables, dietary fibre and non-starch polysaccharides. For the prevention of obesity, the participants recommended:

1. for infants, promoting exclusive breastfeeding, avoiding the use of sugar and starch in feeding formulas and allowing infants self-regulation of energy intake;

2. for older children, promoting active lifestyles, limiting television viewing, promoting plentiful fruit and vegetable consumption, restricting consumption of energy-dense, micronutrient-poor foods, such as snacks and soft drinks;
3. limiting young children's exposure to heavy marketing of energy-dense, micronutrient-poor foods;
4. giving special attention in some communities to avoiding overfeeding stunted individuals, such as infants of low weight for age, but normal weight for height;
5. protecting and encouraging traditional diets that promote health, such as those with a high level of fruit and vegetables;
6. in education for parents with experience of food insecurity, stressing that overweight and obesity in children do not represent good health;
7. taking measures to modify the environment, so that it enhances physical activity; and
8. using one hour a day for moderately intense physical activity, which may be accomplished in several short bouts.

### WHO expert consultation on childhood obesity

WHO held an expert consultation on childhood obesity in 2005 (49). The participants made a number of recommendations on the most appropriate forms of intervention in schools and communities and the types of intervention needed at the national and international levels to ensure that community interventions are supported. They fully endorsed the WHO Global Strategy on Diet, Physical Activity and Health (2) and its recommendations, and made recommendations for the early years, school years, health care facilities, governments and the commercial sector, to prevent obesity in children.

For the early years, the participants recommended the following.

- Health services should routinely monitor and advise women, starting with health advice in schools and community settings.
- Preventive services should ensure that the needs of nutritionally at-risk infants and children are met, giving special attention to linear growth of preterm and/or low-birth-weight infants, and that interventions should prevent excess weight gain, to decrease the risk of obesity in later life. Parents should be encouraged to interact with their children, especially infants, to promote active play and developmental growth.
- Nurseries and kindergartens should ensure that they do not unnecessarily restrict physical activity during the growing years.

Second, schools are positioned to be community leaders, and their practices should set an example. A coherent, comprehensive whole-school approach is desirable, including children, parents and all staff and covering the lessons taught, physical activities and food services; it may have potential benefits to the wider community.

For the school years, the experts recommended the following.

- Schools need to be fully funded, so they do not have to raise funds for school programmes, which renders them vulnerable to pressure from commercial interests.
- Teachers may need additional training in health promotion, including training to ensure obese children are not stigmatized or bullied in school.
- Schools should set high standards. They should develop standards for foods made available on the premises.
- Schools need consistent policies to ensure a health promoting food environment.
- Schools should require daily physical education in all grades and make sure the programmes are appealing to children.

Third, health care facilities need to provide a range of preventive services and health promoting activities. Moreover, they should liaise with schools and community services to ensure their messages are given prominence. Health care professionals also have a role in monitoring children's growth, to recognize early signs of poor nourishment, including stunting and overweight, and to provide appropriate responses.

Fourth, governments need to centralize action into one office, to ensure that cross-departmental, cross-sectoral policies can be implemented. This should be monitored by a separate agency, such as a parliamentary scrutiny committee or an obesity observatory. In addition, governments can:

- help build capacity at national and at local levels, to support public health initiatives;
- ensure that the incentives given to commerce (such as food enterprises and agricultural enterprises) include health criteria;
- ensure that political donations from food companies are restricted or banned;
- improve access to and affordability of fruit and vegetables, especially for low-income and disadvantaged population groups; and
- support WHO moves to ensure that all United Nations agencies have policies that are consistent with the Global Strategy.

Fifth, the experts strongly supported the Global Strategy's call to ensure that the promotion of food products in the commercial sector is consistent with a healthy diet. They recommended:

- continued support for the full implementation of the International Code of Marketing of Breast-milk Substitutes in all countries;
- the creation of an international marketing monitoring body, which should include health and consumer advocacy organizations, to report to WHO and other United Nations agencies on compliance issues and the development of new marketing methods;
- an international code on marketing of food and beverage products;
- the extension of controls on marketing to include printed and electronic media, cross-branding, product positioning (for example, at checkout tills) and product formulation (for example, the use of non-nutritional food additives designed to attract children to energy-dense, micronutrient-poor foods); and
- the development of a global alliance of NGOs concerned with health issues, which would consider food production and marketing policies as part of their range of concerns.

In addition, the experts noted that high levels of obesity are acceptable, or even considered desirable in some cultures, while in others there is strong prejudice against overweight people, of which many children are clearly aware. Measures that emphasize healthy behaviour and activities, rather than idealized weight or appearance, need to be introduced to reduce the prevalence of obesity.

Also, care must be taken to ensure that obesity prevention programmes do not induce unhealthy slimming practices, which may lead to the development of clinical eating disorders or risky behaviour, such as smoking to control weight. Although there appears to be little evidence to suggest that treatment of obesity can lead to eating disorders, there is a possible risk that preventive programmes focusing on dietary restrictions may induce anxiety and disrupted eating patterns in vulnerable children, which may in turn trigger a disorder.

Care may also be needed when encouraging increased physical activity. For many reasons – including embarrassment in changing facilities, fear of ridicule or failure, and discomfort from sweating or breathlessness – children resist participation in sport. Schools may also need to consider their responsibilities for safety and the prevention of accidental injury. Training for staff may be valuable in helping them to promote and provide physical activities and to recognize and prevent discriminatory behaviour.

The solution to some of these problems is to ensure that the target groups for the interventions take part in their planning. A change in school practices, for example, might be most successful if all the relevant stakeholders – such as children, staff and parents – participate in the planning; this is especially important if their cooperation is needed to implement the proposals.

### Research and policy needs

This section considers the shortcomings in the current evidence base for obesity prevention and the difficulties in obtaining relevant evidence for policy-making. The WHO expert meeting on childhood obesity (49) considered these problems, and made several recommendations, including the following.

1. All interventions should include process evaluation measures and provide resource and cost estimates. Evaluation can include impact on other parties, such as parents and siblings.
2. Interventions that use control groups should be explicit about what the control group experiences. Such phrases as “normal care” or “normal curriculum” or “standard school physical education classes” are not helpful, especially if normal practices have changed over the years.
3. More interventions that look into the needs of specific subpopulations – including immigrant groups, low-income groups and specific ethnic and cultural groups – are needed.
4. There is a shortage of long-term programmes that monitor interventions. Long-term outcomes could include changes in knowledge and attitudes, behaviour (such as diet and physical activity) and adiposity outcomes.
5. New approaches to interventions, including prospective meta-analyses, should be considered.
6. Community-based demonstration programmes can be used to generate evidence, gain experience, develop capacity and maintain momentum.
7. An international agency is needed to encourage networking of community-based interventions, to support methods of evaluation and to assist in the analysis of the cost–effectiveness of initiatives.

The experts also expressed concern about the role of interested parties in funding and evaluating research. They recommended that commercial interests should not fund research reviews. They identified the need to evaluate the impact of programmes funded by industry and other sources of potential bias, so that their contribution to the evidence base could be examined.

### Wider range of interventions

Although these suggestions for improving the evidence base are welcome, they may not be sufficient to meet the needs of policy-makers. As noted, the range of potential policies for obesity prevention, such as those suggested in national initiatives in several European countries, has a severely narrow research base. In part, this is because of the narrow definition of what is considered hard scientific evidence, and in part because development must occur in some areas of social policy before an evidence base can exist. Similar conclusions about actions to stem global climate change have been drawn: for example, where the effects of interventions to stem the rise in global temperature cannot easily be tested before implementing such interventions as national strategies.

While evidence-based public health should incorporate the same rigor and attention to internal validity as clinical trials, it should also maintain contextual and policy relevance, have a realistic chance of implementation and show potential sustainability (27). By itself, evidence of effectiveness is not sufficient to guide appropriate decision-making, and true evidence-based policy-making is probably quite rare (50). Some major policy decisions are made on the basis of extremely little evidence, despite their large costs. Engaging policy- and decision-makers in setting out the forms of evidence they may need is a move towards practice-based evidence of greater relevance than is possible with the classical evidence-based practice.

### Broader definition of evidence

Evidence in its widest sense is information that provides a level of certainty about the truth of a proposition (50,51). To address questions about obesity prevention, Swinburn et al. grouped evidence into observational, experimental, extrapolated and experience-based sources of evidence and information (27). Each type of evidence has its own strengths and weaknesses, and each can be judged on its ability to contribute to answering the question at hand. The following are examples, adapted from Swinburn et al. (27), of evidence relevant to obesity prevention:

1. epidemiological studies that may involve comparisons of exposed and non-exposed individuals: for example, cross-sectional, case–control or cohort studies;
2. population-level data that can provide time-series information: for example, trends in the prevalence of obesity, food supply data, and car and television ownership;
3. intervention studies in which the investigator has control over the allocation and/or timing of interventions: for example, controlled trials among individuals, groups or whole communities;

4. expert opinion: for example, from practitioners and stakeholders with practical experience, such as paediatricians, marketing agencies and parents;
5. critical assessment of programmes and analysis of their outcomes, objectives and processes;
6. modelling of possible causative pathways, to help identify potential evidence gaps or areas for research: for example, comparing price regulation with consumer education;
7. modelling of methods to estimate a programme's efficacy, uptake and population reach;
8. modelling of methods that examine costs: for example, intervention costs, cost-effectiveness or cost-utility;
9. information that allows an inference to be made: for example, high levels of food advertising allow the inference that it increases the sales of the advertised products and/or product categories;
10. information from comparable fields or comparable interventions: for example, the role of social marketing in changing such health-related behaviour as smoking, speeding, sun exposure or dietary intake, or information gained from health promoting schools programmes; and
11. economic modelling: for example, identifying the impact of farm policies on agricultural production and pricing, and the effects of price changes on purchasing and consumption patterns.

In practice, the quantity and quality of information available on interventions to prevent obesity in different settings, approaches and target groups vary widely. There is virtually no evidence on the potential effects on obesity of altering social and economic policies, such as policies on agricultural production or food pricing. Much more evidence, however, is available on localized attempts to influence the individual through various means, such as education, exhortation, school training and parental training. This might seem odd, given the broad range of environmental and social influences that raise the risk of obesity and that might be more effectively dealt with through policy measures, rather than asking individuals to resist the temptations placed before them.

### Evidence for investing in health

The last decade has seen increasing interest in using the investment portfolio paradigm, borrowed from the realm of banking and financial investment, to describe health promotion, instead of the usual medical paradigm that requires controlled trials. With respect to obesity prevention, Hawe & Shiell (52) suggested that interventions can be described as investments and, just as an investment portfolio should carry a mixture of safe, low-return reliable savings schemes and risky, potentially high-return gambles, so investments in preventing obesity can carry a mixture of low-risk, low-cost approaches and higher-risk, higher-cost initiatives.

In health promotion, expected health gains and other desired outcomes can be used to measure a return on investment, and the consistency of the impact of an intervention and indications of its likely effectiveness can be used to measure risk. Swinburn and colleagues (27,53) developed this approach further by explicitly describing a portfolio promise table in which the risk element is displayed in two dimensions: population impact (ranging from low to high) and certainty of having an effect (also ranging from low to high), and the resulting investment promise ranging from least (low certainty, low impact) to most (high certainty, high impact). Thus, intensive interventions with small groups or individuals might be low risk, as they consistently result in changes in behaviour and other outcomes. The overall return may only be small to moderate, however, as the effect of the intervention may be small and make only a slight impact on the health of the community as a whole.

The process of assessing and weighing potential gains and risks permits the adoption of a mix of interventions (or a portfolio) to balance the risks. It is a way to maintain health promotion momentum without having complete evidence about the effectiveness of interventions (52). This approach allows the selection of interventions based on the best available evidence, while not excluding untried, but promising strategies.

One difficulty with the practical implementation of such modelling work is that policy-makers do not base decisions on purely scientific or even financial criteria. Pressures on government agencies and other key stakeholders have led them to make judgements that affect the portfolio of options put in practice. The various needs and demands of stakeholders must therefore be included in the theoretical model for preventing obesity in children.

The main point here is that investments require different types of information, including costs, likely effectiveness, likely depth and breath of impact, sustainability and acceptability. Further, when making investment

decisions, attention is needed to the effects of upstream policy decisions that affect the context in which prevention policies are implemented.

### Considering upstream evidence

From recent economically based analyses for the Treasury in the United Kingdom (54), it is clear that interventions that relate to smoking, obesity and physical inactivity require economic modelling, to show which offer the most favourable cost–benefit or cost–effectiveness ratios. Such modelling might include an analysis of the effects of product prices and marketing practices on consumers’ purchasing patterns. The EU has used these approaches in its agricultural policies to manipulate the production of cereals, meat, milk, butter, sugar, wine, fruit and vegetables. It has done so by altering subsidy and tariff levels, controlling minimum prices and shaping markets: for example, by removing fish catches and fruit and vegetable crops from the market. Routine approaches to economic planning have not often been applied sufficiently to analyses of options for social policy change, and the evidence required to show how policy changes in these areas might affect consumption patterns and subsequent noncommunicable disease rates has received too little attention.

In a review of the determinants of dietary trends, Haddad (55) noted the need to consider several macroeconomic factors, including income growth, urbanization, and the relative prices and availability of foods. These factors are affected by mass-production technology and commodity costs, along with the costs of retail distribution chains and catering outlets. As an example of the linkages, Haddad noted that one study of food supply price elasticity in the United States showed that an increase in the price of oils would lead to a decrease in fat consumption and total energy intake, and an increase in the consumption of most other nutrients (56). As this example shows, food prices are linked to the cost of commodities, which are in turn linked to agricultural support policies and trade regulations. Also, food prices must absorb marketing and promotion budgets.

Although marketing affects consumer awareness and cultural practices, there are remarkably few publicly available data on the impact of commercial marketing strategies on children’s diet and physical activity and consequential weight gain (see also Chapter 10). Commercial interests are highly likely to hold valuable data. A government initiative to acquire these data on behalf of consumers would be a valuable research resource, on a par with the commercial papers released during litigation against tobacco companies. The evidence needed to link marketing to children’s behaviour should include not only direct marketing strategies, such as television advertising and promotional Internet sites, but also product placement on film and television programmes, cross-branding of recognizable elements of food brands on non-food items, the use of colouring and flavour-boosting food additives to promote sales, the use of sponsorship and celebrity endorsement of products, the licensing of children’s cartoons for use on food labels, and other techniques aimed at influencing children’s food and leisure choices. Evidence is needed to show how these various promotional methods affect dietary choices and subsequent health.

Similarly, more evidence is needed on the impact of investment strategies on diet and health, mediated through food prices and availability: for example, direct foreign investment in sectors that affect food supplies (agriculture, food manufacturing, retailing and catering, such as fast-food catering).

As in the above suggestions, similar analyses could be undertaken to relate products to their effect on the physical environment and physical activity, or their encouragement of sedentary behaviour. The production and marketing of products that influence physical activity – such as television programmes, video games, cars used for short journeys, streets and sidewalks, stairs and escalators, outdoor play areas and parks – all need further research, to demonstrate to policy-makers that interventions can be a worthwhile investment.

### New opportunities for intervention

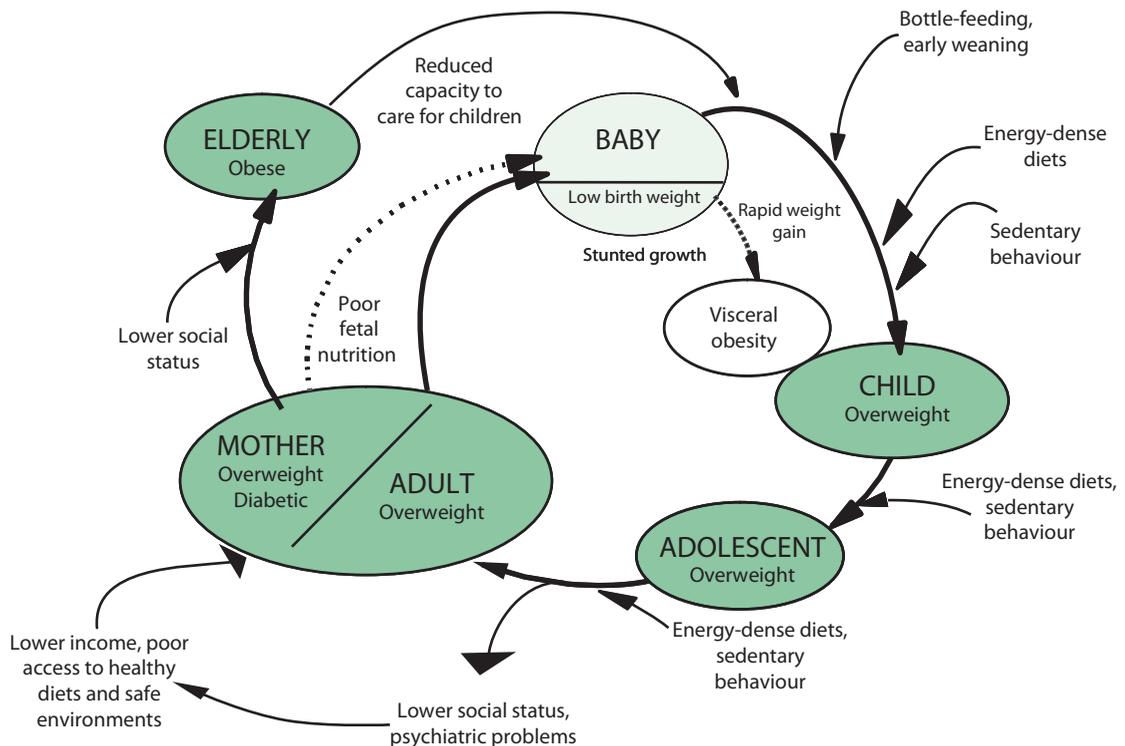
This section offers tools to help policy-makers identify opportunities for public health interventions and, in particular, explores two so-called maps that can help show areas in need of further development. The first is the well-established life-course approach to public health action, which considers the influences of a number of direct and indirect risk factors on a person’s nutritional status: through current diet and physical activity, earlier experiences of breastfeeding and weaning, childhood diet and physical activity, and parents and grandparents. The second map considers determinants of food choices as a means of identifying unexplored areas for intervention.

Based on increasing evidence that the risk of chronic disease begins in the fetal stage of life and accumulates throughout later stages, United Nations and WHO expert reports (48,57) have recommended a life-course approach that captures both the cumulative risk and the numerous opportunities to intervene afforded by this approach. The life-course approach considers the opportunities to improve health at each stage in life, for both individuals and their offspring. Good nutrition in early life pays clear social and economic dividends in later childhood and adult life. Further, the impact of early nutrition on a young woman may in turn affect the health of the children she bears. Improved life expectancy increases the numbers of older people, which brings further intergenerational advantages through better opportunities for child care, stable family structures, and the transfer of culture and skills. Fig. 13.2 shows the life-course risk factors for obesity.

### Determinants of food choice

As noted, far more is known about what can prevent obesity at the individual and local levels than about the potential effects of changing supply policies, food pricing or marketing, or, for that matter, altering the physical environment to reduce the use of cars, for example. Also, if interventions are to succeed, they need to take the socio-economic context into account, which includes the nutrition transition (in which traditional, locally produced foods are replaced by mass-produced, globally marketed products that deliver higher levels of fat and sugar, refined starch, dairy foods and meat products, and lower levels of fruit and vegetables and whole-grain foods).

Fig. 13.2. Life-course risk factors for obesity

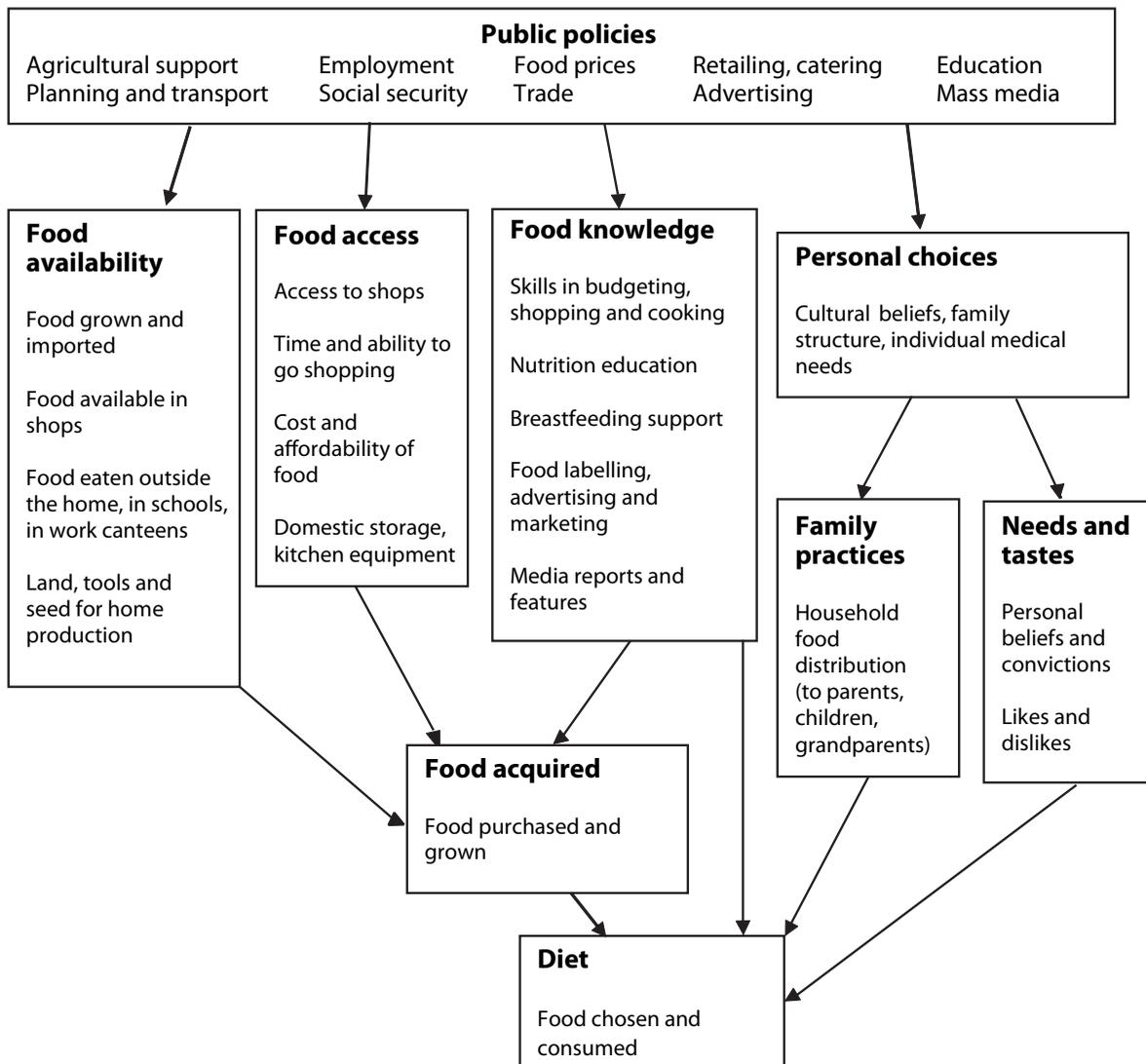


Source: adapted from Commission on the Nutrition Challenges of the 21st Century (57).

For some sectors of the population, nutritional insecurity will have a significant effect on food choices. Public health interventions need to be sensitive to such socioeconomic contexts and to the groups most at risk, such as ethnic minorities and children in migrant families, with diabetic mothers, with a risk of stunting or in families with HIV/AIDS.

As shown in the schematic of influences on food choice (Fig. 13.3), concerns about the availability and accessibility of healthy food choices and health promoting environments are largely determined by macroeconom-

Fig. 13.3. Influences on food choices



Source: Robertson et al. (58).

ic policies and their expression in the marketplace. In contrast, most of the interventions that try to influence healthy choices have been directed towards aspects of food knowledge and family practices and, as the evidence review suggests, they have had weak and poorly sustained results. There is thus a strong argument for investigating and investing in macroeconomic policies to influence food availability and food access.

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## 14. Economic instruments for reducing consumption of energy-dense foods

### Main messages

- Although there is little direct evidence that economic instruments can change dietary patterns, indirect evidence suggests that such a causal relationship is plausible.
- A small body of evidence indicates that reducing the price of fruit, vegetables and other healthful snacks at the point of purchase increases their consumption and that financial incentives may result in temporary weight change.
- A combination of increased prices (in the form of taxes) for such nutrients as fat, saturated fat and sugar and subsidies on foods rich in dietary fibre could alter consumption and reduce total energy intake.
- Policy interventions in taxes and prices of tobacco and alcohol products may serve as models for similar approaches to nutrients and foods, subject to certain caveats.
- Any policies that raise the prices of particular foods without a complementary intervention, such as subsidies for healthful foods, may be viewed as inequitable.

The increased prevalence, health consequences and associated costs of overweight and obesity necessitate the identification of effective interventions to contain these conditions (1). Although many interventions have been proposed, the effectiveness of economic instruments, including price policies, taxes and incentives, has not been well studied. These types of interventions, however, have been partially successful in reducing the prevalence of other public health phenomena, such as smoking and tobacco use in the EU (2). This chapter summarizes the available evidence on the effectiveness of economic instruments in containing or reducing food consumption, particularly of foods high in saturated fats, often a focus of interest for studies on counteracting heart disease.

High rates of obesity and diabetes are found among the lower-income groups in many middle- and high-income countries. Socioeconomic status affects the choice of food and contributes to consumption of energy-dense, nutrient-poor foods, such as refined grains, added sugar and fats (3–6) (see Chapter 12). These are generally inexpensive, convenient and taste good. Also, their cost per energy unit is low. In contrast, more nutrient-dense lean meats, fish, fresh vegetables and fruit are in general more costly (7). Indeed, some modelling analyses and information on food prices and buying patterns indicate that low-income and unemployed populations subject to cost constraints are more likely to consume low-cost, nutrient-deficient foods (6,8) (see Chapter 8).

### Review of evidence

The literature on the impact of economic instruments on food consumption is organized into two main categories:

- policy-related economic instruments: taxes, prices and subsidies enacted by governments in countries or other macroenvironments;
- local or site-specific economic instruments: prices, incentives and similar instruments implemented in microenvironments, such as schools, workplaces, restaurants, cafeterias and food markets.

Evidence on policy-related economic instruments may be direct or indirect. Direct evidence comes from studies that demonstrate a causal relationship between economic instruments (involving purposeful interventions) and patterns of food consumption, particularly of foods high in saturated fat. Other types of studies may provide indirect evidence of the relationship between economic instruments and patterns of food consumption: that is, evidence of:

- economic instruments that affect food purchasing and (presumably) consumption of less energy-dense or more healthful foods or that affect weight loss, possibly due to changes in food consumption; and
- an association between economic changes (based on observational studies of market prices or taxes, but not purposeful interventions of these) and food consumption (or behaviour that might influence food consumption, such as purchasing healthful foods) or weight changes that might have resulted from changes in food consumption.

Modelling studies are quantitative simulations that project what could happen under various scenarios, such as the imposition of price increases, taxes or subsidies. Although these studies often draw in part on actual market data, their results do not constitute empirical evidence. Still, they may provide insights into the plausible impact of certain proposed interventions.

## Policy-related economic instruments

### Direct evidence

No systematic reviews, randomized controlled trials or other interventional studies have yielded direct evidence of a causal relationship between policy-related economic interventions and consumption of foods high in saturated fat or other energy-dense foods.

### Indirect evidence

While no systematic reviews have addressed this topic, two large longitudinal studies examined the association between changes or differences in food prices and food consumption or weight gain. These are not purposeful experimental interventions, but observational studies that track the relationship between prices and other market factors, and food consumption or BMI (which is likely to be linked to consumption) over time.

### Prices and food consumption

Guo et al. analysed longitudinal data collected in 1989–1993 from China's health and nutrition survey on food prices and the consumption habits of 6667 people in urban areas and rural villages (9). The study measured the impact of price changes in six food groups (rice, wheat flour, coarse grains, pork, eggs and edible oils) on the consumption of each group and the consumption of three macronutrients (energy, protein and fat), according to socioeconomic group. The analysis found large and significant responses in consumption to changes in prices: that is, price elasticities, which measure the percentage change in quantity of a food consumed in response to a 1% change in the price of that food.

As an example of price elasticity, if a 10% increase in the price of a food results in a 5% decrease in consumption of that food, then the own-price elasticity of that food is  $-0.5$ . Also, cross-price elasticities reflect how the change in the price of a food affects the consumption of another food, such as a substitute (such as margarine for butter) or a complementary food: one that is often consumed with the one being studied, such as ready-to-eat cereal and milk. Significant reductions in the probability of consuming food and the amount of food consumed within the food groups were observed when the price of the group increased. Also, increases in the price of certain foods had substantial effects on consumption of their substitute foods and their complementary foods. Increases in the price of rice raised consumption of wheat flour and coarse grains. Increases in the price of pork led to increases in consumption of wheat flour, coarse grains and edible oils, but decreases in consumption of eggs and rice, in particular. For example, the overall cross-price elasticities of rice for consuming foods were: 0.37 for coarse grains and 0.26 for wheat flour. The overall cross-price elasticities of pork were: 0.21 for wheat flour, 0.36 for coarse grains, 0.33 for edible oils,  $-0.93$  for rice and  $-0.32$  for eggs.

Only increases in the price of pork resulted in lower protein intake. Fat intake was most responsive to increased pork prices, particularly among the poor, although changes in protein intake for both the poor and the rich were small and comparable. Overall own-price elasticities of foods for the poor and rich, respectively, were:  $-0.54$  and  $-0.25$  for rice,  $-0.54$  and  $-0.35$  for wheat flour,  $-0.09$  and  $-0.03$  for coarse grains,  $-0.96$  and  $-0.33$  for pork,  $-0.03$  and  $-0.40$  for eggs, and  $-0.39$  and  $-0.47$  for edible oils. Overall elasticities of fat intake with respect to pork prices were  $-1.10$  for the poor and  $-0.49$  for the rich. The greatest elasticities of protein intake were those of pork prices for both the poor ( $-0.26$ ) and the rich ( $-0.18$ ).

The authors (9) noted that one goal of price policy would be to reduce the fat intake of the rich without adversely affecting the protein intake of the poor. Although revealing associations between prices and food consumption, this was not a study of the impact of a pricing or tax policy intervention.

As noted by the authors, the study was conducted at a time of transition in China, including improvements in food supply and consumption in many regions (9). These improvements were accompanied by more high-fat foods, processed foods and emerging problems of dietary excess. At the same time, many poor people in China still experienced food insecurity and undernutrition. Thus, while the study added to the evidence on how food consumption patterns respond to price changes, the conditions under which it was conducted limit the relevance of its findings for present-day Europe.

### Prices and weight gain

The Rand Corporation conducted a prospective four-year observational study that investigated the association between children's BMI and both differences in food prices and the density of food outlets (restaurants, grocery and convenience stores) in communities (10). The study was based on a nationally representative sample of children in kindergarten in the United States, with data collection one year and three years later. The analysis controlled for baseline BMI, age, real family income and sociodemographic characteristics.

Investigators found that lower prices for fruit and vegetables predicted a significantly lower increase in BMI for children between kindergarten and third grade, with half of the effect occurring in the first year (10). A decrease in fruit and vegetable prices by 1 SD across the nationally representative range of fruit and vegetable prices would decrease BMI by 0.114 by third grade, half of which (a decrease of 0.054) would occur between kindergarten and the first grade.

Lower meat prices had an opposite though smaller effect that became insignificant at three years. There were no significant associations between the prices of dairy foods or fast food, or density of food outlets and change in BMI. Data were not collected on food consumption, so the study could not confirm a causal pathway from food prices to food consumption to changes in BMI. The authors concluded that geographic variation in fruit and vegetable prices is large enough to explain a meaningful amount of the differential gain in BMI among elementary-school children across metropolitan areas (15).

### Modelling studies

Four studies, using different models, simulated the effects of scenarios that involve taxes and/or subsidies on food consumption, including foods high in saturated fat. Three of these models used as input existing market data on the association between food prices and food purchasing. Only one model was reported in peer-reviewed literature. The first two summarized here examined the effect of taxes and subsidies on food consumption, drawing on data on about 2000 households from a representative panel of Danish consumers. These studies helped to distinguish the effects of focusing policies on particular types of foods, as opposed to particular types of nutrients.

The first model simulated two main types of scenarios intended to decrease consumption of saturated animal-based fat, increase consumption of fibre and decrease consumption of sugar (11). The first set of intervention scenarios applied changes in the value-added tax (VAT) according to food type: an increase in VAT from 25% to 31% (a 4.8% net price increase) on beef, fatty meat, butter and cheese and a decrease in VAT from 25% to 22% (a 2.4% net price decrease) on fresh fruit and vegetables, potatoes and grain-based products. The second set of intervention scenarios imposed taxes and subsidies according to nutrient type: a tax on saturated fat (Dkr 7.89 per kg), subsidies on fibres (Dkr 18 per kg) and tax on sugar (Dkr 10.30 per kg).

The results of these interventions indicated that both general approaches would reduce total energy intake, although the effect of that based on nutrient type would be much greater. Also, raising the VAT on fatty meat, fat and cheese would decrease consumption of saturated fat by 5.7%, and imposing the tax on saturated fat content (rather than on particular foods themselves) would decrease consumption of saturated fat by 9%. Similarly, fibre consumption would increase more, owing to the subsidy on foods according to their fibre content, than would lowering the VAT on particular food items: fruit, vegetables, potatoes and grain products. Without the tax on sugar, in which case sugar consumption would drop by 17% or more, all other scenarios would result in unwanted increases in sugar consumption. The authors concluded that applying the VAT to the approach based on nutrient type would be more effective than applying the VAT to particular types of foods (11).

The second study modelled the impact of taxes and subsidies on food consumption on different socioeconomic groups, using four scenarios: a tax on all fats, a tax on saturated fat, a tax on added sugar and subsidies on fibres (12). According to the simulations, for most consumers, either tax on fat would reduce total energy intake and its share of fat (including saturated fat), but would increase the share of sugar. Conversely, a tax on sugar would reduce the share of sugar and increase the share of fat in total energy intake. A subsidy on fibre would have a small or negligible effect on the shares of fat and sugar in total energy intake. Also, according to these simulations, the sugar tax would have the largest effect on the younger and older consumers, lower socioeconomic groups and rural residents. Similarly, taxes on fats would tend to increase the share of sugar in total energy intake, particularly for consumers who are younger, in lower socioeconomic classes and in rural areas. The authors concluded that general taxes or subsidies on particular types of nutrients cannot solve the problems of nutrition and obesity across all groups of consumers, but might be used to complement other types of regulation or information campaigns (12).

A monograph from the Institute for Fiscal Studies (13) reported on results of simulations of the potential impact of a so-called fat tax in the United Kingdom. This simulation addressed the potential differential effects the tax would have on food purchasing (not consumption) by families at different income levels. The hypothetical fat tax was applied, regardless of family income, according to the levels of each of the four nutrients in food: £0.01 per kg on saturated fat and monounsaturated fat, and £0.01 per g on sodium (from salt) and on cholesterol. The simulation was based on food purchasing patterns of 8000 households in the 2000 National Food Survey of household food consumption and expenditure. The Survey data suggested that the purchase of fat, sodium and cholesterol differs little across the income spectrum (14). The results of the simulations indicated that the amounts purchased of these four nutrients would change very little across the range of family income, although lower-income people might purchase products with slightly less fat and cholesterol. Because the taxes would only minimally affect purchasing patterns, the fat tax would be regressive, as it would cost lower-income people a greater share of their total income than higher-income people. The effect ranged from 0.7% of the poorest household incomes (defined as less than £36 per week) to about 0.25% of median household income (£140 per week) to less than 0.1% of the richest household incomes (more than £519 per week). A simulation of a so-called calorie tax of £0.01 per 1000 kcal (4.184 MJ), also based on National Food Survey data, resulted in a similarly regressive effect, ranging from 0.5% of income for poor people to 0.1% for median households and 0.05% for the richest. The authors concluded that the regressivity of a fat tax is likely to persist regardless of whether it is applied to fat content, energy or particular foods (13).

Another model projected the effect of extending the VAT (17.5%) to leading sources of dietary saturated fat in the United Kingdom. Noting the lack of data on price elasticities of demand for the specific foods of interest, the author (15) assumed that foods that have close substitutes have a high price elasticity of demand: that is, small changes in the relative prices of close substitutes can result in large changes in consumption patterns. Foods with perfect substitutes have price elasticities of  $-1.0$ , and foods with acceptable, yet imperfect substitutes (for example, margarine for butter) have price elasticities of smaller magnitude. The author then simulated the application of the VAT to selected foods with price elasticities that he termed “reasonable”, though not based on empirical evidence: whole milk,  $-0.1$ ; cheese,  $-0.5$ ; butter,  $-0.7$ ; and biscuits, buns, cakes, pastries, puddings and ice cream (all of which may be replaced with lower saturated fat versions),  $-1.0$ . With these assumptions, the model derived reductions in dietary energy from saturated fat and reductions in serum cholesterol and ischaemic heart disease. The author noted that the health benefits of such a tax are likely to be progressive, but that the tax is likely to be regressive. Aside from the model not being based on empirical evidence of consumer responses to taxes, some observers have contended that the author’s price elasticity estimates for these foods were severely overestimated, leading to overestimation of the potential effects (16).

### Tax and price policies for tobacco and alcohol

Studies of tax and price policies applied to tobacco and alcohol products in many countries provide persuasive evidence of their effects on decreasing consumption. Such policies may serve as a model for lowering consumption of foods high in saturated fats and other energy-dense foods. Even so, some differences in these products may limit generalizability to food consumption.

The most successful interventions in reducing smoking rates have involved combinations of policies, including price increases, advertising restrictions, smoking-site restrictions, consumer education and smoking cessation therapies (17). A 2004 review examined the effects of a range of smoking reduction interventions, including tax and price policies, media campaigns, telephone support hotlines, bans on advertising and indoor smoking in public places, health warnings, school education and limits on retail sales. Among these, the evidence of reduced smoking rates was strongest for the combination of substantially higher cigarette taxes and laws banning indoor smoking in public places. Based on relatively consistent evidence from many studies across a number of countries, the review found that a 25% price increase would yield a 7–13% decrease in smoking, with increasing effects over time and greater effects on young and low-income smokers. The magnitude of the effect depends on the initial price and the size of the tax increase (17,18). A comprehensive international review of a similar body of literature found that a price increase of 10% decreases consumption by about 8% in low- and middle-income countries (19) and by about 4% in high-income countries (20). A World Bank fact sheet that draws from these reviews places higher taxes at the top of its list of cost-effective interventions (20).

Extensive evidence, based on population-based market analyses, indicates that increases in the full price of alcoholic beverages influences consumption, and alcohol-related health and social problems. Also effective are stricter controls on availability of alcohol (via minimum legal purchasing age), government monopoly on retail sales and restrictions on sale times and distribution outlets (21). The sensitivity of consumption to price depends on the type of alcoholic product. An extensive review of the economic literature on population-based alcohol demand concluded that price elasticities of demand for beer, wine and distilled spirits are  $-0.3$ ,  $-1.0$  and  $-1.5$ , respectively: in other words, consumption of beer is least sensitive to price changes and consumption of distilled spirits is most sensitive (22). Analyses of Swedish price and sales data for 1984–1994 showed that consumers responded to price increases by changing their total consumption and by varying their choice of product brands. Although significant reductions in sales were observed in response to price increases, significant substitutions between quality classes mitigated the effects.

These findings suggest that the net impact of purposeful price policies to reduce alcohol consumption will depend on how these policies affect the range of prices across brands of alcoholic products (23). A recent extensive review found that the majority of the economic research on the relationships between prices and consumption of alcoholic beverages supports the view that increases in prices significantly reduce consumption. These effects vary according to such factors as age group, socioeconomic status, baseline consumption (light versus heavy drinkers) and type of beverage (24). The effects of alcohol control measures, including price increases, vary among countries and are subject to the prevailing alcohol culture and public support for controls (22).

In the case of controls on tobacco and alcohol, social and cultural factors mediate the effectiveness of economic instruments. For both tobacco and alcohol control, evidence suggests that the most effective approaches comprise multiple concurrent interventions, including price increases and other market restrictions and measures (22,25).

### Local or site-specific economic instruments

Again, local or site-specific economic instruments refer to prices, incentives and similar instruments implemented in such microenvironments as schools, workplaces, restaurants, cafeterias and food markets. The evidence summarized in this section addresses the effect of such instruments primarily on food purchasing and weight loss. While food purchasing and weight loss are not the same as food consumption, they may be surrogate markers of or otherwise causally related to consumption. In the literature on this, economic instruments include not only prices but also coupons for price reductions, provision of food at no or reduced cost and other incentives, such as rewards or prizes.

While some systematic reviews include some of the studies on economic instruments for influencing food purchasing and weight loss, none of the reviews presents findings specific to such instruments. In addition, a small group of studies, comprising mostly time-series studies in schools and workplaces, provides evidence that reducing the price of fruit, vegetables and other healthy snacks at the point of sale (in vending machines and cafeterias) increases purchases. In the small set of studies on financial incentives for weight change, some showed short-term weight loss by the intervention groups, but there was no evidence that losses could be sustained following the interventions.

## Systematic reviews

The role of local or site-specific economic instruments in preventing or managing obesity is not well represented in systematic reviews. Only four comprehensive systematic reviews appear to have included local and site-specific economic instruments for influencing food consumption or related behaviours. As described below, some of the reviews covered studies of economic incentives for health conditions in addition to obesity, while others covered studies of various types of interventions for obesity, including economic ones. None, however, presents specific findings on a set of studies of the impact of economic interventions on obesity. Other systematic reviews focus on interventions to prevent and manage obesity, but do not include studies of economic interventions.

In 2004, the United States Agency for Healthcare Research and Quality published a systematic review of economic incentives for preventive health care, not only for obesity, prepared by one of its evidence-based practice centres (26). This review identified a variety of local, site-specific or other consumer-oriented economic incentives, including cash payments, lotteries, coupons for free or reduced-price goods and services, gifts, free or reduced-price medical services and opportunities to avoid disincentives. It included 47 studies of consumer incentives for preventive care, including 7 that pertained to obesity and weight loss. Of the 47 studies, only 4 assessed long-term results (none involving weight loss), and these showed that none of the participants retained the short-term improvements attained. The systematic review (26) concluded that consumer economic incentives can be effective in the short term for simple preventive care if they have distinct, well-defined behavioural goals, but found insufficient evidence to conclude that economic incentives are effective for promoting long-term lifestyle changes. It also noted that there is a possible dose–response behaviour for consumer incentives and that the threshold for influencing a consumer behaviour response appears to be low. The review reached no specific conclusions about evidence on economic incentives for obesity and weight loss.

Jain's systematic review of a broad range of interventions for preventing and reducing obesity (27) included a small set of articles that addressed weight loss in the workplace, including several studies that used financial incentives. This review apparently relied primarily on one by Katz et al. (28) of studies on interventions to control obesity in schools and workplaces. Katz et al. cited four studies that involved financial incentives to promote, for example, aerobic exercise, attend group meetings and attain weight loss goals. Neither systematic review, however, drew any conclusions about the impact of these financial incentives on weight loss. Also, neither review included any studies of financial incentives for changing food consumption or purchasing patterns.

A Cochrane Collaboration systematic review on psychological interventions for obesity included three studies that involved local or site-specific economic incentives for weight reduction (29). It did not provide findings for the economic incentives in particular, but grouped them with studies of behavioural interventions. The review found that behavioural interventions and cognitive–behavioural interventions are predominantly useful when combined with dietary and exercise strategies.

A lack of economic intervention appears in other reviews and assessments. Another Cochrane Collaboration systematic review of interventions for preventing obesity in children found no economic interventions (30). Similarly, economic interventions were not included in either a technology assessment by the Institute for Clinical Systems Improvement, in Minnesota, United States of a variety of dietary, exercise and behavioural interventions (31) or a comprehensive systematic review of obesity prevention and treatment conducted by the Swedish Council on Technology Assessment in Health Care (1).

A 2001 systematic review from New Zealand (32) covered 75 studies of environmental interventions (mostly in restaurants, supermarkets, schools and workplaces) to reduce energy intake or density or to affect certain other measures of dietary habits. It excluded studies of policy-related interventions, such as taxation or pricing policies. The authors noted that the quality of the literature available on environmental interventions was generally poor. Although the inclusion criteria for this review allowed for studies on pricing interventions, the small number of pricing studies identified in the literature search was excluded, because they did not assess change in energy intake or density as an outcome.

As the available systematic reviews as a group did not focus or report on relevant studies, it was necessary to identify and summarize the available relevant primary studies here.

### Price change and food purchases

Price reductions (including coupons) have been studied in such local settings as vending machines, restaurants, school cafeterias and markets, where they resulted in increased purchases of fruit, vegetables and low-fat snacks. One randomized controlled trial, one non-randomized controlled trial, and six prospective time-series or uncontrolled studies examined the effects of economic instruments, including price policies and coupons, on the purchase of healthful foods.

A randomized controlled trial conducted over 12 months studied the impact of different levels of price reduction on the sales of low-fat snacks in 55 vending machines in 12 secondary schools and 12 workplaces in the United States (33). When vending machines were stocked with low-fat snacks discounted by 10%, 25% and 50% relative to higher-fat snacks, sales of the low-fat group increased by 9%, 39% and 93%, respectively. The investigators also reported that, once the cost of healthful foods returned to pre-intervention prices, their sales decreased to baseline levels. In a time-series study conducted in the United States (34), an intervention that incorporated 50% price reductions for low-fat snacks in nine vending machines for three weeks resulted in a 45.8% share (of total snack purchases) for low-fat snacks purchased, compared to pre- and post-intervention shares of 25.7% and 22.8%, respectively. Total snack purchases did not vary by period.

In a non-randomized controlled trial of price reductions, educational health messages and interventions conducted over four months in a restaurant in the United States (35), the price reductions alone led to an increase in the purchase of some of the healthy food. In a time-series study conducted in a cafeteria in the United States (36), temporary 50% reductions in the price of fruit and salad resulted in a threefold increase in their purchase. In another time-series study conducted in two secondary school cafeterias in the United States (37), 50% reductions in the price of fresh fruit and baby carrots resulted in a fourfold increase in sales of the former and a twofold increase for the latter. In another time-series study in secondary school cafeterias in the United States (38), 10% increases in the price of high-fat foods and 25% decreases in the price of healthier foods resulted in low-fat food averaging about 13% of total sales. Based on sensitivity analyses, the authors concluded that sales of low-fat foods would have averaged 9% without the intervention.

An interrupted time-series study conducted in a supermarket in the United States (39) examined the effects of a multipart intervention that consisted of prompting, product sampling and price reductions (store coupons) on low-fat milk, salad dressings and frozen desserts. The study results showed low-to-moderate increases in purchases of all three food types, with the greatest effect on frozen desserts. The study did not appear to isolate the effects of price reductions alone on changes in purchasing behaviour. An uncontrolled intervention (40), in which low-income elderly people (assumed to be at nutritional risk) were given coupons for fresh produce at farmers' markets in the United States, resulted in high levels of coupon use and an additional 20 000 shoppers per year at the farmers' markets over 5 years.

### Food provision

Providing specific types and portions of food is another economic instrument. A small body of evidence supports the use of this direct approach to promoting weight loss, including a few randomized controlled trials conducted by a research team in the United States.

One randomized controlled trial randomly divided 202 men and women into 5 treatment groups: no treatment, standard behavioural treatment (SBT), SBT plus food provision, SBT plus incentives (financial rewards), and SBT plus food provision and incentives (41). The main finding was that food provision significantly enhanced weight loss. At 6, 12 and 18 months, weight losses with SBT averaged 7.7, 4.5 and 4.1 kg, respectively, and 10.1, 9.1 and 6.4 kg, respectively, with the addition of food provision. The incentives, however, did not affect weight loss. An assessment after 12 months of a no-intervention follow-up of 177 of the 202 people (42) found that all treated groups had gained weight and maintained only slightly better weight losses than the no-treatment control group and that the five treatment groups did not differ from each other. The people who lost weight during active treatment and the subsequent no-intervention follow-up were more likely to have increased exercise, decreased percentage of energy from fat, increased nutrition knowledge and decreased perceived barriers to adherence.

A subsequent study (43) by the same investigators randomly divided 163 overweight women into 4 treatment groups: SBT with weekly meetings for 6 months, SBT plus structured meal plans and grocery lists, SBT plus

meal plans plus food provision with subjects sharing the cost, and SBT plus meal plans plus free food provision. Women in the SBT-only group lost significantly less weight than those in the other three groups after 6 months (8.0 kg versus 12.0, 11.7 and 11.4 kg, respectively) and 12 months (3.3 kg versus 6.9, 7.5 and 6.6 kg, respectively). The differences in weight loss among the latter three groups were not significant, however, suggesting that food provision, whether free or with cost sharing, conferred no further benefit. Thus, while providing food appears to result in short-term weight loss, the effect may originate in the structure of meals, which is also achievable through structured meal plans, and the weight loss is difficult to maintain after the intervention ceases.

### Incentives for weight change

The search for studies of the impact of local economic instruments on weight loss yielded seven randomized controlled trials and one non-randomized controlled trial. All addressed particular types of economic incentives in schools and workplaces, including no-cost weight loss programmes (in which participants pay a deposit that is refunded according to their success in the programme), payroll deductions that are returned if weight loss goals are achieved and monetary rewards for achieving weight loss goals.

In a randomized controlled trial to test incentives for weight loss goals (44), 131 university employees were randomly divided into 4 weight loss protocols that involved group versus individual instruction and required versus optional attendance. Participants chose their weight-loss goals and the incentives to be deducted from their pay cheques, which would be returned if their goals were achieved. At the six-month follow-up, participants had lost an average of 5.5 kg. Because the goals and deductions were chosen and not assigned at random, however, it was not possible to discern the independent impact of the financial incentives on weight loss. A second study obtained similar results (45). In the studies on SBT (40,41), financial incentives did not affect weight loss. A large randomized controlled trial of interventions for smoking cessation and weight control (46) randomly grouped 32 workplaces to receive either health education classes plus payroll-based incentives with self-selected weight loss goals or no intervention for 2 years. Among the 2041 participants in the intervention group who lost weight, the loss averaged 2.2 kg, but there was no significant effect for weight across all those participants.

A multigroup randomized controlled trial (47) tested individual and group monetary incentives of various sizes that were contingent on weight loss by 89 males aged 35–57 years who were more than 13.6 kg overweight at baseline. All participants forfeited US\$ 30, US\$ 150 or US\$ 300 at the outset. This money was returned to them at various rates (US\$ 1, US\$ 5 or US\$ 10, respectively) per 0.45 kg lost, up to 13.6 kg. Three groups were given incentives as individuals and three as a group. All groups received written material on self-monitoring, diet and exercise, self-motivation and other aspects. The interventions lasted 15 weeks, and weight changes were assessed after a year. All six groups maintained average weight losses after a year, with slightly greater losses among the groups with individual-contingent incentives. A Cochrane Collaboration review that included this study (29) noted that it was subject to substantial selection bias.

A study of workplace interventions that used behavioural and financial approaches (various levels of lottery draws and cash prizes) were followed over a twelve-month period (48). Those given behavioural counselling with or without financial incentives showed an early significant decrease in body fat, but there were no significant changes in percentage of body fat for any of the groups after 12 months.

In the non-randomized controlled trial (49), 1304 participants chose to take part in a six-month weight loss correspondence programme that either cost US\$ 5 or required a deposit of US\$ 60, to be returned based on success in the programme. The average weight losses for the groups were 1.8 kg and 3.6 kg, respectively.

The studies noted in this section did not require specific methods for weight loss. People who lost weight are likely to have changed their food consumption, exercise patterns or both. The evidence from these studies as a group indicates that financial incentives do not substantially affect weight loss. Most of the studies used financial incentives in conjunction with other programmes, such as correspondence, behaviour therapy and food provision, making it difficult to attribute any weight changes to the financial incentives.

### Other incentives

In a randomized controlled trial that tested nonfinancial incentives (50), 210 students were randomly divided into one of two groups with different levels of academic rewards for participating in a voluntary exercise programme intended to decrease their percentage of body fat. At a twelve-week follow-up, the group that received the higher

rewards – bonus points for a course grade – showed greater adherence to exercise and had lost significantly more body fat (3.3%) than the group that received the lower rewards – bonus points on an examination (1.4%).

In a non-randomized controlled trial (51), two inner-city London primary schools with a total of 749 students were given either no intervention or one that included videos of hero figures who ate fruit and vegetables and small rewards: a prize and a sticker for eating fruit and vegetables. This study found a significantly higher fruit and vegetable consumption during the intervention, during follow-up and while students were at home. A prospective observational study of 402 students in three primary schools in England and Wales (52) that used the same intervention also found a significantly increased consumption of fruits and vegetables.

## Conclusions

The evidence available suggests – but does not demonstrate – that the introduction of economic instruments, particularly in the form of taxes and price policies, could reduce purchases of certain foods and increase purchases of others. Further evidence is needed to clarify the national or regional policy-related economic instruments best suited for these purposes. Policy considerations would benefit from including the following observations, needs and suggestions.

1. Price inelasticity for foods may dampen the effect of economic instruments and could be regressive. Any policies that raise prices of popular, but unhealthy foods without some complementary intervention, such as subsidies for healthy food, may be viewed as inequitable.
2. Compared to tobacco and alcohol, specific foods to which to apply taxes or other pricing policies are more difficult to identify. Research is needed to establish definitions and characteristics of foods suitable for taxation or subsidy through some form of nutrient profiling.
3. Consumer reaction, administrative costs and commercial food industry considerations need to be evaluated before introducing economic instruments. Implementing educational campaigns in conjunction with taxing and subsidizing foods should be considered.
4. Providing rewards and other incentives for consumption of healthful foods in schools may introduce students to healthy eating, encouraging healthy eating habits at an early age.
5. Tax revenues generated from the sale of foods high in saturated fats could be used to subsidize the cost of healthful foods or health promotion programmes.
6. To the extent that policy-makers choose to implement economic instruments in the absence of rigorous studies, these interventions should be subject to prospective, continuing evaluation and comparison with alternative means of promoting healthy dietary behaviour and more exercise.

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## 15. Actions and policies to promote physical activity

### Main messages

- There are many cost-effective opportunities for promoting physical activity as part of daily life in a range of settings, especially at the local and community levels.
- Interventions that have proven sufficiently effective – such as school-based physical education, comprehensive workplace approaches, active transport and urban planning strategies such as mixed land use – should be given priority for further development.
- Promoting physical activity requires engaging different sectors and shifting from individual- to population-based interventions.
- Future interventions need to be systematically evaluated and of adequate length.
- Complex interventions and natural experiments require the development of innovative study designs and methods for evaluation

In many arenas of practical public health research, assessing the evidence, particularly on effectiveness, is a challenge. This is especially true of physical activity, in which broader understanding of its relation to environmental conditions is relatively new and rapidly developing, requiring new tools and methods to understand the nature of the associations observed, such as those between the walkability of a neighbourhood and its residents' levels of physical activity.

This chapter reviews the evidence for the effectiveness of strategies to promote physical activity. This can be done intentionally or directly: the health sector typically takes action through health promotion interventions. Promotion can also be implicit or indirect: other ministries or sectors take action that affects levels of physical activity, regardless of the original objective of the intervention; for example, reduced-speed zones, introduced to increase road safety, may also promote more cycling and walking.

The literature was reviewed to collect and summarize evidence from peer-reviewed articles (including epidemiological studies and reviews) pertaining to the promotion of physical activity in the WHO European Region and elsewhere, focusing on current evaluations of interventions and programmes that have been shown directly or indirectly to improve physical activity in individuals (children and adults) and populations.

### Interventions to promote physical activity

This chapter presents current evidence on the effectiveness of interventions to promote physical activity and has two main parts. The first reports on recent systematic reviews; the second, much larger part looks at results by settings and sectors: transport, urban planning and housing, leisure and sport, education, workplace and health services (including non-published evidence) and discusses the implications for research.

### Results of systematic and other reviews

Sallis et al. (1) reviewed seven published evaluations of environmental and policy interventions to promote physical activity and showed that two studies (2,3) encouraging stair use in public places were effective. Kahn et al. (4) systematically reviewed 14 studies for their effectiveness of informational, behavioural, social, environmental and policy approaches to increasing physical activity and concurred with Sallis et al. on the effectiveness of the informational interventions to encourage stair use (2,3); this has since been recommended by CDC (5). Kahn et al. also found that three behavioural and social interventions – school-based physical education, social support in community settings and individually adapted change in health behaviour – and one environmental and policy intervention – creating or enhancing access to places for physical activity combined with informational outreach activities – were effective (4).

Foster & Hillsdon (6) systematically reviewed studies that used environmental interventions to increase health-enhancing physical activity: those that: changed the physical environment by creating new facilities, policies and supporting mechanisms for health-enhancing physical activity; and used the elements of the environment to induce a choice of activity through educational materials. Environmental change studies showed a small increase in health-enhancing physical activity, but the relative impact of environment changes versus individual choices was not evaluated. Several before-and-after studies have observed a weak effect of a simple environmental change to stimulate stair climbing while travelling or shopping.

Matson-Koffman et al. (7) reviewed 129 studies on policy and environmental interventions to increase people's physical activity or improve their nutrition. They concluded that policy and environmental strategies may promote physical activity. The interventions providing the strongest evidence include prompts to increase stair use, access to places and opportunities for physical activity, school-based physical education with better trained physical education teachers and increased length of time students are physically active, and comprehensive workplace approaches, including education, employee and peer support for physical activity, incentives and access to exercise facilities. The authors suggested further research to determine the long-term effectiveness of various interventions with various populations and to identify the steps necessary for their successful implementation.

In their Cochrane review of interventions to promote physical activity, Hillsdon et al. (8) concluded that such interventions moderately affect self-reported physical activity and cardiorespiratory fitness but did not achieve a predetermined level of physical activity. They also noted that only limited conclusions could be drawn about the effectiveness of individual components of the interventions, owing to the heterogeneity of the studies.

Cavill & Foster (9) reviewed the effectiveness of interventions at the community level to promote physical activity. They identified four types of approaches: comprehensive integrated community approaches (including large cardiovascular disease programmes such as the Stanford Five City trial), community-wide campaigns using the mass media, community-based approaches using person-focused techniques and community approaches to environmental change. They concluded that, although the larger-scale community programmes had some positive results, they had not tended to demonstrate population-level impact. Smaller-scale programmes that translated behaviour change techniques more normally used in primary care to the community setting produced more positive results. Highly visible campaigns were also somewhat successful.

Zimring et al. (10) reviewed the evidence linking the design and intended use of a site to physical activity. Individuals' intentions for physical activity seem to be particularly significant and should be kept in mind when designing interventions. Zimring et al. (10) defined several types of physical activity: "recreational" is aimed at diversion, exercise and pleasure; "instrumental" is the product of routine activities such as walking to and from work or climbing stairs in a building; and "hybrid" physical activity results when a person decides to be physically active during routine activity, such as choosing stairs over a lift, not primarily meant to exercise or achieve health benefits.

Reviewers consistently found that, although certain interventions were promising, they had many methodological and other shortcomings, of which no or poor evaluation was key. Hillsdon et al. (8) noted that the interventions were heterogeneous and that most studies included lasted no more than one year, creating difficulty in assessing the long-term effects of interventions (11). Ogilvie et al. (11) highlighted the fact that many interventions, often natural experiments, are not well evaluated. Thus, most reviews called for better evaluation of the effects on population health, using well-designed prospective (and where appropriate, controlled) studies. These studies should use varied methods of evaluation to provide multiple perspectives on the supposed causal relationship between a complex intervention and its effects.

In conclusion, systematic reviews found strong evidence on the effectiveness of the following interventions: school-based physical education with well-trained physical education teachers, prompts to increase stair use, social support in community settings and individually adapted health behaviour change, comprehensive workplace approaches and creating or enhancing access to places for physical activity combined with informational outreach activities. Moderate evidence supports a positive association between urban-design features such as residential density, street connectivity and mixed land use and transport-related physical activity (12) and an association between both perceived and objectively determined environmental attributes (such as aesthetics, convenience (sidewalks), access (green spaces), safety and security) and increased physical activity.

## Results by setting and sector

The following sections highlight the evidence on interventions in transport, urban planning and housing, leisure and sport, education settings, occupational settings, health services and the policy environment.

### Transport

Work in the United Kingdom on the ratio of life-years gained as a result of the health benefits of cycling to those lost through cyclist deaths on the road (13) supports an earlier study estimating that the health gain from cycling far outweighs the health risks, such as those of traffic crashes and pollution (14). Transport policies designed to promote cycling and make it safer could increase this ratio (15). These estimates are supported by studies investigating the link between transport-related physical activity and health, which have indicated that regular walking and cycling (in commuting, for example) positively affect health (16,17). For example, a study in Denmark on a cohort of 30 000 people over 14.5 years found that physically active people had a lower mortality rate than physically inactive people. In particular, those who did not cycle to work had a 39% higher mortality rate than those who did, irrespective of other leisure physical activity and the other factors investigated (Box 15.1) (16).

The suggestion that more cycling and walking could increase the number of road traffic accidents is not supported by comparisons between countries in Europe (20). As shown in Fig. 15.1, increased active transport appears linked to reduce road crash deaths, implying that the presence of walkers and cyclists improves the awareness of motor vehicle drivers or that policies to separate motorized from nonmotorized transport are effective (20). The number of deaths associated with physical inactivity in the European Region is estimated to be about five times as high as those caused by road traffic crashes (21,22).

#### Box 15.1. Cycling cities: Odense, Denmark and Sandnes, Norway (18,19)

The city of Odense was the official National Cycle City of Denmark from 1999 to 2002. By the end of 2002, cycling traffic in the municipality had increased by 20%, according to Statistics Denmark, thus meeting one of the project goals. Even though bicycle traffic in Odense has markedly increased, the project also managed to reduce the number of accidents involving cyclists by 20% compared with 1996–1997. Further, the evaluation estimated savings of €4.4 million for the health sector, largely attributed to increased safety and a reduction in noncommunicable diseases. All the goals were achieved during the three-year period.

The city of Sandnes, Norway combined the promotion of active living with environmental concerns in its cycling initiative. As part of the city's transport plan, a project was started with the support of the Ministry of Environment and the Directorate of Public Roads: "Sandnes will be the 'Bicycle Town' of Norway. The project will develop cycling in Sandnes as an alternative to motor vehicles. In Sandnes there are many separate pedestrian and bicycle paths, but they are not linked together. The main object is to make the existing roads continuous by building new roads and linking them together."

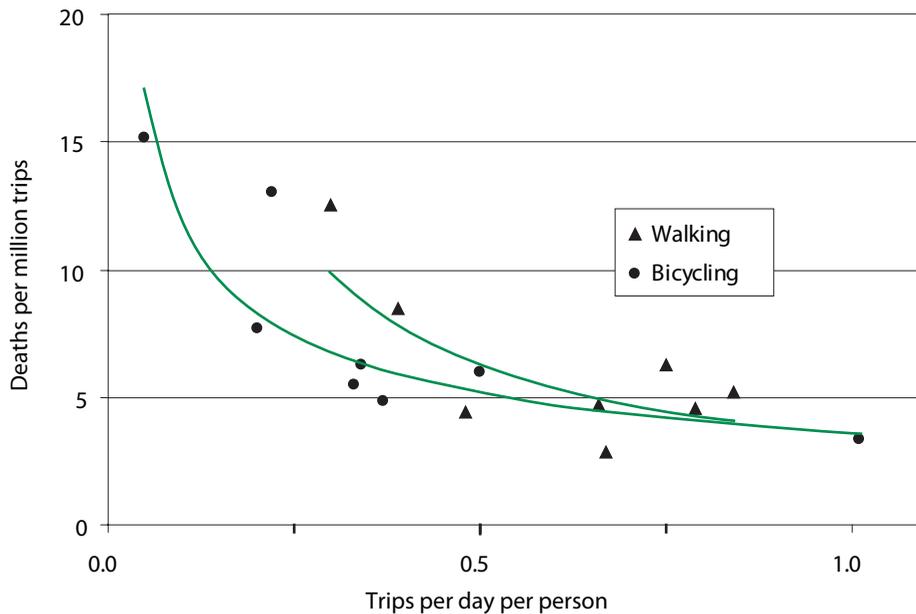
By promoting cycling as opposed to car use, the project both encouraged people to travel more actively and alerted them to the great harm motor vehicles cause to the environment. Further, the project intended to prepare the city for the change by adapting conditions to meet cyclists' requirements. It was hoped that Sandnes would become "a more bicycle-friendly city with a conscious cycling culture" (18).

### Increasing physical activity through active transport

Ogilvie et al. (11) systematically reviewed the best available evidence on the effects of population-level interventions to promote a shift from using cars towards walking and cycling. Of 22 studies that met the inclusion criteria, 4 found a significant positive effect from:

- the Walk In to Work Out self-help package from Glasgow, Scotland (see the section on workplace initiatives);
- the TravelSmart programme from Perth, Australia, which targeted behaviour change;

Fig. 15.1. Levels of cycling and walking and road crash fatalities in eight European countries, 1998



Source: Jacobsen (20).

- a programme in California, United States that offered subsidies to staff who commuted by modes other than driving; and
- the opening of a train station in Voorhout, Netherlands.

As part of the European Youth Heart Study, Cooper et al. (23) studied 300 primary-school children wearing an accelerometer to record minute-by-minute physical activity. The study concluded that children who walked to school were significantly more physically active than those who travelled by car. Cycling was associated with higher overall physical activity only among boys (Box 15.2).

### Box 15.2. TravelSmart projects in the United Kingdom

The NGO Sustrans is beginning a major expansion of TravelSmart, an innovative community-based programme to change the way people travel (24). TravelSmart works with households offering tailor-made information and support that allows people to walk, cycle and use public transport more often through a process known as individualized travel marketing.

Sustrans is working on four TravelSmart projects targeting a total of more than 60 000 households, including large-scale individualized travel marketing projects in Worcester and Peterborough, as part of their Sustainable Travel Demonstration Town programmes. Eight TravelSmart projects completed during 2003–2005 and targeting 15 000 households reduced car travel 9–14% by promoting walking, cycling and public transport directly to households.

### Cost-effectiveness of active transport

A cost-benefit analysis of completing walking and cycling track networks in three cities in Norway included some of the health effects of walking and cycling and the barrier effect related to motorized road traffic. The work resulted in net benefit-cost ratios of 4, 14 and 3 for the three cities covered by the study, respectively, supporting the economic soundness of investing in walking and cycling infrastructure (25). A valuation of the

health benefits of cycling in Great Britain found an annual net benefit of £500 (about €740) per cyclist commuting to work per year (26). An analysis of several examples in Switzerland concluded that investments in cycling and walking infrastructure yielded better cost–efficiency than comparable investments in road or public transport infrastructure projects (27). Wang et al. (28–30) estimated the cost of investing in trails in Nebraska, United States. They found that, even though changing environments to create physical activity opportunities might be resource intensive, building bicycle and pedestrian trails may be cost beneficial from a public health perspective because the direct health benefits alone might outweigh the expenses of creating the trails (30). These studies and recently developed guidelines for cost–benefit analysis of investment in cycling (31) can be used to support moves to promote cycling and walking and to integrate them with public transport.

### Quality of the environment

Humpel et al. (32) reviewed 19 quantitative studies that assessed the relationships between physical activity behaviour and perceived and objectively determined attributes of the physical environment. Such attributes as aesthetics, convenience and access were associated with an increased likelihood of physical activity (see also Chapter 11). Saelens et al. (33) and Owen et al. (34) echoed these findings, concluding that aesthetics, perceived convenience of facilities for walking (sidewalks and trails), accessibility of destinations (stores and parks) and perceptions about road traffic and busy roads were associated with walking for particular purposes. These conclusions are also relevant to urban planning and housing.

### Urban planning and housing

Changes in land use and the built environment have the potential to enable people to be more physically active (35). At the population level, Badland & Schofield (12) suggested that such changes could lead to considerable long-term benefits such as reducing health care expenditure, infrastructure costs, traffic and pollution.

### Planning and building

Several authors have reviewed the relationship between physical activity and the built environment; most detailed a positive association between physical activity and key factors including perceptions of accessibility, actual accessibility, neighbourhood walkability and aesthetics (32,33). Badland & Schofield (12) reviewed the existing evidence on various urban design factors and physical activity behaviour. They concluded that mixed land use was the urban design variable most likely to affect the walkability of neighbourhoods; this in turn encourages physical activity (33,36,37). Two studies supported this conclusion. A study in Australia (37) found that men and women who reported an increase in the convenience of walking facilities in their neighbourhoods were twice as likely to have increased their walking. A study in South Carolina, United States (38) found that residents of neighbourhoods with well-maintained sidewalks and bicycling routes were more likely to reach the recommended 30 minutes' physical activity per day.

An intervention study on street lighting in London, United Kingdom (39) found that improving lighting greatly improved public confidence, and increased the intensity of street use after dark and walking in general. Blamey et al. (2) and Brownell et al. (3) targeted individuals' behaviour around stair use and convincingly showed that a simple and very inexpensive intervention could substantially increase physical activity in public places: buildings in both studies had adjacent stairs and escalators; after signs were posted encouraging stair use, the observed rates of walking up them approximately doubled in both studies and declined when the signs were taken down (Box 15.3).

Finally, the availability of playgrounds and other play areas is conducive to physical activity among children. In Hamburg, Germany the intersectoral Moving Kids initiative – designed by the health, parks and road departments, town and district planners and landscape architects – focuses on day-care centres and supports the development of areas for play and physical activity that offer children a variety of choices (42). Components of this project include redesigning playgrounds and designing new forms of gymnastics for parents and children.

### Reducing sedentary lifestyles at home

Watching television appears to be linked with sedentary lifestyles, low levels of physical activity and obesity (43). Three school-based randomized controlled trials in the United States aimed to reduce television watching within

### Box 15.3. Finland on the Move programme: a pilot study

The Finland on the Move pilot programme tested a top-down model for promoting health-enhancing physical activity through funding, communication, training and consultation support for a wide variety of small-to-medium local projects. The programme proved to be feasible, cost-effective and successful in generating new grassroots physical activity interventions (40).

The characteristics for successful projects included: a well-defined basic idea, realistic goals, broad acceptance, clear identity, genuine commitment, tailoring for target groups, monitoring sensitive to small changes, phasing of activities, focused financial support, combining individual and community approaches, and building competence for personnel. The model was chosen as the framework for the subsequent national Fit for Life programme (41).

During the first five-year programme phase, 855 projects were granted about €2 million. Although no reliable scientific evidence shows increased physical activity or improved health and functioning at the population level, a recent external evaluation indicated a variety of positive effects from Fit for Life: generating new collaboration, improving prerequisites for physical activity, increasing awareness in the population, activating previously inactive middle-aged people and generation of new physical activity services (41).

a broader health promotion initiative including increasing physical activity; they appear to have succeeded in changing television-watching behaviour by using health education and practical skills development to increase knowledge and awareness (44–46). Further research is needed to determine the long-term effects, such as potentially increased physical activity, associated with reducing television viewing among young children (46).

### Leisure and sport

Regular participation in sporting activities positively affects people's health and is an important way to promote health (47). Discussing the successful physical activity policy environment in Finland, however, Vuori et al. (48) propose that the emphasis has shifted in the past 20 years from competitive and elite sport to health-enhancing physical activity for all. Multisectoral policies have led to substantial changes in the public funding of sports organizations and services and the construction of sports sites, and three successive five-year national programmes for physical activity promotion have been launched. New opportunities to participate in physical activity have thus become available, and the infrastructure and networks for provision of services have been strengthened. The Netherlands has also shifted from organized sport to "sport for all" (49), which aims to reinforce the local sports infrastructure to support both the intrinsic and social aims of sport, to use it to contribute to solutions to local social issues and to make local links between various sports providers and between them and other sport-related sectors, such as education, recreation, social services and health care.

In the United States, Evenson et al. (50) documented (through site visits and a telephone survey) the public availability of school physical activity facilities and the reasons facilities were not made available to the public, identifying the barriers to and benefits associated with having facilities available. The barriers are relevant to European countries: facilities were normally open only to students; there were supervision and personnel requirements, safety concerns and insurance and liability issues; and some facilities were private or church-owned. Evenson et al. (51) found that the most common benefits of allowing the public to use school facilities were that they provided a space in which young people could keep active and created good publicity for the school.

### Education

Schools are an ideal setting for health promotion in children and adolescents (see Chapter 8). Unfortunately, many interventions have been fragmented into single projects. The challenge is to integrate health promotion into schools' educational system and to plan and coordinate interventions so that they address specific needs (51). Schools can mainly promote physical activity among children and adolescents by using different approaches, as described below. Two or more of these probably need to be combined to affect health behaviour significantly (52).

### Increasing supervised physical education

For a significant proportion of children, physical education is the main opportunity to engage in moderate and vigorous physical activity (53). Physical activity in schools can be increased by increasing the proportion of physical education in the curriculum or by extracurricular, supervised sessions, such as lunchtime exercise clubs and after-school exercise.

If physical activity at schools is the only way to increase children's physical activity, the amount needed is rather high. Studies with a moderate amount (3 sessions of 30 minutes weekly) have rarely been able to increase total physical activity or decrease obesity (52). Content is also an important issue, since well-planned physical education can help improve children's skills and physical self-esteem, which may then lead to increased physical activity at leisure (53).

### Increasing unsupervised physical activity at schools

In many countries, students have more time for breaks than for curricular physical education. Unfortunately, the time spent in strenuous activities during breaks is often very low (54).

Improving the environment, facilities and equipment in schoolyards (for playing ball games and climbing) could probably increase physical activity during recess. Concerns remain about bullying, personal injury and lack of proper supervision, for which schools might be held liable. In Finland, the Ministry of Education gives financial support to local communities for building neighbourhood sports facilities (playgrounds for unorganized physical activity for children and adolescents) in, for example, schoolyards. In addition to recess, physical activity could be incorporated in teaching music (dance) and biology (excursions to the countryside or urban parks).

### Active transport between home and school

Children and adolescents who walk or cycle to and from school seem to have higher levels of average and vigorous physical activity than those who travel by car, bus or train (55). The main barriers to walking and cycling to school, according to children and parents, are excessive travel distances, traffic-related danger, poor weather and fear of crime (51). These barriers may be overcome by multiple interventions, including environmental solutions to make walking and cycling safer (such as traffic-calming measures, sidewalks and safe street crossings), adult supervisors who walk or cycle with children, classroom education, newsletters and contests for frequent riders (56).

The Safer Routes to School project is a successful active travel initiative to and from school (Box 15.4). For example, walking buses, where adults accompany children in a group walking to school along a set route picking up additional passengers at specific stops along the way, have rapidly developed throughout the United Kingdom and are increasingly being introduced in other European countries, such as Italy, where several cities are experimenting with walking buses (see Chapter 13).

### Workplaces

Most adults spend most of their time away from home in the workplace. It therefore represents an important setting for opportunities for physical activity (see also chapters 11 and 13). Promoting health and a healthy environment at work is also one of the priority objectives of the WHO global strategy on occupational health for all (58).

#### Box 15.4. Safe Routes to School, United Kingdom

St Luke's School, in Lancashire, has a school travel plan action group that meets regularly (57). It set targets of reducing car journeys to and from school by one third over two years and increasing cycling from 0% to 5% over the same period. At the start of the travel plan in March 2004, car use was 57%. The action group reviewed the plan in December 2004 and resurveyed the pupils. There had been an increase in walking from 43% to 53%, with a corresponding decrease in car use from 57% to 47%. Bicycle use had not increased at the date of the survey but this may be due to the time of year that the survey was performed.

### Increasing physical activity at work

A systematic review by Dishman et al. (59) found that drawing conclusions about workplace physical activity interventions is difficult due to their poor outcomes and methodological shortcomings. In contrast, Proper et al. (60) found strong evidence for a positive effect on physical activity and musculoskeletal disorders and limited evidence for a positive effect on fatigue. No evidence supported an effect on overall physical fitness or other health outcomes. A more recent systematic review by Engbers et al. (61) aimed to assess the effects of workplace health promotion programmes with environmental changes on several factors, including physical activity: of 13 studies, 3 focused on physical activity and the results were inconclusive.

As to individual studies, at least two (one in Switzerland and one in the United States) focused on encouraging stair use and found statistically significant positive results (62,63). Chan et al. (64) found that a pedometer-based physical activity intervention, the Prince Edward Island–First Step Program, increased physical activity among sedentary workers; participants experienced significant average decreases in BMI, waist girth and resting heart rate. A decrease in waist girth and heart rate was significantly related to an increase in steps per day. Chan et al. estimated that, four weeks into the intervention, participants' steps per day increased from approximately 7000 to 10 500, even though they were not given a specific target. The participants invested approximately 30 minutes per day in increasing their physical activity (Box 15.5).

#### Box 15.5. Commuting to work – European Mobility Week 2005 (65)

Employers and businesses, irrespective of their size and resources, can contribute to resolving commuter traffic problems. This would benefit the employer, the employees and the wider community in various ways.

- Active commuting can contribute to the improvement of employees' health by reducing car use and pollutants in the ambient air.
- Alternatives to the solo-driven car can help employers to achieve their environmental management goals.
- Active commuting can improve the accessibility of the premises for employees, deliveries and visitors.
- Money can be saved by reducing costs for constructing and maintaining car parks and reducing the budget for reimbursing travel costs.
- Employers can show their commitment to society's concerns and express the importance of ethics in businesses.
- If employees feel that the authority or company for which they work cares about finding solutions to commuter traffic problems, they will also care and identify themselves with the employer.

### Active transport between home and work

In a randomized controlled trial of the efficacy of an active transport information pack (Walk In to Work Out – including practical information and an activity diary) to increase walking and cycling to work at three workplaces in Scotland, Mutrie et al. (66) found a significant increase in the proportion of intervention group workers who walked to work, but cycling was unaffected. Wen et al. (67) pilot-tested an active transport study over a twelve-month period in a workplace and found that a combined social and individualized marketing campaign in this setting can increase the use of active transport (Box 15.6).

### Incentive schemes

A study in Australia assessing potential motivators for and barriers to workplace physical activity initiatives for less-skilled workers (69) found that most insurers incorporated physical activity elements into injury prevention programmes. Workplace managers identified reduced premiums and lower-cost programmes through insurers as possible motivators. Both insurers and managers identified workers' reluctance to participate in physical activity, lack of awareness of potential benefits and programme cost as major barriers. Others included potential adverse effects on productivity and increased injury risk.

### Box 15.6. Mit dem Rad zur Arbeit – Going to work by bicycle (68)

In 2001, the General German Bicycle Club (ADFC) and AOK Health Insurance launched a campaign seeking to stimulate healthy everyday cycling. Starting in one city in Bavaria, this initiative was extended to several regions between 2001 and 2005.

Employees who participated in this campaign received a special action calendar, which they used to enter the working days on which they cycled to work, either directly to the company or to the nearest bus stop or other means of public transport. Those who cycled on a certain number of working days within a given time period, fixed by individual federal states, were eligible to win attractive lottery prizes. For this purpose, companies built teams of four employees each. In the 2004 campaign, more than 60 000 cyclists from about 3200 companies participated.

### Cost-effectiveness of workplace physical activity

Promoting health and physical fitness among employees has led to many benefits, including improved quality of work and higher productivity; reduced turnover, sickness and absenteeism, accidents and stress; longer healthy working life and healthy retirement for staff; and good public relations and additional incentives in staff recruitment for employers (70). Promoting the health of the workforce also makes good business sense. A review of the evidence on the economic benefits of occupational health promotion, including physical activity promotion (71), concluded that the costs of absenteeism could be reduced by about one third and that each €1 invested produced savings of €2.5 to €4.85. Costs from illness were expected to be reduced by about one quarter, and the cost-benefit ratios found ranged from 1:2.3 to 1:5.9.

### Health services

As interventions based in general practice have had some success in other areas of public health, such as in reducing smoking (72), this is also a potential setting for strategies to promote physical activity (73). Reviews of research on physical activity interventions in general practice have found that the evidence supporting them is not conclusive (74) or that the benefits are only short term (75).

Clinicians can try to promote physical activity through exercise referral or prescription. A controlled trial on the impact of prescriptions found modest short-term improvements in physical activity (73). A written goal-oriented exercise prescription, in addition to verbal advice, is a useful tool for general practitioners in motivating their patients to increase physical activity (76,77). In Australia, Huang (78) found that physicians can facilitate positive behaviour change for their patients in their role as agents of change and respected authorities on health. Huang (78) suggests that current best practice for general practitioners incorporates the “five A’s” approach:

- ask (identify those who can benefit)
- assess current activity level
- advise in individual terms
- assist by providing a written script for action and support material
- arrange appropriate referral and follow-up.

### Implications for policy and research

This review shows that interventions of adequate length need to be systematically and thoroughly evaluated to provide policy-makers and practitioners with robust, up-to-date evidence. Policy-makers should therefore support the implementation of evaluation as an integral part of projects and interventions, and allocate appropriate funds for the task.

Further, evidence shows that alternative study designs need to be identified (79), since research on public health policy and practice and many of the major social determinants of health often cannot be randomized for practical or political reasons. In addition, evaluation needs to be extended to interventions developed outside the health sector, and the capacity to carry out cost-benefit analysis needs improvement.

Finally, individuals' intentions in terms of physical activity seem to be particularly significant and should be kept in mind when designing interventions. Recreational physical activity is aimed at diversion, exercise and pleasure; instrumental physical activity is the product of routine activities such as walking to work, and hybrid physical activity results when a person decides to be physically active during a routine activity, such as choosing stairs over a lift.

Policy-makers and other stakeholders in all concerned sectors should thus aim at implementing evidence-based interventions to promote physical activity, as identified in this chapter, accompanied by systematic evaluation. They should also encourage novel approaches where appropriate and support the identification of alternative study designs.

### Importance of an intersectoral approach

Evidence from other strategies for promoting public health – such as tobacco control, enforcing the use of seat-belts and promoting breastfeeding – indicates the potential for success despite the complex nature of these issues. These successful models have predominantly targeted promoting physical activity and preventing obesity at the population level (80), rather than focusing on the individual. A broader change in social environments is warranted (81), as is an effort to strike an appropriate balance between strategies addressing environmental determinants and individual behaviour.

Implementing environmental and population strategies requires involving people and resources from sectors and settings such as schools, workplaces, municipalities and communities. Environmental and population policy requires multisectoral collaboration through strong networks and alliances involving all relevant authorities and sectors that have direct or indirect responsibility and opportunities for promoting physical activity. Importantly, this requires strengthening the health sector's capacity to play a stewardship role and become more effective in establishing dialogue and partnerships with other sectors and understanding the levers that can trigger their support. To achieve this, the health sector needs to strengthen its capacity to develop compelling arguments, identify win-win opportunities and highlight the benefits for other sectors from supporting more physically active lifestyles.

National and regional public authorities have an important role in providing a strong foundation for building local motivation and capacity, as well as drawing attention to health-enhancing physical activity as an important determinant of health and a relatively new field of work. Plans, programmes and strategies should be based as far as possible on local involvement. The impact is likely to be greater if local communities have interest in and ownership of the work.

Thus, national and regional public authorities should increasingly allocate responsibility for the development of knowledge, motivation, political mobilization, resources and action at the local level. The authorities should set clear priorities among the measures and strategies for supporting the local level, and integrate them into national action plans for physical activity. Local governments need technical, motivational and fiscal support to initiate a successful local process of political mobilization.

Specifically, local decision-makers with relevant experience should be involved in establishing technical and economic relationships with local government. Their proximity to and knowledge of their region's municipalities and communities make such a connection natural. To build local capacity and policy to increase physical activity, the alliance of local and regional partners should include collaboration with different regional authorities. Such an alliance should aim to develop:

- an information base on and awareness of physical activity as an important determinant of health;
- political education, involvement and decision-making;
- interdepartmental and intersectoral work, including voluntary and private stakeholders;
- more opportunities to become active;
- thematic plans and integration within existing plans;
- inclusion of local and regional physical activity initiatives in budgets;
- targeted and continued work; and
- evaluation of the work.

Several networks and associations work to increase physical activity through policy and environmental interventions, even though the impact of their work may not yet have been assessed. For example, the European network for the promotion of health-enhancing physical activity (defined as any form of physical activity that benefits health and functional capacity without undue harm or risk) issued guidelines for the promotion of walking and cycling as a means of transport (82). Major national initiatives, strategies or programmes to promote health-enhancing physical activity are being implemented in many countries in the WHO European Region, including Belgium, Denmark, Finland, the Netherlands, Norway, Slovenia, Spain, Sweden, Switzerland and the United Kingdom (21), but a platform for sharing experience with developing and implementing evidence-based policies and strategies was lacking. To fill this gap, the European network was relaunched in May 2005 as an international, collaborative initiative working closely with the WHO Regional Office for Europe. The overall vision of this initiative is to achieve better health through physical activity among all people in Europe (83).

### Overview of strategies

As demonstrated in this chapter, policy-makers have many opportunities to intervene to make environments less obesogenic and to encourage individuals to choose more activities at the home, at school, in the workplace, in the community and in the built environment. The ANGELO (analysis grid for elements linked to obesity) model provides a means of structuring the analysis of these opportunities (42); the analysis grid is designed to analyse factors that promote overweight and obesity and to help health and other ministries set priorities among areas for intervention and research (see also Chapter 17).

Table 15.1 gives examples of the use of this approach in which the four main sets of factors or settings – physical, economic, policy and sociocultural – are considered in terms of potential actions on physical activity. The physical setting refers to what is available in existing infrastructure (such as parks and playgrounds), capacity-building opportunities (such as research and implementation expertise on physical activity) and information (such as physical activity in the school curriculum). The economic setting addresses the related costs (such as the cost of building bicycle paths) and the income available to pay them (such as taxation schemes, parking and zoning fees) or resource needs, such as those required to train staff. The policy setting refers to rules, legislation, standards and strategic goals and action plans. The sociocultural setting refers to the many different cultural approaches specific to communities and individuals, including those relating to gender and faith, as well as contemporary popular icons such as celebrities and sport stars, and their interpretation and communication through the mass media.

Table 15.2 considers these same factors and applies them more specifically to government opportunities for action, both within the health sector and through other ministerial responsibilities. It follows the strategies for effective food and nutrition initiatives (STEFANI) model developed by Robertson et al. (85) and applies it to action in relation to health promotion through physical activity.

Making full use of the potential for environments to support active living requires long-term strategies and investment. Individuals and societies can achieve significant gains, especially when stronger partnerships between sectors are built to maximize policy impact. More effective ways and arguments therefore need to be developed to win the support of all relevant sectors. Attracting the attention of other sectors may require developing cross-cutting policy instruments – such as air quality targets and carbon emission targets linked to the reduced use of motorized transport – or developing cost-benefit approaches showing, for example, the elevated productivity and reduced social care burden of physically active employees.

### Conclusions

This chapter summarized the findings of systematic and other reviews on the effectiveness of promoting physical activity. This body of evidence convincingly shows that interventions to promote physical activity directly and indirectly can be effective. Several key issues emerged.

First, there are many cost-effective opportunities to promote physical activity as part of daily life across a range of settings, particularly at the local and community levels. Interventions that have proven sufficiently effective – including school-based physical education, comprehensive workplace approaches, active transport and urban planning strategies such as mixed land use – should be given priority for further development.

**Table 15.1. Analytical grid to identify opportunities for intervention with examples of elements that can be developed to populate the grid**

Settings	Elements			
	Physical	Economic	Policy	Sociocultural
<b>Macroenvironmental</b>				
Education system	National standards for outdoor areas Standards for the design of safe school playgrounds and safe walk-to-school routes	Investment in school facilities for play and sport Payment for staff supervision of play and sport	Policies on television watching in kindergarten and school Teacher training to include physical activity methods	National support for use of school facilities during weekends Curriculum respecting girls' needs and students' religious beliefs
Transport system	Awards for design of safe junctions, crossings and walkways Standards for the design of separate bicycle lanes	Tax incentives for using active transport Subsidies and incentives to local authorities for safe road design	Intersectoral collaboration on the built environment, retailing and transport Review accessibility standards for out-of-town retail	Celebrity promotion of active transport on children's television Integrated health and environmental campaigns by NGOs
Sport and leisure activities	Provision of local leisure and sports facilities Provision of play areas in new housing	Reduced fees for use of local facilities Tax incentives for workplace health and fitness schemes	Criteria for commercial sponsorship of sports Land-use standards to protect sports fields	National awards to municipalities with high uptake of sports facilities Popular television soap operas to promote more physical activity
Urban and rural design	Cross-country routes for safe leisure cycling Neighbourhoods designed for walking to retailers and schools	Incentives to invest in pedestrian-friendly neighbourhoods Investment in rural footpaths and bicycle paths	Standards for interconnectivity of streets and buildings Priority given by police services to safe streets and parks	New images of street safety and security Promotion of countryside access and walking opportunities
<b>Microenvironmental</b>				
Home and community	Placing of lifts and stairs to encourage active climbing Bicycle racks and secure storage on public streets	Social housing investment to include opportunities for physical activity Investment in user-friendly stairwells	Family policies on television watching and computer use Policies to encourage people to use nearby retailers	Television promotion of family activities and sport Church and community group active outings and sport
Schools	Provision for play and sport spaces for all children Restrictions on traffic along school routes Bicycle racks at schools	Budget to provide facilities for recess and after-school activities Fund-raising programmes for sports and games equipment	Policies for minimum activity time during the school week Policies to encourage parents to conduct after-school activities	Sports celebrities to promote school team games Lessons to include dance and self-defence
Workplaces	Redesign jobs to include minimum activity levels Facilities for employees, such as bicycle racks, showers and gyms	Incentives for bicycle use Assisted purchases of bicycles, sports equipment and gym membership	Car parking and bicycle use policies Standards for break-time and lunch activity On-site health promotion advisers	Lifts and escalators labelled as aids for special needs Increased opportunity for promotions or bonuses from participation in workplace activities
Sport and leisure facilities	Location and attractiveness of fitness centres, swimming pools and game pitches Access to leisure centres from footpaths, bicycle paths and transport nodes	Costs of use of facilities, especially for low-income people Financial incentives (free events and vouchers) to encourage use	Open-to-all or members-only policies Safety and security standards for parks and game areas Support for free access to sports facilities for children and elderly people	Women-only nights Additional activities, such as dance classes and self-defence classes Weekly competitions to promote the use of swimming pools

Table 15.2. Strategies for effective physical activity promotion: action by health and other ministries

Setting	Action	
	Health ministry	Other ministries
Physical (What is available?)	<p>Facilities to increase physical education at school in the curriculum and other initiatives, such as lunchtime exercise clubs</p> <p>Facilities to promote the concept of green prescriptions (written advice from a health professional to a patient to be physically active as part of the patient's health management) so that both practitioners and patients take them seriously and implement them</p>	<p>Interventions to improve the built environment, such as informational interventions increasing stair use</p> <p>Contribution by urban planners and the transport sector to promoting active travel to and from school and the workplace</p> <p>Contribution by the education sector and local governments to promoting the active use and/or improvement of existing playgrounds and green spaces in schools and urban settings</p> <p>Improvement the medical school curriculum by the education sector to include education on health promotion and specifically promoting physical activity through the health services</p>
Economic (What are the financial factors?)	<p>Creating financial incentives for health practitioners to promote physical activity</p> <p>Including health practitioners in decision-making committees discussing the economic benefits of promoting physical activity and other health promotion</p>	<p>Cost-benefit analysis and other cost studies, carried out by the finance ministry, on the impact of active transport and on interventions in the workplace and school</p> <p>Documentation by the education sector of the costs involved, thus making studies and evaluations more feasible</p> <p>Financial support from the education ministry (such as in Finland) to support local communities in building sports facilities (such as playgrounds)</p>
Policy (What are the rules, legislation and recommendations?)	<p>Promoting health promoting hospital initiatives</p> <p>Developing best practice guidelines for physicians and other practitioners, such as incorporating the "five A's" approach (74)</p>	<p>Intersectoral initiatives such as Partnership for a Walkable America (84) initiated by the transport sector</p> <p>Promotion and dissemination of health-enhancing physical activity initiatives</p> <p>Promotion of health promoting school and workplace initiatives</p>
Sociocultural (What are the attitudes, beliefs, perceptions and values?)	<p>Training and encouragement to ensure that health practitioners feel ownership of the promotion of physical activity</p>	<p>Top priority given by local government to issues such as neighbourhood safety (reducing crime and traffic accidents), as the main barriers for active travel include traffic-related danger and fear of crime</p> <p>Consideration of both perceived and objectively determined environmental attributes such as aesthetics, convenience and access, as they are associated with increased physical activity</p> <p>Change of time slots for cartoons and other children's television so that after-school hours can more easily be spent in active pursuits</p>

Second, promoting physical activity requires engaging various sectors (and thus the capacity to gain their support) and a shift from individual- to population-based interventions. In particular, local governments and communities should be mobilized and supported; strong networks and alliances should be built to increase involvement, and multisectoral action should be implemented at the local level.

Finally, future interventions should reflect the multifaceted nature of the promotion of physical activity by developing alternative and innovative study designs and ensuring systematic evaluation and adequate project length. The review highlights the need to improve the capacity and range of methodological tools to assess the effectiveness of complex interventions in real-life situations.

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## 16. Designing and developing a strategy to prevent obesity

### Main messages

- Tackling obesogenic determinants at an early stage in the causal pathway requires a multisectoral and multiactor approach. The ministries and sectors involved in implementation should also be involved in developing the strategy.
- The national situation needs to be analysed to illustrate the problem and to mobilize multisectoral commitment.
- The government and its ministries need to reach consensus on the significance of the problem, its determinants and their shared responsibility for improving the situation.
- The government has a role in managing the process of developing, implementing and monitoring a national strategy to prevent obesity.

This chapter illustrates a possible method for designing a national strategy for preventing obesity. It gives a framework for the collaboration process that can facilitate the move from identifying the problem to identifying practical measures that can contribute to solving it.

The WHO Global Strategy on Diet, Physical Activity and Health (1) emphasizes that tackling obstacles to healthy habits at an early stage in the casual pathway requires society-wide approaches throughout the process. The Global Strategy therefore recommends that regional and national strategies have a long-term perspective and be: multisectoral, comprehensive, multidisciplinary, participatory, and based on scientific research and evidence.

The European Charter on Counteracting Obesity (2), which was adopted by the ministers and other participants at the WHO European Ministerial Conference on Counteracting Obesity in Istanbul, Turkey in November 2006, reinforces this approach and highlights the role of government ministries, local authorities, civil society, the mass media and the private sector. The approach requires active involvement from the ministries responsible for policy sectors that directly or indirectly influence dietary habits and physical activity. The Charter mentions the ministries responsible for agriculture, food, finance, trade and economy, consumer affairs, development, transport, urban planning, education and research, social welfare, labour, sport culture and tourism. As their participation is necessary to implement measures for preventing obesity, their participation in designing the strategy and the measures is equally necessary.

The process of developing the Charter involved government sectors, international organizations, experts, civil society and the private sector through dialogue and consultation. A similar participatory process is recommended to governments for developing national strategies. When a participatory approach is applied from the very beginning, stakeholders in all sectors can take part in designing the strategy and thus obtain ownership of it. A strategy is more likely to be feasible if opinions and obstacles to change are discussed at an early stage. A broad invitation to take part in the development process creates the basis for commitment, which is necessary to change the social, economic, cultural and physical environment.

Chapter 13 discusses the recommendations made at the 2005 WHO expert consultation on childhood obesity (3). As to policy, the participants called for:

- an overall framework, such as a government-supported multisectoral action plan;
- commitment to implementation, including the provision of adequate resources; and
- involvement of stakeholders in setting priorities among and evaluating measures.

Considerable political will is needed to implement policies affecting economic enterprises or requiring resources. Even when there is agreement on which factors need attention, a political process is still needed.

The process needed to develop policies for obesity prevention can be broken down into logical steps, which need not be taken in sequence, and can be likened to models for risk assessment combined with those for health impact analysis (4). The starting point can be a scoping exercise used to identify the key issues of concern to interested parties at an early stage in the planning process. This exercise summarizes the known risk factors, adds expert opinion and incorporates any evidence for the success of interventions; it also looks at the potential harm of interventions – for example, stigmatization and encouraging eating disorders – if there is evidence of this, too.

The scoping exercise leads to an assessment. It takes the results of the exercise and maps them into flow diagrams that enable upstream and downstream relationships to be brought into the process, gaps in knowledge to be identified and participants' values to be incorporated. Stakeholder participation in this part of the process helps improve the understanding of the public health concepts involved in population-wide interventions. It also can help prevent participants from holding overly simplistic views, such as victim blaming (“it’s their own fault if they get fat”) or the value of health education (“just give consumers the information and they will make the right choices”). The goal is to ensure that stakeholders are in a position to participate in the discussion of risk assessment strategies and to come to an agreement on the range of feasible obesity prevention policies.

Once an agreement is reached on the upstream factors that need attention, a political process is likely to decide appropriate means of achieving change – for example, through voluntary measures, legislation, or initiatives led by government, local authorities, NGOs or commercial interests – and to resolve questions about funding, providing human resources for the intervention activities and developing the capacity to undertake these activities.

This approach to public health intervention recognizes the need for beneficiaries of an intervention to be participants in its development and implementation. The Ottawa Charter for Health Promotion (5) states: “Health promotion is the process of enabling people to exert control over the determinants of health and thereby improve their health”, not only individually, but also through, for example, education and economic advancement and the development of social capital, to create environments conducive to health.

The Ottawa Charter framed the challenge for public health by reaffirming social justice and equity as prerequisites and by proposing advocacy and mediation as the processes for their achievement. Using the Ottawa Charter as a reference point, preventing obesity would be seen as only one benefit of a larger social gain. Also, based on the Ottawa Charter, any evaluation of an intervention should include the gains made in a community’s ability to protect and promote its own health. Thus, social and political empowerment becomes one of the indicators of health gain (6).

## Procedure for developing a national strategy

This chapter illustrates a procedure to involve many stakeholders while simultaneously ensuring political leadership. The procedure has five steps that are explained below with text and Fig. 16.1–16.5 (7). Fig. 16.1–16.5 show all the actors involved in the process, but highlight those that are active in each step.

The five steps to a national strategy for preventing obesity are:

1. setting the scene by developing a national situation analysis and mobilizing multisectoral involvement;
2. taking political responsibility by deciding to develop a national strategy with a multisectoral approach;
3. implementing the multisectoral approach by developing measures within each relevant policy area;
4. formulating a comprehensive strategy by combining input from the various policy sectors; and
5. starting implementation by the government and/or parliament’s ratifying the strategy.

### 1. Setting the scene

Somebody must set the scene and initiate a national dialogue on the serious consequences of obesity, how it is linked with diet and physical activity and the widespread responsibility for identifying solutions. In most countries, the health ministry and its national authorities are responsible for describing dietary habits, physical activity, overweight and obesity among various population groups. National and international data can be analysed to lay the basis for creating awareness about the health, social and economic effects of obesity and the shared responsibility for action to improve public health. To find arguments and create a solid basis of national facts to refer to, the health ministry and its bodies should therefore:

1. describe the current national prevalence of overweight and obesity and assess the dietary habits and level of physical activity in the population and subgroups that differ in age, sex, socioeconomic status and geographical area;
2. prepare plans for implementing a system for monitoring overweight, obesity, dietary habits and physical activity in the future;
3. establish national dietary and physical activity goals based on nutrition recommendations (8–10), national dietary surveys and national physical activity surveys;
4. identify the most urgent changes needed, such as doubling the consumption of fruit and vegetables or halving the consumption of sweets, soft drinks, cakes, biscuits, ice cream and similar types of food;
5. identify the underlying national determinants of food consumption and physical activity, such as food supply, retailers' role, changes in food processing, transport, entrance fees at sports grounds and location of play and recreation areas;
6. identify and assess the groups and sectors that can influence the determinants of dietary habits and physical activity;
7. collect and analyse current national policies, strategies and goals and analyse how current processes can be integrated in such policy areas as inequality in health, cardiovascular diseases and public health reform, as well as school development, young people's recreation and food advertising;
8. compile a description of possible actors and solutions in combination with the estimated cost to society, the national analysis of the health situation and the national determinants for food consumption and physical activity;
9. formulate an overall societal goal that could be applied to all sectors, such as organizing society so that the healthier choice is the easiest choice for all groups;
10. formulate this goal with reference to dietary habits and physical activity: for example, organizing all settings so that it is easier to choose fruit than cake; and
11. present the comprehensive document to the national government with reference to the European Charter on Counteracting Obesity (2).

Carrying out this first step requires competence and experience in the health ministry and/or its counterparts (Fig. 16.1). An established and inspiring international discussion is going on, and the necessity of involving several policy areas, all levels of society and many stakeholders to prevent obesity is widely accepted. International actors include WHO, FAO, UNICEF, the World Bank, the International Labour Organization (ILO), the Council of Europe and the EU.

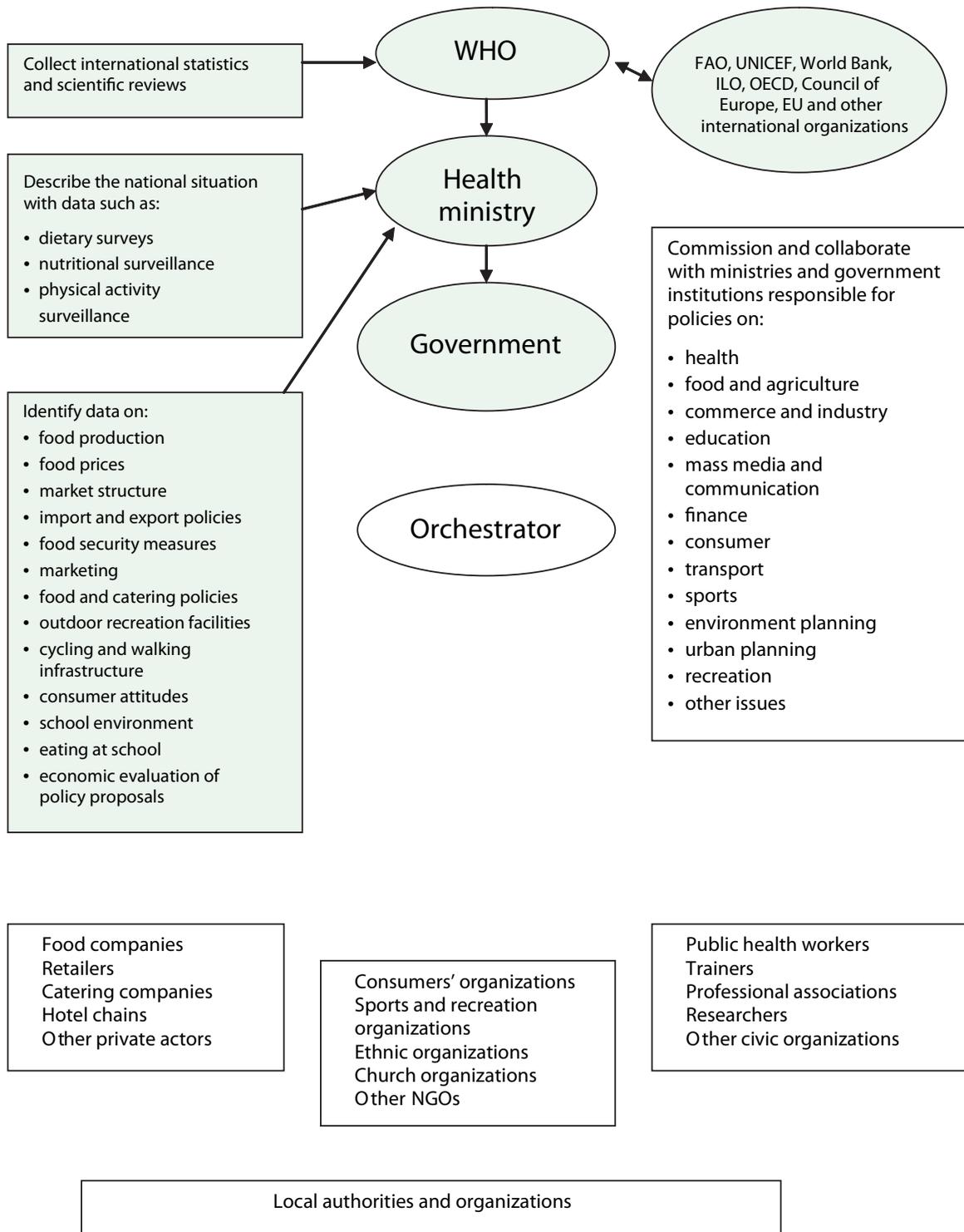
In the European Charter on Counteracting Obesity, the health ministers in the WHO European Region declared their commitment to placing the issue of counteracting obesity high on the political agenda of their governments and to acting on it. Health ministers face the challenge of finding ways to disseminate the issue from their ministries and securing recognition of its priority from the whole government. If a multiple-policy approach is desired, other ministries than health must take up and tackle the issue.

## 2. Taking a multisectoral approach

In most countries, the health ministry is responsible and has the technical expertise for initiating a process to address obesity, alert the rest of society to the seriousness of the problem, provide information on its extent and formulate nutrition and physical activity goals. A single ministry, however, does not have the mandate to design measures to be implemented by others. Measures to combat obesity extend into a range of ministries such as agriculture, commerce and industry, education, the mass media and communication, finance and transport. Obtaining the multisectoral approach called for in the WHO Global Strategy on Diet, Physical Activity and Health (1) requires basing the development of measures in each of the relevant ministries. Without input in the analysis and commitment from the relevant sectors, a policy will not be transformed into action.

Although procedure would differ between countries, the whole government needs to declare officially its decision to develop a strategy for preventing obesity. One conclusion from the WHO European Ministerial Conference on Counteracting Obesity is that political leadership at the highest level is required for progress and that this commitment has to be manifested formally.

Fig. 16.1. Setting the scene: step 1 towards a national strategy for preventing obesity



Source: adapted from James & Rigby (7).

When the health ministry has developed the situation analysis, framework of a strategy and overall goals, it presents them to the government. Consensus has to be reached within the government and its ministries on the significance of the problem, its determinants and, most importantly, the shared responsibility for identifying solutions and commitment to action.

The government as a whole needs to declare its commitment to a multisectoral approach and its intention to act, and decide on goals. With several ministries involved, coordination is needed. One way to secure this is for the government to appoint a high-level, independent coordinating body with the responsibility to guide, combine and facilitate the efforts of all actors. This body can take the form of a national committee comprising experts and administrators representing the relevant policy areas. The health ministry and health professionals are essential members and might chair the committee.

In this chapter, the coordinating body is called the orchestrator. To be successful, it must have a mandate and legitimacy, support integration within existing institutions and processes, engage representatives and establish participation, coordinate between decision-making levels and monitor performance. The orchestrator should report directly to the government or parliament and be capable of providing leadership and competence to coordinate intersectoral approaches to prevention strategies.

In addition, the government, not the orchestrator, should commission ministries to take part in the initiative (Fig. 16.2). The ministries that should be involved might differ from country to country; as mentioned, however, the European Charter on Counteracting Obesity (2) emphasizes agriculture, food, finance, trade and economy, consumer affairs, development, transport, urban planning, education and research, social welfare, labour, sport, culture and tourism as having essential roles to play in developing health promoting policies and actions.

### 3. Developing measures in each relevant policy area

Step 3 illustrates a possible method of transforming the general policy and goals into specific measures and allocation of resources.

No country in the European Region has yet succeeded in breaking the trend of increasing obesity rates. The urgency of the problem calls for inventive solutions and structures, as traditional structures tend to favour traditional solutions (11). Ministries that have the means to make changes in policy areas that influence transport priorities, food prices, school food policies and the design of play areas need to be actively involved in identifying measures from an early stage. This publication outlines measures that could be initiated, but the cultural context will determine which should be taken (see Chapter 17). The process of selecting measures includes a sifting or filtering procedure: analysing relevance in the national context and cost–effectiveness, and setting priorities.

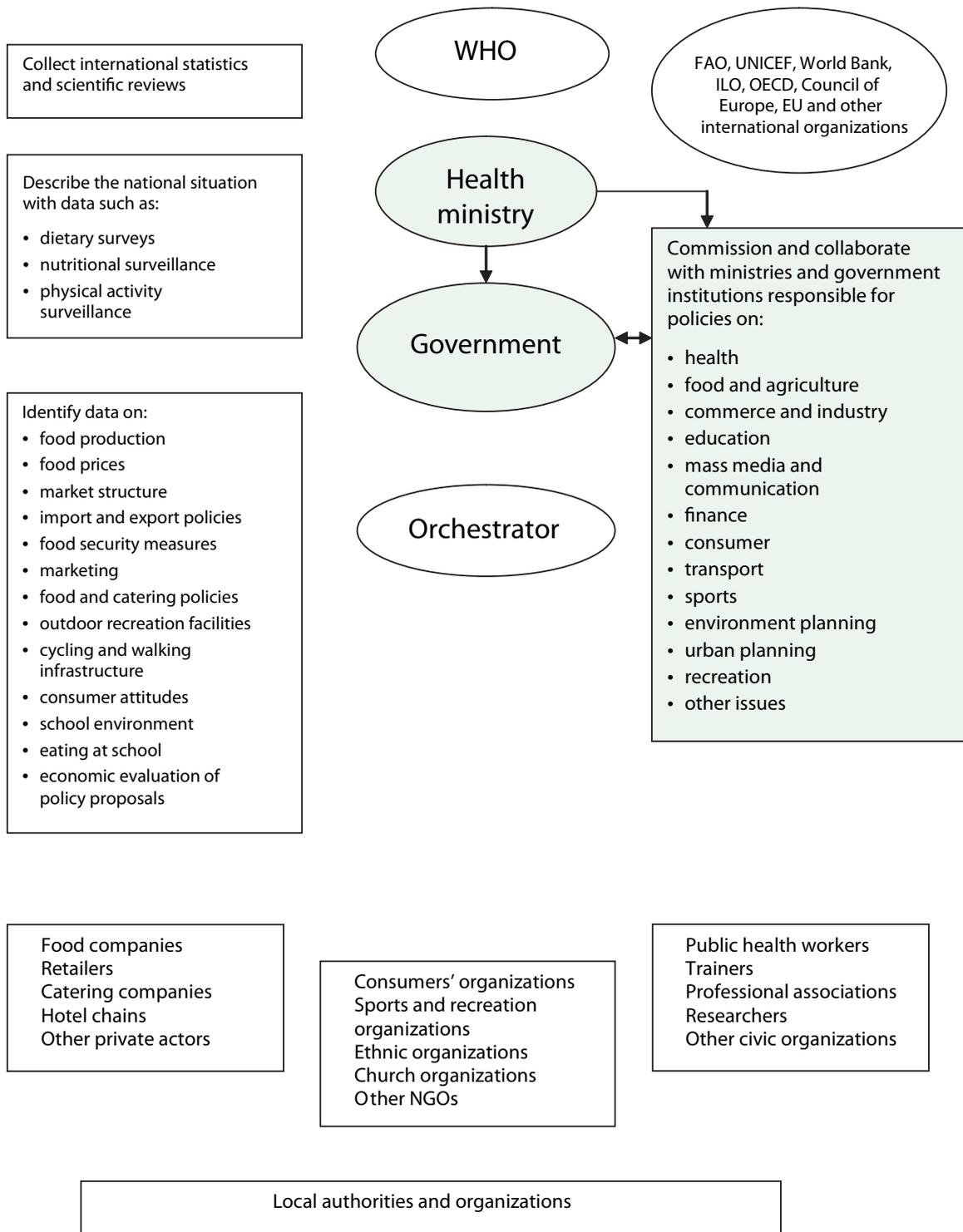
The government or parliament commissions each of the ministries identified to take the lead within its respective policy area, but they cannot succeed without engaging numerous stakeholders. The stakeholders that are relevant depend on the policy sector. The European Charter (2) gives as examples local authorities, civil society, the private sector and the mass media. Each ministry needs to identify possible informants, actors, stakeholders and arenas within its policy area. Civil society includes employers, consumers, parents, young people, sport and trade unions. A guiding principle of the Ottawa Charter for Health Promotion (5) is that people should be enabled to take control of the determinants of their health to improve their health, and this emphasizes the importance of engaging stakeholders at all levels of society. Chapter 18 further discusses stakeholders' roles and responsibilities.

Meetings of and between stakeholder groups can generate further advantages:

- access to relevant information and networks from a broad range of sectors in society;
- development of innovative strategies and ideas;
- efficient implementation;
- ownership of the policy process by all actors; and
- creation of new knowledge that is more than the sum of the participants' experience.

Direct methods for consultation with stakeholders have been developed, such as the Delphi technique, which incorporates expert opinions, value judgments and agreements in the process of building consensus among a panel of stakeholders, to reach mutually agreed judgement principles (12). Another approach uses selected juries as a stakeholder panel that participates in a debate conducted along adversarial lines and then works to reach

Fig. 16.2. Taking a multisectoral approach: step 2 towards a national strategy for preventing obesity



Source: adapted from James & Rigby (7).

an agreed verdict (13). A range of other consultative techniques – for example, structured focus groups, group feedback analysis and convergent interviewing – form a body of qualitative methods under the general umbrella of action-research techniques (14). Also, multicriteria mapping is a new technique that offers semiquantitative methods for producing descriptive maps of the debate and eliciting the framing assumptions behind the positions taken by stakeholders (15).

During the development process, both supportive and unsupportive forces need to be treated openly and flexibly to explore and confront conflicting views at an early stage (16,17).

Chapter 13 discusses what is meant by target groups. Traditionally, target groups are specified with reference to the life-course, such as preschool children or elderly people. Using this approach is a limitation, as it can be interpreted to mean that interventions should directly affect the group whose health is in question. This might lead to traditional health promotion activities, such as encouraging individuals to improve their eating habits and physical activity. Instead, action needs to be developed that leads to changes in the conditions for people's habits (18). Changing the conditions keeps the focus on the overall goal of organizing society so that the healthier choice is the easiest choice for all population groups.

With this approach, the target group for action to prevent obesity is the providers of health information, policy-makers in such areas as pricing and marketing, professional groups and public opinion leaders (Chapter 13). This supports the view presented as the socioecological model, which emphasizes the relationships between individual factors and the social and physical environment (19–22). In this model, measures taken by public actors at the national, regional and local levels are integrated with those taken by private and nongovernmental local actors.

Identifying clear objectives understandable to everybody involved facilitates the formulation of measures. For example, if the overall societal goal is to make the healthy choice the easiest choice, each ministry and its stakeholders can discuss how they can contribute to this goal by addressing such questions as: what employers can do to increase the availability of healthy food for their employees, what schools can do to develop surroundings that encourage physical activity and how the road network can be designed to encourage active transport.

Nevertheless, measures cannot be designed as a wish list. All measures must be applicable in practice. Know-how is just as important as know-what. This means that stating what could be attained, such as “schools should be healthy”, is not enough. The measures must indicate how this will be achieved and identify a responsible actor. The conclusion might well be that a whole set of measures is required, each with a different responsible actor. For example, making schools healthy may require measures affecting teacher training and schools' physical environment, meals and curricula. Every suggestion for a measure should be questioned: how can this be achieved? The answer must comprise specific actions, a responsible actor for each action, cost estimates and funding. The orchestrator should collect the measures identified in each policy area by the relevant sectors, and the attached rationale for them.

The following could be considered when formulating measures. Measures should:

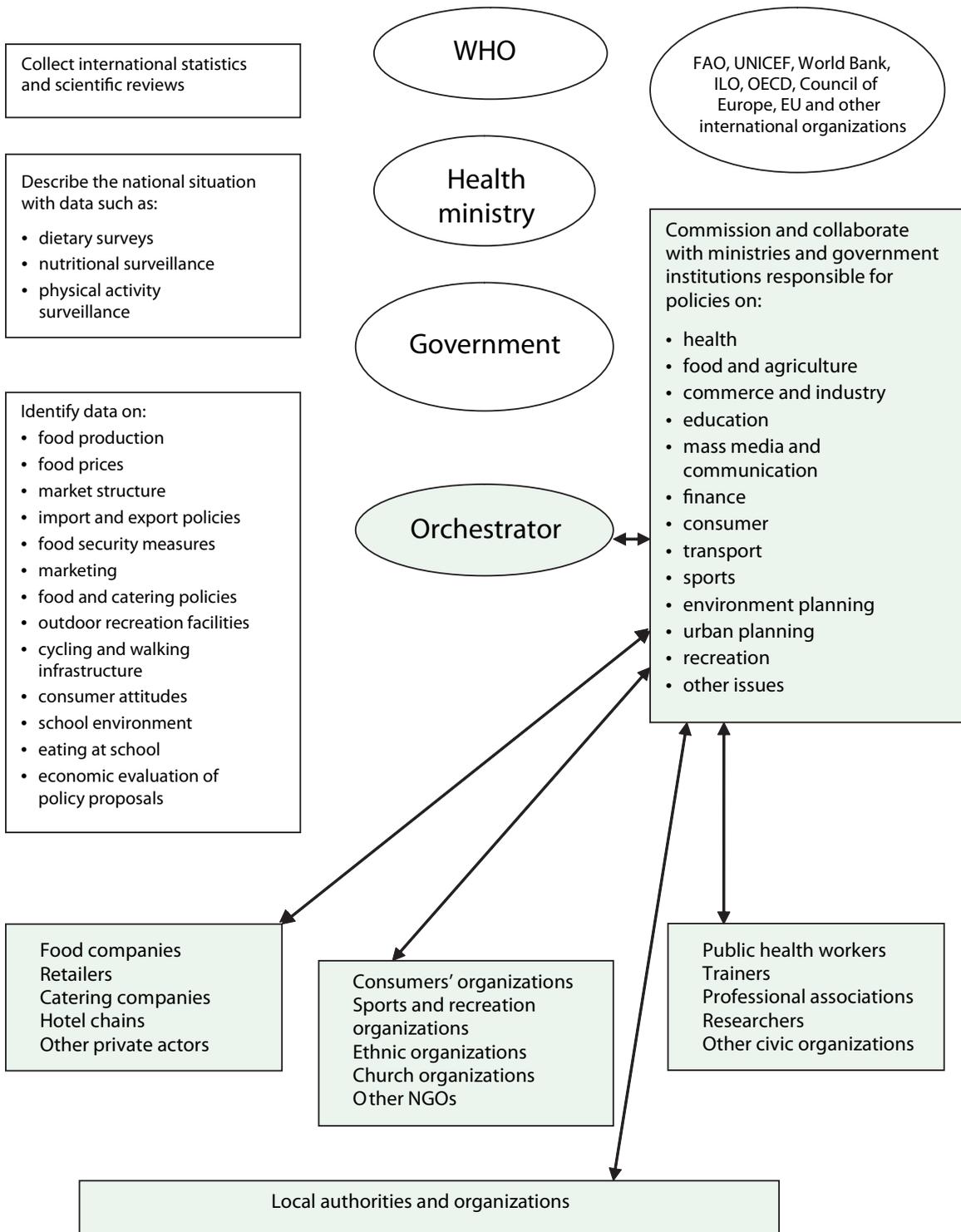
- be integrated with ongoing work;
- be as concrete as possible;
- include indicators to be monitored regularly;
- be linked with a responsible actor;
- include the costs and suggestions for financing;
- be based on best available evidence;
- take account of socioeconomic inequality in health (see Chapter 12).

The second food and nutrition action plan for the WHO European Region for 2007–2012 will describe a series of specific actions that can assist this process (23).

#### 4. Formulating a comprehensive strategy

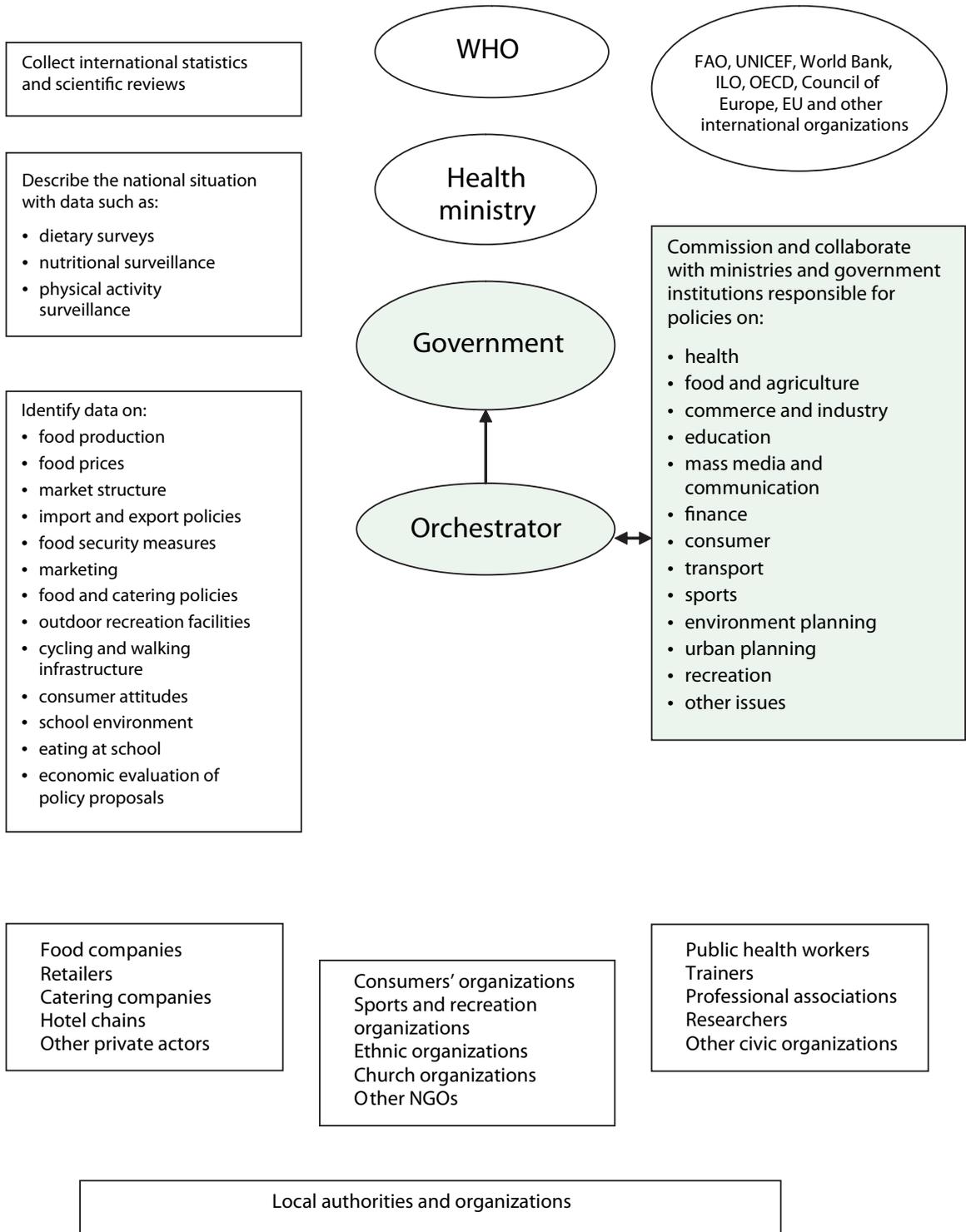
In step 4, the orchestrator compiles and coordinates the ministries' contributions into a portfolio of measures and presents it to the government (Fig. 16.4). This is a demanding and responsible task that requires continuous contact with all actors involved. The orchestrator must analyse not only the contributions but also what is missing, and define how different contributions can be combined. Priorities need to be set. In the process of compiling the

Fig. 16.3. Developing measures in each relevant policy area: step 3 towards a national strategy for preventing obesity



Source: adapted from James & Rigby (7).

Fig. 16.4. Formulating a comprehensive strategy: step 4 towards a national strategy for preventing obesity



Source: adapted from James & Rigby (7).

contributions from different ministries and judging their effects on population groups and stakeholder interests, the orchestrator must consider the appropriate balance for the recommended portfolio of measures (23).

Policy processes are inherently unpredictable and therefore uncertain. Progress needs to be monitored and evaluated over the long term. Structures for systematically monitoring dietary and physical activity patterns, body weight, food production, prices and availability may need to be developed. Evaluating which particular measures have the greatest impact when a battery of measures is implemented may be difficult. The strategy will be powerful only if most of the actions are realized and harmonize with each other, not if measures are picked out and taken in isolation. A comprehensive strategy is more than the sum of the measures included.

A national strategy for preventing obesity should:

1. be based on contributions from a range of political sectors that influence the conditions for the population's dietary habits and physical activity;
2. include measures that address both society and the individual, and are long term, based on the best available evidence;
3. estimate the costs and allocate resources for implementation;
4. ensure that measures are located at several political and societal levels;
5. ensure that measures taken by the public and private sectors, civil society and NGOs correspond and support each other;
6. ensure that efforts have been made to acknowledge the public's views;
7. include measures that address socioeconomic inequality;
8. ensure that every measure has a lead actor appointed; and
9. ensure that the actors strongly support the overall goal and the measures.

### 5. Starting implementation by ratifying the strategy

When the orchestrator has compiled the comprehensive strategy, containing a series of activities in a range of different policy areas, the strategy must still be officially adopted to ensure the commitment of the entire government. The government must clearly state to all ministries, as well as private and civil stakeholders, that it will strive to reach the strategy's goals, that many policy areas have been assigned to carry out the measures and that competent staff are being appointed to lead the implementation and evaluate progress (Fig. 16.5).

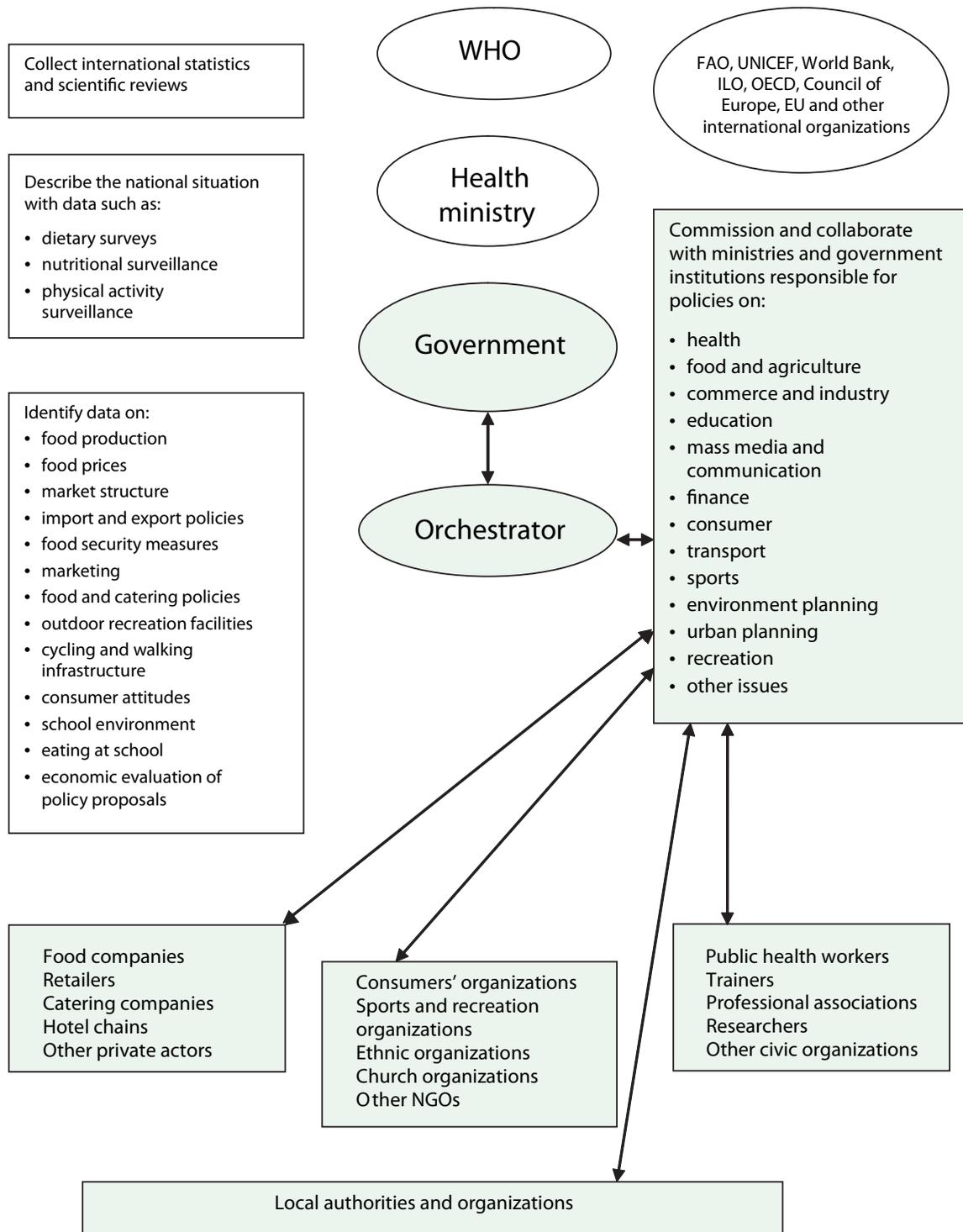
This step is decisive for implementing the strategy. Completing it will show the strength of the political interest, as the purpose of a strategy is not development but implementation. In the European Charter on Counteracting Obesity, health ministers in the European Region declared their commitment to prioritizing and acting on the issue of obesity. The Charter contains nine principles to guide this action; the first reads (2): "High-level political will and leadership and whole-government commitment are required to achieve mobilization and synergies across different sectors."

A strategy to counter obesity can be part of general public health documents such as strategies for combating noncommunicable diseases or of an action plan on food, nutrition and lifestyles; it can also be an independent document with references to related strategies and plans for diet and physical activity. Integrating the strategy with efforts to combat social inequality in health is of special concern, as obesity is closely interrelated with social conditions.

The European Charter states the need for a framework linking the main actors, policy tools and settings when the goals and principles are translated into action. The government might appoint an independent supervising body to coordinate the implementation of the strategy and appoint independent scrutiny agencies to evaluate the impact and effectiveness of the action, so that those responsible for implementing policies do not judge their own success. The coordination body might comprise a series of agencies, as it does not need to be a single office. The coordination body must be able to draw on the expertise and legitimacy of the whole government, so that it is able to make proposals and take action in all the relevant policy areas. Action taken in different areas, with different actors or at different levels (national, regional and local) might require coordinated timing and implementation (24).

Countries in the WHO European Region increasingly need to learn from others' experience. Examples of good practice need to be shared, and the national coordination agency or agencies can compile the national

Fig. 16.5. Starting implementation: step 5 towards a national strategy for preventing obesity



Source: adapted from James & Rigby (7).

efforts, analyse the synergy when many sectors are involved and report to relevant international bodies. A prerequisite for an international catalogue of good practice is national coordinators who have an overview of the measures carried out in different sectors or societal levels and keep track of the quality and comparability of the evaluations.

Among United Nations agencies, WHO has taken a lead in developing policy, but the involvement of sectors such as transport, urban planning, education, labour and culture indicates that other agencies may be interested in the results. The European Charter on Counteracting Obesity (2) indicates that intersectoral collaboration is essential at not only the national level but also the international level. Collaboration should take place at all decision-making levels for the process to be both efficient and effective (25).

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## 17. Preventing obesity: selecting the best investments

### Main messages

- Selecting the best investments for preventing obesity requires assessing the existing evidence and the obesogenic context, followed by formal stakeholder processes that give priority to solution-oriented questions rather than problem-oriented questions.
- This allows the creation of a portfolio of priority actions for preventing obesity that is evidence based, contextually relevant and stakeholder owned. At strategic levels, these can be costed and compared for cost–effectiveness. At the local level they can be chosen as a health investment.

Public health action is often inhibited by a “mismatch between the magnitude and importance of a public health problem, and the adequacy of evidence on potential interventions to address the problem” (1). This is currently the case for obesity. The rapid increase in publicity on obesity over the past five years (2) has now focused attention, particularly of governments, on what to do about the problem. Although childhood and adolescence are emerging as priority age groups for efforts to prevent obesity (3), the paucity of specific evidence on effectiveness clearly to guide the way is a major impediment to action (4).

This chapter describes two processes being used – one at the state or national level in Australia and one at the community level in Australia, Fiji, New Zealand and Tonga – to select the best investment interventions (mainly policies and programmes) to prevent obesity.

The first challenge in each process is to define what could be done to reduce obesity and the next is to set priorities from that list to determine what should be done at a practical level. Both processes combined assessment of the current available evidence and contexts with planned engagement of stakeholders in selecting a portfolio of recommended actions.

### Practice-based evidence

Evidence is not sufficient by itself to guide appropriate decision-making (5), and true evidence-based policy-making is probably quite rare (6). Getting the process right and engaging decision-makers from the start therefore moves towards practice-based evidence (6). This allows for the consideration of many important factors in the decision mix, beyond the existing published material that dominates the classic evidence-based practice approach. A plan to prevent obesity based only on the limited published trials available would be patchy and probably ineffective.

Determining a portfolio of action on obesity therefore requires a set of technical analyses and a process to engage the key stakeholders in all decisions. By maintaining relevance and ownership, the eventual recommendations have a greater chance of being implemented but, as always, political considerations, funding limitations and extraneous events play a major role in what is finally supported.

The elements needed for high-quality priority setting have been well articulated (7) but little applied to obesity prevention, where the task is magnified by its complexity, contextual nature and lack of evidence. Two examples at different levels are presented here; both originated in Australia, but the processes and technical tools could be, and in some cases have been, readily applied in other countries.

### Assessing the cost–effectiveness of obesity interventions

The Victorian Government has supported previous projects to assess the cost–effectiveness of action on mental health, cardiovascular diseases and cancer (8). This approach, used in the assessing the cost–effectiveness of obesity interventions project (ACE-Obesity), includes extensive economic analysis of agreed, specified interventions to reduce childhood obesity at the state or national level, plus a process that engages key stakeholders in selecting the interventions for analysis and then judging the modelling assumptions and several second-stage

filters that mainly relate to implementation issues. It adopts standardized methods to avoid methodological confounding and seeks to provide a balanced approach to setting priorities.

ACE-Obesity's technical features include:

- a clear rationale for the selection of the interventions, including the availability of evidence; relevance to current decision-making on policy, potential impact, achievement of a balance of interventions and ability to specify intervention in clear concrete terms;
- a common comparator, such as current practice;
- a standardized economic protocol, including a consistent approach to the identification, measurement and valuation of costs and consequences;
- a common setting, such as the national population of people aged 5–18 years, and study perspective, such as societal;
- the use of existing data on health system costs and offsets, disease prevalence and incidence, risk factors and disease burden;
- a standard discount rate, such as 3%;
- extensive sensitivity testing of value parameters (discount rate and disability weights) and probabilistic uncertainty testing of technical parameters;
- calculation of incremental cost–effectiveness results (cost per DALY) reported as both discrete estimates (best estimate) and as a range (reflecting uncertainty); and
- a concern for technical rigour, using the best available evidence balanced by awareness of the need for due process.

The second-stage implementation filters include:

- the strength (quantity and quality) of the evidence
- the feasibility of implementing the intervention
- the intervention's potential for sustainability
- the capacity to reduce inequality
- any other positive or negative side-effects
- acceptability to stakeholders.

A working group of stakeholders and a team undertaking the technical analysis decide which interventions to assess and define them in sufficient detail to allow costs, the effects on the health of the population and cost–effectiveness ratios to be assessed. Once this analysis has been done, qualitative statements are included for each second-stage implementation filter. The estimates of cost–effectiveness, total costs and population health gains, plus the second-stage filters, provide the evidence base on which decision-makers can choose a portfolio of potential interventions in which to invest. The portfolio needs to be balanced across settings, between healthy eating and physical activity and between preventing and managing existing obesity. Many of these concepts and processes are also included in a guide to the best options for promoting healthy weight and preventing obesity in New South Wales (9).

The ACE-Obesity project assessed 13 specific interventions (10), including: programmes to promote active transport to school, curriculum-based programmes to reduce soft drink consumption and television viewing, multifaceted school-based programmes, various health care programmes for overweight or obese children, after-school activity programmes and strengthened regulations to reduce television food advertising targeting children.

This modelling has posed several technical challenges, including: the modelling of behavioural changes to changes in weight (11), assumptions about the persistence of reductions in BMI from childhood into adulthood and modelling reductions in BMI to reductions in DALYs lost. An overview of the modelled effectiveness results has been published (10). The Government of Victoria has published a summary of the preliminary findings (12), and Table 13.3 is based on this (see Chapter 13, p. 185).

## Whole-community demonstration projects

Well-evaluated community demonstration projects are an excellent strategy for building evidence on preventing obesity at the community level. Six of these have used a common priority-setting process: three in the Barwon South Western region of Victoria, Australia and one each in Fiji, Tonga and South Auckland, New Zealand. The projects in four countries span three age groups (preschool, primary school and secondary school), high-income and medium- and low-income countries, six main cultural groups and urban and rural settings.

The challenges of defining what could be done and then setting priorities to determine what should be done apply at the community level as much as the state or national level. Similar principles to the ACE-Obesity process were applied in the formative stages of the demonstration projects, although the availability of technical information, on effectiveness and efficiency of interventions, for example, was much more limited. The central feature is ANGELO (analysis grid for elements linked to obesity). Originally developed for scanning environments for obesogenic barriers (13), it provides the necessary structure for conceptualizing the multitude of factors that contribute to obesity; Tables 15.1 and 15.2 (see Chapter 15, pp. 219–220) provide examples of its application to promoting physical activity. ANGELO workshops were used in the formative stages of all six demonstration projects to derive the projects' action plans. Table 17.1 outlines the essential elements of the ANGELO process.

The ANGELO process fits within the overall health promotion process by undertaking a situation analysis, setting priorities for action, gaining consensus on an action plan and building community capacity by increasing skills, knowledge and ownership. For the community projects in which more information was needed on socio-cultural factors (such as those on Fiji and Tonga), preliminary qualitative interviews were conducted to identify the important sociocultural factors related to eating, physical activity and perceptions of body size.

At the ANGELO workshop, the key stakeholders (including young people in the secondary-school projects) were brought up to date with the strategies for influencing changes in population behaviour (such as social marketing, environmental changes, policies and programmes) and the specific evidence on interventions to prevent obesity. They then completed a process in which they set priorities among the interventions and produced a draft action plan. Workshop participants were given a prepared list of about 20 potential behavioural targets, such as reducing television viewing, eating more fruit, participating in more organized sport or eating less takeaway food. The participants altered the wording of the targets or added new targets to suit their context, and then in-

**Table 17.1. The ANGELO process for priority setting to prevent obesity at the community level**

Stage	Components	Outcomes
1. Community engagement	Consulting with and engaging the relevant organizations (such as local government), leaders in key settings (such as schools and churches) and other stakeholders (such as young people)	Support for developing a community action plan Agreement to participate in a priority-setting workshop
2. Gathering intelligence	Collecting data relating to obesity, eating patterns, physical activity and inactivity patterns and sociocultural factors, and identifying existing and planned programmes and activities	Situation analysis for stages 3–4 Modification of the elements for priority setting (ANGELO worksheets) according to local information
3. Updating stakeholders	Updating stakeholders on obesity and its determinants, the evidence on prevention from the literature and health promotion processes <sup>a</sup>	Stakeholders with sufficient information and contextual understanding to develop priorities
4. Scoring priority elements	Participants' scoring elements for change: behaviour, gaps in knowledge and skills, and barriers in relevant environments (such as homes and schools) <sup>a</sup>	List of priority elements ready to mould into an action plan before the end of the workshop
5. Forming the action plan	Grouping common elements into objectives for the plan <sup>a</sup> Later refining and rechecking of the draft plan with stakeholders	Action plan efficiently produced and approved by the community, with ownership by stakeholders

<sup>a</sup>ANGELO workshop components.

dividually scored each for its likely impact on promoting healthy weight and feasibility of behaviour change. The combined scores determined the priority behaviour for targeting.

Next, the participants identified gaps in knowledge (such as what constitutes a healthy school lunch or how much physical activity is recommended) and skills (such as cooking skills and fundamental motor skills), and set priorities. Finally, they rated the elements in each relevant environmental setting, such as schools, homes, neighbourhoods and churches. Prior to the workshop, environmental scans of each setting had identified 10–30 potential physical, economic, policy or sociocultural environmental barriers to healthy eating and physical activity. Workshop participants adjusted them and then set priorities in the same manner.

All the priority components were then merged into a draft action plan with about 8–10 objectives. All plans contained three standard objectives for capacity building, social marketing messages and evaluation. Another four or five objectives focused on specific types of behaviour, such as reducing consumption of sweet drinks and increasing consumption of water. The identified gaps in knowledge and skills and the environmental barriers were included as strategies under each appropriate objective. For example, strategies under the sweet-drink objective included social marketing messages that sweet fruit drinks promote unhealthy weight gain and dental caries and school policies on water, canteens, vending machines and providing more water fountains.

The final one or two objectives in the action plan were novel or developmental: for example, influencing particular environments, such as health promoting churches or reducing the fat content of takeaway foods, or developing new programmes, such as family-centred programmes for overweight children. All community-based intervention programmes are underway, with follow-up measurements between 2006 and 2008 to determine any changes on BMI z-scores compared with control communities.

## Conclusions

Arriving at an agreed portfolio of priority local or national action to prevent obesity requires coupling assessment of the existing evidence and contexts (such as existing programmes, cultural and environmental factors) with a formal process of setting priorities with stakeholders. This ensures, as far as possible, that the portfolio is evidence based, contextually relevant and stakeholder owned.

Two final important points flow from this: all substantial action taken to reduce obesity needs to be well evaluated so that the lessons learned can contribute to the evidence base for preventing obesity, and obesity research funding needs to support this action agenda by giving greater priority to solution-oriented questions (what to do) than problem-oriented questions (what is to blame) (14).

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## 18. Involving different stakeholders

### Main messages

- Involving multiple stakeholders is a crucial part of developing new strategies to tackle the new challenges in preventing and managing obesity.
- Stakeholders from outside the health arena can play a key role in reorienting public health policies.
- Stakeholders should be encouraged and enabled actively to support the implementation of comprehensive long-term strategies.
- Not all stakeholders share a fundamental commitment to health goals. Some must be convinced that health concerns should take priority over their traditional imperatives, and they should be given incentives to act.
- The effective involvement of stakeholders, including those in the private sector, requires that clear strategic objectives be set and combined with a strong policy lead from an independent government agency.
- The stakeholder approach to preventing and managing overweight and obesity can be strengthened by proposals to legislate or regulate, rather than relying on voluntary participation alone.

Involving stakeholders in consultation, dialogue or even more participatory partnership roles is an important component in the development of new health strategies and related legislative processes. Defining who is a legitimate stakeholder and establishing processes to manage stakeholder involvement therefore become important considerations when determining new approaches to tackling obesity. The United Nations Environment and Development Forum (now the Stakeholder Forum for a Sustainable Future) prepared a checklist for those designing multistakeholder processes for the 2002 Earth Summit in Johannesburg, South Africa (1).

A stakeholder may be anyone who affects or is affected by a particular policy or action. This definition permits a broad interpretation of who should be consulted or involved during the development and implementation of health policies. In a different context, WHO (2) offers the following definition:

A stakeholder is any person, group or organisation who holds an important or influential community position, and who might have an interest, investment or involvement in the issue being investigated. Stakeholders include: people in government and other positions of power at a national, regional or city level; local policy makers and service providers, people in the community where projects may be introduced; and people who may benefit (or lose out in some way) from the intervention.

An integrated approach to stakeholder involvement offers the opportunity to identify beneficial synergies. For example, work by the WHO Regional Office for Europe and the United Nations Economic Commission for Europe within the Transport, Health and Environment Pan-European Programme pursues Agenda 21 objectives, which include a specific focus on child and adolescent health and the promotion of physical activity through safer road and transport strategies. This work led to a third high-level meeting, to assess implementation progress by 2007 (3), and represents an opportunity for local community involvement through guidelines amenable to NGO and local government participation.

Nevertheless, wide-ranging stakeholder participation is not always deemed essential. For example, the most recent Swedish Institute of Public Health assessment of the health impact of the EU's Common Agricultural Policy relied on expert review, rather than stakeholder consensus (4).

Many chapters in this book note the broad range of societal influences. These influences are more formally noted as the causal web of societal influences over obesity, developed by IOTF (5).

As mentioned in earlier chapters, a broad range of stakeholders is involved in addressing the challenge of preventing and managing obesity. Non-health sectors of government include agriculture, education, trade, trans-

port, social welfare, housing and planning, finance, culture, the mass media and sport. All these areas of jurisdiction also affect regional and local governments. In the private sector, parties that contribute to the obesity epidemic extend beyond the food and drink, retail and advertising industries. Industrial stakeholders that can make major contributions to preventing and managing obesity include the construction and design, development, automotive, leisure, media and computer industries. Also, NGOs and others in civil society, from professional associations with special expertise to community-focused organizations, offer access to important knowledge networks and resources that can help strengthen proposals and reinforce outcomes.

## Government

Safeguarding public health, particularly for vulnerable groups, is a fundamental responsibility of governments. Governments need to provide leadership and formulate, monitor and evaluate comprehensive policies as described in Chapter 16. Successful policies depend on high-level political commitment, full involvement of all government sectors and effective coordination.

Public health authorities should express a stewardship role and emphasize the importance of public health as a key component in overall strategic planning, following the principle that health should be included in all policies. In addition, the health sector plays an important role in health promotion and disease prevention through specific public health programmes, although health promotion programmes have been found to have little success if implemented on their own. The health sector can also play a leading role in assessing the impact of current dietary and physical activity patterns on obesity and obesity-related burden of noncommunicable disease.

Addressing health issues should be seen a strategic requirement for all departments with economic clout, as suggested in the *Wanless report* (6) from the United Kingdom.

Departments dealing with food, agriculture and fisheries could incorporate public health and nutrition objectives into primary production, food processing, distribution and retail. Departments dealing with consumer protection could ensure that adequate information is provided to consumers and that an adequate system is in place to assess, manage and communicate risks related to the nutritional characteristics of food. Education authorities could ensure that schools influence food preferences and consumption and physical activity, and that adequate nutrition knowledge is disseminated at all levels of education, particularly in the curricula for the health professions.

Sport could ensure the accessibility of facilities. Transport, urban planning and housing could ensure access to healthy and safe food and facilitate physical activity, and could create or re-establish the conditions for making walking and cycling feasible, safe and attractive options. Environment could facilitate outdoor recreation. Labour could promote healthy and safe dietary habits and physical activity in the workplace. Social policy could consider social benefits to improve the access to healthy food and recreational facilities of vulnerable population groups. Government's combined purchasing power can nurture improvements in the quality of food available, and governments can set standards and ensure that support for healthy food is distributed equitably (7).

As a general recommendation, all sectors of government should be engaged as stakeholders in policies to prevent obesity, and support strategies to promote higher nutritional standards and greater physical activity. They should do this by utilizing health impact assessments of their programmes.

## Regional and local government

Regional and local governments are part of the public sector. They have considerable power to influence diet, activity and health through: controlling urban development and planning, adopting standards for healthy cities; managing schools and school catering standards, using group purchasing power to support local markets that sustain local agriculture and horticulture, and setting local economic priorities.

Regional and local governments should be encouraged to recognize their role as stakeholders in the prevention of obesity, to explore all opportunities to implement nutritional health standards in all areas under their authority and to foster greater physical activity.

## Economic operators

Some representatives of the international food and beverage industry have acknowledged their responsibility to work towards improving diet, physical activity and health (8). Many such stakeholders, however – with consid-

erable influence over food production, urban design and development, and transport priorities – do not recognize their important contribution towards bringing about the fundamental changes needed to achieve strategic health objectives.

The advertising and marketing industries serve a range of clients with quite different agendas, including the public sector. Stakeholders in the commercial media thus face a number of conflicting challenges when discussing marketing controls, particularly with respect to children (see Chapter 10). The practice of voluntary or self-regulation of marketing and the advertising media is heavily promoted, with stakeholders representing this sector favouring non-compulsory, self-determined standards. Noting that self-regulation involves inherent conflicts of interest between commercial goals and the requirement to “create a media environment more conducive to healthier choices”, however, the International Food Policy Research Institute suggested that the alternative of multiple-stakeholder regulation may be required if statutory forms of regulation are not to be deemed essential (9).

Primary producers can improve the availability of fruit and vegetables and the nutritional quality of products. Food manufacturers can reduce the levels of saturated fat, added sugar and salt in existing products, and remove *trans* fatty acids from them; consider introducing new products with better nutritional value; provide consumers with adequate and understandable product and nutrition information; and practise responsible marketing. Food retailers can improve the availability of healthy options and reduce the promotion of energy-dense and nutrition-poor foods and excessive portion sizes. The mass media could support awareness campaigns on nutrition and physical activity.

While the internal and external conflicts faced by these stakeholders need to be taken into account when addressing the implementation of a national action plan, they should not be allowed to prejudice public health interests during policy development. Although the fast-food and soft-drink industries are powerful members of the food industry, other significant producers, processors and distributors in the food supply chain have a much broader portfolio of products, which they wish to see associated positively with supporting health. The private sector therefore needs to work closely with government to promote health, by improving nutritional quality across its entire product range and not simply by producing alternative, healthy options.

Involving economic operators in the stakeholder process does not eliminate government’s responsibility to legislate or regulate, where necessary, to protect citizens. A set of principles governing private-sector involvement as stakeholders should be defined to avoid conflict between public policy development and industrial interests and to ensure that the private sector is encouraged to make positive contributions to support public health policies.

## Civil society

The Centre for Civil Society of the London School of Economics adopted the following definition (10):

Civil society refers to the arena of uncoerced collective action around shared interests, purposes and values. In theory, its institutional forms are distinct from those of the state, family and market, though in practice, the boundaries between state, civil society, family and market are often complex, blurred and negotiated. Civil society commonly embraces a diversity of spaces, actors and institutional forms, varying in their degree of formality, autonomy and power. Civil societies are often populated by organisations such as registered charities, development non-governmental organisations, community groups, women’s organisations, faith-based organisations, professional associations, trades unions, self-help groups, social movements, business associations, coalitions and advocacy group[s].

The WHO Civil Society Initiative (11) fosters relations with NGOs and civil-society organizations and is responsible for the administration of formal relations, as set out in its principles for dealing with NGOs (12). WHO builds relations with NGOs to promote WHO policies, strategies and activities and, where appropriate, to collaborate with NGOs in jointly agreed activities to implement them. WHO may also seek to harmonize intersectoral interests among concerned sectoral bodies in various country, regional or global settings. In the stakeholder consultations for the WHO Global Strategy on Diet, Physical Activity and Health, WHO distinguished between civil-society interests and commercial interests.

Civil society is defined by a range of independent institutions, NGOs, trade unions, and advocacy and interest groups. Their interests need to be more clearly defined and perhaps delineated, to avoid groups with primarily industrial and commercial membership from being mistakenly represented as non-profit-making NGOs.

Civil society clearly has the potential to play a role in changing attitudes, creating new social norms and influencing the political process. Nevertheless, the challenge is often to find ways to mobilize people within civil society, to enable representative organizations and NGOs with limited resources to play a full role in stakeholder processes. These processes may involve both consultation and the implementation of action to promote improvements in public health.

WHO recognizes that health ministries benefit from taking special measures to involve civil society. They benefit both from ensuring an appropriate understanding of the big public health issues and from NGOs' help in promoting intersectoral collaboration within government through their diverse and interacting interests. This important role in support of health-ministry interests can help governments recognize their longer-term interests when the priorities of national security, economic development and foreign policy dominate the agenda.

### Contrasting concerns

One of the challenges of working with so many different stakeholders is to reconcile their differing values and concerns. Each sector has distinct and sometimes conflicting concerns. For example, those of the public sector are often determined by national political concerns, and those of the private sector are predominantly influenced by international business perspectives. All sectors' engagement is important in any strategic approach to combating obesity, and decision-making processes based on seeking consensus need to be developed, such as the ANGELO model described in Chapter 17.

In contrast to carefully controlled clinical decision processes, the basis of obesity prevention requires "many different types of evidence and often needs the informed opinions of stakeholders to ensure external validity and contextual relevance" (5).

In expressing its commitment to developing stronger action on obesity in Europe, the Council of the EU (13) noted in 2005 that "obesity is a multi-causal condition which requires a comprehensive preventive approach, including multi-stakeholder efforts at local, regional, national, European and global levels". The EU Platform for Action on Diet, Physical Activity and Health (14), established in March 2005, is a prominent example of a multiple-stakeholder forum. It brings together representatives of industrial groups, advocacy organizations and NGOs, along with representatives of Member States. WHO is represented and has observer status.

The Platform is intended to lead stakeholders to implement more practical steps or "concrete actions designed to contain or reverse current trends" (14). Its participants are challenged to commit their constituents to act to improve diet and activity and combat obesity. These endeavours are open to public scrutiny on the EU web site. The aim is to achieve "coordinated but autonomous action by different parts of society to deal with the many aspects of the problem" (14).

As with national programmes, the EU Platform deals with complex interactions between key stakeholders, attempting a self-regulated approach to achieving greater efforts to tackle obesity, with the alternative of regulatory proposals from the European Commission if no satisfactory progress is achieved. Great emphasis has been placed on the private sector's delivering new initiatives, to demonstrate both its commitment and its ability to involve a substantial proportion of its members in joint action. Work is under way to develop a framework to monitor the implementation of actions and commitments undertaken via the Platform. Whether sufficient resources can be mobilized through the relatively minor changes envisaged to have any significant or lasting impact in combating the escalating rates of obesity in the EU is also an issue. Moreover, additional, comprehensive, coherent and effective strategies need to be developed and implemented across all sectors, not merely among the limited group of Platform participants; this is of paramount importance.

Governments adopting the Platform as a model to engage public- and private-sector stakeholders should recognize the potential of this programme, the need for clear mechanisms to monitor and evaluate delivery and the need for additional comprehensive, coherent and effective strategies to be developed and implemented fully across all sectors.

## Conclusions

Involving stakeholders should be a crucial part of the government's thinking as it develops policies to tackle the new challenges in preventing and managing obesity. A fundamental reorientation of public health policies, as well as all contingent policies, is needed to reflect (15):

... a shared responsibility among many stakeholders to work towards improving the quality of diet and activity for whole populations in order to minimize weight-related ill health, requiring real commitments and effective action from non-health sectors such as culture and education, commerce and trade, development, planning, and transport.

Effective mechanisms are needed for regions, countries and the WHO European Region as a whole, to ensure that stakeholders from all sectors not only are encouraged to acknowledge their role but also have the means actively to participate in supporting the implementation of comprehensive long-term strategies to prevent and manage obesity.

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## 19. Monitoring and evaluating policies and programmes

### Main messages

- Outcome and output indicators are imperative for assessing the impact, relevance, efficiency and effectiveness of a policy, project or programme to bring the obesity epidemic under control and for building better evidence-based, public health monitoring and evaluation processes.
- Monitoring and evaluation should be built into each action and programme and incorporated into its budget.
- A variety of monitoring activities and databases is being established at the local, national and international levels.
- A health impact assessment can help identify indicators for monitoring and evaluation, and support cross-government collaboration to strengthen the health-in-all-policies approach.

Various countries have launched public health policies, programmes or interventions to prevent or tackle the increasing prevalence of obesity in the WHO European Region (see Chapter 20). To assess the progress of such activities, to identify constraints for early corrective action and to measure activities' effectiveness and efficiency, monitoring and evaluation should be incorporated into each public health policy measure, ideally during the design and planning phase, and should be included in the budget. Monitoring and evaluation are also needed to establish the evidence needed for evidence-based public health (1,2).

Defining some terms will help frame the subject of this chapter. Monitoring is the continuous follow-up of activities, to ensure that they proceed according to plan and that the policy aims are achieved. Evaluation is the systematic assessment of outcome indicators: it aims to determine a policy or programme's effectiveness, efficiency, relevance and impact on the target population. Effectiveness is measured as the percentage reduction in morbidity or mortality that results from a specific intervention. Efficiency is a measure of the relationship between the results achieved and the effort expended, in terms of financial and human resources and time (3). Relevance refers to the extent to which an activity is suited to local and national development priorities and organizational policies, including changes over time (4).

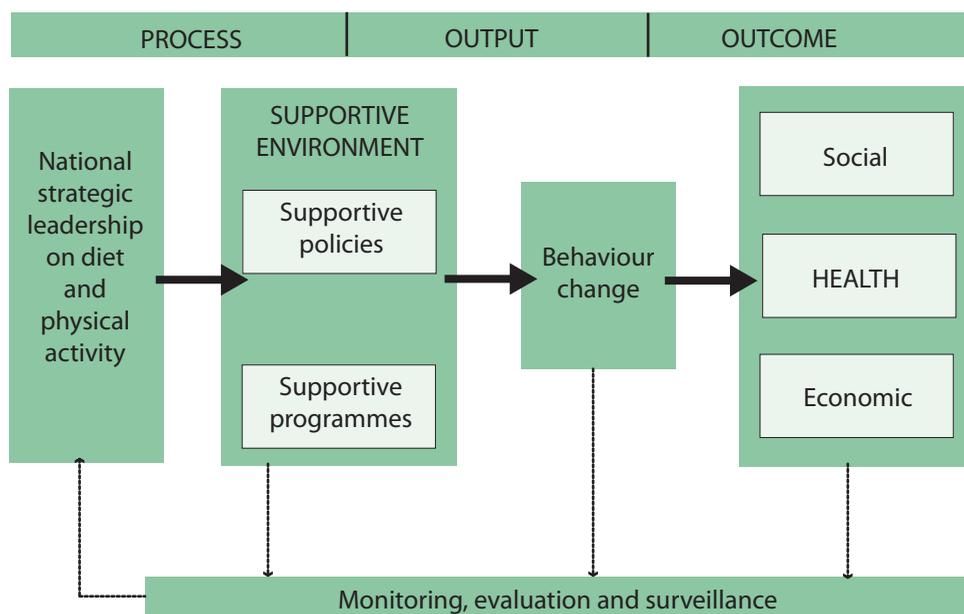
In the case of obesity, continuously monitoring its indicators and determinants – for example, dietary and food consumption patterns and physical activity levels – is essential to evaluating policies and actions and bringing the obesity epidemic under control. The results of monitoring need to be used as the basis for regular reviews of policy instruments and their implementation. Also, well-conducted evaluations need sufficient means and time, and policy reviews that are independent of commercial and political interests need to be made by bodies with a mandate to make policy recommendations, such as an independent obesity observatory, nutrition council or public health institute.

### Developing a monitoring and evaluation system

The Global Strategy on Diet, Physical Activity and Health asks WHO to “set up a monitoring system and to design indicators for dietary habits and patterns of physical activity” (5). Fig. 19.1 presents the Global Strategy's monitoring and evaluation framework intended for country use (6). This framework can be adjusted for use at other levels, and aims to explain how policies and programmes, and their implementation, may influence populations, thus leading to behaviour change and longer-term social, health and economic benefits.

A multisectoral team should develop, implement and evaluate a policy or programme on diet and physical activity. In this process, about 5–10% of the total budget should be allocated to monitoring and evaluation when the programme is designed and the budget allocated (7). Before a monitoring and evaluation system is set up, existing activities should be identified and examined for their potential use and relevance for the new programme. To measure progress, the policy or programme's objectives should be clearly established from the beginning,

Fig. 19.1. Integrating monitoring and evaluation indicators in the process of behaviour change



Source: *Global Strategy on Diet, Physical Activity and Health. A framework to monitor and evaluate implementation* (6).

and should be SMART: specific, measurable, achievable, realistic and time bound (4,8). Specific indicators to measure progress towards these objectives may need to be developed to evaluate the processes, outputs and outcomes.

### Indicators

Indicators are variables that help to measure changes and facilitate the understanding of where a policy or programme is, where it is going and how far it is from its goal. They are measurements used to answer such questions in the process of monitoring and evaluating an intervention or policy, and should meet methodological criteria such as validity, reliability and sensitivity. The purpose that indicators will serve should guide their selection (6).

**Process indicators** are used to measure progress and are related to the input (human and financial resources, and allocated time) in the process. They focus on how something has been done, rather than results. These indicators can measure the process and quality of implementation (6).

**Output indicators** are used to assess the outputs or products that result from the processes. They can measure the output of supportive programmes, environments and policies. One objective can generate several output parameters (6).

**Outcome indicators** are used to measure the ultimate outcomes of an action (6):

- short-term outcomes, such as increased knowledge;
- intermediate outcomes, such as a change in behaviour; or
- long-term outcomes, such as a change in health, social or economic status: for example, a reduction in the prevalence or incidence of obesity or an increase in the percentage of people who meet the recommendations for physical activity or have healthier lifestyles.

The indicators chosen for monitoring and evaluation can be classified as core and optional. Core indicators form a minimum set of measures that monitor processes, outputs and outcomes. Optional or additional indicators can be included when resources and capacities allow the development of a more comprehensive and informative system for monitoring and evaluation (6). To help make these general ideas more specific, the following are examples of core and optional process indicators that are applicable to different policies and programmes

on obesity or other public health goals, as well as being useful for different levels of monitoring: international, national, local or programme based (6). Core indicators include the existence of legislation on and a budget, a coordinating mechanism (organization, body or committee) and a monitoring, evaluation and surveillance system for the policy or programme. Optional indicators include the existence of academic centres of excellence, and a resource mobilization plan for the policy or programme.

Table 19.1 gives examples of both core and optional output indicators: for instance, the percentages of schools with a published food policy and offering a minimum of one hour of physical activity a day, respectively. Table 19.2 presents examples of favourable and unfavourable outcome indicators for adults, adolescents and children.

Because BMI is used extensively to classify overweight and obesity in populations (13), attention should be paid to the difference in the definitions of overweight and obesity used for adults (9) and for children and adolescents (10,11): the cut-off points for the latter are adjusted for gender and age.

The monitoring system should include demographic and socioeconomic factors. Those used to examine differences and inequalities between population groups include age, gender, ethnicity, education, occupation, income and geographical location.

**Table 19.1. Examples of core and optional output indicators for different settings**

Setting	Core indicators	Optional indicators
Work	Number of companies with physical activity incorporated in workplace policies	Workplaces equipped with appropriate sporting facilities (%)
School	Schools equipped with appropriate sporting facilities (%) Schools with a published food policy (%) Schools with a published physical activity policy (%) Schools offering healthy food options (%)	Schools offering school meals consistent with dietary guidelines (%) Teachers attending training courses about physical activity (%) Schools offering a minimum of one hour of physical activity a day (%)
Community	Communities with formal transportation plan, listing walking and bicycling as priorities (%)	Bicycle paths (km) per km <sup>2</sup> in the community
Country	Existence of a mechanism to deal with marketing to children Existence of national standards for school meals	Population with access to safe places to walk (%) Existence of surveillance mechanisms for food safety

Source: *Global Strategy on Diet, Physical Activity and Health. A framework to monitor and evaluate implementation* (6).

### Other needs

After suitable indicators are identified, the evaluation should be timely and repeated periodically. The key steps in setting up a monitoring and evaluation scheme for activities in a public health intervention to counteract obesity, including those that promote a healthy diet and physical activity, are (6):

1. ensuring that monitoring and evaluation are included in any policy or programme, as activities and budget items;
2. identifying existing monitoring and evaluation activities, and the agencies responsible for them (which can be useful partners) and ensure that the existing data, if relevant, can inform or be useful for the new programme or policy;
3. identifying suitable indicators to monitor process, output and outcome;
4. carrying out the evaluation in a timely manner to allow for the possibility of revising or better adjusting the implementation activities; and
5. if feasible, repeating the evaluation periodically, so that a monitoring system can be established.

Although existing evaluation processes may be adaptable, some new ones are likely to be needed. A number of important points should be taken into account:

Table 19.2. Examples of core and optional outcome indicators for the short, intermediate and long terms

Period	Core indicators	Optional indicators
Short term	Increase of x% in the population with increased awareness of healthy diet and physical activity	Increase of x% in the population with an increased knowledge of healthy diet and physical activity
Intermediate term	Reduction of x% in the adult population with a BMI $\geq$ 25 kg/m <sup>2</sup> (9) Reduction of x% in the adult population with a BMI $\geq$ 30 kg/m <sup>2</sup> (9) Reduction of x% in children and adolescents (< 20 years) with overweight according to the international gender- and age-specific cut-off points defined by Cole et al. (10) and reduction of x% in the population of children under 5 years with overweight, according to the new WHO child growth standards (11) Reduction of x% of children and adolescents (< 20 years of age) with obesity, according to the international gender- and age-specific cut-off points, as defined by Cole et al. (10) and reduction in percentage of under 5-year-olds with overweight, according to the new WHO Child Growth Standards (11) Reduction of x% in the population with low levels of physical activity (for example, < 600 MET-minutes/week (12) Increase of x% in physically active children and adolescents (minimum of 1 hour of vigorous physical activities at least 3 times a week) Increase of x% in the population recalling messages from campaign or strategies Increase of x% in the population with a healthy behaviour change in diet and physical activity.	Reduction of x% in the population exceeding the recommendations on intake of nutrients and food (energy, fat, sugar and salt) Reduction of x% in the population not reaching dietary recommendations on fruit and vegetable intake and breastfeeding Reduction of x% in adults engaging in sedentary behaviour (television/computer time) Increase of x% in the population accumulating at least 1 hour of moderately intense activity daily
Long term	Reduction of x% in the adult population with a BMI $\geq$ 25 kg/m <sup>2</sup> (9) Reduction of x% of the adult population with a BMI $\geq$ 30 kg/m <sup>2</sup> (9) Reduction of x% in children and adolescents (< 20 years of age) with overweight, according to the gender- and age-specific international cut-off points, as defined by Cole et al. (10) and reduction in the percentage of children under 5 with overweight, according to the new WHO child growth standards (11) Reduction of x% in children and adolescents (< 20 years of age) with obesity, according to the international gender- and age-specific cut-off points, as defined by Cole et al. (10) and reduction in the percentage of children under 5 with obesity, according to the new WHO child growth standards (11)	Increase of x% in the population with a permanent healthy behaviour change in diet and physical activity Reduction of x% in obesity-specific morbidity Reduction of x% in obesity-related mortality

Source: Global Strategy on Diet, Physical Activity and Health. A framework to monitor and evaluate implementation (6).

- simplicity: the structure and the ease of operation of the surveillance system, which includes the methods of, the numbers of stakeholders involved in and the time spent on data collection;
- data quality: representative, valid and sensitive data; and
- data acceptability: people and organizations' willingness of to participate in a surveillance system.

Moreover, timelines are required to identify trends and the steps in the surveillance system, and the system should be stable, which means it should be reliable and available (14).

### Existing monitoring systems

Various monitoring activities and databases are already established at the local, national and international levels. They provide valuable intercountry comparisons and help to harmonize data-collection methods and data interpretation. Various international data-gathering and -monitoring activities that are relevant to obesity and involve the WHO European Region are described here.

The **WHO Global Database on Body Mass Index** (15) was developed as part of WHO's commitment to implementing the recommendations of a consultation (9) that identified the lack of nationally representative cross-sectional data as an obstacle to facilitating international comparisons of the prevalence of adult obesity, monitoring the magnitude of current and future obesity problems and evaluating the effectiveness of intervention strategies. The Global Database was developed to monitor the nutrition transition and to present data on

the prevalence of adult underweight, overweight and obesity, using information reported in national and sub-national representative surveys. It is linked to the **WHO Global Noncommunicable Disease InfoBase**, which collects, stores and displays information on noncommunicable diseases and their important risk factors for all WHO Member States (16). The indicators included are: tobacco use, high alcohol consumption and abstainers, fruit and vegetable intake, overweight and obesity, raised blood pressure, raised cholesterol, physical inactivity and diabetes. A major objective of the WHO noncommunicable disease surveillance programme is to use the country data collected to produce best estimates of both the prevalence of risk factors at this level and trends in standard age groups.

The **WHO countrywide integrated noncommunicable disease intervention (CINDI) programme** provides participating countries with an integrated approach to activities that prevent and control various risk factors for noncommunicable diseases simultaneously (such as smoking, high blood pressure, high blood cholesterol, obesity and excessive alcohol consumption) and address their social and environmental determinants (17–19). CINDI uses a standardized methodology and comprehensive system for monitoring and evaluation at both the national and local levels (demonstration areas). Monitoring and evaluation take place at regular intervals, using agreed indicators and applying an agreed methodology for epidemiological surveys. The CINDI health monitor is a survey intended to reflect risk factors related to health behaviour and lifestyle. It is used at the CINDI demonstration-area, regional or national level. The main indicators, covering the databases for the CINDI data analyses, are: body weight and height, total cholesterol, systolic and diastolic blood pressure, smoking, alcohol consumption, physical activity, food habits, traffic-accident prevention, educational level, age, sex, perceived health status and use of health services (20).

The **HBSC study** is cross-national research conducted in collaboration with the WHO Regional Office for Europe (see also chapters 4 and 7). It started in 3 countries in 1982 but now has 41 participating countries and regions. HBSC aims to gain new insights into young people's health and well-being, their health behaviour and its social context. The study examines young people aged 11, 13 and 15 years for different aspects of health: the use of drugs, tobacco, alcohol and medicines, nutrition, dental hygiene, leisure activities, psychosocial problems, physical activity and health complaints (21,22). The figures for weight, height, diet and lifestyles are based on information supplied by the young people, and are not validated against independently measured values.

The **WHO Global School-based Student Health Survey** is a collaborative, school-based surveillance project designed to help countries measure and assess, in a standardized way, the behavioural risk and protective factors related to the leading causes of morbidity and mortality among adolescents aged 13–15 years worldwide. Respondents address 10 key areas: alcohol and other drug use, dietary behaviour, hygiene, mental health, physical activity, protective factors, demographics, sexual behaviour, tobacco use and violence and unintentional injury (23). As with HBSC, the Survey is based on information supplied by the young people.

The **WHO Global Database on Child Growth and Malnutrition** (24,25) was initiated in 1986 to compile, standardize and disseminate results of population-based nutritional surveys carried out worldwide. Its specific objectives are:

- to characterize nutritional status in children younger than 5 years
- to enable international comparisons of nutritional data
- to identify populations in need
- to help evaluate nutritional and health interventions
- to monitor secular trends in child growth
- to raise political awareness of nutritional problems.

Since the release of the new WHO Growth Standards, data are being recalculated to ensure that the prevalence of overweight in children under 5 years is clearly indicated.

The **FAO food balance sheets** provide insight into trends in food supply (26). Although supply data provide some insight into food availability, they do not reflect actual intakes or availability at the household level. These agricultural statistics are available from 1961 to 2003 and are comparable internationally (see Chapter 7 for more details).

The **DAFNE databank** is sponsored by the European Commission and based on information collected from household budget surveys in 24 European countries (27). In most countries, the national statistical office periodically conducts the survey in representative samples of households. The methodology followed is uniform enough to allow comparisons between countries on daily household food availability. The surveys are not primarily designed to collect nutrition information. By recording data on the types and quantities of household food purchases, however, they can indicate the dietary patterns prevailing in representative population samples. Moreover, the concurrent recording of four demographic and socioeconomic characteristics of the household members (the degree of urbanization of the area where the household is situated, household composition, and the education and occupation of the head of the household) allows comparisons of the eating habits of various population segments and the evaluation of the effects of these four characteristics on dietary choices (see Chapter 7 for more details).

The **European Food Consumption Survey Methods Project** was undertaken within the framework of the EU programme on health monitoring and aims to harmonize food consumption surveys in EU countries (28), to establish a common monitoring method for food intake. The recommended methodology consists of two steps: post-harmonization and pre-harmonization. The first aims to make existing food consumption data in the EU comparable and available, and the second, to define a method for monitoring in the future.

Since the beginning of this project in 1999, 23 countries have participated and the data from 15 can be made comparable at the food-item level. Much work is still needed to achieve comparability at the food-intake level, so a minimum list of dietary indicators considered to be the most relevant for the health information exchange and monitoring system has been identified. The 24-hour recall method (28,29) was selected as the most suitable to obtain internationally comparable new data on population means and distributions of actual dietary intake. This method should be used at least twice to reduce recall bias to a minimum. The project has created not only a general outline for methods and indicators, but has also shown that it is feasible to carry out a survey of the EU. A monitoring proposal will be implemented when the necessary funds are made available. In the meantime, it is recommended that countries adopt the new methodology.

The **European Physical Activity Surveillance System** project is involved mainly in developing a health monitoring system, as promoted by the EU health monitoring programme. Within this context, the project's general aims (30) are to develop and test a surveillance system for physical activity as a major behavioural determinant of health by:

- providing a valid and cross-nationally applicable list of core and optional indicators for health-enhancing physical activity among adults;
- testing selected physical activity indicators by employing different survey methodologies; and
- investigating implementation structures of health monitoring in the EU.

The project evaluated the International Physical Activity Questionnaire in nine European countries. It was considered to be the most advanced international approach to assess the type, frequency, duration and intensity of physical activity at the population level (12). Given the increased global interest in the role of physical activity in preventing noncommunicable disease and the lack of data useful for both informing public health efforts within a country and making intercountry comparisons, WHO developed a Global Physical Activity Questionnaire for surveillance in low-income countries, where patterns of energy expenditure differ from middle- and high-income countries (31). Which questionnaire should be used depends on the type of questionnaire that has already been used in a country and those used in other countries with which comparisons are desirable.

The **WHO European health for all database** (32) contains data on about 600 health indicators, including:

- basic demographic and socioeconomic indicators;
- some lifestyle- and environment-related indicators, mortality, morbidity and disability;
- hospital discharges; and
- health care resources, utilization and expenditure.

The database allows easy and user-friendly analysis of trends and international comparisons for a broad range of health statistics on the national and international levels for the countries in the WHO European Region.

The **EPIC study** is coordinated by the International Agency for Research on Cancer and supported by the European Commission. EPIC was designed to investigate the relationships between diet, nutritional status, lifestyle and environmental factors and the incidence of cancer and other noncommunicable diseases in the general population aged 20 years and older in 10 European countries (33). The data collected include measures of dietary intake, anthropometry and biological indicators from blood samples.

The **European Community Health Indicators project** aims to establish a health monitoring system at the EU level (34,35). The project envisages the establishment of a set of comparable community health indicators for monitoring community programmes or policies and providing Member States with common measurements for making possible intercountry comparisons. The project has led to the selection of priority indicators for the following areas:

- demographic and socioeconomic factors, such as fertility rate, population by gender or age, and total unemployment;
- health status, including life expectancy, prevalence of chronic illness and perceived general health;
- determinants of health, such as consumption of fruit and vegetables, percentage of smokers and litres of alcohol consumed; and
- health interventions or services, including expenditure on health, number of hospital beds and utilization of general practitioners.

### Health impact assessment

Although not a method for monitoring and evaluation, health impact assessment (HIA) is a procedure for systematically examining the impact of all policies on health outcomes. It can enhance the monitoring and evaluation effort by identifying relevant process, output and outcome indicators, as well as acting as a catalyst for action across a broad range of sectors (36).

HIA is primarily a tool for predicting the direct or indirect health effects of all policies at the national or local level and the distribution of those effects within the population. For practical reasons, many obesity studies measure the effect of interventions at the community, local or programme level (37). Programmes or policies at the national level deal with the larger social determinants of obesity and the resulting obesogenic environments; the effects of such programmes and policies are often not assessed, and an evidence base related to them is lacking.

The HIA approach is recommended as an alternative tool to assist the assessment of policy. Ideally, effects on health should be considered at the conceptual stage, when opportunities for change are greatest (38). Thus, an HIA should be made before the policy, programme or project is implemented, to predict the outcomes for health, maximize positive health effects, minimize negative effects and, finally, decide whether the plan should go ahead. In practice, an HIA cannot always be performed prospectively; it can instead be carried out concurrently or retrospectively to influence decision-makers during the life of the programme or policy and evaluate health outcomes, respectively.

Fig. 19.2 illustrates the HIA procedure (39). The general objectives of an HIA are:

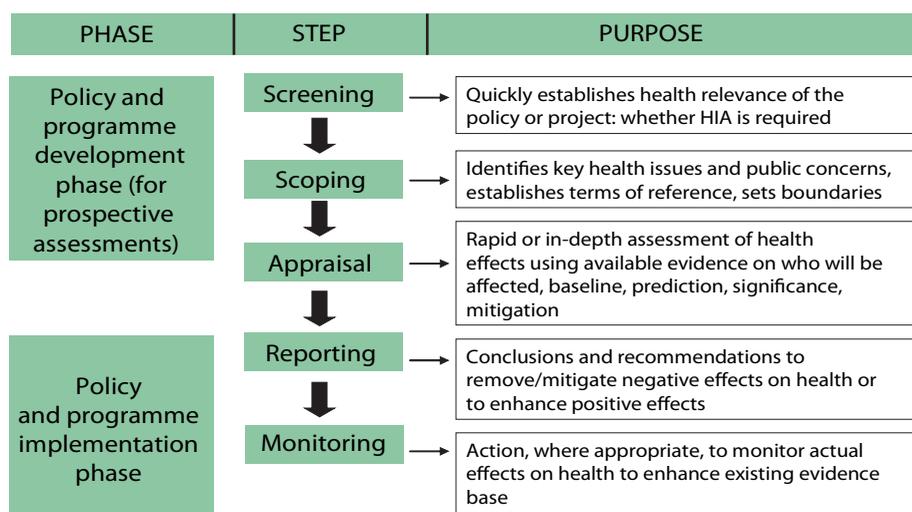
- to improve knowledge about the potential health impact of policies or programmes from other sectors;
- to inform decision-makers and the people affected;
- to facilitate adjustment of proposed policies in all sectors, to reduce health damage and maximize positive effects; and
- to help improve policy-making and reduce health inequalities.

The importance of HIA has been recognized by Article 152 of the Treaty of Amsterdam, which calls on the European Commission to examine the possible impact of major policies on health (40). An independent retrospective evaluation of two HIAs carried out on the Mayoral Strategies for London, United Kingdom and a concurrent evaluation of another two have shown that HIAs can be valuable in strategy development (41).

### Conclusions

Monitoring and evaluation are necessary processes to assess the impact, relevance, efficiency and effectiveness of a policy, project or programme on obesity, and to build an evidence base for public health. Indicators should

Fig. 19.2. HIA procedure



Source: Health impact assessment. Tools and methods [web site] (39).

be used to measure not only the outcome but also the process and output of a policy or programme. A review of various monitoring activities and databases with useful information on obesity showed a serious lack of data on children aged 5–11 years and a lack of objectively measured data for older children.

The existing and available data focus mainly on adults, although some are available on young people aged 11 and older (through the HBSC study and the WHO Global School-based Student Health Survey) and preschool children (included in the WHO Global Database on Child Growth and Malnutrition). Because early identification of risk factors for increased adiposity can be instrumental in preventing obesity in children and young adults (42), a monitoring system is needed that collects data on childhood obesity and risk factors in children aged 5–11 years. Further, the adolescent anthropometric data come from self-reported surveys, so increased surveillance of adolescents is needed, using measured indicators of adiposity.

A tool to assess the impact on health of all policies at the national and local levels, HIA is stimulating a multi-sectoral approach to improving the population's health and well-being and reducing health inequalities. The use of HIAs should be routinely considered in policies and programmes, because they contribute to cross-governmental collaboration in integrating health into all government policies.

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## 20. National policies in the European Region

### Main messages

- A review of national policies shows that they recognize the importance of an environmental approach to improving health, the need to act at the national, community and individual levels and the need to involve stakeholders in implementing policies.
- Clear and realistic objectives and setting priorities among the suggested actions are necessary for successfully implementing a policy and evaluating the outcome.
- Exchanging experience and skills is important, and collaboration and harmonization between national activities should be strengthened.

The 1992 World Declaration on Nutrition and Plan of Action on Nutrition (1) provided the basis for the global development of nutrition policies. WHO subsequently emphasized this in its analysis of the global burden of noncommunicable disease (2). The First Action Plan for Food and Nutrition Policy for the WHO European Region for 2000–2005 (3) encouraged Member States to develop overarching, intersectoral policies that combined nutrition, food safety and food security, and sustainable development.

The Global Strategy on Diet, Physical Activity and Health (4), which the Fifty-seventh World Health Assembly adopted in 2004, provides an international commitment to strengthen existing national, regional and international efforts to prevent and control chronic diseases and their common risk factors.

In the EU, a resolution on health and nutrition by the Council of the European Union in 2000 (5) was a major step in nutrition policy, emphasizing the importance of placing nutritional health in the future EU public health programme. In response to the emerging threat of obesity, the European Commission launched the EU Platform for Action on diet, physical activity and health in 2005 (6) to tackle the problem of obesity at a multisectoral level. In 2007, the Council called on Member States to take action to reduce obesity and on the European Commission to continue its public health action (7). The European Commission published a strategy on nutrition, overweight and obesity-related health issues (8), calling for partnership and policy coherence at the Community level.

At the national level, nutrition policy is at different stages of development. Some countries are just beginning the process, with the focus on specific risk factors, while others take a more comprehensive approach, spreading obesity prevention across several public health strategies.

This chapter compares and analyses in detail national policies focusing on nutrition, physical activity or specifically on obesity. The analysis aims to identify strong elements of existing policies to make examples of good practice available to countries at an earlier stage of policy development and to define common elements of successful policies.

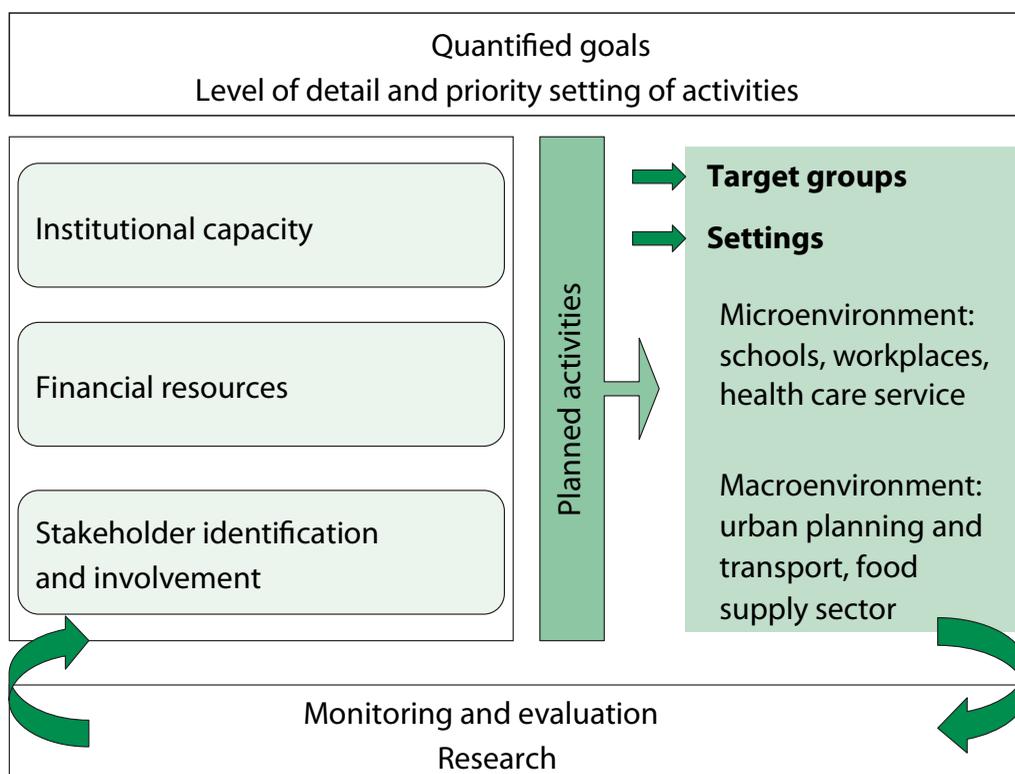
### Analysis of national obesity policies

A WHO survey on food and nutrition policies in 2006 (9) revealed that 48 countries in the WHO European Region have national policies. This analysis of national obesity policies drew on this source, as well as a questionnaire on national noncommunicable disease prevention and control sent to WHO European Member States in 2005 and an inventory of documents on physical activity promotion in the Region (10). In addition, a search of web sites of national health, environment and transport ministries and health agencies was conducted.

The analysis included solely policy documents, published in English by a national body, that contained specific information and formulated goals and action for nutrition and physical activity. Documents from 19 countries were analysed: Bulgaria, Croatia, Denmark, Estonia, Finland, France, Georgia, Hungary, Ireland, Latvia, Lithuania, the Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, Turkey and the United Kingdom. Since only English documents were considered, the analysis does not show the whole picture of strategies in the European Region. Many other countries are taking action to counteract obesity; this is briefly described at the end of the chapter.

An analytical framework (Fig. 20.1) was elaborated to analyse the policy documents, based on elements used in previous policy analyses (11–13) and policy analysis tools (14).

Fig. 20.1. Elements of national policy documents



The national documents were analysed by their specific goals for nutrition, physical activity and obesity, and the level of detail and priority setting of the described activities. The analysis also considered stakeholder involvement, financial resources, institutional capacity, monitoring and evaluation, and research.

Using ANGELO as a basis (15), settings were divided into microenvironment (schools, workplaces and health care services) and macroenvironment (urban planning and transport and the food supply sector).

### National documents on nutrition, physical activity and obesity

Table 20.1 lists the policy documents analysed. Those that address obesity were either published in separate documents or included in strategies to tackle public health or environmental issues. Only four countries had a specific action plan or strategy addressing obesity. Denmark developed the first such plan in 2003 (16), followed by Spain in 2004 (17) and Ireland (18) and Portugal (19) in 2005. The Netherlands (20,21), Norway (22,23) and the United Kingdom (24,25) developed both public health or nutrition plans and separate documents dealing with physical activity.

Some countries, such as Denmark, Hungary and Portugal (28,35,42), have a general public health strategy that comprises the basis for an action plan or a programme on specific risk factors. For Norway (22,43) and the United Kingdom (24,25,44), a white paper formed the basis for the development of action plans.

### Quantifiable goals

Most countries have goals for nutrition, but few have specific goals for obesity or physical activity. Bulgaria, Croatia, France and the United Kingdom set quantifiable goals related to overweight and obesity.

Table 20.1. National policy documents considered in the analysis

Country	Title (reference)	Date finalized or adopted
Bulgaria	<i>Food and Nutrition Action Plan 2005–2010 (26)</i>	2005
Croatia	<i>Croatian Food and Nutrition Policy (27)</i>	1999
Denmark	<i>Healthy throughout Life – The targets and strategies for public health policy of the Government of Denmark, 2002–2010 (28)</i>	2002
	<i>National action plan against obesity: recommendations and perspectives (16)</i>	2003
Estonia	<i>Food and Nutrition Action Plan for Estonia (29)</i>	2001
	<i>National Strategy for Prevention of Cardiovascular Diseases 2005–2020 (30)</i>	2005
Finland	<i>Summary of the action programme for implementing national nutrition recommendations (31)</i>	2003
France	<i>National Nutrition Health Programme 2001–2005 (32)</i>	2001
Georgia	<i>Food security, healthy eating and physical activity. National Policy, Food and Nutrition Action Plan for Georgia 2006–2010 (33)</i>	2006
Hungary	<i>“Johan Bela” National Programme for the Decade of Health (34)</i>	2003
	<i>National Public Health Programme – Summary (35)</i>	2004
Ireland	<i>The National Health Promotion Strategy 2000–2005 (36)</i>	2000
	<i>Obesity: the policy challenges – The report of the National Taskforce on Obesity (18)</i>	2005
Latvia	<i>Healthy Nutrition 2003–2013 – Concept of the Cabinet of Ministers (37)</i>	2003
Lithuania	<i>State Food and Nutrition Strategy and Action Plan 2003–2010 (38)</i>	2003
Netherlands	<i>Living longer in good health: also a question of healthy lifestyle. Netherlands Health-Care Prevention Policy (20)</i>	2004
	<i>Time for sport – Exercise, participate, perform (21)</i>	2005
Norway	<i>A healthy diet for good health. Strategy plan for 2005–2009 (22)</i>	2005
	<i>Working together for physical activity. The Action Plan on Physical Activity 2005–2009 (23)</i>	2006
Portugal	<i>National Programme against Obesity 2005–2009 (19)</i>	2005
Slovenia	<i>The National Programme of Food and Nutrition Policy 2005–2010 (39)</i>	2005
Spain	<i>Spanish strategy for nutrition, physical activity and prevention of obesity (NAOS) (17)</i>	2005
Sweden	<i>Background material to the action plan for healthy dietary habits and increased physical activity (40)</i>	2005
Turkey	<i>National Plan of Action for Food and Nutrition of Turkey 2002–2010 (41)</i>	2002
United Kingdom	<i>Choosing a better diet: a food and health action plan (24)</i>	2004
	<i>Choosing activity: a physical activity action plan (25)</i>	2005

Nutrition-related goals refer mainly to total or specific fat intake. Most countries set quantitative targets for fat quantity; fewer define targets for fat quality, such as saturated fatty acids. Only the Netherlands policy document (20) includes a goal for *trans* fatty acids. Other nutrition goals cover the intake of carbohydrate, sugar, dietary fibre and fruit and vegetables. Bulgaria, Denmark, Norway, Sweden and the United Kingdom have specific targets for increasing the consumption of fruit and vegetables. All countries translated their dietary goals into food-based dietary guidelines. They use different graphic models: most often the food pyramid and the food circle (9).

The most common goal for physical activity is to increase the number of adults engaging in at least 30 minutes (or 60 minutes for children) of physical activity per day. France, Norway and the United Kingdom have set this goal. The United Kingdom's physical activity action plan (25) sets specific goals for schoolchildren and priority groups, which include people with physical or mental disability, black or minority ethnic groups, those with low socioeconomic status and women.

France's guidelines also provide a good example of policies with an individual focus, addressing 24 different target groups and considering their income, religious and cultural practices, societal factors and personal preferences (45).

### Level of detail and priority setting

The documents vary in the level of detail of the information given. Sweden's action plan is one of the most detailed documents, containing 79 proposals for measures with a description of the rationale and responsible stakeholders for each measure, sometimes estimating the costs (40). Further, it clearly gives priority to measures that promote the creation of supportive environments for healthy dietary habits and increased physical activity for children and young people in the first phase, along with research into these issues. To implement the action plan, measures for its coordination and monitoring are also given priority.

The list of tasks and activities in Slovenia's programme (39) includes not only the ministries responsible but also the performers of tasks, which is very useful in implementation. Buse et al. (46) pointed out the importance of the relationship and communication channels between policy-makers and implementers for successful implementation.

Some documents indicate the time frames of the action. The timeline in Portugal's programme (19) gives a graphic overview of all action over time.

Norway's document (22) is a good example of setting priorities: the National Council for Nutrition assigned high priority to five areas – measures to facilitate healthy choices in educational institutions, and in the health and social services; increased focus on research and monitoring; and communication measures – and proposed priority actions within each.

### Institutional capacity

The key role of a national coordination institute, such as a food and nutrition council, is to advise the government on developing, implementing, monitoring and evaluating nutrition policies, guidelines and action plans. It should be more than just a technical scientific advisory body, acting as a gateway between evidence and policy and examining obstacles to policy coherence (47).

In 17 of the 19 countries with policy documents, a national institute, such as a food and nutrition council or an institute of public health, is assigned coordination tasks. Georgia and Turkey are planning to set up such institutions.

Policy councils have a long history in Scandinavia. Norway's Council on Nutrition and Physical Activity, founded in 1999, is based on the National Nutrition Council of 1937, the first recorded council. In the United Kingdom, the Food Standards Agency was created in 1997 with a technical support role (47).

### Financial resources

Some documents elaborate on the budgets allocated for implementing the strategies. Sweden's action plan indicates the budget for several of the planned measures (40). The United Kingdom will invest £1 billion over three years to support and deliver the contents of its white paper (24). The Netherlands aimed to spend a total of €45 billion on health care in 2004, including €625 million for health promotion and protection (20). Denmark allocated a financial pool of €10 million to develop and evaluate strategies for preventing obesity in municipalities (48).

Bulgaria, Estonia, Ireland, Latvia, Lithuania and Turkey did not mention specific amounts but identified financial sources such as the state budget, municipality budgetary funds, a health insurance budget or other financial support, such as donations from foreign sources.

### Stakeholder identification and involvement

The causes underlying obesity are so complex that the health care sector alone cannot solve the problem. Involving various stakeholders and taking an intersectoral approach at the national, local and community levels are necessary. Norway's National Council for Nutrition, for example, emphasizes that nutrition-related activities must be viewed in the context of public health as a whole, with the public health sector playing a leading role (22).

Most documents identify a wide range of stakeholders. First, most countries mention various government institutions and ministries as stakeholders, with a leading role for the health ministry.

Many countries included research institutes, universities and health professionals' associations in developing the policy. The private sector is an important partner in obesity intervention, with the food industry identified as the main partner in all countries. Further, the pharmaceutical industry, the catering sector, distribution com-

panies, restaurant chains, the leisure industry, transport, town planning and the mass media are identified as potential partners. In addition, all documents consider non-profit-making organizations as stakeholders, including consumer associations, employees' unions, and patients' and health professionals' organizations.

The consultation process for Spain's strategy involved a wide range of stakeholders and the Ministry of Health and Consumer Affairs and the private sector signed various collaboration agreements (17).

The parties to the Netherlands' Covenant on Overweight and Obesity (49) include the Ministry of Health, Welfare and Sport, the Ministry of Education, Culture and Science, the food industry, the hotel and catering industry, caterers, supermarkets, medical insurance companies, employers and sports associations. Each party looks for ways to contribute through its own activities and role in society to achieving the government targets on overweight (20). The Ministry of Health, Welfare and Sport set up a project office to encourage and support parties to the Covenant in organizing activities and to ensure cohesion and synergy. Civil-society partners or other parties can apply to the Ministry to become parties (20).

In the United Kingdom, local strategic partnerships bring together local authorities, primary care trusts, other public services, private, voluntary and community organizations, and residents to improve local areas and services. Local authorities can play a key role in supporting healthy eating in communities through working with local retailers, running food-growing schemes, developing cooking skills and establishing food cooperatives and community lunches that also will be supported by national and regional action (44).

### Monitoring and evaluation

All countries have surveillance systems in place, regularly monitoring the nutritional status and dietary intake of the whole population or at least some subgroups (9). For example, Denmark's national action plan against obesity (16) proposes to create a system to monitor body weight, nutrition conditions, physical activity and environmental determinants.

A national committee was established in Sweden (40) and a series of local public health observatories was established in the United Kingdom (44) to monitor health outcomes. The nutrition policies of Bulgaria, Croatia, Georgia, Hungary, Ireland, Latvia, Lithuania, the Netherlands, Portugal and Slovenia also consider monitoring and evaluation of the strategic aims and objectives.

Denmark's programme includes indicators for all the priority areas for risk factors, target groups and settings for health promotion, as well as key indicators for health promotion by the public sector. The indicator programme will be developed and updated continually. It has two parts:

- a set of overall key indicators to describe trends and results in relation to the overall targets of the public health policy; and
- a detailed, specific set of indicators to describe the trends and results for each priority area in relation to the targets and collective challenges in the public health policy (28).

In Finland, the National Nutrition Surveillance System was launched in 1995 to collect, interpret, evaluate and distribute data on nutritional status and to assess the need for measures to promote nutrition and health policies. In addition, it communicates nutritional data to health care professionals, researchers, teachers, journalists and people working in the food industry, trade and mass catering (31).

Spain's Ministry of Health and Consumer Affairs proposes the creation of an obesity observatory with various functions:

- carrying out epidemiological surveillance and monitoring trends in obesity;
- defining indicators to measure the impact of interventions;
- developing specific objectives and defining the time required to achieve them;
- offering coordination and facilitating the exchange of experience;
- demanding a rigorous and permanent evaluation to identify and give priority to successful initiatives;
- identifying research priorities;
- establishing relations with international bodies; and
- monitoring adherence to and application of the various self-regulation agreements (17).

## Supporting research

Scientific evidence is crucial for every policy decision. Developing integrated policies requires evolving systems for ensuring closer interaction between both scientists and policy-makers in health, agriculture and the environment (50). Countries choose different ways to foster and fund research and identify fields in which more study is needed, such as the effectiveness of interventions to promote health and prevent disease.

Under the responsibility of France's Ministry of Research, a European Food Reference Network was set up in 1998 to encourage the development of research in public health nutrition and economic research related to cost-benefit analysis. The Network brings together government agencies and private enterprises from the agricultural and food sector (32).

In the Netherlands, the Knowledge Centre on Overweight stimulates coherence between various research projects on obesity and the exchange of knowledge (20).

Sweden's action plan (40) proposes to set up a consortium with representatives from various research councils to initiate a number of long-term research projects, mainly intervention research on diet and physical activity.

In the *Choosing health* white paper (44), the Government of the United Kingdom proposed:

- to establish a new public health research initiative and provide new funding for it, building to £10 million by 2007/2008;
- to launch a public health research consortium and a national prevention research initiative, working in collaboration with research funders;
- to provide additional resources to support the National Institute for Health and Clinical Excellence; and
- establish a new innovations fund with £30 million in 2006/2007 and £40 million annually from 2007/2008.

## Planned action

### Target groups and socioeconomic inequality

All the strategies consider the need to address target groups, such as particular age groups, and some countries focus their programmes on people who have low socioeconomic status or limited education, or are distressed, chronically ill or disabled, members of ethnic minority groups, immigrants or refugees.

Sixteen countries aim at reducing socioeconomic inequality in health by conducting programmes targeting socioeconomically disadvantaged groups.

Schools are often chosen as a target arena to reduce social inequality in nutrition and physical activity by providing equal opportunities for all children and adolescents.

Georgia's strategies to eradicate extreme poverty include (33):

- identifying groups with food insecurity and vulnerable groups;
- gathering, analysing and improving the quality of data relevant to measuring and monitoring food insecurity and vulnerability;
- providing vulnerable population groups with a minimum level of social protection and developing community-based nutrition projects providing "food for the poor in all areas"; and
- resolving concerns about, for example, minimum wage legislation, unemployment, child care and support for working women, housing and fuel policy, and insufficient education.

Skilled for Health is a collaborative initiative partially funded by the Department of Health in the United Kingdom. By designing learning materials for specific groups with common health issues, it aims to improve basic skills and health literacy (44).

## Settings

Using ANGELO, the planned activities described in the policy documents are divided into microenvironments and the macroenvironment (15). Microenvironmental settings include schools, workplaces and health care services, and the macroenvironment covers urban planning and transport and the food supply sector. Chapters 8, 9, 11, 13 and 14 discuss the effectiveness of interventions in micro- and macroenvironments in more detail.

## Schools

Schools provide many opportunities to influence nutrition and physical activity. Multiple whole-school approaches addressing education, food availability and physical activity appear to be more effective than single-focus approaches (51). National strategies share the goal of changing the school environment by providing a good framework for physical activity and strengthening health education by including knowledge and skills related to diet and nutrition in the curriculum.

All 19 countries aim at improving school food, and canteens appear to be a major setting for interventions. Hungary and the Netherlands introduced programmes for healthy school canteens. To support implementation, the Netherlands Nutrition Centre provides comprehensive information packages and guidelines for the supply of healthy and safe food in the school canteen (52).

France banned vending machines from schools in 2005. The products sold through the machines can be modified, however, and their prices manipulated to increase the consumption of healthy products (53,54). Slovenia and Spain are considering optimizing the contents of vending machines. In Hungary, several schools successfully introduced apple vending machines.

A review of the school food environment concluded that environmental change interventions in schools show potential for positively affecting young people's fruit and vegetable consumption (55). As a further attempt to improve nutrition among schoolchildren, France, Latvia, Norway and the United Kingdom provide fruit free of charge or make it easily accessible in schools. A school fruit project is under way in seven large cities in the Netherlands.

The Norwegian School Fruit Programme was launched in 1996 to provide free fruit and vegetables for all children in day-care centres and primary schools. In 2004 this parent-supported, subsidized Programme was introduced nationwide, although each individual school decides whether or not to participate. In 2004, about 10% of all primary school pupils took part (22).

The national healthy schools programme in the United Kingdom seeks to bring into everything that schools provide policies and approaches that foster better health. *Choosing health* (44) made a commitment that half of all schools should be healthy schools by 2006, with the rest working towards achieving this status by 2009. It also encouraged local healthy schools programmes targeting deprived schools (44).

## Workplace

The workplace is a setting in which many adults can be reached, regardless of sex, age, social group and ethnicity. Interventions at the workplace, as in schools, appear more successful when they do not focus solely on one aspect but include nutrition education and physical activity (56).

Proposed actions in Sweden include certification of health promoting workplaces and guidelines for the food provided in workplaces or competitions for healthy workplaces, such as in Norway.

The policies in Denmark, Ireland and the United Kingdom suggest opportunities such as flexible working hours, reduced rates for gym membership, incentives for cycling or walking to work, access to shower and changing facilities, and the employer paying for exercise breaks and training facilities and providing company bicycles.

To encourage enterprises to focus on physical activity, the Norwegian Action Plan on Physical Activity proposes to include a provision in the working environment act that obliges employers to consider physical activity as a part of enterprises' systematic efforts for healthy and safe working environments (23).

The Government of the United Kingdom established the Healthy Workplace Award to promote awareness and recognize the work companies are doing to improve their employees' health and well-being (24).

## Health care services

All 19 countries consider establishing or improving training for health care professionals, nutritionists, dietitians and personnel in health and social services and residential homes. Ireland suggests that an education and training programme for health professionals in the appropriate and sensitive management of overweight and obesity be developed and implemented (18). Denmark emphasizes the need for psychological insight and practical knowledge of methods to achieve changes in body weight and lifestyle (16). Norway plans to introduce HIA in the medical curriculum (23). Spain's strategy underlines the need to make professionals in the national health system able systematically to detect overweight and obesity in the population.

Prevention, detection and treatment are important measures to combat obesity in the health care system. The Irish Taskforce on Obesity emphasizes that health services should recognize the maintenance of a healthy weight as an important health issue, and that measuring height, weight and waist circumference and calculating BMI should be part of routine clinical health care practice in primary care and hospitals (18).

Slovenia's programme aims to introduce nutritional screening and assessment of patients. France is considering establishing clinical practice recommendations for screening and treating nutritional disorders. Norway and Sweden focus on intensifying nutrition work in health care for mothers and children.

Portugal's programme against obesity strongly emphasizes improving obesity treatment in the hospital. Strategies focusing on the health sector (19) include:

- publishing guidelines for health professionals on preventing and treating obesity;
- planning and setting up hospital outpatient clinics for obese people and hospital departments for bariatric surgery;
- proposing a national commission to assess the surgical treatment of obesity;
- drawing up a proposal for a list of pharmaceutical and nutritional supplements that will be used to treat obesity; and
- promoting increased hours for undergraduate and postgraduate training on obesity at university faculties of medicine, compulsory training on the approach to obesity during residencies in general and family medicine and surgery, and specific training on the approach to obesity among health professionals other than physicians.

### Urban planning and transport

Urban planning is an important factor in obesity policy, as increasing urbanization leads to changed consumption patterns, and the local environment and infrastructure influence physical activity and food availability.

Eight policy documents suggest constructing safe walking and cycling paths, increasing safe and efficient public transport and reducing car use. The Irish Taskforce on Obesity recommends applying a designated percentage of all road budgets to reaching this goal (18).

Spain's strategy emphasizes collaborating with autonomous communities and town councils to promote the construction of green areas and sports facilities in neighbourhoods, using instruments offered by legislation (17).

Sweden's action plan focuses on housing policy, because it affects public health in general and physical activity in particular. With appropriate planning, environments can be created that support a physically active lifestyle. The creation of an intersectoral project to develop a community environment for physical activity among children and adults was proposed (40). In Norway, the planning and building act was to be revised to create more activity-enhancing surroundings (23).

The policy documents of Denmark and the United Kingdom emphasize the need for traffic and transport plans.

Denmark's National Board of Health calls for a transport policy that enhances opportunities for physical activity in everyday life:

- establishing car-free pedestrian and cycling areas in cities and places where people go in connection with shopping or work;
- establishing cycling paths along the roads or cross-cutting paths in the countryside;
- planning new housing areas with easy access to service areas on foot or bicycle; and
- securing opportunities for bicycle parking in connection with public transport and workplaces (16).

In the United Kingdom, the Government's *Travelling to school: an action plan* (57) outlines a series of measures for national and local governments and schools to promote more walking, cycling and bus use to and from school. School travel plans will engage parents, pupils, schools, local authorities and other interested parties and set out measures to make them safe and attractive alternatives on a journey to school.

## Food supply sector

Sweden's document says that the food industry, through its supply management, pricing and marketing strategies, represents part of both the problem and the solution for better dietary habits (40).

Countries use different approaches in working with the private sector. Many countries seem to rely on voluntary and self-regulation codes, while the United Kingdom tends to achieve commitments with a more government-led approach. Recognizing the potential of the food industry to change food composition, the United Kingdom Government is cooperating with the food industry to reduce salt, added sugar and fat in processed food and will further develop and publish guidance on portion sizes to reduce energy, fat, sugar and salt intake and reverse the trend towards bigger portion sizes. Ireland also emphasizes that the food and drink industry should be consistent in following the lead of those who have already abandoned extra-large individual portion sizes. The Netherlands, Norway and Spain also engage with the food industry to promote the production and distribution of products with a favourable nutritional profile by modifying food composition. Further to optimizing food composition, Ireland emphasizes that the food and drink manufacturing industry, the retail sector, the catering industry and their suppliers should promote research and development investment in healthier food choices.

Nutrition labels should provide consumers with accurate, standardized and comprehensive information about food so that they can make wise choices (4). Nutrition labelling is harmonized throughout the EU. It is optional but becomes compulsory if a nutrition claim appears on the label or in advertising (58).

Norway's National Council for Nutrition calls on public authorities to make more stringent demands on the food industry on the listing of ingredients and the presentation of the nutritional value of food. Further, it proposes that labelling of the sugar, salt and fat content (including *trans* fatty acids), should be made mandatory and labelling systems should be international (22).

Three countries use striking visual symbols to indicate the nutritional value of food (59–61): Finland (the Heart symbol), Sweden (the Keyhole symbol) and the United Kingdom (the traffic-light labelling scheme of the Food Standards Agency). These symbols are discussed in detail in Chapter 9 (pp. 101–102).

The Global Strategy on Diet, Physical Activity and Health (4) emphasizes that messages promoting unhealthy dietary practices or physical inactivity should be discouraged and positive, healthy messages encouraged. In 2005, France's parliament passed legislation imposing a 1.5% tax on advertising revenue from soft-drinks companies with the aim to discourage unhealthy dietary practices. The companies can avoid paying this tax if the products carry or promote a specific positive health message (48).

Children are uniquely vulnerable to the marketing of food (see Chapter 10). Hastings et al. (62) showed that it affects children's food preferences, purchasing behaviour and consumption at both the brand and category levels. Eleven countries' policy documents recognize the importance of developing strategies on marketing food and non-alcoholic beverages to children and aim to tighten the regulations that prevent the marketing of unhealthy food and drinks to children and adolescents.

Many countries, such as Bulgaria, Denmark, the Netherlands and Spain, seem to rely on voluntary agreements and self-regulation, but will consider new approaches if self-regulatory measures prove to be ineffective. None, however, sets a time limit for this.

The Government of the United Kingdom has introduced a series of measures to reduce children's exposure to the advertising of food and beverages high in fats, sugar or salt on television, and is considering how to extend it to non-broadcast mass media (63). Similarly, Sweden has banned marketing to children on television and would like to extend this ban to other EU countries (40).

## Market interventions with economic instruments

The shape of food markets determines consumer's choices, with the price of food being one of the most important indicators (64). Marshall (65) proposed manipulating food prices through such means as taxation positively to influence the nutritional habits of the population, but evidence of the effects of wide-scale food taxes at the national level is not sufficient.

Prices can also be influenced through subsidies or direct pricing to encourage healthy eating and physical activity. Reducing prices is effective in increasing consumption: even more effective than a combination of price reduction with health information (66). Chapter 14 discusses economic interventions in greater detail.

Several countries are using or considering fiscal measures such as taxing unhealthy food and providing incentives to encourage the supply and consumption of healthy food or access to physical activity, but more often the purpose of taxation is to generate revenue (67).

Norway's National Council for Nutrition recommends that authorities consider using normative and financial measures in shaping nutrition policy. For example, taxation policy in Norway should include reducing the value-added tax on fruit and vegetables, increasing value-added tax on energy-dense, nutrient-poor foods and increasing taxes on sugar, chocolate and other foods containing sugar.

Reducing the value-added tax would lower the prices of fruit and vegetables; studies have shown that exempting these types of food from value-added tax would make them relatively cheaper than other types. In contrast, the consumption of energy-dense, nutrient-poor food could be reduced if it were relatively more expensive, which can be achieved by increasing the value-added tax from the current reduced percentage to the standard percentage. Doubling the production tax and value-added tax on soft drinks was proposed to be effective in reducing consumption among high-consumption groups (68). Sugar, chocolate and other foods containing added sugar are subject to special excise taxes that also tax their consumption. Consideration could be given to earmarking the government revenue from these taxes for health promoting nutrition efforts (22).

Ireland concluded that taxing unhealthy food would probably be regressive, costing poor people relatively more than the affluent, as poor people spend relatively more on food (69,70). Instead, Ireland's strategy suggests positive discrimination: providing grants and funding to local industry in favour of healthy products. Further, the Irish Department of Social and Family Affairs will review social welfare payments to take account of the relatively high cost of healthy food for socially disadvantaged groups.

In their policy documents, Bulgaria, Denmark and Sweden are considering economic regulations through incentives for the production and sale of food with low fat and sugar content, and taxation of soft drinks and sweets.

A Danish study (71) advocates combining taxes and subsidies with other instruments, such as information campaigns, and emphasizes the need for more research. Recognizing this need, Denmark's, Ireland's and Sweden's policies suggest investigations of economic regulations to get more information on long-term effects, the effect on cross-border trade, consumers' recognition of price changes, the impact on overweight and obesity and feasible actions at the national relative to the EU level.

### Other national strategies in the European Region

This section gives examples of initiatives related to preventing obesity in countries that had no specific national document related to nutrition and physical activity available in English. A recent publication of the WHO Regional Office for Europe (72) includes references for the initiatives described below.

In **Austria**, the health promotion act of 1998 formed the basis for the creation of the Fund for a Healthy Austria. Its major task is to support practical and research projects, structural development, continuing training, and networking and information campaigns in health promotion. In 2006, the Fund strongly emphasized projects on nutrition and physical activity.

The national nutrition and health plan in **Belgium** was launched in 2006. It emphasizes the need to create an environment stimulating healthy eating habits and physical activity; this is to be achieved by improving education on food and nutrition and involving a number of stakeholders. Working with the private sector, the plan aims at increasing the availability of food for a healthy diet and improving the nutritional composition of food.

In 2005, the national nutrition action plan of **Cyprus** was finalized, leading to several activities organized by the Ministry of Health to motivate people to adopt healthier lifestyles.

In 2004, a National Council for Obesity was established in the **Czech Republic** as a permanent advisory body to design and implement a national action plan against obesity. The national cycling strategy of 2004 is progressively recommended to regional and local governments, businesses and NGOs to be included as a complementary part of their activities, programmes and documents. Mechanisms to ensure successful implementation have been created.

The Federal Ministry of Health in **Germany** has made preventing overweight its health and nutrition policy objective. Germany's platform on diet and physical activity was founded in 2004 with members in various sectors. Its major aim is preventing obesity, especially among children and adolescents.

In **Iceland**, the national health plan of 2001 is being revised; action to improve diet and physical activity and to prevent obesity will now be emphasized more strongly. Parliament passed a resolution calling for action to improve the health of Icelanders through healthier diet and increased physical activity in May 2005. As a result, the government was made responsible for preparing an action plan to improve public health.

In **Israel**, the proposed strategy of the national obesity task force focuses on primary, secondary and tertiary prevention strategies. Recommendations include annual anthropometric screening in schools and taking multi-sectoral action on the marketing and advertising of products aimed at children.

In **Italy**, the objective of the national health plan for 2003–2005 was to promote healthy lifestyles, prevent and tackle obesity and improve communication. In March 2005, an agreement was reached at the national and regional levels on the formulation of a national prevention plan for 2005–2007, of which obesity, especially in children, is a key priority.

A first strategic document for health promotion up to 2010 was developed for **Kazakhstan**; it identifies eight priority areas, including healthy nutrition and physical activity. The document calls for greater joint responsibility of government, employers and individuals.

Following the first National Health Conference in **Luxembourg** in November 2005, an initiative was taken to elaborate a national programme to promote healthy nutrition and physical activity. An interdisciplinary coordination body was established to implement the policy, to evaluate the initiatives realized, to identify further needs and regularly to adapt the programme on nutrition and physical activity.

In **Malta**, several projects and initiatives are in place to prevent overweight and obesity, mainly carried out by the health sector through its Health Promotion Department. These focus on interventions in schools and the community and on establishing a national policy for a healthy school nutrition environment.

In **Poland**, a platform for action on diet, physical activity and health was established in 2005 with a particular focus on counteracting and preventing overweight, obesity and other diet-related diseases. The objectives of the national health programme for 2006–2015 included developing a national programme to prevent overweight, obesity and noncommunicable diseases through diet and improved physical activity in 2007–2016.

In the **Russian Federation**, the implementation of a multisectoral policy document, approved by the government, on a concept for a national policy for healthy nutrition up to 2005 resulted in the establishment of a system monitoring food intake and increased production or reformulation of food. Regional governments and local authorities used a 2001 document on healthy nutrition and an action plan for developing regional programmes in the Russian Federation; this led to the implementation of programmes on diabetes and hypertension with a focus on nutrition and physical activity.

In 2005, the Ministry of Health established a commission to prepare a nutrition plan of action for **Serbia**.

The two main strategies dealing with nutrition and physical activity in **Slovakia** are the state health policy and the national health promotion programme. A proposal for a national obesity prevention programme was developed as an initiative of the Public Health Authority of Slovakia in 2005.

In 2000, the Federal Council in **Switzerland** approved an action plan on nutrition and health to reduce the prevalence of nutrition-related diseases, ensure the supply of safe and high-quality food and contribute to the sustainable and environmentally friendly production and distribution of food. In 2004, the Network Health-enhancing Physical Activity Switzerland was created to promote physical activity among the population.

In 2006, **Tajikistan** was planning to develop a policy on preventing obesity and to survey its prevalence.

## Conclusion and policy implications

Most countries in the WHO European Region are tackling the growing problem of obesity through various strategies. The countries analysed here have published comprehensive documents that either specifically focus on obesity or include its prevention in a strategy on diet and physical activity or a public health approach.

The documents vary in the level of detail they give to their strategies and proposed actions. For example, Sweden's action plan gives the rationale for proposing certain measures and defines the time frames, resources and the responsible actors. Slovenia's document names the task performers, which could help strengthen the commitment of the stakeholders and support implementation. Only a few countries set quantitative targets that can be used for evaluating effectiveness. Policy evaluation tools and sets of quantitative and qualitative indicators could be part of future activities at the European level to compare countries and to monitor trends.

Getting more information on the implementation and effectiveness of specific interventions is important, but many countries seem to struggle with political commitment and lack of resources. Strategies to raise political awareness could include cost–benefit calculations, which then could provide a convincing argument to allocate resources.

Evidence on the effectiveness of interventions is more developed at the microenvironmental level. Although the evidence on large-scale observations at the macroenvironmental level is not sufficient, all countries' strategies recognized that health promotion requires an environment that supports healthy lifestyles. Opting for an environmental approach, the national policies involve various sectors in the strategies' consultation process and implementation. Signed agreements, partnerships, networks and platforms with relevant stakeholders are new tools that may be able to help harmonize activities, strengthen resources and prevent the distribution of messages conflicting with public health objectives.

Greater exchange of experience, collaboration and harmonization between countries are needed.

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## 21. Implementing the WHO Strategy on Diet, Physical Activity and Health: analysis of global progress

### Main messages

- The WHO Global Strategy on Diet, Physical Activity and Health, launched in 2004, is the founding document for international action on noncommunicable diseases, including obesity.
- Subsequent meetings and workshops have produced valuable reports and tools for policy development, and additional tools are being developed.
- Policy development is uneven across the WHO regions, and some Member States need further support to develop a meaningful response to the obesity epidemic.
- Both the commercial sector and civil society have major roles to play in supporting the Global Strategy, and WHO is working to promote this.

In response to the growing global epidemic of noncommunicable diseases, the 2002 World Health Assembly called on the WHO Director-General to develop a global strategy on diet, physical activity and health within the framework of the renewed WHO strategy for the prevention and control of noncommunicable diseases (1). In consultation with Member States, United Nations agencies, civil-society groups and the private sector, WHO developed the Global Strategy on Diet, Physical Activity and Health over a two-year period and the World Health Assembly endorsed it in 2004 (2). The Global Strategy (3) builds on several previous World Health Assembly resolutions on preventing and controlling noncommunicable diseases and promoting health, in addition to agreements and declarations made in WHO regions.

This chapter illustrates progress in the global implementation of the Strategy, to give context to action against obesity in the WHO European Region.

### Scope of the Strategy

The Global Strategy urges all Member States to develop, implement and evaluate the action it recommends, as appropriate to national circumstances, to promote individual and population health by improving diet and increasing physical activity to reduce the risk and incidence of noncommunicable diseases. Ideally placed in their primary steering and stewardship roles, governments are encouraged to build on existing structures and processes that address all aspects of diet, nutrition and physical activity. Within a multisectoral framework, health ministries have central responsibility for coordinating and facilitating the contributions of other sectors.

The Global Strategy requests WHO to provide technical advice to Member States and mobilize support for implementing the Strategy and monitoring and evaluating implementation. Emphasizing the multistakeholder approach, the Global Strategy requests WHO to strengthen international cooperation with other organizations of the United Nations System and bilateral agencies in promoting healthy diets and physical activity, to cooperate with civil society and public and private stakeholders and to work with other specialized bodies of the United Nations System and intergovernmental agencies on assessing and monitoring the Strategy's impact.

The Global Strategy also calls on all other stakeholders to contribute to achieving its objectives by taking action within their sphere of influence. Civil society and NGOs have important roles in influencing individual behaviour and monitoring the activities of organizations and institutions that promote a healthy diet and physical activity. As advocacy organizations, they can also help to ensure that governments provide support for healthy lifestyles and that the food industry provides more healthy products and services.

The Global Strategy calls on other international organizations and bodies to give high priority to promoting healthy diets and physical activity to improve health outcomes. The role of international partners is of paramount importance in achieving the Strategy's goals and objectives, particularly for transnational issues or when the actions of a single country are insufficient.

The private sector can be a significant actor in promoting healthy diets and physical activity. Because many companies operate globally, international collaboration is crucial. Initiatives by the food and drink industries – to reduce portion sizes and the fat, sugar and salt content of processed foods, to increase the introduction of innovative, healthy and nutritious choices and to review current marketing practices – could accelerate health gains worldwide. Moreover, the private sector employs many people in many countries. Workplaces can enable healthy food choices and support and encourage physical activity.

## **Implementation of the Strategy**

### **Action by countries and WHO regions**

Member States have implemented or plan to implement the Global Strategy, either independently or as part of existing programmes related to nutrition, preventing noncommunicable disease or promoting health. The preliminary results of the WHO global survey on countries' progress in prevention and control of noncommunicable diseases (4) and information from WHO regional offices show that several countries have developed specific responses to the request made by the Global Strategy.

At the fifty-fifth session of the WHO Regional Committee for Africa in August 2005, Member States in the WHO African Region adopted resolution AFR/RC55/R4, which includes a call to implement the Global Strategy as a priority intervention in preventing cardiovascular diseases. In October 2005, chronic disease focal points from several countries participated in the Network of African Noncommunicable Diseases Interventions–WHO International Visitors Programme for Chronic Disease Prevention and Control in Mauritius, to develop draft proposals for national policy development, strategic plans and action plans, integrated or specific programmes for disease prevention and risk factor intervention, including their Global Strategy implementation plans. In addition, training workshops were conducted in Benin and South Africa in 2004 to enable countries to strengthen and implement their intersectoral food and nutrition plans. An intercountry workshop on the use of physical activity as an entry point for noncommunicable disease prevention was held in February 2007 in Uganda.

In the WHO Region of the Americas, discussions have focused on the need to support well-established national programmes to prevent and control noncommunicable diseases, their common risk factors and related activities. In September 2006, the 47th Directing Council of the Pan American Health Organization endorsed the Regional Strategy and Plan of Action on an Integrated Approach to the Prevention and Control of Chronic Diseases, Including Diet, Physical Activity and Health (resolution CD47.R9). This makes the case for urgent action and is intended to guide the future development of all related noncommunicable disease prevention and control activities in the Region, including implementation of the Global Strategy, review of food-based dietary guidelines and other programmes and projects. In addition, an implementation plan for the Global Strategy was prepared and discussed with all stakeholders, and further refined at a workshop in April 2006.

In response to a growing burden of death and disability resulting from noncommunicable diseases, the fifty-second session of the WHO Regional Committee for the Eastern Mediterranean endorsed three main strategic directions in 2005: estimating population need and advocating action based on the WHO STEPwise approach to surveillance (5); developing national policies, strategies and plans for noncommunicable disease prevention and care and capacity-building; and promoting and implementing community participation in the prevention and care of noncommunicable diseases. A training workshop was conducted in Cairo, Egypt in February 2006 to strengthen and implement intersectoral food and nutrition plans at the country level. In March 2007, a WHO workshop on implementing the Global Strategy in the Gulf Cooperation Council States was held in Dubai, United Arab Emirates.

Countries in the WHO European Region are integrating the implementation of the Global Strategy into their activities to prevent and control noncommunicable diseases. In September 2006, the WHO Regional Committee for Europe endorsed the European Strategy for the Prevention and Control of Noncommunicable Diseases (6). The Strategy promotes a comprehensive and integrated approach to tackling noncommunicable diseases and puts forward a framework for action to assist countries in formulating their responses to these diseases. To facilitate Region-wide action to increase physical activity and improve dietary habits, the WHO Regional Office for Europe organized the WHO European Ministerial Conference on Counteracting Obesity, in Istanbul, Turkey in November 2006. At the Conference, Member States adopted the European Charter on Counteracting Obesity (7). The Regional Office and WHO headquarters are jointly participating in the EU platform on diet, physical ac-

tivity and health (8), a multistakeholder platform in which industry stakeholders have a voice, along with NGOs and country representatives. In addition, Member States reviewed and evaluated the First Action Plan for Food and Nutrition Policy in the WHO European Region, 2000–2005 (9), including the increasing problems of obesity and other diet-related noncommunicable diseases, and have developed a second plan proposed for adoption in late 2007.

In June 2006, the health secretaries of Member States of the WHO South-East Asia Region adopted the Regional Framework for Prevention and Control of Noncommunicable Diseases. The Framework provides a stepwise construction to support countries in updating, strengthening and developing national policies, strategies and programmes for the integrated prevention and control of noncommunicable diseases. A meeting of the South-East Asia Network for Noncommunicable Disease Prevention and Control in late 2005 endorsed a regional framework for the implementation of the Global Strategy, including a plan of action and guidelines on planning implementation. Four South-East Asian countries have developed national plans for Global Strategy implementation and another four are preparing plans. In addition, a training workshop was conducted in India in 2005 to enable countries to strengthen and implement their intersectoral food and nutrition plans. In 2006, the WHO Regional Office for South-East Asia organized a meeting in Myanmar on implementing the Global Strategy in the South-East Asia Region.

The WHO Regional Office for the Western Pacific developed a regional implementation plan highlighting a number of key strategies and actions needed to strengthen existing policies, plans and programmes for non-communicable disease prevention in the Western Pacific Region. The Tonga Commitment to Promote Healthy Lifestyles and Supportive Environments and other regional policy statements provide the basis for prevention and control activities in the Region. By implementing the Global Strategy, the Region's goal over the next three years is to enhance the prevention and management of noncommunicable diseases and build greater awareness of the social determinants of health and the role of health gains in countries' economic and social development in terms of governance, productivity, quality of life and extended healthy years of life. In addition, training workshops were conducted to enable countries to strengthen and implement their intersectoral food and nutrition plans in Fiji in 2004 and 2006. In 2006, a workshop on implementing the Global Strategy in Asian countries was held in the Philippines.

### Action by WHO at the global level

WHO is producing and disseminating a range of tools to assist Member States and stakeholders in implementing the Global Strategy (10). This work focuses on:

- improving diets
- improving the population's level of physical activity
- forging partnerships for public health
- building national capacity
- measuring and monitoring progress.

### Improving diets

Unhealthy diet is a major risk factor for chronic disease. Inadequate fruit and vegetable consumption alone causes an estimated 2.7 million deaths per year (11).

As part of the implementation of the Global Strategy, WHO organized a meeting on reducing salt intake in populations in 2006 in France (12). The participants achieved consensus about the adverse effects of excessive salt consumption on health, and concluded that interventions to reduce population-wide salt consumption are highly cost-effective. The policies developed should be intersectoral, multidisciplinary and include the participation of all relevant stakeholders. The participants also agreed that interventions at the national level should be based on three main pillars: product reformulation; health promotion and consumer education; and changing the environment (11).

A recurring theme during the development of the Global Strategy was the need for effective guidance for Member States on how best to manage the marketing of food and non-alcoholic beverages to children. In 2006, WHO convened a meeting on this subject in Norway (13). The participants agreed that exposure to the commer-

cial promotion of energy-dense, micronutrient-poor foods and drinks can adversely affect children's nutritional status. They recommended that WHO (13):

- support national action to protect children from marketing by substantially reducing the volume and impact of commercial promotion of energy-dense, micronutrient-poor foods and beverages to children;
- address issues such as cross-border television advertising and global promotional activities; and
- consider developing an international code on the marketing of food and beverages to children.

An FAO/WHO consultation on national food-based dietary guidelines was held in Egypt in 2004 to review the status of the guidelines in seven countries in the Eastern Mediterranean Region, identify gaps and resources, and formulate a framework to assist Member States in developing and implementing guidelines (14). The participants concluded that considerable basic and supportive data to enable the development of national food-based dietary guidelines already existed in all countries participating in the consultation. They called on countries to take immediate action to follow up on developing and implementing such guidelines. As part of the effort to implement the Global Strategy, national food-based dietary guidelines in the countries in the Western Pacific Region and the Region of the Americas were reviewed in 2006.

A 2004 WHO/FAO workshop in Japan endorsed a framework that guides the development of cost-efficient and -effective interventions for promoting adequate fruit and vegetable consumption at the national or subnational level (15). WHO facilitates the implementation of this framework through regional training workshops at which relevant stakeholders, especially from low-income countries, can discuss this tool and how it can be implemented in their countries. A workshop for Portuguese-speaking countries in 2005 (16) triggered the establishment of an informal network for promoting fruit and vegetable consumption. Other workshops were held with Latin American countries in Argentina in 2006 and with francophone African countries in Cameroon in 2007. Further, a meeting took place in South Africa in 2005, to identify particular roles for stakeholders in promoting fruit and vegetable consumption.

### Improving physical activity levels in populations

Physical inactivity is a major risk factor for chronic disease and is responsible for about 2 million deaths per year worldwide (11).

As a result of a WHO workshop in China in 2005, WHO developed a guide for population-based approaches to increasing levels of physical activity (17). It will assist countries and other stakeholders in developing and implementing a national physical activity plan and provide guidance on policy options for effectively promoting physical activity at the national and subnational levels. The guide includes general principles and examples of possible areas of action.

Measuring physical activity levels in populations is difficult, particularly for populations in low-income countries, where patterns of energy expenditure differ from those in high-income countries. WHO developed the Global Physical Activity Questionnaire (18) to improve the development of standard measurement tools and the description of the prevalence of and changes in physical activity within and between countries. The Questionnaire is being promoted and disseminated as part of the WHO STEPwise approach to chronic disease risk factor surveillance (5) and as a stand-alone tool for physical activity surveillance. In February 2007, the Questionnaire was further discussed during the second CDC/WHO technical meeting on adult physical activity in Rome, Italy.

### Partnerships for public health

The Global Strategy stresses the need to develop effective working relationships with relevant stakeholders to promote a healthy diet and physical activity.

The WHO expert consultation on childhood obesity was held in Japan in 2005 (19). The participants identified a way forward in developing international reference standards for monitoring the growth of school-age children and adolescents, identified the types of effective strategies to prevent childhood obesity and the possible obstacles to their implementation, realized the need to invest in early childhood health and nutrition to prevent overweight and obesity later in life, and identified needs for further research. They proposed a concrete action plan for the next steps to be taken in preventing childhood obesity.

WHO has established a discussion group on preventing childhood obesity with selected companies from the global food and non-alcoholic beverage industries to further the engagement of stakeholders and align their policies, plans and activities with the objectives of the Global Strategy. The group provides a vehicle to enable stakeholders to exchange mutually beneficial ideas on current practices, identify successful initiatives and activities and provide leadership for sector-wide action.

WHO has started an initiative on product reformulation to reduce the content of *trans* fatty acids. Its expected outcomes include: an international standard on acceptable levels of *trans* fatty acids and the removal or reduction of *trans* fatty acids in the product portfolios of the major global food and non-alcoholic beverage companies. A WHO expert meeting will be prepared to develop specific recommendations.

WHO will foster collaborative work with the World Economic Forum, particularly on the Working Towards Wellness initiative. The overall objective is to strengthen the prevention of noncommunicable diseases at the workplace by addressing their common risk factors. Employers in the commercial and the public sectors will take part in developing the activities and in identifying best practices.

WHO is finalizing a framework for interacting with the global food and non-alcoholic beverage industries in implementing the Global Strategy, so that the commercial sector takes part in improving public health by implementing the Strategy's recommendations.

Building on the WHO Global School Health Initiative, the WHO Nutrition-Friendly Schools Initiative and other school health and nutrition programmes of the United Nations System, WHO is developing a framework for preventing noncommunicable diseases through the school setting. The framework will provide policy options and recommendations for primarily education ministries on suitable interventions to improve diet and physical activity.

### Building national capacity

Many countries critically need to foster the development of coordinated national responses to the increasing problem of noncommunicable diseases, including their common risk factors, which include unhealthy diets and physical inactivity.

As a follow-up to the advocacy tool *Preventing chronic diseases: a vital investment* (20), WHO is preparing a framework for country action. This framework will assist policy-makers and planners in updating, strengthening, developing, implementing and evaluating national policies, plans and programmes for preventing and controlling noncommunicable diseases. It is a practical how-to document for Member States, taking a comprehensive integrated approach to noncommunicable disease policies worldwide.

WHO is preparing a review of the most effective nutrition and physical activity interventions, to provide countries with a priority framework of best-practice interventions for nutrition and physical activity to reduce the risk of noncommunicable diseases. This report will update previous reviews of effective interventions on diet (21) and broaden this review to physical activity in resource-constrained settings, on which knowledge is currently lacking.

### Measuring and monitoring progress

The Global Strategy recommends that Member States, NGOs, private-sector and research communities regularly measure and monitor all activities. Thus, WHO developed a framework to monitor and evaluate the Strategy's implementation at the national level (22). Its aim is to assist Member States and other stakeholders in monitoring the progress of their activities to promote healthy diets and physical activity in coordination with ongoing monitoring and surveillance initiatives. The indicators provided should be seen as examples to be used, as appropriate, after adjustment to the country's situation.

In addition to WHO activities to support countries in monitoring developments, WHO is making a second global survey to review the progress of national programmes for noncommunicable disease prevention and control with regard to the implementation of the Global Strategy for Noncommunicable Disease Prevention and Control (23), the Global Strategy on Diet, Physical Activity and Health (3) and the WHO Framework Convention on Tobacco Control (24). The results will assist WHO in better identifying the needs of Member States and in developing appropriate tools to respond to them.

### Action by international partners

WHO has been working with FAO and the Codex Alimentarius Commission to explore how the Codex Alimentarius – the system setting food standards, guidelines and related texts to protect consumers' health and ensure fair trade practices – can support the implementation of the Global Strategy. The Commission's work on nutrition labelling and nutrition and health claims provides important information about the nutrient content of foods and the role of diet in reducing disease. Accordingly, WHO introduced the Global Strategy to the 26th Session of the Codex Committee on Nutrition and Foods for Special Dietary Uses in 2004, the 55th Session of the Executive Committee of the Codex Alimentarius Commission in 2005 and the 33rd Session of the Codex Committee on Food Labelling in 2005 and prepared a joint WHO/FAO discussion paper for the 56th Session of the Executive Committee of the Codex Alimentarius Commission and the 28th Session of the Codex Alimentarius Commission in 2005.

### Action by civil society and NGOs

Global NGOs and WHO have reached informal agreements to support the implementation of public health objectives identified in the Global Strategy. For example, the agreement between the global alliance of NGOs and WHO can significantly contribute to NGO activities at the national level.

Major NGOs – the International Association for the Study of Obesity–IOTE, the World Heart Federation, the International Diabetes Federation, the International Paediatric Association and the International Union of Nutritional Sciences – have established the Global Alliance for the Prevention of Obesity and Related Chronic Disease. Through its national committees, the Alliance is advocates and encourages countries to implement the Global Strategy.

Physical activity networks share information and assist in implementing the Global Strategy and promoting physical activity across regions. Such networks include: the Physical Activity Network of the Americas, the European network for the promotion of health-enhancing physical activity and the Asia Pacific Physical Activity Network.

### Action by the private sector

The adoption of the Global Strategy has accelerated action by the private sector, especially the food and non-alcoholic drinks industries, to improve the nutritional profile of their products. Many reduced-energy products, products offering reduced sugar and carbohydrates, and reduced saturated fat and *trans* fat have been introduced. Nevertheless, new or reformulated products still represent a low percentage of product portfolios for a vast majority of companies. Portion sizes are changing also, but most companies have chosen to expand the range of available choices rather than restrict or eliminate unhealthy choices. Several organizations are redrafting and redefining their marketing codes to reflect concerns about childhood obesity.

Many major nutrition and fitness programmes supported by the private sector, including insurance companies, have been launched across the Americas and Europe. Companies across all sectors have invested in workplace wellness programmes. Some have launched exercise challenges with pedometers; others promote cycling-to-work projects and/or lunchtime walks. The vast majority of company initiatives are taking place in high-income countries.

### Conclusions

Although the epidemic of noncommunicable diseases and their common risk factors is growing rapidly in all parts of the world (except parts of sub-Saharan Africa), governments and international agencies are not investing sufficiently to reduce them. The preliminary results of the WHO global survey on assessing national progress in prevention and control of noncommunicable diseases and information from WHO regional offices show that countries' capacity in this area has improved somewhat. Several countries have developed specific responses to the request made by the Global Strategy. Many, however, have not developed any meaningful response to the problems caused by noncommunicable diseases.

The private sector has made some progress in response to the development and adoption of the Global Strategy. Manufacturers and advertisers of food and non-alcoholic beverages have been active in developing new and healthier product options and improving consumer information about their products. Such action is

important but often remains ad hoc and limited, and industry-wide action is needed. Much more needs to be done.

Global NGOs have not yet significantly affected the implementation of the Global Strategy objectives, but WHO and NGOs representing professional groups have established excellent working relationships.

The resources to support the implementation of the Global Strategy comprise an important limiting factor. Nevertheless, continued advocacy of implementation of the Global Strategy by all stakeholders, in the context of overall national policies, plans and programmes for noncommunicable disease prevention and control, is essential. More needs to be done urgently.

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## 22. Effective treatment: an evidence base for the treatment of overweight and obesity

### Main messages

- Modern obesity treatment programmes aim to improve health and well-being: treatment should be seen as a health benefit, not as a response to the dictates of current fashion.
- For some patients, general advice on eating and activity is sufficient. For those who need therapy for health reasons, a lifestyle programme and adjunctive therapy may be justified. Adjunctive therapy may include the prescription of an anti-obesity drug and/or bariatric surgery.
- Treatment requires sufficient consultation time, and, once adequate weight loss or another health benefit goal has been achieved, a continuing weight maintenance programme should be provided.
- Successful long-term weight maintenance depends on continuing follow-up.

Overweight and obesity cause or exacerbate a large number of health problems – both independently and in association with other diseases – and are among the most significant contributors to ill health (see Chapter 2). The intra-abdominal visceral deposition of adipose tissue, which characterizes central obesity (assessed by waist circumference and/or WHR), is a major contributor to the development of hypertension, elevated plasma insulin concentrations, and insulin resistance, hyperglycaemia and hyperlipidaemia (metabolic syndrome). The term metabolic syndrome refers to risk-factor clustering: a collection of metabolic traits that occur in the same person, with the clustering presumably reflecting a unifying underlying pathophysiology that requires a holistic approach to its management.

Many of the health risks associated with increasing body weight first appear in children and young people; the increasing prevalence of type 2 diabetes and associated medical complications is of great concern (1). This early onset needs to be dealt with by active management and research priorities aimed at reducing the resulting health and economic burdens.

The increasing prevalence of overweight and obesity has ensured that these disorders are now considered to be major medical problems. This chapter focuses on the evidence base for the treatment of overweight or obese adults. The review includes a short section on the management of children and young adults, but the equivalent evidence base for specific treatments of these two groups is small. This underscores the importance of further randomized controlled trials in young people. The compelling management requirement for young people must be one of prevention, because health services already face a substantial burden of illness secondary to the current high adult prevalence of obesity (see also chapters 4, 6, 8 and 11).

### Fundamental principles of managing overweight and obesity

Obesity management is perceived as a challenge, requiring skilled therapists, considerable time (usually in a busy practice) and belief in a successful outcome. Such requirements tend to leave many health professionals feeling unprepared for the task. This feeling is based on a lack of training, few long-term maintenance programmes, little understanding of the pathophysiology of weight control and often a prejudice about obesity: that obese people can solve their problem with sufficient self-control and will power. Also, few health professionals have been taught about nutrition and physical activity or realistic weight-loss goals, and obesity treatment is frequently instituted without the benefit of an integrated lifestyle management programme.

Modern obesity treatment programmes need to focus on people in true need, and aim to improve health and well-being. Obesity treatment by health professionals is undertaken for the resulting health benefit and not for the dictates of current fashion. In line with these caveats, not everyone who seeks weight-loss treatment requires it.

Obesity therapy today is based on a clinical assessment and the assessment of associated medical risks. Some patients require only general advice on eating and activity. For others, who need therapy for health reasons, a life-

style programme and adjunctive therapy may be justified. Treatment requires sufficient consultation time and, once adequate weight loss or another goal has been achieved, an ongoing weight-maintenance programme. The need for long-term follow-up cannot be stressed too strongly: successful long-term weight maintenance depends on continuing follow-up (2,3).

### Weight-loss goals

The few long-term studies of intentional weight loss and its effect on mortality appear to indicate that intentional weight loss in women results in a decrease in mortality in the first two years and that this decrease is related to cancer deaths (4). Also, there are other improvements in medical risk factors and complications from other diseases.

Many people, both health professionals and people with weight problems, have unrealistic expectations about weight loss, and set unachievable goals. Reaching the ideal or healthy weight is not necessary, because people can obtain health benefits by, first, maintaining their weight (not gaining more) and, second, losing a moderate amount of weight: 5–10% of their presenting weight. Weight-loss goals for overweight and obese patients should be tailored to the individual. A weight loss of 5% of the initial body weight will result in some improvement, while a loss of 10% is of major benefit, with clinically useful changes (such as lowered blood pressure, reduced plasma total cholesterol and triglycerides, and increased HDL cholesterol) and a significant improvement in the control of diabetes. Therapists should explain this to patients, who may understandably have unrealistic weight goals (5–7).

Recent studies confirm that mild-to-moderate weight loss can be achieved by lifestyle intervention and maintained for up to four years. Several major trials on diabetes prevention in China, Scandinavia and the United States (8,9) have given encouraging results. For example, the Diabetes Prevention Program in the United States studied the effects of a placebo, metformin and a reasonably intensive lifestyle intervention on preventing diabetes. At the end of four years, a maintained mean weight loss of 4.6 kg reduced the incidence of diabetes 58%. The other studies, with in general less intensive lifestyle interventions, produced similar results.

To tackle the difficulties in understanding appropriate and necessary weight loss and the lack of training and experience in weight management, many organizations and health departments have produced and occasionally update best-practice guidelines. Examples of such guidelines include those of the Scottish Intercollegiate Guidelines Network (5), the United States National Institutes of Health (6), the Royal College of Physicians of London (1), the National Health and Medical Research Council of Australia (10) and the National Institute for Health and Clinical Excellence (7).

With their evidence-based approach, such guidelines highlight areas of difficulty. For example, the BMI cut-off points for obesity, which were derived largely from data on Caucasians (indeed, those in the United States), are probably inappropriate for other ethnic groups. Some countries and organizations, including WHO, have suggested lower BMI cut-off points for people of Asian origin and possibly higher values for people of Pacific island ancestry. Another problem with such guidelines is their potential rigidity. It is essential to realize that, with increasing risk factors or disease or possibly with people of Asian origin, treatment needs to be instituted or intensified at the earliest stage and/or lower BMI level (11).

The management of overweight and obesity should not replace the need to treat, when indicated, other diseases or risks, such as type 2 diabetes and dyslipidaemia, even though weight loss may reduce or obviate the need for such treatment (12).

### Aims of treatment

Weight loss is definitely an aim of obesity treatment, but should not be the only one. Additional aims are to reduce the risk to health and complications from associated disease that may be present. Also, treatment is not just for the short term, but for a lifetime. The therapist needs to negotiate and document the possible aims for the treatment of overweight and obesity with each patient. Possible aims include:

1. weight loss (5–10%) or maintenance, especially in older patients;
2. waist reduction;
3. change in body composition for some;

4. diminished metabolic disease: better control and/or less medication for diabetes, dyslipidaemia and hypertension;
5. diminished mechanical disease: better control, less intensive therapy for obstructive sleep apnoea and arthritis;
6. more activity for control of mechanical disease (more able, less short of breath), less restriction and greater feeling of well-being;
7. fewer medications overall;
8. improved quality of life, well-being and psychosocial functioning;
9. improved fertility (important for in vitro fertilization programmes); and
10. individual goals, such as occupational reasons or wishing to look one's best for a special occasion.

If a patient cannot lose weight, an aim of no additional weight gain may be practical, achievable and beneficial. Some patients may find weight loss difficult, owing to mechanical complications (such as osteoarthritis), or emotional or psychological factors. When patients achieve their goals, however, therapists must congratulate and give them credit for their success. New goals, which may include further loss or weight maintenance, should then be negotiated.

Overall, weight loss should be approached incrementally with new goals set when the original target has been reached. Goals for elderly people (aged over 65 years) and the young are likely to differ. It has been suggested that, although a population becomes heavier with age, the risk from obesity does not increase proportionately.

For the future, methods and measures of identifying and characterizing obese people more likely to benefit from therapeutic interventions remain to be defined.

### Dietary treatment

Traditional diets low in food energy (3.3–6.3 MJ (800–1500 kcal) per day) that incorporate various methods for restricting intake have been recommended for weight management. The use of low-energy diets, with a treatment period beyond 6 months has been associated with a mean weight loss of about 8%, although, with longer use (3–4.5 years), the loss decreases to about 4% (13). A number of dietary manipulations may achieve this with varying success for longer-term weight maintenance, as detailed in Table 22.1 (14).

Low-fat ( $\leq 30\%$  of energy from fat), high-carbohydrate diets play a central role in the dietary management of overweight and obesity. Fat restriction seems to be an effective method of lowering energy density and is associated with spontaneous weight loss.

A fixed-energy-deficit diet has become increasingly popular, and dietitians commonly use it to provide a structured eating plan, based on the individual's estimated energy requirements. These requirements are estimated by calculating basal metabolism, adjusting for physical activity and subtracting an energy deficit (about 2.5 MJ (600 kcal) per day) to induce a weight loss of about 0.5 kg per week. Some evidence suggests that such a modest energy reduction per day may improve compliance, and this approach has been recommended as a dietary option for weight management (7).

Meal-replacement programmes are controlled-portion products (such as shakes, bars, soups and pastas) that replace two meals and snacks a day, while allowing the inclusion of one regular meal of healthy foods. This approach usually provides 5.0–6.7 MJ (1200–1600 kcal) per day, and several studies indicate short-term (three-month) weight loss is higher in the group treated with meal replacements than in the standard intervention group (15). The efficacy of meal replacements in real-life settings, where products need to be purchased and may be discontinued at an early stage, however, has not been investigated.

Very-low-energy diets are formula foods, providing about 1.9–3.3 MJ (450–800 kcal) per day. They are used as the single source of nutrition, replacing all meals and snacks. Due to the potential adverse effects of these diets, they are generally reserved for patients with severe obesity ( $\text{BMI} \geq 35 \text{ kg/m}^2$ ) and associated co-morbidities that justify rapid weight loss. Evidence suggests that very-low-energy diets are no more effective in managing obesity in the long term than are more moderate dietary strategies (7).

The glycaemic index describes the effect of carbohydrate foods on postprandial glycaemia and is measured by comparing the glycaemic effect of the test food with that of a reference food, such as glucose or white bread. Foods with a low glycaemic index are more slowly absorbed, leading to a less acute effect on glucose and insulin

Table 22.1 Summary of evidence for various dietary approaches to managing overweight and obesity

Dietary approach	Evidence of effectiveness	
	Good	Inconclusive/Inadequate
Low fat	Spontaneous weight loss Risk reduction Maintenance of modest weight loss with low-fat diet as part of comprehensive treatment programme	Unclear if energy restriction plus fat restriction are more effective than fat restriction alone
Fixed energy deficit	Modest weight loss	Some evidence of improved compliance relative to more severe energy restrictions
Meal replacements	Weight loss and maintenance	Unclear of outcome if product not free Effectiveness unclear in morbidly obese
Very-low-energy diets	Short-term weight loss greater than that with low-energy diets	Relative effectiveness versus low-energy diets over the long term (> 1 year)
Low glycaemic index	Risk reduction for coronary heart disease and type 2 diabetes	No randomized controlled trials on weight loss over time
High protein, low carbohydrate	–	Short-term and long-term safety profile unclear Effectiveness on long-term weight loss and maintenance not available

Source: Adapted from Kopelman & Grace (14).

levels, which suggests this may reduce hunger, increase satiation and reduce energy intake (16). No long-term randomized controlled trials have evaluated diets with a low glycaemic index for obesity management, and it is premature specifically to recommend them for weight management.

Diets high in protein and low in carbohydrates are currently popular choices for managing weight, but their popularity is not supported by evidence of their efficacy and long-term safety. Typically, these diets contain a high proportion of protein foods; unrestricted use of fats, particularly saturated fats; and a severe restriction of refined and complex carbohydrates.

Two studies have suggested that weight loss over the first 3–6 months was higher in the group whose diet was low in carbohydrates and high in protein. This difference was no longer evident at one year, however, indicating a greater weight regain in the group on a high-protein diet (17).

### Evidence of effectiveness

High-quality evidence supports the effectiveness of low-energy diets for the treatment of obesity, and that of lower-fat diets combined with energy restriction, and low fat diets alone. Moreover, high-quality evidence suggests that very-low-energy diets are more effective for acute weight loss than low-energy diets, but this benefit is not maintained over the long term.

### Physical activity

Physical activity seems to play a critical role in maintaining weight loss, with a positive association between the level of activity and the degree of weight loss sustained. It is the most variable component of energy expenditure, representing 20–50% of the total, and an evaluation of an individual's activity behaviour is critical to any therapeutic assessment. When physical activity alone is used in the treatment of obesity, weight losses are modest and average 2–3 kg (6).

Recommendations for physical activity suggest 30 minutes of moderate activity on at least 5 days of the week: a level of activity associated with improved fitness and protection from cardiovascular diseases. Recent evidence, however, has highlighted that a longer period of daily activity is required (perhaps 45–60 minutes a day) to maintain lowered weight and prevent weight regain (18).

Physical inactivity is a major risk factor for the development of type 2 diabetes. Prospective studies suggest that the more exercise taken weekly, the lower the risk of developing type 2 diabetes (19). Physically inactive people are more likely to have impaired glucose tolerance, and type 2 diabetes is more common among them. Intervention studies have demonstrated that a programme of lifestyle change that focuses on improved diet and increased activity can delay or possibly prevent the development of type 2 diabetes in people with impaired glucose tolerance (8,9).

### Evidence of effectiveness

High-quality evidence indicates that increased physical activity is effective in producing a modest total weight loss. Diet alone, however, was more effective than exercise alone. There is also high-quality evidence that physical activity alone, diet alone and physical activity and diet combined are effective interventions for the treatment of adult obesity.

There is high-quality evidence to confirm that intensive lifestyle modification prevents the progression from impaired glucose tolerance to type 2 diabetes in obese people.

### Managing behaviour

Behavioural approaches to managing obesity aim to help people make and sustain changes in their eating and activity behaviour, and require trained health professionals with good interpersonal skills to be used appropriately. Strong evidence indicates that combining a behavioural approach with more traditional dietary and activity advice leads to improved short-term weight loss, and that this is currently the most effective lifestyle approach to managing weight (20,21)

### Evidence of effectiveness

High-quality evidence indicates that a combination of behavioural therapy techniques and other weight-loss approaches is effective over a one-year period. There is limited evidence for the effectiveness of extending the length of behaviour therapy beyond this period.

### Pharmacological treatment

Anti-obesity drugs act on the gastrointestinal system (pancreatic lipase inhibitors) or the central nervous system to primarily suppress appetite.

In the first category, orlistat inhibits pancreatic and gastric lipase, thereby decreasing hydrolysis of ingested triglycerides. It produces a dose-dependent decrease in dietary fat absorption: weight loss in obese people results largely from reduced fat intake, which helps to avoid such gastrointestinal effects as steatorrhoea. Vitamin supplements (especially vitamin D) may be considered if there is concern about deficiency of fat-soluble vitamins. Orlistat is not licensed for use longer than two years, because there is insufficient clinical experience beyond this period.

In the second category, sibutramine promotes a sense of satiety through its action on the central nervous system, as a serotonin and norepinephrine reuptake inhibitor. In addition, it may mitigate against the fall in thermogenesis through stimulation of peripheral norepinephrine receptors. It is used in the adjunctive management of obesity in people with a BMI  $\geq 30$  kg/m<sup>2</sup> and no associated co-morbidity or those with a BMI  $\geq 27$  kg/m<sup>2</sup> in the presence of other risk factors, such as type 2 diabetes or hypercholesterolaemia. Sibutramine is not licensed for use longer than a year.

In addition, rimonabant is a novel agent for the treatment of obesity. It is a selective antagonist of the CB1 receptor in the endocannabinoid system. At present, it is unlicensed.

### Efficacy and evidence

Randomized controlled trials on orlistat and sibutramine suggest that about 60% of patients treated will achieve and maintain a 5% loss from their starting weight after 12 months of treatment, and 40% will experience a 10% weight loss (22,23). When drug therapy stops, weight loss often reverses gradually. Side-effects, however, may limit the use of both drugs. For example, any deviation from a low-fat diet while taking orlistat results in unpleasant and often explosive diarrhoea, and the use of sibutramine in clinical practice may be accompanied by an

elevation in blood pressure that requires close monitoring. The National Institute for Clinical Excellence, in the United Kingdom, has provided guidance for the use of both drugs (24,25).

Encouraging results for rimonabant come from two-year studies that compared different doses of the drug and placebo in overweight and obese subjects with untreated dyslipidaemia and/or diabetes. Of subjects treated with 5 mg rimonabant, 42% achieved and maintained a 5% weight loss at two years and 16% achieved and maintained a 10% reduction. The equivalent figures for obese subjects treated with 10 mg of rimonabant were 73% achieving a 5% weight loss at two years and 44% achieving a 10% weight reduction. Also, more than 50% of obese subjects treated with 10 mg rimonabant experienced both a physical and biochemical improvement in measures indicative of metabolic syndrome at one year (27).

There is high-quality evidence that anti-obesity drugs are effective in inducing modest weight loss in certain obese people for up to two years, but no evidence to date confirms effectiveness beyond this period or a longer-term benefit against associated medical risks.

### Surgical treatment

Three operative procedures are used for the surgical treatment of obesity: gastric restriction and gastric bypass operations and the biliopancreatic diversion. Gastric restriction involves creating a small-capacity compartment (< 20 ml) by either a combination of vertical stapling and a constrictive band opening or a circumgastric band that pinches off a small proximal pouch. A modification of the latter procedure uses an inflatable circumgastric band attached to a subcutaneous reservoir, which allows access to a hypodermic syringe that injects or withdraws fluid, thereby tightening or enlarging the band width.

The most common gastric bypass surgery, Roux-en-Y gastric bypass, is performed by stapling shut a vertically oriented pouch (< 20 ml) and connecting it to the jejunum transected 50 cm from the ligament of Treitz. Published evidence confirms that this procedure produces greater weight loss, but it is accompanied by more frequent adverse effects, including dumping (25).

The last of the three operative procedures, biliopancreatic diversion, includes a gastric resection and diversion of biliopancreatic juice to the terminal ileum, to reduce the absorption of nutrients. In this operation, an entero-entero anastomosis is performed between the proximal limb of the jejunum and ileum section, 50–100 cm proximal to the ileocaecal valve. A more recent modification, called a duodenal switch, maintains the pylorus and a portion of the duodenum, which improves protein absorption and results in fewer side-effects. Most anti-obesity surgical procedures have been successfully performed laparoscopically, which reduces the requirement for pain killers and facilitates prompt postoperative mobility.

### Efficacy

Surgery is usually successful in inducing substantial weight loss in the majority of obese patients. This is achieved primarily by a necessary reduction in energy intake.

Gastric restriction operations require strict dietary compliance, because the narrow outlet does not inhibit intake of high-energy liquids or soft foods, which may explain a failure to lose weight. The advantage of these techniques is their relative simplicity, with no anastomoses or bypass of any part of the bowel. As a consequence, operative mortality is very low and longer-term nutritional deficiencies unlikely. The reported excess weight loss after 3–5 years is 40–60%, but there is a slow regain thereafter. Some patients, however, lose no weight at all.

Gastric bypass operations usually achieve an excess weight loss of 49–62% maintained over 5–14 years. The operation is more complicated, and operative mortality is about 1%. The procedure can be associated with nutritional deficiency, although this is unusual when detailed dietary advice is reinforced with dietary follow-up.

Biliopancreatic division achieves up to 78% excess weight loss at 18 years. Operative mortality is 1%, but nutritional deficiencies are relatively common: 5–40% of patients for the longer term. In addition, alterations in bowel movements are frequent, with 3–5 movements, commonly offensive, occurring each day.

### Long-term outcome

The Swedish Obese Subjects study, a prospective intervention, is evaluating the medical outcomes of obesity surgery over a ten-year period. The reported outcome to date, after 8 years, has shown a weight loss of 16.3 kg,

compared with no loss in a medically treated control group (27). The unadjusted prevalence of diabetes among the controls, followed for 8 years, increased from 7.8% to 24.9%, while the rate in the surgically treated group was stable at 10.5%. The course of blood pressure showed a different pattern, with an initial significant fall in the surgically treated group associated with rapid weight loss. Despite continuing weight loss during the next six years, the decrease in diastolic blood pressure ceased and was accompanied by a small rise in systolic blood pressure. As a result, no difference was observed in systolic blood pressure between the two groups at 8 years; the diastolic pressure, however, was 2.5 mmHg higher in the surgically treated group than in the controls, despite the weight loss. Further, the initial improvement in all parameters of serum lipid profiles was not sustained in the surgically treated group at eight years: although HDL cholesterol levels increased, total cholesterol showed no change from the preoperative values (28).

In summary, surgery is effective for the treatment of obesity when all other methods have failed. The development of any service requires adequately trained, multidisciplinary teams to operate and provide long-term support to patients.

## Management of associated medical conditions

### Dyslipidemia

In all patients, lifestyle and dietary interventions, as well as weight management, are equally important in the management of lipid disorders. In many patients, however, additional pharmacological therapy is indicated to achieve treatment targets. In general, an HMG CoA reductase inhibitor (statin) should be considered for patients with overweight and obesity. Results from the Medical Research Council/British Heart Foundation Heart Protection Study confirm the benefit of statins in people with diabetes but without manifest coronary artery disease or raised cholesterol concentrations (29). Treatment of elevated LDL cholesterol does not itself target the most characteristic lipid abnormality associated with obesity: elevated triglycerides and low HDL cholesterol. Thus, both lifestyle intervention and the use of drug therapy to target these abnormalities are appropriate (30).

### Hypertension

In general, more stringent goals for blood pressure control are required for the treatment of hypertension in people with obesity and diabetes, to reduce the risk of coronary artery disease and other cardiovascular events. A level of 130/80 mmHg or less is associated with significant reductions in morbidity and mortality in people at high risk. Such a level may be difficult to achieve, however, in some patients in clinical practice.

The Antihypertensive and Lipid-Lowering Treatment to Prevent Heart Attack Trial suggested that a thiazide diuretic is at least as good as the more expensive angiotensin-converting enzyme inhibitor and calcium-channel blocker as an initial treatment for hypertension (31). The LIFE (losartan intervention for endpoint reduction) trial compared losartan (an angiotensin-receptor blocker) with atenolol (a beta-blocker) and showed an apparent reduction in insulin resistance and new-onset diabetes (32). For any obese person at significant risk for coronary artery disease, antiplatelet therapy (usually low-dose aspirin) is indicated, providing that there are no contraindications.

### Insulin resistance and glucose intolerance

Although much is known about the benefits of controlling glycaemia in people with diabetes, the impact of intensive glucose lowering on cardiovascular risk in those with obesity and impaired glucose tolerance remains unknown. Epidemiological studies indicate that blood glucose concentrations greater than 6 mmol/l are associated with an increased risk of coronary artery disease, but long-term studies of lowering glucose have not demonstrated compelling evidence for a significant reduction in cardiovascular risk. For obese non-diabetic patients, the use of such drugs as metformin and thiazolidinediones needs further investigation (33).

### Evidence

High-quality evidence confirms that the treatment of associated medical risks and established complications are as important as the management of obesity. Too often, treatment of risk or complication is delayed in the mistaken belief that the benefits of weight reduction alone are sufficient.

## Targeted treatment

Patients and some health professionals increasingly believe that drugs and surgery are the only effective treatment options for obesity. Because of the rising prevalence of obesity, European health economies will be unable to support all who may require such treatment. Thus, robust criteria will be needed to decide who warrants priority treatment. A priority may be to treat people with morbid obesity and those with established and serious medical complications, but the longer-term data to support this and associated cost–benefit studies are still lacking. Further, the clinical observation that impressive success occurs in people who are overweight, rather than obese, needs qualification.

Data from many countries on the prevalence of obesity indicate a progressive rise in obesity, while rates for overweight have remained static. This suggests that the major challenge is to contain the progression from overweight to obesity. Moreover, there should be universal agreement on process and outcome measures to be used to judge the ultimate success of anti-obesity treatment. Table 22.2 suggests some process measures.

Table 22.2. Process measures to judge the success of anti-obesity treatment

Measures	Benefits	
	Immediate	Longer-term
Physical	Weight loss Reduction in waist circumference Improvement in co-morbidities	Reduced breathlessness Decreased sleep apnoea Reduced angina Reduced blood pressure
Metabolic	Decreased fasting blood glucose and plasma insulin Improvement in fasting lipid profile Decreased glycosylated haemoglobin (HbA1c) level (if diabetic)	Reduction in doses of concomitant medications
Functional	Increased mobility Decreased symptoms Increased well-being and mood Increased health-related quality of life	Reduced time away from work Improved involvement in social activities Fewer consultations with health professionals

## Intervention approaches: children and adolescents

Reviews of the treatment of obesity among children and adolescents have shown that, when weight reduction is achieved, several associated factors also improve, although successful, sustained weight reduction is hard to achieve. Approaches to treating children and adolescents are in general designed to limit further weight gain and manage and alleviate the associated illnesses.

Motivation is essential. If the child or an influential parent is not motivated, the prospects for a successful intervention are poor. Adolescents are less likely than children to accept a highly controlled home or school regimen; their dropout rate is higher, and they have a wider range of strategies to avoid treatment and provide inaccurate self-reporting. Adolescents are in danger of falling into the gap between paediatric and adult services, refusing to be treated as children and failing to attend appointments. New, more innovative strategies, such as communication through text messaging and the Internet, need to be explored.

The approaches discussed here are: dietary treatment, physical activity, psychological and familial support, residential treatment, pharmaceutical treatment and surgery. Weight-maintaining diets combined with increased physical activity are the first-line treatments for obesity in children and adolescents. Long-term, randomized controlled trials are needed to evaluate the effectiveness of other therapeutic interventions for the management of obesity in young people.

Dietary control can lead to not only benefits but also negative consequences, including loss of lean body mass, reduced linear growth and exacerbation of eating disorders. Weight-maintenance regimens, with nutritional counselling, are preferred for all but very obese children until after puberty. For very obese children or moderately obese children with additional complications, a balanced low-energy diet that uses normally available foods is recommended.

Reducing inactivity, increasing walking and developing an activity programme can increase the effectiveness of obesity therapy, and independently reduce morbidity, even when they do not reduce obesity. Strategies for raising energy expenditure involve both increasing physical activity and reducing sedentary behaviour, such as watching television. Simple measures, such as reducing television time and use of videotapes and video games, can significantly contribute to decreasing overweight in children. The type of exercise used – such as exercise incorporated in daily life, involving games, swimming, sport, dance and cycling – also appears to be important for sustained weight loss. Children and adolescents are more likely to continue in the long term with exercise integrated into their daily lives.

Any effective treatment must take account of the family's influence on a child's food and activity habits. Parental involvement in treatment programmes is necessary for successful weight loss, among both young children and, to a lesser extent, adolescents. Clinicians should note potential barriers to parental involvement in treating children. For example, some parents may not perceive the child as obese, for cultural or psychological reasons. Other parents may acknowledge the child's obesity but deny its importance.

Behavioural and psychological forms of therapy that help to enhance physical activity and healthy eating habits are valuable for the long-term success of treatment of obese children and adolescents. With preschool children, group treatment is more important than individual treatment, and the whole family should be involved. By the time children reach puberty, they are creating their own groups and social networks, and individual treatment may be more appropriate. Forms of treatment can include cognitive behavioural therapy, family therapy, specialized schools and hospital treatment.

In some circumstances, interventions may be considered more effective if they are delivered in a more controlled environment – for example, in so-called fat camps – using a programmed combination of therapeutic measures to tackle the range of health effects of obesity. Residential programmes are best reserved for older children who can accept staying away from the family home and can form social networks with peers in the programme.

Several drug therapies for adults have been considered for adolescents, but most have yet to reach the approval stage. Until more extensive safety and efficacy data are available, medication for weight loss should be used only in specialized units.

Surgical interventions are not yet recommended for children and adolescents with common forms of obesity. Their safety and effectiveness in these patient groups have not been sufficiently established, and other approaches should be tried first. Surgery should be considered only when all else fails, children have achieved adult height and severe, potentially life-threatening complications of obesity are present.

## Conclusions

Current medical treatments for overweight and obesity in adults may be effective in the short term, thereby reducing associated risks. Surgical treatment, however, is the only intervention proven to maintain weight reduction in severely obese patients for the longer term (over 10 years). This weight reduction is associated with significant metabolic benefits: particularly a reduction in the incidence of type 2 diabetes. The treatment of overweight and obesity, for which appropriately trained health professionals are needed, requires not only weight reduction but also management of associated medical complications.

Immediate needs include an expanded evidence base for management of overweight and obesity in children and adolescents, agreed priorities for treatment and more robust measures for predicting successful outcomes, given the numerous obese people in the WHO European Region and the related costs to health systems, society and economies.

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## 23. Obesity policy: the next steps

### Main messages

- Considerable progress has been made in recognizing the need to tackle obesity and related noncommunicable diseases, but policy-makers are still struggling to find the right mix of policies.
- The causes of disease are embedded in a web of social policies. Making an impact requires the consideration of a wide range of changes across the policy spectrum, including market interventions and economic planning.
- This chapter outlines possible approaches as a basis for starting the political process necessary for change.

“Obesity is an epidemic peculiar to this century. We must decide whether we address it today or pass it on to future generations. Comprehensive changes to the way we live have led to this problem, and we are all aware that action in the field of health alone is not enough.”

– Recep Tayyip Erdoğan, Prime Minister of Turkey,  
WHO European Ministerial Conference on Counteracting Obesity,  
Istanbul, Turkey, 15 November 2006

If, perhaps just three decades ago, a senior health official had predicted that more than half of adults and one third of children in the WHO European Region would be overweight, that half a million European adolescents would have impaired glucose tolerance or that ambulances would routinely require four staff to help lift patients into the vehicles, the official would have been ridiculed, had diminished promotion prospects and considered unsuitable to advise policy-makers.

If, just two decades ago, a politician had suggested banning the advertising of soft drinks on children’s television, putting red warning signals on foods containing more than 20% fat or banning vending machines from schools, he or she would have been called an extremist, lost political party support and considered a liability by constituents.

Nevertheless, the burden of disease is now not only probable but reality, and the political responses are not only serious options but also widely supported by the voting population. This was reflected in the commitment shown by Member States, United Nations agencies, the European Commission, experts and NGOs in adopting the European Charter on Counteracting Obesity (1) at the WHO European Ministerial Conference on Counteracting Obesity in 2006.

The Charter reflects the new political impetus needed to drive forward the strategies required to counter obesity and promote health in the Region. Now the political impetus needs to be translated into a set of actions. This means identifying the targets for action, the main actors and the tools, information and skills that will be needed. Seeing the obesity challenge in its wider context is useful in starting this process.

### Policy challenges

The European Region has a long and noble history of pioneering public health and consumer protection. The implicit social contract that underpins much of its political, economic and legal structure promotes individual rights within a protective and supportive environment. The individual’s rights include those to personal health and the infrastructure to support health, but these are persistently challenged, easily undermined and continually exposed to changing circumstances. Thus, they need to be continually reviewed and revised.

Obesity provides a good example of the evolving processes that shape people’s health. Economic growth and increased consumer consumption can lead to increases in the energy density of the diet and the amounts of time spent being inactive, in both employment and domestic and leisure occupations. Further, the idea that an indi-

vidual has the right to become obese may conflict with the social costs of providing the consequential health care. Moves to provide political solutions may focus on changing individual behaviour or providing health promoting environments. Commercial activity may be changed by voluntary means or statutory measures.

Much of the evidence and many of the arguments presented in this book reflect the rapidly changing assessment of the obesity problem. The material was simply not available a decade ago, and few people appreciated the potential escalation of the problem. In the 1980s and 1990s, noncommunicable disease control was concerned with cardiovascular problems and cancer, with public health attention focused on smoking and diet as the upstream determinants of these diseases. Now the spotlight has shifted to focus on obesity, which brings both cardiovascular and cancer as co-morbid risks, along with a range of other disease states, including diabetes and other metabolic and endocrinal problems, as well as hepatic and osteopathic disorders and mental stress, apparent even during childhood.

The policy debate has changed accordingly. The last decade has seen significant developments in policies on obesity and its drivers in the European Region. The First Action Plan for Food and Nutrition Policy, WHO European Region, 2000–2005 (2) was remarkable because it attempted to provide an integrated approach to policy by embracing concerns for noncommunicable diseases, including obesity, and food supply issues such as sustainable food production, as well as the more traditional problems of undernutrition and food safety. A WHO Regional Office for Europe publication (3) supported the Action Plan by highlighting the wide disparities between countries in the Region, the rapidly changing priorities and the need to move from an old health promotion model of setting targets and providing educational messages to a new model focusing on ensuring adequate access to and societal facilitation of health promoting foods, with implications for production and marketing. The Regional Office designed subsequent activities to help implement the policies outlined in the Action Plan and particularly to ensure that Member States consider tackling obesity through policies in many sectors, including education, transport, social security, agriculture, media and finance. A second action plan was proposed for adoption in September 2007 (4).

The Regional Office continued to respond to public health concerns by organizing the WHO European Ministerial Conference on Counteracting Obesity in 2006. Preliminary expert meetings considered issues such as inequality in health, food and beverage marketing, agricultural supplies and school-based preventive action. The Conference participants recognized the activities of countries and the European Commission and explicitly identified outstanding initiatives by presenting special awards for innovative public health measures (5).

The European Commission's competence to deal with health-related issues has changed in important ways. The largest part of the Commission's budget has long comprised the support given to food production through the Common Agricultural Policy, but this was primarily designed to support producers, rather than to consider effects on health, except in relation to foodborne disease. A series of crises in the 1990s relating to foodborne diseases (such as salmonellosis and listeriosis, variant Creutzfeldt-Jakob disease, chemical contamination and adulteration), however, shook confidence in food production policies. These problems led to a reorganization of the Commission, with the creation of a directorate-general dealing with consumer and health concerns to strengthen competence in public health and consumer protection.

A European Commission white paper on food safety in 2000 included several broader food policy issues (6) and was followed by a review of Commission activities related to nutrition in 2003 (7). In 2005, the newly appointed Commissioner responsible for health and consumer protection, Markos Kyprianou, said "I would like to see the industry not advertising directly to children any more ..." and that the "... food industry has been given a year to stop advertising junk food to children and improve product labelling or face possible legislation" (8).

Following this statement, the European Commission launched the EU Platform for Action on diet, physical activity and health (9), composed of various stakeholder groups, and coordinated meetings of the European Network on Nutrition and Physical Activity, composed of experts on nutrition-related topics from various Member States. A series of meetings was subsequently held on the Platform, at which participating organizations made commitments to action on such issues as monitoring, provision of information, support for local interventions, networking and research.

In 2007, the European Commission white paper on a strategy for nutrition, overweight and obesity (10) called for better partnership and increased policy coherence across the EU, and raised issues directly related to obesity prevention policies, such as:

- information to consumers, such as food labelling
- the need for codes to restrict the promotion of energy-dense foods
- the role of institutional catering in schools and workplaces
- the role of commercial operators in school-based health education
- the adequacy of physical activity in schools
- the role of health professionals in promoting healthy diets and physical activity
- the measures needed to reach disadvantaged and minority population groups.

In 2001, the Council of the European Union, reflecting the views of Member States' ministers, invited the European Commission to take food, diet and health policies and preventing obesity into account in developing policy (11). Although the Council called for more informational and educational activities, its resolution also expressed the need to review many other intersectoral policies potentially affecting health, and emphasized that:

many Community policies, particularly in the fields of public health, agriculture, fisheries, research, transport, consumer protection and the internal market, have such an impact that ... national nutritional policies can have full effect only if aspects relating to nutritional health are taken into account in the drafting and implementation of the Community policies concerned.

This concept – that all policies should be examined for their health effects, just as they are for their environmental effects and cost implications – reflects the text of the Treaty of Amsterdam (12), whose Article 152 states: “high levels of human health protection shall be ensured in the definition and implementation of all Community policies and activities ...”.

In 2007, the Council of the European Union adopted a new resolution on promoting health through nutrition and physical activity (13), adopting the goals of the European Charter on Counteracting Obesity.

### Whole-society approach

Uneven economic development and wide cultural differences across the European Region mean that policy details have to be determined at the national and local levels. Nevertheless, a broad set of policy requirements can be outlined that would apply in virtually all parts of the Region. Examining the determinants of obesity helps in understanding the range of issues involved, which in turn means considering the determinants of diet and of physical activity. The First Action Plan for Food and Nutrition Policy (2), for example, recognized the importance of a wide range of determinants of diet when it considered food and nutrient security. Fig. 13.3 (see Chapter 13, p. 193) illustrates this by showing influences on food and nutrient intake and indicating how a range of environmental drivers – including price, access, attractiveness and familiarity – determine behaviour. Family income determines residential location as well as food choices. Social and employment policies determine levels of family income. Trade and investment policies determine the prices and availability of branded soft drinks, fast foods, confectionery and snacks. Formulation, packaging and promotion determine attractiveness by using traditional media and new advertising techniques.

A very similar diagram could be constructed to show many sectors' importance in determining physical activity and sedentary behaviour. Transport policy, fuel policy and planning determine how streets are used, for example, and policies on crime and police patrols influence whether parents let their children play outside. The design of buildings and video games affect the level of physical activity, and location, price or cultural prohibition may restrict access to enjoyable amenities for exercise (see Chapter 11).

As suggested earlier, one of the underlying causes of obesity in society is the nature of modern economic development, bringing consumer products that encourage high energy intake and reduced energy output. The relationship is not simple. As an economy develops, the market penetration of obesity-encouraging products is initially low and only more affluent people can afford the largely imported consumer goods: cars, televisions and energy-dense and nutrient-poor foods. Gradually the market is developed, inward investment brings locally produced products, prices fall and obesogenic products become widely consumed.

As the market matures, people on the lowest incomes and living in urban areas are the most exposed to the most obesogenic environments: widely available and low-priced energy-dense and nutrient-poor foods and re-

duced access to fresh, perishable foods, traffic-dense streets and poorly policed parks and play areas, and less access to enjoyable amenities for physical activity. The combination of low income and impoverished environments leads to lower self-esteem, which in turn leads to reduced motivation to pursue health-enhancing behaviour.

In a further twist to the problem, those who become obese are likely to experience discrimination, poorer employment prospects and less likelihood of marriage; this further reduces self-esteem and increases poverty. Not surprisingly, the prevalence of obesity tends to be highest in countries with a higher degree of social inequality (14), but even in those with lower levels of inequality, such as the Nordic countries, the prevalence of obesity is significant and rising.

Economic growth in the eastern part of the European Region in the past two decades has been triggered primarily by inward investment (foreign direct investment). Overseas companies purchase or construct local production facilities to reduce import costs, expand local production capacity and hence expand market share and total market size. On a global scale, foreign direct investment grew sixfold from 1990 to 2000, faster than global GDP or global trade (15).

Foreign direct investment in the countries of central and eastern Europe rose rapidly during the economic transition of the 1990s, when formally centralized command economies were being dismantled in favour of liberalized market economies. Nearly two thirds of the inward investment in the region's food and agriculture sector went into just two areas of food production: confectionery and soft drinks (16). This investment encouraged the growth of consumption of particular foods: in Poland, for example, sales of chocolate confectionery increased 26% from 1999 to 2004, and those of sugar confectionery and soft drinks sales rose 22% and more than 50%, respectively (17,18).

Investment in mass-produced foods such as soft drinks can show significant returns in capturing a local market, and reduced costs ensure that products formerly only available to a small group in the population are available to many more. Figures from the soft-drink industry show that increasing capacity for a single canning unit from 300 cans to 800 cans per minute reduces the production cost from nearly £0.06 per litre to less than £0.03 per litre (19). Further increases in capacity cause a smaller fall in price per litre but allow much greater volumes to be produced.

These simple relationships underpin the expansion of markets in emerging and transition economies. Globally, the United States has taken the lead, with direct investment into foreign food processing companies growing from US\$ 9 billion in 1980 to US\$ 36 billion in 2000. Sales by these companies increased from US\$ 39.2 billion in 1982 to US\$ 150 billion in 2000 (20). In 1998, companies based in the United States invested US\$ 5.7 billion in eating and drinking places overseas (21), shaping the processed foods market and making more processed foods available to more people (22,23).

The drive towards economic growth has also been fuelled by specific policy objectives, most notably the Lisbon Strategy in 2000, which declared that the EU's priority for 2000–2010 was to increase its commercial competitiveness in the global market and to ensure its sustained economic growth. Despite the provisions of the Treaty of Amsterdam, the Lisbon Strategy and its follow-up documentation mentioned little about health protection or promotion.

## Wealth and health

This discussion has emphasized that economic growth can generate many of the drivers of obesity by affecting the food supply and the physical environment. Nevertheless, two arguments qualify this relationship. The first is obvious: economic growth does not inevitably create obesogenic conditions; alternative products and environments that stimulate healthier lives and lifestyles can be conceived. Second, obesity stunts economic growth through its impact on the workforce and increased costs to the health and social services.

This latter case is easily made. In the United States alone, the federal outlay on health care (primarily Medicare and Medicaid) as a proportion of total federal spending rose from less than 5% in the 1960s to 15% in 1990 and was estimated to exceed 25% by 2007 (24). A significant amount of this increase can be attributed to overweight and obesity: recent figures suggest that excess body weight accounts for 5–9% of United States health care costs (24). Health care expenditure on obesity-related ill health in the Netherlands and in Portugal has been estimated at 3–4% of total health care expenditure, while the combined health care and social cost of obesity in the United

Kingdom was estimated at £2.6 billion in 1998, and £3.3 billion in 2002 (25). More than half of this cost was due to lost economic production. The figures did not include the likely greater total cost arising among people who are overweight but not obese.

Realigning the drivers of obesity presents the challenge of halting what may appear to be a self-perpetuating and unstoppable juggernaut, but changes are possible. The food industry's capacity to respond to the obesity crisis shows some of the possibilities: products with reduced energy density, smaller portion sizes and benefiting from realigned pricing and promotional marketing schemes can have useful effects on purchasing patterns and diet. There is, however, a danger that these strategies will be more effective among higher-income households, potentially increasing inequality in health. Beyond these developments, the food supply may benefit from being reshaped towards more food that has received less processing: fresh fruit and vegetables, fresh fish and lean meat, for example, and the distribution channels for these more perishable foods need to be developed. This may also help promote greater local production, reduce transport needs, improve the environment and increase local food security, all of which are policy goals for various sectors.

Similarly, reducing the use of cars and increasing that of public transport, bicycles or walking not only benefit health but also comprise the declared policy of many urban planning authorities, bringing further benefits in terms of pollution and road safety. Changing the built environment comprises economic activity generating economic growth and, again, public health measures to counter obesity have potential benefits to the environment and policies on climate change.

Deliberately intervening in the operation of the marketplace to accelerate beneficial changes is not easily justified in the current political and ideological climate. Commercial and government circles resist market interventions through regulation or other external measures. Economists use several arguments, however, when they recognize the need for intervention from a strictly economic perspective (26). These justifications include the cost externalities (such as the costs of the health services not embedded in the price paid for obesogenic goods at the time of purchase), the lack of rationality of normal individual decision-making (children and adolescents may not be expected to make rational choices, but adults also discount long-term costs in favour of immediate gratification) and imperfect information about the long-term health effects of obesity, anti-monopoly controls, restricted resources and safety. These are considered in more detail below.

The case for intervention becomes even stronger only slightly beyond the framework of strict economic efficiency. People can only make personal choices about diet, physical activity and other health promoting action within a specific context. If this context increases the risk of obesity, then healthier choices may be hard to make. Social, cultural and economic pressure can make the exercise of individual choices difficult, and these pressures can affect some people more than others. Although certain types of lifestyle behaviour may be classified as avoidable, in reality they can be fully avoided only when the circumstances in which choices are made are understood, addressed and changed so as to promote rather than hinder healthy lifestyle choices (27–29). In practice, avoiding the drivers of obesity requires individuals and their families to produce a robust microenvironment to withstand the pervasive pressures. This demands skill, time, commitment and money.

### **Making the case for market intervention (26)**

In standard economic reasoning, government intervention is merely an afterthought; market forces are usually considered to work best, or at least better than governments, in achieving the optimal allocation of resources from a social perspective. In liberal societies, consumer sovereignty is valued and government interference in the private sphere is not. In some conditions, however, the market fails to achieve optimal outcomes if left alone, and economists therefore advise governments to consider policy interventions to correct for market failure.

Under ideal conditions, the free coordination of individuals produces an outcome that not only is in the best interest of the individual but also represents the best possible outcome for society. The neoclassical economic model, on which this ideal view is based, posits the following central assumptions.

All costs and benefits are internal (or private): the person making a given choice takes account of and bears all the costs and benefits associated with it.

People act rationally; they maximize some objective function, such as their utility function, under the constraints they face, weighing the cost they would expect to incur with the expected benefits of the choice in question. The decision ultimately taken is the one that maximizes net benefits or utility.

People have perfect (complete) information about the expected effects of their actions.

Preferences are time-consistent: people face no serious self-control problems such as deferring significant healthy behaviour while indulging in unhealthy behaviour.

If these assumptions were fully met, there might be no justification for public policy intervention. None of the potentially huge costs associated with noncommunicable disease would be relevant for public policy. In reality, however, one or more of the above assumptions often do not hold true, with the result that the market on its own does not achieve the outcome most desirable for society.

In the WHO European Region, the costs of obesity in terms of ill health, social care and lost productivity are not borne entirely by the individual, but in part by the population more generally. Other external costs that justify intervention are those relating to product safety (such as controls on foodborne diseases or vehicle emissions) and protection from other people's unhealthy choices (such as controlling tobacco smoke in workplaces and providing nutrition assistance for pregnant women).

The assumption that people act rationally (maximize their expected utility) represents a core pillar of economic thought. This assumption does not hold true, however, in the specific case of children and adolescents. Their choices may not be in their best interests, especially given the lasting impact that health and health behaviour in childhood are known to have over a lifetime. Age limits on the purchase of alcohol and tobacco products follow this line of reasoning. Determining an age at which rationality would prevail is impossible; indeed, one might argue that, even for adults, much of the efficacy of modern marketing occurs because marketing influences non-rational motivational impulses operating when choices are made (30).

Insufficient or asymmetric information poses further reasons for intervention. Asymmetric information occurs when one party to an exchange has information that it does not share with the other, and a mechanism is needed to force its disclosure. Insufficient information can be corrected using comprehensive or targeted information campaigns. Imperfect information may also occur where the health effects of behaviour are insufficiently understood and researched or where marketing efforts distort information, intentionally or otherwise.

A fourth justification for intervention has been described as time-inconsistent behaviour, in which a perfectly informed and rational individual reneges on a commitment at the point when he or she should fulfil it. For example, a smoker asked today to stop smoking immediately will probably answer no, but might agree to stop smoking in one year. One year from now, if asked again to quit smoking, the smoker might prefer to continue smoking rather than adhere to the previous commitment to quit. A similar pattern can be found among those who intend to lose weight.

Governments also use other arguments for market intervention, such as:

- competition failure, such as a supermarket chain dominating local food supplies;
- capital investment failure, such as fruit orchards that show no return for 10–20 years;
- protection of essential resources, such as fish stocks and urban green spaces; and
- income support to compensate employment failure, disability, etc.

## Choosing interventions

Both the principles and the practice of intervention need to be considered. The previous section discussed the principles, but the practice can take a wide range of forms. A project on stakeholder opinions on obesity funded by the European Commission identified several categories of intervention in an assessment of views on what should be done to tackle obesity (Table 23.1).

Policy-makers concerned with preventing noncommunicable disease need clear evidence showing what they should do. Scientifically controlled trials can obtain evidence evaluating the medical treatment of affected individuals, but can only obtain evidence on the prevention of noncommunicable diseases in communities and larger population groups in very limited circumstances. Other forms of evaluative evidence are needed.

This is true for obesity. The limited evidence on primary prevention in controlled trials suffers from a settings bias, in which the most reliable data are based on interventions in the most easily controlled settings such as schools and clinics, where the intervention can be manipulated and the effects properly monitored (see Chapter 13). Interventions such as restrictions on marketing, improved labelling, food taxation or redesigned urban envi-

Table 23.1. Categories of intervention to tackle obesity

Category	Contents
Education and research	Strengthening training for health professionals in preventing, diagnosing and counselling for obesity Improving public education to enable citizens to make healthier choices Enhancing the teaching of food and health in the school curriculum Conducting more research into the causes and effects of obesity and why losing weight is difficult
Information supply	Controlling health claims and marketing terms such as “low-fat”, “light” and “healthy” Restricting the advertising and promotion of foods and drinks Requiring enhanced nutritional labelling, such as front-of-pack traffic-light signals
Market manipulation	Controlling access to obesogenic foods in schools and hospitals and restricting vending machines Providing publicly financed subsidies for healthy food or food distribution Taxing food and drink products to reduce the consumption of products that promote obesity Regulating the nutritional composition of processed food products Providing financial incentives to reformulate food products Providing financial incentives to caterers to improve menu quality Improving the provision of sports and recreational facilities in schools and communities Making changes to the built environment, transport facilities, etc.
Technological innovation	Increasing the use of synthetic fat substitutes and artificial sweeteners in food Increasing the use of medication to control body weight, including non-obese people Increasing the availability and use of pedometers or similar monitoring devices
Institutional reforms	Reforming EU Common Agricultural Policy to help achieve nutritional targets Creating a new public agency to coordinate government policies on obesity

Source: adapted from Lobstein & Millstone (31).

ronments do not have and may never have an evidence base comparable to preventive interventions in the school and clinical settings.

Further, even when clear scientific evidence is available, additional approaches to policy development are possible and desirable. The most often used is to seek the recommendations of health experts who can consider the potential effects of a range of possible interventions. Several publications (32–36), in addition to this book, provide the evidence on which to establish policies for the primary prevention of obesity.

### Investment approach

Most of the elements needed for effectively preventing obesity are already in place. All stakeholders accept the case for prevention; there is sufficient understanding of the causes to know which determinants need to be targeted; the population groups of concern and the range of settings that can be used to make the changes needed are known; a broad range of strategies and approaches could be tried; and there is some evidence of what might work and what does not work. The full range of policies that will be sure to succeed is not clearly known. As mentioned, most of the scientific evidence is limited to easy-to-control settings such as schools and clinics, with very little direct evidence of the effectiveness of interventions that operate in the wider economic, social and physical environment.

Given the lack of sufficient evidence (see also Chapter 14), the challenge is to widen the forms of acceptable evidence for policy-makers and to consider investment rather than intervention. Investment involves a range of more and less risky actions (a portfolio of actions) that contain a good investment balance, which means a balance of:

- content: both nutrition and physical activity;
- settings: not all school-based;
- strategies: policies, programmes and communications; and
- target groups: the whole population and high-risk groups (see also Chapter 17).

Hawe & Shiell (37) used the analogy of choosing a balance of products (shares, property and bonds) to create a portfolio of financial investments to conceptualize appropriate investment in health. The best investments are safe and have high returns (a high level of evidence and high population impact), but inevitably the choices come down to including some safe, lower-return investments and some with higher risk (less certainty) but potentially higher returns, while excluding those with high risk and low returns.

The recent economically based analysis for HM Treasury in the United Kingdom (38) shows that interventions to reduce smoking, obesity and physical inactivity require economic modelling including analysis of the effects of product prices and marketing practices on consumers' purchasing patterns. The EU has used these approaches in its agricultural policies to manipulate the production of cereals, meat, milk, butter, sugar, wine, fruit and vegetables by altering subsidy and tariff levels, controlling minimum prices and shaping markets by, for example, destroying fish catches and fruit and vegetable crops. Other opportunities for intervening at the level of economic and trade policy include the following.

The model of the 1990s, which relied on health education to encourage individuals to make behavioural life-style changes, should now give way to a model that takes account of inequality in health and the environmental determinants of health and disease. Tackling obesity requires influencing the nature of the food supply and the built environment using a range of policy measures, including economic and trade instruments. Potential economic and trade instruments national governments might use to influence the obesogenic environment include the following:

1. protecting traditional foods: considering whether any categories of food can be designated as special national, regional or local dishes or components so that they might be protected from competing products with lower standards, using the Cassis de Dijon (protected designation) argument;
2. setting high standards: considering alternative national food standards, such as for the fat content of meat carcasses, and implementing regulation domestically that also alters imported food products;
3. invoking sanitary and phytosanitary measures under the WTO agreement on the application of sanitary and phytosanitary measures, which permits the restriction of food imports (such as products containing high levels of salt, saturated fats or *trans* fats) if they pose a possible threat to health that is scientifically justifiable;
4. reviewing development aid: considering withholding local, regional or external development assistance to projects that undermine nutrition and physical activity policies, and providing assistance to investments that promote healthier policies;
5. reviewing tax policies: considering withholding tax concessions (such as withdrawing the ability to offset against tax such expenses as marketing of obesogenic goods and services that undermine health policies), providing tax concessions for commercial activities that promote health policies and reviewing VAT categories to encourage the sales of healthier products while taking revenue from the sales of less healthy products;
6. reviewing public research support: directing publicly funded research and technology towards investment that, for example, ensures that fresh, perishable foods can compete fairly with long-shelf-life foods (cold chains, city farms, horticulture stores, small abattoirs and dairies and fish farms);
7. improving market feedback: the long food chain from farmer to processor to supermarket to shopper prevents effective feedback; primary producers being more aware of consumers' needs and preferences requires better support for consumer advocacy agencies, from public funds if necessary;
8. internalizing the externalized costs of production (such as the pollution caused by intensive animal and dairy farming and long-distance transport of sugar, starch and oil) and the amenities lost and true costs resulting from road congestion and road crashes; and
9. using the public purchasing power of local and national authorities (which purchase up to 25% of all food and have huge contractual power) to improve food quality.

Various international policy instruments can also be explored:

1. ensuring that Codex Alimentarius standard setting supports the need for high-quality food supplies, does not undermine national standards, accepts precautionary principles for health protection and promotes labelling requirements that assist healthy choices;

2. supporting moves to extend WHO's regulation-setting competence to include tackling noncommunicable diseases, and to develop conventions and codes for trade and marketing;
3. supporting moves to extend the United Nations Convention on the Rights of the Child (39) to include freedom from commercial pressures and inducements; and
4. developing Region-wide food labelling systems that incorporate both health-based criteria and such forms of public information as proposed in the nutritional profiling traffic-light system in the United Kingdom (see Chapter 9, p. 102), which has already led to the reformulation of products to achieve higher nutrient standards.

Economic planning approaches have not been used to analyse the options to change social policy to prevent obesity. They could provide valuable insight and guidance on the action that could successfully address the obesity crisis. Substantial evidence is needed, however, to convince politicians that economic policy can affect consumption patterns and subsequent noncommunicable disease rates.

## Conclusion

The rise of obesity presents a clear and relatively new challenge, which requires a whole-society response. The Ministerial Conference in Istanbul accepted this, which will form the basis of WHO's programme of work.

The heart of the challenge is the need to build the popular and political support necessary to ensure that promoting health is seen to be as important to economic policy as creating wealth and that protecting the population from unhealthy environments is seen to be as important as the military defence of the country. A decade from now, perhaps no one will doubt that health ministries have as much political importance as defence, trade and economics ministries.

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## Annex 1. Recent reviews on obesity prevention

This annex comprises an annotated list of examples of recent reviews, most of them systematic and some conforming to the Cochrane protocols. They were identified in a search of English language papers in January 2006. (Reports from the Cochrane Library can be accessed through different national portals by inserting their titles in its web site (<http://www.cochrane.org/reviews/clibintro.htm>.) The accompanying notes are a brief indication of the reviews' findings or recommendations. The last section of the annex includes a selection of reviews of interventions for other public health purposes that could have a bearing on obesity prevention strategies. The seven sections of the annex cover:

1. prevention of overweight and obesity
2. physical activity promotion
3. non-medical treatment for overweight
4. medical treatment for weight loss
5. breastfeeding promotion and infant growth
6. noncommunicable disease prevention and dietary intervention
7. examples of other public health interventions.

### Prevention of overweight or obesity

#### Reducing obesity and related chronic disease risk in children and youth (1)

This review found that there is a lack of programmes to address the particular needs of subgroups of children and young people. Although immigrants new to middle- and high-income countries may be more vulnerable to the obesogenic environment, no programmes were identified that specifically targeted their potentially specialized needs. Also, there is underrepresentation of programmes for children 0–6 years of age and for males. In addition, there are only a limited number of interventions in home and community settings, and there is a serious lack of upstream population-based interventions. Moreover, current programmes lead to short-term improvements in outcomes that relate to obesity and noncommunicable disease prevention with no adverse effects noted. Further, engagement in physical activity is a critical intervention in obesity prevention and reduction programmes.

Programmes require sustained long-term resources to facilitate comprehensive evaluation that will ascertain if long-term impact, such as sustained normal weight, is maintained. Finally, there is a critical need for the development of consistent indicators to ensure that comparisons of programme outcomes can be made to better inform best practice.

#### The prevention of overweight and obesity in children and adolescents (2)

This review was sponsored by industry. It was limited to school-based studies with a quantitative evaluation that used anthropometric outcomes. The studies intervened on diet- or activity-related behaviour. Of 25 interventions, 17 were effective, based on a statistically significant reduction in BMI or skinfold measurements for the intervention group. Four interventions were deemed effective by BMI and skinfold measurements. Of these, two targeted reductions in television viewing. The remaining two studies targeted physical education programmes combined with nutrition education. One intervention was effective in reducing childhood overweight, but it was also associated with an increase in the prevalence of underweight. The review recommends giving more attention to preventing adverse outcomes such as underweight.

#### Interventions for preventing obesity in children (Cochrane review)

This review found that the majority of studies were short-term. Studies that focused on combining dietary and physical activity approaches did not significantly improve BMI, although nearly all studies resulted in some improvement in diet or physical activity. There is not enough evidence from trials to prove that any one particular

programme can prevent obesity in children, although comprehensive strategies to address dietary and physical activity change, together with psychosocial support and environmental change, may help. There was a trend for recent interventions to involve their respective communities and to include evaluations.

Future research might usefully assess changes made on behalf of entire populations, such as improvements in the types of foods available at schools and in the availability of safe places to run and play, and should assess health effects and costs over several years. The programmes in this review used different strategies to prevent obesity, so direct comparisons were difficult. Also, the duration of the studies ranged from 12 weeks to 3 years, but most lasted less than 1 year.

### **Public health strategies for preventing and controlling overweight and obesity in school and worksite settings (3)**

The Task Force on Community Preventive Services recommends multicomponent interventions that include nutrition and physical activity (including such strategies as providing nutrition education or dietary prescription, providing physical activity prescription or group activity, and providing behavioural skills development and training) to control overweight and obesity among adults in worksite settings.

The Task Force determined that insufficient evidence existed to determine the effectiveness of interventions that combined nutrition and physical activity, to prevent or reduce overweight and obesity in school settings, because of the limited number of qualifying studies that reported non-comparable outcomes.

### **Physical activity and obesity prevention (4)**

The majority of studies suggest that low levels of activity are only weakly associated with future weight gain. Observational studies leave uncertainties about the direction of causality, as individuals who are overweight are less likely to stay active.

The updated review found 6 trials published since 2000 in adults and 11 in children and, for various methodological reasons, they are uncertain in their conclusions about whether increasing activity will be effective in preventing obesity. In the meantime, however, it is wise to stick to the consensus public health advice of advocating 45–60 minutes of moderate intensity activity daily to prevent obesity.

### **Increasing activity to reduce obesity in adolescent girls (5)**

This review of research on physical activity interventions conducted with adolescent girls found that results were not consistent across studies. However, the results suggest that school-based, multicomponent interventions that include designs to decrease sedentary behaviour were effective in increasing physical activity. Future research should focus on determinants of long-term adherence and the duration and intensity of interventions necessary to prevent obesity in adolescent girls.

### **Exercise prescription for the prevention of obesity in adolescents (6)**

School personnel reported lack of training in intervention, and health providers reported ineffective office-based (clinic-based) intervention strategies. With coordination of interventions in the school and office, prevention and treatment of childhood obesity can be improved. The evidence base, however, is insufficient to provide specific guidelines for assessment and treatment, although general recommendations can be made.

### **Addressing childhood obesity (7)**

This review of systematic reviews found, among other things, that long-term follow-up is critical to determine the relationship between physical activity interventions and lifelong patterns of activity and should be included as a measure of efficacy of the intervention. Also, interventions to increase physical activity in schools should include measures of both in-school and out-of-school physical activity, to determine the effect of these interventions on total activity levels. Moreover, comparative studies on dietary interventions should be conducted specifically in populations of overweight children, to determine the characteristics associated with improved dietary habits. Further, age at intervention should be evaluated to assist in targeting available resources, to achieve maximum impact. Finally, research should be systematically reviewed, to determine appropriate strategies for minority populations.

### **Physical activity interventions in the prevention and treatment of paediatric obesity (8)**

This review found that the evidence on childhood obesity prevention is not encouraging, although promising targets for prevention are now clear, notably reduction in sedentary behaviour. There is stronger evidence that targeting activity and/or inactivity might be effective in paediatric obesity treatment, but the generalizability of existing interventions and their clinical relevance are unclear.

### **Prevention of obesity – Is it possible? (9)**

Although effective in reducing cardiovascular risk factors, the programmes reviewed did not affect the mean BMI of the target populations. Also, selective prevention directed at high-risk individuals (such as children with obese parents) exhibited various degrees of effectiveness, and targeted prevention produced promising results in obese children when compared with no treatment. As well as health promotion and counselling, better school education and social support appear to be promising strategies for future interventions.

### **The management of obesity and overweight (10)**

This review has separate findings for children and adults. For schoolchildren, there is evidence to support the use of multifaceted school-based interventions to reduce obesity and overweight, particularly in girls. These interventions included: nutrition education, physical activity promotion, reduction in sedentary behaviour, behavioural therapy, teacher training, curricular material and modification of school meals and tuck shops. Currently, there is limited evidence to support school-based health promotion (such as classroom curriculum to reduce television, videotape and video game use) for the prevention of obesity and overweight in children. Also, limited evidence shows that family-based behaviour modification programmes (such as family therapy in addition to diet education, regular visits to a paediatrician and encouragement to exercise) impede weight gain in obese children. Moreover, there currently is a lack of evidence for school-based physical activity programmes led by specialist staff or classroom teachers for the prevention of obesity and overweight in children. There is also a lack of evidence that family-based health promotion interventions have an impact on obesity and overweight; these interventions focused on dietary and general health education and increased activity, with sustained contact with children and parents.

For adults, the evidence on effectiveness is mixed and inconclusive. There is inconclusive evidence about the effectiveness of community-based interventions (such as seminars, mailed educational packages and mass-media participation) for the prevention of obesity and overweight in adults.

### **The prevention and treatment of childhood obesity (11)**

This review found that there is some evidence that school-based programmes that promote physical activity, the modification of dietary intake and the targeting of sedentary behaviour may help reduce obesity in children, particularly girls. It also found that family-based programmes that involve parents, increase physical activity, provide dietary education and target reductions in sedentary behaviour may help reduce childhood obesity. Finally, it found that future research must be of good methodological quality, involve large numbers of participants, be carried out in appropriate settings and be of longer duration and intensity.

### **The effectiveness of school-based strategies for the primary prevention of obesity and for promoting physical activity and nutrition, the major modifiable risk factors for type 2 diabetes (12)**

The review concluded that the most effective interventions should be based on a whole school approach, including cafeterias, physical education classes, lunch and recess activities, classroom teaching, and should include links to home and the community. The longer the intervention, the greater the change in outcome measures. Also, different age groups, ethnic groups and genders needed different approaches.

### **Obesity: diagnosis, prevention, and treatment (13)**

This review states:

There is some doubt as to whether obesity is preventable in school age children, using currently available intervention strategies. ... Further research is indicated, though more recent evidence, published after the present literature review had been completed, is not promising.

### **Prevention of obesity (14)**

This review found that interventions should take into account national changes in dietary trends that may be occurring during the period of intervention: a five-year school-based nutrition education programme showed significantly raised awareness of nutritional knowledge among intervention children compared with controls, but no difference in energy or macronutrient intake, while both intervention and control groups showed reduced consumption of chips and an increased use of olive oil over the period. It also found that environmental changes, such as alterations in school physical education or monitoring television viewing time, are at least as important as classroom-based educational interventions. Studies conducted in less diverse settings were more likely to show significant obesity-related treatment effects. Moreover, it found that the absence of long-term treatment effects makes it difficult to evaluate the efficacy of interventions on the prevalence of obesity. Most of the studies were able to show improvements in eating and/or exercise habits of children, and the large trials indicate the feasibility of implementing school-wide changes to prevent obesity. The effects of these interventions on health-related behaviour or health status, when children become adults, remain to be assessed. Finally, future studies will need to evaluate the cost-effectiveness of school- and/or community-based obesity prevention interventions in young people, including long-term follow-up of obesity prevalence and incidence.

### **Obesity – Problems and interventions (15)**

This review found that most scientifically assessed, population-based preventive programmes have not demonstrated any favourable effects on the prevalence of obesity. However, there are examples of successful programmes for both adults and children. New outreach strategies need to be developed and assessed and, concurrently, public policy initiatives are needed to reduce the incidence of obesity.

### **Preventing obesity in children and adolescents (16)**

This review found that families and schools represent the most important foci for preventive efforts in children and adolescents. One productive approach is to proceed from an examination of factors that affect energy balance to the identification of closer influences on those factors. For example, television viewing affects both energy intake and energy expenditure and therefore represents a logical target for interventions. Also, guidance by paediatricians may help to change parental attitudes and practices about television viewing. As important foci for preventive action, schools are a base for directing interventions to change food choices and sedentary behaviour.

### **The importance of physical activity in the prevention of overweight and obesity in childhood (17)**

This review found that the role of physical activity in the primary and secondary prevention of obesity is not clear. However, a number of recent school-based interventions, directed at either increasing physical activity and/or decreasing sedentary behaviour, have shown encouraging results. On balance, increasing physical activity in children is an attractive and non-restrictive approach to obesity prevention. To adopt this approach requires the support and involvement of many community sectors other than health.

### **Interventions to prevent weight gain (18)**

This review found that interventions effects on weight were mixed, but that follow-up was generally short. Smaller effects on weight gain were found among low-income participants, students and smokers, and study drop-out was higher among thinner and lower-income subjects.

Interventions to prevent weight gain exhibited various degrees of effectiveness. Definite statements that relate the contributions of the intervention elements to increased effect size cannot be made, as only one of the five studies that involved a randomized controlled trial design reported a significant effect on weight. This intervention involved a correspondence programme and a mix of behaviour change methods, including goal setting, self-monitoring and contingencies.

### **School-based approaches for preventing and treating obesity (19)**

This review found that school-based treatment showed positive, though modest short-term results. Since relatively few primary prevention studies have been conducted, efficacy has not been established. Both primary and

secondary obesity interventions have a role in schools. A model, building on the comprehensive school health programme model, consists of eight interacting components: health instruction, health services, school environment, food service, school-site health promotion for faculty and staff, social support services, physical education classes and integrated and linked family and community health promotion efforts.

### **Role of physical activity in the prevention of obesity in children (20)**

This review found that the beneficial effect of physical activity in children is supported by controlled exercise intervention programmes. Several broad-based public health interventions designed to increase children's levels of physical activity have been implemented in schools, families and communities, with results suggesting promising strategies for the prevention of childhood obesity. It is likely that successful prevention of childhood obesity through the promotion of physical activity will involve theory-based, culturally appropriate school, family and community interventions. Through policy changes, environmental planning and educational efforts in schools and communities, increased opportunities and encouragement for physical activity can be provided.

### **The prevention and treatment of obesity (21)**

This review found that the progression of obesity in high-risk children may be prevented by family therapy. Prevention of obesity in adults may be achieved by community-based education programmes linked to financial incentives. Also, interventions to reduce sedentary behaviour can reduce overweight in children.

### **Physical activity promotion**

#### **Interventions implemented through sporting organisations for increasing participation in sport (Cochrane review)**

This review found that there is an absence of high-quality evidence to support interventions designed and delivered by sporting organizations to increase participation in sport. Interventions funded and conducted in this area must be linked to a rigorous evaluation strategy, to examine overall effectiveness, sociodemographic differentials in participation and cost-effectiveness of these strategies.

#### **Policy interventions implemented through sporting organisations for promoting healthy behaviour change (Cochrane review)**

This review found that, though unable to find any controlled studies to guide the use of policy interventions used in sporting settings, the search process revealed a number of case studies with anecdotal reporting of outcomes. More rigorous evaluation techniques should be employed to evaluate outcomes and the contexts and processes likely to be effective.

### **Physical activity and diabetes prevention (22)**

Hyperglycaemia is the hallmark clinical manifestation of diabetes and evolves through a multifactorial etiology of genetic, environmental and behavioural enablers. The hypothesis used by the authors is that the closest behavioural cause of insulin resistance is physical inactivity. Several streams of scientific research have demonstrated a role for physical activity in the etiology and prevention of diabetes and its related morbidity. The review examined associations between physical activity, cardiorespiratory fitness and non-insulin-dependent diabetes.

### **Non-curricular approaches for increasing physical activity in youth: a review (23)**

The amount of time for school physical education has declined. Curricular interventions have had limited effects and alternative non-curriculum approaches need to be tested. The review found that children were active during school break periods, and inexpensive interventions further increased activity during these times. Active travel to school offered the potential for physical exercise, but its effectiveness was impaired by traffic congestion and parental fears for child safety. Extracurricular, school-based interventions had problems with low attendance, which might be removed if delivered through existing community organizations. Summer day camps offered the potential for increasing the activity of young people, but research is required to determine how best to convert camp activity into increased post-camp habitual activity.

### **Interventions for promoting physical activity (Cochrane review)**

This review found that physical activity interventions have a moderate effect on self-reported physical activity and cardiorespiratory fitness, but not on achieving a predetermined level of physical activity. Professional advice and guidance with continued support can encourage people 16 years of age and older to be more physically active. The majority of studies lasted no more than a year. Also, there was no increase in exercise-related cardiac events or injuries among those who had become physically active, compared with those who remained sedentary.

### **Physical activity in the management of obesity (24)**

Exercise has a pivotal role in weight management. It optimizes body composition by minimizing fat-free mass losses and maximizing fat mass loss, and it enhances metabolic fitness. The amount and type of exercise needed to obtain health-related benefits may differ from those recommended for fitness benefits. Public health messages about exercise have focused on improvements in general health and fitness rather than on weight loss, prevention of weight gain or weight regain. About two and a half times more exercise than the United States Surgeon General's recommendation is needed to maintain energy balance and thus maintain a certain weight. The challenge is to get the exercise prescription right at an individual level.

### **Initiating and maintaining physical activity for type 2 diabetes mellitus (Cochrane review in process<sup>1</sup>)**

Most of the evidence to date on physical activity and diabetes has focused either on the effects of exercise on various biological and physiological outcomes or on demonstrating the importance of exercise for managing the disease. These investigations do not indicate what interventions are effective in promoting physical activity in people with diabetes or identify the unique barriers this population may face when deciding to become more physically active.

### **Achieving physiological change in school-based intervention trials (25)**

This commentary on school-based interventions notes that only a few interventions have had significant effect on physiological measures. The authors suggest improved success rates may result from an adequate length of intervention and a reduction in dropout through greater participant involvement. Heterogeneity – that is, the involvement of participants from diverse cultural backgrounds – is rarely catered for in the experimental designs where “one size fits all”, and this may compromise the ability to show significant effects.

### **Recommendations to increase physical activity in communities (26)**

This review found interventions that either are strongly recommended or show insufficient evidence. School-based physical education is strongly recommended, but classroom-based health education focused on providing information or on reducing television viewing and video game playing shows insufficient evidence. Family-based social support shows insufficient evidence, but individually adapted programmes for changing health behaviour are strongly recommended, as are enhanced access to places for physical activity and informational outreach activities.

### **The effectiveness of interventions to increase physical activity (27)**

Changes in physical activity behaviour and aerobic capacity were used to assess effectiveness. Two informational interventions (“point-of-decision” prompts to encourage stair use and community-wide campaigns) were effective, as were three behavioural and social interventions (school-based physical education, social support in community settings and individually adapted health behaviour change) and one environmental and policy intervention (creation of or enhanced access to places for physical activity combined with informational outreach activities). There was insufficient evidence to assess classroom-based health education, family-based social support, mass-media campaigns, college-based health education and physical education or classroom-based health education focused on reducing television viewing and video-game playing.

<sup>1</sup> A preliminary version was published on the Cochrane web site, but still being updated.

### **The effectiveness of school-based interventions in promoting physical activity and fitness among children and youth (28)**

The review found moderate improvement in physical activity among children and among adolescent girls exposed to promotional campaigns, but with little measurable effect on blood pressure, BMI or heart rate. The most effective initiatives involved children through the whole school day, including lunch and recesses as well as class time and physical education lessons. Adults who had participated in school-based physical activities as children were more likely to be active in adulthood than those that had not. The review found that interventions should be multifaceted, including classroom instruction and changes in school environment, and that interventions should be behaviourally focused. It also found that longer lasting interventions and/or frequent booster sessions improve effectiveness and that age, gender and ethnicity may affect outcomes and require further study.

### **Effects of physical activity interventions in youth (29)**

The review found that studies that showed the best results used randomized designs, valid and reliable measurements, and more extensive interventions. Some follow-up results showed physical activity was sustained after interventions ended. Special attention is needed for girls, middle schools, and community settings for all young people. Also, more objective assessments are needed for measuring physical activity outside of school and in younger children, since they cannot provide reliable self-reporting.

### **Non-medical treatment for overweight**

#### **Long-term non-pharmacological weight loss interventions for adults with prediabetes (Cochrane review)**

Overall, weight loss strategies using dietary, physical activity or behavioural interventions produced significant improvements in weight among people with prediabetes and a significant decrease in the incidence of diabetes. Modest, but not statistically significant improvements were noted in the few studies that examined blood sugar control, blood pressure and lipid levels. No data on quality of life or mortality were found. Further work is needed on the long-term effects of these interventions on morbidity and mortality and on how to implement these interventions in diverse community settings.

#### **Long-term non-pharmacological weight loss interventions for adults with type 2 diabetes mellitus (Cochrane review)**

Weight loss strategies that used dietary, physical activity or behavioural interventions produced small between-group improvements in weight. These results were minimized by weight loss in the comparison group, however, and examination of individual study arms revealed that multicomponent interventions that included very-low-energy diets or low-energy diets may hold promise for achieving weight loss in adults with type 2 diabetes.

#### **Psychological interventions for overweight or obesity (Cochrane review)**

Overweight or obese people benefit from psychological interventions, particularly behavioural and cognitive-behavioural strategies, to enhance weight reduction. They are predominantly useful when combined with dietary and exercise strategies. The bulk of the evidence supports the use of behavioural and cognitive-behavioural strategies. Other psychological interventions are less rigorously evaluated for their efficacy as weight loss treatments.

#### **Screening and interventions for overweight in children and adolescents (30,31)**

Interventions to treat overweight adolescents in clinical settings have not been shown to have clinically significant benefits, and they are not widely available. Screening to categorize overweight among children less than 12 or 13 years of age who are not clearly overweight may not provide reliable risk categorization for adult obesity. Screening in this age group is compromised by there being little generalizable evidence for primary care interventions: the United States Preventive Services Task Force found insufficient evidence for the effectiveness of behavioural counselling or other preventive interventions that can be conducted in primary care settings with overweight children and adolescents. Research is needed to provide well-defined and effective approaches to medical and psychological screening in children – as well as effective clinical approaches for the prevention and treatment of overweight in children – that can be implemented by primary care clinicians.

### **Chitosan for overweight or obesity (Cochrane review)**

There is some evidence that chitosan is more effective than a placebo in the short-term treatment of overweight and obesity. However, many trials to date have been of poor quality, and results have been variable. Results obtained from high-quality trials indicate that the effect of chitosan on body weight is minimal and unlikely to be of clinical significance.

### **The effectiveness of physical activity interventions for the treatment of overweight and obesity and type 2 diabetes (32)**

Among adults, strategies that combine diet and physical activity are more effective than physical activity strategies alone. Combined lifestyle strategies are most successful for maintained weight loss, although most programmes are unsuccessful in producing long-term changes. There is little evidence about compliance to prescribed behaviour changes or the factors that promote or hinder compliance to lifestyle changes. Limited evidence suggests that continued professional contact and self-help groups can help sustain weight loss.

### **Family involvement in weight control, weight maintenance and weight-loss interventions (33)**

This review found that parental involvement is associated with weight loss in children and that the use of a greater range of behaviour change techniques improves weight outcomes for both parents and children. There was a suggestion that spouse involvement increased effectiveness but that adolescents achieved greater weight loss when treated alone.

Future interventions should pay attention to which family members are targeted and how they are involved in the intervention, in terms of setting goals for behaviour change and providing support and training in behaviour change techniques.

### **Follow up exercise studies in paediatric obesity (34)**

The studies reviewed indicate that exercise is efficacious for reducing the percentage of body fat in obese children and adolescents and that exercise interventions may encourage long-term maintenance of the observed gains.

### **Interventions for treating obesity in children (Cochrane review)**

Although 18 research studies were found, most of these were very small studies drawn from homogeneous, motivated groups in hospital settings. There are limited data on the components of programmes to treat childhood obesity, and no direct conclusions can be drawn. Research is needed on the psychosocial determinants for behaviour change, strategies to improve clinician–family interaction, and cost-effective programmes for primary and community care.

### **Obesity – Problems and interventions (15)**

This review found that changes in dietary habits through counselling (mainly reduction of energy and fat intake) can lead to weight reduction, as a rule in the range of 3–10 kg during the first year (or 10% of body weight in children). The long-term effects, however, are uncertain. Also, regular exercise contributes to weight reduction.

Moreover, behavioural therapy in conjunction with changes in diet and exercise can have further effects on weight if supportive interventions continue for a longer period.

About a fifth of those who undergo treatment based on the weight watcher approach and who reach their goals achieve a permanent weight loss of 10% or more of their original weight. Very-low-energy diets (based on protein formulas) for 6–12 weeks yield a greater weight reduction than conventional low-energy diets. In studies of very-low-energy diets for 1–2 years, where the treatment was often periodic, the authors noted a retained weight loss of a few kg more than in a treatment using a balanced diet alone.

The scientific evidence for a wide range of alternative medicine methods is too weak to draw any conclusions about the possible effects these methods have on obesity. Also, the risks of obesity can be reduced through weight reduction, regardless of the methods used. Intervening against other risk factors – even when weight reduction does not succeed – can help reduce the risks of obesity. Such interventions would include increased physical activity, smoking cessation, and improved control of diabetes, high blood pressure and elevated blood lipids.

### **Advice on low-fat diets for obesity (Cochrane review)**

The review suggests that fat-restricted diets are no better than energy-restricted diets in achieving long-term weight loss in overweight or obese people. Overall, participants lost slightly more weight on the control diets, but this was not significantly different from the weight loss achieved through dietary fat restriction and was so small as to be clinically insignificant.

### **Exercise for obesity (Cochrane review in process)**

Studies show that maintenance of weight loss is enhanced if patients adhere to exercise programmes (35,36). Exercise may also affect weight loss through psychological pathways: exercise enhances body image, boosts self-esteem and improves mood, and individuals may adhere more rigorously to their dietary regimen (36). This enhanced dietary adherence may explain the link between exercise and weight control.

### **Improving health professionals' management and the organisation of care for overweight and obese people (Cochrane review)**

This review found that, at present, there are few solid leads to improving obesity management, although reminder systems, brief training interventions, shared care, inpatient care and dietitian-led treatments may all be worth further investigation. In addition, decisions for the improvement of provision of services must be based on the existing evidence on interventions with patients and on good clinical judgement. Further research is needed to identify cost-effective strategies for improving the management of obesity.

### **The prevention and treatment of obesity (21)**

This review found that treatments based on behaviour, diet, exercise and drugs have all been shown to be effective, to some extent, in treating obesity in adults, particularly when two or more approaches are used in combination. Also, most people begin to regain weight a few months after treatment. Longer term follow-up and use of maintenance interventions are necessary to sustain weight loss.

### **Medical treatment for weight loss**

#### **Surgery for morbid obesity (Cochrane review)**

This review found that the limited evidence suggests that surgery is more effective than conventional management for weight loss in morbid obesity. The comparative safety and effectiveness of different surgical procedures are unclear, however.

#### **Pharmacotherapy for weight loss in adults with type 2 diabetes mellitus (Cochrane review)**

This review found that fluoxetine, orlistat, and sibutramine can achieve statistically significant weight loss over 12–57 weeks. The magnitude of weight loss is modest, however, and the long-term health benefits remain unclear. Also, the safety of sibutramine is uncertain. There is a paucity of data on other drugs for weight loss or control in people with type 2 diabetes.

### **Systematic review of the long-term effects and economic consequences of treatments for obesity and implications for health improvement (37)**

This review found that the drugs orlistat and sibutramine appear beneficial for the treatment of adults with obesity, and metformin appears beneficial for obese patients with type 2 diabetes. Also, exercise and/or behaviour therapy appear to improve weight loss when added to diet. Long-term weight loss in epidemiological studies was associated with a reduced risk for type 2 diabetes and may be beneficial for cardiovascular disease. Moreover, low-fat diets and exercise interventions in individuals at risk for obesity-related illness are of comparable cost to drug treatments.

### **Long-term pharmacotherapy for obesity and overweight (Cochrane review)**

This review found that studies that evaluated the long-term efficacy of anti-obesity agents are limited to orlistat and sibutramine. Both drugs appear modestly effective in promoting weight loss; however, interpretation is limited by high attrition rates. Longer and more methodologically rigorous studies of anti-obesity drugs that are

powered to examine endpoints, such as mortality and cardiovascular morbidity, are required to fully evaluate any potential benefit of such agents.

### **Obesity – Problems and interventions (15)**

Pharmacological treatment using orlistat or sibutramine yields an average weight loss of 2–5 kg beyond that which would be attained through diet and exercise alone. In clinical trials, a fourth to a fifth of those who started pharmacological treatment lost at least 10% in weight, compared with half as many of those treated with placebo.

The major problem is that weight loss is not usually permanent. Within a few years, most of those who had initially succeeded in losing weight had returned to their original weight; it is therefore particularly important to develop and assess long-term treatments that aim at permanent weight loss.

Surgical treatment, which is an option in severely obese patients, reduces weight, on average, by somewhat more than 25% (for example, from 125 kg to 90 kg) up to 5 years after surgery. After 10 years, a weight loss of about 16% remains, slightly over 20 kg on average. This has substantial health and quality-of-life benefits for this patient group. The intervention, however, carries risks for complications.

### **The prevention and treatment of obesity (21)**

This review found that treatments based on behaviour, diet, exercise and drugs have all been shown to be effective, to some extent, in treating obesity in adults, particularly when two or more approaches are used in combination. A few months after treatment, most people begin to regain weight. Longer-term follow-up and use of maintenance interventions is necessary to sustain weight loss.

Surgery is the most effective and possibly cost-effective approach for reducing weight in people with severe obesity.

### **Breastfeeding promotion and infant growth**

#### **Baby-friendly hospitals' influence on breastfeeding duration (38,39)**

Two studies evaluated the Baby-Friendly Hospital programme from UNICEF in Europe. The more recent (38) found that children in Switzerland born in a baby-friendly health facility are more likely to be breastfed for a longer time, and this is particularly marked in hospitals that show the greatest compliance with the programme guidelines.

A second study, in Italy (39) found that an increase in the number of baby-friendly staff practices was related to a large rise in breastfeeding initiation and duration.

#### **Interventions for promoting the initiation of breastfeeding (Cochrane review)**

This review found that five trials involving women on low incomes in the United States showed breastfeeding education had a significant effect on increasing initiation rates compared with routine care – about 50% were more likely to start breastfeeding following educational interventions.

#### **The effectiveness of public health interventions to promote the initiation of breastfeeding (40)**

This review found that breastfeeding literature alone is not effective in promoting breastfeeding among women of different income and ethnic groups in Ireland, the United Kingdom and the United States. Also, group health education can be effective among women from different ethnic and low-income groups in middle- and high-income countries. Moreover, one-to-one educational programmes were more effective for women who planned to bottle-feed, while group programmes were more effective for women who planned to breastfeed. This evidence is based on studies of low-income African Americans.

Paying participants to attend a breastfeeding intervention increased participation rates for group classes. Also, advice, leaflets and routine health education plus intensive staff training had significant effects on breastfeeding initiation rates. Breastfeeding promotions delivered over both the ante- and postnatal period were most likely to have a positive effect on breastfeeding. The interventions used were intensive, involving multiple contacts with a professional promoter or peer counsellor. The confidence and commitment to breastfeed successfully are best achieved by exposure to breastfeeding rather than talking or reading about it.

Five of six effective multifaceted interventions included a media campaign, in combination with health education programmes, training of health professionals and/or changes in government and hospital policies. Four of six effective multifaceted interventions included a peer support programme in combination with health education programmes, media programmes and/or legislative and structural changes to the health care sector. In Scandinavia, four types of intervention contributed to the high level of breastfeeding:

1. problem-based information about breastfeeding, written mostly for and often by mothers, but read also by health workers (consequently, more health workers also succeeded in their own breastfeeding);
2. increased availability of mother-to-mother support groups, health workers with better management skills and sometimes personal experience, and the rise in collective breastfeeding experience as more women successfully breastfeed;
3. an increase in paid maternity leave with guaranteed return to previous employment; and
4. maternity ward practices changing substantially towards mother–infant contact and autonomy.

### **Optimal duration of exclusive breastfeeding (Cochrane review)**

This review found that no deficits have been demonstrated in growth among infants from either low-income or middle- and high-income countries who breastfed exclusively for six months or longer, although infants should still be managed individually so that insufficient growth or other adverse outcomes are not ignored. Other foods are often introduced to breastfed babies after three or four months, but exclusive breastfeeding for six months has advantages over mixed feeding after three to four months in both middle- and high-income countries and low-income countries. These advantages include fewer gastrointestinal infections, delay of return of fertility and weight loss for the mother.

### **Formula milk versus term human milk for feeding preterm or low birth weight infants (Cochrane review)**

This review found that, in preterm and low-birth-weight infants, feeding with formula milk, compared with unfortified human milk, leads to a greater rate of growth in the short term. The limited data available do not allow definite conclusions on whether adverse outcomes occur in the longer term, and there are no data from randomized trials on the comparison of feeding with formula milk versus nutrient-fortified breast-milk.

### **Extending breastfeeding duration through primary care: a systematic review of prenatal and postnatal interventions (41)**

Interventions that were most effective in extending the duration of breastfeeding generally combined information, guidance and support and were long term and intensive. During prenatal care, group education was the only effective strategy reported. Home visits used to identify mothers' concerns about breastfeeding, assist with problem solving and involve family members in breastfeeding support were effective during the postnatal period or both periods. Individual education sessions were also effective in these periods, as was the combination of two or three of these strategies in interventions involving both periods. Strategies that had no effect were characterized by no face-to-face interaction, practices that contradicted messages or small-scale interventions.

### **Consolidation and updating the evidence base for the promotion of breastfeeding (42)**

This review found that interventions should be long term and intensive, span both the antenatal and postnatal periods and involve multiple contacts and the recognition that information provision alone is not effective, and may exacerbate inequalities.

Peer support programmes are particularly promising. Also, flexible and individualized approaches are more likely to be effective. In particular, there need to be different approaches for women whose original intention is to breastfeed and those who originally intend to bottle-feed.

Encouragement to consider breastfeeding is needed as early in pregnancy as possible (if not before pregnancy). Professionals need to be consistent in the advice and support they provide. Also, hospital practices should reflect current knowledge. Moreover, health professionals should be aware of the research on the negative effects of smoking on breastfeeding.

Fathers have an important role in the initiation and establishment of breastfeeding. This is more likely to be positive if they are included in breastfeeding education as early as possible during pregnancy. Antenatal sessions should include opportunities and exercises to help couples communicate with one another about their feelings and attitudes towards breastfeeding.

Returning to full-time work has a negative impact on the duration of breastfeeding. Workplace initiatives can address the barriers that currently exist, including negative attitudes and lack of facilities.

More coordinated and consistent education about breastfeeding is needed in schools for both girls and boys.

### **Toward public health nutrition strategies in the European Union to implement food based dietary guidelines and to enhance healthier lifestyles (43)**

This review found that there are wide variations in rates of breastfeeding initiation and continuation in EU Member States. Hospital practices and the support of community health services are important influences in this. Systematic reviews of the literature show that opportunities and barriers to good nutritional health in infants are associated with the physical hospital environment and routines, such as feeding at set times, separation of mother and baby and use of infant formula, and (importantly) are also associated with the attitudes and expectations of the health professionals involved.

### **A systematic review to evaluate the effectiveness of interventions to promote the initiation of breastfeeding (44)**

This review found that there is some evidence that breastfeeding literature alone among the general population is not effective in promoting breastfeeding among women of different income and ethnic groups. It also found that group health education can be effective among women from different ethnic and low-income groups. Moreover, one-to-one educational programmes were more effective for women who planned to bottle-feed, while group programmes were more effective for women who planned to breastfeed. Paying participants to attend an intervention has been shown to be effective at increasing participation rates for groups.

The provision of additional health education from community staff through face-to-face and telephone contacts in the antenatal and postnatal periods, however, had no significant effect. Finally, in Sweden, advice, leaflets and routine health education plus intensive staff training had significant effects on initiation rates.

### **Effectiveness of interventions to promote healthy feeding in infants under one year of age (45)**

This review found that one-to-one educational sessions were more successful than group sessions when they were aimed at promoting initial breastfeeding with women who had already made a decision to bottle-feed. Breastfeeding promotions delivered in the period both before and after birth were most likely to have a positive effect on breastfeeding. These interventions were intensive, involving multiple contacts with a professional promoter or peer counsellor. Also, the effectiveness of prenatal educational sessions in initiating breastfeeding was enhanced by contact with peer counsellors.

Weaker evidence shows that including partners, providing incentives and changing the content of commercial hospital packs given to women upon discharge from hospital may aid promotion. The least successful interventions were those where breastfeeding promotion was only one part of the focus of multiple health promotion programmes and involved special visits to the hospital or clinic or took place by telephone.

### **Noncommunicable disease prevention and dietary intervention Interventions for increasing fruit and vegetable consumption in pre-school children (Cochrane review in process)**

This review found that there is currently no evidence-based guidance on effective methodologies for conducting five-a-day-type programmes in preschool children. This information is important particularly when resources, including time and money, are limited.

### **Dietary advice for the prevention of type 2 diabetes mellitus in adults (Cochrane review in process)**

This review found that there is now evidence that type 2 diabetes can be prevented or at least delayed by dietary efforts: the United States Diabetes Prevention Program reported a reduction of 58% in the incidence of diabetes

when participants were treated with the lifestyle intervention, compared with a 31% reduction of incidence of diabetes for metformin-treated participants (46).

### **Dietary advice for reducing cardiovascular risk (Cochrane review)**

This review found that dietary advice appears to be effective in bringing about modest beneficial changes in diet and cardiovascular risk factors over about nine months, but longer-term effects are not known. The dietary improvements recommended to the people in the intervention groups centred largely on the reduction of salt and fat intake and an increase in the intake of fruit, vegetables and fibre. Advice was delivered in a variety of ways, including one-to-one contact, group sessions and written materials. There was some evidence of greater effectiveness in people told that they were at risk of heart disease or cancer. Modest improvements were shown in cardiovascular risk factors, such as blood pressure and total and LDL-cholesterol levels. The trials did not last long enough to answer the question of whether the beneficial changes in cardiovascular risk factors resulted in a reduced incidence of heart disease, stroke or heart attack.

### **Diet or exercise, or both, for weight reduction in women after childbirth (Cochrane review in process)**

This review found that evidence suggests that failure to lose weight gained during pregnancy contributes to female overweight and obesity. However, the effects of negative energy balance during the postpartum period (achieved by restricted energy intake), increased energy expenditure or the combination of both are still not fully understood. Since the growth rate of exclusively breastfed infants depends on the energy provided by maternal breast-milk, it is paramount to evaluate the impact of diet and exercise on lactation performance.

### **Primary prevention of diabetes (47)**

This review found that there is increasing evidence that the quality of fat and carbohydrate plays a more important role than does the quantity, and thus public health strategies should emphasize replacing saturated and *trans* fats with unsaturated fats and replacing refined grain products with whole grains. Recent studies have also suggested a potential role for coffee, dairy, nuts, magnesium and calcium in preventing diabetes. Overall, a healthy diet, together with regular physical activity, maintenance of a healthy weight, moderate alcohol consumption, and avoidance of sedentary behaviour and smoking, could nearly eliminate type 2 diabetes.

### **Cardiovascular health promotion in the schools (48)**

This review found that, across well-controlled and well-conducted studies, differential results in physiological outcome indicators point to the need for researchers to pay more attention to developmental age, gender, cultural and sociodemographic factors. The results indicate that the modification of risk factors for cardiovascular disease in “real-world” school settings must be reinforced and complemented at multiple levels of intervention. Towards that goal, from a population perspective, broader public health interventions, as suggested in the American Heart Association’s guide for improving cardiovascular health at the community level, are warranted. Partnerships between health care and educational professionals in collaboration with policy-makers and community leaders will be required to actualize the school environment in promoting the cardiovascular health of all of children and young people and in reducing the risk and public health burden of cardiovascular diseases.

### **Systematic review of literature on the cost–effectiveness of nutrition services (49)**

This review found that relatively consistent evidence exists to support the cost–effectiveness of nutrition services in the reduction of serum cholesterol levels (for example, US\$ 20–1268 per mmol/l decrease in serum low-density lipoprotein level), weight (US\$ 2.40–10.00 per 0.45 kg lost) and blood glucose levels (US\$ 5 per mmol/l decrease) in target populations with diabetes mellitus and hypercholesterolemia. However, the randomized controlled trials had important limitations and used different cost perspectives. Also, limited evidence of economic benefit exists to support coverage of outpatient nutrition services for selected indications. More randomized controlled trials of nutrition services should be conducted, taking into consideration all potential candidates for nutrition therapy and all potential costs to patients, providers and payers.

### **Dietary advice for treatment of type 2 diabetes mellitus in adults (Cochrane review)**

This systematic review found that no high-quality data on the efficacy of diet alone exists for the treatment of type 2 diabetes mellitus. It assesses the effects of 18 studies that examined dietary advice with or without the addition of exercise or behavioural approaches. No data were found on microvascular or macrovascular diabetic complications, mortality or quality of life. The addition of exercise to dietary advice showed an improvement of metabolic control after six- and twelve-month follow-up.

### **Low glycaemic index diets for coronary heart disease (Cochrane review)**

This review found that weak evidence from randomized controlled trials showed that low-glycaemic-index diets reduce coronary heart disease and its risk factors. Many of the trials identified were short term, of poor quality and conducted on small sample sizes. There is a need for well-designed, adequately powered, randomized controlled studies of greater than twelve-week duration to assess the effects of low-glycaemic-index diets on coronary heart disease.

### **Dietary advice given by a dietitian versus other health professional or self-help resources to reduce blood cholesterol (Cochrane review)**

This review found that dietitians were better than doctors at lowering patients' blood cholesterol in the short to medium term, but there was no evidence that they were better than self-help resources. There was no evidence that dietitians provided better outcomes than nurses. The results should be interpreted with caution, as the studies were not of good quality and the analysis was based on a limited number of trials.

### **Advice to reduce dietary salt for prevention of cardiovascular disease (Cochrane review)**

This review found that intensive support and encouragement to reduce salt intake led to reduced salt intake. It also lowered blood pressure, but only by a small amount (about 1 mmHg for systolic blood pressure and less for diastolic blood pressure) after more than a year. This reduction was not enough to expect an important health benefit. It was also very hard to keep to a low-salt diet.

### **Energy and protein intake in pregnancy (Cochrane review)**

This review found that providing pregnant women with a balanced supplement of energy and protein (a supplementation in which protein provides no more than 25% of the total energy content) modestly increases the growth of the fetus and improves fetal and neonatal survival. Also, high-protein supplementation in pregnancy does not appear beneficial and may be harmful. Moreover, restriction of energy intake in pregnant women who are overweight or gain excessive weight does not help prevent pre-eclampsia and adversely affects fetal growth.

### **Calorie controlled diet for chronic asthma (Cochrane review)**

This review found that there is very limited evidence that asthma may improve with reduced energy intake, and more research is required. Also, it is thought that high-energy diets may contribute to the development of asthma. Theoretically, reducing dietary energy intake may help alleviate the symptoms of asthma. No firm conclusions can be drawn about the effects of dietary manipulation, and more research is required.

### **Environmental influences on eating and physical activity (50)**

Recent trends in food supply, eating out, physical activity and inactivity are reviewed, as are the effects of advertising, promotion and pricing on eating and physical activity. Public health interventions, opportunities and potential strategies to combat the obesity epidemic by promoting an environment that supports healthy eating and physical activity are recommended.

### **School-based interventions for primary prevention of cardiovascular disease (51)**

This review found that there were no consistent effects of school-based interventions on blood pressure, lipid profiles, or measures of body mass and obesity. There was evidence that changes in knowledge and health behaviour occurred. Findings are interpreted within the context of population-wide approaches to prevention, and recommendations for future research directions are discussed.

### School-based cardiovascular disease prevention studies (52)

This review found that the majority of school-based studies reported statistically significant effects on health knowledge, attitudes and behavioural outcomes. The diet and physical activity changes reported in some studies were modest in magnitude, although from a population perspective they could translate into potentially sizeable reductions in population-attributable cardiovascular disease risk. The results of school-based intervention research showed only a modest change in physiological indicators, including serum cholesterol, blood pressure and measures of adiposity.

### Guidelines for school health programs to promote lifelong healthy eating (53)

This review found the following recommendations for action at the school and community level:

- review of policies that would be useful in supporting physical education and health education in schools;
- establishment of safe and pleasant environments and opportunities for physical activity;
- physical education to promote development of knowledge, attitudes, skills and confidence to maintain physically active lifestyle;
- health education curricula to support healthy eating;
- extracurricular activities to meet all students' needs or interests;
- parental involvement in instruction and support of physical activity;
- training for school and community personnel to promote lifelong physical activity;
- health services to assess, counsel, refer to and advocate health promoting physical activity;
- community to provide a range of sports and recreation programmes; and
- evaluation of community and school physical activity programmes and facilities.

### Examples of other public health interventions

#### Bicycle helmet legislation for the prevention of head injuries (Cochrane review in process)

This review found that barriers to the use of helmets include inhibitive costs, discomfort, lack of belief in necessity and an unpopular image of helmets among young cyclists (54,55). To overcome resistance to helmet use, legislation has been enacted in various parts of the world, including Australia, Canada, New Zealand and the United States. Jurisdictions differ in the population range affected by legislation. In Australia, for example, cyclists of all ages must wear a helmet. In Canada, legislation applies to children and adolescents only. Evaluations have shown that legislation is successful in increasing helmet use (56–61).

#### Workplace interventions for smoking cessation (Cochrane review)

This review found that the workplace can be an effective setting for smoking cessation. Proven methods, such as group therapy, individual counselling and nicotine replacement therapy, are equally effective when offered in the workplace. The evidence is less clear for self-help methods. Bans and restrictions can reduce smoking at work, although it is not clear whether they reduce overall smoking levels. Social and environmental support, competitions and incentives, and comprehensive programmes do not show a clear benefit in helping smokers to quit at work.

#### Individual behavioural counselling for smoking cessation (Cochrane review)

The review looked at trials of counselling by a trained therapist that provided one or more face-to-face sessions, separate from medical care. All the trials involved sessions of more than 10 minutes, with most also including further telephone contact for support. The review found that individual counselling could help smokers quit, but there was not enough evidence about whether more intensive counselling was better.

#### Interventions for preventing tobacco sales to minors (Cochrane review)

This review found that interventions can reduce the number of illegal sales, but young people may still be able to buy cigarettes. If young people are unable to purchase cigarettes, it may reduce the number who start to smoke. Various interventions, including warnings and fines, can reduce the proportion of retailers who sell tobacco to minors. However it has been difficult to demonstrate a clear effect on young smokers' perceptions of how easily they can buy cigarettes, or on their smoking behaviour.

### **Mass media interventions for smoking cessation in adults (Cochrane review in process)**

The United States Federal Communications Commission enforced the fairness doctrine, obliging radio and television stations to broadcast one antismoking message for every three cigarette commercials (equivalent to a media value today of US\$ 300 million) (62). This policy lasted until 1970, when a ban on broadcast cigarette advertising came into effect. Cigarette consumption declined by 37% during the campaign, but began to rise again after the advertising ban ended free access to broadcast time for antismoking messages (63–65). Previous reviews of the literature lend some support to antismoking media campaigns as a component of a comprehensive tobacco control programme (66,67). Much of the literature is focused on the effects of antismoking advertising on young people, but there are also a number of evaluations of campaigns that target adult smokers, which show mixed results. Some national and state-wide interventions have been shown to be effective in reducing smoking rates, while the outcomes are less consistent for community and local campaigns.

### **Impact of tobacco advertising and promotion on increasing adolescent smoking behaviours (Cochrane review)**

Tobacco advertising and promotion increase the likelihood that adolescents will start to smoke. Advertising is the use of media to create positive product imagery or associations. Promotion or marketing is the mix of activities designed to increase sales. There are no trials of the impact of tobacco advertising and promotional activities on people taking up smoking. However, there are studies that follow nonsmokers and their exposure to advertising (such as the number of tobacco advertisements in the magazines they read). The review found that in all these studies, nonsmoking adolescents who were more aware of or receptive to tobacco advertising were more likely to become smokers later.

### **Telephone counselling for smoking cessation (Cochrane review)**

People trying to quit smoking can be helped with medication or through behavioural support, such as specialist counselling and group therapy. Support, information and counselling are offered either face to face or by telephone. Counselling via telephone hotlines can be provided as part of a programme or separately and gives access to more people than face-to-face contact. The review of trials found telephone counselling is effective, compared with a programme with no personal contact.

### **Community interventions for preventing smoking in young people (Cochrane review)**

The decision to start or continue smoking is made within a broad social context, which is affected by many factors. Community interventions use coordinated, widespread, multicomponent programmes to try and influence people's behaviour. These include age restrictions on tobacco purchase, prevention of disease (such as heart disease) and mass-media and school programmes. The review of trials found some evidence that coordinated multicomponent programmes can reduce smoking among young people and that they do so more effectively than single strategies alone.

### **Community interventions for reducing smoking among adults (Cochrane review)**

This review found that there is little convincing evidence that community interventions reduce smoking among adults. Although intervention communities often showed substantial awareness of their programme, this rarely led to higher quit rates. Similarly, increased knowledge of health risks, changes in attitudes to smoking, more attempts to quit, and better environmental and social support for quitting were not accompanied by reductions in community smoking levels. Light-to-moderate smokers did slightly better than heavy smokers, and men did a little better than women, but overall smoking rates remained similar between intervention and control communities.

### **School-based programmes for preventing smoking (Cochrane review)**

This review found that there is little evidence that information alone is effective. The majority of studies drew on a social influence intervention. Although half of the best-quality studies found short-term effects on children's smoking behaviour, the best-quality and longest trial showed no long-term effects from 65 lessons over 8 years. There was limited evidence for the effects of interventions that included developing generic social competence and for those with a multimodal approach that included community initiatives.

### Interventions for preventing tobacco smoking in public places (Cochrane review)

Different methods are used to keep people from smoking in such public places as hospitals and workplaces. The review looked at trials of different strategies and found that simply putting up signs of announcing a nonsmoking policy does not seem to help prevent people smoking in public places. However, complete bans that have strong support from management do work. Intensive educational campaigns and multicomponent strategies also help reduce smoking in public places. Such strategies have been shown to work for hospitals in the United States, but research is needed on the best strategies for other places and other countries.

### Mass media interventions for preventing smoking in young people (Cochrane review)

This review found that mass-media campaigns (television, radio, newspapers, billboards and booklets) may deter young people from starting to smoke, but the evidence is not strong. Campaigns that researched and developed their message to reach their target audience had a higher success rate than those that did not. Effective campaigns also lasted longer and were more intense than less successful ones.

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## The WHO Regional Office for Europe

The World Health Organization (WHO) is a specialized agency of the United Nations created in 1948 with the primary responsibility for international health matters and public health. The WHO Regional Office for Europe is one of six regional offices throughout the world, each with its own programme geared to the particular health conditions of the countries it serves.

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In response to the obesity epidemic, the WHO Regional Office for Europe held a conference in November 2006, at which all Member States adopted the European Charter on Counteracting Obesity, which lists guiding principles and clear action areas at the local, regional, national and international levels for a wide range of stakeholders. This book comprises the second of two publications resulting from the conference. It presents the many technical papers written for the conference and updated for publication by a large group of experts in public health, nutrition and medicine.

Using a wide range of evidence drawn from countries across and beyond the WHO European Region, this book illustrates the dynamics of the epidemic and its impact on public health throughout the Region, particularly in eastern countries. It describes how factors that increase the risk of obesity are shaped in different settings, such as the family, school, community and workplace. It makes both ethical and economic arguments for accelerating action against obesity, and analyses effective programmes and policies in different government sectors, such as education, health, agriculture and trade, urban planning and transport. The book also describes how to design policies and programmes to prevent obesity and how to monitor progress. Finally, it calls for specific action by stakeholders: not only government sectors but also the private sector – including food manufacturers, advertisers and traders – and professional, consumers', international and intergovernmental organizations such as the European Union.

It is time to act: 150 million adults and 15 million children in the Region are expected to be obese by 2010. Obesity not only harms the health and well-being of a vast proportion of the population, and generates large expenditures by health services, but also has a striking and unacceptable impact on children. This book uses evidence to spell out ideas and information that will enable stakeholders across the Region, particularly policy-makers, to work to stop and then reverse the obesity epidemic in Europe.



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