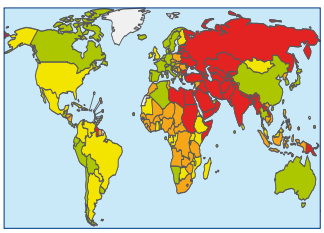
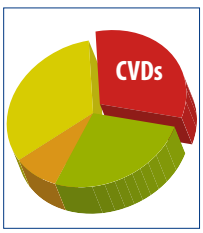
Global Atlas on cardiovascular disease prevention and control





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World Health Organization

WORLD HEART FEDERATION

World Stroke Organization

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Contributions were made by A. Alwan, T. Armstrong, D. Bettcher, T. Boerma, F. Branca, J. C.Y. Ho, C. Mathers, R. Martinez, V. Poznyak, G. Roglic, L. Riley, E. d`Espaignet, G. Stevens, K.Taubert and G. Xuereb. Others who provided assistance in various ways in the compilation of this document include A. Ayinla, X. Bi, F. Besson, L. Bhatti, A. Enyioma, N. Christenson, F. Lubega, P. Nordet, M. Osekre-Amey and J. Tarel.

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Abbreviations

AIDS	acquired immunodeficiency syndrome
BMI	body mass index
CVD	cardiovascular disease
DALY	disability-adjusted life year
FCTC	Framework Convention on Tobacco Control
GDP	gross domestic product
GNP	gross national product
G20	Group of 20 countries
HDL cholesterol	high-density lipoprotein cholesterol
HIV	human immunodeficiency virus
ISH	International Society of Hypertension
LDL cholesterol	low-density lipoprotein cholesterol
LMIC	low- and middle-income country
MDG	Millennium Development Goal
NCD	noncommunicable disease
NGO	nongovernmental organization
UN	United Nations
USA	United States of America
WHA	World Health Assembly
WHO	World Health Organization
WHO Global NCD Action Plan	WHO 2008–2013 Action Plan for the Global Strategy for Prevention and Control of Noncommunicable Diseases
WHO NCD Research Agenda	WHO Prioritized Research Agenda for Prevention and Control of Major Noncommunicable Diseases
YLD	years living with disability

Measurements

dl	decilitre
g	gram
kg	kilogram
l	litre
M/m	metre
mg	milligram
mmHg	millimetre of mercury
mmol	millimole

Foreword

Cardiovascular diseases (CVDs) remain the biggest cause of deaths worldwide. More than 17 million people died from CVDs in 2008. More than 3 million of these deaths occurred before the age of 60 and could have largely been prevented. The percentage of premature deaths from CVDs ranges from 4% in high-income countries to 42% in low-income countries, leading to growing inequalities in the occurrence and outcome of CVDs between countries and populations.

There are also new dimensions to this alarming situation. Over the past two decades, deaths from CVDs have been declining in high-income countries, but have increased at an astonishingly fast rate in low- and middle-income countries (LMIC).

CVDs are largely preventable. Both population wide measures and improved access to individual health care interventions can result in a major reduction in the health and socioeconomic burden caused by these diseases and their risk factors. These interventions, which are evidence based and cost effective, are described as best buys in the Global Status Report on Noncommunicable Diseases (NCDs) 2010.

At present, public health services in developing countries are overstretched by increasing demands to cope with heart disease, stroke, cancer, diabetes and chronic respiratory disease. At the same time, health care systems in many LMIC are let down by a model based on hospital care focused on the treatment of diseases, often centred around high-technology hospitals that provide extensive treatment for only a small minority of citizens. Hospitals consume huge amounts of resources, and health ministries may spend more than half their budgets on treatment services which depend on hospitals. As a result, a large proportion of people with high cardiovascular risk remain undiagnosed, and even those diagnosed have insufficient access to treatment at the primary health-care level; while evidence suggests two-thirds of premature deaths due to NCDs including CVDs can be prevented by primary prevention and another one-third by improving health systems to respond more effectively and equitably to the health-care needs of people with NCDs.

Two new developments have led to this report at this juncture. The first development is the growing international awareness that premature deaths from CVDs and other NCDs reduce productivity, curtails economic growth, and pose a significant social challenge in most countries. The second development is that there is now unequivocal evidence that "best buy" interventions to reduce the toll of premature deaths due to CVDs and other NCDs are workable solutions and that they are excellent economic investments -- including in the poorest countries.

As the magnitude of CVDs continue to accelerate globally, the pressing need for increased awareness and for stronger and more focused international and country responses is increasingly recognized. This atlas on cardiovascular disease prevention and control is part of the response to this need. It documents the magnitude of the problem, using global cardiovascular mortality and morbidity data. It demonstrates the inequities in access to protection, exposure to risk, and access to care as the cause of major inequalities between countries and populations in the occurrence and outcome of CVDs. It also highlights the causes responsible for the declining cardiovascular mortality in developed countries, and sends the message that, to break this cycle of growing inequalities, we must use this knowledge to benefit people in all countries.

Addressing CVDs require concrete and sustained action in three areas which represent the key components of any global or national strategy; surveillance and monitoring, prevention and reduction of risk factors, and improved management and health care through early detection and timely treatment. Actions should include setting national goals and targets and measuring results, advancing multisectoral partnerships and health-in-all-policies approaches, strengthening health systems and primary health care, and developing the appropriate national capacity and institutional arrangements to manage NCD programmes.

Halting premature deaths from CVDs and other NCDs will also require global solidarity and broad alliances that go beyond national, cultural and ethnic boundaries. Eleven years since the landmark World Health Assembly endorsed the Global Strategy for the Prevention and Control of NCDs to reduce the toll of premature deaths due to CVDs and other NCDs. Heads of State and Government will come together to address the prevention and control of NCDs worldwide at the 2011 High-level Meeting of the United Nations General Assembly on the Prevention and Control of NCDs between 19-20 September 2011 in New York. This is the second time in the history of the United Nations that the General Assembly will meet on a health issue with major socio-economic impact. National leaders are expected to adopt a concise action-oriented outcome document that will shape the international agenda for years to come.

The opportunity provided by the High-level Meeting is unprecedented. By ensuring that the response to CVDs is placed at the forefront of international efforts to promote development and protect health, we will be achieving a more balanced distribution of the benefits of globalization and, in turn, reinforce the broader scope of human security. And this gives me an occasion for great optimism.

Dr Ala Alwan
Assistant Director General
Noncommunicable Diseases and Mental Health Cluster
World Health Organization

Section A

Cardiovascular diseases (CVDs) due to atherosclerosis

1

What are cardiovascular diseases (CVDs)?

KEY MESSAGES

- **CVDs are the leading causes of death and disability in the world.**
- **Although a large proportion of CVDs is preventable they continue to rise mainly because preventive measures are inadequate.**
- **Out of the 17.3 million cardiovascular deaths in 2008, heart attacks were responsible for 7.3 million and strokes were responsible for 6.2 million deaths.**

Figure 1 Normal heart with its blood supply (*i*). Reproduced with permission.

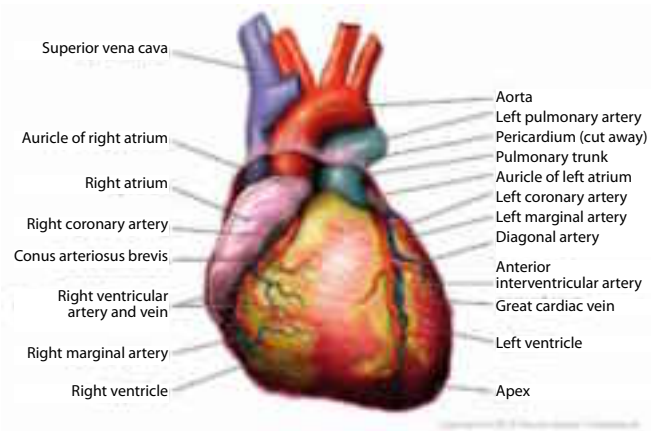
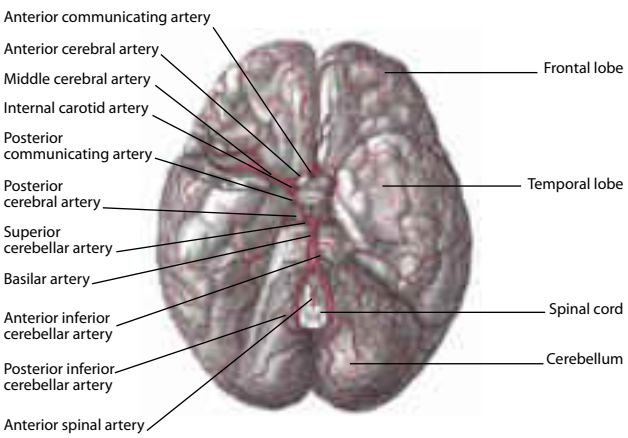


Figure 2 Normal brain with its blood supply (*i*). Reproduced with permission.



The normal heart

The heart is a muscular organ about the size of a fist (Figure 1). With every heartbeat, the heart pumps blood that carries oxygen and nutrients to all parts of the body. The heart beats about 70 times per minute in a person at rest. The heart rate increases when a person is active or experiences strong emotions. Heart muscle receives its own blood supply from a system of coronary arteries. A good blood supply is vital for the normal function of the heart.

The normal brain

The brain is a complex organ that controls intellectual functions as well as other organ systems (Figure 2). The centralized control of the brain allows the body to make rapid and coordinated responses to changes in the environment. Normal function of the brain depends on its blood supply. Two large vessels that run along either side of the neck carry blood from the heart to the brain. The blood vessels branch off into cerebral arteries and carry oxygen and nutrients to all parts of the brain. A good blood supply is vital for the normal function of the brain.

CVDs include diseases of the heart, vascular diseases of the brain and diseases of blood vessels. CVDs are responsible for over 17.3 million deaths per year and are the leading causes of death in the world (*1*) (Figure 3).

The different types of CVDs are listed below.

1. CVDs due to atherosclerosis:

- ischaemic heart disease or coronary artery disease (e.g. heart attack)
- cerebrovascular disease (e.g. stroke)
- diseases of the aorta and arteries, including hypertension and peripheral vascular disease.

2. Other CVDs

- congenital heart disease
- rheumatic heart disease
- cardiomyopathies
- cardiac arrhythmias.

Deaths due to heart attacks, strokes and other types of CVDs as a proportion of total cardiovascular deaths for males and females are shown in Figures 4 and 5, respectively (*1*). Figures 6 and 7 show the global CVD mortality rates in males and females, respectively (*1*). Figures 8 and 9 show the global disease burden (DALYs) due to CVDs in males and females, respectively (*2*). The disability-adjusted life year (DALY) is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death (premature death). CVDs and their risk factors are major contributors to global morbidity and mortality (*1–5*).

Atherosclerotic disease

The underlying disease process in the blood vessels that results in coronary heart disease (heart attack) and cerebrovascular disease (stroke) is known as atherosclerosis. It is responsible for a large proportion of CVDs. In 2008, out of the 17.3 million cardiovascular deaths, heart attacks were responsible for 7.3 million deaths and strokes were responsible for 6.2 million deaths (*1*).

Atherosclerosis is a complex pathological process in the walls of blood vessels that develops over many years. In atherosclerosis, fatty material and cholesterol are deposited inside the lumen of medium- and large-sized blood vessels (arteries). These deposits (plaques) cause the inner surface of the blood vessels to become irregular and the lumen to become narrow, making it harder for blood to flow through. Blood vessels also become less pliable as a result. Eventually, the plaque can rupture, triggering the formation of a blood clot. If the blood clot develops in a coronary artery, it can cause a heart attack; if it develops in the brain, it can cause a stroke.

Factors that promote the process of atherosclerosis are known as risk factors (*2–6*), and include:

Behavioural risk factors:

1. tobacco use
2. physical inactivity
3. unhealthy diet (rich in salt, fat and calories)
4. harmful use of alcohol.

Metabolic risk factors:

5. raised blood pressure (hypertension)
6. raised blood sugar (diabetes)
7. raised blood lipids (e.g. cholesterol)
8. overweight and obesity.

Other risk factors:

9. poverty and low educational status
10. advancing age
11. gender
12. inherited (genetic) disposition
13. psychological factors (e.g. stress, depression)
14. other risk factors (e.g. excess homocysteine).

There is strong scientific evidence that behavioural and metabolic risk factors play a key role in the aetiology of atherosclerosis.

Rheumatic heart disease

Rheumatic heart disease is caused by damage to the heart muscle and heart valves from rheumatic fever, following a streptococcal pharyngitis/tonsillitis.

Congenital heart disease

Malformations of heart structures present at birth are known as congenital heart defects. They may be caused by: (i) a close blood relation between parents (consanguinity); (ii) maternal infections (e.g. rubella); (iii) maternal use of alcohol and drugs (e.g. warfarin); and (iv) poor maternal nutrition (e.g. deficiency of folic acid). In some cases the cause remains unknown. Examples of congenital heart disease include holes in the septum of the heart, abnormal valves and abnormalities in heart chambers.

Other CVDs

Other CVDs such as disorders of the heart muscle (e.g. cardiomyopathy), disorders of the electrical conduction system of the heart (e.g. cardiac arrhythmias) and heart valve diseases are less common than heart attacks and strokes.

Figure 3 Distribution of major causes of death including CVDs (*1*).

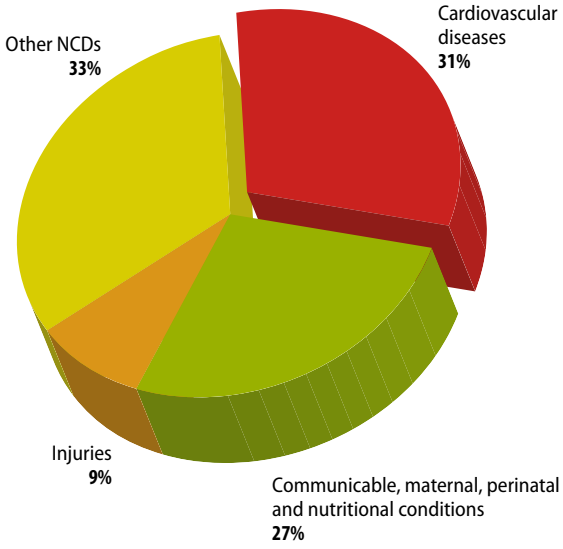


Figure 4 Distribution of CVD deaths due to heart attacks, strokes and other types of cardiovascular diseases, males (*1*).

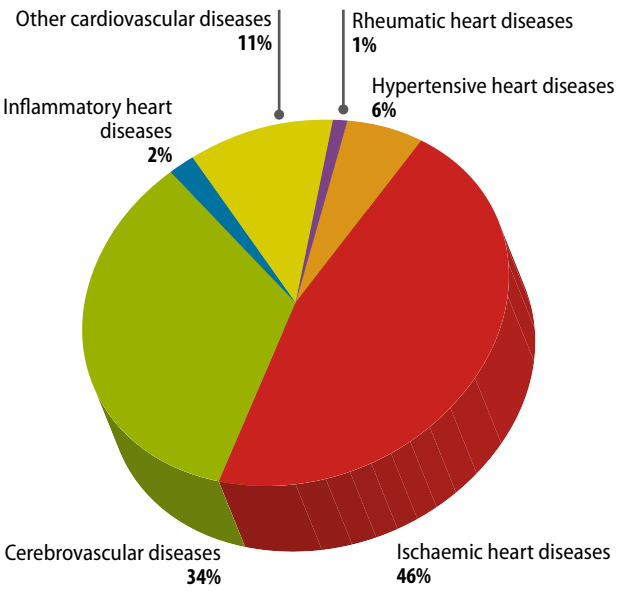


Figure 5 Distribution of CVD deaths due to heart attacks, strokes and other types of cardiovascular diseases, females (*1*).

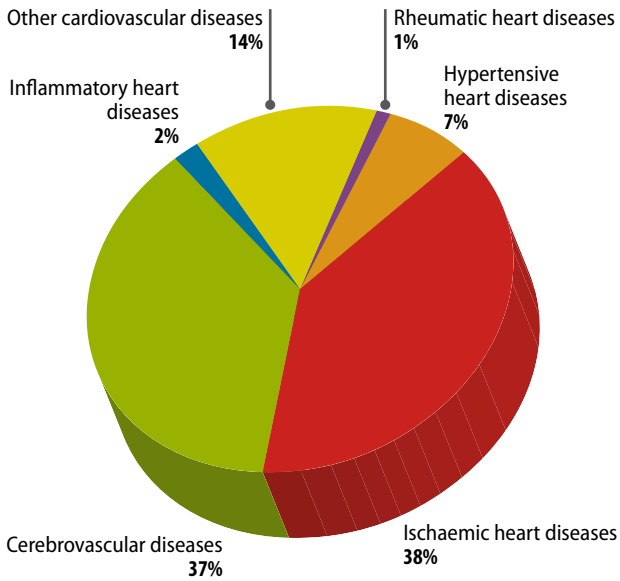


Figure 6 World map showing the global distribution of CVD mortality rates in males (age standardized , per 100 000) (*1*).

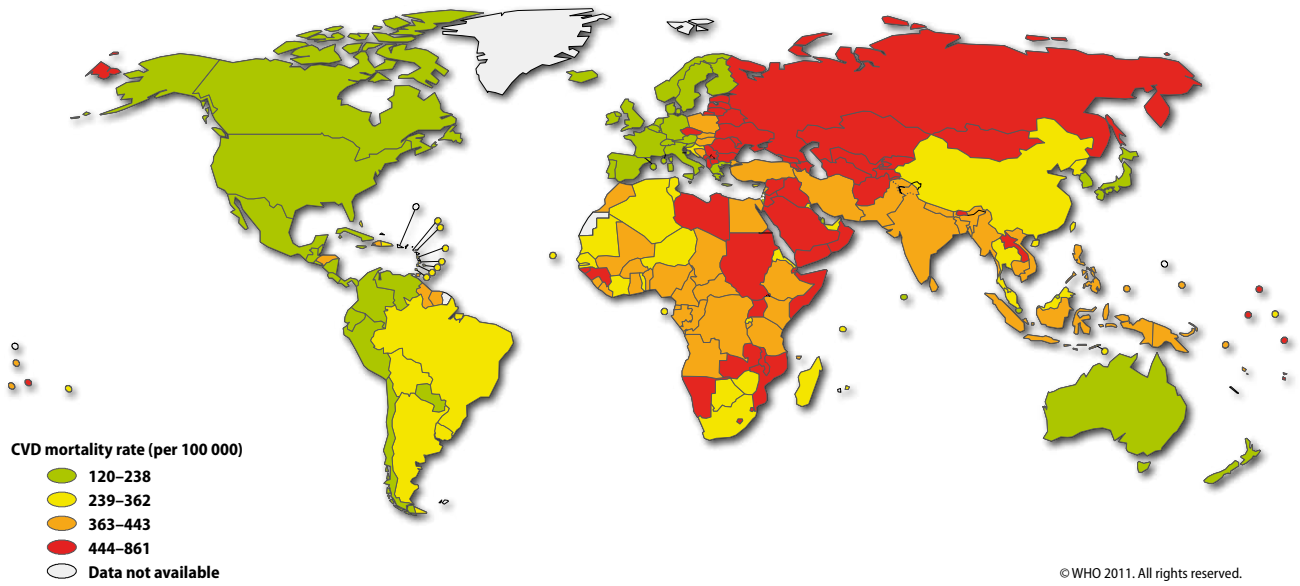


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Figure 7 World map showing the global distribution of CVD mortality rates in females (age standardized, per 100 000) (*1*).

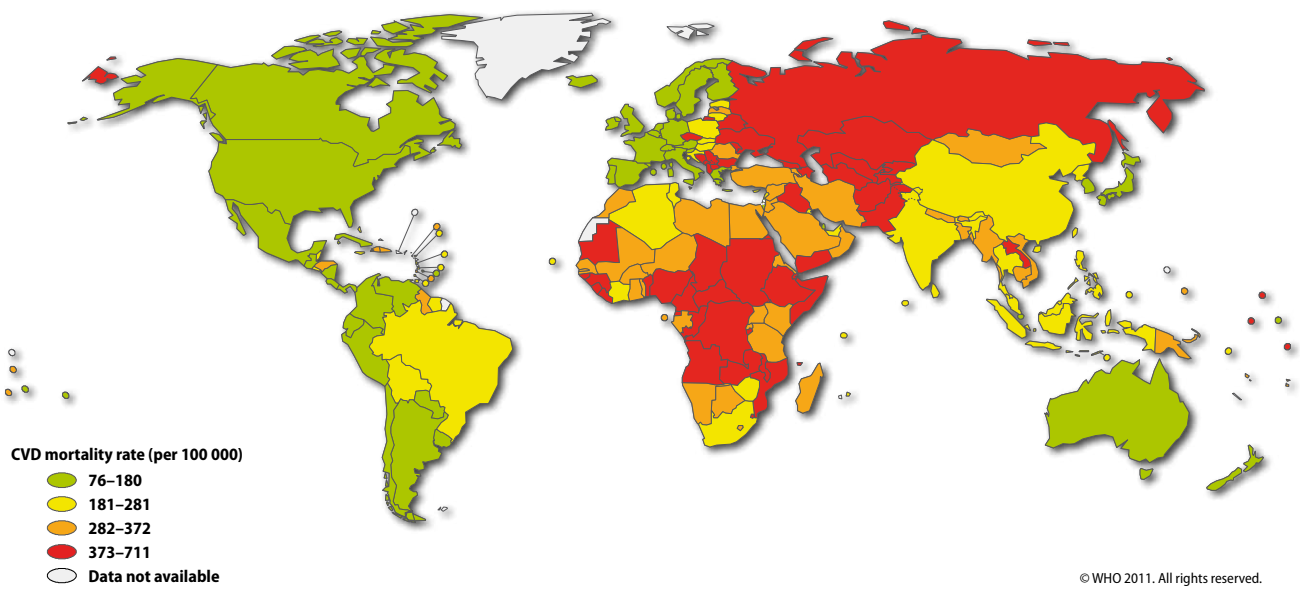

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Figure 8 World map showing the global distribution of the burden of CVDs (DALYs), in males (age standardized, per 100 000) (*1*).

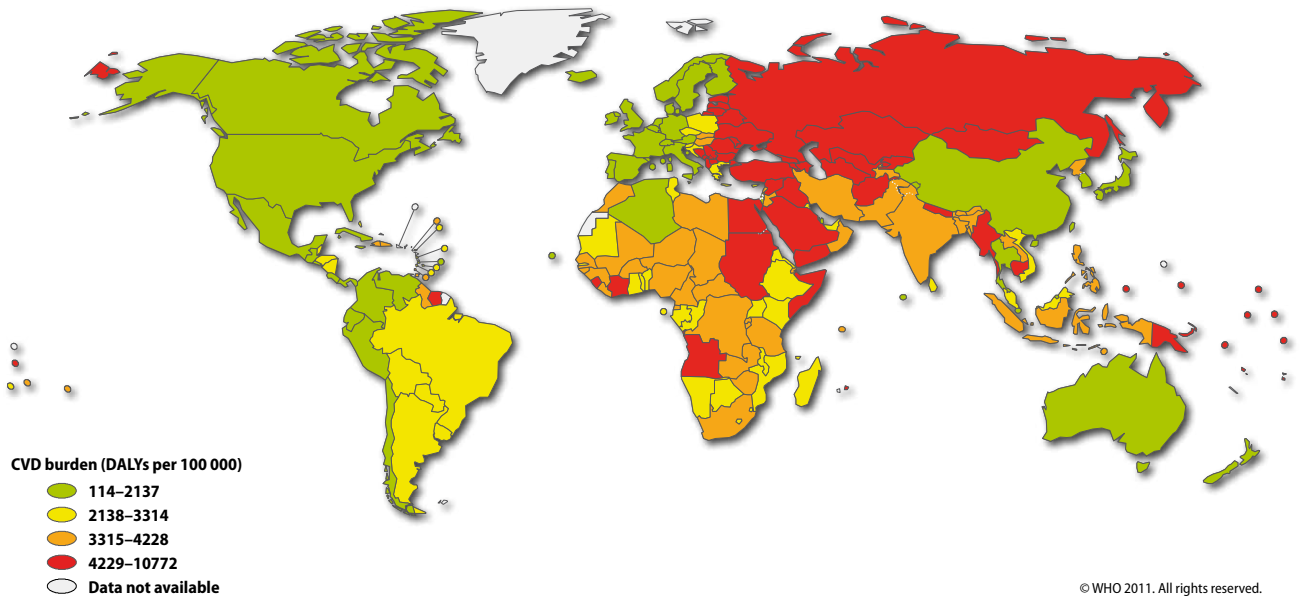

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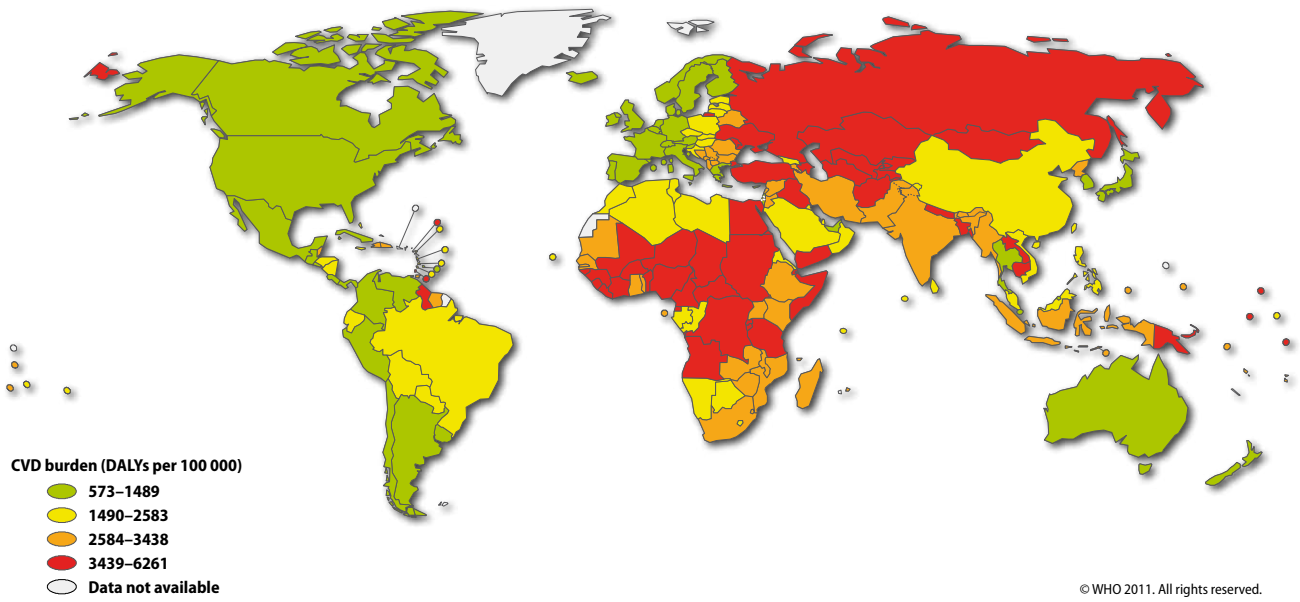
Figure 9 World map showing the global distribution of the burden of CVDs (DALYs) , in females (age standardized, per 100 000) (*1*).



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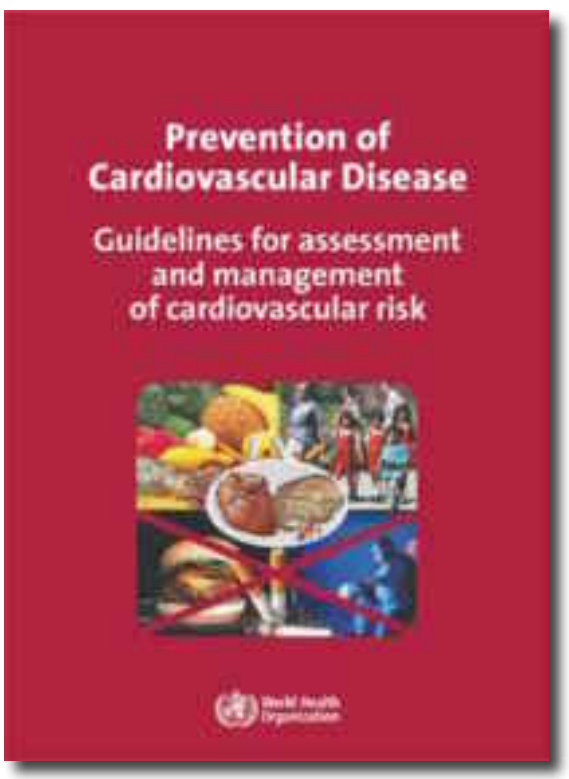
There is a clear vision on how to address CVDs



2

Death and disability due to CVDs (heart attacks and strokes)

KEY MESSAGES

- **CVD is the leading noncommunicable disease ; nearly half of the 36 million deaths due to noncommunicable diseases (NCDs) are caused by CVDs.**
- **In 2008, nine million people died of NCDs prematurely before the age of 60; some eight million of these premature deaths occurred in low- and middle-income countries (LMICs).**
- **10% of the global disease burden (DALYs) is attributed to CVD.**
- **Tobacco smoking, physical inactivity, unhealthy diets and the harmful use of alcohol are the shared causative risk factors of heart disease, stroke, cancer, diabetes and respiratory disease.**

Tobacco smoking, physical inactivity, unhealthy diets and the harmful use of alcohol are the main behavioural risk factors of CVDs. These risk factors are shared by other major NCDs such as cancer, diabetes and chronic respiratory disease. Long-term exposure to behavioural risk factors results in raised blood pressure (hypertension), raised blood sugar (diabetes), raised and abnormal blood lipids (dyslipidaemia) and obesity. Major cardiovascular risk factors such as hypertension and diabetes link CVD to renal disease.

Of the 57 million global deaths in 2008, 36 million (63%) were due to NCDs (Figure 10) and 17.3 million (30%) were due to CVDs. Nearly 80% of NCD deaths occur in LMICs and is the most frequent cause of death in most countries, except in Africa (*1*). In Africa, NCDs are rising rapidly and are projected to exceed communicable, maternal, perinatal and nutritional diseases as the most common causes of death in another two decades. Over 80% of cardiovascular and diabetes deaths occur in LMICs.

While 29% of NCD deaths occurs among people below the age of 60 in LMICs, in high-income countries only 13% of deaths occur below the age of 60 (*1, 6*) (Figure 11). Among people below the age of 70, CVDs were responsible for the largest proportion (39%) of NCD deaths (Figure 12). There has been a doubling of CVD rates in LMICs during recent decades, with rates, for example, for stroke and heart attack exceeding those in high-income countries (*1, 6, 7*).

According to the Global Burden of Disease estimates (*5*), 68% of the 751 million years living with disability (YLD) worldwide is attributable to NCDs, and 84% of this burden of NCD disability arises in LMICs. Heart disease is one of the five leading contributors to YLD in elderly people in LMICs. Stroke is also reported as a leading cause of disability in LMICs, second only to dementia. CVDs are responsible for 151 377 million DALYs, of which 62 587 million are due to coronary heart disease and 46 591 million to cerebrovascular disease (*2, 5*).

The contribution of different CVDs to the global CVDs burden in males and females is shown in Figures 13 and 14, respectively. Figures 15–18 show mortality rates of ischaemic heart disease (Figures 15 and 16) and stroke (Figures 17 and 18) for males and females, respectively. Figures 19–22 show healthy years of life lost due to ischaemic heart disease (Figures 19 and 20) and stroke (Figures 21 and 22) for males and females, respectively.

Figure 10 Distribution of global NCD by cause of death, both sexes (*1, 6*).

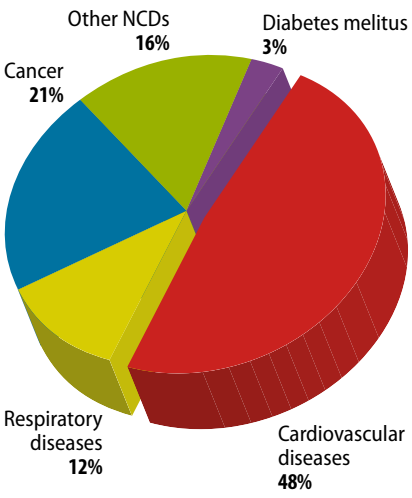


Figure 11 Distribution of global NCD by cause of death for less than 60 year old persons, both sexes (*1, 6*).

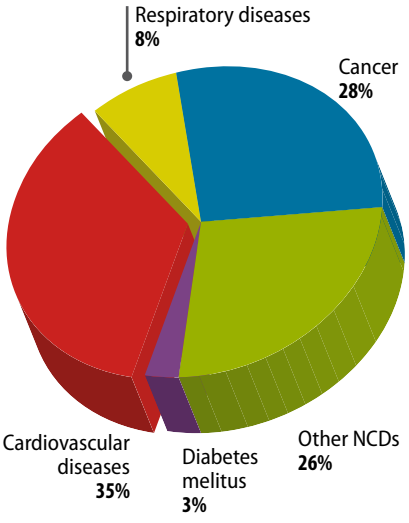


Figure 12 Distribution of global NCD by cause of death for less than 70 year old persons, both sexes (*1, 6*).

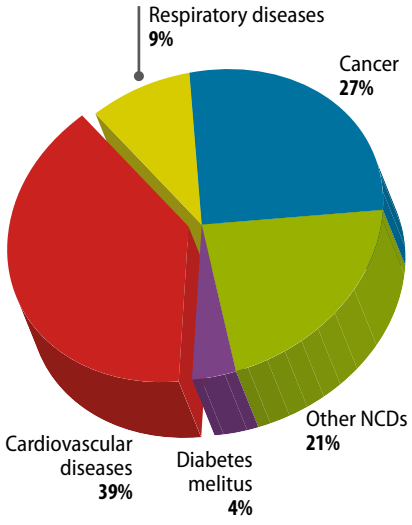


Figure 13 Distribution of global CVD burden (DALYs) due to heart attacks, strokes and other types of CVDs in males (*5*).

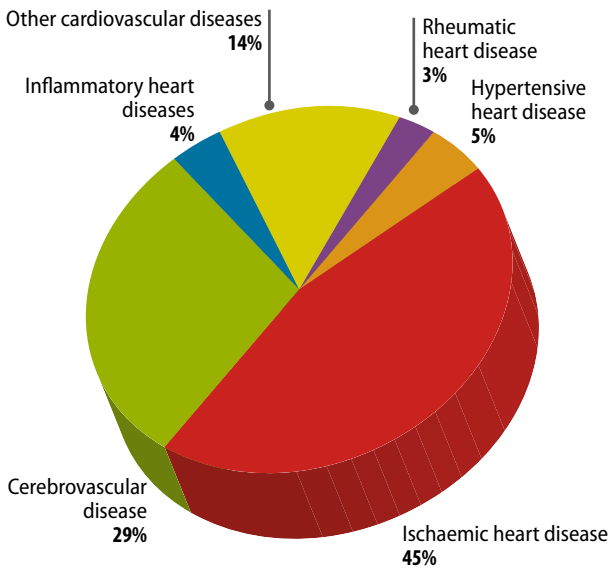


Figure 14 Distribution of global CVD burden (DALYs) due to heart attacks, strokes and other types of CVDs in females (*5*).

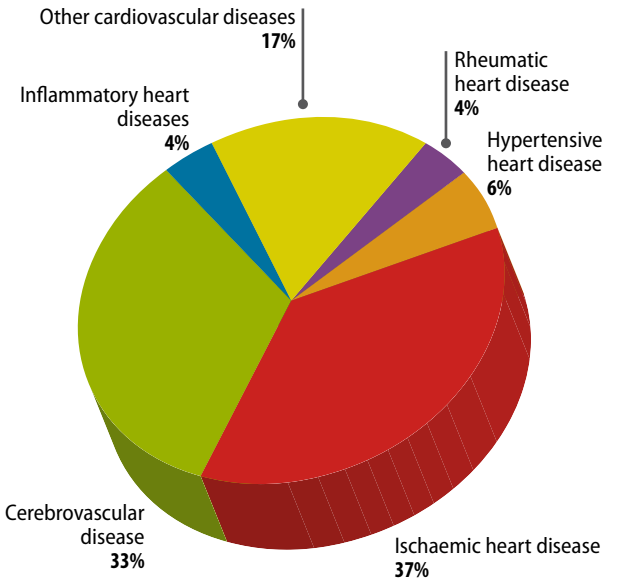


Figure 15 World map showing the global distribution of ischemic heart disease mortality rates in males (age standardized, per 100 000) (*1*).

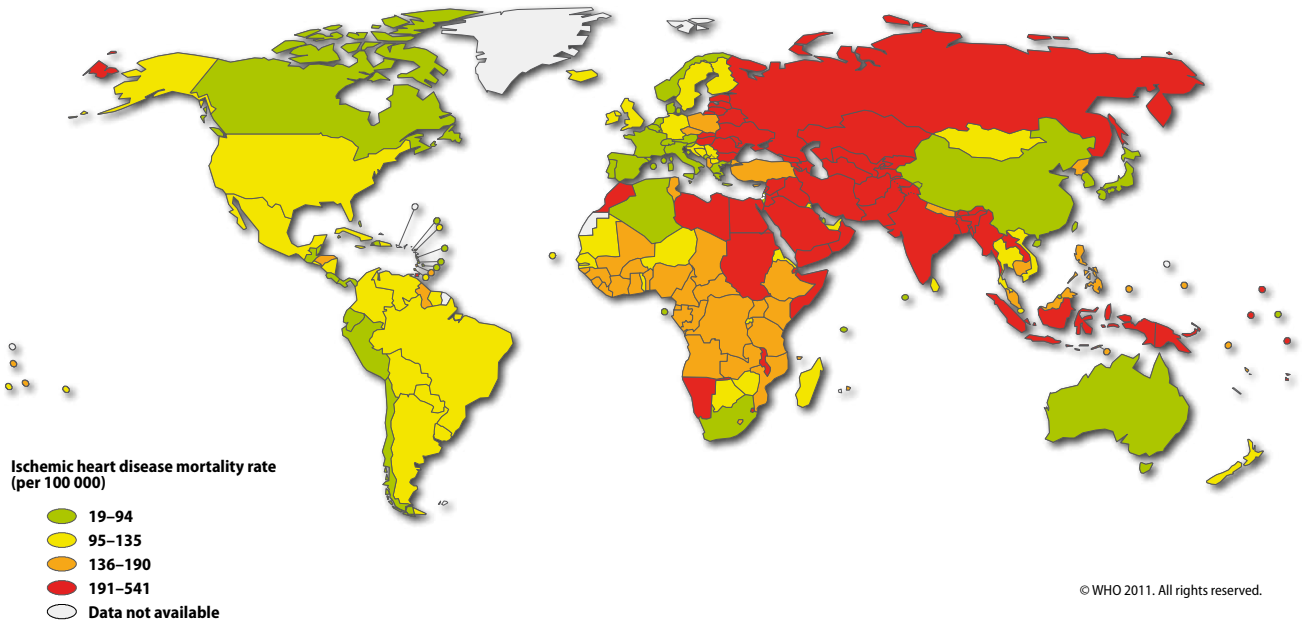


Figure 16 World map showing the global distribution of ischemic heart disease mortality rates in females (age standardized, per 100 000) (*1*).

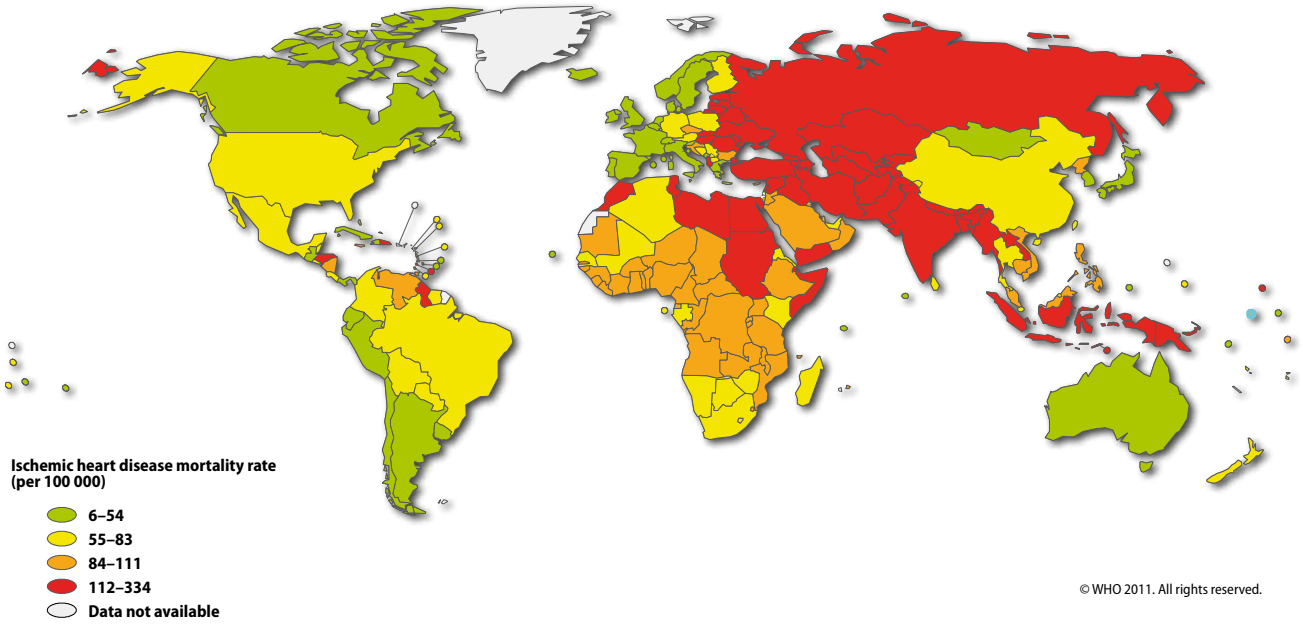


Figure 17 World map showing the global distribution of cerebrovascular disease mortality rates in males (age standardized, per 100 000) (*1*).

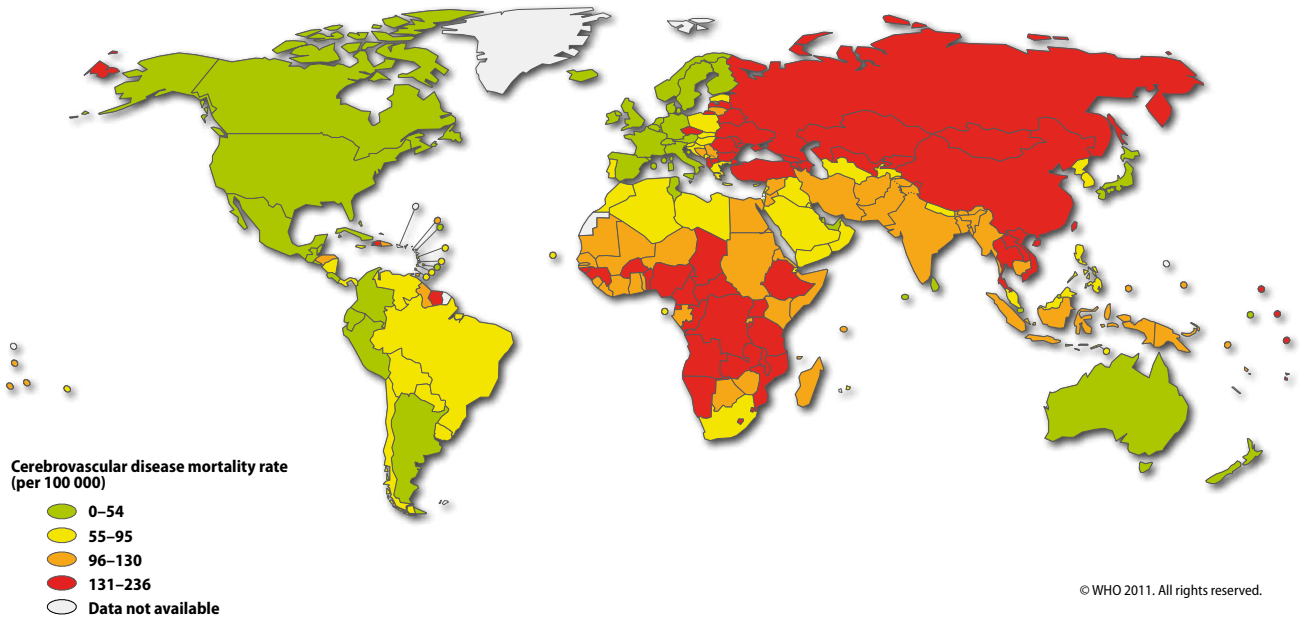


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Figure 18 World map showing the global distribution of cerebrovascular disease mortality rates in females (age standardized, per 100 000) (*1*).

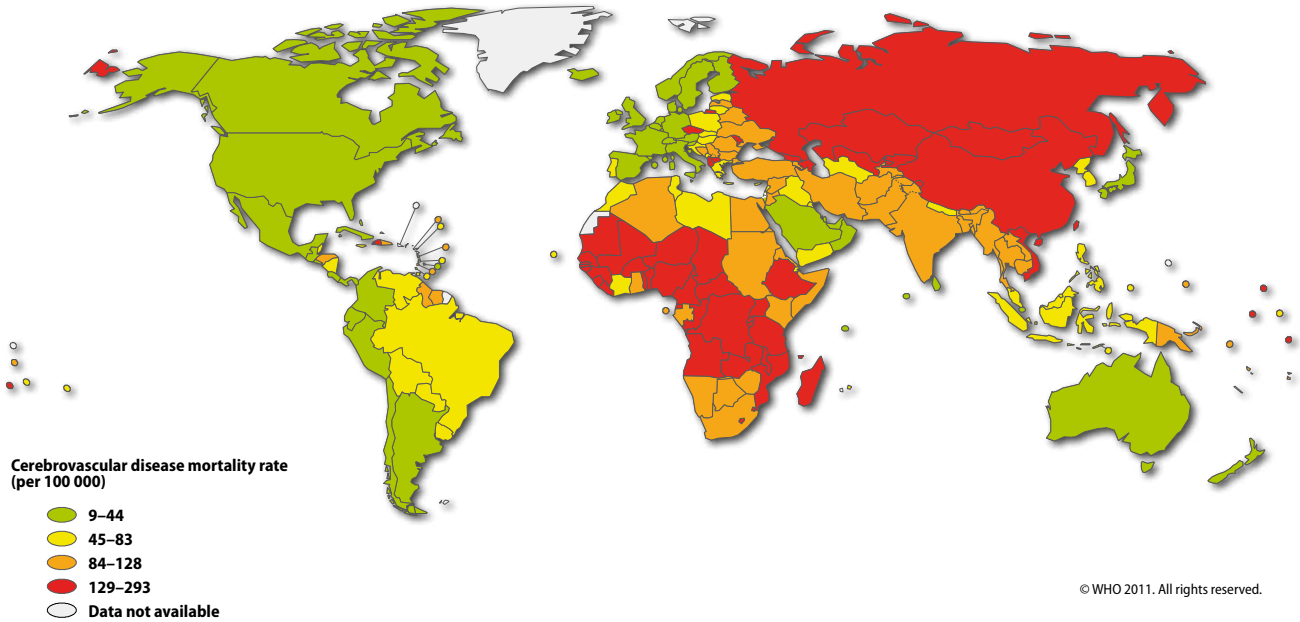

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Figure 19 World map showing the burden of ischemic heart disease (DALYs),in males (age standardized, per 100 000) (*5*).

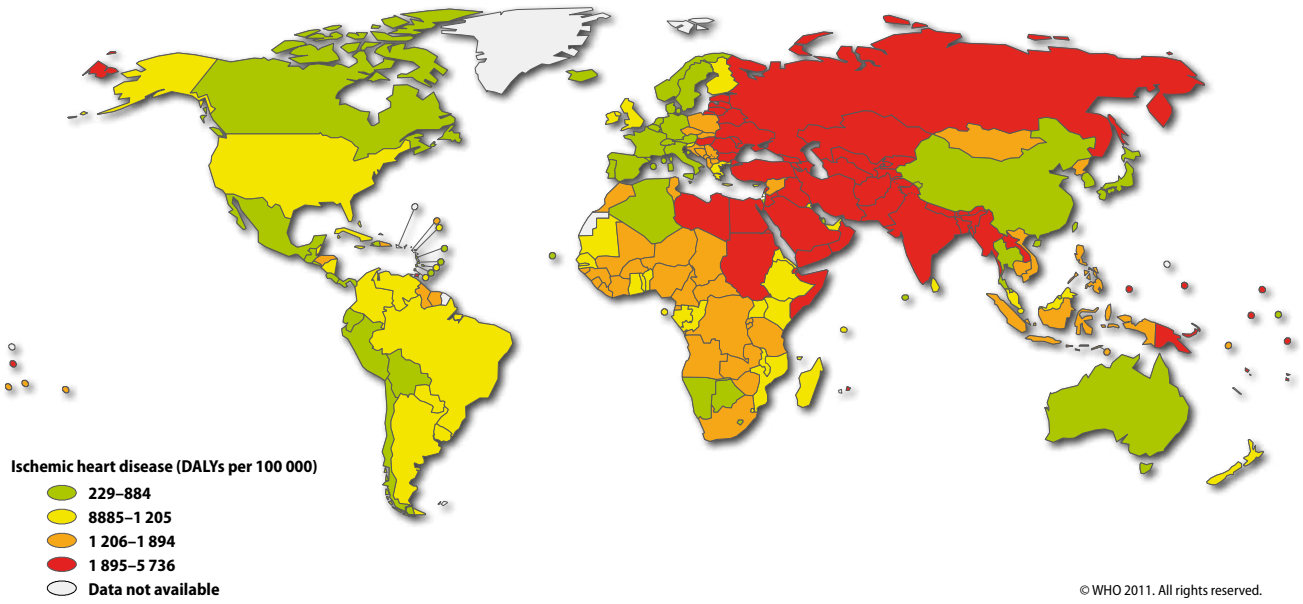

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Figure 20 World map showing the burden of ischemic heart disease (DALYs) in females (age standardized, per 100 000) (*5*).

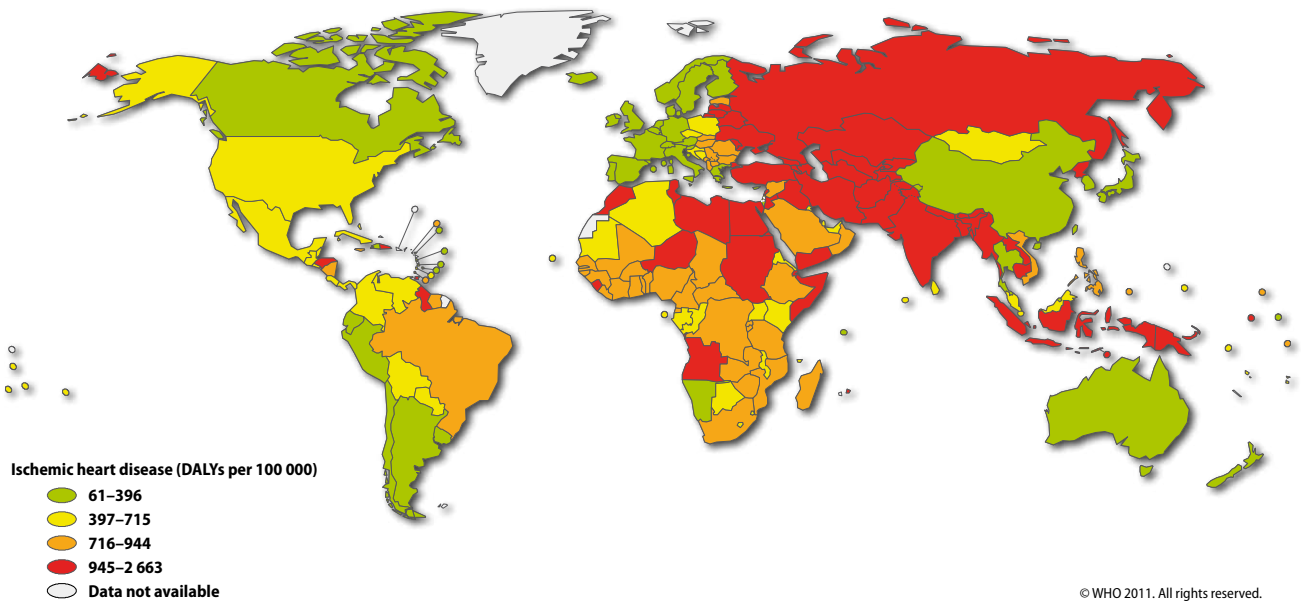

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Figure 21 World map showing the burden of cerebrovascular disease (DALYs) in males (age standardized, per 100 000) (*5*).

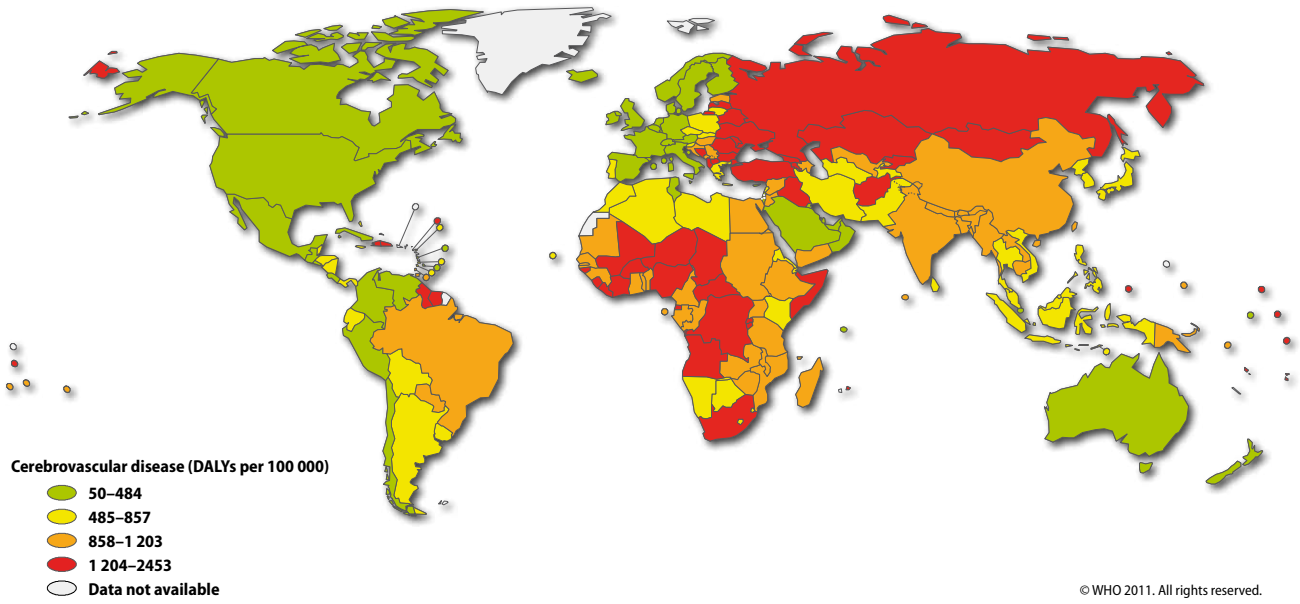

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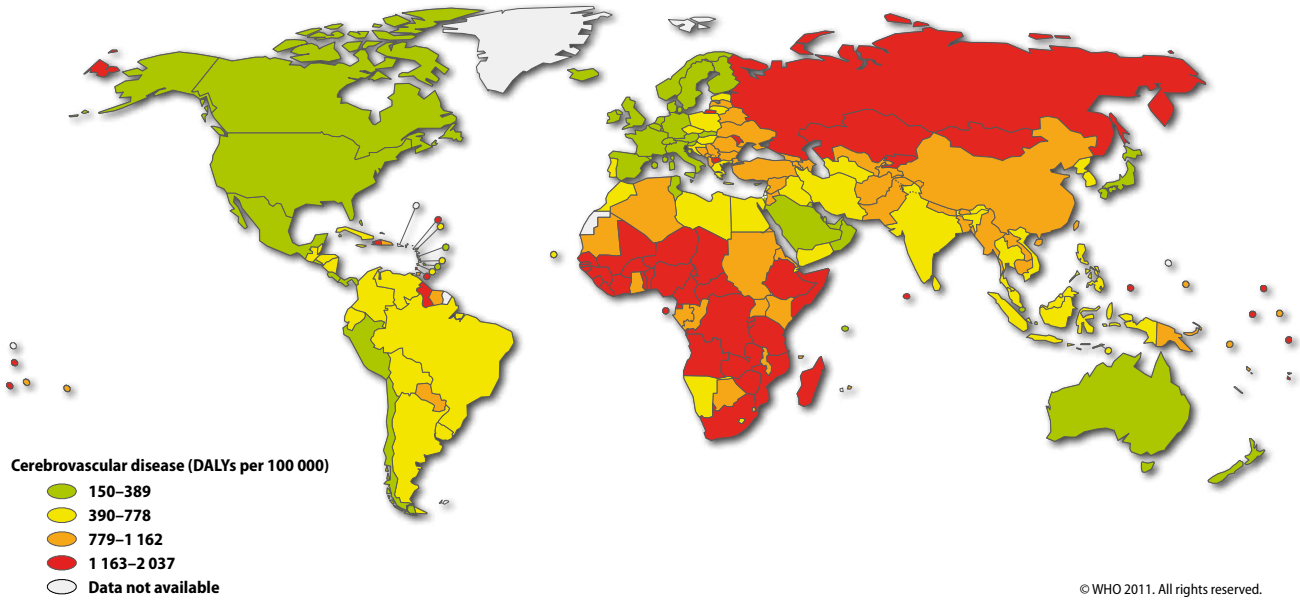
Figure 22 World map showing the burden of cerebrovascular disease (DALYs) in females (age standardized, per 100 000) (*5*).



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3

The underlying pathology of heart attacks and strokes

KEY MESSAGES

- **Tobacco use, physical inactivity, unhealthy diet, obesity, hypertension, diabetes, and dyslipidaemia, together with ageing and genetic factors, promote atherosclerosis and narrowing of the blood vessels.**
- **The process of atherosclerosis starts in childhood and adolescence and manifests as heart attacks and strokes in later years.**

Atherosclerosis; the underlying basis of heart attacks and strokes

One of the main underlying pathological processes that leads to heart attacks (coronary heart disease) and strokes (cerebrovascular disease) is known as atherosclerosis. The early changes of atherosclerosis develop in childhood and adolescence due to the overall effect of a number of risk factors (*4–6*). They include tobacco use, physical inactivity, unhealthy diet, harmful use of alcohol, hypertension, diabetes, raised blood lipids, obesity, poverty, low educational status, advancing age, male gender, genetic disposition and psychological factors.

Atherosclerosis is an inflammatory process affecting medium- and large-sized blood vessels throughout the cardiovascular system (8–*10*). When the lining (endothelium) of these blood vessels is exposed to raised levels of low-density lipoprotein cholesterol (LDL cholesterol) and certain other substances, such as free radicals, the endothelium becomes permeable to lymphocytes and monocytes. These cells migrate into the deep layers of the wall of the blood vessel. A series of reactions occur, attracting LDL cholesterol particles to the site. These particles are engulfed by monocytes, which are then transformed into macrophages (foam cells). Smooth muscle cells migrate to the site from deeper layers of the vessel wall (the media). Later, a fibrous cap consisting of smooth muscle and collagen is formed. At the same time, the macrophages involved in the original reaction begin to die, resulting in the formation of a necrotic core covered by the fibrous cap. These lesions (atheromatous plaques) enlarge as cells and lipids accumulate in them and the plaque begins to bulge into the vessel lumen (Figures 23–26). When the process continues, there is thinning of the fibrous cap accompanied by fissuring of the endothelial surface of the plaque, which may rupture. With the rupture of the plaque, lipid fragments and cellular debris are released into the vessel lumen. These are exposed to thrombogenic agents on the endothelial surface, resulting in the formation of a thrombus. If the thrombus is large enough, and a coronary blood vessel or a cerebral blood vessel is blocked, this results in a heart attack or stroke (*9, 10*).

Heart attack

When the blood flow to the heart is cut off, due to a thrombus on a ruptured atherosclerotic plaque, the decrease in the supply of oxygen and nutrients can damage the heart muscle, resulting in a heart attack. When the blood flow is decreased due to a blockage, it causes chest pain (angina) due to ischaemia.

Stroke

The pathophysiology of ischaemic stroke is more diverse and includes, besides thrombus formation in atherosclerotic cerebral blood vessels (ischaemic stroke), small vessel disease in the brain linked to vascular risk factors. Another cause of stroke is haemorrhage (bleeding) due to a rupture of a blood vessel because of the presence of an aneurysm, for example, or due to damage from uncontrolled high blood pressure or atherosclerosis (haemorrhagic stroke). In addition, strokes can also be caused by a travelling blood clot. If a person has an irregular heartbeat, blood clots may form in the heart and travel through the blood vessels to the brain. A clot carried to the cerebral circulation in this way can be trapped in a cerebral blood vessel and block the blood flow to an area of the brain.

Figure 23 **Endothelial dysfunction: Leukocyte adhesion and migration into the deep layer of the intima (*9*). (*From Ross I. Reproduced with permission. © 1999 Massachusetts Medical Society.*)**

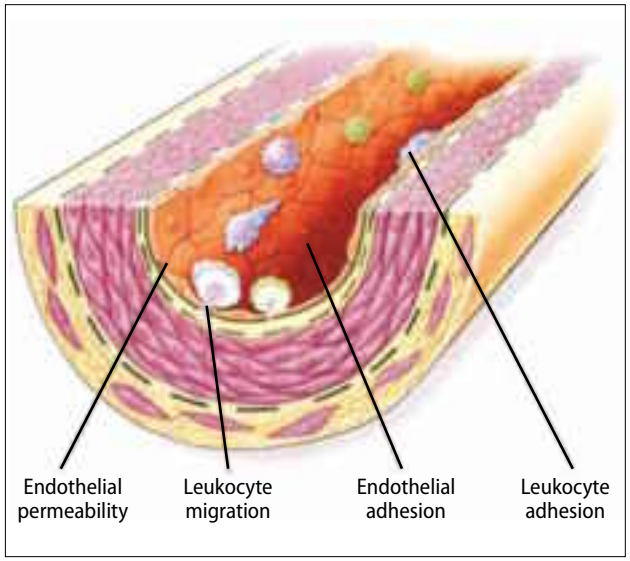


Figure 24 **Fatty streak formation revealing platelet aggregation on the endothelial surface, foam-cell formation and smooth muscle migration (*9*). (*From Ross I. Reproduced with permission. © 1999 Massachusetts Medical Society.*)**

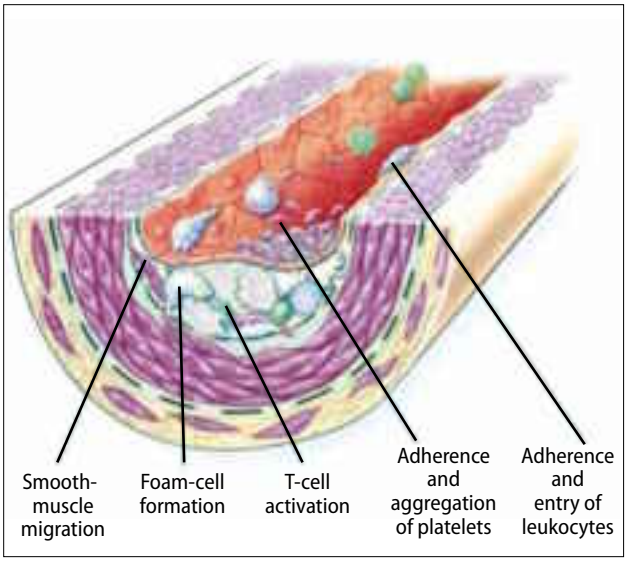


Figure 25 **Fibrous cap formation and the necrotic core (*9*). (*From Ross I. Reproduced with permission. © 1999 Massachusetts Medical Society.*)**

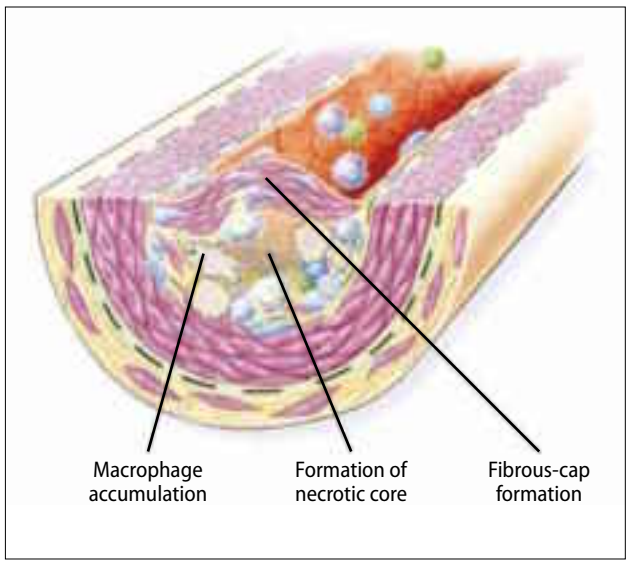
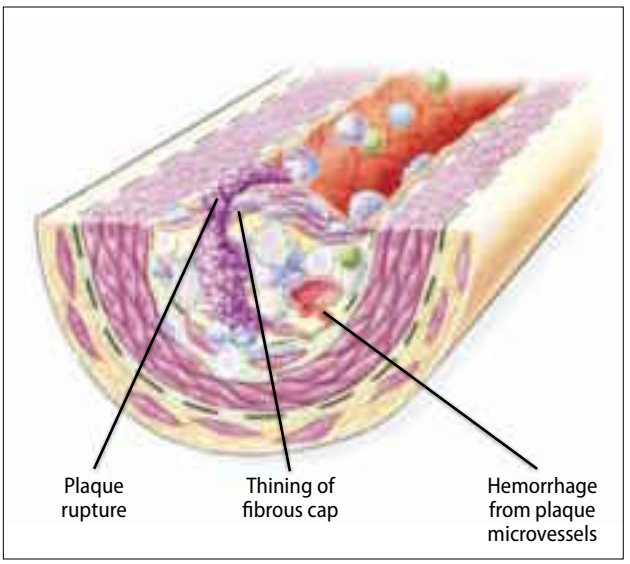


Figure 26 **The ruptured plaque (*9*). (*From Ross I. Reproduced with permission. © 1999 Massachusetts Medical Society.*)**



4

Evidence for prevention of heart attacks and strokes

KEY MESSAGES

- **CVDs are eminently preventable.**
- **Investment in prevention is the most sustainable solution for the CVD epidemic.**
- **Over the last two decades, CVD mortality has declined in developed countries due to a combination of prevention and control measures.**

Figures 27 and 28 show mortality rates of ischemic heart disease and cerebrovascular disease. Over the past two decades, cardiovascular mortality rates have declined substantially in high-income countries (*6, 11–13*). There is clear evidence that population-wide primary prevention and individual health-care intervention strategies have both contributed to these declining mortality trends. For example, during the 10-year period covered by the World Health Organization (WHO) Multinational Monitoring of Trends and Determinants of Cardiovascular Disease initiative (WHO MONICA Project), mortality from coronary heart disease and stroke declined dramatically in many of the 38 MONICA populations (*13*).

The decline in mortality has been attributed to reduced incidence rates and/or improved survival after cardiovascular events due to prevention and treatment interventions. Across all populations with declining coronary heart disease mortality, reduced cardiovascular risk contributed to 75% and 66% of the change in men and women, respectively; the remainder being attributed to providing health care resulting in improved survival in the first four weeks after the event. For stroke, about one third of the changes in populations with declining mortality was attributed to reduced incidence and 66% to improved survival.

There has been a dramatic decline in coronary heart disease mortality in the United Kingdom from 1981 to 2000 (*14*). Nearly 42% of this decrease has been attributed to treatment (including 11% to secondary prevention, 13% to heart failure treatment, 8% to initial treatment of acute myocardial infarction and 3% to hypertension treatment). About 58% of the decline has been attributed to population-wide risk factor reductions (*14*).

The above data and similar experiences in Finland (*15*) and other countries (*16, 17*) strongly support the view that population-wide primary prevention and individual health-care approaches go hand-in-hand to reduce the population burden of CVDs (*6*).

Figure 27 World map showing ischemic heart disease mortality rates (age standardized, per 100 000) (*1*).

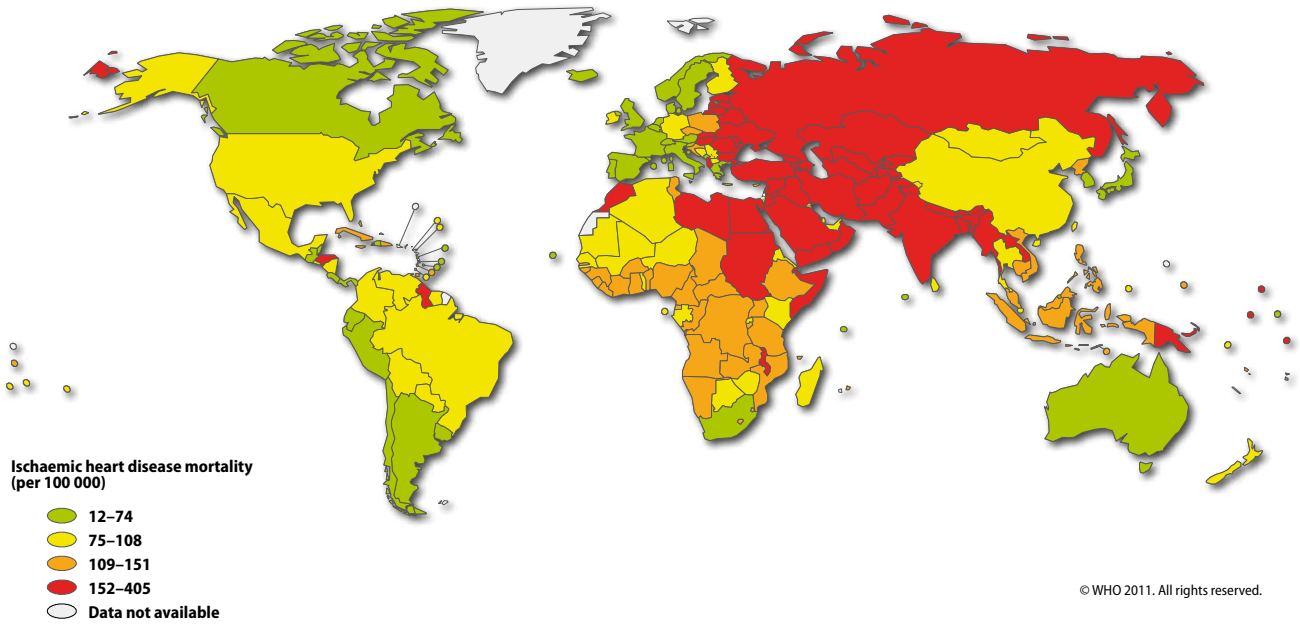


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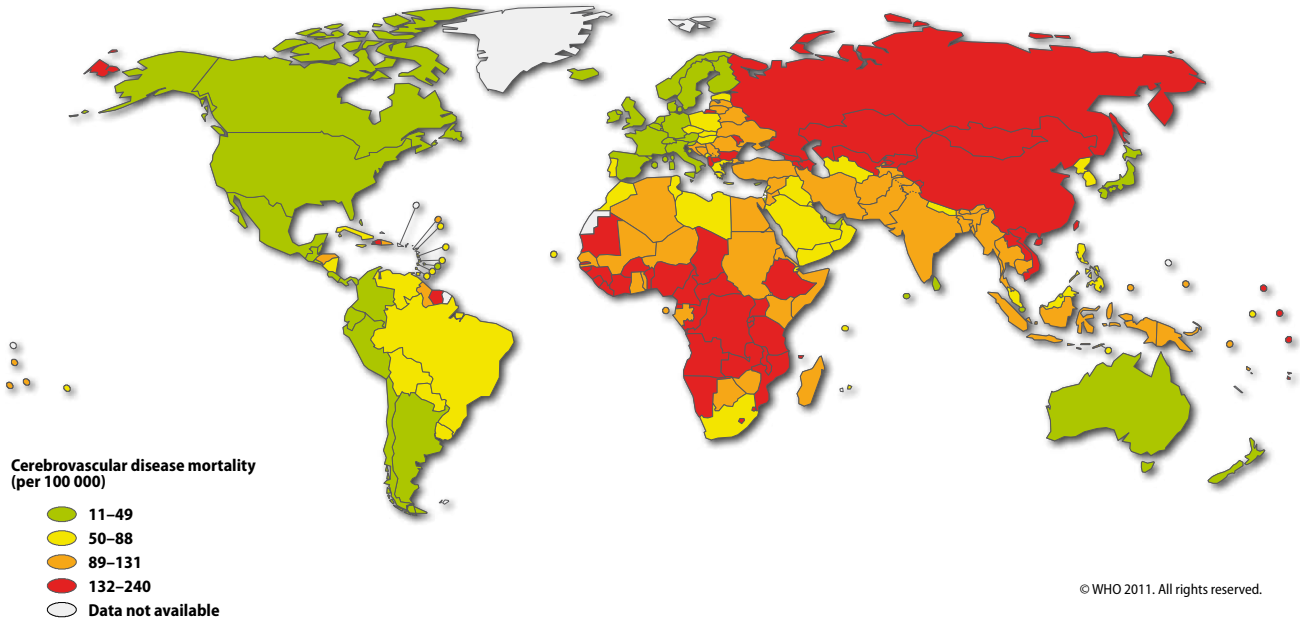
Figure 28 World map showing cerebrovascular disease mortality rates (age standardized, per 100,000) (*1*).



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5

Reducing cardiovascular risk to prevent heart attacks and strokes

KEY MESSAGES

- **Cardiovascular risk factors such as hypertension, diabetes and hyperlipidaemia cluster together and are major risk factors for strokes and heart attacks.**
- **To prevent heart attacks and strokes, the total cardiovascular risk needs to be reduced by lowering all modifiable risk factors.**
- **Prevention of heart attacks and strokes by reducing the total cardiovascular risk is cost effective.**

A large percentage of CVDs (and other NCDs) is preventable through the reduction of behavioural risk factors (tobacco use, unhealthy diet, physical inactivity and harmful use of alcohol) (*3, 6*).

Unhealthy behaviours lead to metabolic/physiological changes: raised blood pressure (hypertension); overweight/obesity; raised blood sugar (diabetes); and raised blood lipids (dyslipidaemia). These intermediate risk factors cause damage to coronary and cerebral blood vessels due to atherosclerosis, a process that develops over many years, starting in childhood and manifesting as heart attacks and strokes in people of middle age. Since the underlying pathological process that causes heart attacks and strokes is similar, common approaches that address behavioural risk factors and metabolic risk factors are effective for prevention of both conditions.

In terms of attributable deaths, the leading cardiovascular risk factor globally is raised blood pressure (to which 13% of global deaths is attributed), followed by tobacco use (9%), raised blood glucose (6%), physical inactivity (6%) and overweight and obesity (5%) (*2*) (Figure 29).

These behavioural and metabolic risk factors often coexist in the same person and act synergistically to increase the individual's total risk of developing acute vascular events such as heart attacks and strokes. Strong scientific evidence demonstrates that reducing total cardiovascular risk results in the prevention of heart attacks and strokes (*4*).

Pioneering work conducted by the Framingham Heart Study project in the United States (*18, 19*) and the Seven Countries study (*20*) in the 1960s and many other studies since then, including the WHO MONICA Project (*13*) and the INTERHEART study (*21*), have provided further insights into the risk factors and determinants of CVDs.

If people at risk of developing myocardial infarctions and strokes can be identified and measures taken to reduce their cardiovascular risk, a vast majority of fatal and non-fatal cardiovascular events can be prevented (*4, 21, 22*). WHO ISH (International Society of Hypertension) risk prediction charts and other risk prediction tools can be used to assess the risk of developing heart attacks and strokes (Figure 30).

Cardiovascular risk distribution of the population can be lowered through national health policies targeting the whole population as well as those at high risk (Figure 31). Population-wide strategies should address behavioural risk factors. Simultaneously, those at high risk need to be identified and targeted through health systems using integrated risk assessment and management approaches that are cost effective (*4, 6, 23*). Figure 32 shows the distribution of the population across different levels of cardiovascular risk in all WHO regions.

Figure 29 Ranking of 10 selected risk factors of cause of death (*2*).

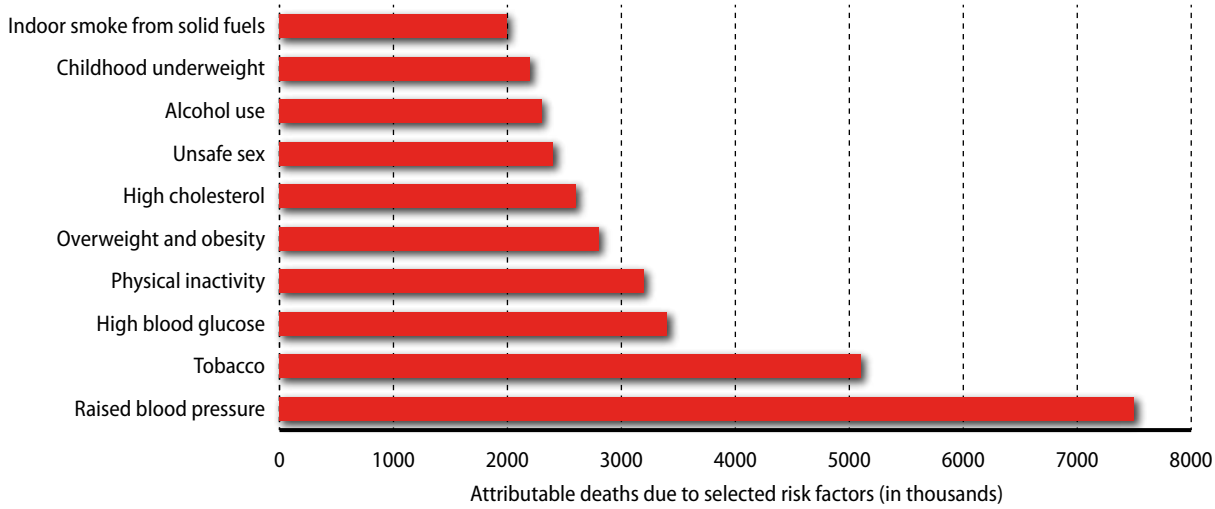


Figure 30 **WHO and International Society of Hypertension (ISH) cardiovascular risk prediction chart (Shows the 10 year risk of a fatal or nonfatal cardiovascular event by gender, age, smoking status, systolic blood pressure, blood cholesterol and presence or absence of diabetes. Different charts are available for all WHO subregions).**

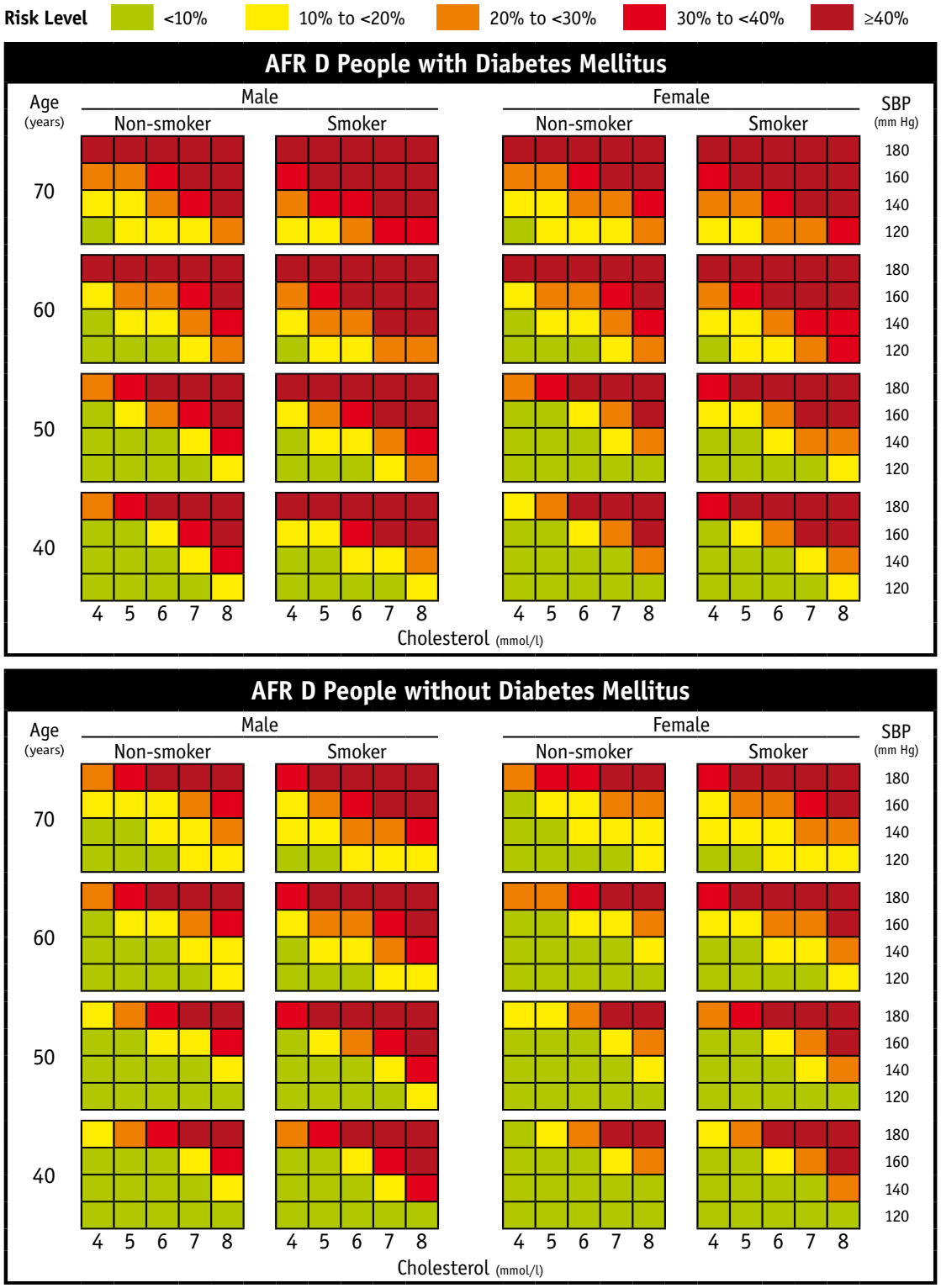
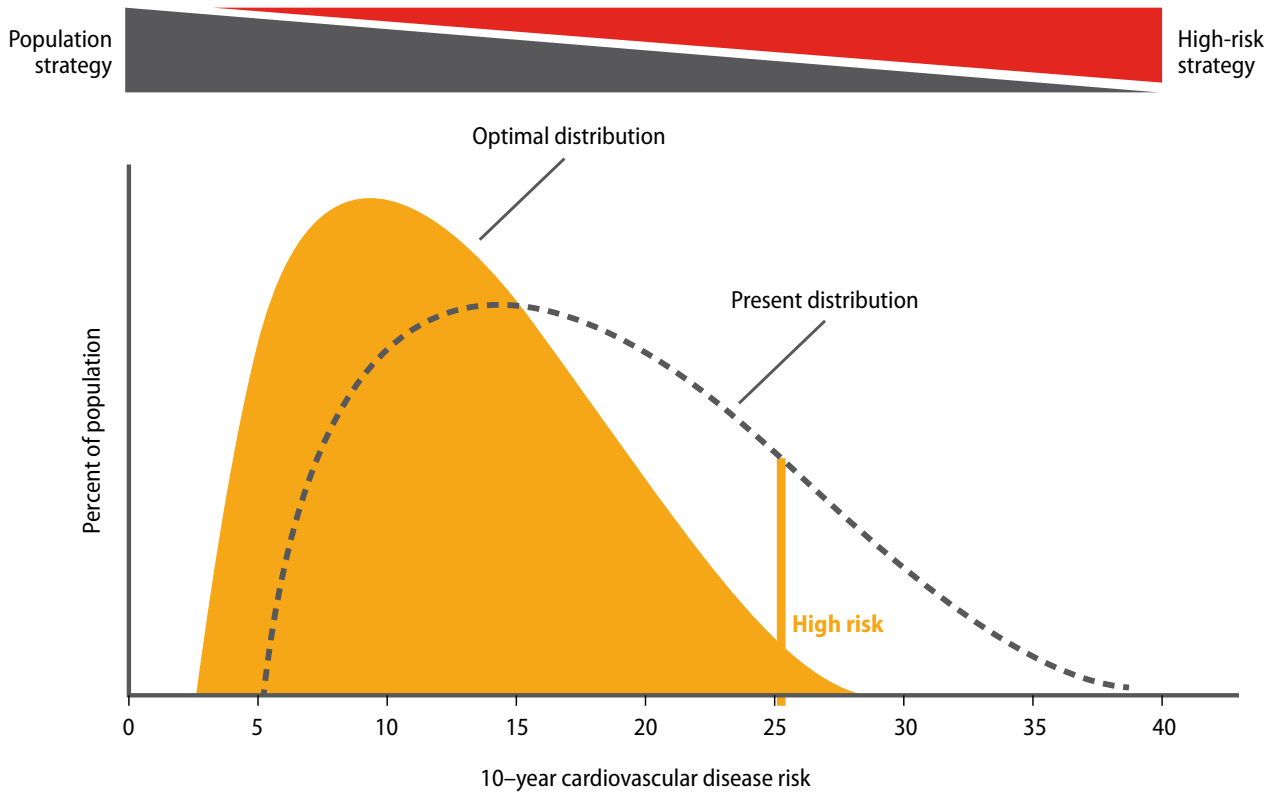


Figure 31 A combination of population wide and high risk strategies are required to shift the cardiovascular risk distribution of populations to more optimal levels (*23*).



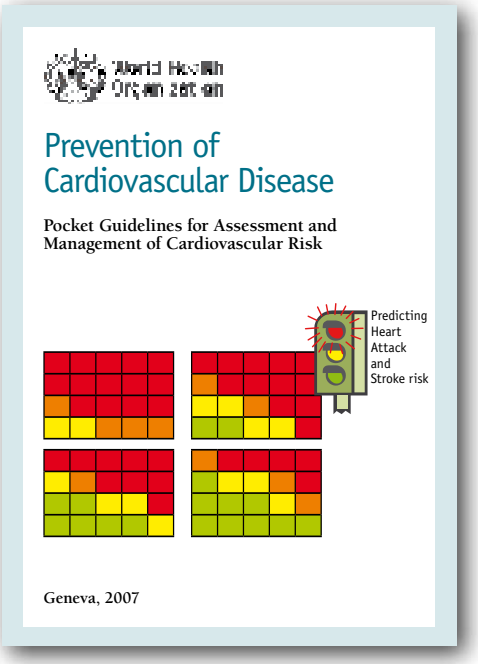
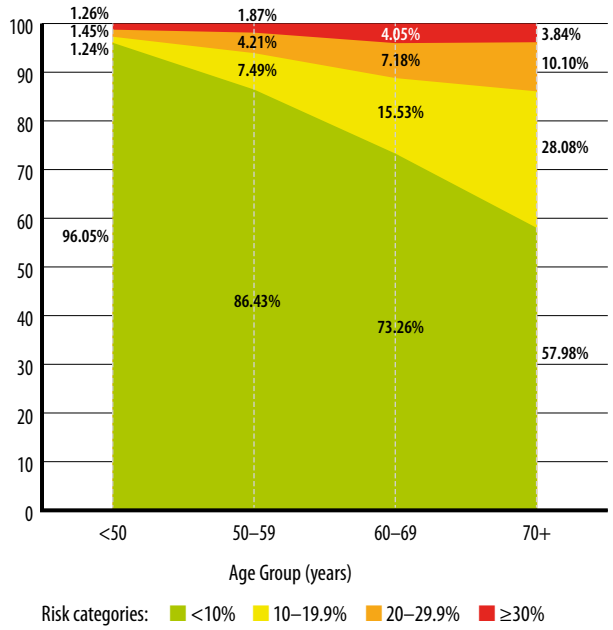
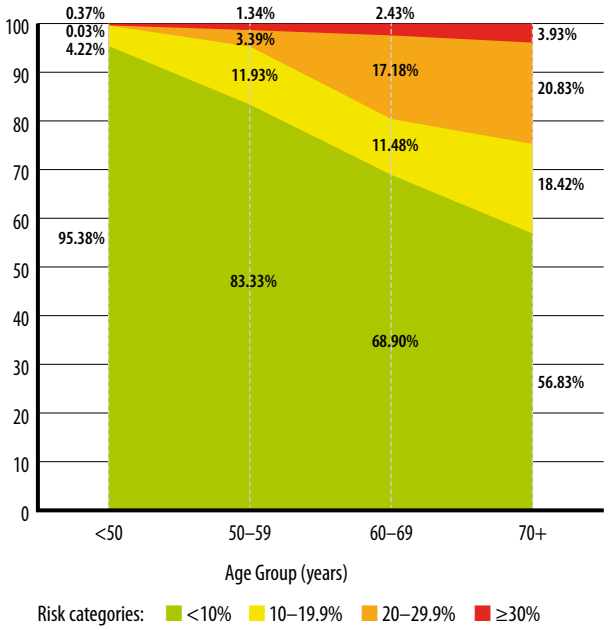


Figure 32 Distribution of cardiovascular risk categories in selected WHO subregions (*4*).

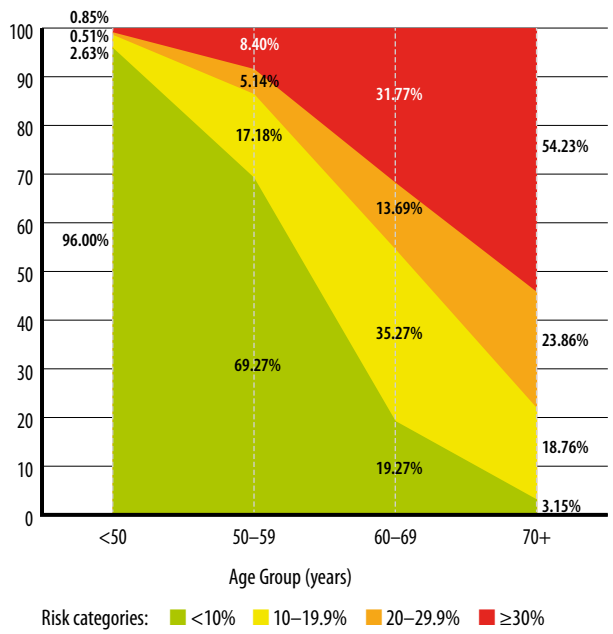
1. African Region D (Males)



2. African Region D (Females)



3. Americas Region A (Males)



4. Americas Region A (Females)

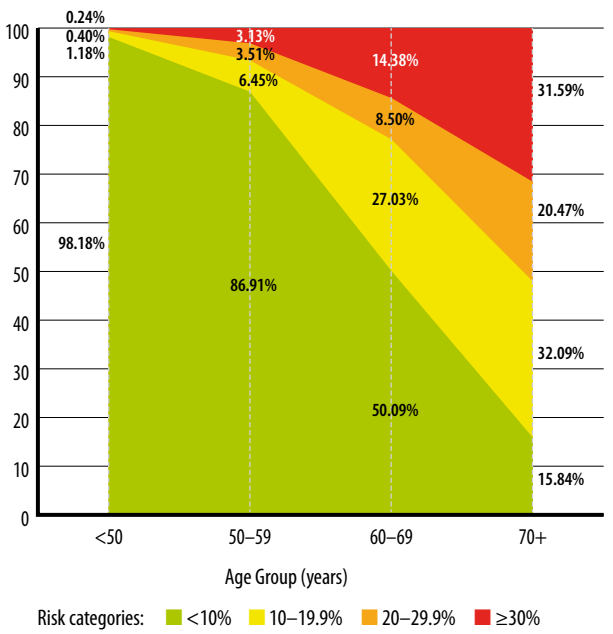
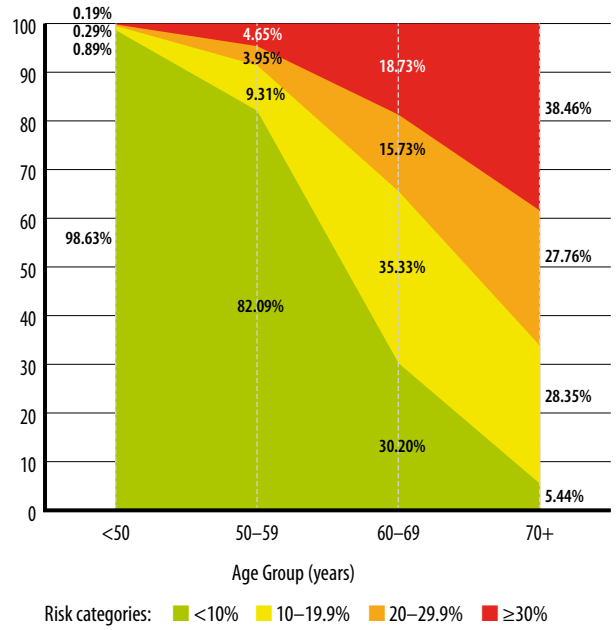
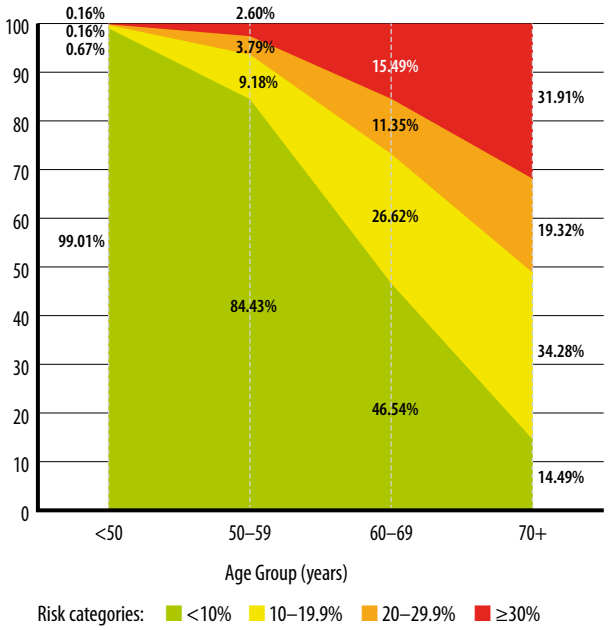


Figure 32 Distribution of cardiovascular risk categories in selected WHO subregions (4) (continued).

5. Eastern Mediterranean Region D (Males)



6. Eastern Mediterranean Region D (Females)



Essential technology need to be affordable and simple for application in the field

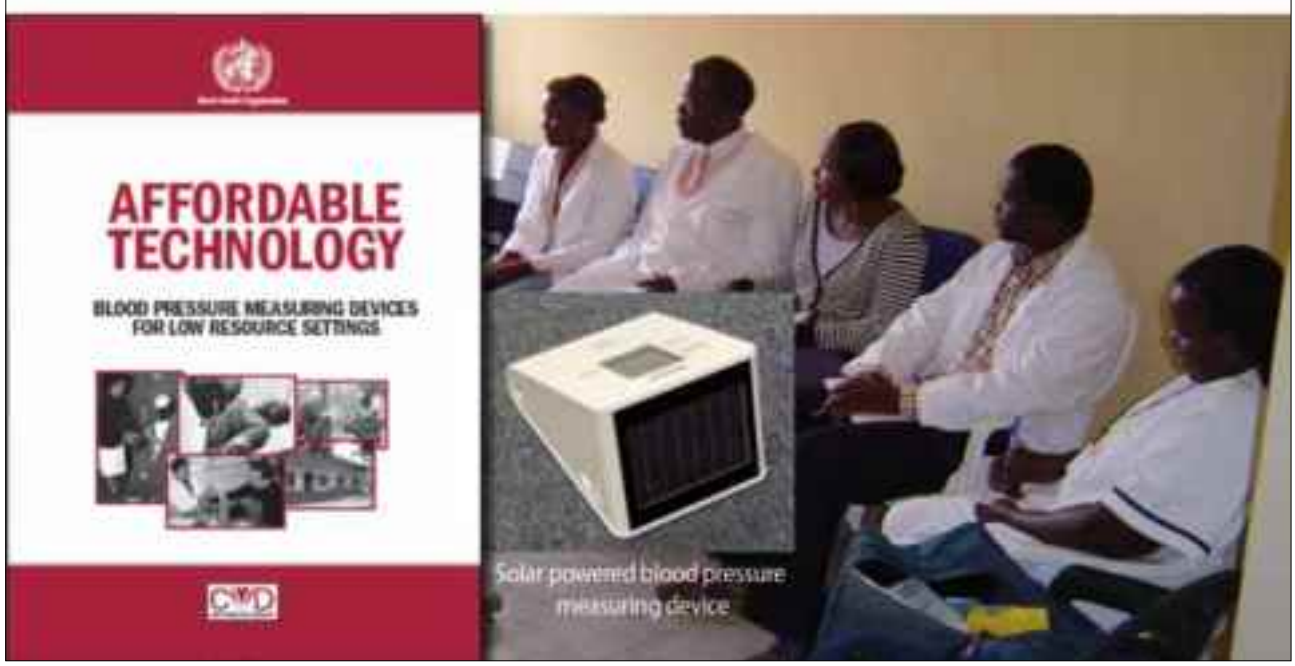
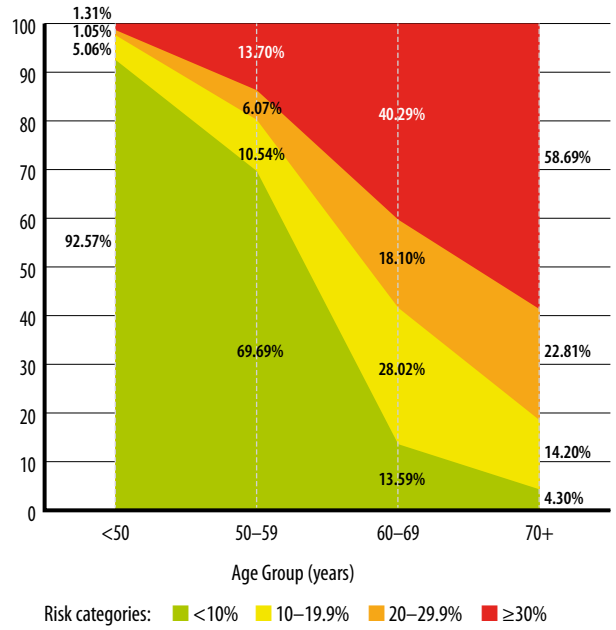
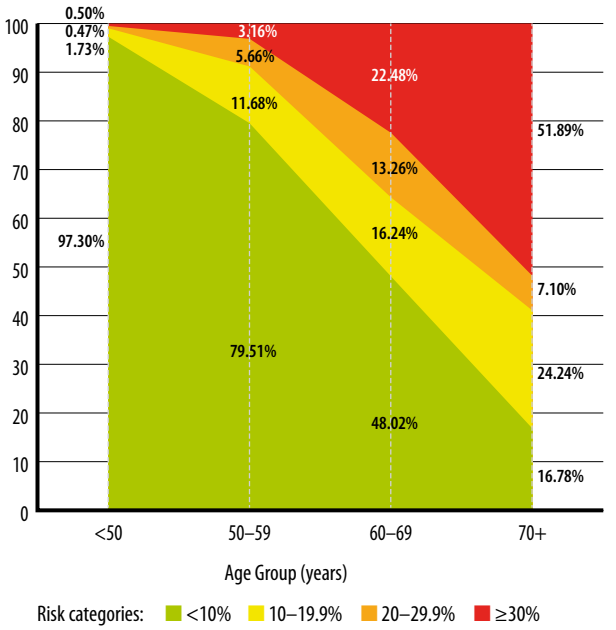


Figure 32 Distribution of cardiovascular risk categories in selected WHO subregions (4) (continued).

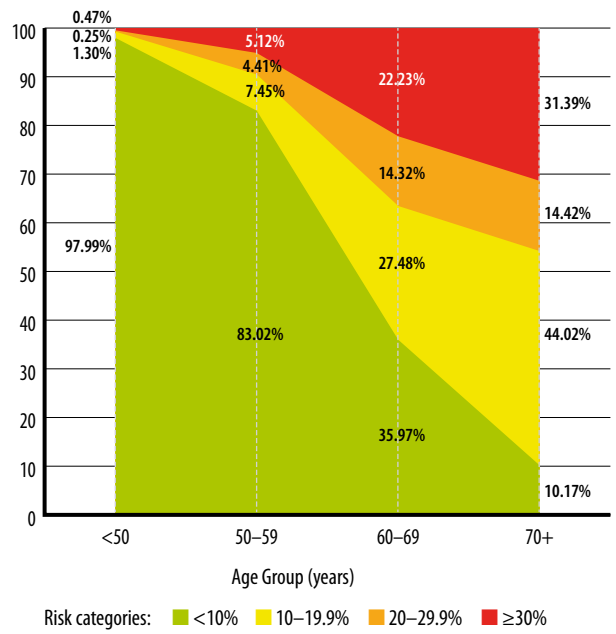
7. European Region C (Males)



8. European Region C (Females)



9. South-East Asia Region C (Males)



10. South-East Asia Region C (Females)

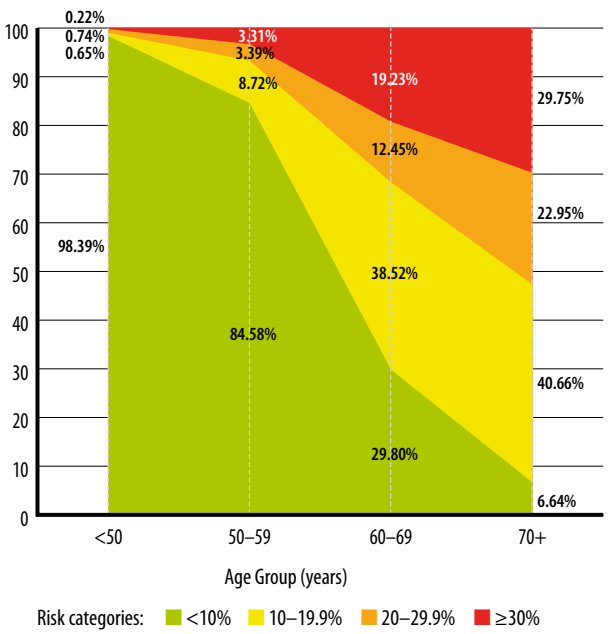
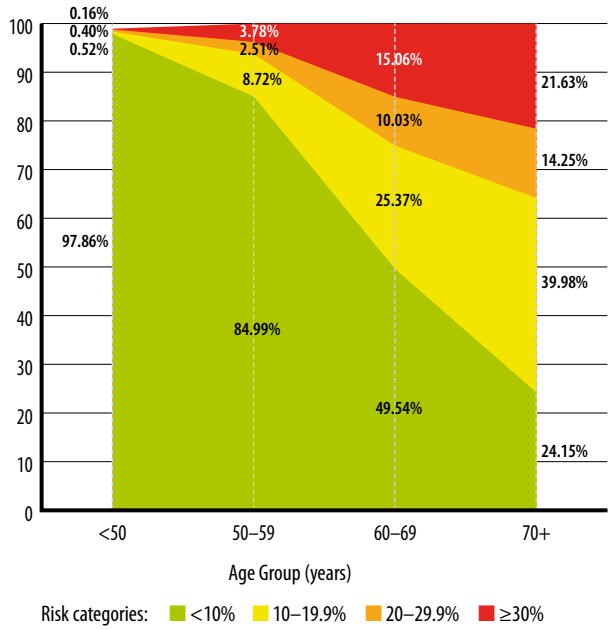
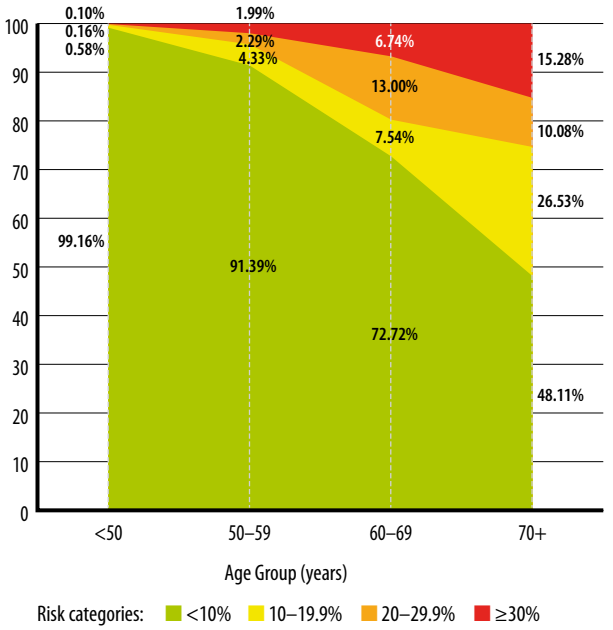


Figure 32 Distribution of cardiovascular risk categories in selected WHO subregions (4) (continued).

11. Western Pacific Region B (Males)

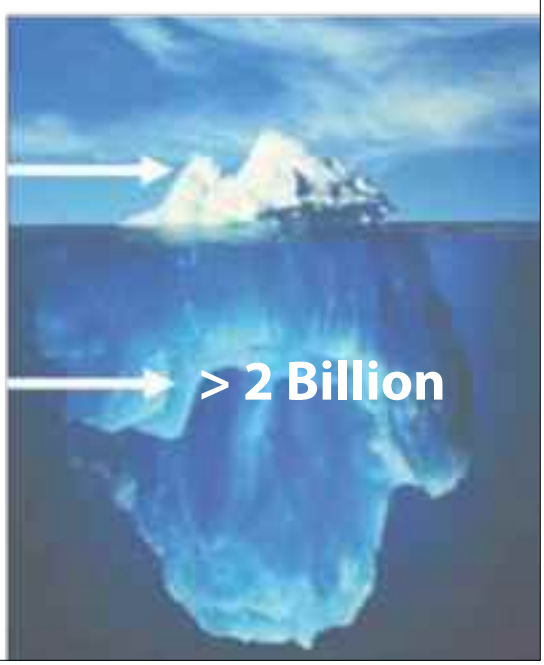


12. Western Pacific Region B (Females)



Public health burden hidden and underestimated

Heart attacks and strokes are only the tip of the iceberg



Risk factor burden; unrecognised

- Obesity
- Physical activity
- Unhealthy diet
- Tobacco use
- Raised blood pressure
- Raised blood sugar
- Raised blood lipids
- Air pollution
- Poverty

6

Tobacco: The totally avoidable risk factor of CVDs

KEY MESSAGES

- **Tobacco use is a principal contributor to the development of heart attacks, strokes, sudden death, heart failure, aortic aneurysm and peripheral vascular disease.**
- **Smoking cessation and avoidance of second-hand smoke reduce the cardiovascular risk and thereby help to prevent CVDs.**

There are currently about one billion smokers in the world. Manufactured cigarettes represent the major form of smoked tobacco; other forms of tobacco consumed include "bidis" (a type of filter-less hand-rolled cigarette), cigars, hookahs and chewed tobacco (*24, 25*). Figure 33 and 34 show the prevalence rates of current daily tobacco smoking. The prevalence of daily tobacco smoking varied widely among the six WHO regions in 2009.

The highest overall prevalence for smoking is estimated at nearly 31% in the WHO European Region, while the lowest is in the WHO African Region at 10% (*26*).

Risks to health from tobacco use result not only from direct consumption of tobacco, but also from exposure to second-hand smoke (*24, 25*). Nearly six million people die from tobacco use and exposure to second hand smoke each year, accounting for 6% of all female and 12% of all male deaths in the world (1, 6). By 2030, tobacco-related deaths are projected to increase to more than 8 million deaths every year (*2, 6*).

Smoking is estimated to cause nearly 10% of CVD (*2*). There is a large body of evidence from prospective cohort studies regarding the beneficial effect of smoking cessation on coronary heart disease mortality (*4*). A 50-year follow-up of British doctors demonstrated that, among ex-smokers, the age of quitting has a major impact on survival prospects: those who quit between 35 and 44 years of age had the same survival rates as those who had never smoked (*27*).

There is an inverse relationship between income level and prevalence of tobacco use and its related consequences. In addition, tobacco consumption inflicts a greater harm among disadvantaged groups due to tobacco-related illness and the impact on household expenditure. Therefore, policies and interventions focusing on prevention of tobacco use, promotion of smoke free environments and smoking cessation should be important components of national and international efforts to improve the health and well being of populations, especially the less affluent (*28*).

Figure 33 World map showing the prevalence of current daily tobacco smoking in males (age standardized adjusted estimates) (*6*).

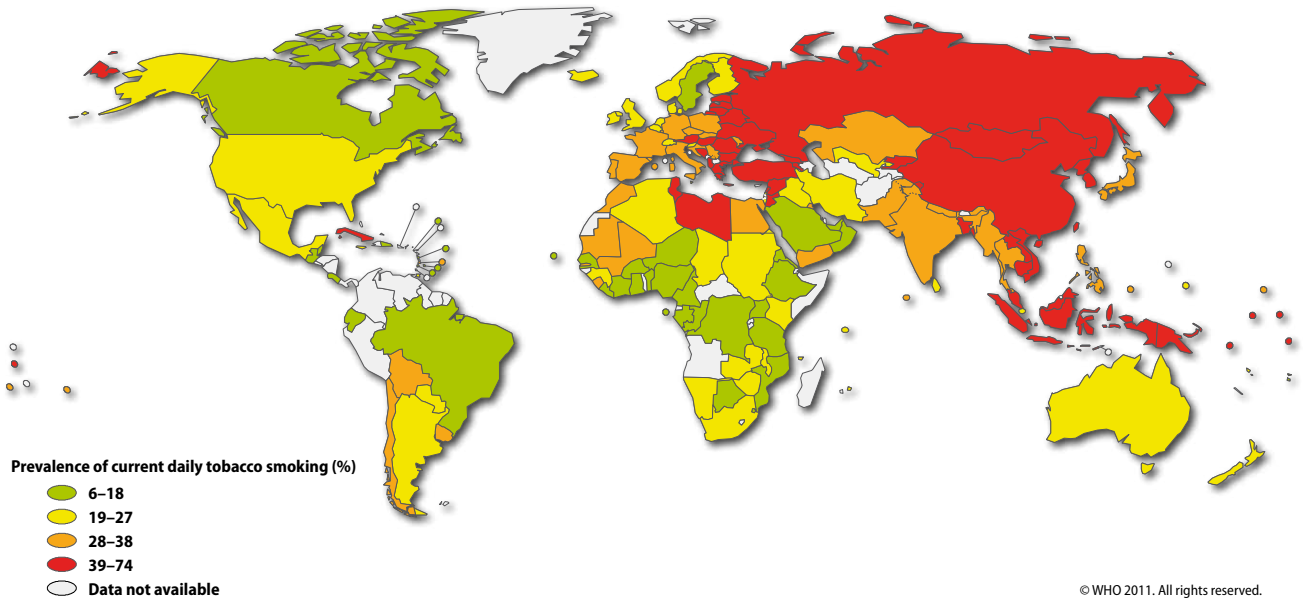


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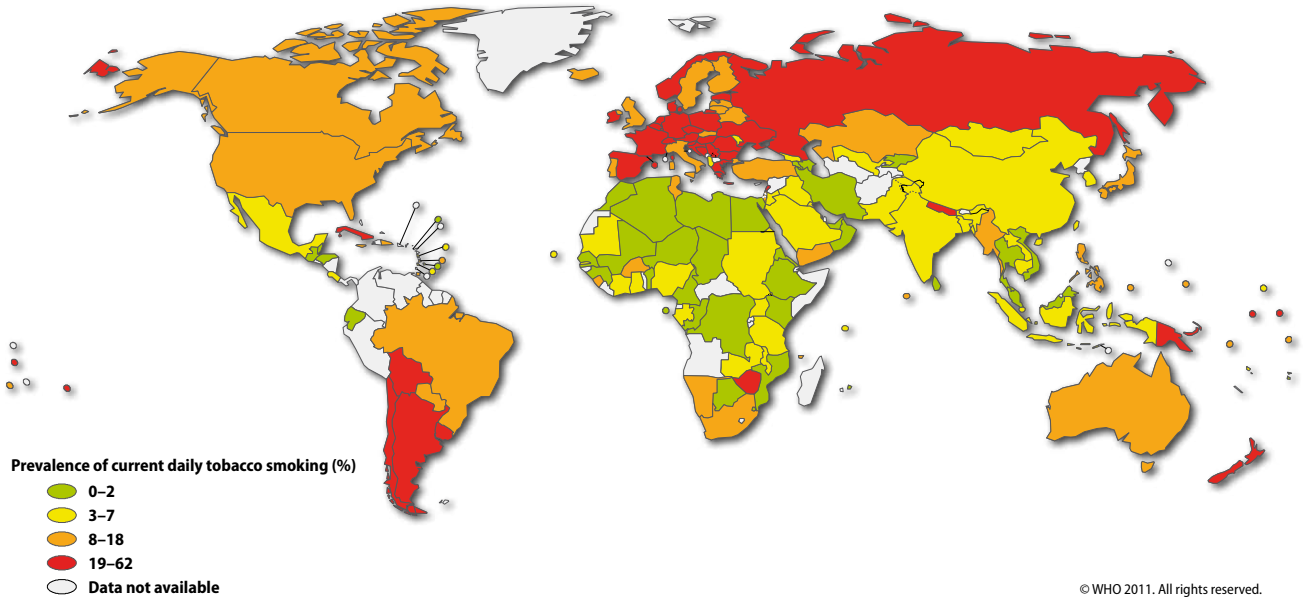
Figure 34 World map showing the prevalence of current daily tobacco smoking in females. (age standardized adjusted estimates) (*6*).



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7

KEY MESSAGES

- **Regular physical activity reduces the risk of heart attacks and strokes.**
- **Physical activity is a key determinant of energy expenditure and thus fundamental to energy balance and weight control.**

Physical inactivity: A preventable risk factor of CVDs

Insufficient physical activity can be defined as less than 5 times 30 minutes of moderate activity per week, or less than 3 times 20 minutes of vigorous activity per week, or equivalent. Insufficient physical activity is the fourth leading risk factor for mortality. Approximately 3.2 million deaths and 32.1 million DALYs – representing about 2.1% of global DALYs – each year are attributable to insufficient physical activity (*2*). People who are insufficiently physically active have a 20% to 30% increased risk of all-cause mortality compared to those who engage in at least 30 minutes of moderate intensity physical activity most days of the week. In 2008, 31.3% of adults aged 15 or older (28.2% men and 34.4% women) were insufficiently physically active (*6*).

In adults, participation in 150 minutes of moderate physical activity each week (or equivalent) is estimated to reduce the risk of ischaemic heart disease by approximately 30% and the risk of diabetes by 27% (*4*).

Many studies that have examined the association between physical activity and CVDs (*4, 6, 29–32*) have reported reduced risk of death from coronary heart disease and reduced risk of overall CVDs, coronary heart disease and stroke, in a dose–response fashion. Physical activity is a key determinant of energy expenditure and thus fundamental to energy balance and weight control. Physical activity improves endothelial function, which enhances vasodilatation and vasomotor function in the blood vessels (*33*). In addition, physical activity contributes to weight loss, glycaemic control, improved blood pressure, lipid profile and insulin sensitivity (*34, 35*). The beneficial effects of physical activity on cardiovascular risk may be mediated, at least in part, through these effects on intermediate risk factors.

The Global Status Report on NCD (*6*) showed that the prevalence of insufficient physical activity was highest in the WHO Region of the Americas and the WHO Eastern Mediterranean Region. In all WHO regions, men are more active than women, with the biggest difference in prevalence between males and females in the WHO Eastern Mediterranean Region (Figures 35 and 36).

The prevalence of insufficient physical activity is higher in high-income countries compared to low-income countries due to increased automation of work and use of vehicles for transport in high-income countries. High-income countries have more than double the prevalence of insufficient physical activity compared to low-income countries for both men and women, with 41% of men and 48% of women being insufficiently physically active in high-income countries compared to 18% of men and 21% of women in low-income countries (*6*).

Figure 35 World map showing the prevalence of insufficient physical activity *, in males (age 15+, age standardized) (*6*), (* less than 5 times 30 minutes of moderate activity per week or less than 3 times 20 minutes of vigorous activity per week, or equivalent).

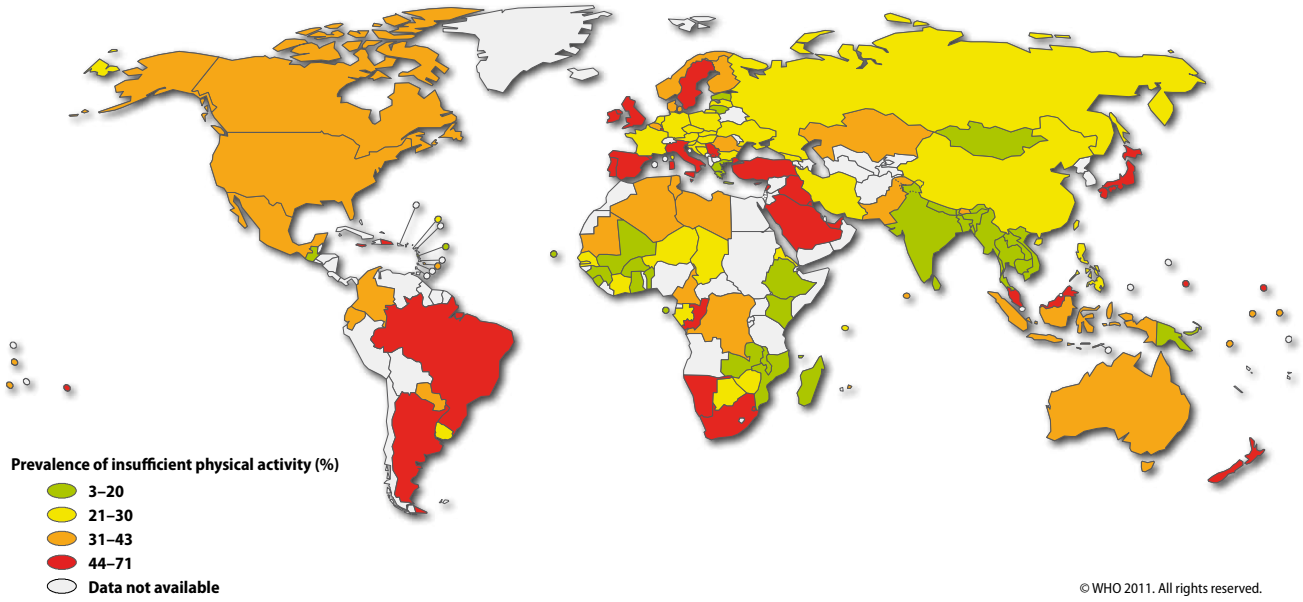

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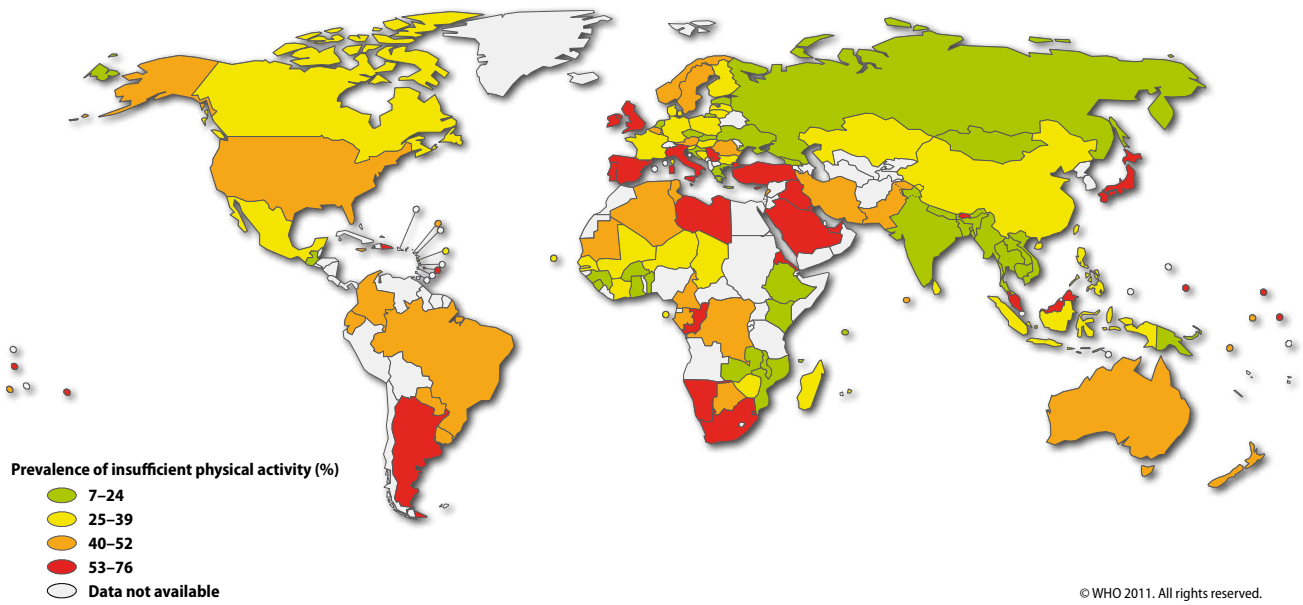
Figure 36 World map showing the prevalence of insufficient physical activity *, in females (age 15+, age standardized) (*6*), (* less than 5 times 30 minutes of moderate activity per week or less than 3 times 20 minutes of vigorous activity per week, or equivalent).



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8

Harmful use of alcohol: A preventable risk factor of CVDs

KEY MESSAGES

- **14% of alcohol-attributable deaths globally are due to CVD and diabetes mellitus.**
- **There is a direct causal relationship between levels and patterns of alcohol consumption and risk of CVD.**
- **High levels of alcohol consumption and heavy episodic (binge) drinking are associated with increased risk of CVD.**
- **Harmful use of alcohol damages the heart muscle, increases the risk of stroke and promotes cardiac arrhythmia.**

The harmful use of alcohol is a risk factor for multiple adverse health and social outcomes, including hypertension, acute myocardial infarction, cardiomyopathy, cardiac arrhythmia, cirrhosis of the liver, pancreatitis, neuropathy, encephalopathy, sexually transmitted diseases, unintended pregnancy, fetal alcohol spectrum disorders, sudden infant death syndrome, violence, suicide and unintentional injuries (e.g. motor vehicle crashes). In addition, people are affected by other people's drinking, including that of their families, friends, co-workers and strangers. These harms range in magnitude from noise and fear to physical abuse, sexual coercion and social isolation (*2–6, 36*). The adult per capita consumption of pure alcohol (litres) is shown in Figure 37.

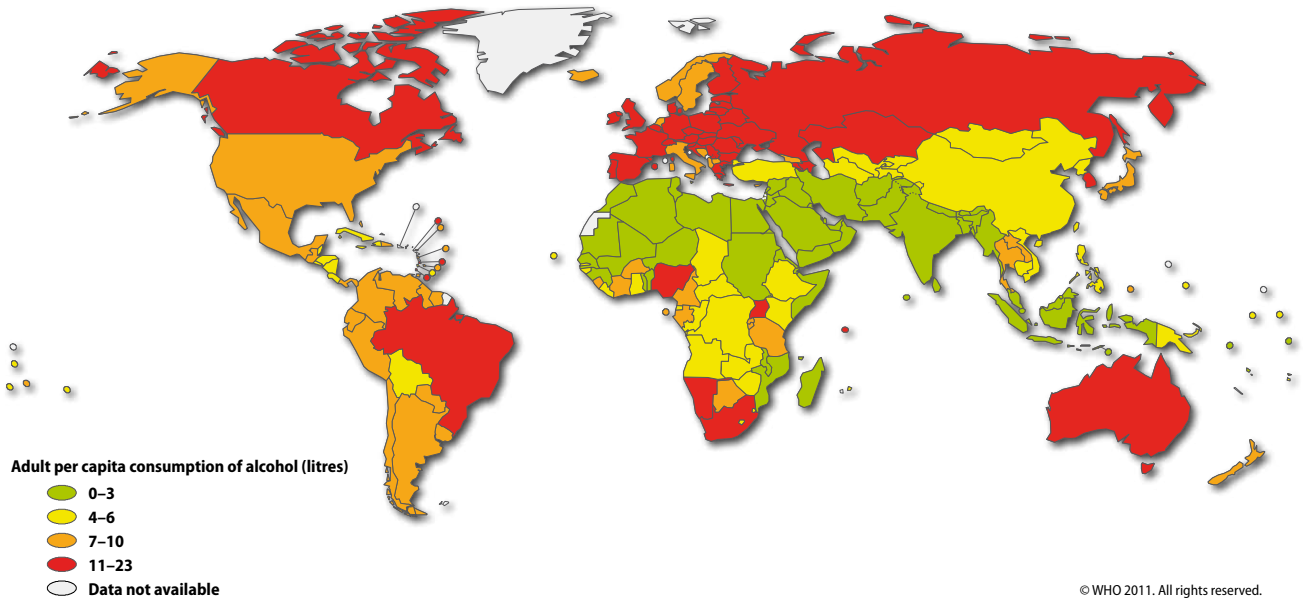
Hazardous and harmful drinking was responsible for 2.5 million (3.8%) deaths worldwide in 2004 (2,37,38). More than 50% of these deaths were due to CVDs, liver cirrhosis and cancer. An estimated 4.5% of the global burden of disease – as measured in DALYs – is caused by the harmful use of alcohol (*2*).

The relationship between alcohol consumption and coronary heart disease and cerebrovascular diseases is complex. It depends on both the level and the pattern of alcohol consumption. There is a direct relationship between higher levels of alcohol consumption and the pattern of binge drinking (defined as 60 or more grams of pure alcohol per day) with the risk of CVD. Drinking at low levels without episodes of heavy drinking may be associated with a reduced risk of multiple cardiovascular outcomes (overall mortality from CVDs, incidence of and mortality from coronary heart disease and incidence of and mortality from stroke) in some segments of the population (*36–38*). However, these effects tend to disappear if the patterns of drinking are characterized by heavy episodic drinking (*39, 40*).

Various mechanisms have been proposed for the protective effect of light to moderate alcohol consumption, including the beneficial effects of alcohol on the HDL cholesterol level, thrombolytic profile and platelet aggregation (*39–42*).

Overall alcohol consumption is associated with multiple health risks that, at the population level, clearly outweigh potential benefits.

Figure 37 World map showing the adult per capita consumption of pure alcohol (litres), in males and females (*6*).



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Strategies are needed to prevent the harmful use of alcohol

9

Unhealthy diet: A preventable risk factor of CVDs

KEY MESSAGES

- **A modest reduction in salt intake reduces blood pressure in individuals with both normal and raised blood pressure.**
- **Dietary salt increases blood pressure in most people with hypertension and in about one third with normotension.**
- **Dietary salt aggravates the age-related rise in blood pressure.**
- **High dietary intakes of saturated fat, trans-fat, cholesterol and salt, and low intake of fruits, vegetables and fish increase the risk of CVD.**

There is a considerable body of evidence regarding the nutritional background of atherosclerosis in general and coronary heart disease in particular. High dietary intakes of saturated fat, trans-fat cholesterol and salt, and low intake of fruits, vegetables and fish are linked to cardiovascular risk (*2–6, 43*). Obesity is a cardiovascular risk factor closely linked to diet and physical inactivity. Obesity results, when there is an imbalance between energy intake in the diet and energy expenditure. Regular physical activity can prevent obesity by increasing the expended energy. Figures 38 and 39 show the prevalence of obesity in adults and Figure 40 shows the per capita intake of fruits and vegetables.

Approximately 16 million (1.0%) DALYs and 1.7 million (2.8%) of deaths worldwide are attributable to low fruit and vegetable consumption (*2*). The amount of dietary salt consumed is an important determinant of blood pressure levels and overall cardiovascular risk (*43–45*). Adequate consumption of fruit and vegetables reduces the risk of CVD (*2, 46, 47*). Frequent consumption of high-energy foods, such as processed foods that are high in fats and sugars, promotes obesity compared to low-energy foods (*48*). A healthy diet can contribute to a healthy body weight, a desirable lipid profile and a desirable blood pressure (*44*).

WHO recommends a population salt intake of less than 5 grams/person/day to help the prevention of CVD (*43*). However, data from various countries indicate that most populations are consuming much more salt than this (*44*). It is estimated that decreasing dietary salt intake from the current global levels of 9–12 grams/day to the recommended level of 5 grams/day would have a major impact on blood pressure and CVD (*45, 49*).

A modest reduction in salt intake has a significant, and from a population viewpoint, important effect on blood pressure in individuals with either normal or raised blood pressure (*50*). There is also a correlation between the magnitude of salt reduction and the magnitude of blood pressure reduction within the daily intake range of 3–12 grams/day; the lower the salt intake, the lower the blood pressure (*49, 50*).

High consumption of saturated fats and trans-fatty acids is linked to heart disease; elimination of trans-fat and replacement of saturated with polyunsaturated vegetable oils lowers coronary heart disease risk (*43*).

Energy from saturated fats usually accounts for one third of the energy from total fat, with the notable exception of the WHO South-East Asia Region, where saturated fatty acids account for over 40% of total fat intake. The availability of total fat increases with income level, with the availability of saturated fats around 8% in low- and lower-middle-income countries and 10% in upper-middle-income and in high-income countries (*6, 43*).

Figure 38 World map showing the prevalence of obesity * in males (ages 20+, age standardized) (*6*). (*BMI≥30 kg/m²)

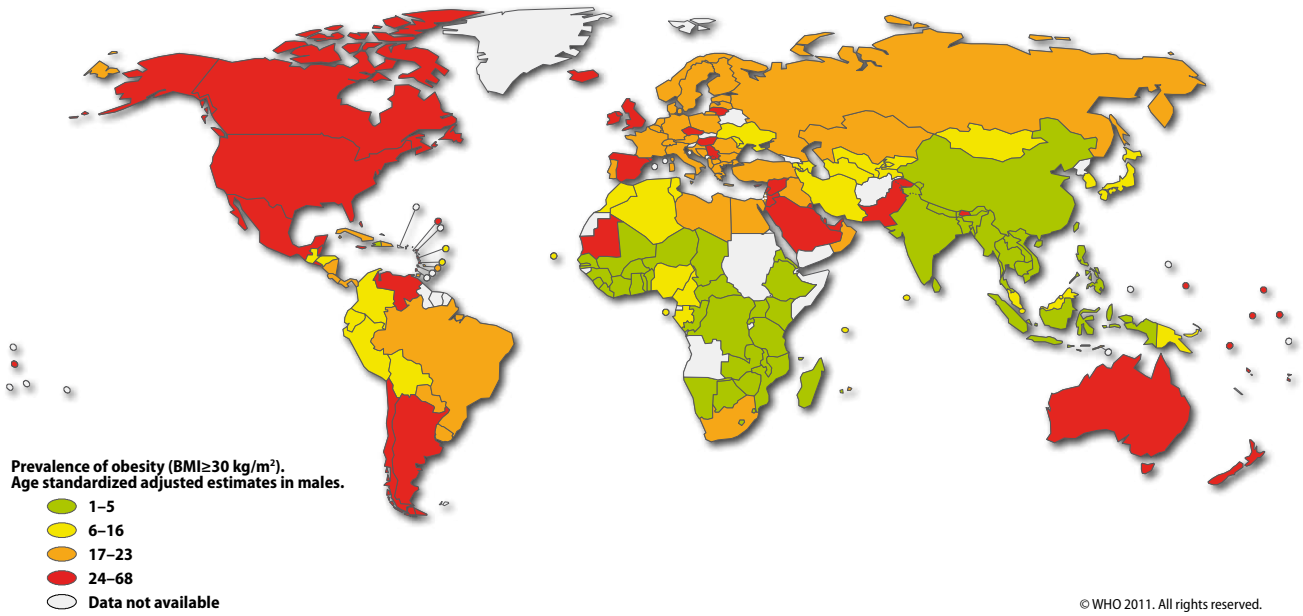

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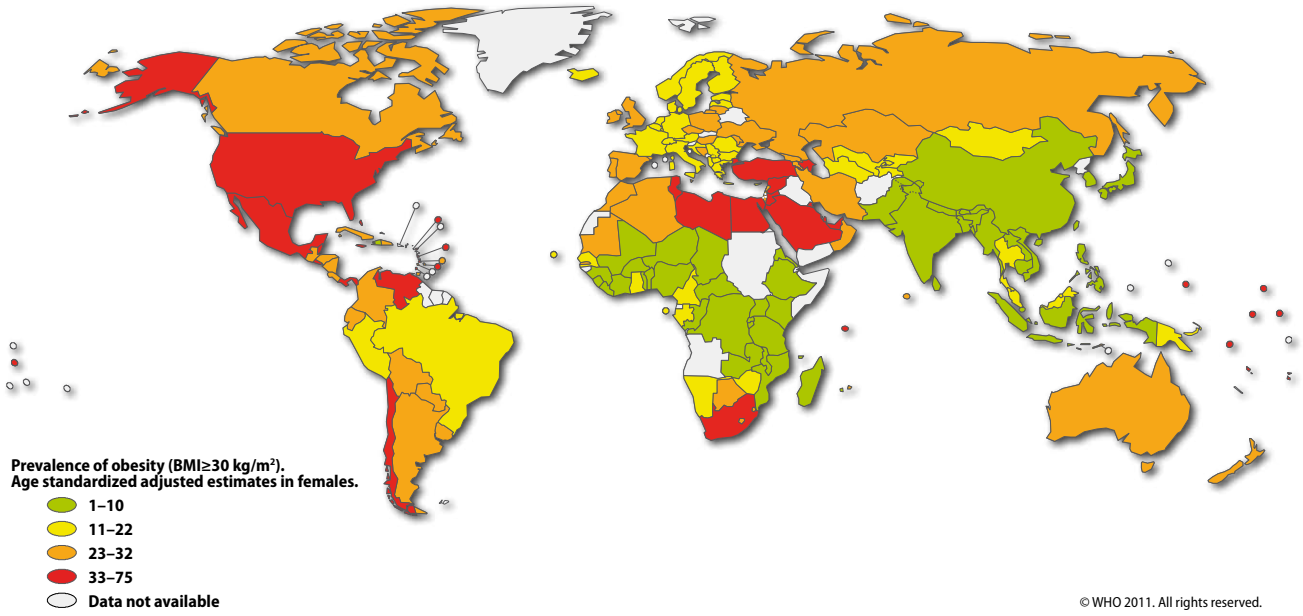
Figure 39 World map showing the prevalence of obesity * in females (ages 20+, age standardized) (*6*). (*BMI≥30 kg/m²)



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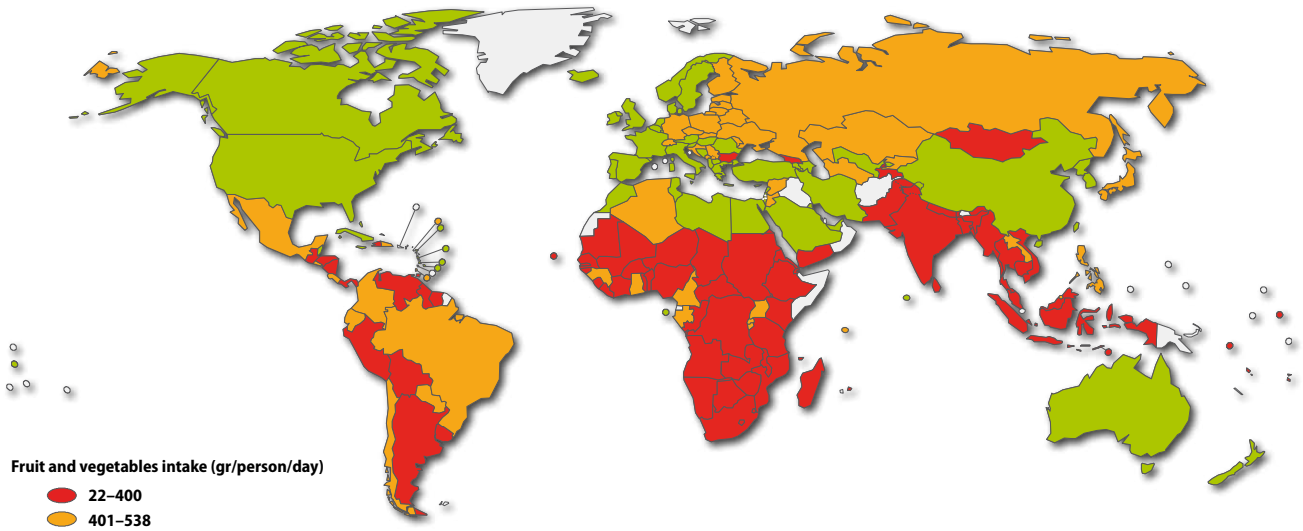
Consumption of calorie-rich food promote obesity

Reduce salt intake by restricting preserved and processed food high in salt

Figure 40 World map showing fruits and vegetable intake (grams per person per day) (*ii*).



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Consumption of fruits and vegetables promotes health

10

Obesity: A risk factor of CVDs

KEY MESSAGES

- **Obesity is strongly related to major cardiovascular risk factors such as hypertension, type 2 diabetes and dyslipidaemia.**
- **Imbalance between increased energy intake (diet) and energy expenditure (physical activity) is the major cause of obesity.**
- **Obesity is a growing health problem worldwide.**

Worldwide, at least 2.8 million people die each year as a result of being overweight or obese, and an estimated 35.8 million (2.3%) of global DALYs are caused by overweight or obesity (*6*). In 2008, 34% of adults over the age of 20 were overweight with a body mass index (BMI, a measure of weight relative to height) greater than or equal to 25 kg/m^2 (33.6% of men and 35% of women). In 2008, 9.8% of men and 13.8% of women were obese (with a BMI greater than or equal to 30 kg/m^2), compared to 4.8% for men and 7.9% for women in 1980 (*6*).

Obesity is a growing health problem in both developed and developing countries (*6*). Figures 41 and 42 show the world distribution of the prevalence of overweight. Prospective epidemiological studies have shown a relationship between overweight or obesity and cardiovascular morbidity, CVD mortality and total mortality. Obesity is strongly related to major cardiovascular risk factors such as raised blood pressure, glucose intolerance, type 2 diabetes and dyslipidaemia (*4, 6, 51–53*).

Overweight and obesity cause adverse metabolic effects on blood pressure, cholesterol, triglycerides and insulin resistance. Risks of coronary heart disease, ischaemic stroke and type 2 diabetes mellitus increase steadily with an increasing BMI (*54*). To achieve optimal health, the median BMI for adult populations should be in the range of 21–23 kg/m^2, while the goal for individuals should be to maintain a BMI in the range 18.5–24.9 kg/m^2 (*4*).

The prevalence of raised BMI increases with income level of countries, up to upper-middle-income levels. The prevalence of overweight in high-income and upper-middle-income countries was more than double that of low- and lower-middle-income countries. For obesity, the difference more than triples from 7% obesity for both males and females in lower-middle-income countries to 24% in upper-middle-income countries (*6*). Rising income is associated with rising rates of overweight among infants and young children. In high-income countries, such as the United Kingdom and the United States, lower socioeconomic status is associated with a higher prevalence of obesity (*55, 56*). In contrast, in medium- and low-income countries a positive relationship between socioeconomic status and obesity in men, women and children has been observed.

Figure 41 World map showing the prevalence of overweight * in males (ages 20+, age standardized) (*6*), (*BMI ≥ 25 kg/m²).

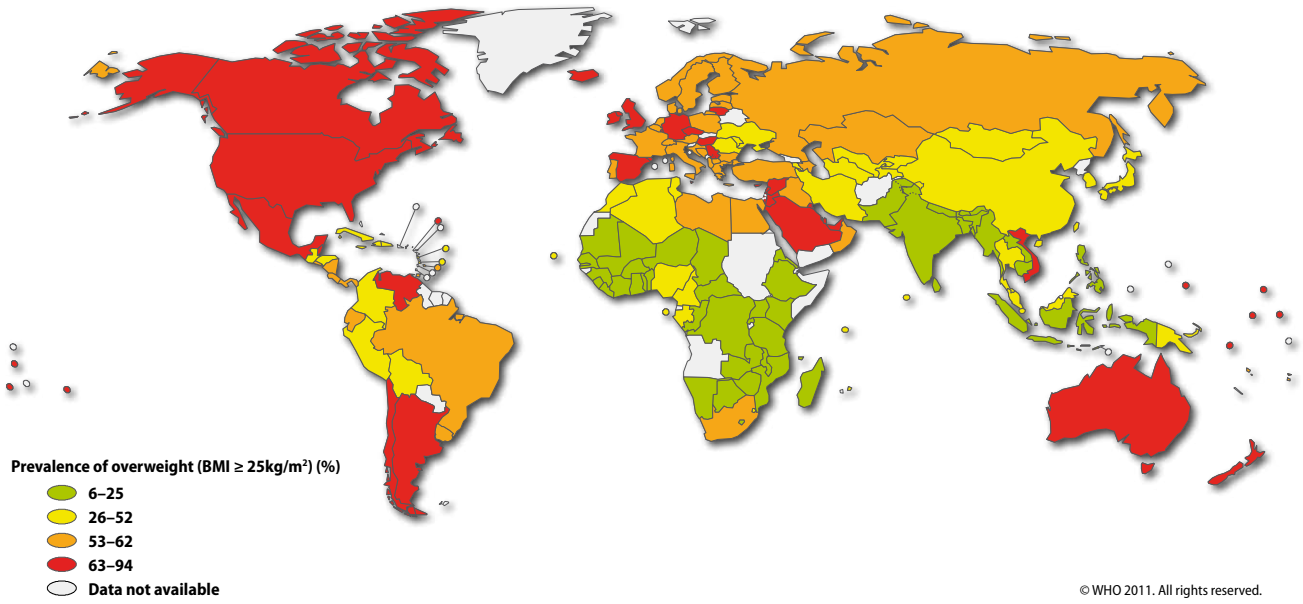

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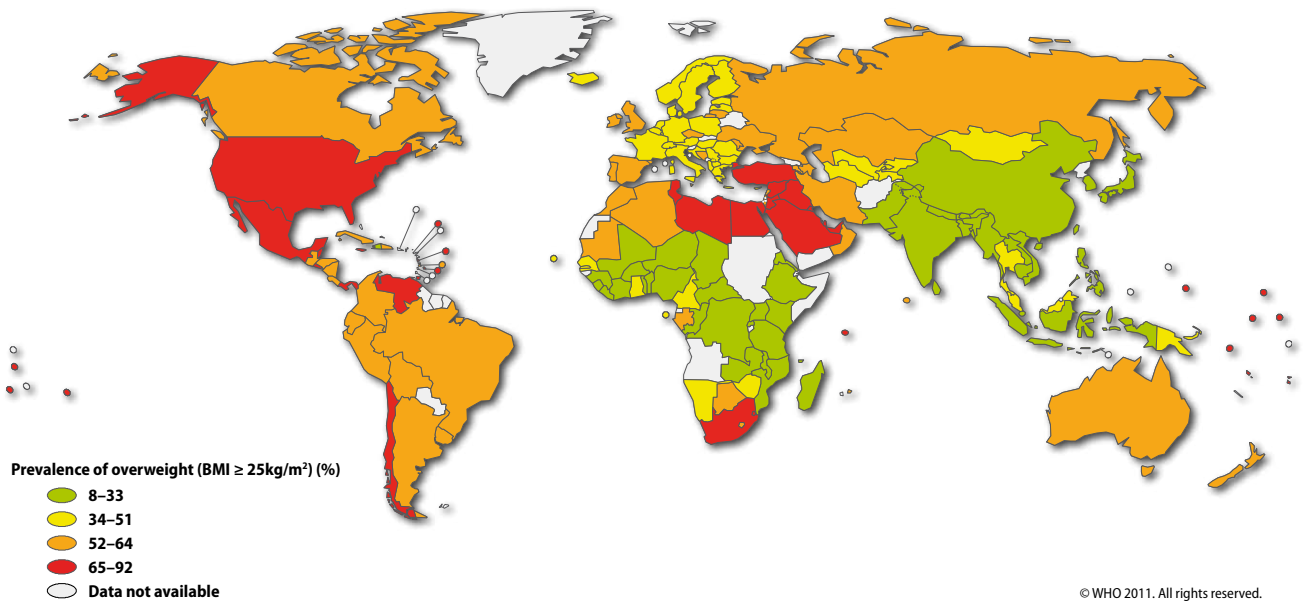
Figure 42 World map showing the prevalence of overweight * in females (ages 20+, age standardized) (*6*), (*BMI ≥ 25 kg/m²).



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11

Raised blood pressure (hypertension): A major risk factor of CVDs

KEY MESSAGES

- **Raised blood pressure is a major risk factor for strokes and heart attacks as well as heart failure, renal impairment, peripheral vascular disease and blindness.**
- **There is a continuous relationship between blood pressure and cardiovascular risk (risk of developing heart attacks and strokes).**
- **Early detection of hypertension and treatment to reduce cardiovascular risk in people with hypertension is vital for prevention of strokes and heart attacks.**

Worldwide, raised blood pressure is estimated to cause 7.5 million deaths, about 12.8% of the total of all annual deaths (*2, 6*). This accounts for 57 million DALYS or 3.7% of total DALYS. Raised blood pressure is a major risk factor for coronary heart disease and cerebrovascular disease (*4*). Blood pressure levels have been shown to be positively and progressively related to the risk of stroke and coronary heart disease. In some age groups, the risk of CVD doubles for each incremental increase of 20/10 mmHg of blood pressure, starting as low as 115/75 mmHg. In addition to coronary heart disease and cerebrovascular disease, uncontrolled blood pressure causes heart failure, renal impairment, peripheral vascular disease and damage to retinal blood vessels and visual impairment (*1–6, 57*).

Figures 43 and 44 show the distribution of prevalence of raised blood pressure in the world in adult males and females, respectively. Globally, the overall prevalence of raised blood pressure in adults aged 25 and over was around 40% in 2008. The number of people with uncontrolled hypertension has risen from 600 million in 1980 to nearly one billion in 2008 (*6*). Undetected and uncontrolled hypertension that increases the cardiovascular risk is a major contributor to stroke worldwide (*6*).

The prevalence of raised blood pressure was highest in the WHO African Region, where it was 46% for males and females combined. The lowest prevalence of raised blood pressure was in the WHO Region of the Americas, with 35% for both males and females. Across the income groups of countries, the prevalence of raised blood pressure was consistently high, with low-, lower-middle- and upper-middle-income countries all having rates of around 40% for males and females. The prevalence in high-income countries was lower, at 35% for both genders (*6*).

Policies to reduce salt consumption can shift the population distribution of blood pressure so that there is a reduction in cardiovascular risk (*4*). The stroke and heart attack risk of people with high cardiovascular risk and/or raised blood pressure can be reduced through non-pharmacological (e.g. low salt diet, physical activity) and pharmacological measures. These measures are very important for people with diabetes as they are particularly vulnerable to heart attacks and strokes. Primary care access to cardiovascular risk assessment and essential medicines for reducing cardiovascular risk can improve health outcomes of people with hypertension (*6*).

Figure 43 World map showing the prevalence of raised blood pressure* in males (ages 25+, age standardized) (*6*), (* SBP≥ 140 and /or DBP ≥90).

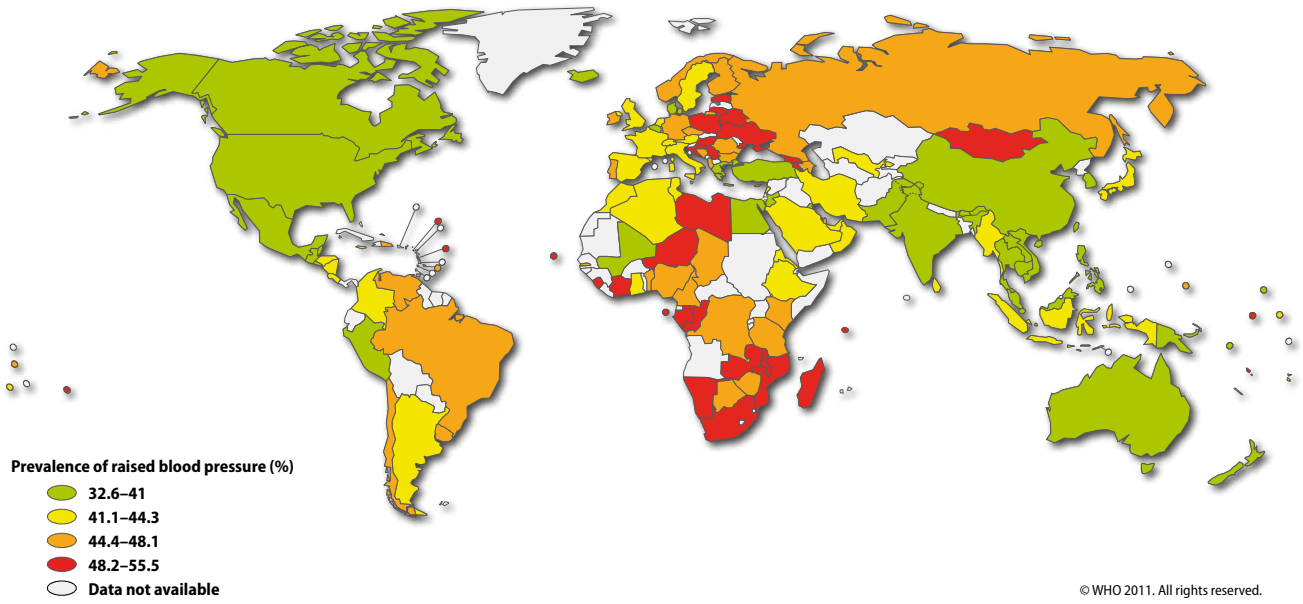

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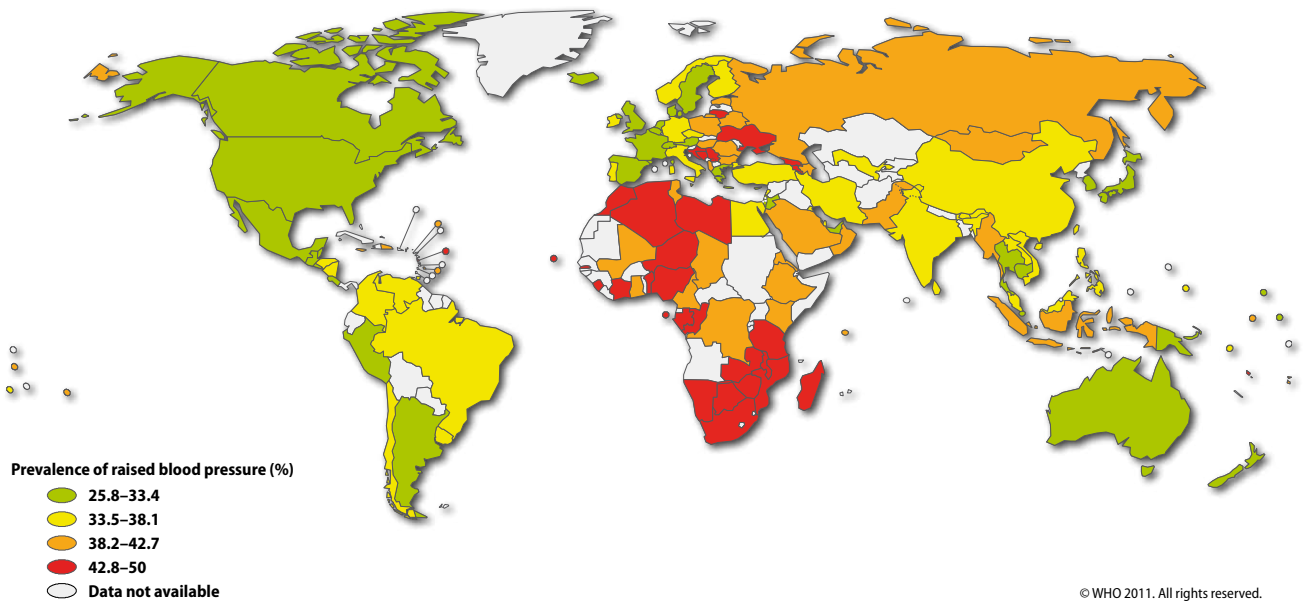
Figure 44 World map showing the prevalence of raised blood pressure * in females (ages 25+, age standardized) (*6*), (* SBP≥ 140 and /or DBP ≥90).



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12

Raised blood sugar (diabetes): A major risk factor of CVDs

KEY MESSAGES

- **The risk of cardiovascular events is two to threefold higher in people with diabetes and the risk is disproportionately higher in women.**
- **Impaired glucose tolerance and impaired fasting glycaemia increase the risk for future development of diabetes and CVD.**
- **Early detection and treatment of diabetes, including reduction of cardiovascular risk in people with diabetes, is vital for prevention of heart attacks and strokes and other complications of diabetes.**

Diabetes is a major risk factor of CVD. Diabetes is defined as having a fasting plasma glucose value ≥ 7.0 mmol/l (126 mg/dl). Impaired glucose tolerance and impaired fasting glycaemia are risk categories for future development of diabetes and CVD (*4*).

In 2008, diabetes was responsible for 1.3 million deaths globally. The magnitude of diabetes and other abnormalities of glucose tolerance would be considerably higher than the above estimate if the categories of "impaired fasting" and "impaired glucose tolerance" were included. In 2008, the global prevalence of diabetes was estimated to be 10% (*6*).

The estimated prevalence of diabetes is relatively consistent across the income groupings of countries. Low-income countries showed the lowest prevalence (8% for both males and females), and the upper-middle-income countries showed the highest prevalence (10% for both males and females). The prevalence of raised blood glucose worldwide is shown in Figures 45 and 46).

CVD accounts for about 60% of all mortality in people with diabetes. The risk of cardiovascular events is from two to three times higher in people with type 1 or type 2 diabetes and the risk is disproportionately higher in women (58–60). In some age groups, people with diabetes have a twofold increase in the risk of stroke (*4*). Patients with diabetes also have a poorer prognosis after cardiovascular events compared to people without diabetes.

Cardiovascular risk increases with raised glucose values (*61, 62*). Furthermore, abnormal glucose regulation tends to occur together with other known cardiovascular risk factors such as central obesity, elevated blood pressure, low HDL cholesterol and a high triglyceride level (*63–66*).

Lack of early detection and care for diabetes results in severe complications, including heart attacks, strokes, renal failure, amputations and blindness. Primary care access to measurement of blood glucose and cardiovascular risk assessment as well as essential medicines including insulin can improve health outcomes of people with diabetes (*6*).

Figure 45 World map showing the prevalence of raised blood glucose * in males (ages 25+, age standardized) (*6*), (* ≥ 7 mmol/l or on medication for raised blood glucose).

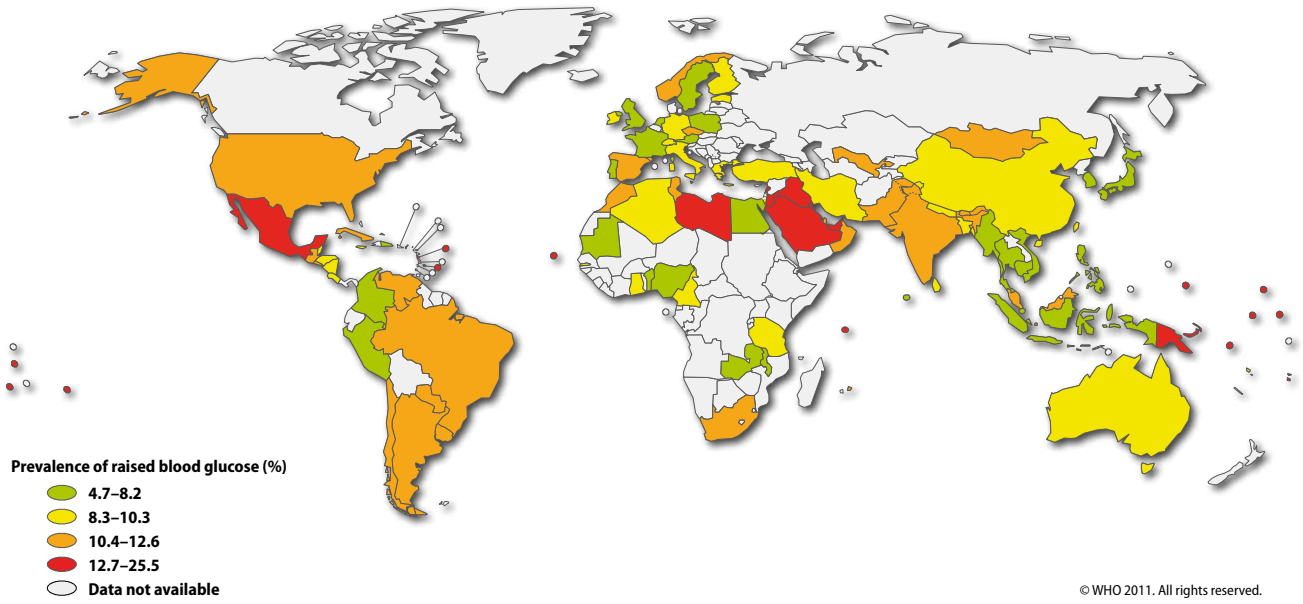

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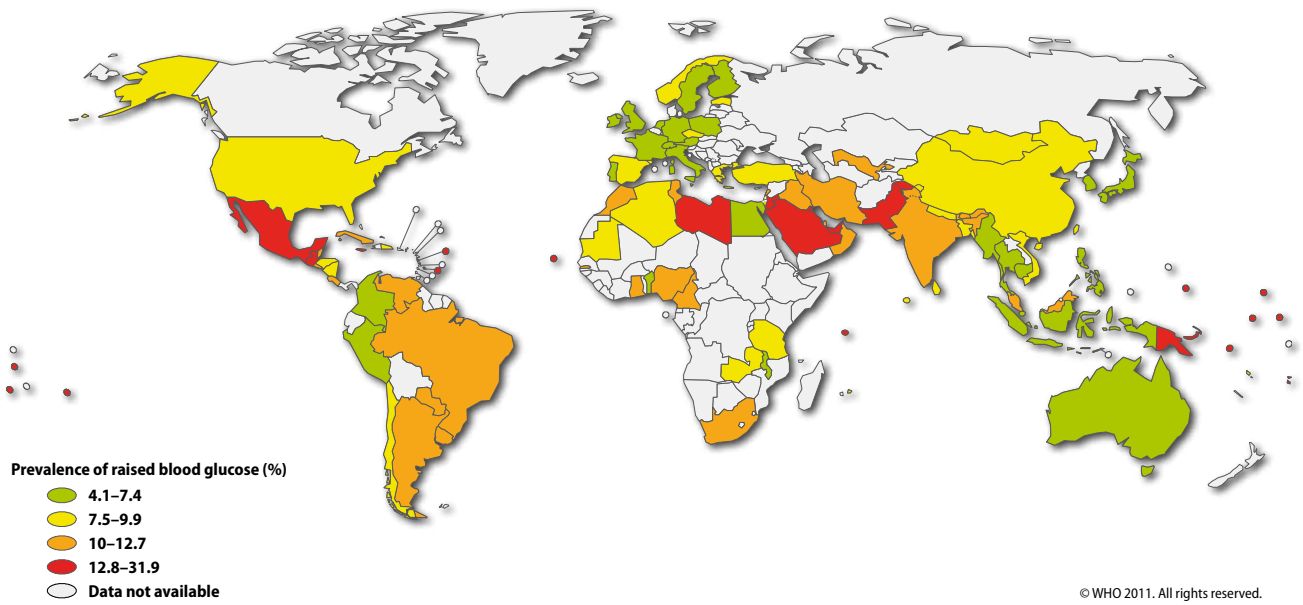
Figure 46 World map showing the prevalence of raised blood glucose * in females (ages 25+, age standardized) (*6*), (*≥ 7 mmol/l or on medication for raised blood glucose).



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13

Raised blood cholesterol: A major risk factor of CVDs

KEY MESSAGES

- **Hypercholesterolaemia is a major cardiovascular risk factor.**
- **There is continuous association between total cholesterol and cardiovascular risk.**
- **Lowering cholesterol in people with moderate-high cardiovascular risk prevents heart attacks and strokes.**

The lipoprotein profile includes: (i) low density lipoprotein cholesterol (LDL), also called "bad" cholesterol); (ii) high density lipoprotein cholesterol (HDL), also called "good" cholesterol); and (iii) triglycerides. Excess calories in the body are converted into triglycerides and stored in fat cells throughout the body.

LDL cholesterol is deposited in the walls of arteries and causes atherosclerosis. In general, lower LDL cholesterol numbers are better for vascular health. HDL cholesterol protects against vascular disease by removing the "bad" cholesterol out of the walls of arteries. Total blood cholesterol is a measure of LDL cholesterol, HDL cholesterol and other lipid components. High triglycerides increase the risk of atherosclerotic CVD.

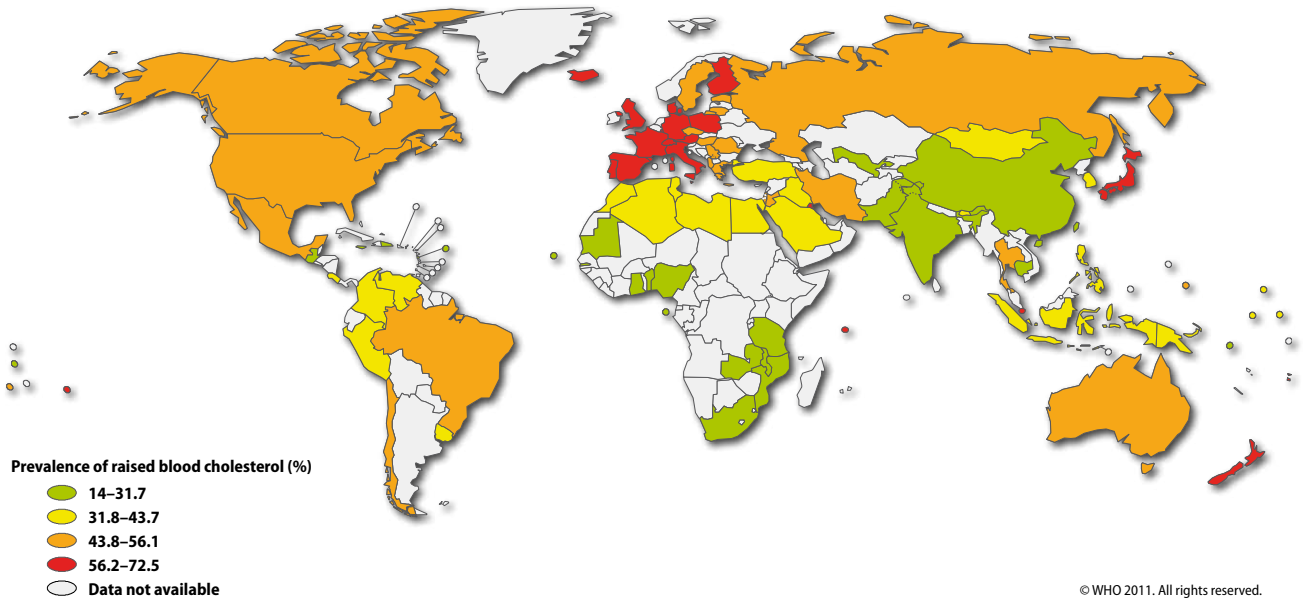
Raised blood cholesterol increases the risk of heart disease and stroke (*4*). Globally, one third of ischaemic heart disease is attributable to high cholesterol (*2, 5*). Overall, raised cholesterol is estimated to cause 2.6 million deaths (4.5% of total) and 29.7 million DALYS, or 2% of total DALYS globally (*2*). In 2008, the prevalence of raised total cholesterol among adults – defined as total cholesterol ≥ 6.2 mmol/l (240 mg/dl) – was 9.7% (8.5% for males and 10.7% for females) (*6*).

Lowering raised serum cholesterol reduces the risk of heart disease. For example, a 10% reduction in serum cholesterol in 40-year old men has been reported to result in a 50% reduction in heart disease within five years; the same serum cholesterol reduction for 70-year old men can result in an average 20% reduction in heart disease occurrence within five years (*6*).

In 2008, the global prevalence of raised total cholesterol among adults was 39% (37% for males and 40% for females). The prevalence of raised cholesterol in males and females in different parts of the world is shown in Figures 47 and 48, respectively. Globally, mean total cholesterol changed little between 1980 and 2008, falling by less than 0.1 mmol/l per decade in males and females. The prevalence of elevated total cholesterol was highest in the WHO European Region (54% for both genders), followed by the WHO Region of the Americas (48% for both genders). The WHO African Region and the WHO South-East Asia Region showed the lowest percentages (23% and 30%, respectively) (*6*).

The prevalence of raised total cholesterol noticeably increases according to the income level of the country (*6*). In low-income countries, around 25% of adults have raised total cholesterol, while in high-income countries, over 50% of adults have raised total cholesterol (*6, 67*).

Figure 47 World map showing the prevalence of raised blood cholesterol * in males (ages 25+, age standardized) (*6*), (* ≥ 5 mmol/l or on medication for raised blood cholesterol).



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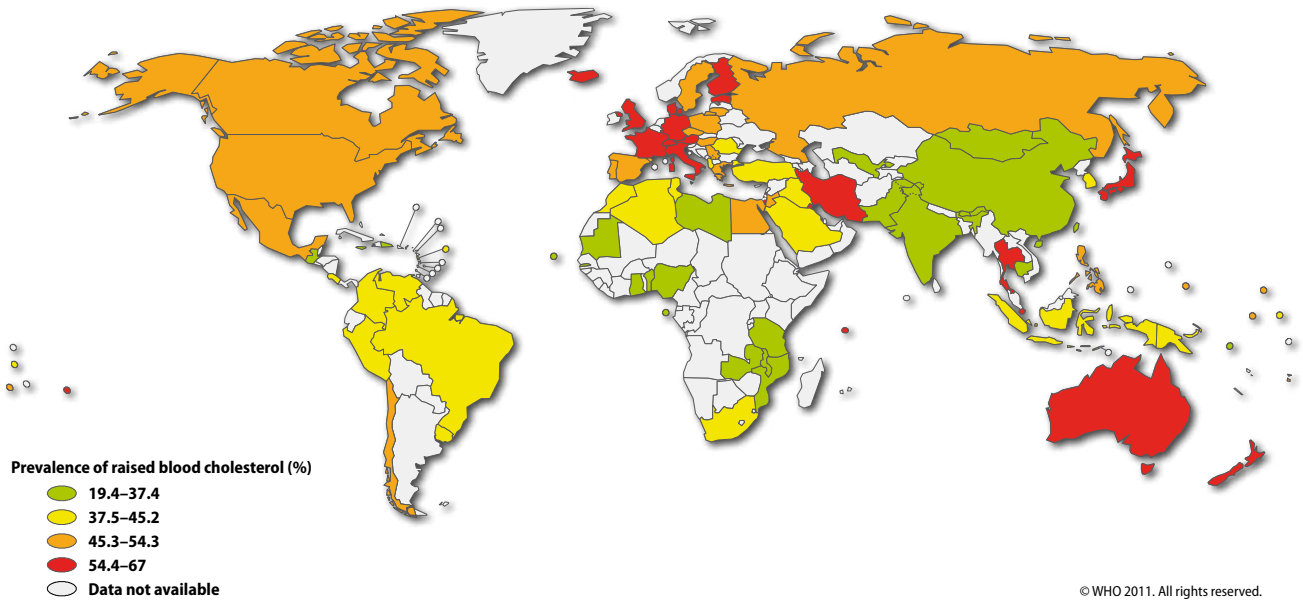
* ≥5 mmol/l or on medication for raised blood cholesterol.

Figure 48 World map showing the prevalence of raised blood cholesterol * in females (ages 25+, age standardized) (*6*), (*≥ 5 mmol/l or on medication for raised blood cholesterol).



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* ≥5 mmol/l or on medication for raised blood cholesterol.

14

Social determinants and CVDs

KEY MESSAGES

- **Choices that people make regarding behaviour (tobacco use, use of alcohol, physical activity or diet) are shaped by the "opportunities" that society offers to them.**
- **Poverty, lack of education and unplanned urbanization have a negative impact on cardiovascular health.**
- **Unfair distribution of power, money and resources increases exposure to cardiovascular risk factors.**

Social determinants such as the distribution of income or the level of education indirectly influence cardiovascular health as well as health in general. These determinants shape a set of socioeconomic positions within hierarchies of power, prestige and access to resources. Several structural mechanisms are responsible for creating the differential social positions of individuals, including governance, education systems, labour market structures and the presence or absence of redistributive welfare policies. Social stratification shapes individual health status as well as CVD outcomes by impacting behavioural and metabolic cardiovascular risk factors, psychosocial status, living conditions and the health system (*68*).

In 2005, WHO convened the Commission on Social Determinants of Health to provide advice on how to reduce health inequities. The final report of the Commission (*69*) made three overarching recommendations: (i) to improve daily living conditions; (ii) to tackle the unequal distribution of power, money and resources; and (iii) to monitor health inequities. WHO Member States discussed the report and passed a resolution urging action on social determinants at the 2009 World Health Assembly (WHA) (*70*). The resolution called for a "Health in All Policies" approach and a renewed commitment to intersectoral action to reduce health inequities as well as the implementation of a social determinants approach across public health programmes.

Poverty, low rates of literacy (Figure 49), environmental degradation, poor housing and unplanned urbanization have a negative impact on health (*68, 69, 71, 72*). For example, children from lower socioeconomic strata have a high prevalence of rheumatic heart disease and people living in poor housing develop Chagas cardiomyopathy. The poor, have limited opportunities for healthy choices and have a high prevalence of smoking (Figure 50).

To mount an effective response to address social determinants that impact health, governance and systems need to be put in place that deliver a wide range of intersectoral actions. Promoting participation and leadership of communities and civil society groups in decision-making are key aspects of the governance necessary for action on social determinants. Such an inclusive and responsible approach would contribute to the implementation of coherent policies that increase opportunities for people and create a fairer society and healthier populations.

Figure 49 World map showing adult literacy rates (*iii*).

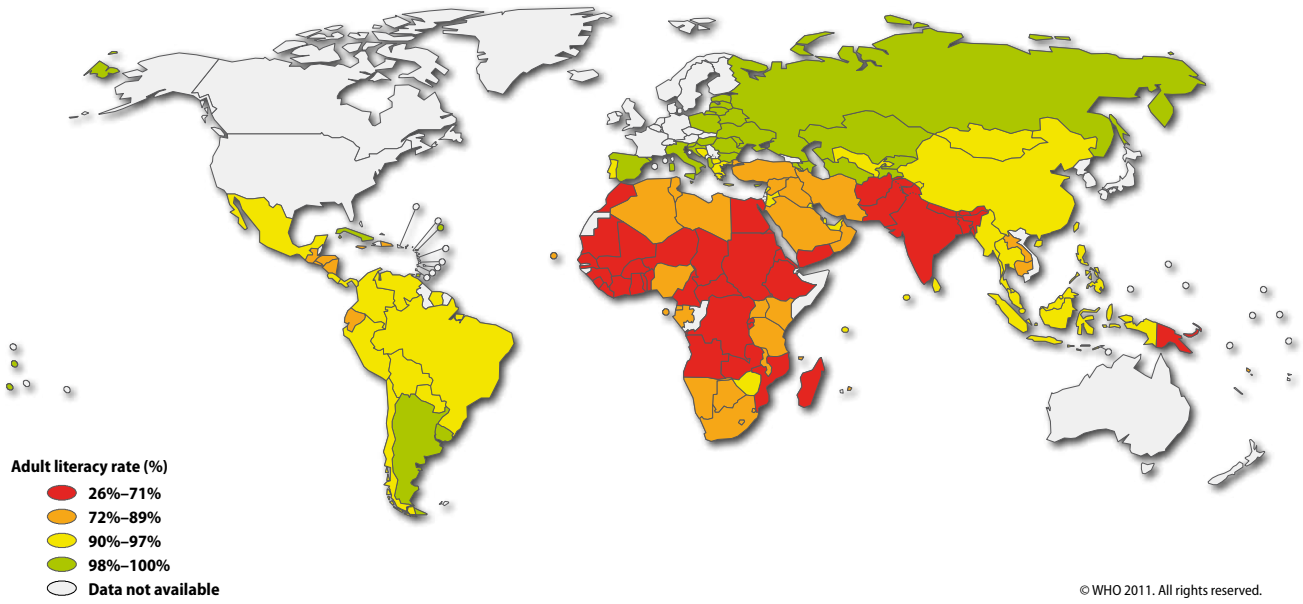

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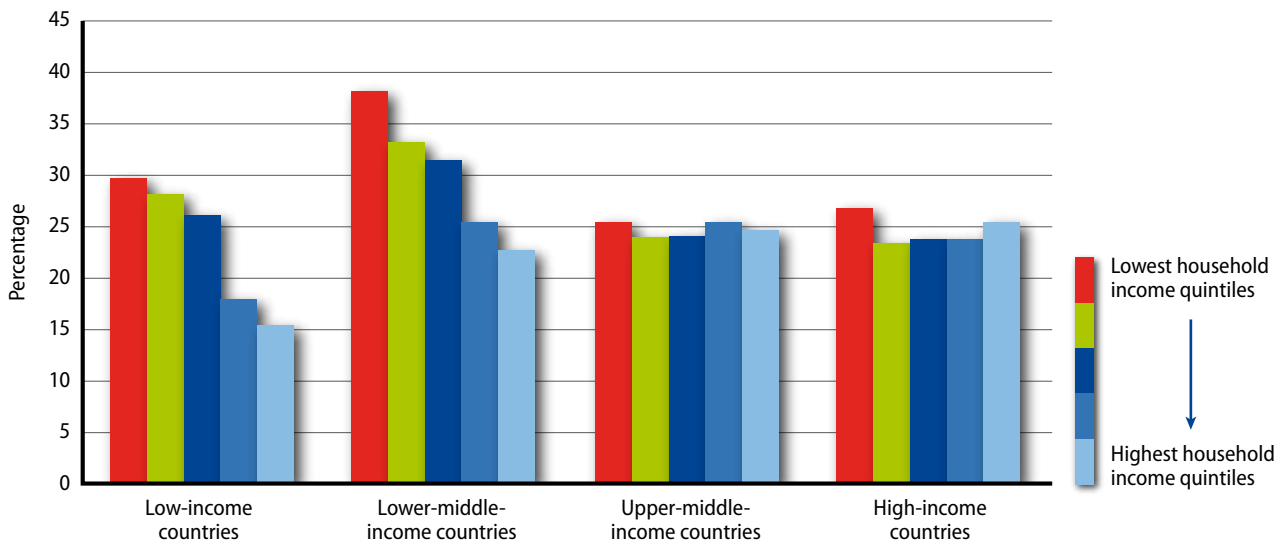
Figure 50 Smoking prevalence by income quintiles, People in poorest households in poorer countries smoke the most (*11, 24, 25*).



15

Risk factors take root in the womb, childhood and youth

KEY MESSAGES

- **Improving the nutrition of girls and women could prevent CVD in future generations.**
- **Implementation of policies to promote healthy lifestyles in children and youth is essential for prevention of CVD.**
- **Undernutrition in fetal life and infancy increases an individual's vulnerability to CVD.**
- **Healthy behaviours are learned in childhood and continue into adulthood.**

Low birth weight is associated with an increased risk of adult diabetes and CVD. There is increasing evidence that exposure to undernutrition in early life increases an individual's vulnerability to these disorders by "programming" permanent metabolic changes (*73–75*). The fetus depends on the mother for its nutrition and adapts to inadequate nutrition by prioritization of brain growth at the expense of other tissues such as the abdominal organs and by altered secretion and sensitivity to the fetal growth hormones, insulin and upregulation of the hypothalamo-pituitary-adrenal "stress" axis. The fetus sacrifices tissues that require high-quality building blocks, such as muscle or bone, and instead lays down less demanding tissue, such as fat. These changes can become "programmed" because they occur during critical periods of early development and can lead to adult CVD, or render the individual more susceptible to the effects of environmental and behavioural risk factors.

Behavioural risk factors such as tobacco use and dietary habits are learned in childhood and continue into adulthood. In many countries, metabolic risk factors such as obesity and diabetes are starting to appear at early ages (*76, 77*). In 2008, global estimates for overweight among infants and young children indicated that there were 40 million (or 6%) preschool children with a weight-for-height above more than two standard deviations of the WHO child growth standards median (*6*). Children spend a substantial portion of their time watching television, which can contribute to obesity through displacement of physical activity and increased calorie consumption while watching or caused by the effects of advertising (Figures 51 and 52). Children also have no control over exposure to passive cigarette smoke.

When exposed to risk factors, changes of atherosclerosis within blood vessels have been shown to begin in the first decade of life as fatty streaks and plaques (*7*). These lesions have been shown to regress through modification of behavioural risk factors.

Many WHA resolutions address the protection of children and youth from health risks (*3, 78–81*):

- WHO Framework Convention on Tobacco Control (FCTC); resolution WHA56.1;
- Global Strategy to Reduce the Harmful Use of Alcohol, resolution WHA63.13;
- Global Strategy on Diet, Physical Activity and Health, resolution WHA57.17;
- recommendations on the marketing of foods and non-alcoholic beverages to children; endorsed in resolution WHA63.14;
- 2008–2013 Action Plan for the Global Strategy for Prevention and Control of Noncommunicable Diseases (WHO Global NCD Action Plan); resolution WHA61.14.

However, development and implementation of policies and strategies at the country level to protect the health and well-being of pregnant women, children and youth remain inadequate. Undernutrition in fetal life and infancy increases an individual's vulnerability to CVD. Healthy behaviours such as physical activity are learned in childhood and continue into adulthood.

Figure 51 **Association between overweight in children and intensity of television advertising of unhealthy food (*iv*).**

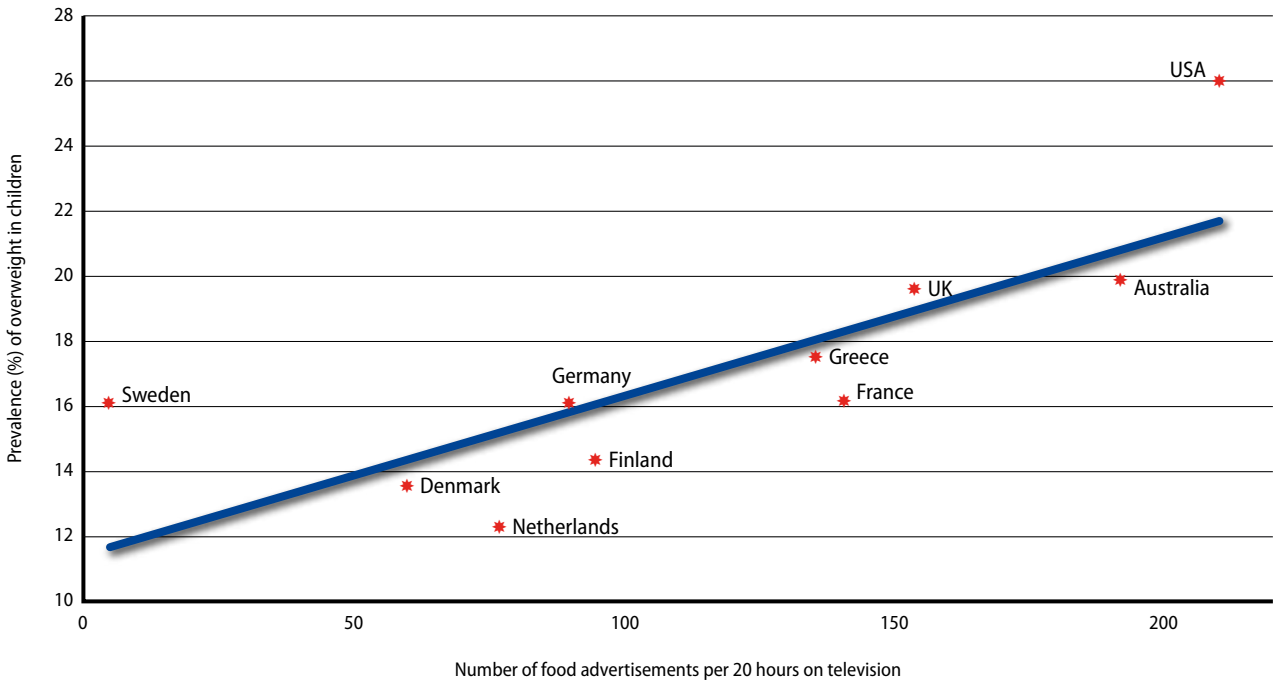
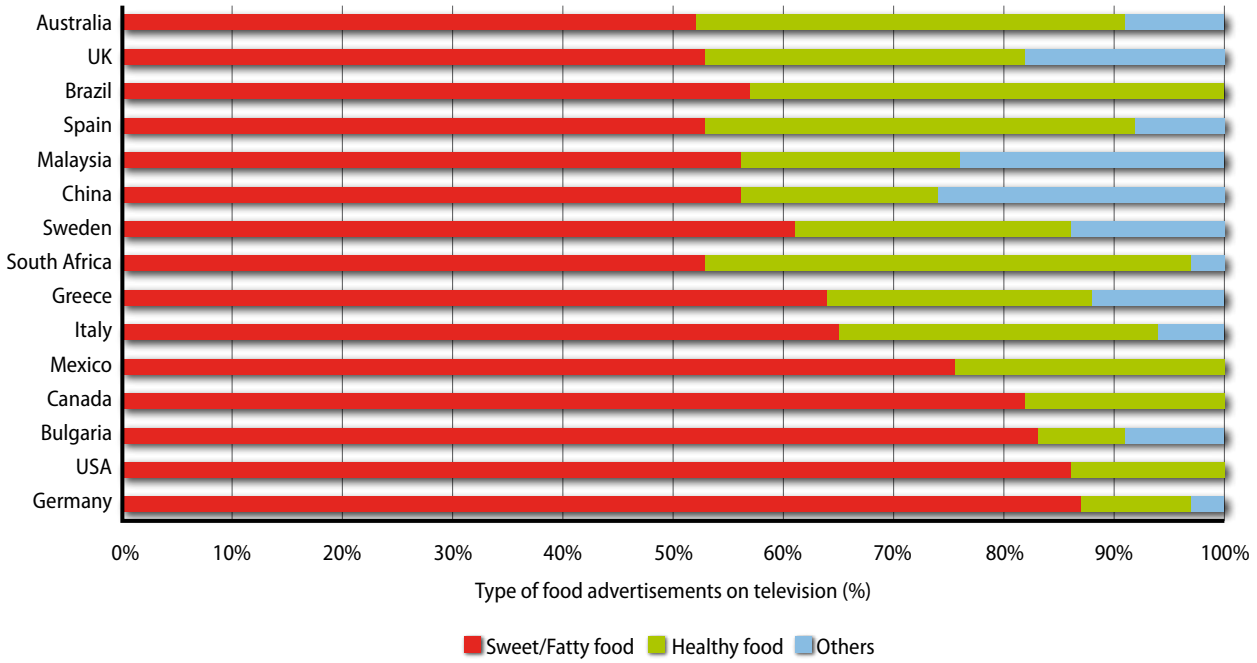


Figure 52 **Percentage of television advertisements on sweets, fatty food and healthy food in selected countries (*iv-ix*).**



16

KEY MESSAGES

- **Risk factors of CVDs are similar for men and women.**
- **Every year 8.6 million women die from CVDs.**
- **CVD affects as many women as men.**

Heart attacks and strokes in women

There are many misconceptions about CVDs in women. In reality, CVDs affect as many men as women. However, women loose less years of life due to CVDs as the disease develops about 7-10 years later in women compared to men (*4, 6*) (Figure 53). Risk factors of CVDs are similar for men and women. Every year, 3.3 million women die of heart attacks and 3.2 million die of strokes globally.

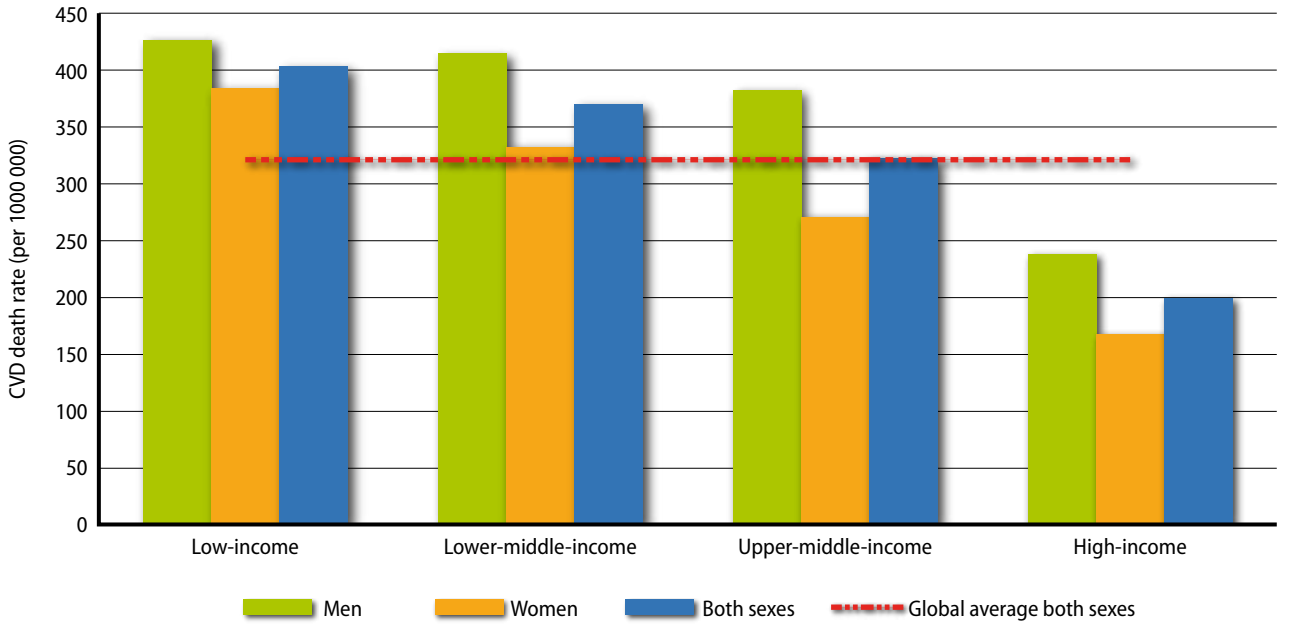
Gender norms and roles influence these risk factors as women, in some contexts, do not have access to and control over resources that can diminish their exposure to the risk factors. For example, women's multiple roles in the household and workplace community may diminish their ability to engage in meaningful physical activity. Social expectations relating to mobility and norms about permitted clothing influence the ability of girls and women to participate in sports and developing a lifelong habit that values physical activity.

In the developing world, tobacco use rates for adult females remain relatively low, but could rise quickly among teenage females (*25*). Aggressive campaigns by the tobacco industry, which targeted women and girls increasingly over the years, have contributed to such increases and are of great public health concern.

The risk of heart disease and stroke in women are often underestimated because of the mistaken notion that females are protected from CVDs. There may be certain differences in the clinical presentation of CVD in women leading to inadequate diagnostic and treatment interventions (82). Better self-awareness in women regarding identification of their cardiovascular risk factors and symptoms can improve early detection. There is evidence that CVD is underdetected in women and that there are delays in referral, hospitalization, diagnosis and invasive treatment compared to men (*83–86*). Women with CVD living in developing countries experience specific challenges in accessing cost-effective prevention, early detection and treatment due to gender inequality, family responsibilities and the costs of seeking care. These factors are made worse by health systems that fail to respond to specific needs of women.

Women, although responsible for household food procurement and preparation in most societies, may not have access to the requisite information about healthy food. Women are responsible for rearing children, including how time is used and development of health promoting habits. Such habits are often not passed along if women are not specifically targeted as both beneficiaries and significant gatekeepers for health promotion to other members of their families. Their potential role as "change agents" of families and communities with respect to healthy behaviours is often underutilized.

Figure 53 Cardiovascular disease mortality by World Bank income groups in males and females (per 100 000) (*1, 6*).



17

Other determinants of CVDs: Ageing, globalization and urbanization

KEY MESSAGES

- **Ageing, globalization and urbanization drive the cardiovascular epidemic that is shaped by the rise of behavioural risk factors.**
- **Unregulated globalization and unplanned urbanization increase the risk of exposure to cardiovascular risk factors and are detrimental to cardiovascular health.**

Mortality due to CVD has declined in high-income countries during the last three decades, while the cardiovascular epidemic continues to increase in other countries to the extent that the majority of the disease burden from CVD is found in LMICs. This situation primarily results from tremendous global shifts in demographics with the ageing of populations (Figure 54) and accompanied by urbanization (Figure 55) and the globalization of unhealthy behaviours, producing an explosive increase in the population prevalence of cardiovascular risk factors and subsequent disease (*1, 2, 6*).

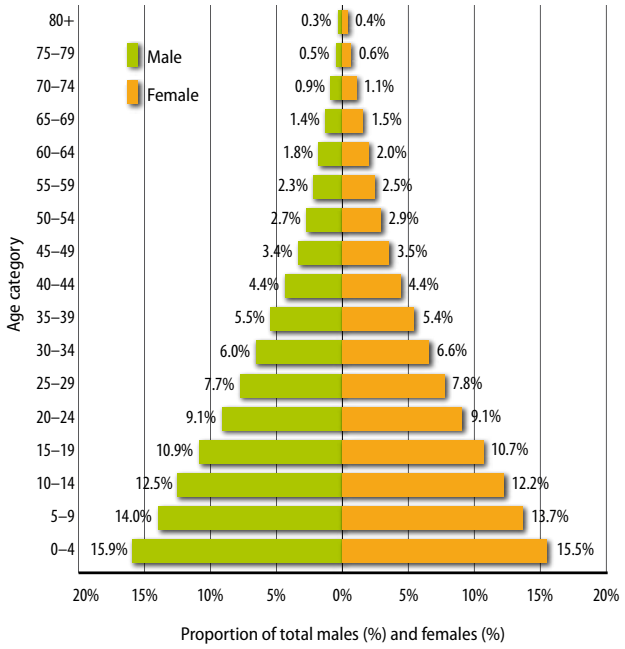
Age is a powerful cardiovascular risk factor. The rapidly growing burden of CVD in LMICs is accelerated by population ageing. According to United Nations (UN) projections, in 2025 there will be 1.2 billion elderly people worldwide, with 71% of them likely to be in developing countries (*87*).

CVD is also driven by the negative effects of unregulated globalization and unplanned urbanization (*88, 89*). For example, irresponsible marketing supported by multinational food cooperations is targeting children and adolescents to promote consumption of "junk" food with high levels of energy, fat and salt. Similarly, well-funded advertising campaigns of tobacco companies are targeting women to promote tobacco smoking. Financial and economic globalization also has an influence on trade, national income, national economic performance and household income. National income is particularly important for prevention and control of CVD because of its impact on public sector resources available for health care.

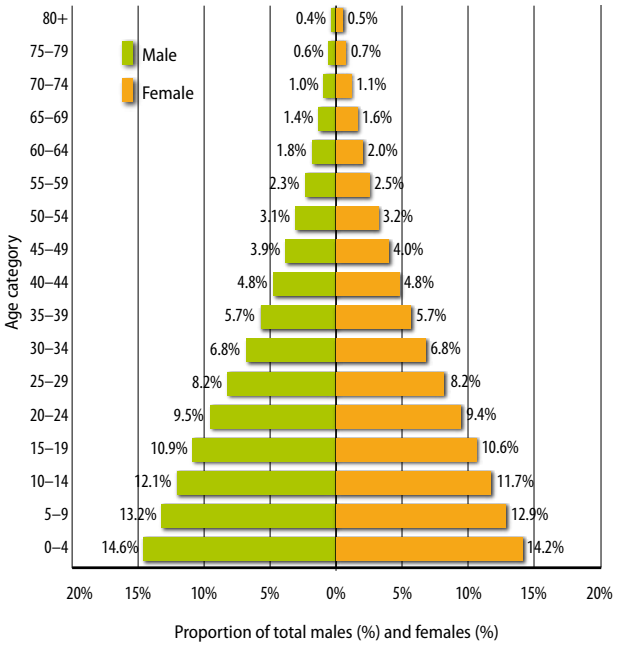
Rapid, unplanned urbanization also promotes unhealthy behaviours i) by limiting healthy food choices ii) by not providing environments conducive to physical activity iii) by causing exposure to air pollutants (including tobacco smoke) and the harmful use of alcohol (*90*). Many governments and municipalities are unable to keep pace with rapidly expanding needs for infrastructure and services and overlook the fact that urban planning is needed to support health behaviours. As a consequence, people are exposed to risks and denied healthy choices in terms of diet and physical activity.

Figure 54 Comparison of the average age pyramids in 2000 with 2010, in low-income, low-middle income, upper middle income and high income countries respectively (*x*).

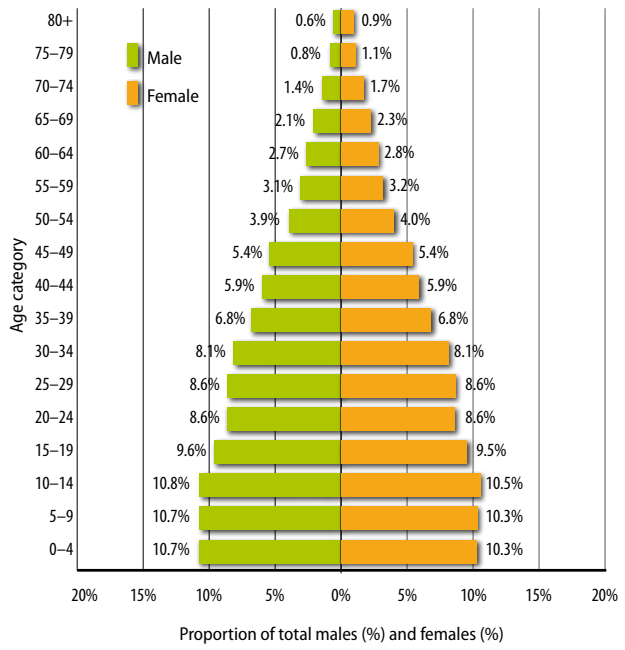
Low-income 2000 pyramid



Low-income 2010 pyramid



Lower-middle-income 2000 pyramid



Lower-middle-income 2010 pyramid

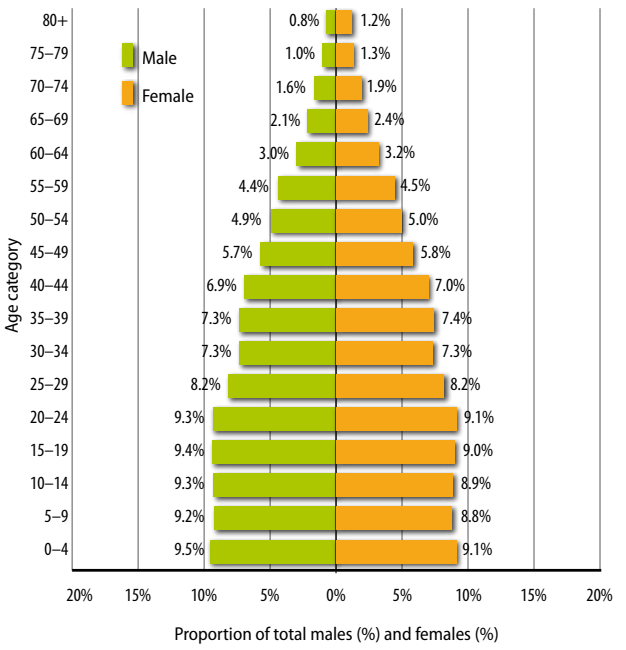
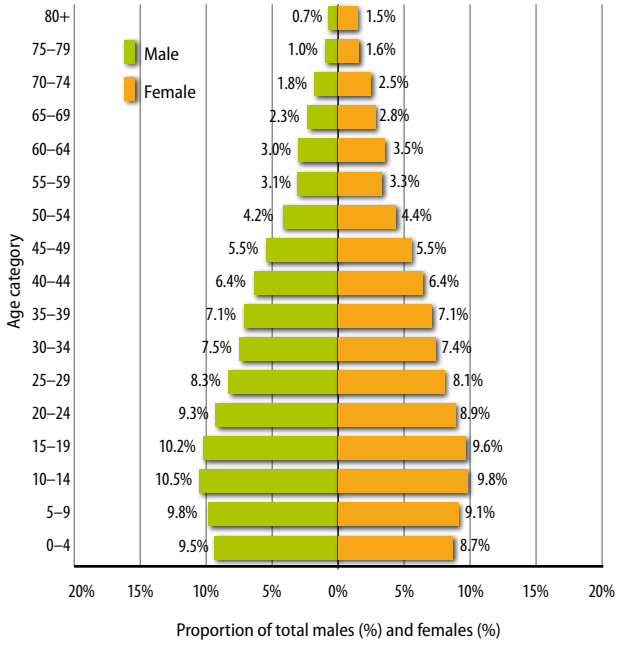
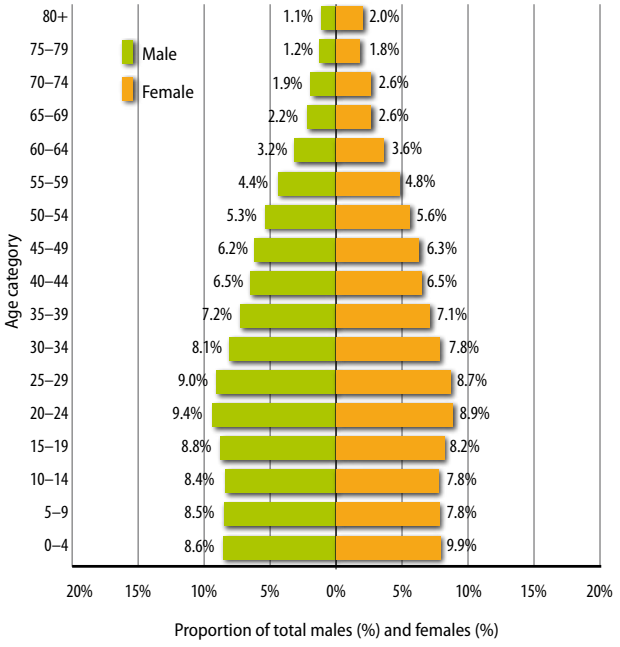


Figure 54 Comparison of the average age pyramids in 2000 with 2010, in low-income, low-middle income, upper middle income and high income countries respectively (*x*). (continued)

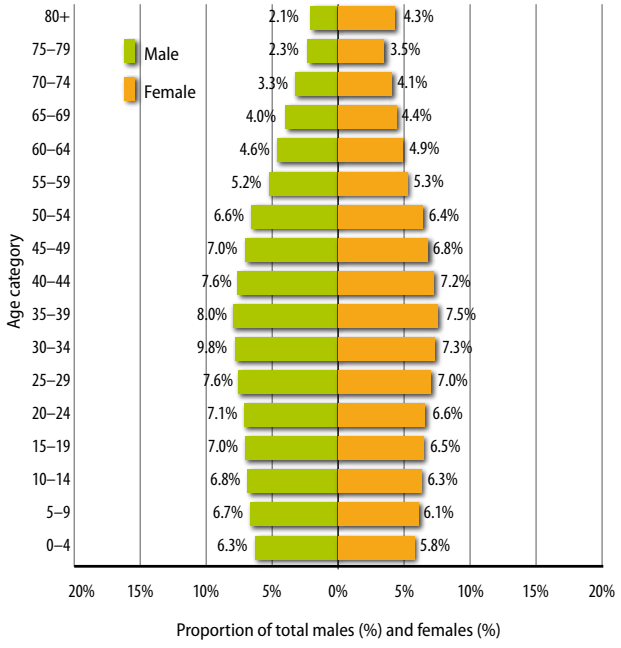
Upper-middle-income 2000 pyramid



Upper-middle-income 2010 pyramid



High-income 2000 pyramid



High-income 2010 pyramid

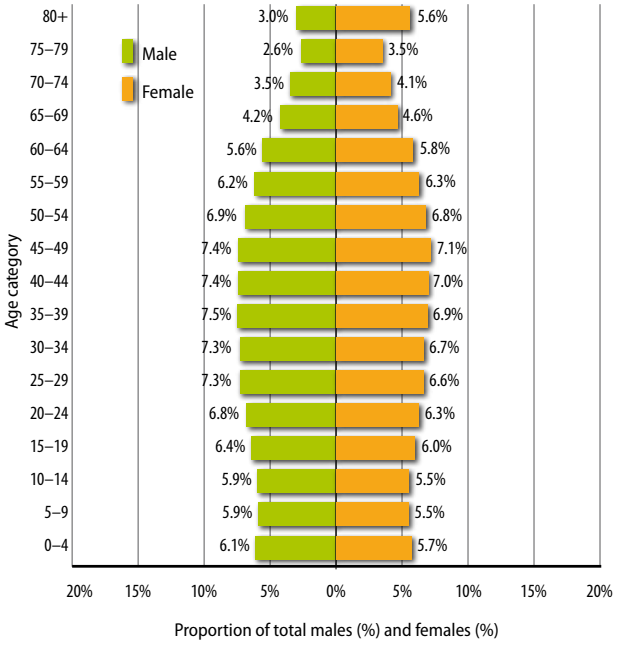
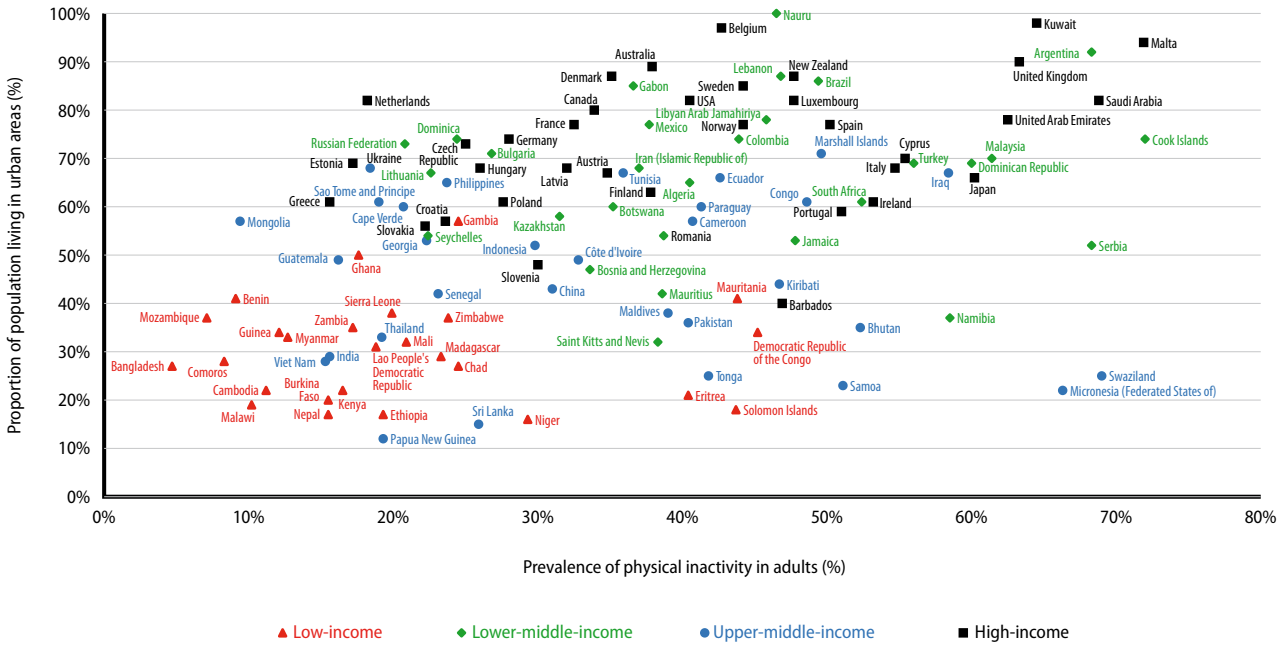


Figure 55 Association between the proportion of population living in urban areas and physical inactivity in adults in 122 countries classified by income group (*iii, x*).



Lack of urban planning is a barrier to physical activity of urban dwellers

18

Inequities and CVDs

KEY MESSAGES

- **CVD affect the poor as well as the rich.**
- **Inequities of power, money and resources impact the health status and the development of CVD.**
- **Disadvantaged populations are more exposed to cardiovascular risk due to lack of power and knowledge.**
- **Unfair policy choices are the root causes of health inequities.**

Socioeconomic stratification has been consistently associated with differences in prevalence of cardiovascular risk factors, CVD incidence and mortality across multiple populations (*91–96*). CVD and its risk factors were originally more common in upper socioeconomic groups in the developed world, but this pattern has reversed over the last 50 years. Those in low socioeconomic positions have a poorer risk factor profile, including greater levels of hypertension and diabetes and a trend towards higher rates of smoking compared to those of higher socioeconomic positions (*6, 97*). The inverse association between socioeconomic status and CVD is strongest for incidence and mortality of stroke, with low socioeconomic groups showing lower survival and higher stroke incidence in many populations in developed countries (*93, 95, 96*).

From the moment of conception, during intrauterine life and over the course of a lifetime, the cumulative risk of coronary heart disease and cerebrovascular disease develops by way of a complex interplay of genetics, in utero environment, biological risk factors and social determinants. Disadvantaged populations are more exposed to risks (tobacco use, use of alcohol, physical activity or diet). The extent of exposure is shaped by the "opportunities" that society offers to individuals (*97*). In addition to unhealthy behaviours, disadvantaged groups have limited access to social support, lack of perception of control and greater job stress, lower health-seeking behaviours, less access to medical care and greater comorbidity (*98*).

There are differences in exposure to health risks and health outcomes between different population groups that are avoidable, unfair and remediable (*99–107*). Unfair policy choices are often the root causes of these differences. Even in countries where the conditions for universal health coverage are broadly achieved, inequities persist between different socioeconomic, ethnic and geographic groups.

Figure 56 shows the Gini index of national income distribution around the world. The Gini index is a measure of the inequality of a distribution (0 = equality and 100 = inequality). Figure 57 shows the CVD mortality by World Bank income groups and the higher Gini index (higher income inequality)in low income countries compared to high income countries. Figure 58 shows the association between stroke mortality rates and national income.

Several complementary approaches in health and other sectors are required to address inequities. First, policy and structural interventions must address root social causes such as poverty, illiteracy, unemployment and deprived neighbourhoods. Second, protecting the cardiovascular health of lower socioeconomic groups through population-based prevention strategies needs to be a priority. Third, health system delivery of primary and secondary prevention interventions must pay special attention to disadvantaged groups. And fourth, resources need to be earmarked for improving the health of disadvantaged groups who may lack political power for making the case for sufficient funding.

Figure 56 **Differences in national income inequality around the world as measured by the Gini index (*iii*).**

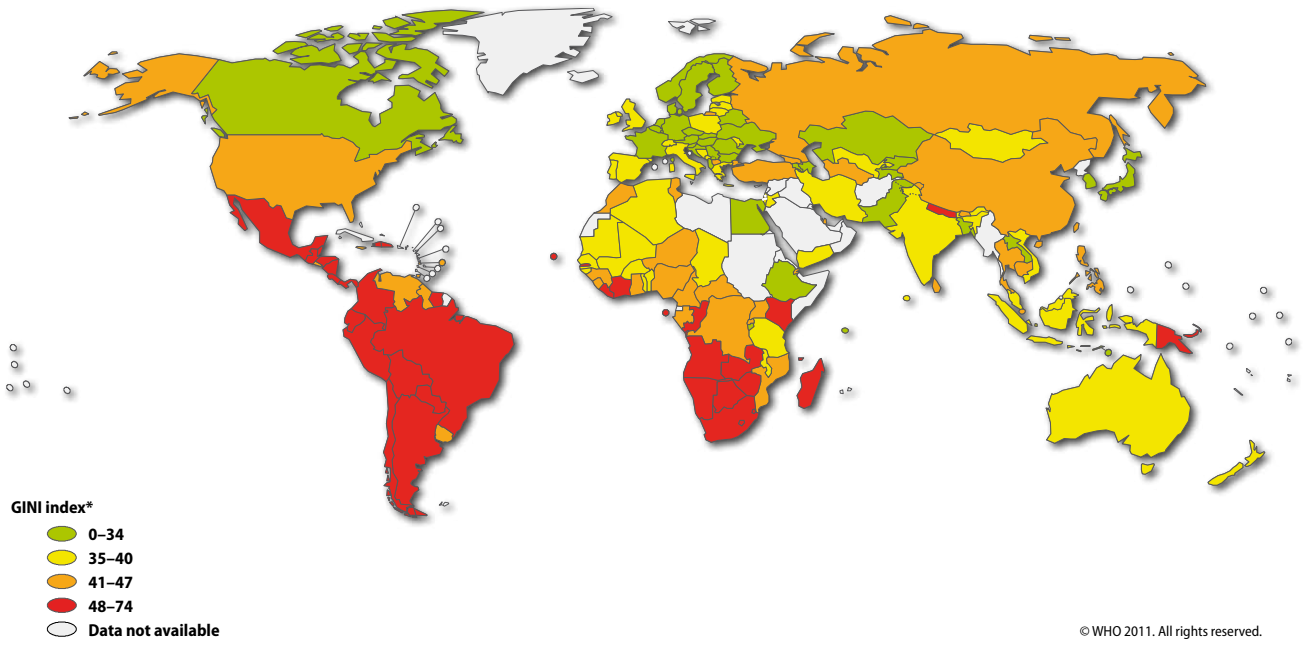


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Figure 57 **Gini index and CVD mortality by World Bank Income group in men and women, (age standardized, per 100 000) (*1, iii*).**

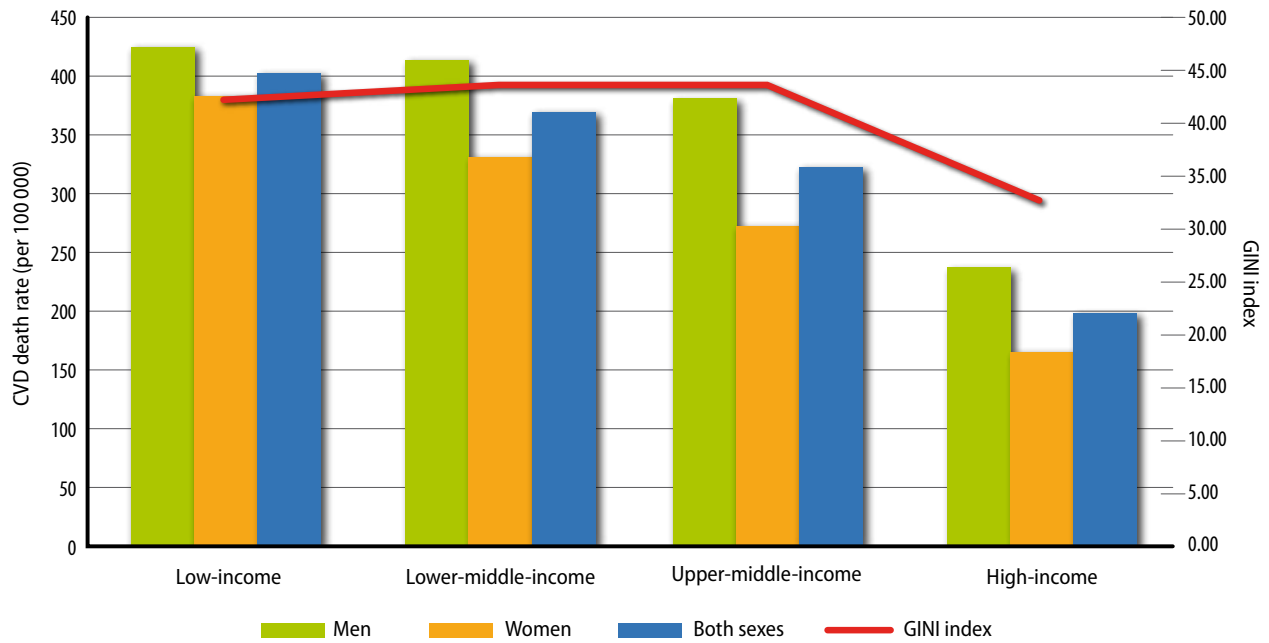


Figure 58 1. Association between cerebrovascular disease mortality and national income (*130*).

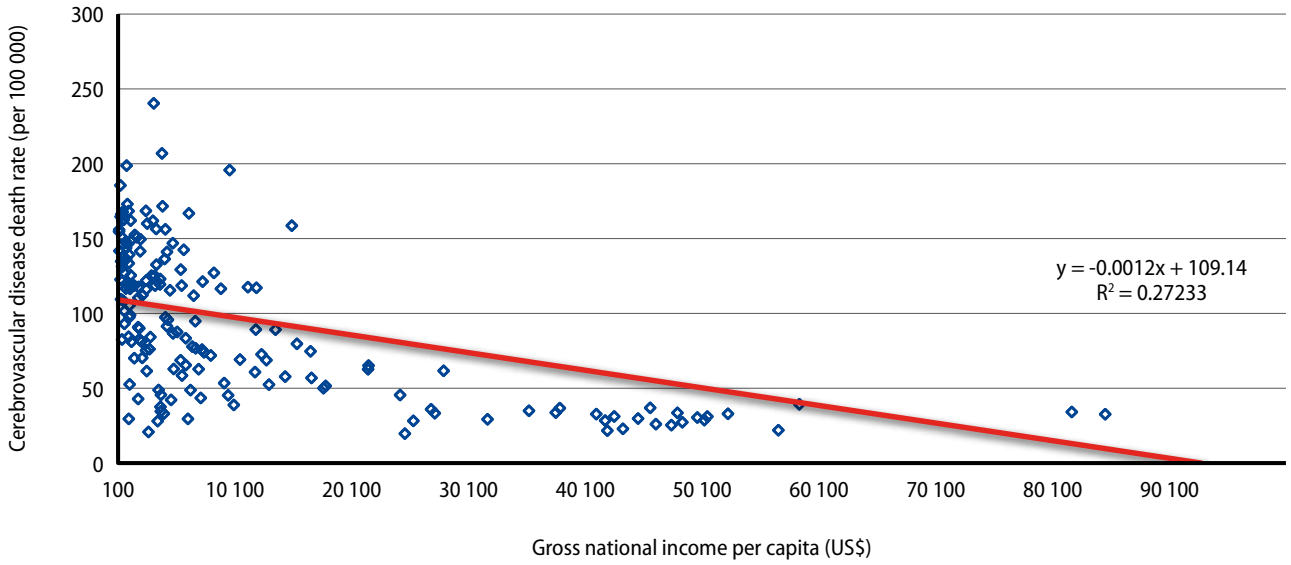
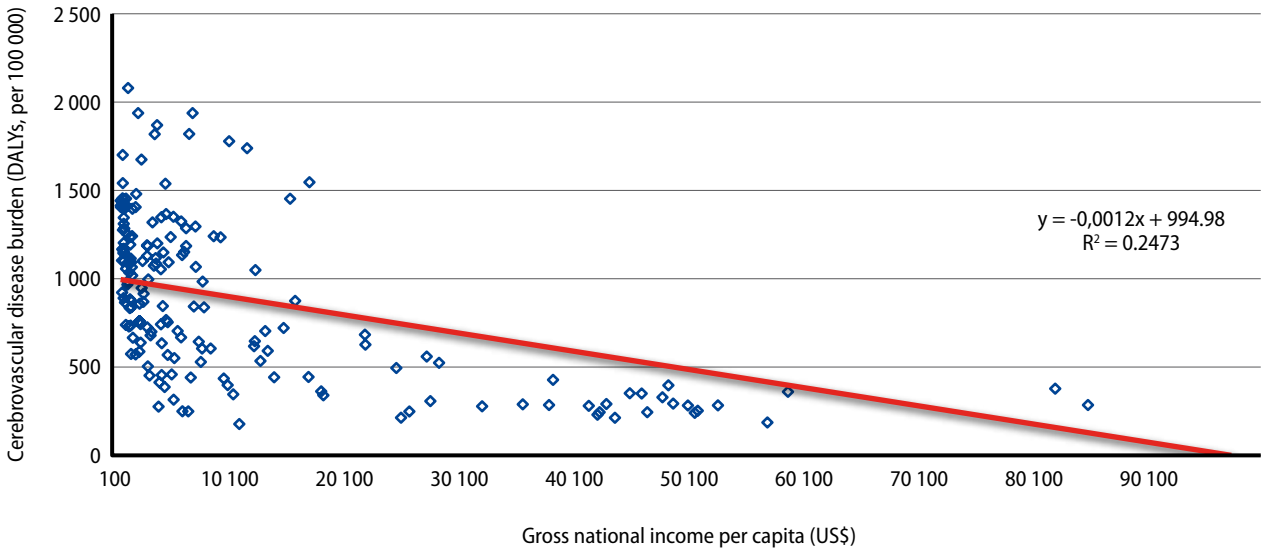


Figure 58 2. Association between the burden of cerebrovascular disease and national income (*130*).



Section B

Other CVDs

19

Cardiac arrhythmia

KEY MESSAGES

- **The percentage of strokes attributable to atrial fibrillation increases with age, and in the elderly it accounts for about one fifth of all strokes.**
- **Coronary artery disease is a cause of cardiac arrhythmia.**
- **Sudden death due to a cardiac arrhythmia may be the first sign of coronary artery disease.**

Each heartbeat originates as an electrical impulse in the right atrium of the heart in the area called the sino atrial node. The impulse initially causes both of the atria to contract, then activates the atrioventricular node and the electrical impulse spreads through both ventricles via the bundle of His and the Purkinje fibres causing a synchronized contraction of the ventricles of the heart.

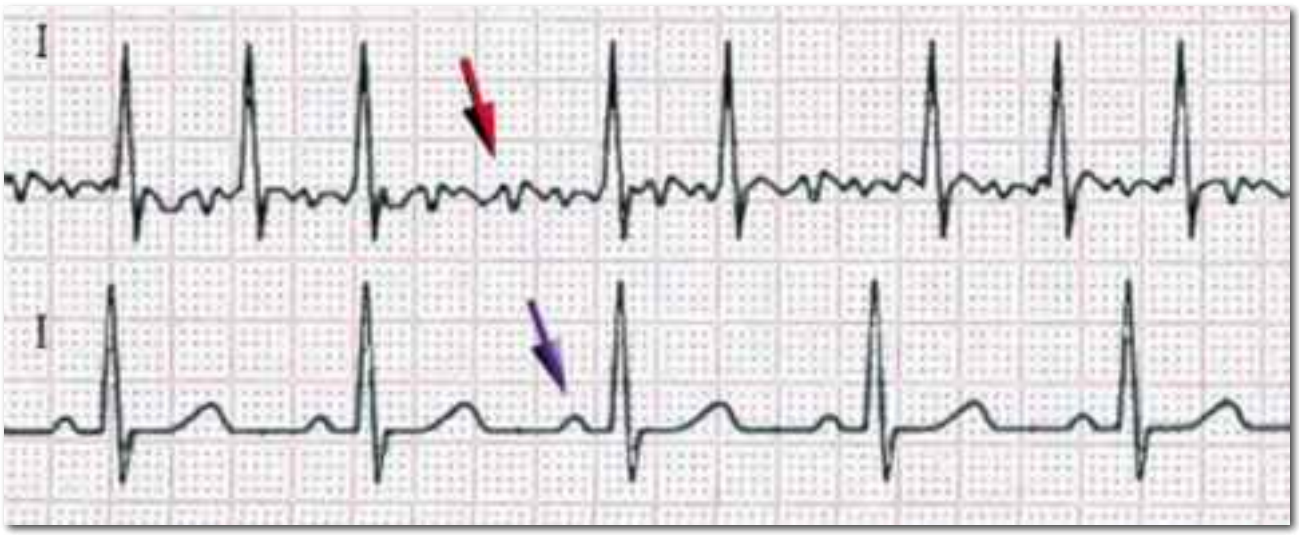
Abnormal electrical activity in the heart is known as cardiac arrhythmia; the heartbeat may be too fast or too slow, and may be regular or irregular. It may originate from the region of the atria or ventricles. Sometimes cardiac arrhythmia is life threatening and causes medical emergencies, sometimes it may not cause symptoms or it may give rise to palpitations. Atrial fibrillation is one of the common tachyarrhythmias arising from the atria (Figure 59). It is characterized by predominantly uncoordinated atrial activation with consequent deterioration of mechanical function of the heart (*108*).

The prevalence of atrial fibrillation increases with advancing age to a prevalence of about 9% for ages 80–89 (*108*). Other risk factors of atrial fibrillation include hypertension, diabetes, thyroid overactivity and cardiac valve abnormalities. Atrial fibrillation is commonly associated with, and complicated by, stroke and congestive heart failure. Atrial fibrillation increases the risk of stroke fivefold. The incidence of stroke attributable to atrial fibrillation increases from 1.5% for ages 50–59 to 23.5% for ages 80–89 (*108, 109*). If electrocardiography facilities are available, atrial fibrillation can be diagnosed by opportunistic and targeted screening in primary care. Once atrial fibrillation is diagnosed, drugs are given to control the heart rate and anticoagulants are given to prevent stroke (*110*).

Heart attacks may present as ventricular arrhythmias. Sudden cardiac death due to such arrhythmias is an important cause of cardiovascular mortality. Electrical defibrillation is required to restore coordinated activity of the heart in these cases and even short delays in defibrillation significantly deteriorate outcome. To enable early out-of-hospital defibrillation, automated external defibrillators are increasingly made available for public use in highly frequented places in developed countries (*111, 112*).

However, public access defibrillation programmes are expensive and the marginal improvements in survival do not justify spending the limited financial resources for widescale deployment of automated external defibrillation in resource-constrained settings. In such settings, more funds need to be diverted to strengthening programmes for prevention of CVD in order to reduce the need for defibrillation programmes (*112–114*).

Figure 59 **Electrocardiogram ; atrial fibrillation compared with normal sinus rhythm. Atrial fibrillation (top) and normal sinus rhythm (bottom). The purple arrow indicates a P wave, which is lost in atrial fibrillation (*i*). Reproduced with permission.**



Cardiac arrest due to an arrhythmia requires emergency resuscitation (*i*, Reproduced with permission)

20

Congenital heart disease

KEY MESSAGES

- **A significant proportion of congenital heart disease can be prevented by public health measures such as rubella vaccination, promotion of universal use of salt fortified with iodine and promotion of staple food fortified with folic acid.**
- **Policies to optimize women's diet before and throughout pregnancy are critical for prevention of congenital heart disease.**

Congenital heart disease is a defect in the structure and function of the heart due to abnormal heart development before birth. With an incidence ranging from 19 to 75 per 1000 live births, congenital heart disease is an important cause of childhood morbidity and mortality worldwide (*115*). Congenital heart disease is the leading cause of birth defects. When infectious diseases are excluded, congenital heart disease accounts for more deaths in the first year of life than any other condition (*1, 116*).

Birth defects can be caused by single gene defects, chromosomal disorders, multifactorial inheritance, environmental teratogens and micronutrient deficiencies (*115, 116*). Maternal infectious diseases such as syphilis and rubella are also significant causes of birth defects in LMICs. Diabetes mellitus and iodine and folic acid deficiency in the mother as well as exposure to medicines and recreational drugs, including alcohol and tobacco, certain environmental chemicals and high doses of radiation, are other factors that cause birth defects (*116*).

The majority of congenital heart diseases presents as an isolated defect and is not associated with other diseases. They can also be a part of various genetic and chromosomal syndromes such as Down syndrome, Turner syndrome, Marfan syndrome, trisomy 13 and Noonan syndrome.

Congenital heart disease can be cyanotic (Figure 60) or non-cyanotic (Figure 61) depending on whether the defect in the heart causes mixing of blood from the right and left sides of the heart. Non-cyanotic congenital heart diseases include ventricular septal defect, atrial septal defect, patent ductus arteriosus, aortic stenosis, pulmonary stenosis, coarctation of the aorta and atrioventricular canal (endocardial cushion defect).

Symptoms depend on the specific defect. While cyanotic congenital heart disease such as Fallots tetrology (Figure 60) features are present at birth, some other defects may not be immediately obvious. Defects such as coarctation of the aorta may not cause problems for many years. People with small ventricular septal defects may have no symptoms and can have a normal lifespan. Many congenital heart defects are amenable to cost-effective surgery that can be life saving and improve long-term prognosis.

A portfolio of prevention approaches are available for prevention of congenital heart disease and other birth defects (*117*). Most birth defects of environmental origin can be prevented by public health approaches, including prevention of sexually transmitted infections, legislation controlling management of toxic chemicals (e.g. certain agricultural chemicals), vaccination against rubella and fortification of basic foods with micronutrients (iodine and folic acid). Policies to optimize women's diet before and throughout pregnancy are critical for prevention of birth defects, including congenital heart and nervous system defects (*117, 118*).

Figure 60 Congenital heart disease; diagram of a healthy heart and one suffering from tetralogy of Fallot (*i*). Reproduced with permission.

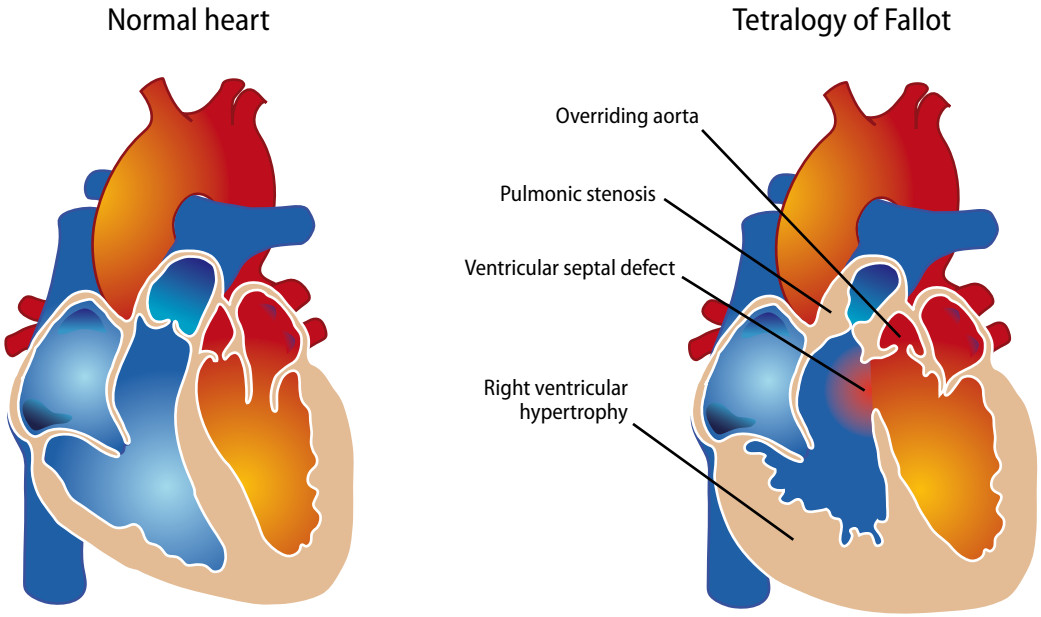
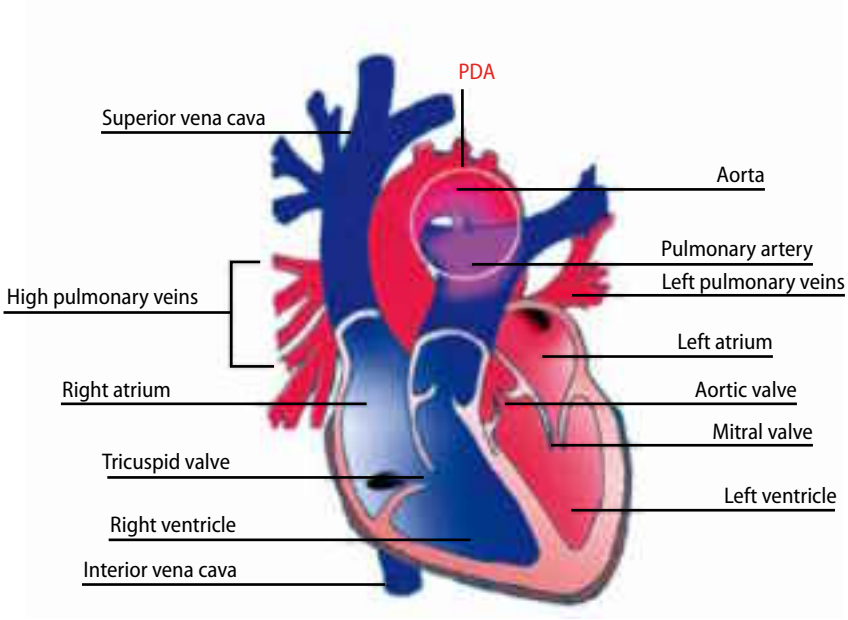


Figure 61 Diagram of a heart with patent ductus arteriosus (PDA); an abnormality seen in 50% of children with congenital rubella syndrome (i). Reproduced with permission.



21

Rheumatic heart disease: A neglected heart disease of the poor

KEY MESSAGES

- **At least 15.6 million people are estimated to be currently affected by rheumatic heart disease.**
- **Rheumatic heart disease disproportionately impacts children and young adults living in low-income countries.**
- **Poverty alleviation and better living conditions are key for prevention of rheumatic heart disease.**
- **Progressive damage of heart valves in children who have had rheumatic fever can be prevented by administering long-term penicillin prophylaxis.**

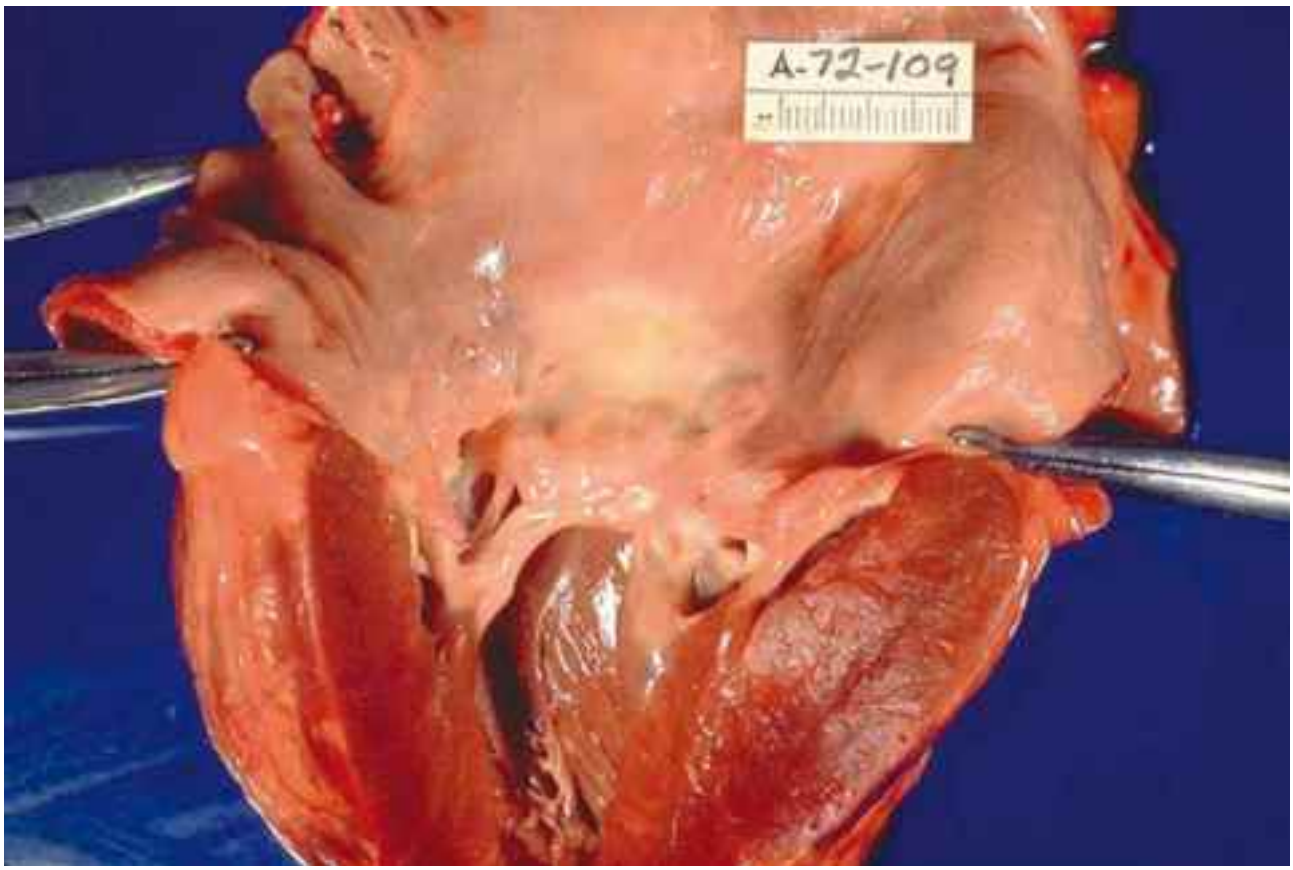
Rheumatic fever is a common cause of acquired heart disease in children and adolescents living in poor socioeconomic conditions. Acute rheumatic fever follows untreated or inadequately treated group A streptococcal infection of the tonsillopharynx and manifests after a latent period of about three weeks. Acute rheumatic fever primarily affects the heart, joints and central nervous system. The major importance of acute rheumatic fever is its ability to cause fibrosis of heart valves (Figure 62), leading to crippling haemodynamics of valvular heart disease, heart failure and death. Surgery is often required to repair or replace heart valves in patients with severely damaged valves, the cost of which is very high and a drain on the limited health resources of poor countries.

Rheumatic fever and rheumatic heart disease continue to exert a significant burden on the health of low socioeconomic populations in LMICs despite the near disappearance of the disease in the developed world over the past century (*119*). The decline of rheumatic fever in developed countries is believed to be the result of improved living conditions and availability of antibiotics for treatment of group A streptococcal infection. Overcrowding, poor housing conditions, undernutrition and lack of access to health care play a role in the persistence of this disease in developing countries.

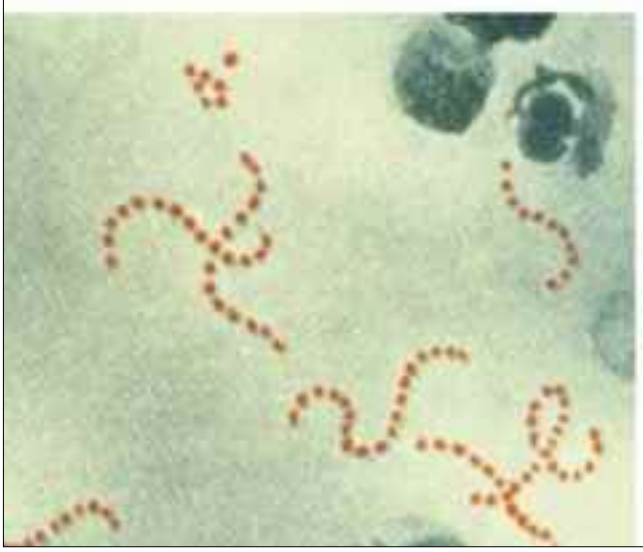
The global burden of disease caused by rheumatic fever and rheumatic heart disease currently falls disproportionately on children and young adults living in low-income countries and is responsible for about 233 000 deaths annually (Figures 63–66). At least 15.6 million people are estimated to be currently affected by rheumatic heart disease with a significant number of them requiring repeated hospitalization and often unaffordable heart surgery in the next 5 to 20 years (*120–122*).

Primary prevention is achieved by treatment of acute throat infections caused by group A streptococcus. This effect may be achieved at relatively low cost if a single intramuscular penicillin injection is administered (*123*). Secondary prevention is used following an attack of acute rheumatic fever to prevent the progression to cardiac disease and has to be continued for many years. Secondary prevention programmes are currently thought to be more cost effective for prevention of rheumatic heart disease than primary prevention and may be the only feasible option for LMICs (*119*) in addition to poverty alleviation efforts.

Figure 62 **Rheumatic heart disease at autopsy with characteristic findings (thickened mitral valve, with its attachments and hypertrophied left ventricular wall)**



Group A streptococci (*i*, Reproduced with permission)



Streptococcal pharyngitis with typical exudate on tonsils (*i*, Reproduced with permission)

Figure 63 Proportion of global CVD deaths due to rheumatic heart disease in males, 2008 (*1*).

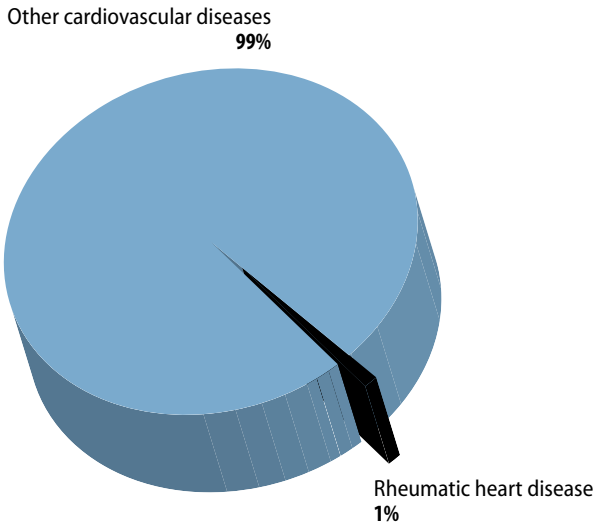


Figure 64 Proportion of global CVD deaths due to rheumatic heart disease in females, 2008 (*1*).

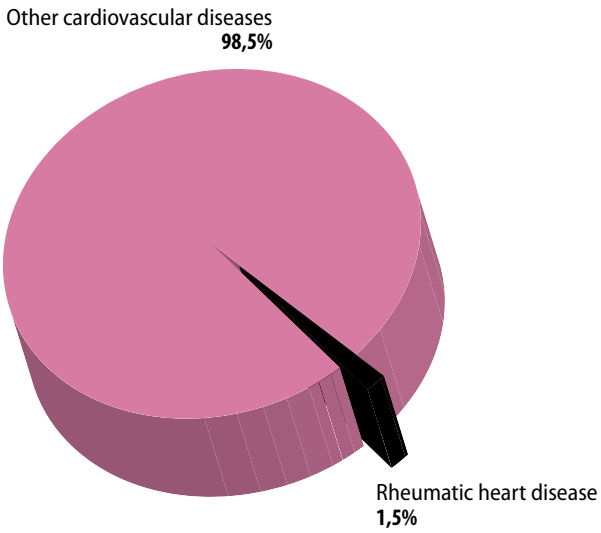


Figure 65 Proportion of global CVD burden (DALYs) due to rheumatic heart disease in males, 2008 (*5*).

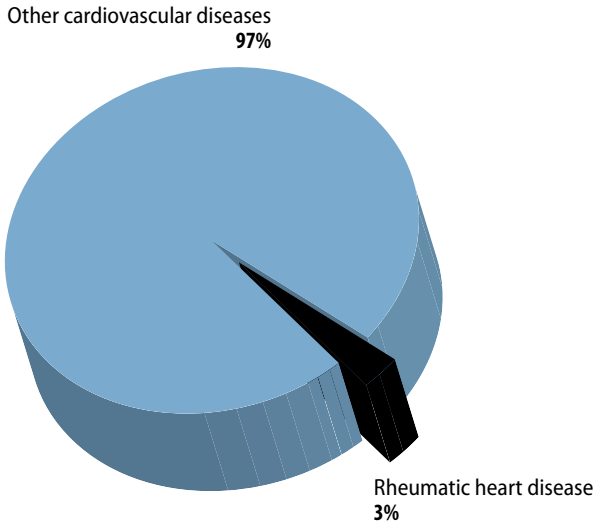
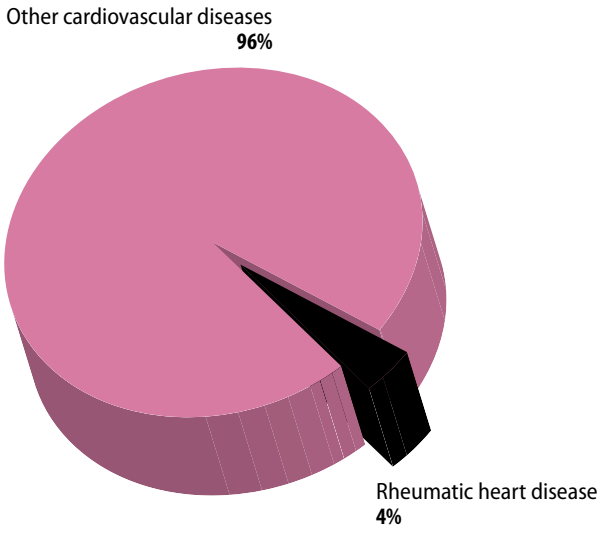


Figure 66 Proportion of global CVD burden (DALYs) due to rheumatic heart disease in females, 2008 (*5*).



Poverty promotes rheumatic heart disease

Children need to be protected from rheumatic fever

22

KEY MESSAGES

- **Chagas disease is a neglected disease of the poor that has a high potential for elimination through alleviation of poverty and improvement of living conditions.**
- **An estimated 10 million people are infected with Chagas disease worldwide.**

Chagas disease (American trypanosomiasis): A neglected disease of the poor

Chagas disease is a chronic, systemic, parasitic infection caused by the protozoan Trypanosoma cruzi. It is mainly transmitted by the infected faeces of triatomine bugs (also known as "kissing bugs"), which live in the cracks in the walls of poorly constructed homes in rural or suburban areas. The illness can also be transmitted by blood transfusions or organ transplants from infected donors or from an infected mother to her newborn during pregnancy or childbirth (*124–128*).

Chagas disease has two phases: the initial acute phase of infection lasts from four to eight weeks; and the chronic phase persists for the lifespan of the host. The acute phase may be asymptomatic; when symptoms occur, they include: malaise; fever; hepatomegaly; splenomegaly; lymphadenopathy; subcutaneous oedema (localized or generalized); signs of portal of entry of Trypanosoma cruzi through a skin lesion (chagoma); or purplish swelling of the lids of one eye (Romaña sign) (Figure 67). During the chronic phase, up to 30% of patients suffer from cardiac disorders and up to 10% suffer from digestive problems (typically enlargement of the oesophagus or colon) and neurological involvement. Chagas disease can lead to sudden death or heart failure caused by progressive destruction of the heart muscle (*124–126*).

An estimated 10 million people are infected worldwide, mostly in Latin America where Chagas disease is endemic (Figure 68). More than 25 million people are at risk of the disease. It is estimated that in 2008 Chagas disease killed more than 10 000 people (*124*). In the past several decades, it has been increasingly detected in Canada, the United States and European and Western Pacific countries mainly due to migration of infected people from endemic countries (*127*).

Key components of prevention and control initiative of Chagas Disease include vector control, prevention of transmission from non-vectorial mechanisms, improved housing, health education, epidemiological surveillance, serological screening and drug treatment. Such initiatives have achieved a substantial decrease in the burden of Chagas disease. However, to maintain the achieved results and further decrease the burden, surveillance and control activities, including vector control, serological screening, supervised treatment and new antiparasitic drugs, are needed at international, regional and national levels in the future (*127–129*).

Figure 67 **Transmission of Chagas disease, signs of portals of entry of Trypanosoma cruzi; purplish swelling of the lids of one eye and swelling in arm and manifestations of chronic phase (*124 reprinted with permission*).**

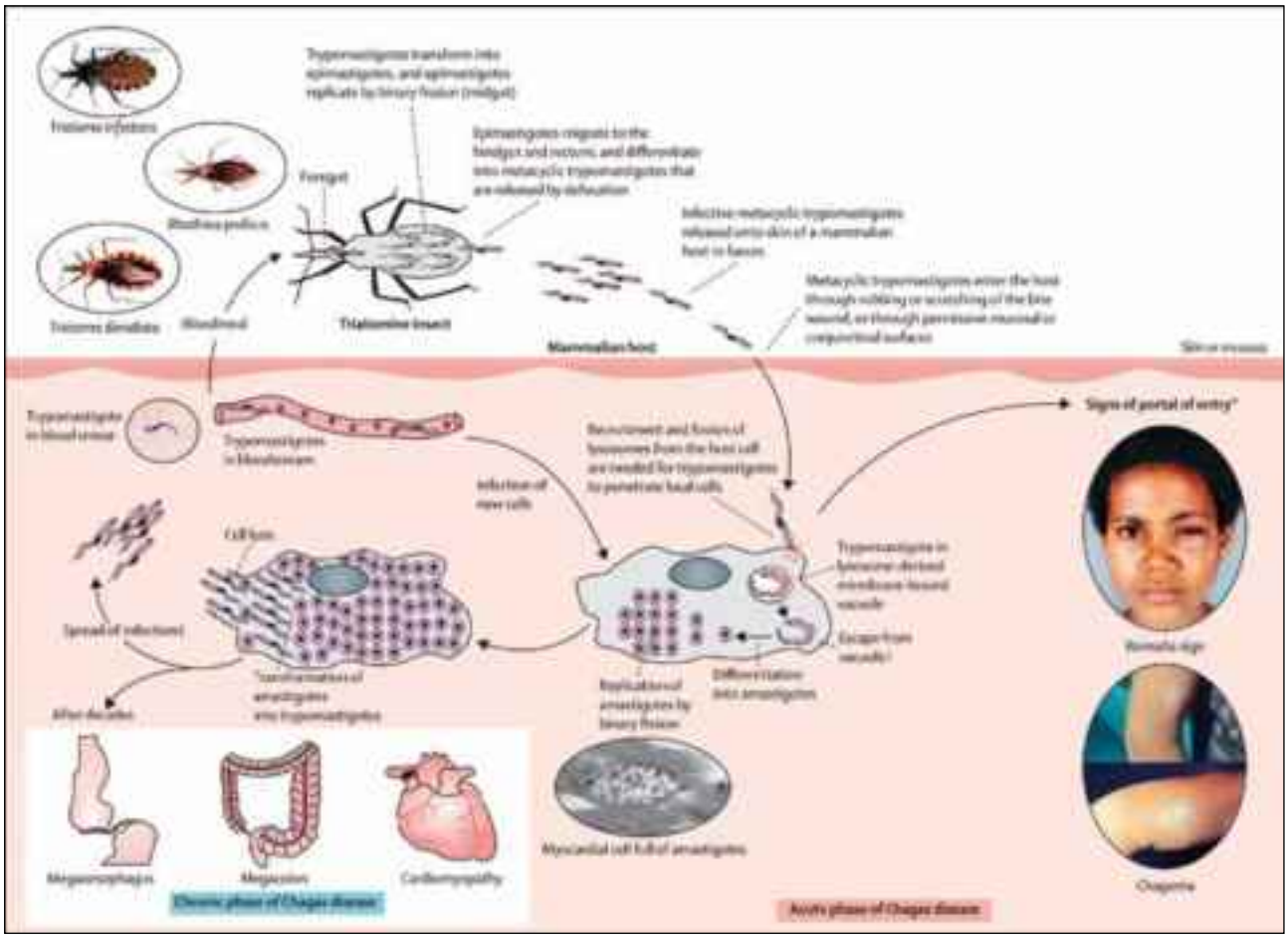
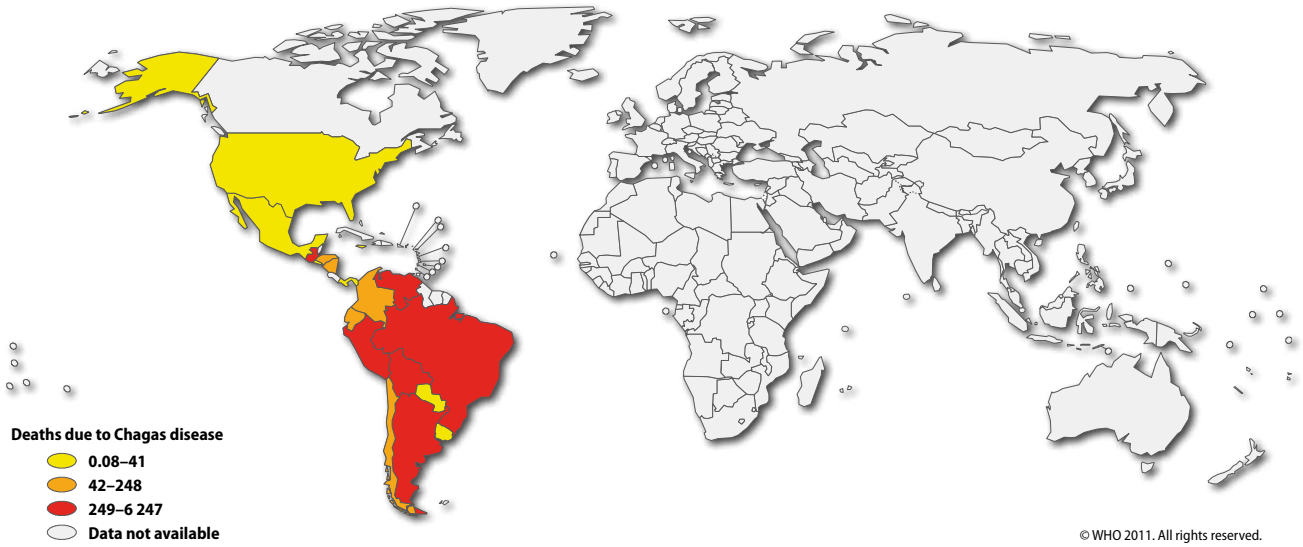


Figure 68 World map showing distribution of Chagas disease (*1*).



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Better housing can help to prevent Chagas disease through vector control (*i*, Reproduced with permission)

Section C

Prevention and control of CVDs; policies, strategies and interventions

23

Prevention and control of CVDs: How do we know what works?

KEY MESSAGES

- **The decline in cardiovascular mortality seen in many developed countries over the last two decades has been attributed to reduced incidence rates and/or improved survival after cardiovascular events due to a combination of prevention and treatment interventions.**
- **To reverse CVD trends, a significant increase in the investment in prevention strategies is required.**

Over the last two decades, cardiovascular mortality rates have declined in many high-income countries (*13, 14, 130, 131*). A combination of population-wide primary prevention and individual health-care intervention strategies have contributed to these declining mortality trends (*4–6, 13, 14*). Figure 69 shows the declining trends in CVD mortality rates in some developed countries. This decline in mortality has been attributed to reduced incidence rates and/or improved survival after cardiovascular events due to health care interventions (*13*).

The North Karelia project in Finland began in 1972. A comprehensive community intervention was designed and implemented to achieve population-wide changes in dietary habits to shift the population distribution of cardiovascular risk factors. By 1995, the project reported an impressive 73% reduction in age-adjusted coronary heart disease mortality rate (Figure 70.1). The framework for the project incorporated behaviour change and communication and community organization principles; and the intervention itself included media campaigns, partnership with the food industry, involvement of local health-care and community organizations, agricultural reforms and providing health care for those at high cardiovascular risk among other components (*15*).

The cardiovascular mortality rate in right-bank Warsaw inhabitants in Poland declined between 1991 and 2002 by over 50% (*132, 133*). It is thought that changes in dietary patterns explain, at least in part, this marked reduction in cardiovascular mortality observed in Poland. During this period, a decrease in the consumption of butter by 52%, other animal fats by 20%, milk by 27%, beef by 57% and potatoes by 8% was noted. On the other hand, the consumption of vegetable fat increased by 100%, poultry by 70% and fruit by 64%. A decrease of 19% in the consumption of saturated fatty acids and an increase of 32% in the intake of the polyunsaturated fatty acids were reported (*13, 133*).

Coronary heart disease mortality in the United Kingdom has also declined sharply between 1981 and 2000 (*14*) (Figure 70.2). About 42% of this decrease has been attributed to treatment and the rest to population-wide risk factor reductions.

Population wide strategies for tobacco and alcohol control and salt reduction in diet are very cost effective. They are affordable even for low and middle income countries. Some individual interventions are also cost effective, affordable and scalable in LMIC. Multidrug therapy in primary care for people at high risk of developing heart attacks and strokes and aspirin for acute myocardial infarction (heart attacks) are two such interventions which are further elaborated in chapter 33.

Figure 69 Trends in CVD mortality rates (age standardized) in developed countries (*xi*).

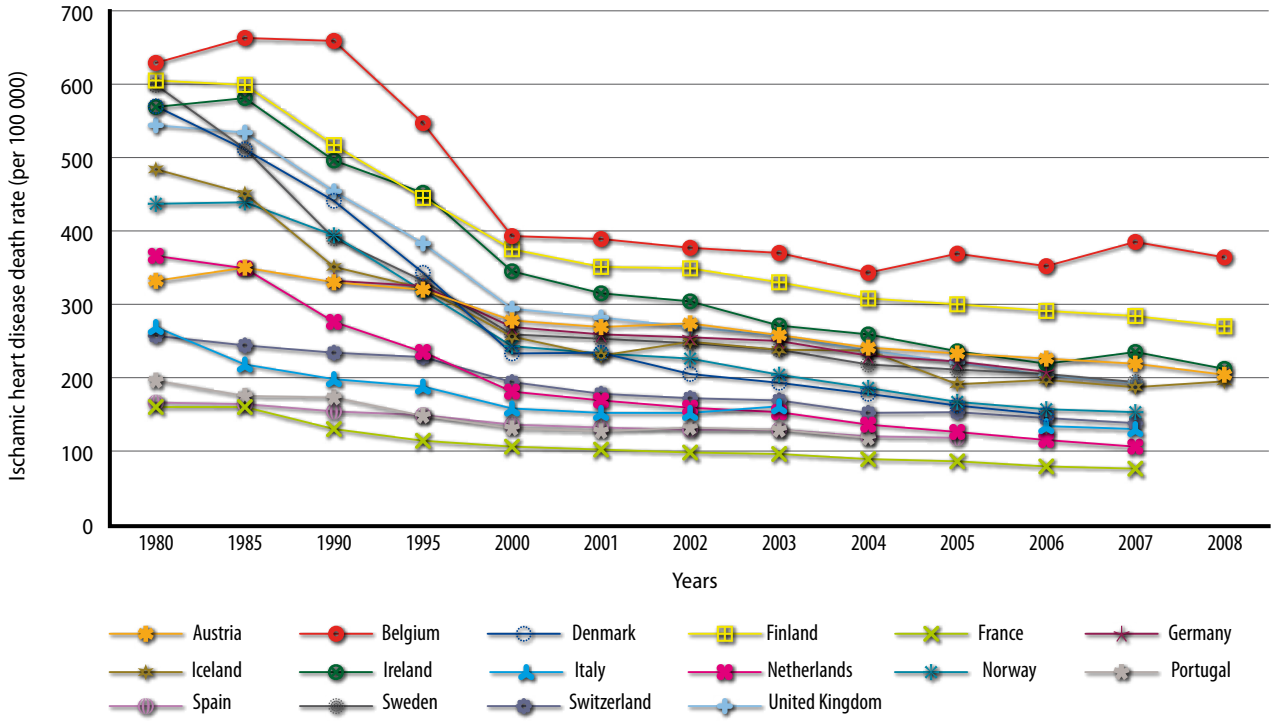


Figure 70.1 Trends in CVD mortality rates in the United Kingdom (*15, xi*).

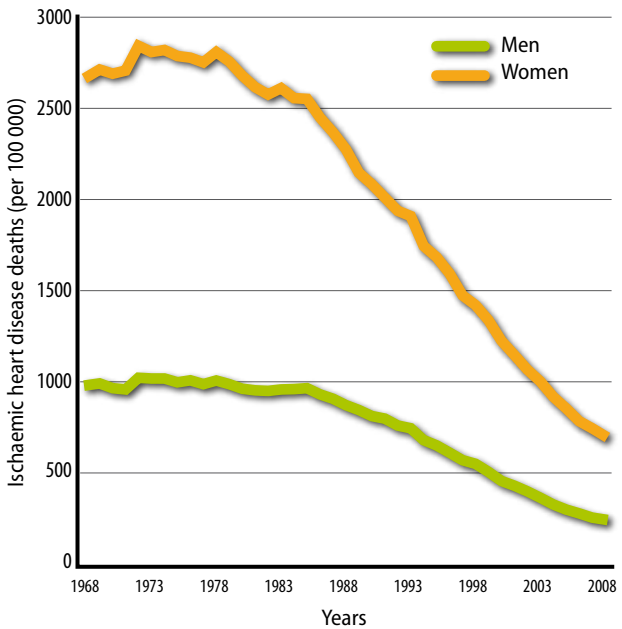
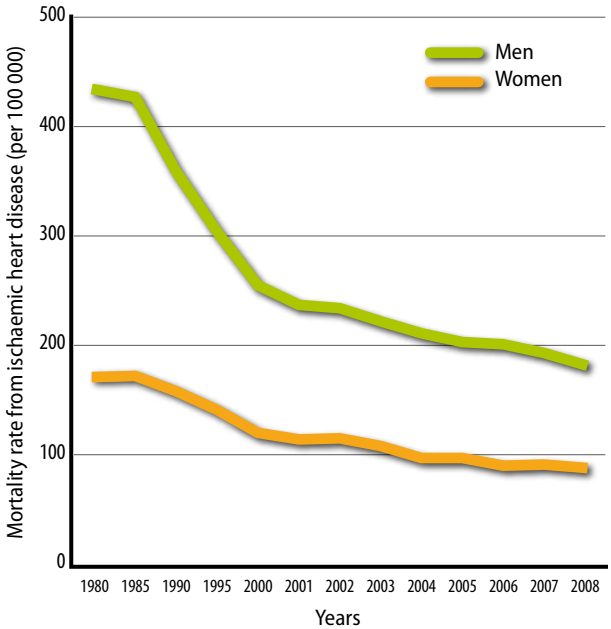


Figure 70.2 Trends in CVD mortality rates in Finland (*14, xi*).



24

KEY MESSAGES

- **For prevention and control of CVD a combination of population-wide and individual health-care strategies is required.**
- **The total-risk approach for controlling cardiovascular risk factors is more cost effective than a single-risk factor approach.**

Prevention and control of CVDs: The need for integrated and complimentary strategies

In all populations, it is essential that individual health care targeting people at raised cardiovascular risk and people with disease is complemented by population-wide public health strategies (Figure 31) (*4, 6*). Although cardiovascular events are less likely to occur in people with low levels of risk, no level of risk can be considered "safe". Without population-wide public health prevention efforts, cardiovascular events will continue to occur in people with low and moderate levels of risk, and who are the majority in any population. Furthermore, public health approaches can effectively slow down the development of atherosclerosis (and also reduce the incidence of some cancers and chronic respiratory diseases) in young people, thereby reducing the likelihood of future epidemics of cardiovascular events such as were seen in the period 1960–1990 in most high-income countries. Population-wide strategies would also support lifestyle modification in those at high risk. The extent to which one strategy is emphasized over the other depends on achievable effectiveness, cost effectiveness and resource considerations. Prevention and control of strokes and heart attacks require integrated strategies because they share common risk factors and a common pathogenesis (atherosclerosis) (*134–136*).

The appropriate threshold of an individual's total risk at which intensive lifestyle interventions and drug treatment are initiated depends on the availability of resources and the impact of specific interventions. The cost effectiveness of pharmacological treatment for high blood pressure and blood cholesterol depends on the total cardiovascular risk of the individual before treatment (*4, 137–141*); long-term drug treatment is justified only in high-risk individuals with a low risk–benefit ratio. If resources allow, the target population can be expanded to include those with moderate levels of risk; however, lowering the threshold for treatment will increase not only the benefits, but also the costs and potential harm. Everyone with low levels of risk will benefit from population-based public health strategies and, if resources allow, individual counselling to motivate behavioural change.

State-funded health systems have the difficult task of setting a risk threshold for treatment that balances the health-care resources in the public sector, the wishes of clinicians and the expectations of the public. These decisions are particularly challenging when public expenditure for health is inadequate (Figures 71 and 72). As the threshold for intervention is lowered, the number of individuals eligible to benefit increases, but so do the costs and the number of adverse events caused by drug treatments (*2, 4, 6*).

Figure 71 World map showing the per capita expenditure on health in 193 countries (*11*).

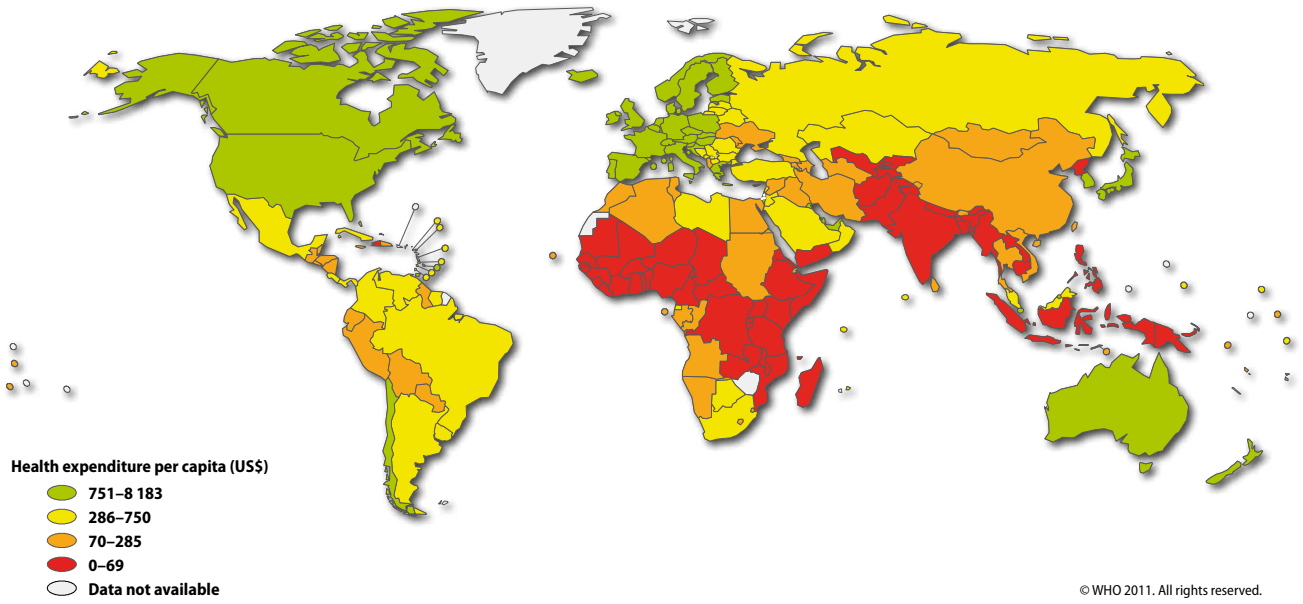


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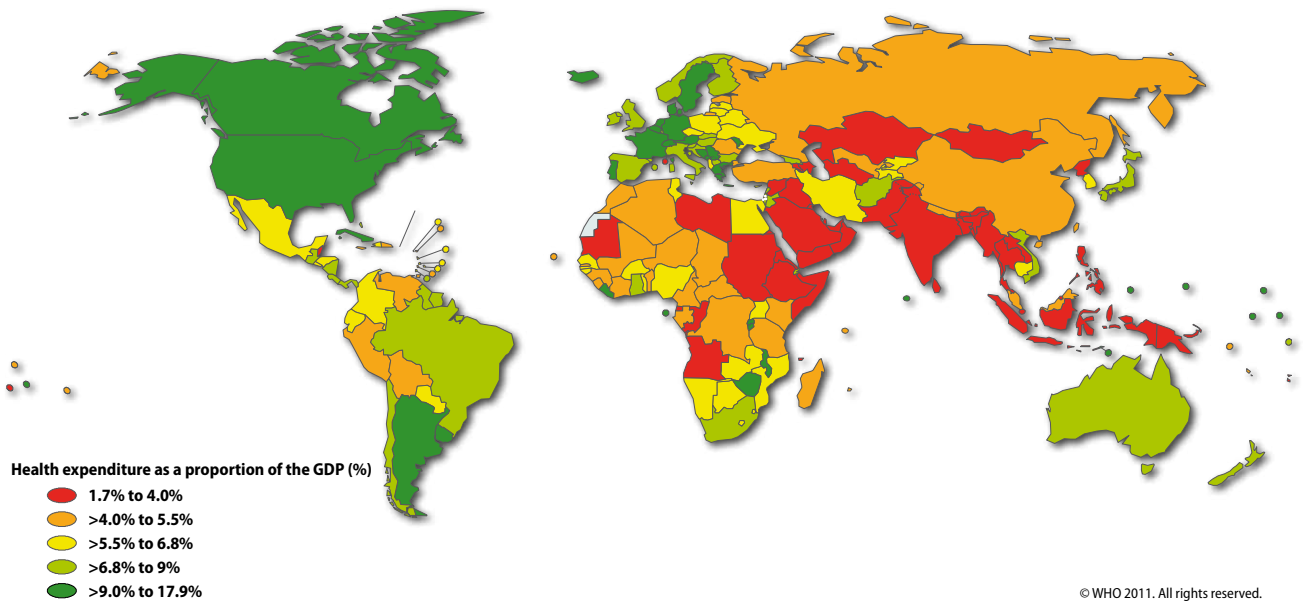
Figure 72 World map showing health expenditure as a percentage of the gross domestic product (*11, iii*).



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25

KEY MESSAGES

- **Determinants of CVD lie outside the health sector in many other domains.**
- **Prevention and control of CVD require a coherent policy response and intersectoral collaboration.**

Prevention and control of CVDs: Health in All Policies

Determinants of cardiovascular risk factors (tobacco use, unhealthy diet and physical inactivity) lie outside the health sector in many other domains, including finance, education, transport, agriculture, food, trade, environment and urban planning (*4, 142, 143*). Prevention and control of CVD require a coherent policy response across all these sectors. Ministries of health have the challenging task of providing leadership to navigate stakeholders in these multiple sectors who have differing interests by setting shared responsibilities for improvements in health that are linked to other development priorities.

Health in All Policies highlights the important links between health and broader economic and social goals in modern societies. It is a political choice and highly context specific. It requires strategies to support the required governance and implementation of integrated policies. Health in All Policies needs to be viewed as a shared goal across different government departments, and be used as an innovative approach to intersectoral action.

While implementation of policies across different sectors is essential to improve cardiovascular health, the health sector remains vital for progress. It has an important role in the governance required for intersectoral action, although it should not expect to lead all activities in other sectors. Instead, the health sector needs to construct a dialogue on why health is a shared goal across society and identify how other sectors can benefit from action to protect health, in terms of their own priorities. The health sector also has an important role in working with other sectors to reduce differences in exposure and vulnerability to cardiovascular risk factors.

Despite new insights into the impact on health of poor housing, built-up environment, lack of education and unemployment, systems in all countries remain inadequate to coherently implement whole-of-government strategies working between different sectors to address these issues (*68, 69, 144*). As no single sector on its own can mount an effective response, new systems and governance are required to deliver a range of actions for protection of cardiovascular health. The lack of development of the necessary governance and systems to implement coherent policies across government has been a significant obstacle to progress. The response needs to consider the impact of intersectoral policies on health as well as the benefits of improvements in health for the goals of other sectors.

Health in all policies

26

Prevention and control of CVDs: The need for a national NCD policy framework

KEY MESSAGES

- **Healthy public policies are essential for prevention and control of CVD.**
- **A national NCD policy enables governments to take coherent and sustained macrolevel action on intersectoral and health system issues that are key for prevention and control of all NCDs, including CVD.**
- **Multiple stakeholders need to be engaged in monitoring and evaluation of intersectoral action for prevention of CVD.**

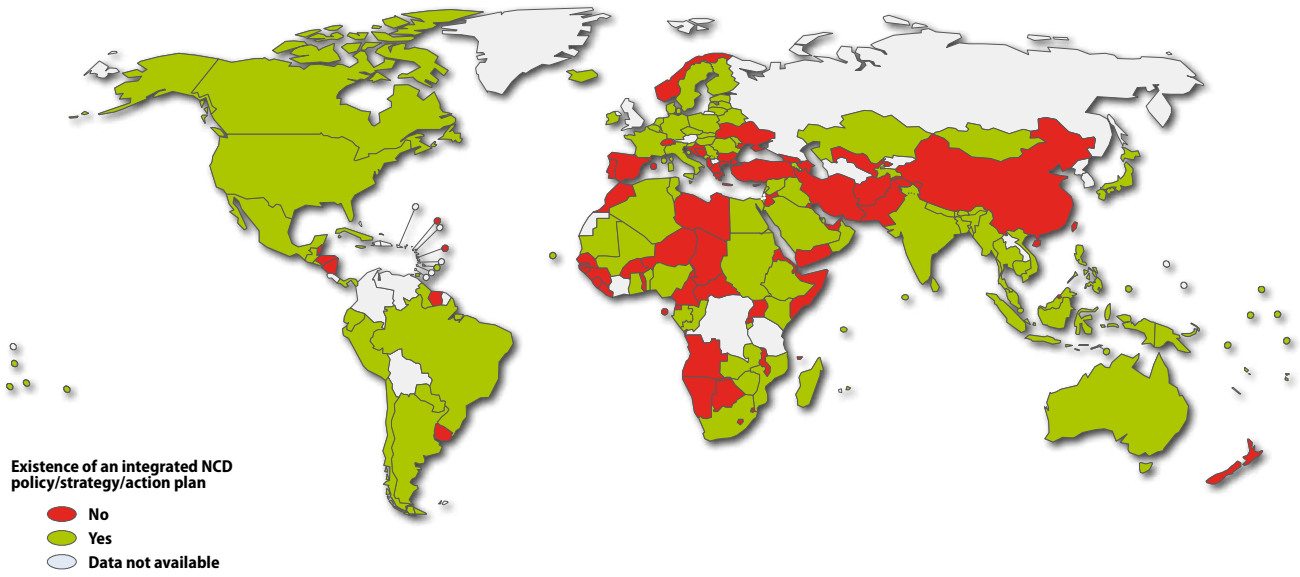
For prevention and control of CVD, unhealthy behaviours of people, including tobacco use, unhealthy diet, physical inactivity and the harmful use of alcohol, need to be modified. These behaviours are shaped by economic growth, globalization, urbanization, social determinants and corporate influences. Health literacy, individual efforts and health education by health professionals can play an important role in modifying these behaviours. However, changing the behaviour of people is difficult and cannot be accomplished by such efforts alone. An enabling policy environment is fundamental for modifying and sustaining healthy behaviour.

Environments conducive to healthy behaviours can be created if health is a key consideration of sector-wide public policies in domains that have an influence on health; such as transport, agriculture, education, finance, social services and trade. Only such a policy environment can provide people opportunities and affordable choices to change and maintain healthy behaviours in relation to diet, physical activity and tobacco and alcohol use. A national NCD policy can serve as a tool for coordinated action if relevant ministries outside health collaborate in the development process and have a co-responsibility in implementing multisectoral policy actions. Figure 73 shows WHO Member States reporting the presence of an NCD policy.

Most NCDs have long incubation periods and require long-haul policy actions to bring about change. The long incubation periods also provide windows of opportunity for control of behavioural as well as metabolic risk factors of NCDs (e.g. obesity, raised blood sugar, hypertension, hyperlipidaemia) and thereby prevent complications of CVD (e.g. heart attacks, strokes, heart failure, renal disease). Health systems should catalyse, coordinate and coherently integrate policies across other relevant health sectors to create conducive environments that enable people to make and maintain healthy living choices (*4, 6 ,68, 142–144*). Such policies are integral to the promotion of tobacco and alcohol avoidance, healthy diet and regular physical activity for reducing risk factors in the whole population. Complimentary health-care policies need to target early detection and treatment of risk factors and diseases through a primary health care approach. One of the key objectives of a national NCD policy framework should be to reduce unfair social gradients related to NCDs and their risk factors (*68, 69*). In this respect, comparing the impact of all NCD policies on affluent and disadvantaged groups can help to identify areas of public policy that require greater attention in respect of social gradients.

Strategies and policies that support tobacco control, healthy nutrition, physical activity and prevention of the harmful use of alcohol play a key role in NCD prevention and control and require multi-stakeholder efforts (*4, 6, 26, 29, 41, 43*). Policy making and planning in all aspects of NCD prevention and control need to be inclusive and involve a broad range of relevant stakeholders including the civil society, nongovernmental organizations and the private sector.

Figure 73 World map showing WHO member states reporting the presence of a NCD policy (*6*).



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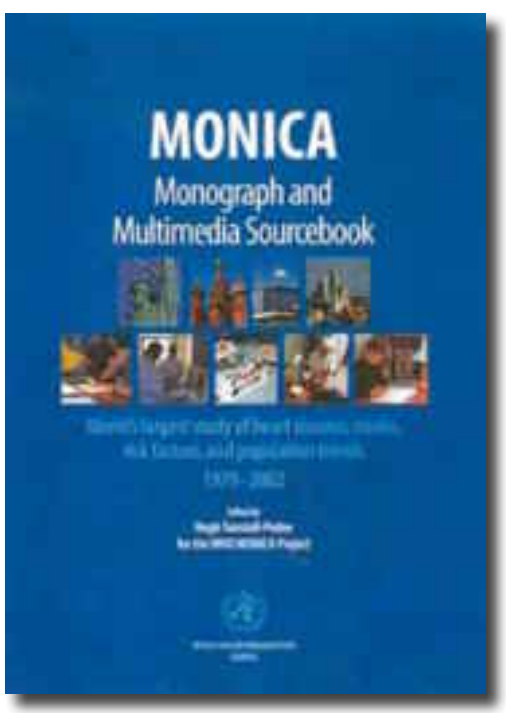
What gets measured gets done.



27

Policies and strategies for tobacco control

KEY MESSAGES

- **Tobacco control interventions are best buys.**
- **Implementing specific tobacco demand reduction measures is possible in a short time.**
- **Accelerating progress in tobacco control requires leadership of national authorities, political commitment, efficient governance mechanisms and investment.**

To counter the global threat of the growing tobacco epidemic, WHO Member States have negotiated the WHO Framework Convention on Tobacco Control (FCTC), which has been ratified by over 170 countries representing about 90% of the world's population (*145–147*). The reports from Parties indicate massive progress worldwide, with strong achievements by Parties and the Conference of Parties. Countries can take advantage of the significant progress in implementing the WHO FCTC and remarkable global momentum for tobacco control created by the treaty to further advance its implementation.

Preliminary new evidence indicates that total expenditure for implementation of tobacco control demand reduction strategies would range from US$ 0.10 to US$ 0.23/person/year in low-income and lower-middle-income countries, and from US$ 0.11 to US$ 0.72/person/year in upper-middle-income countries. An important portion of this expenditure is attributed to educational media campaigns, while other measures come at a lower cost (e.g. increasing taxes, complete smoke-free indoor environments, health warnings, banning tobacco advertising, promotion and sponsorship) (*6, 145, 148, 149*).

Experiences in several countries show that implementing the demand reduction measures of the WHO FCTC can be accomplished in a short time and at very reasonable cost. Scaling up the implementation of the WHO FCTC is feasible and would bring immense health, social and economic benefits (*25, 78, 150–157*).

Many countries have successfully implemented the following articles of the WHO FCTC:

- Article 6: Increasing tobacco taxes and prices (Figure 74);
- Article 8: Creating completely smoke-free environments in indoor workplaces, public places and transportation;
- Articles 11 and 12: Warning the population about the dangers of tobacco;
- Article 13: Banning tobacco advertising, promotion and sponsorship;
- Article 5.2: Creating strong national tobacco control programmes as a mechanism to exert governmental leadership in tobacco control;
- Article 5.3: Protecting public health policies from commercial and other vested interests of the tobacco industry.

More recently, the tobacco industry has been shifting its focus to LMICs, with a particular emphasis on marketing to the young and to women in these countries. This has resulted in an increase in tobacco use among the young (Figure 75) and in women. The size and reach of the tobacco industry activities alone can, if left unchecked, undo much of the health gains achieved by many LMICs in the last 20 or so years.

Figure 74 World map showing countries that tax tobacco products (tax as a percentage of the price of the most sold brand of cigarettes) (*11*).

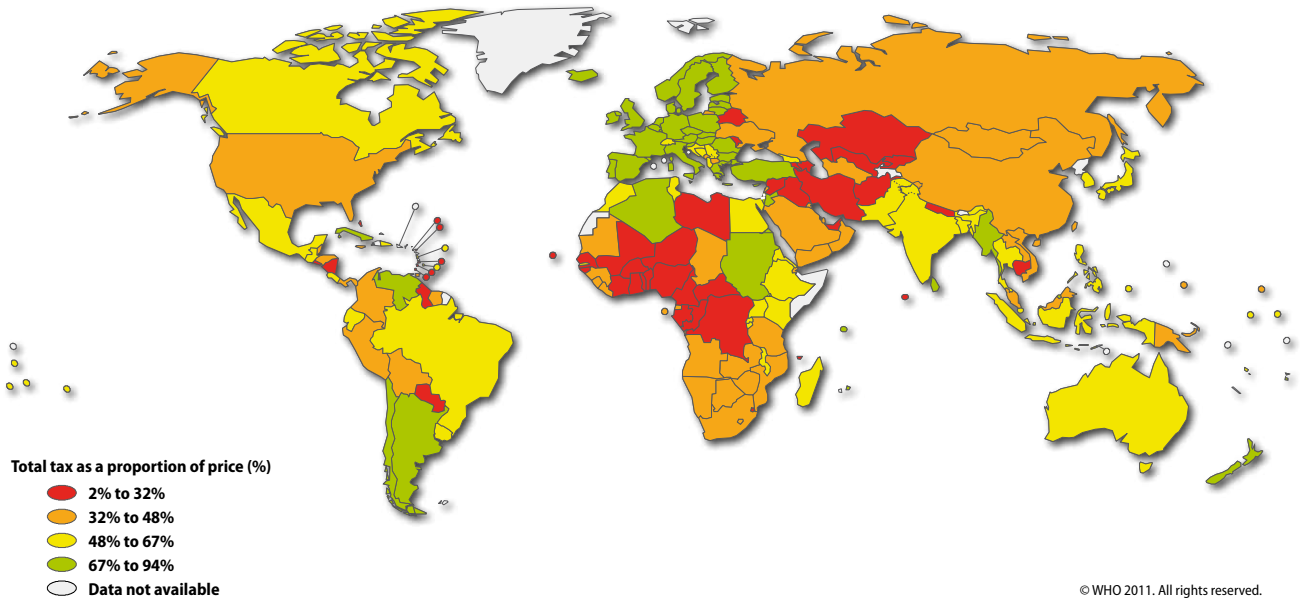


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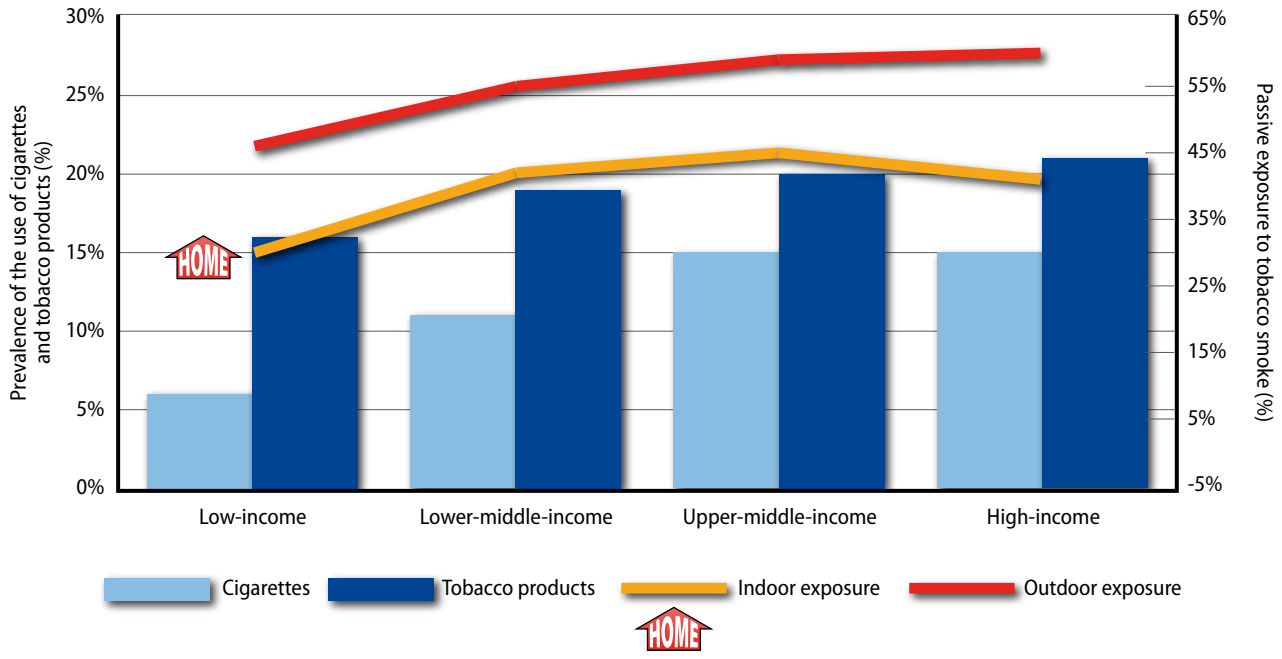
Figure 75 Prevalence of current tobacco use among youth (13-15 year old boys and girls) by World Bank income group and exposure to tobacco smoke(indoor and outdoor) (*11*).



28

Policies and strategies to facilitate healthy eating

KEY MESSAGES

- **Reduction of saturated and trans-fatty acids, reduction of salt from industrially processed food, reduction of marketing of food and non-alcoholic beverages to children and improvement of availability of fruits and vegetables are interventions that can have a high impact in preventing CVDs.**
- **Accelerating progress in reducing diet-related NCDs/CVDs requires the leadership of national authorities, political commitment, efficient governance mechanisms and adequate investment.**

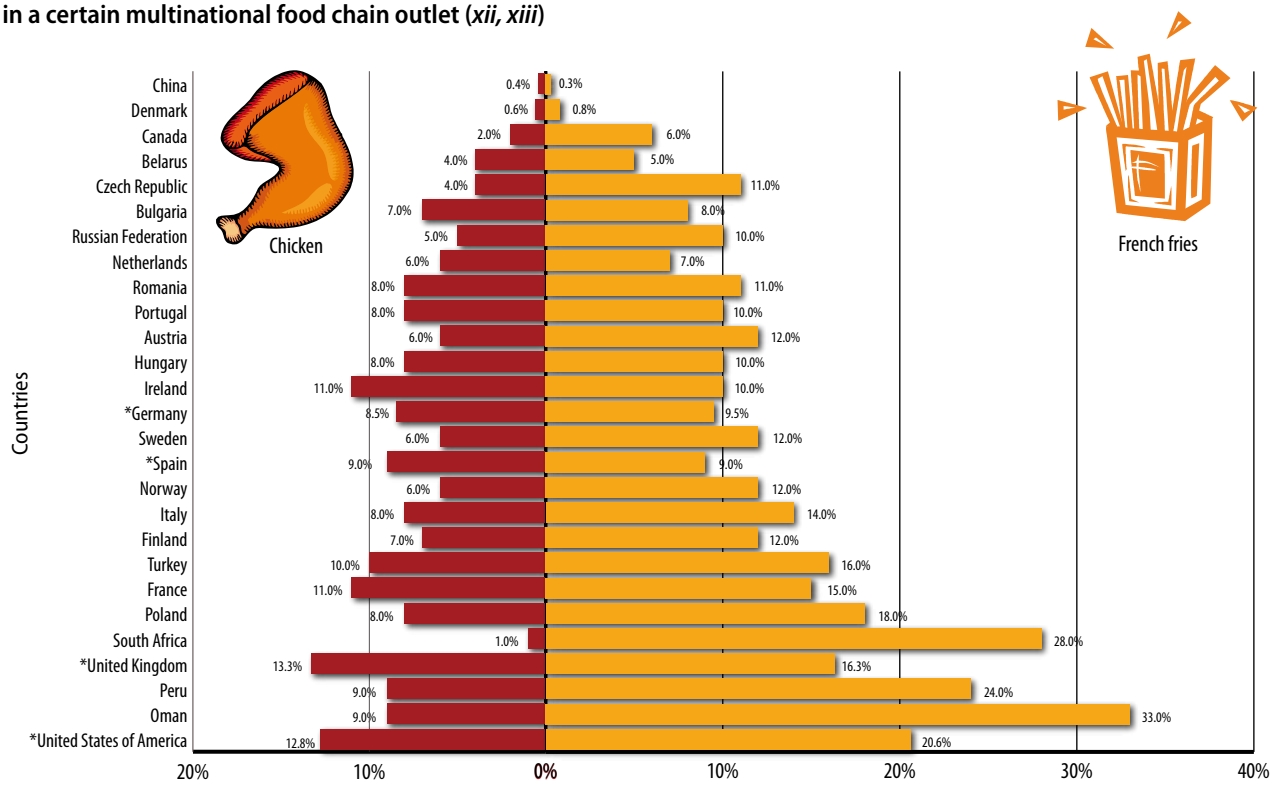
In response to global nutrition challenges, the 63rd World Health Assembly requested WHO to develop a comprehensive implementation plan on maternal, young child and infant nutrition that would boost the implementation of food and nutrition policies and programmes worldwide (*158*). In addition, to counteract the extensive advertising and other forms of food marketing to children, the 63rd World Health Assembly endorsed a set of recommendations on the marketing of foods and non-alcoholic beverages to children (*81*). The document calls for national and international action to reduce the impact on children of marketing of foods high in saturated fats, trans-fatty acids, free sugars or salt.

The maximum benefit of a life-course approach to improving nutrition would be achieved from interventions targeting early stages of life as well as actions towards older children and adolescents (*80, 159–163*). There is evidence that poor nutrition during pregnancy and early life increases the predisposition to NCDs later in life (*72–74*). Television advertising is associated with increased consumption of snacks and drinks high in sugar, consumption of nutrient-poor foods and increased caloric intake. Figures 76 and 77 show trans-fatty acids as a percentage of total fat in fast foods sold in selected countries. Improvement of infant and young child feeding and the reduction in marketing of foods and non-alcoholic beverages high in salt, fats and sugar to children are cost-effective actions to reduce CVDs and other NCDs. Figure 78 shows countries that have taken regulatory action to reduce trans-fats.

There is evidence to suggest that multipronged intervention strategies have the potential to achieve greater health gains than individual interventions, and often with greater cost effectiveness. Additionally, a combination of national and local-level actions in different sectors is beneficial to the implementation of food and nutrition policies. They include maternity protection at work, improvement of family and community practices, improving skills in health workers, communication and information strategies, product labelling to help consumers make the right food choices and improving school food in combination with educational activities and interventions in workplace settings (*3, 25, 80, 151–163*).

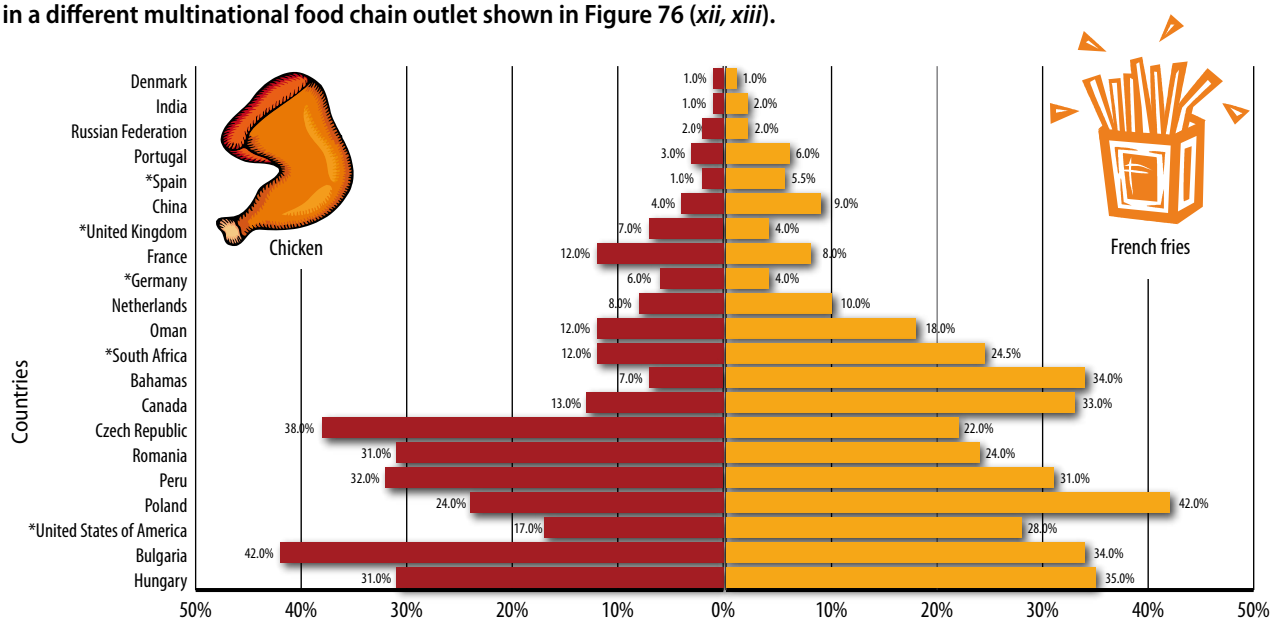
Figure 79 shows the salt consumption per capita and salt consumption surplus in selected countries. WHO has set a global target for maximum intake of salt for adults at 5 grams/day (i.e. 2000 mg/day of sodium) or lower if specified by national targets (*43, 49, 50, 159*). High-income countries are taking steps to reduce population salt intake by reducing salt in processed food (*45*). In rural areas in LMICs, where most of the salt consumed comes from salt added during cooking or from sauces and additives, a public education campaign is needed to encourage people to use less salt. In urban areas in LMICs, there is increasing consumption of processed and prepared food. In these areas, a combination of measures, including a food industry response to reduce the amount of salt added to food, food labelling and consumer education, will be required to reduce the population intake of sodium.

Figure 76 Proportion of trans fatty acids as a percentage of total fat (fried chicken and chips) sold in selected countries, in a certain multinational food chain outlet (*xii, xiii*)



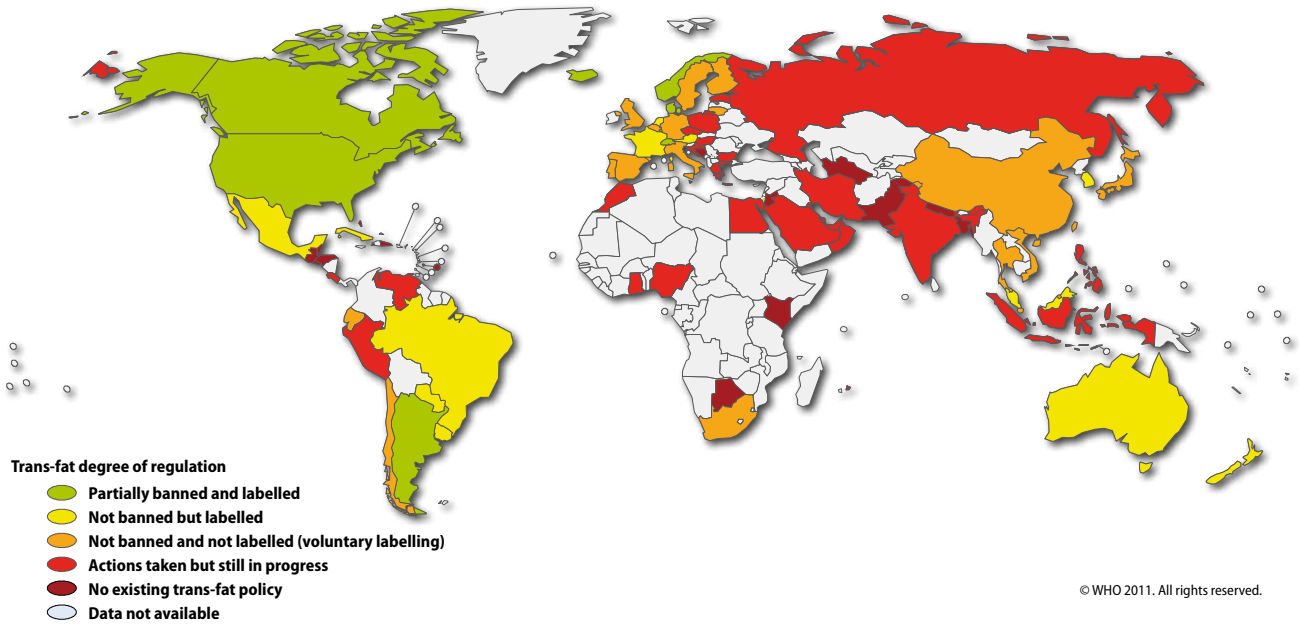
* Spain: average Malaga and Barcelona; UK: average Glasgow, Aberdeen, London; Germany: average Hamburg and Wiesbaden; US: average NYC, Chicago, Boston, Atlanta and Philadeldia; South Africa: Johanesberg.

Figure 77 Proportion of trans fatty acids as a percentage of total fat (fried chicken and chips) sold in selected countries, in a different multinational food chain outlet shown in Figure 76 (*xii, xiii*).



* Spain: average Malaga and Barcelona; UK: average Glasgow, Aberdeen, London; Germany: average Hamburg and Wiesbaden; US: average NYC and Boston; South Africa: average Johanesberg and Durban.

Figure 78 World map showing countries that have taken regulatory action against transfat (*xiii-xxvii*).



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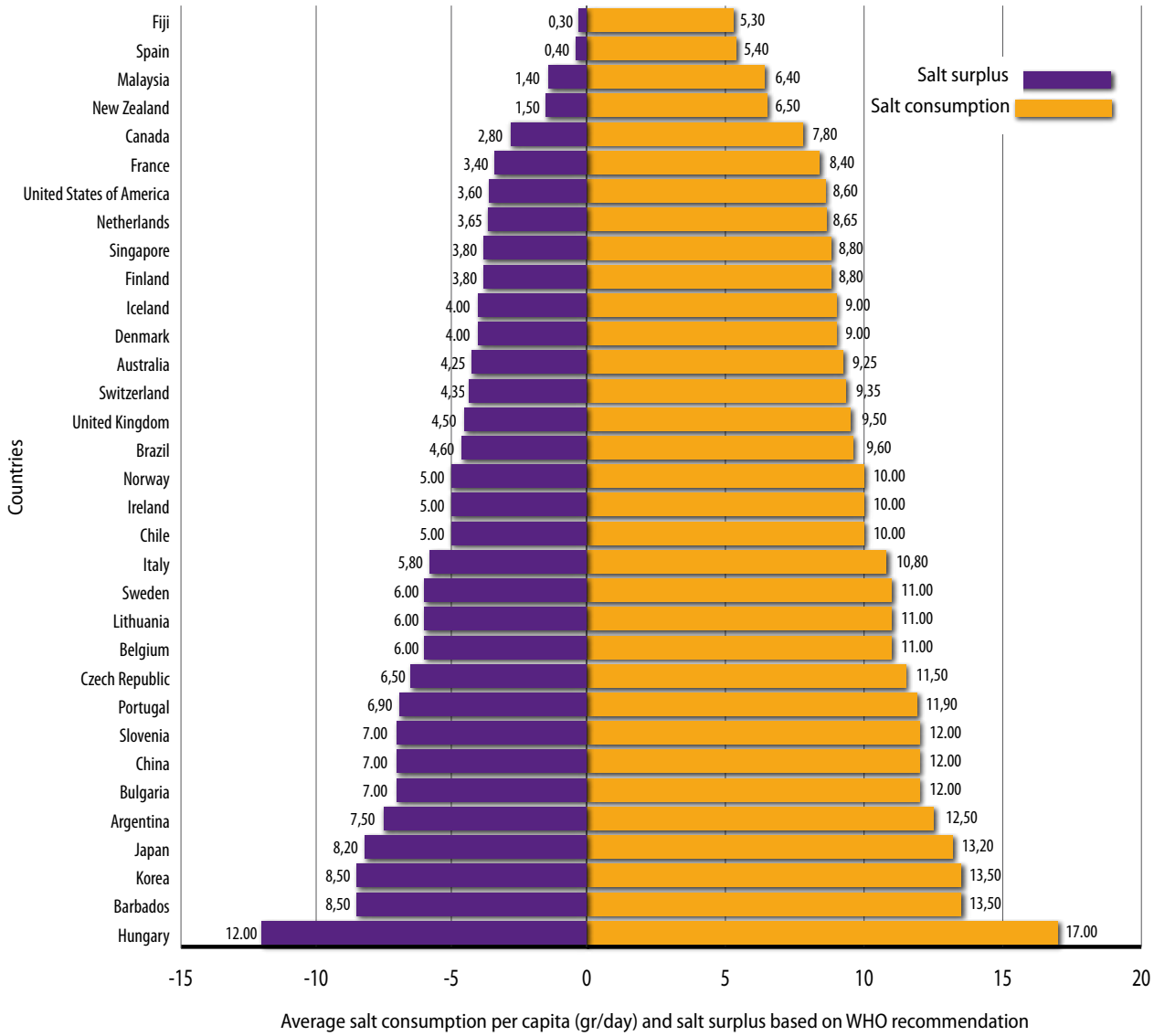
A healthy diet promotes health

Figure 79 **Salt consumption per capita and salt consumption surplus in selected countries (*xxvii-xxx*).**



WHO recommendation: 5 gr/person/day

29

Policies and strategies to facilitate physical activity

KEY MESSAGES

- **An enabling environment facilitates regular physical activity.**
- **Physical activity is influenced by policies and practices in many sectors, including transport, sport, education, environment, urban design and the media.**
- **It is critical to engage all stakeholders as part of the solution for physical inactivity.**

Physical activity can play a significant role in the prevention and control of CVD and in addressing overweight and obesity (Figures 80–82). There are many gaps and challenges encountered in improving physical activity levels, and intersectoral action is required to address them. Areas for action on physical activity promotion include: (i) school-based programmes; (ii) transport policies that prioritize walking and cycling; (iii) urban design; (iv) primary health care; (v) public awareness and mass media; (vi) community-wide programmes; and (vii) sports system/programmes. An effective approach requires the implementation of multiple concurrent strategies, therefore, the participation of the sectors and leaders corresponding to each of these areas of action is critical. In many countries, the first step has been to engage these key sectors to raise their awareness about how their policies and actions are affecting health.

Adequate levels of physical activity, including moderate intensity physical activity such as everyday walking and cycling as a means of transportation, can best be achieved through an enabling environment. Thus, increasing physical activity is a societal and not just an individual undertaking. As such, it demands a population-based, multisectoral, multidisciplinary and culturally relevant approach (*163,164*).

In urban settings, the changing environment is reducing opportunities for physical activity. City dwellers are also likely to have sedentary occupations, to use motorized means of transportation and be less likely to engage in physical activity during their leisure and recreation time.

The WHO Global NCD Action Plan (2008) urges Member States to promote physical activity through the implementation of school-based interventions and the provision of physical environments that support safe active commuting, safe transport and the creation of space for recreational activity (*3*).

All the evidence on changing physical activity habits shows that creating an enabling environment, providing appropriate information and ensuring wide accessibility are critical to influencing behaviour change, regardless of the setting.

Figure 80 Proportion of children (11 years old) who are reported to be overweight or obese in selected European countries, USA and Canada (*xxxi*).

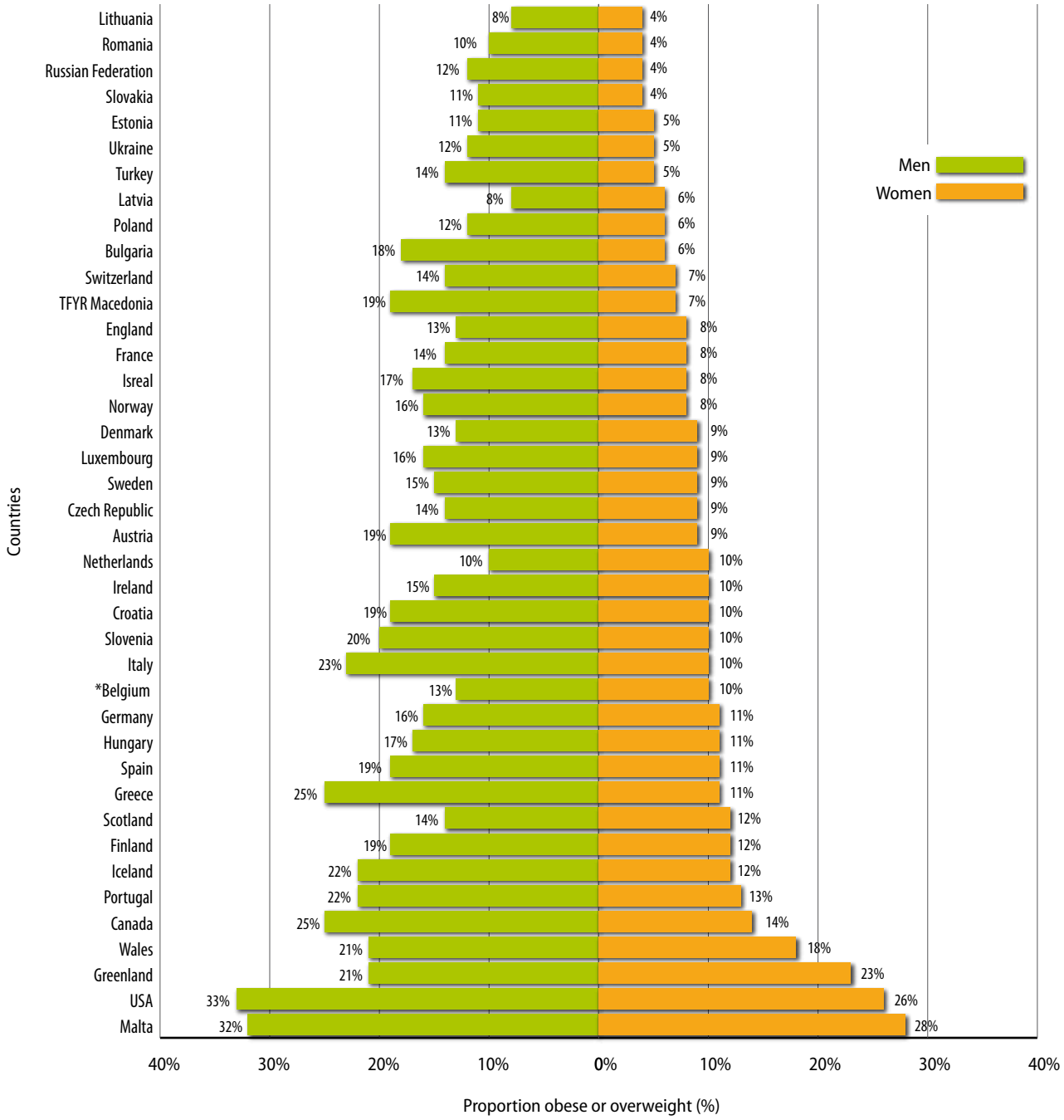


Figure 81 Proportion of children (13 years old) who are reported to be overweight or obese in selected European countries, USA and Canada (*xxxi*).

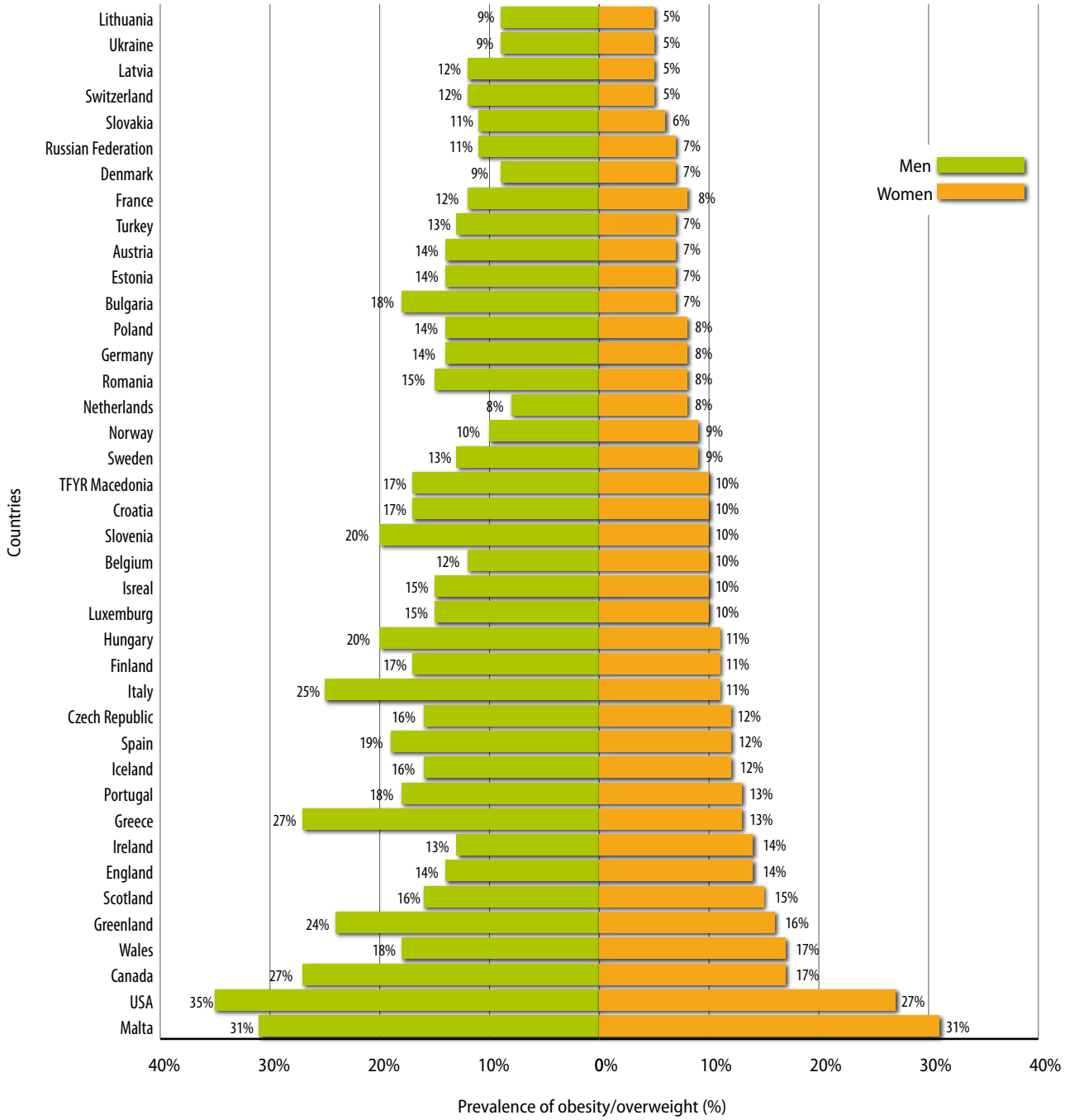
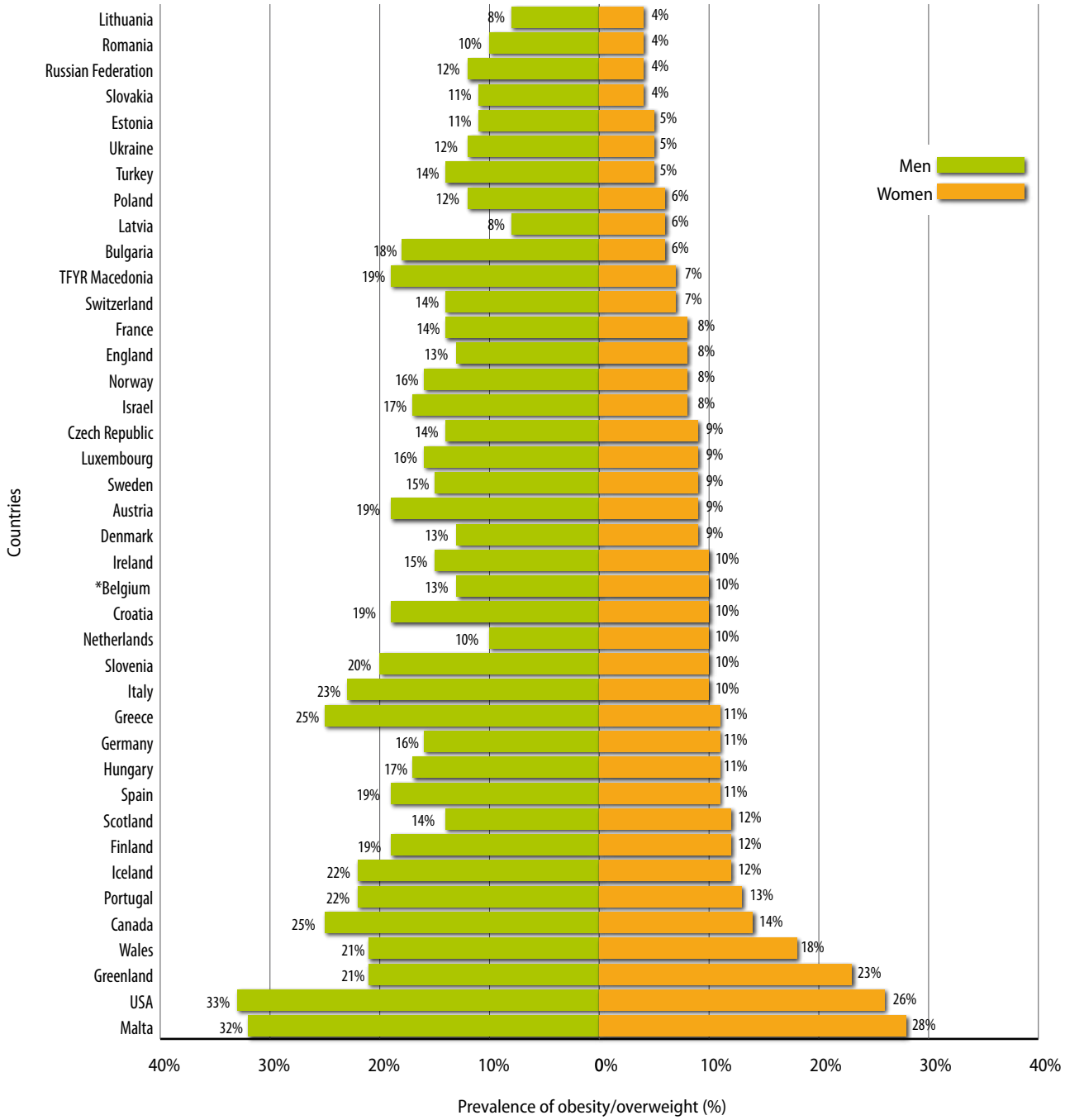


Figure 82 Proportion of children (15 years old) who are reported to be overweight or obese in selected European countries, USA and Canada (*xxxi*).



30

Policies and strategies to address the harmful use of alcohol

KEY MESSAGES

- **Addressing the harmful use of alcohol is one of the key components of NCD/CVD prevention and control.**
- **There are cost-effective interventions with good return (best buys) for addressing the harmful use of alcohol.**
- **Best buys include increasing alcoholic beverage excise taxes, restricting access to alcoholic beverages and comprehensive restrictions and bans on advertising and promotion of alcoholic beverages.**

The Global Strategy to Reduce the Harmful Use of Alcohol, endorsed by the World Health Assembly in May 2010 and the WHA resolutions WHA61.4, WHA63.13 (*79*) and WHA58.26 (*165*) as well as the regional and subregional strategies and action plans provide the necessary policy and implementation frameworks for reducing the harmful use of alcohol. The reduction of alcohol-related harm entails a range of effective measures implemented at all levels, including population-based measures and adequate health services responses such as early identification of people at risk and subsequent interventions (*166–169*). Figures 83 and 84 show the prevalence of alcohol consumption of students (13–15 years) from selected countries. Special attention needs to be paid for preventing alcohol consumption in children.

The following strategies and interventions have the highest level of effectiveness to prevent the harmful use of alcohol:

- increasing excise taxes on alcoholic beverages;
- regulating physical availability of alcoholic beverages, including minimum legal purchase age, restrictions on outlet density and time and place of sales, public health oriented licensing systems and governmental monopolies of retail sales;
- drink-driving countermeasures such as lowered blood alcohol concentration limits and "zero tolerance" for young drivers, random breath testing and sobriety check points;
- legal-based comprehensive restrictions on bans on advertising and promotion of alcoholic beverages;
- treatment of alcohol use disorders and brief interventions for hazardous and harmful drinking.

The challenge to the implementation of these effective strategies is to ensure mobilization of political will and the necessary resources for sustainable multisectoral action to guarantee the necessary resources and establish appropriate monitoring and evaluation mechanisms.

The French alcohol and tobacco policy law – *La Loi Évin* (formally *Loi n°91–32 du 10 janvier 1991 relative à la lutte contre le tabagisme etl'alcoolisme*) – provides examples of restrictions on alcohol advertising and marketing (*170*). This policy bans the advertising of all alcoholic beverages containing over 1.2% alcohol by volume on television or in cinemas, and prohibits sponsorship of sports or cultural events by alcohol companies. *La Loi Évin* also prohibits the targeting of young people and controls the content of alcohol advertisements. Messages and images must refer only to the characteristics of the products and a health warning must be included in each advertisement. In 2008, this legislation was extended to apply to alcohol advertising on the Internet and in newspaper and magazine editorials. Alcohol advertising is only permitted in the press for adults, on billboards, on radio channels (under certain conditions) and at some special events or places. There are significant monetary sanctions for infringements of the law, which have ensured its implementation.

Figure 83 Proportion of students (13-15 years) who consumed alcohol in the last 30 days from selected low and middle income countries (*41, xxxii*).

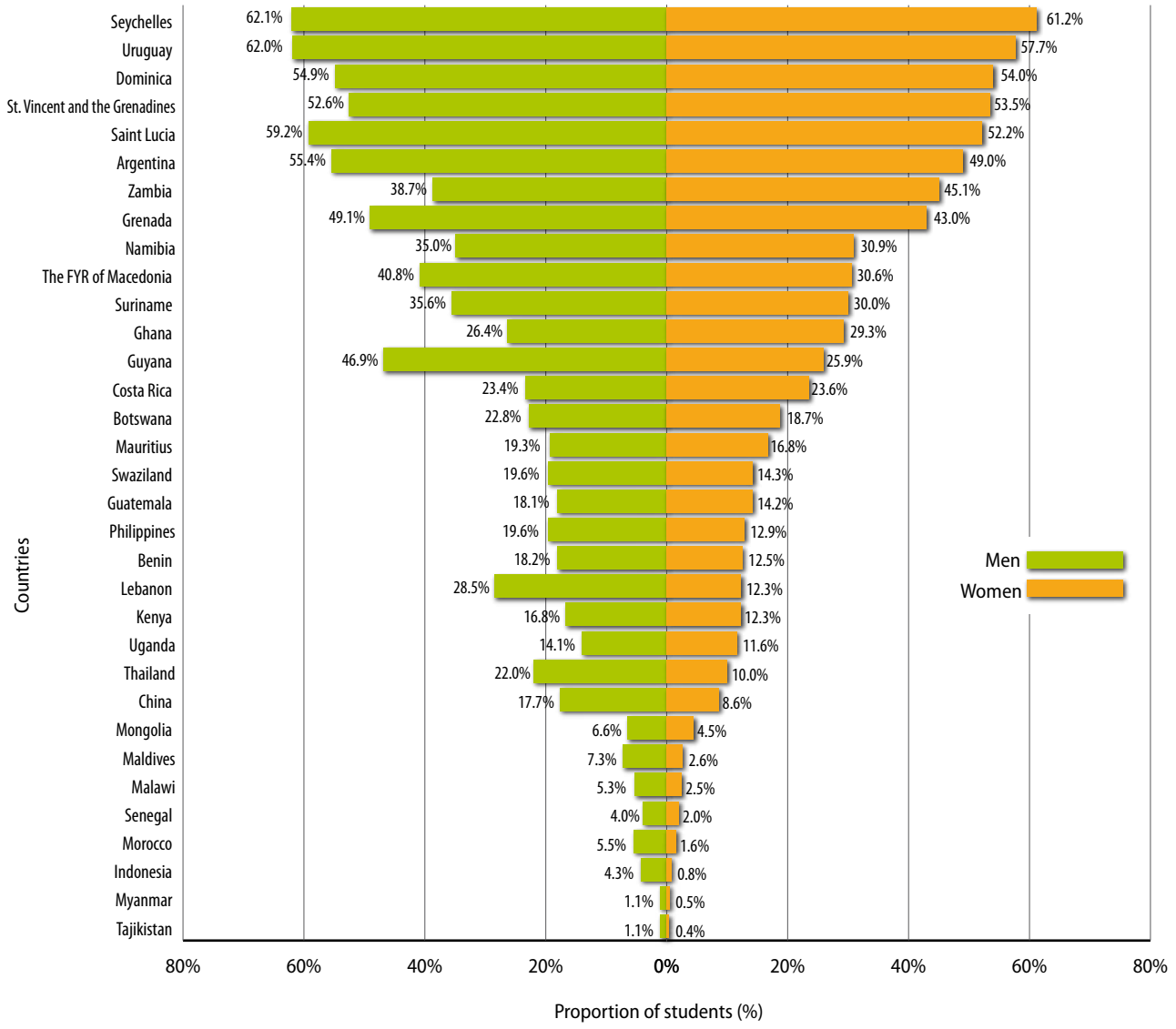
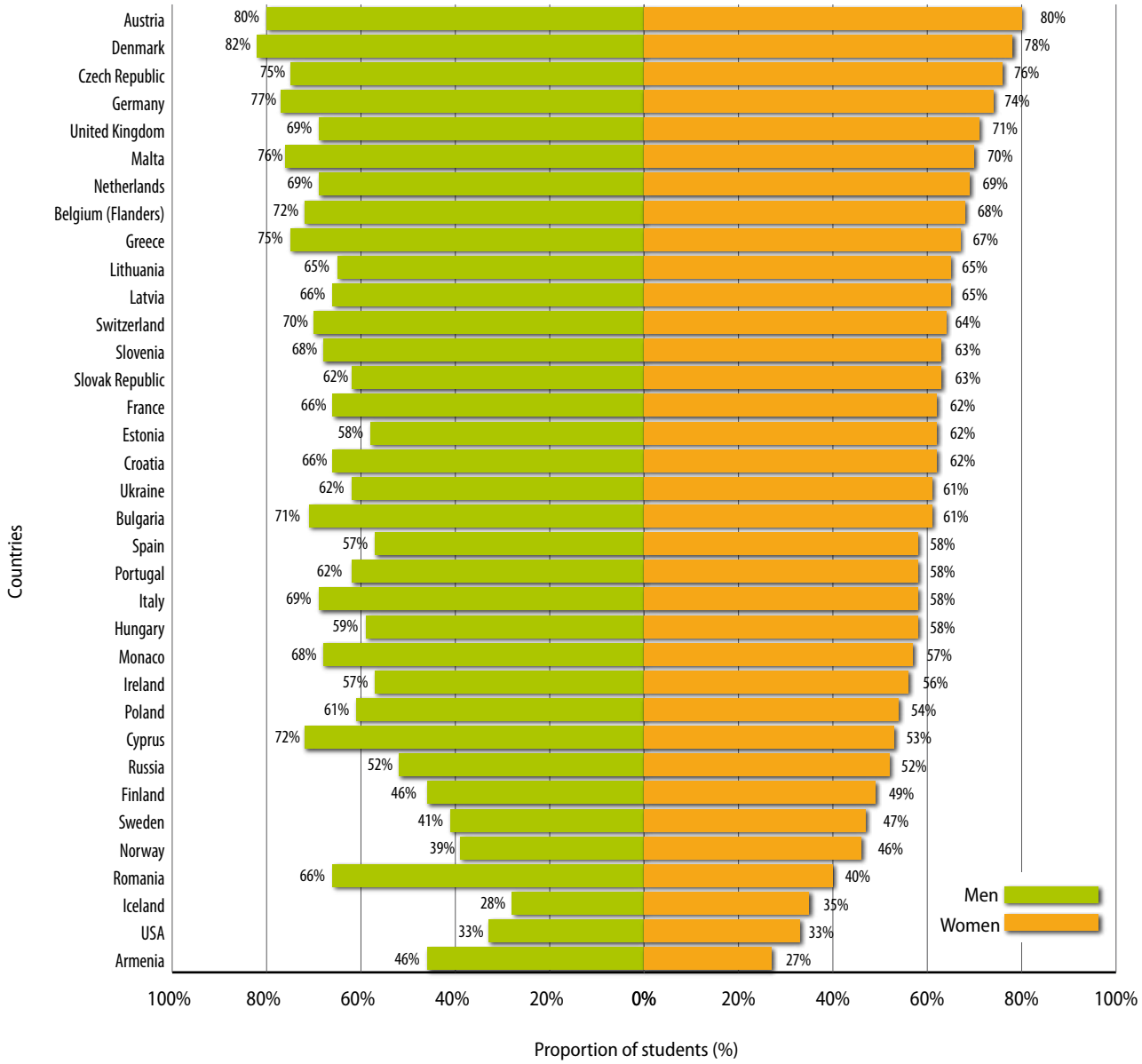


Figure 84 Proportion of students (15-16 years) who consumed alcohol in the last 30 days from 34 European countries and USA (*41, xxxii*).



Obesity and tobacco use are both detrimental to health

Regular physical activity (e.g. walking) promotes health

31

Individual interventions for prevention and control of CVDs

KEY MESSAGES

- **There is a range of evidence-based personal interventions that have been demonstrated to have a significant impact on the health outcomes of people with established disease or at high risk of CVD.**
- **Due to limited resources and weak health systems most of these interventions are not available or accessible to people who need them.**
- **Unless the resource availability and limitations in health systems improve dramatically, a commitment to universal coverage seems unrealistic and unsustainable from an NCD perspective for low-income and lower-middle-income countries.**

Simultaneous actions to reduce the cardiovascular risk of the entire population and high-risk individuals are required to address the burgeoning CVD epidemic (Figures 85–88). Effective individual interventions developed and applied during the last two decades fall into three different categories (*4, 6, 171–175*). One category of health service interventions pertains to acute events and should ideally be delivered in special units dealing with coronary care, stroke care or intensive care. A second category of interventions such as coronary bypass surgery, deals with complications and advanced stages of disease. They both require health workers with specific skills, high technology equipment, costly treatment and tertiary hospital infrastructure. The third category of interventions, by contrast, can be applied at the first contact level. These primary health care interventions are crucial for providing the essential standards of care for the four major groups of NCDs and for reducing the demand for the first two categories of interventions (*173*). Improved access to highly cost-effective interventions at the primary health care level will have the greatest potential in reversing the progression of the disease, preventing complications and in reducing hospitalizations, health-care costs and out-of-pocket expenditures.

For prevention of coronary heart disease and stroke, individual interventions need to be targeted to those at high total cardiovascular risk based on the presence of combinations of risk factors. If interventions are aimed at single-risk factor levels above traditional thresholds such as hypertension and hypercholesterolaemia (*4, 6*) they become less cost effective. The former approach also has a higher potential to reduce cardiovascular events (*4, 6*). Furthermore, it is also feasible to apply the approach to assess and treat cardiovascular risk in primary care in low-resource settings even by non-physician health workers (*176, 177*). It has been estimated that a regimen of aspirin, statins and two blood pressure lowering agents could significantly reduce the risk of death from CVD in people at high cardiovascular risk (*4, 22, 174, 178, 179*). Providing such a regimen to those eligible between 40 and 79 years of age has been estimated to avert about one fifth of cardiovascular deaths in the next 10 years, with 56% of deaths averted in people younger than 70 (*174, 179–181*).

For secondary prevention of CVD (prevention of recurrences and complications in those with established disease), aspirin, beta-blockers, angiotensin converting enzyme inhibitors and lipid-lowering therapies lower the risk of recurrent cardiovascular events by about 25% each, including for those with diabetes (*4, 6, 48, 171*). The benefits of these interventions are largely independent so that when used together with smoking cessation about 75% of recurrent vascular events could be prevented (*171*). Currently, there are major gaps in the implementation of primary and secondary prevention interventions that could be delivered in primary care (*6, 182*).

Figure 85 Total deaths due to cerebrovascular disease by World Bank Income groups, 2008 (*1*).

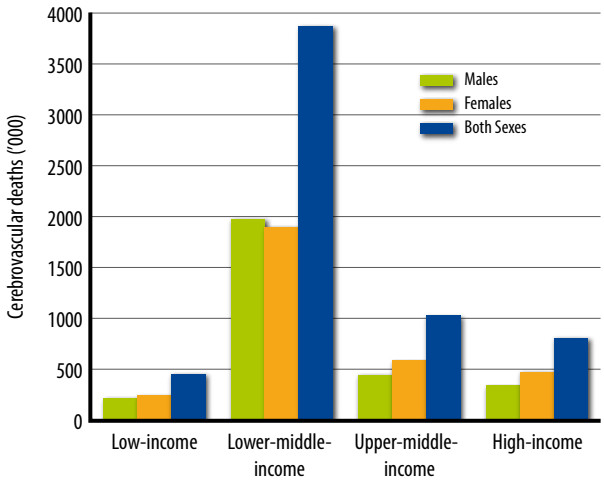


Figure 86 Total deaths due to cerebrovascular disease by WHO regions, 2008 (*1*).

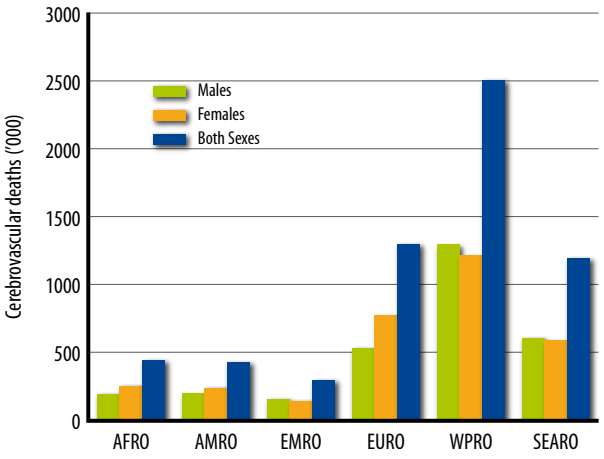


Figure 87 Total deaths due to ischemic heart disease by World Bank Income groups, 2008 (*1*).

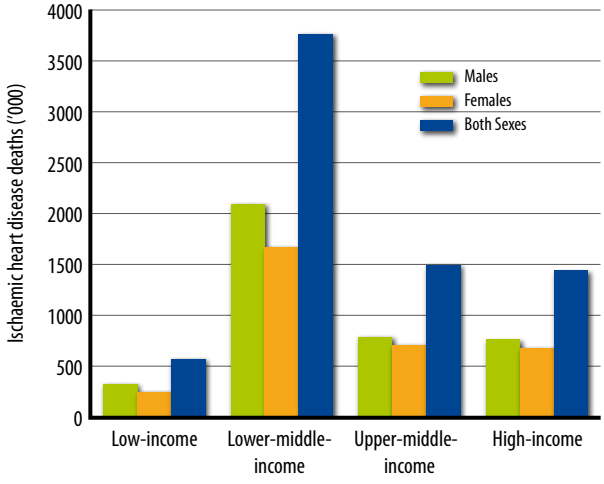
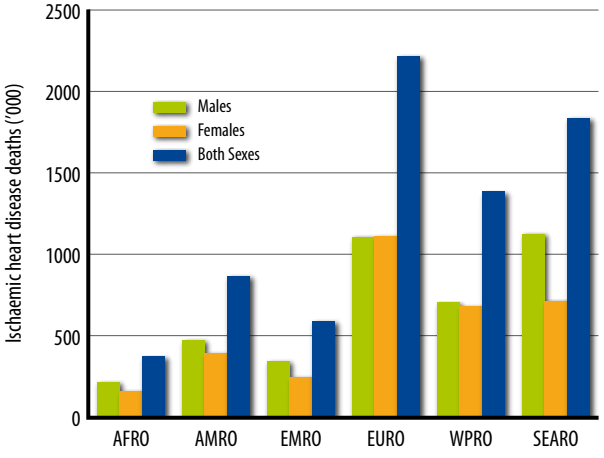


Figure 88 Total deaths due to ischemic heart disease by WHO regions, 2008 (*1*).



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Role of primary health care in prevention and control of CVDs

KEY MESSAGES

- **A balanced investment between primary care and other levels of care is vital for prevention and control of CVD.**
- **Prevention and control of CVD cannot be addressed without strengthening primary care.**
- **Prioritizing, financing and strengthening the health systems to deliver a realistic set of high-impact personal CVD/NCD interventions may be a pragmatic first step to achieve the long-term vision of universal coverage.**

If rising trends of CVDs are to be halted and reversed, current approaches to addressing them need to be reformed. At present, the main focus of health care for CVD in many LMICS is tertiary care based. Tertiary care, including stroke units, coronary care units and rehabilitation units, play an important role in improving outcomes of people who suffer CVD events. However, balancing investment in primary, secondary and tertiary care is vital for sustainability of CVD programmes.

Currently, a large proportion of people with high cardiovascular risk remains undiagnosed and often even those diagnosed have insufficient access to treatment. When diagnosis is made, it is frequently at a late stage of the disease, when people become symptomatic and are admitted to hospitals with acute myocardial infarction or stroke and when costly high-technology interventions are required for treatment. Examples of such costly health-care interventions include coronary artery bypass surgery and other types of vascular surgery for unstable angina and cerebrovascular disease (*6, 106, 171*).

Early detection is key to improving outcomes of CVDs. Affordable tools (e.g. clinical measurements, laboratory investigations, cardiovascular risk assessment charts, affordable blood pressure measurement devices) are available for early detection of people with disease and those at high risk (*4, 6, 183*). Since CVDs are asymptomatic in early stages, such tools need to be proactively utilized to detect those at risk of developing heart attacks or strokes. As population-wide screening is not affordable for LMICs, targeted screening of people in different settings (e.g. adults over a certain age screened at primary care facilities, worksites and community settings) is an approach used for early detection and diagnosis. Addressing cardiovascular risk has been demonstrated to be more efficient when a total-risk approach is used (*178, 184, 185*).

The primary health care approach places equity as a central value across all health system functions: governance, health information, workforce, service delivery, providing essential medicines and technologies (*186, 187*). Universal health coverage is receiving increasing priority as part of the agendas of health systems strengthening. The health sector could address health inequities related to CVD by taking steps towards universal health coverage, starting with the implementation of a set of high-impact essential CVD interventions (*6, 173*). Strengthening primary health care also requires ensuring performance, quality and effectiveness of service delivery. Equitable health system financing and the location of health-care services as well as the motivation and training of the health workforce (Figures 89 and 90) are crucial to positively impact health inequities (*188, 189*). The shortfall of physicians in many parts of the world call for engaging non-physician health workers in service delivery for NCD/CVD, particularly in primary care (Figures 89 and 90). A participatory approach by communities in service delivery is also important for reducing health inequities.

Figure 89 World map showing the density of physicians (per 100 000 population) (*11*).

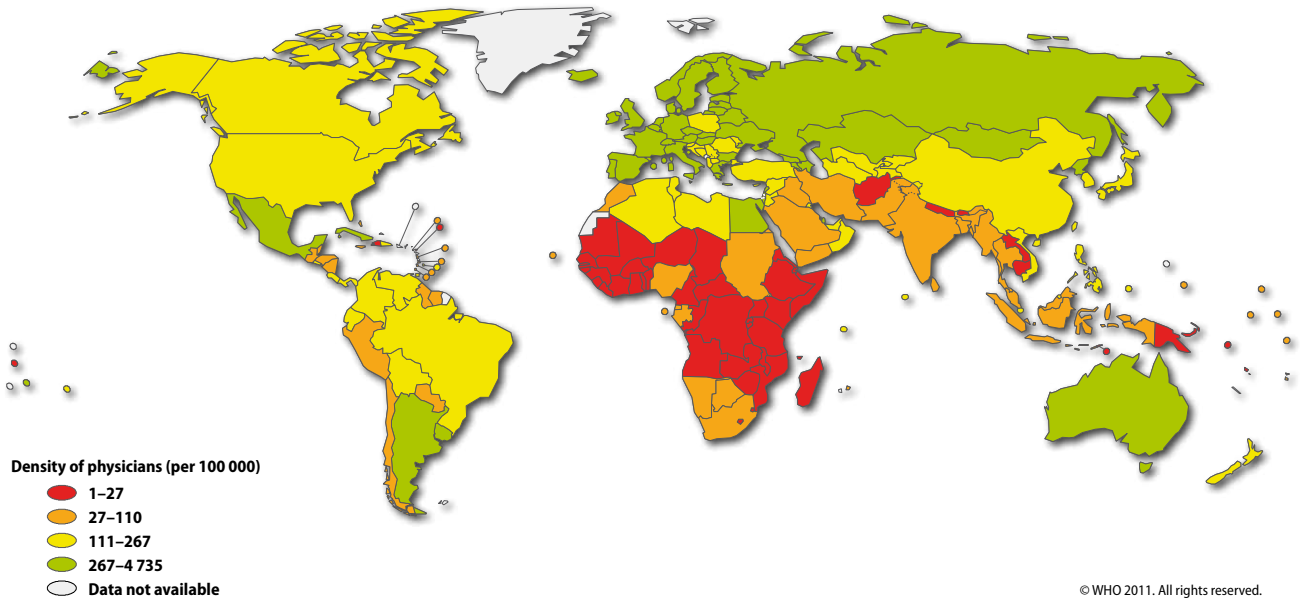

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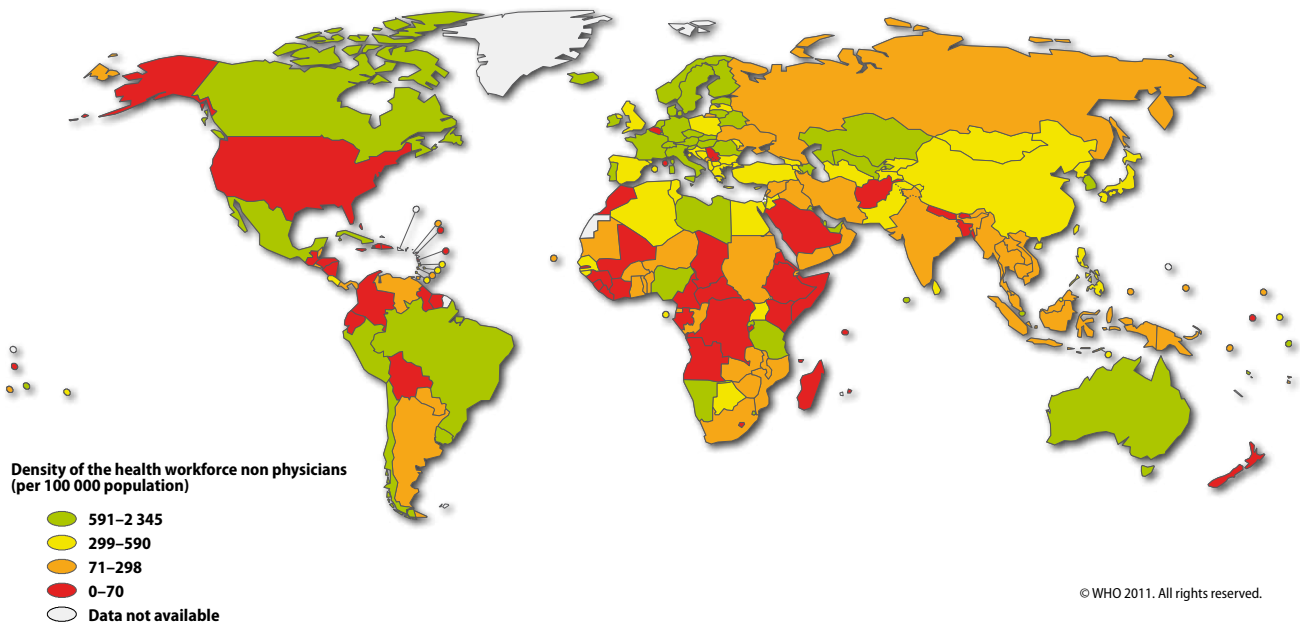
Figure 90 World map showing the density of health workforce (nonphysicians) (per 100 000 population) (*11*).



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33

Best buys for cardiovascular disease (CVD) prevention and control

KEY MESSAGES

- **A pragmatic approach to address CVDs in resource-constrained settings is to implement and scale up very cost-effective, feasible and high-impact interventions (best buys).**
- **Best buys can be implemented even in low-income countries if there is a modest increase in investment in health.**

The CVD epidemic is progressing relentlessly in LMICs. As shown in the world maps (Figures 91 and 92), there is a large disease burden worldwide attributable to heart attacks and strokes. Policy-makers and investors often ask whether CVD can be tackled and, if so, where the focus of attention should be. There is clear evidence that prevention interventions work and that improved access to health care can reduce the burden of morbidity, disability and premature mortality. However, in making a decision, policy-makers also want to know what evidence there is to show that interventions will represent a cost-effective use of resources in the settings in which they are to be implemented and that scaling up these interventions is appropriate, affordable and feasible.

Cost effectiveness summarizes the efficiency with which an intervention produces health outcomes. Feasibility of an intervention depends on: (i) reach (the capacity of the health system to deliver an intervention to the targeted population); (ii) technical complexity; (iii) capital intensity (the amount of capital required for an intervention); and (iv) cultural acceptability.

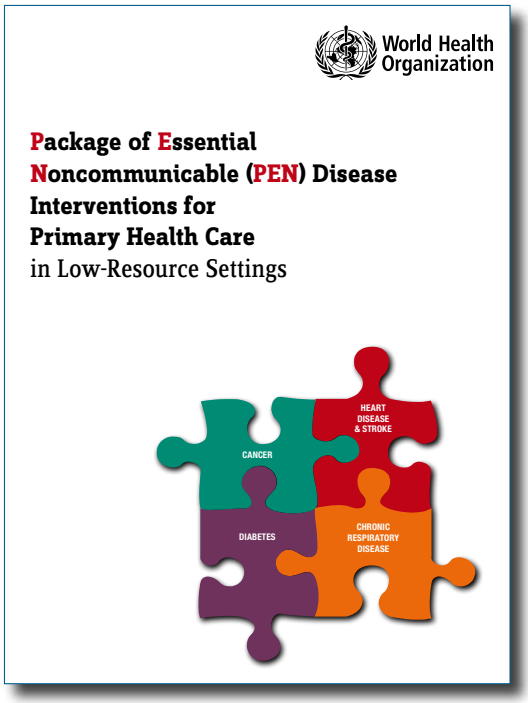
A set of interventions exists for the prevention and control of CVD that has a significant public health impact and is highly cost effective, inexpensive and feasible to implement; these interventions can be considered as "best buys" for investors (Table 1). A range of other interventions that constitute "good buys" can also be identified (*6, 160, 173*).

Implementing population-wide interventions for tobacco control, control of the harmful use of alcohol, reduction of salt content in processed foods and substitution of partially hydrogenated trans-fat with polyunsaturated fats have the potential to prevent millions of deaths per year. In addition, promoting physical activity through the media (in combination with a healthy diet) has been estimated to be a low-cost and highly feasible option.

The above population-wide preventive strategies can be combined with more targeted approaches to improve health gains. Individual interventions that are best buys include (*4, 6, 160, 171, 173*): (i) providing aspirin to people with an acute heart attack – this saves the lives of one in five of those with a heart attack; (ii) providing a simple multidrug treatment to people following a heart attack or stroke (or transient ischaemic attack or angina) in order to prevent recurrent ischaemic events – this results in a reduction in recurrent heart attacks and strokes of up to 75% – and also decrease mortality; (iii) reducing the cardiovascular risk (controlling blood pressure, blood cholesterol and blood sugar; tobacco use) in people, including those with diabetes, who are at high risk of heart attacks and strokes; and (iv) controlling glucose levels in people with diabetes – this investment reduces cardiovascular complications, blindness and kidney failure in people with diabetes. Financing tools are available to assist countries to cost resources required for implementing the best buys (*160*).

Table 1 Best buys for prevention and control of CVDs (*6*)

Risk factor/disease	Interventions
Tobacco use	■ Raise taxes on tobacco ■ Protect people from tobacco smoke ■ Warn about the dangers of tobacco ■ Enforce bans on tobacco advertising
Harmful use of alcohol	■ Raise taxes on alcohol ■ Restrict access to retailed alcohol ■ Enforce bans on alcohol advertising
Unhealthy diet and physical inactivity	■ Reduce salt intake in food ■ Replace trans-fat with polyunsaturated fat ■ Promote public awareness about diet and physical activity (via mass media)
CVD and diabetes	■ Provide counselling and multidrug therapy (including blood sugar control for diabetes mellitus) for people with medium-high risk of developing heart attacks and strokes (including those who have established CVD) ■ Treat heart attacks (myocardial infarction) with aspirin



To ensure equity, delivery of essential NCD interventions in primary care need to be strengthened.

Health systems research related to primary health care is one of the NCD/CVD research priorities.

Figure 91 World map showing burden of ischemic heart disease (DALYs) (age standardized, per 100 000) (*5*).

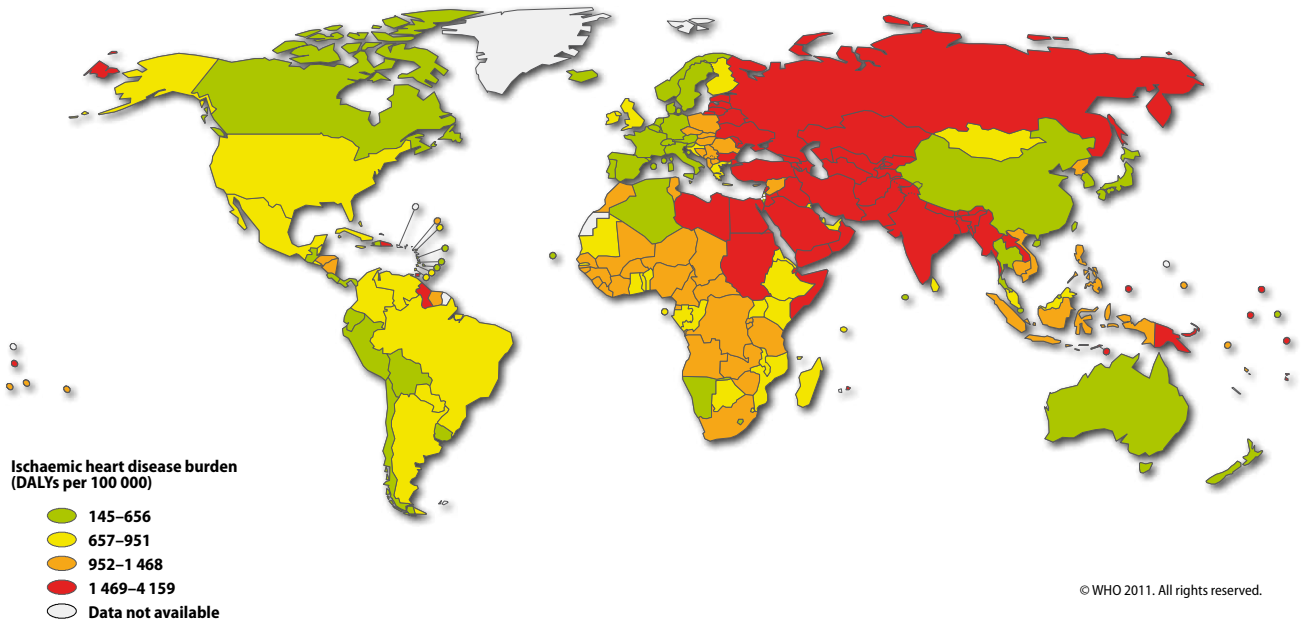


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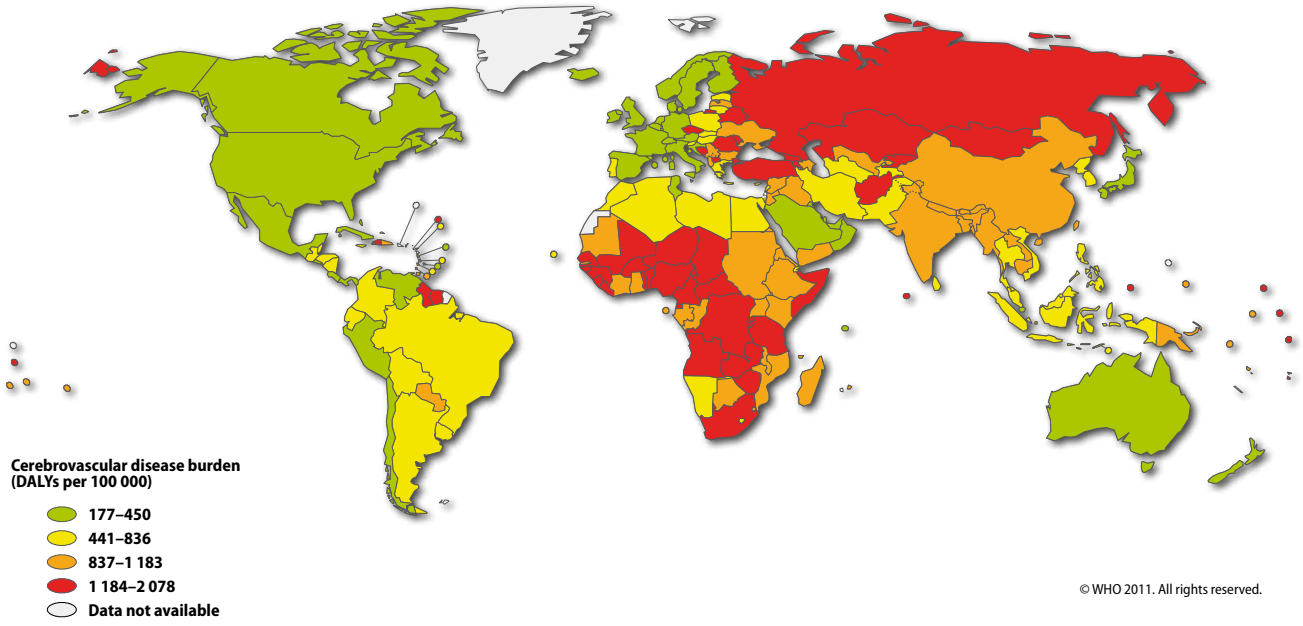
Figure 92 World map showing burden of cerebrovascular disease (DALYs) (age standardized, per 100 000) (*5*).



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National policies are needed to facilitate physical activity

National policies are needed for tobacco control

34

Bridging the implementation gap for prevention and control of CVDs

KEY MESSAGES

- **Research is essential to bridge the "knowledge translation" and "implementation" gaps in prevention and control of NCDs.**
- **In the long run, investment in implementation research and impact evaluation can save resources.**
- **The WHO Prioritized Research Agenda for Prevention and Control of Major Noncommunicable Diseases (WHO NCD Research Agenda) provides a basis for improved cooperation among research funders and other key partners.**

Cost-effective interventions that have the potential to halve the NCD burden over the next two decades and lead to large health and economic benefits are available. Implementation and dissemination of these interventions have resulted in the decline of, for example, CVD in many developed countries (*13, 14*). Research is essential in order to understand and to demonstrate how these interventions can be implemented effectively in LMICs, despite resource constraints and other competing health priorities.

Particularly in resource-constrained settings, available resources need to be invested in NCD programmes and interventions that have a sound scientific basis so that there is a good return on investment. Although we already know "what has worked" in developed countries, "how" these interventions can be applied in resource-constrained settings needs to be researched. At the country level, therefore, implementation research focused on high-impact and affordable interventions (best buys) needs to be strengthened to generate the required insight.

Implementation research seeks to understand how to effectively deliver efficacious interventions in a specific context, thus filling this gap between knowledge and practice. LMICs stand to benefit enormously from promoting and supporting this type of research so that resources are not wasted on programmes that are not appropriate to the context.

At present, there is a major mismatch between country demands for conducting research on prevention and control of NCDs and the human resource and financial capacity to respond to these demands. Therefore, global and national NCD research agendas require prioritization with the aim of focusing on key research issues that are likely to have the greatest potential to impact prevention and control of NCDs.

To address this need, the WHO NCD Research Agenda was developed from 2008 to 2010 and identified 20 top priority research areas that are likely to have a high impact on national NCD policies and programmes, with a special focus on LMICs (*190*). The WHO NCD Research Agenda provides guidance to Member States in understanding and identifying the key public health research needs related to NCDs (*186*).

Figures 93 and 94 show the annual research and development expenditure as a proportion of gross domestic product (GDP) and national health expenditure, respectively. Adequate resources for research are crucial – both financial and technical – through strengthened national, regional and international cooperation and collaboration (*191*). The WHO NCD Research Agenda provides a basis for improved cooperation among research funders and other key partners to align aid with NCD research priorities. This would help to strengthen the research capacity of LMICs and enable them to develop national NCD research plans that articulate clear research priorities focused on national public health needs.

Figure 93 Annual research and development expenditure as a proportion of GDP for 2005 (comparable country estimates) (*xxxiii*).

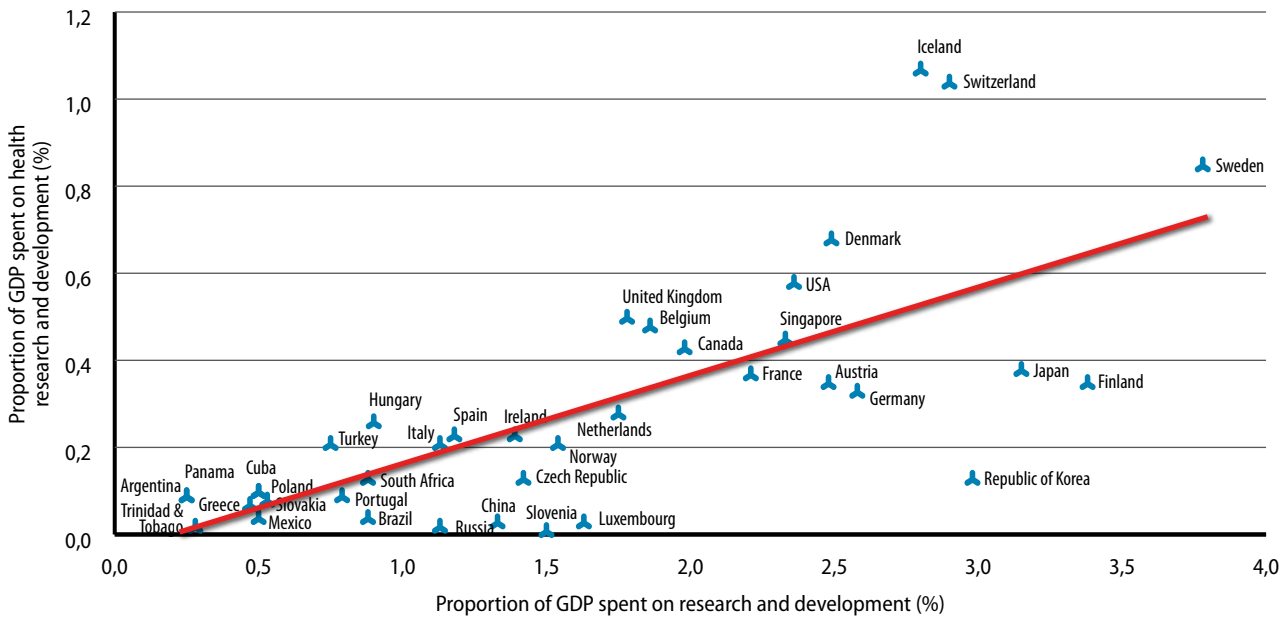
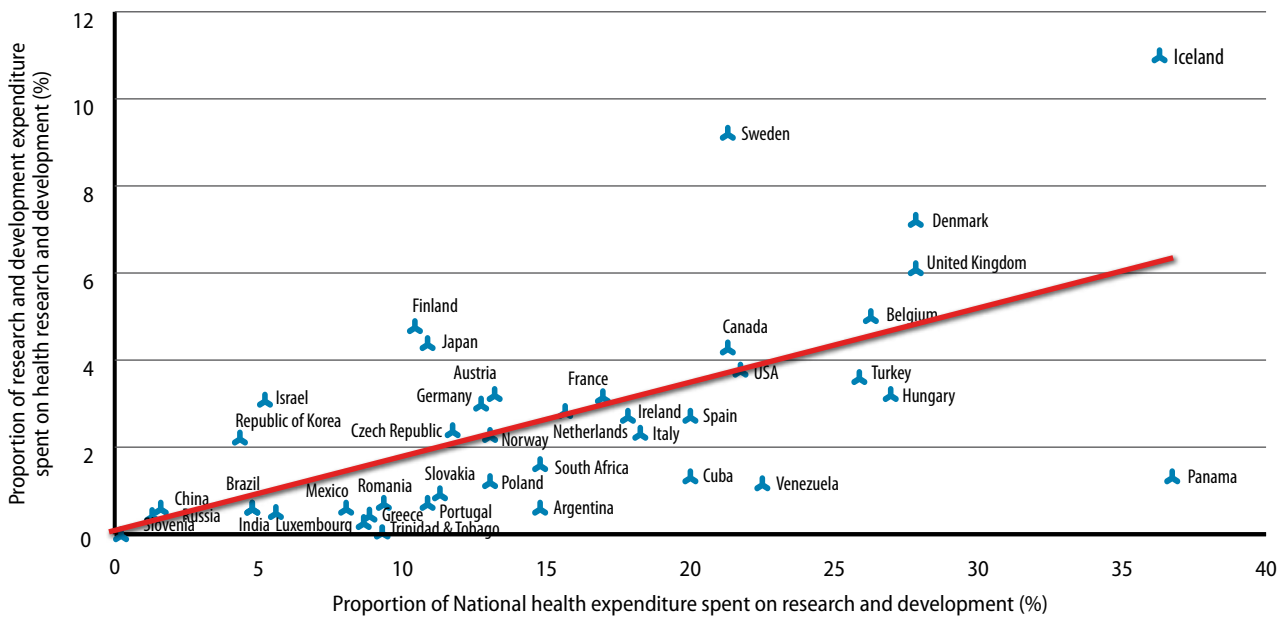


Figure 94 Annual research and development expenditure as a proportion of national health expenditure for 2005 (comparable country estimates) (*xxxiii*).



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Monitoring CVDs

KEY MESSAGES

- **Monitoring major cardiovascular risk factors and CVD death rates is a key component of CVD prevention and control.**
- **Monitoring and evaluation are tools for improving the accountability of different stakeholders.**

Monitoring CVDs and their risk factors provides the foundation for advocacy, policy development and programme implementation. Collection of mortality and risk factor data helps to assess the magnitude, track the trends of CVDs and their risks over time, and evaluate the effectiveness and impact of interventions. Figure 95 shows countries with surveillance data for risk factors. Lack of reliable data on cardiovascular mortality, risk factors and their determinants is a major obstacle to the progress of efforts aimed at addressing the cardiovascular epidemic. High-quality data can only be generated by adequate investment in civil registration and in surveillance systems (*6, 192*).

About one third of the countries in the world still do not have vital registration systems that capture the total number of deaths. Accurate reporting of the cause of death on the death certificate is a challenge. Although total all-cause mortality may be reported reasonably well, significant accuracy problems exist for cause-specific certification and coding in a large number of countries. In these countries, national initiatives to strengthen vital registration systems and cause-specific mortality are a key priority.

Sustainable NCD surveillance systems need to be formalized as a key component of the national public health infrastructure and become part of a country's health information system. They should be seen as more than a data collection exercise and mechanisms must be set in place for the analysis and dissemination of collected data to inform policy-making. Clearly, the capacity to undertake NCD surveillance varies considerably among countries. For countries with little existing NCD surveillance activity, the development of the system should be an incrementally evolving process. In low-resource settings with limited capacity, a viable and sustainable system needs to be simple and, at a minimum, gather data periodically on cardiovascular risk factors.

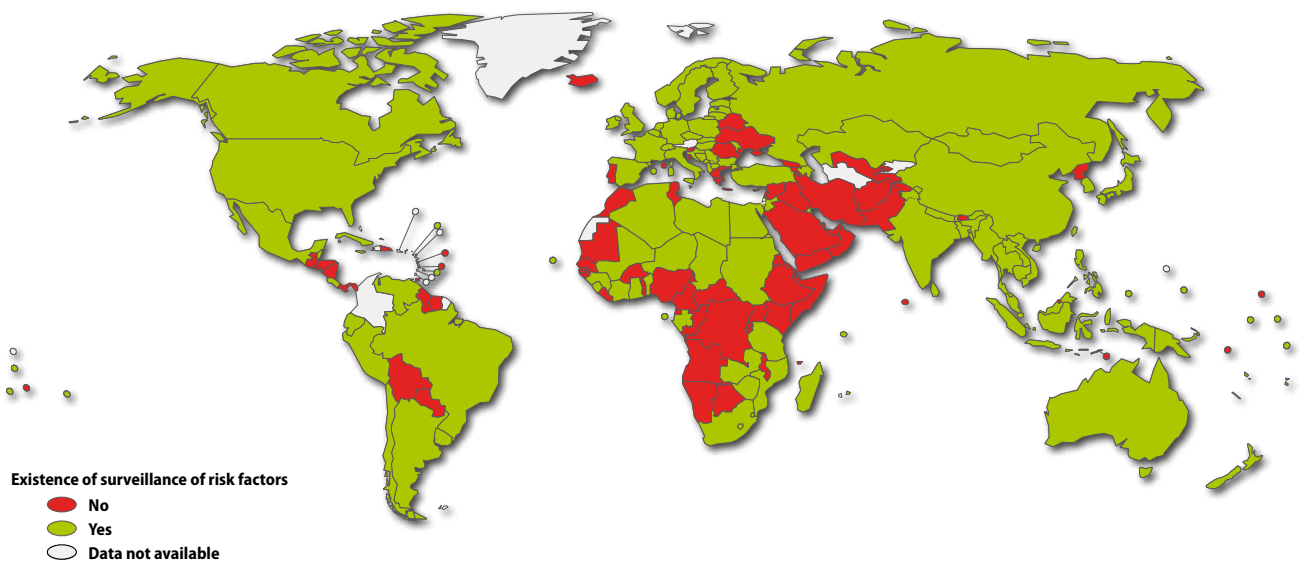
Quality risk factor surveillance is possible even in the least resourced countries. Such surveillance remains the priority within a more comprehensive NCD surveillance framework, as it predicts the future of the NCD burden and gives impetus for action.

There is also a need for measurable process and output indicators to permit accurate monitoring and evaluation of actions taken and their impact. The indicators cited in Table 2 are examples of measurements that can be used for monitoring and reporting on the national status of the prevention and control of CVD.

Table 2 Examples of indicators for monitoring CVDs

1. Mortality	■ All cause mortality by age, sex and region (urban and rural or by other administrative area, as available) ■ CVDs (ischaemic heart disease, cerebrovascular disease) mortality (urban and rural or by other administrative area, as available)
2. Exposure to risk factors	■ Prevalence of tobacco smoking ■ Prevalence of physical inactivity ■ Prevalence of adult population consuming more than 5 grams of dietary sodium chloride per day ■ Prevalence of population consuming less than 5 total servings (400 grams) of fruits and vegetables per day ■ Adult per capita consumption in litres of pure alcohol (recorded and unrecorded) ■ Prevalence of low weight at birth (<2.5 kg) ■ Prevalence of raised blood pressure, raised total cholesterol, raised blood glucose, overweight and obesity
3. Control of tobacco, diet and the harmful use of alcohol	■ Comprehensive tobacco controls (e.g. tobacco product tax increases, health warning labels, smoke-free legislation and advertising bans on all forms of direct and indirect tobacco advertising) ■ Healthy diet policy measures (e.g. food-based dietary guidelines, salt reduction, fiscal policies, consumer information/labelling and marketing restrictions) ■ Comprehensive alcohol control (e.g.tax increases, advertising bans and restricted access)
4. Prevention of heart attacks and strokes through a primary care approach	■ Percentage of adult population with a 10-year cardiovascular risk (fatal and non-fatal cardiovascular events), above 20%, managed through combination therapy (multiple drug treatment and counselling), including people with diabetes mellitus and established CVD

Figure 95 World map showing countries with surveillance data for risk factors (*6*).



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36

Social mobilization for prevention and control of CVDs

KEY MESSAGES

- **Civil society institutions are uniquely placed to mobilize political awareness and support for addressing CVD.**
- **Civil society institutions can play a key role in advocating for a higher priority given to CVDs/NCDs in health and development strategies and programmes.**
- **Civil society institutions are significant providers of prevention and health-care services and often fill gaps in services and training provided to the public and private sectors.**
- **Civil society institutions and nongovernmental organizations (NGOs) have an important role in strengthening capacity to address NCD prevention at the national level.**

Civil society institutions, in particular NGOs, academia and professional associations, have a major role to play in the prevention and control of NCDs at both country and global levels (193). Within countries, these groups help to shape the policy response and also support or deliver prevention and treatment programmes. In addition, these institutions provide important support to WHO technical and normative functions and for the implementation of regional- and country-level initiatives.

Civil society institutions have a number of roles that they are uniquely placed to fulfil. They have a high degree of "legitimacy" that comes from their separation from government and the commercial interests of the marketplace, combined with grassroots networks of committed citizens. Thus, advocacy is central to their role and they are well placed to raise political awareness and mobilize the society for wide support for NCD/CVD prevention and control. This is of particular importance in addressing the common risk factors of tobacco use, unhealthy diet, physical inactivity and the harmful use of alcohol where complex commercial, trade, political and social factors are at play. In particular, civil society institutions act as a political counterbalance to strong commercial and private sector interests in the formation and implementation of NCD/CVD prevention and control policies at the national level.

In many countries, civil society institutions also play a significant role in delivering prevention and treatment services for CVD. Partnerships between NGOs and academia can bring together the expertise and resources needed to build both workforce capacity and the skills of individuals, families and communities. A further role that civil society institutions are best placed to undertake is the independent monitoring and evaluation of progress in delivering on commitments, and in achieving outcomes, by both governments and the private sector.

Recently, a number of civil society institutions, in particular NGOs, have come together to coordinate more effectively their contribution to global NCD prevention and control. A significant milestone was the establishment of the NCD Alliance, a formal association of four international federations of NGOs representing the four main NCDs outlined in the WHO Global NCD Action Plan – CVD, diabetes, cancer and chronic respiratory disease – as a mutual platform for collaboration and joint advocacy. The value of these "collective" civil society organizations is considerable (*194*).

Participation and empowerment of the community

37

KEY MESSAGES

- **The priority accorded to NCD/CVDs in development work at global and national levels needs to be raised.**
- **Prevention of CVDs needs to be a priority of official development assistance in high-burden LMICs.**

Prevention and control of CVDs and socioeconomic development

Underpinning a multisectoral approach to prevention and control of CVD is also a claim for the broader value of health to society. The contributions of health to other important societal priorities such as social and economic development are now well understood. The rationale for all sectors to adopt a Health in All Policies approach is also linked to these benefits (*6*).

CVD entrenches people in poverty due to many reasons, including:

- loss of productivity due to illness and premature mortality;
- expenditure on health creating opportunity costs for other programmes such as education;
- effect of household poverty on family and the education of children;
- catastrophic health expenditure worsening poverty and debt situation.

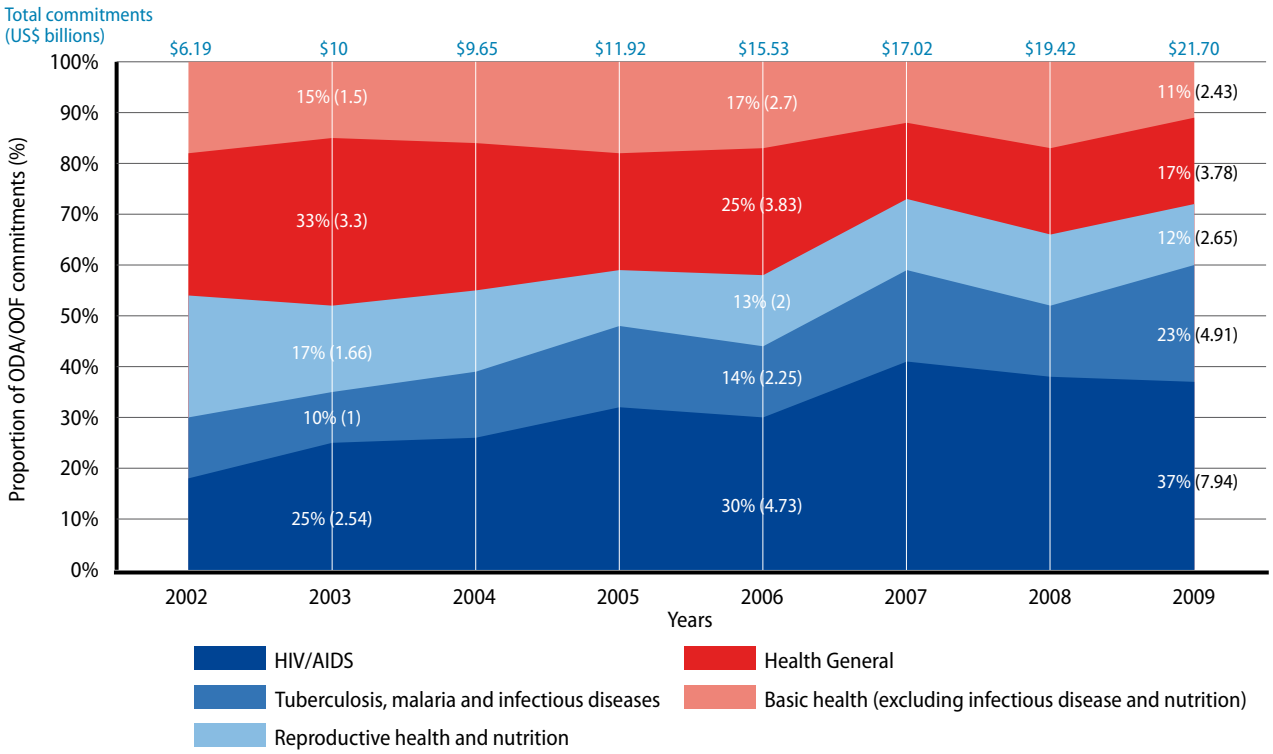
In LMICs, 40% of deaths from NCDs are below the age of 60, whereas as in high-income countries, only 11% are in this age group (*6*). In LMIC, many families with family members suffering from heart attacks and strokes experience catastrophic spending and loss of household income which drive them below the poverty line. In addition, CVD reduces productivity due to premature deaths and sickness. Increasing amounts of national resources are spent on health budgets because of escalating health-care demands caused by CVD. The highest burden of CVDs and prevalence of risk factors such as tobacco use is seen in the poorest segments of the population, and who also suffer from communicable diseases. This situation imposes risks in the economies of LMICs.

Evidence of the association between NCD/CVDs and potential impoverishment of households is growing. For example, a World Bank study in India showed that 25% of families with a member with CVD experiences catastrophic expenditure and 10% is driven into poverty (*195*).

LMICs facing the double burden of disease receive little development assistance that could help them to address both. The UN General Assembly resolution 65/1: Keeping the promise; united to achieve the Millennium Development Goals (MDGs) (*196*) highlighted the importance of tackling NCDs to achieve the MDGs. Specifically, the resolution calls for commitment to achieve MDG 6 (Combating HIV/AIDS, tuberculosis and malaria) by tackling NCDs.

Figure 96 shows the proportions of Official Development Assistance and other official flows committed by health sector disciplines by all donors from 2002 to 2009. As the death, disability and economic degradation caused by NCDs surpass the impact of infectious diseases, country leaders will be increasingly compelled to turn their attention to NCDs (*197*). Consequently, Official Development Assistance to prevent and control NCDs should increase (*198*). This would facilitate investment in health systems and the development and implementation of wider government policies that support the prevention and control of CVD in LMICs.

Figure 96 Proportions of donor commitments (Official Development Assistance and Other commitments) by health sector disciplines 2002 to 2009 (US $, billions) (*xxxiv*).



38

Generating resources for CVD prevention and control

KEY MESSAGES

- **There are different approaches to raise additional resources for health and reduce financial risks and barriers to accessing essential health-care interventions to address CVD.**
- **An innovative financing mechanism based on a global solidarity tobacco levy is feasible to promote sustainable health financing.**
- **A solidarity tobacco levy has the dual benefit of improving the health of the population by dissuading the use of a product dangerous to health, while raising more domestic funds for health.**

Efforts to achieve fairness in financing and financial risk protection through conventional and innovative means of financing are vital for protection against the risk of catastrophic expenditures on health, which are predominantly attributed to cardiovascular and other NCD-related health care (Figures 97 and 98).

As stated in the recent WHO World Health Report (99), innovative financing will be key to supplement national health budgets. Innovative financing for development is the principle of generating new predictable and sustainable funds, in addition to Official Development Assistance, for international developing financing purposes (*197–201*).

Figure 97 shows the change in poverty level by out-of-pocket payments in 11 countries in Asia. Figure 98 shows the out-of-pocket payments as a proportion of total health expenditure by average percentage of households selling assets or borrowing money to finance health.

NCD financing has been relatively absent from the global debate on innovative financing for health. Many examples exist at the national level as listed in the World Health Report: special levies on profitable companies; diaspora bonds; mobile phone voluntary solidarity contributions; digital taxes; tobacco excise taxes; excise tax on unhealthy food. Most of these systems do not produce large amounts of funds and additional revenue generated is not always used to support national health budgets (*99*).

However, evidence of countries using additional national innovative financing to support their health budget exists. For example, Thailand has been successfully funding its ThaiHealth Promotion Foundation since 2001 with 2% of the total national tax revenue on alcohol and tobacco products (202). The foundation is providing key support for advancing public health in the country.

Following the 2009 recommendations of the High-level Task Force on Innovative Financing, one of the new concepts to assess and develop was a global levy on tobacco products. As a consequence, WHO rose to the challenge to develop this concept, which has now become known as the Solidarity Tobacco Levy. The principle of the Solidarity Tobacco Levy is to build upon the recommendations of the WHO FCTC to increase national excise taxes on tobacco products via a micro-levy in all G20 (Group of Twenty) countries and to use the totality or a proportion of additional proceeds that are generated for intentional health financing purposes through a pooled funding system (*203*).

WHO calculates that in excess of US$ 7 billion could be raised each year if the Solidarity Tobacco Levy were to be fully applied in all G20 (plus1) countries and hence represent a significant new source of additional funding for health (*203*).

WHO estimates that a 50% increase in tobacco excise taxes would generate US$ 1.42 billion in additional funds in 22 low-income countries for which data are available. If all of this were allocated to health, it would allow government health spending to increase by more than 25% in several countries and, at the extreme level, by 50% (*203*).

Figure 97 **Change in poverty (USD 1.08 per day) head count ratio by out of pocket payments in 11 countries in Asia (*99, xxv, 11*).**

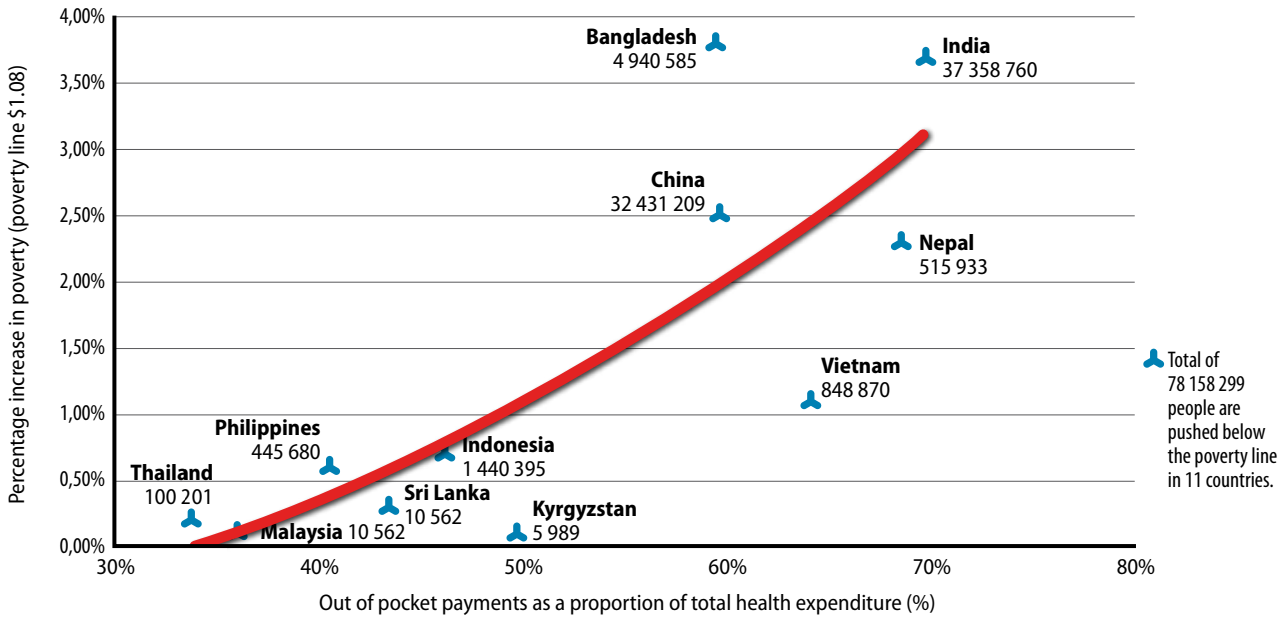
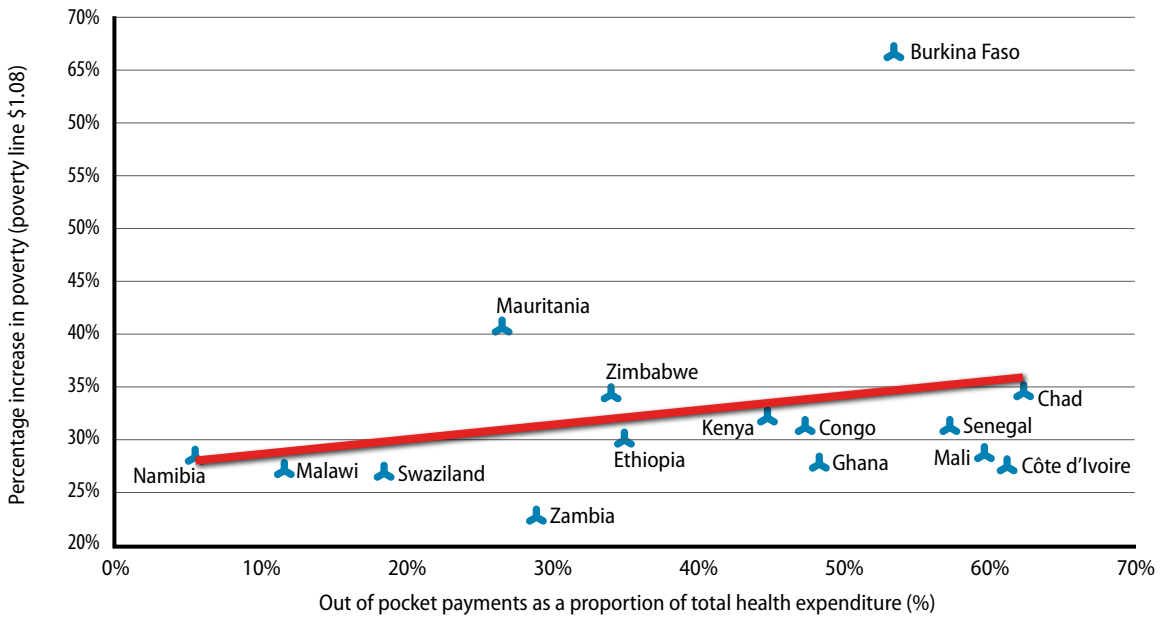


Figure 98 **Out of pocket payments as a proportion of total health expenditure by average percentage of households selling assets or borrowing money to finance health (*99, xxvi, 11*).**



39

CVD prevention and control: Why it should not be ignored any longer?

KEY MESSAGES

- **International efforts in poverty reduction will be derailed if the global challenge of CVD is not addressed.**
- **If no action is taken, increasing numbers of people will slip into high-risk categories or develop CVD due to continuing exposure to risk factors.**
- **Millions of deaths due to CVD can be prevented by scaling up implementation of high-impact interventions that already exist.**
- **High-impact interventions include policies that promote government-wide action: stronger anti-tobacco controls; promotion of healthier diets and physical activity; reducing the harmful use of alcohol; improving people's access to essential health care.**

Currently, CVDs (heart attacks and strokes) and other NCDs represent a leading threat to global health and development (Figures 99–100). Together, they are responsible for 60% of deaths globally and are projected to rise further (Figures 101, 102). Around 80% of these deaths are in LMICs, which can least afford the social and economic consequences they bring. It is estimated that more than eight million deaths from NCDs before the age of 60 occur every year in LMICs (*6*). Most of these premature deaths are due to heart attacks and strokes and many could be preventable if public policies involving all government departments were established and effectively implemented.

There are new and complex dimensions to the NCD problem in LMICs. Many LMICs are now beginning to suffer from a quadruple burden: NCDs, communicable diseases including HIV/AIDS; violence and injuries; and mental diseases. They also have a double burden of undernutrition and obesity. In addition, infant and maternal mortality rates in many low-income countries are deplorably high (*204, 205*). There is clear evidence that poor nutrition during pregnancy and the first two years of life predisposes individuals and populations to the development of CVD and diabetes later in life. Furthermore, NCDs are also linked to the burden of HIV and tuberculosis, and recent analyses suggest that a significant reduction in the magnitude of NCDs would impact positively on the progress towards the achievement of the MDG (*206*). Postponing action to address NCDs will compound the situation further and destroy the health gains that have resulted from years of investment in combating communicable diseases and maternal and child health.

Prevention of NCDs is essential for sustainable development. Progress in poverty alleviation efforts and attainment of MDGs will be compromised if the impact of the global NCD epidemic on socioeconomic development is ignored. Discussions at the 2009 ECOSOC High-level Segment (6–9 July 2009, Geneva) drew the attention of the international community to the NCD gap in the global development agenda. Since then, a growing number of Member States have stressed that global development initiatives must take into account the prevention and control of NCDs.

A number of LMICs recently called on Member States of the UN General Assembly to undertake action. Their call has been supported by the Commonwealth heads of government, which issued the "Statement on Commonwealth Action to Combat Noncommunicable Diseases" (*207*).

Figure 99 Mortality rates of CVDs in high income and low income countries (age standardized, 2008) (*1*, *6*).

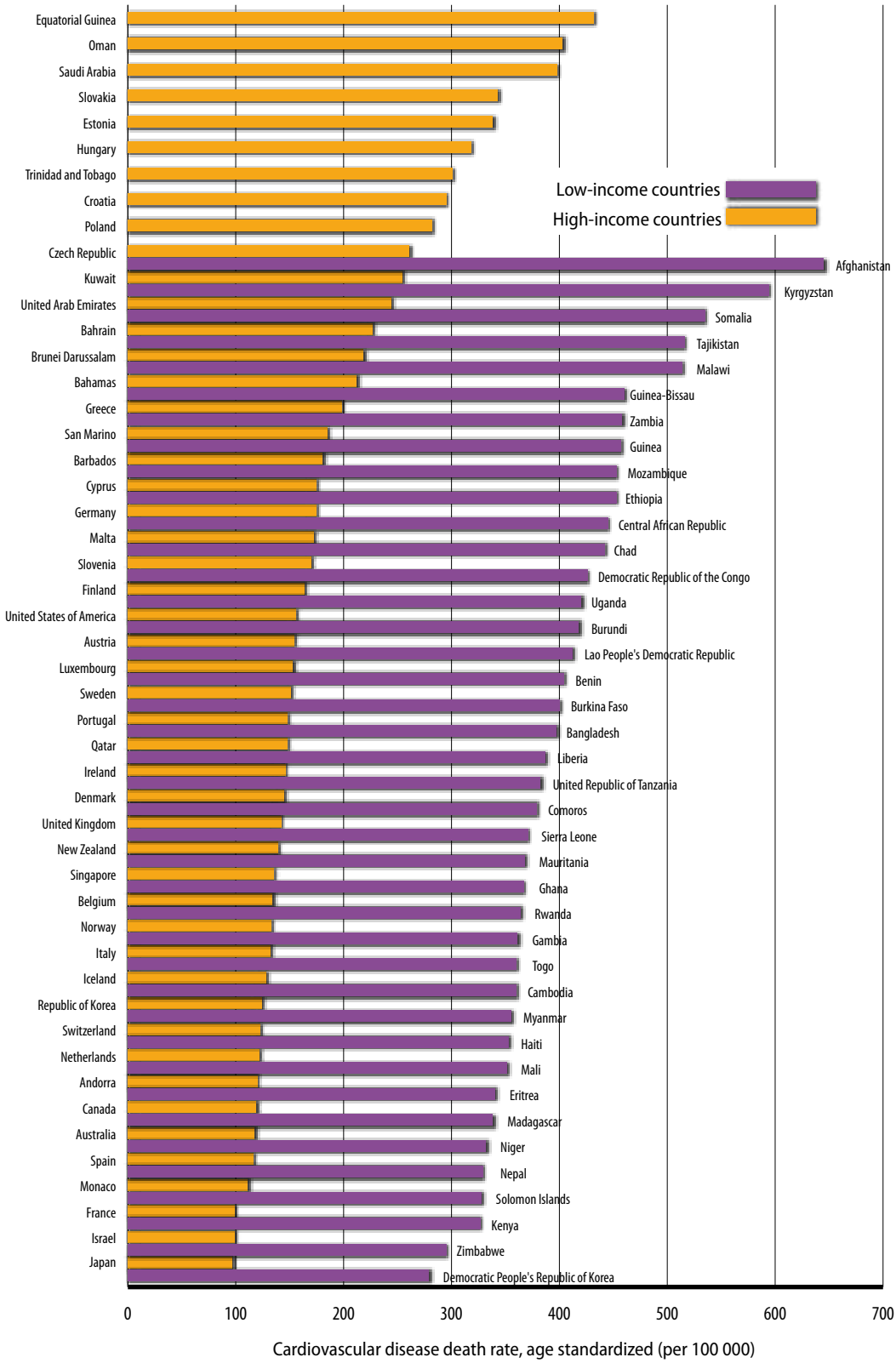


Figure 100 **Mortality rates of CVDs in high-income and low-income countries, 2008 (*1*, *6*).**

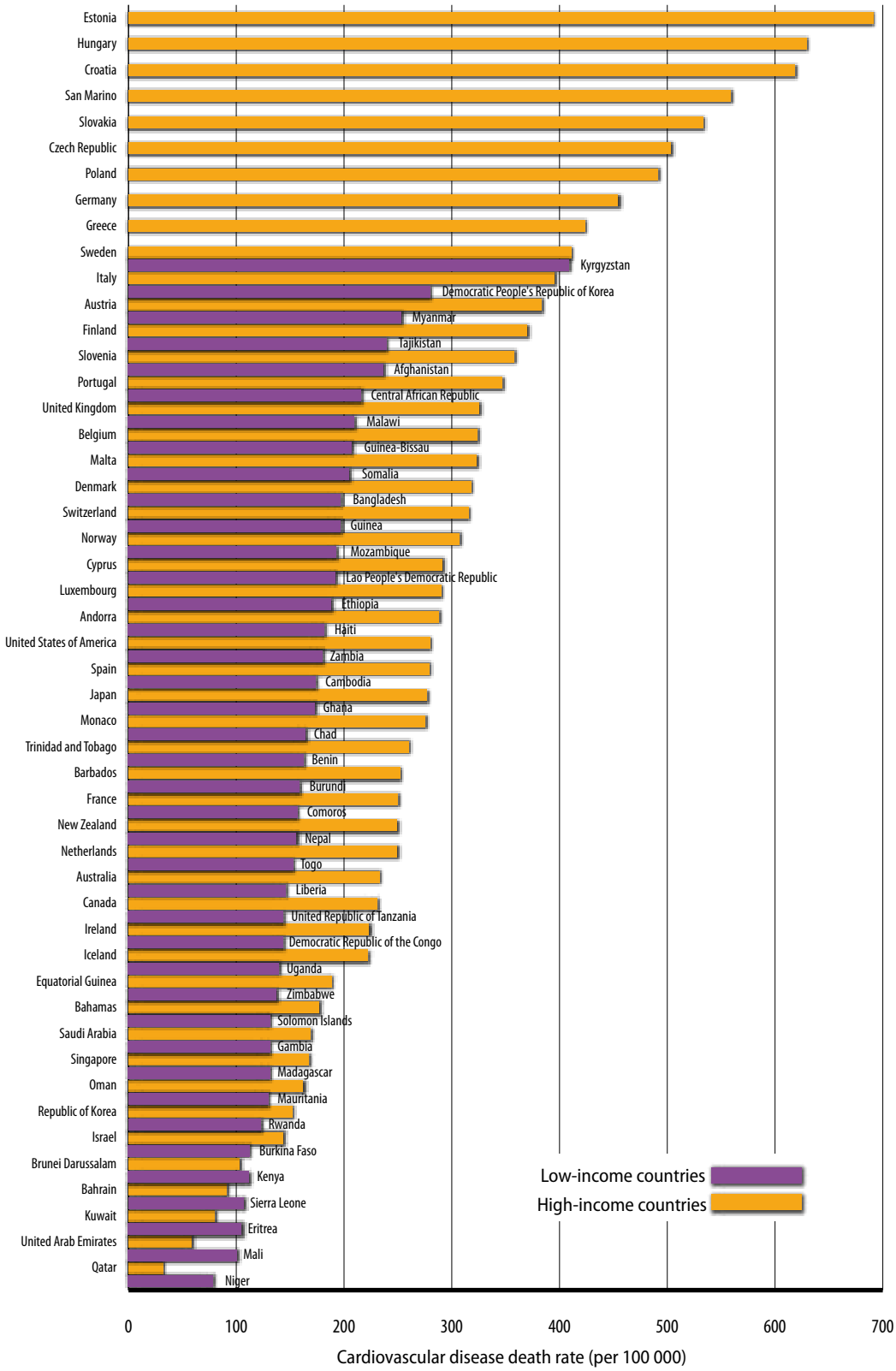


Figure 101 **Graph showing the projected mortality trends from 2008 to 2030 for NCDs, CVDs and communicable diseases (*5*).**

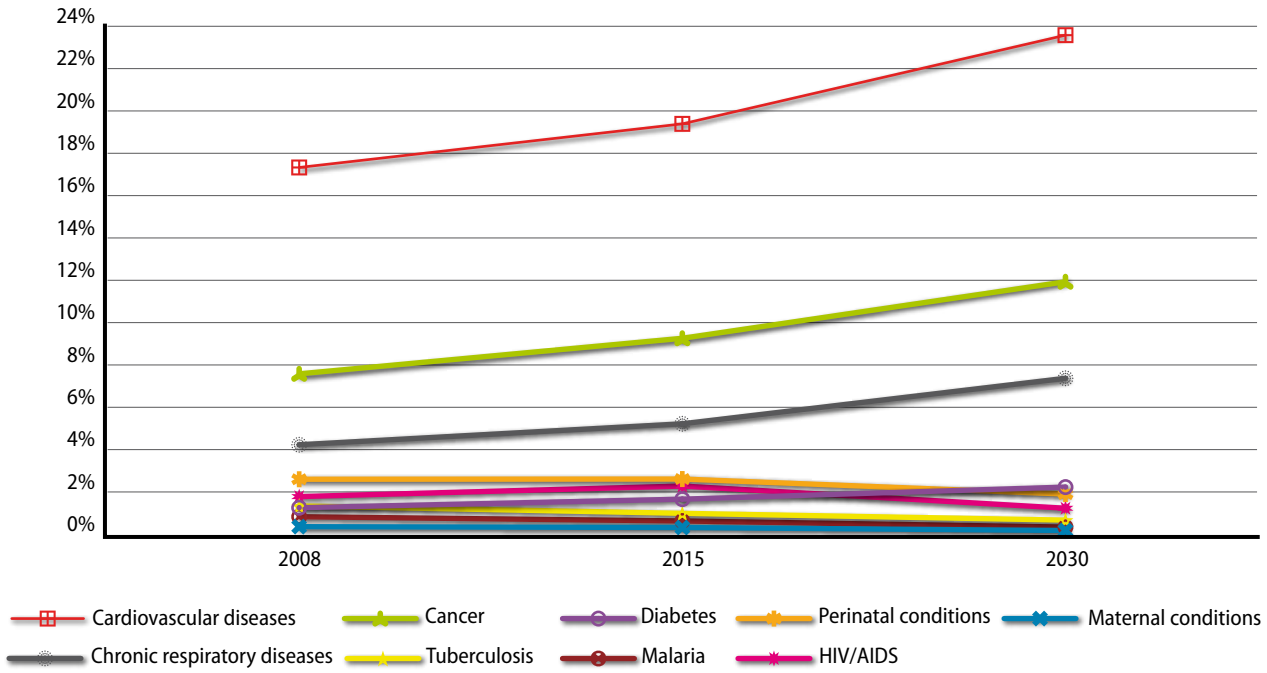


Figure 102 **Ten leading causes of burden of disease, world, 2004 and 2030 (*5*).**

2004 Disease or injury	As % of total DALYs	Rank	Rank	As % of total DALYs	2030 Disease or injury
Lower respiratory infections	6.2	1	1	6.2	Unipolar depressive disorders
Diarrheal diseases	4.8	2	2	5.5	**Ischaemic heart disease**
Unipolar depressive disorder	4.3	3	3	4.9	Road traffic accidents
Ischaemic heart disease	4.1	4	4	4.3	**Cerebrovascular disease**
HIV/AIDS	3.8	5	5	3.8	COPD
Cerebrovascular disease	3.1	6	6	3.2	Lower respiratory infections
Prematurity and low birth weight	2.9	7	7	2.9	Hearing loss, adult onset
Birth asphyxia and birth trauma	2.7	8	8	2.7	Refractive errors
Road traffic accidents	2.7	9	9	2.5	HIV/AIDS
Neonatal infections and other	2.7	10	10	2.3	Diabetes mellitus
COPD	2.0	13	11	1.9	Neonatal infections and other
Refractive errors	1.8	14	12	1.9	Prematurity and low birth weight
Hearing loss, adult onset	1.8	19	18	1.6	Birth asphyxia and birth trauma
Diabetes mellitus	1.3	19	18	1.6	Diarrheal diseases

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CVD Prevention and control: Vision, roadmap and a landmark event

KEY MESSAGES

- **The WHO Global NCD Action Plan endorsed by the WHA for prevention and control of NCDs, in 2008, provides a clear vision and road map to address the cardiovascular epidemic.**
- **A public health framework that incorporates the objectives of the Global NCD Action Plan is essential for prevention and control of CVD at the national level.**

The WHO Global NCD Action Plan (*3*), endorsed by the World Health Assembly in May 2000, focuses on three main areas: (i) mapping the NCD epidemic and determinants; (ii) reducing the level of exposure of individuals and communities to the common risk factors; and (iii) strengthening health care for people with NCDs.

In 2007, the WHA adopted resolution WHA60.23, entitled Prevention and Control of Noncommunicable Diseases: Implementation of the Global Strategy, which requested the Director-General to prepare an action plan for the prevention and control of NCDs. Called the WHO Global NCD Action Plan, it was approved by the 61st World Health Assembly in 2008. The Action Plan urges Member States to continue to implement the actions agreed by the WHA in resolution WHA60.23 (*3*).

The WHO Global NCD Action Plan (*3*) is intended to support coordinated, comprehensive and integrated implementation of strategies and evidence-based interventions across individual NCDs and their risk factors and determinants, both at the global and national levels through the elaboration of six broad objectives that outline a series of activities for Members States, the WHO Secretariat and international partners.

Objective 1. To raise the priority accorded to NCDs in development work at global and national levels, and to integrate prevention and control of NCDs into policies across all government departments.

Objective 2. To establish and strengthen national policies and plans for the prevention and control of NCDs.

Objective 3. To promote interventions to reduce the primary shared modifiable risk factors for NCDs: tobacco use, unhealthy diets, physical inactivity and the harmful use of alcohol.

Objective 4. To promote research for the prevention and control of NCDs.

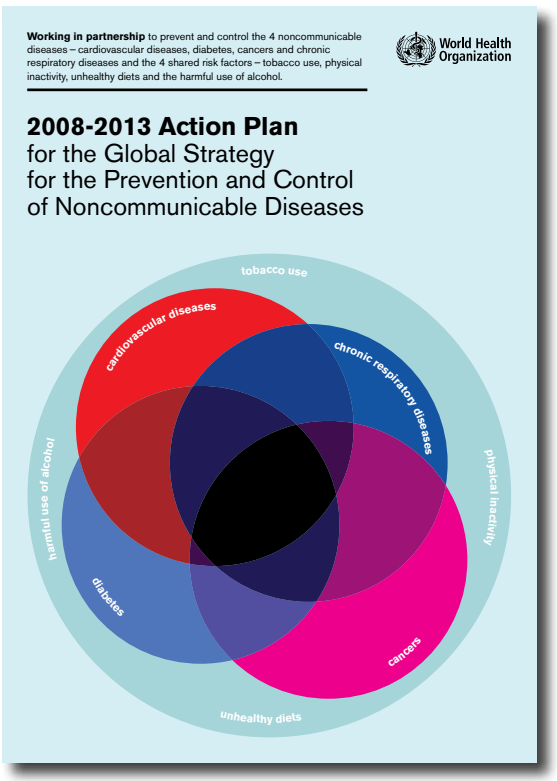
Objective 5. To promote partnerships for the prevention and control of NCDs.

Objective 6. To monitor NCDs and their determinants and evaluate progress at the national, regional and global levels.

The progress in implementation of the WHO Global NCD Action Plan in 2008–2009 has been reported to the 126th Executive Board (*208*) and the 63rd World Health Assembly (*209*).

A landmark event for prevention and control of CVD/NCD: High-level Meeting of the UN General Assembly on Noncommunicable Diseases, New York, 19–20 September 2011

In consecutive sessions, in May and December 2010, the UN General Assembly adopted resolution 64/265 (Prevention and control of noncommunicable diseases) (*210*) and


Working in partnership to prevent and control the 4 noncommunicable diseases – cardiovascular diseases, diabetes, cancers and chronic respiratory diseases and the 4 shared risk factors – tobacco use, physical inactivity, unhealthy diets and the harmful use of alcohol.
World Health Organization
2008-2013 Action Plan
for the Global Strategy
for the Prevention and Control
of Noncommunicable Diseases
tobacco use
cardiovascular diseases
chronic respiratory diseases
physical inactivity
harmful use of alcohol
diabetes
cancers
unhealthy diets

resolution 65/238 (Scope, modalities, format and organization of the High-level Meeting on Noncommunicable Diseases) (*211*). The resolutions related, respectively, to the convening of and detailed organizational arrangements for a High-level Meeting of the UN General Assembly on the prevention and control of NCDs.

In support of the implementation of resolution 64/265, a side event was organized on 20 September 2010 by WHO, jointly with Member States, on the High-level Meeting and the links between the MDGs and NCDs (*210*).

The General Assembly provided further support for the High-level Meeting with resolutions 65/1 (Keeping the promise: United to achieve the Millennium Development Goals) and 65/95 (Global health and foreign policy) (*196, 212*).

In September 2010, the General Assembly also adopted resolution 65/1, which includes the Outcome Document of the 2010 Millennium Development Goal Summit. In the Document, heads of state and government committed themselves to achieving the MDGs by, inter alia, strengthening the effectiveness of health systems and proven interventions to address evolving health challenges such as NCDs, and to undertaking concerted action and a coordinated response at the national, regional and global levels in order to adequately address the developmental and other challenges posed by NCDs.

As mandated by resolution 65/238, the High-level Meeting would result in a concise action-oriented Outcome Document. The Outcome Document is intended to generate global momentum and commitment both in implementing the WHO Global NCD Action Plan (WHA53.17) and it's Action Plan (WHA61.14) and to the "inclusion of the prevention and control of NCDs as an integral part of the global development agenda and related investment decisions" (quoted from proposed action 17.a included in the Action Plan), building on the 2010 commitment from heads of state and government to "undertake concerted action and a coordinated response in order to adequately address the developmental challenges posed by NCDs" (quoted from operative paragraph 76.i of the MDG Outcome Document included in resolution 65/1, which was adopted by the General Assembly on 22 September 2010) (*196, 211*).

At the 64th World Health Assembly, Member States unanimously endorsed a resolution on the preparations for the UN General Assembly High-level Meeting on the Prevention and Control of Noncommunicable Diseases (*213*).

The High-level Meeting is a unique opportunity to end years of neglect of the CVD epidemic and save the lives of many millions who continue to die, particularly in LMICs (Figures 101 and 102), despite the availability of high-impact interventions. The expectation of the world is that heads of state will, at this landmark event, spearhead concerted action that will mitigate this global public health crisis.

Global and Regional Milestones; chronology of events culminating in the adoption of United Nations General Assembly Resoultions 64/265, 65/1, 65/95 AND 65/238

May 2000 - The World Health Assembly adopts resolution WHA53.17, reaffirming that the global strategy for the prevention and control of noncommunicable diseases is directed at reducing premature mortality and improving quality of life, and providing a global vision for tackling noncommunicable diseases.

- May 2003 – The Health Assembly adopts the WHO Framework Convention on Tobacco Control.
- May 2004 – The Health Assembly endorses the Global Strategy on Diet, Physical Activity and Health.
- December 2006 – United Nations General Assembly adopts resolution 61/225, encouraging Member States to develop national policies for the prevention, treatment and care of diabetes.
- September 2007 – Heads of Government of the Caribbean Community, meeting at a special CARICOM Summit on NCDs in Port-of- Spain issues a NCDs declaration.
- May 2008 – The World Health Assembly endorses the action plan for the global strategy for the prevention and control of NCDs, which provides a roadmap for Member States, the Secretariat and international partners.
- April 2009 – A regional ministerial meeting held in Beijing issues recommendations that include accelerating actions to combat NCDs through health literacy, including the use of low-cost, simple but effective health education interventions.
- May 2009 – The ECOSOC/UNESCWA/UNDESA/WHO Western Asia Ministerial Meeting is held in Doha on 10 and 11 May. Participants adopt the Doha Declaration on NCDs and Injuries.

- July 2009 – During the general debate of the United Nations Economic and Social Council's High-level Segment (Geneva, 6–9 July) national and international leaders call on global development initiatives to take into account the prevention and control of NCDs. A Ministerial Declaration is subsequently adopted, in which there is a call for urgent action to implement the global strategy for the prevention and control of NCDs and the action plan.
- November 2009 – The Commonwealth Heads of State and Government, gathered at the Commonwealth Heads of Government Meeting in Port-of-Spain from 27 to 29 November, issue a statement on Commonwealth action to combat noncommunicable diseases.
- 8 May 2010 – The United Nations General Assembly, at its sixty-fourth session, unanimously adopts **resolution 64/265** on the prevention and control of NCDs. The resolution is cosponsored by 78 Member States, as well as by Cameroon on behalf of the Group of African States.
- May 2010 – The World Health Assembly adopts resolution WHA63.13 on the global strategy to reduce the harmful use of alcohol, as well as WHA63.14 on the marketing of food and non-alcoholic beverages to children.
- July 2010 – The United Nations Economic and Social Council adopts resolution 2010/8 on tobacco use and maternal and child health, urging Member States to consider the importance of tobacco control in improving maternal and child health as part of their public health policies and in their development cooperation programmes.
- September 2010 – The High-level Plenary Meeting of the sixty-fifth session of the United Nations General Assembly on the Millennium Development Goals adopts **resolution 65/1**. In the resolution, Heads of State and Government commit themselves to strengthening "the effectiveness of health systems and proven interventions to address evolving health challenges, such as the increased incidence of NCDs".
- November 2010 – The note by the Secretary-General transmitting the report by the Director-General on the global status on NCDs, with a particular focus on the developmental challenges faced by developing countries is discussed on 23 November 2010 at the United Nations General Assembly (document A/65/362).
- December 2010 – The United Nations General Assembly, at its sixty-fifth session, unanimously adopts **resolution 65/238** on the scope, modalities, format and organization of the high-level meeting of the United Nations General Assembly on the prevention and control of NCDs.
- December 2010 – The United Nations General Assembly, at its sixty-fifth session, unanimously adopts **resolution 65/95** on global health and foreign policy, which inter alia welcomes the decision of the United Nations General Assembly to convene a high-level meeting in September 2011, with the participation of Heads of State and Government, on the prevention and control of NCDs, and also welcomes plans to hold the First Global Ministerial Conference on Healthy Lifestyles and Noncommunicable Disease Control, in Moscow, on 28 and 29 April 2011.

The World Health Organization

World Health Organization is the United Nations Health Agency founded in 1948. It plays a critical role as the worlds leading technical authority on health. WHO has served the health needs of the world over the last 60 odd years, through its many constitutional functions including the convening of experts, normative and standard setting work, monitoring and surveillance of health and disease, shaping the health research agenda and technical cooperation with countries. WHO's role in tackling diseases is unparalleled. WHO promotes evidence-based debate, and has numerous formal and informal networks around the world. WHO's regionalized structure provides it with multiple opportunities for engaging with countries. WHO's strengths lie in its neutral status and nearly universal membership, its impartiality and its strong convening power. WHOs mandated role in global health as set out in its constitutional objectives addresses right to health, social justice and equity for all.

World Heart Federation

The World Heart Federation is dedicated to leading the global fight against heart disease and stroke with a focus on low- and middle-income countries via a united community of more than 200 member organizations. With its members, the World Heart Federation works to build global commitment to addressing cardiovascular health at the policy level, generates and exchanges ideas, shares best practice, advances scientific knowledge and promotes knowledge transfer to tackle cardiovascular disease – the world's number one killer. It is a growing membership organization that brings together the strength of cardiac societies and heart foundations from more than 100 countries. Through our collective efforts we can help people all over the world to lead longer and better heart-healthy lives.

World Stroke Organization

The World Stroke Organization (WSO) was established in October 2006, and is based on membership from individual scientists as well as scientific and stroke support societies. Its mission is to provide access to stroke care, promote research and knowledge by (1) promoting prevention and care for persons with stroke and vascular dementia (2) fostering the best standards of practice (3) education, in collaboration with other international, public, and private organizations and (4) facilitating clinical research. The WSO World Stroke Congresses are held biannually. The WSO Journal, the International Journal of Stroke, launched in 2005, is a clinically-oriented journal with a rapidly increasing impact factor. WSO organizes the World Stroke Campaign and the World Stroke Day (held every year on October 29). WSO is an international NGO in official relations with the WHO, and is involved in preparations of the ICD-11. WSO is the global voice for stroke.

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Annexes

Annex I
World Health Assembly resolution A64/61

In May 2011, countries unanimously endorsed a resolution (Annexure II) on the preparations for the United Nations General Assembly high-level meeting on the prevention and control of noncommunicable diseases to be held this September.

The World Health Assembly resolution (agenda item 13.12) recognized WHO's leading role as the primary specialized agency for health and reaffirmed its leadership in promoting global action against NCDs. The resolution urges Member States to prepare for the UN General Assembly High-level Meeting on noncommunicable diseases and be represented at the heads of state and government level. The resolution called for addressing the NCDs challenge through an action-oriented outcome document.

The resolution also urged the WHO Director-General to work together with the wide range of UN and non-UN stakeholders to address the NCD challenges and highlight the social, economic and financial impacts of the diseases, particularly in developing countries.

Before the WHA, WHO has collaborated with countries worldwide to stage six regional consultations on NCDs and to prepare for the UN high-level meeting, as well as organizing the First Global Ministerial Conference on Healthy Lifestyles and NCD Control, which was hosted by the Russian Federation in Moscow in late April 2011.

Preparations for the High-level Meeting of the United Nations General Assembly on the prevention and control of noncommunicable diseases, following on the Moscow Conference (*)

The Sixty-fourth World Health Assembly,

- Having considered the report on WHO's role in the preparation, implementation and follow-up to the high-level meeting of the United Nations General Assembly on the prevention and control of noncommunicable diseases2 (high-level meeting);
- Deeply concerned that the global burden and threat of noncommunicable diseases continues to grow, in particular in developing countries, and convinced that global action is necessary and urgent response is needed, including by effectively addressing the key risk factors for noncommunicable diseases;
- Reaffirming its commitment to the aim of the global strategy for the prevention and control of noncommunicable diseases to reduce premature mortality and improve quality of life (resolution WHA53.17);
- Further recalling United Nations General Assembly resolution 64/265 in which the General Assembly decided to convene a high-level meeting of the General Assembly in September 2011, with the participation of Heads of State and Government, on the prevention and control of noncommunicable diseases, as well as resolution 65/238 on the scope, modalities, format and organization of the high-level meeting; Recognizing the leading role of the World Health Organization as the primary specialized agency for health, and reaffirming the leadership role of WHO in promoting global action against noncommunicable diseases;
- Noting with appreciation the first *WHO Global status report on noncommunicable diseases* launched on 27 April 2011, which may serve as an input into the preparatory process for the high-level meeting; Noting the outcomes of the regional consultations which were held by WHO in collaboration with Member States, with the support of relevant United Nations agencies and entities, which will serve to provide inputs to the preparations for the high-level meeting, as well as to the meeting itself; Welcoming the outcome of the First Global Ministerial Conference on Healthy Lifestyles and Noncommunicable Disease Control, which was organized by the Russian Federation and WHO from 28 to 29 April 2011 in Moscow,

1 First Global Ministerial Conference on Healthy Lifestyles and Noncommunicable Disease Control (Moscow, Russian Federation, 28–29 April 2011).

2 Resolution 64/265 – Prevention and control of noncommunicable diseases.

1. ENDORSES the Moscow Declaration, annexed to the present resolution, including as a key input for the preparations leading to the High-level Meeting;

2. URGES Member States:1

(1) to continue to support the preparations at national, regional and international levels for the high-level meeting, including, where feasible and relevant, situation analysis of noncommunicable diseases and their risk factors, as well as an assessment of national capacity and health system response to address noncommunicable diseases;

(2) to be represented at the level of Heads of State and Government at the high-level meeting and to call for action through a concise action-oriented outcome document;

(3) to consider, as appropriate and where relevant, including in their national delegations to the high-level meeting parliamentarians, representatives of civil society, including nongovernmental organizations, academia and networks working on the control and prevention of noncommunicable diseases;

3. REQUESTS the Director-General:

(1) to continue exercising the leading role of WHO as the primary specialized agency for health working together in a coordinated way with the United Nations, its specialized agencies, funds and programmes, and other relevant intergovernmental organizations and international financial institutions, in supporting Member States, including:

(i) in undertaking concerted action and a coordinated response in order to promptly and appropriately address the challenges posed by noncommunicable diseases, including further building on available situation analyses on noncommunicable diseases and risk factors; and

(ii) in highlighting the social and economic impact of noncommunicable diseases, including financial challenges, in particular in developing countries;

(2) to take into account the outcomes from the Moscow Conference into the preparations for the high-level meeting;

(3) to ensure adequate financial and human resources within the WHO to prepare for the high-level meeting and to respond swiftly to its recommendations;

(4) to report to the Sixty-fifth World Health Assembly, through the Executive Board, on the outcomes of the first Global Ministerial Conference on Healthy Lifestyles and Noncommunicable Disease Control and the high-level meeting, and to develop, together with relevant United Nations agencies and entities, an implementation and follow-up plan for the outcomes, including its financial implications, for submission to the Sixty-sixth World Health Assembly, through the Executive Board.

1 And, where applicable, regional economic integration organizations.

Annex II
Moscow Declaration

First Global Ministerial Conference on Healthy Lifestyles and Noncommunicable Disease Control, Moscow, 28-29 April 2011

Moscow Declaration Preamble

We, the participants in the First Global Ministerial Conference on Healthy Lifestyles and Noncommunicable Disease (NCDs) Control, gathered in Moscow on 28-29 April 2011.

I. Express appreciation for the leading role of the World Health Organization and the Government of the Russian Federation in the preparation and holding of the Ministerial Conference.

II. Recognize that the right of everyone to the enjoyment of the highest attainable standards of physical and mental health cannot be achieved without greater measures at global and national levels to prevent and control NCDs.

III. Acknowledge the existence of significant inequities in the burden of NCDs and in access to NCD prevention and control, both between countries, as well as within countries.

IV. Note that policies that address the behavioural, social, economic and environmental factors associated with NCDs should be rapidly and fully implemented to ensure the most effective responses to these diseases, while increasing the quality of life and health equity.

V. Emphasize that prevention and control of NCDs requires leadership at all levels, and a wide range of multi-level, multisectoral measures aimed at the full spectrum of NCD determinants (from individual-level to structural) to create the necessary conditions for leading healthy lives. This includes promoting and supporting healthy lifestyles and choices, relevant legislation and policies; preventing and detecting disease at the earliest possible moment to minimize suffering and reduce costs; and providing patients with the best possible integrated health care throughout the life cycle including empowerment, rehabilitation and palliation.

VI. Recognize that a paradigm shift is imperative in dealing with NCD challenges, as NCDs are caused not only by biomedical factors, but also caused or strongly influenced by behavioural, environmental, social and economic factors.

VII. Affirm our commitment to addressing the challenges posed by NCDs, including, as appropriate, strengthened and reoriented policies and programmes that emphasize multi-sectoral action on the behavioural, environmental, social and economic factors.

VIII. Express our belief that NCDs should be considered in partnerships for health; that they should be integrated into health and other sectors' planning and programming in a coordinated manner, particularly in low- and middle income countries; that they should be part of the global research agenda and that the impact and sustainability of approaches to prevent and control NCDs will be enhanced through health systems strengthening and strategic coordination with existing global health programs.

Rationale for action

1. NCDs, principally cardiovascular diseases, diabetes, cancers and chronic respiratory diseases, are the leading causes of preventable morbidity and disability, and currently cause over 60% of global deaths, 80% of which occur in developing countries. By 2030, NCDs are estimated to contribute to 75% of global deaths.

2. In addition, other NCDs such as mental disorders also significantly contribute to the global disease burden.

3. NCDs have substantial negative impacts on human development and may impede progress towards the Millennium Development Goals (MDGs).

4. NCDs now impact significantly on all levels of health services, health care costs, and the health workforce, as well as national productivity in both emerging and established economies.

5. Worldwide, NCDs are important causes of premature death, striking hard among the most vulnerable and poorest populations. Globally they impact on the lives of billions of people and can have devastating financial impacts

that impoverish individuals and their families, especially in low- and middle-income countries.

6. NCDs can affect women and men differently, hence prevention and control of NCDs should take gender into account.

7. Many countries are now facing extraordinary challenges from the double burden of disease: communicable diseases and noncommunicable diseases. This requires adapting health systems and health policies, and a shift from disease-centred to people-centred approaches and population health measures. Vertical initiatives are insufficient to meet complex population needs, so integrated solutions that engage a range of disciplines and sectors are needed. Strengthening health systems in this way results in improved capacity to respond to a range of diseases and conditions.

8. Evidence-based and cost-effective interventions exist to prevent and control NCDs at global, regional, national and local levels. These interventions could have profound health, social, and economic benefits throughout the world.

9. Examples of cost-effective interventions to reduce the risk of NCDs, which are affordable in low-income countries and could prevent millions of premature deaths every year, include measures to control tobacco use, reduce salt intake and reduce the harmful use of alcohol.

10. Particular attention should be paid to the promotion of healthy diets (low consumption of saturated fats, trans fats, salt and sugar, and high consumption of fruits and vegetables) physical activity in all aspects of daily living.

11. Effective NCD prevention and control require leadership and concerted "whole of government" action at all levels (national, sub-national and local) and across a number of sectors, such as health, education, energy, agriculture, sports, transport and urban planning, environment, labour, industry and trade, finance and economic development.

12. Effective NCD prevention and control require the active and informed participation and leadership of individuals, families and communities, civil society organizations, private sector where appropriate, employers, health care providers and the international community.

Commitment to action

We, therefore, commit to act by:

At the Whole of Government level:

1. Developing multi-sectoral public policies that create equitable health promoting environments that enable individuals, families and communities to make healthy choices and lead healthy lives;

2. Strengthening policy coherence to maximize positive and minimize negative impacts on NCD risk factors and the burden resulting from policies of other sectors;

3. Giving priority to NCD prevention and control according to need, ensuring complementarity with other health objectives and mainstreaming multi-sectoral policies to strengthen the engagement of other sectors;

4. Engaging civil society to harness its particular capacities for NCD prevention and control;

5. Engaging the private sector in order to strengthen its contribution to NCD prevention and control according to international and national NCD priorities;

6. Developing and strengthening the ability of health systems to coordinate, implement, monitor and evaluate national and sub-national strategies and programmes on NCDs;

7. Implementing population-wide health promotion and disease prevention strategies, complemented by individual interventions, according to national priorities. These should be equitable and sustainable and take into account gender, cultural and community perspectives in order to reduce health inequities;

8. Implementing cost-effective policies, such as fiscal policies, regulations and other measures to reduce common risk factors such as tobacco use, unhealthy diet, physical inactivity and the harmful use of alcohol;

9. Accelerating implementation by States Parties of the provisions of the WHO Framework Convention on Tobacco Control (WHO FCTC) and encouraging other countries to ratify the Convention;

10. Implementing effective policies for NCD prevention and control at national and global levels, including those relevant to achieving the goals of the 2008-2013 Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases, the WHO Global Strategy to Reduce the Harmful Use of Alcohol and the Global Strategy on Diet, Physical Activity and Health;

11. Promoting recognition of the rising incidence and burden of NCDs on national as well as international development agendas, and encouraging countries and international development partners to consider the level of priority accorded to NCDs.

At Ministry of Health level:

1. Strengthening health information systems to monitor the evolving burden of NCDs, their risk factors, their determinants and the impact and effectiveness of health promotion, prevention and control policies and other interventions;

2. According to national priorities, strengthening public health systems at the country level to scale up evidence-based health promotion and NCD prevention strategies and actions;

3. Integrating NCD-related services into primary health care services through health systems strengthening, according to capacities and priorities;

4. Promoting access to comprehensive and cost-effective prevention, treatment and care for integrated management of NCDs, including access to affordable, safe, effective and high quality medicines based on needs and resource assessments;

5. According to country-led prioritization, ensuring the scaling-up of effective, evidence-based and cost-effective interventions that demonstrate the potential to treat individuals with NCDs, protect those at high risk of developing them and reduce risk across populations.

6. Promoting, translating and disseminating research to identify the causes of NCDs, effective approaches for NCD prevention and control, and strategies appropriate to distinct cultural and health care settings.

At the International level:

1. Calling upon the World Health Organization, as the lead UN specialized agency for health, and all other relevant UN system agencies, development banks, and other key international organizations to work together in a coordinated manner to address NCDs;

2. Working through WHO in consultation with other multilateral organizations, international nongovernmental organizations, the private sector and civil society stakeholders to strengthen normative guidance, pool technical expertise, coordinate policy to achieve the best possible results and capitalize on synergies among existing global health initiatives.

3. Strengthening international support for the full and effective implementation of the WHO FCTC, the Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases, the WHO Global Strategy to Reduce the Harmful Use of Alcohol, the Global Strategy on Diet, Physical Activity and Health and other relevant international strategies to address NCDs.

4. Investigating all possible means to identify and mobilize the necessary financial, human and technical resources in ways that do not undermine other health objectives.

5. Supporting the WHO in developing a comprehensive global monitoring framework on NCDs.

6. Examining possible means to continue facilitating the access of low- and middle income countries to affordable, safe, effective and high quality medicines in this area consistent with the WHO Model Lists of Essential Medicines, based on needs and resource assessments, including by implementing the WHO Global Strategy and Plan of Action on Public Health, Innovation and Intellectual Property.

Way forward

With a view to securing an ambitious and sustainable outcome, we commit to actively engaging with all relevant sectors of Government, on the basis of this Moscow Declaration, in the preparation of and the follow-up to the United Nations General Assembly High-level Meeting on the Prevention and Control of noncommunicable diseases in September 2011 in New York.

Annex III
Regional Declarations on NCDs

Brazzaville Declaration on Noncommunicable Diseases

The first Africa Regional Ministerial Consultation on noncommunicable diseases (NCDs) ended in the Congolese capital on 6 April 2011 with the adoption of the **Brazzaville Declaration on Noncommunicable Diseases** .

The Declaration urged urgent action by various stakeholders to address major NCDs and priority conditions which represent "a significant challenge" to people in the African region: cardiovascular diseases, diabetes, cancer and chronic respiratory diseases, diseases of blood disorder (in particular sickle cell disease), mental health, violence and injuries.

Highlights of the Declaration include commitment by the Ministers to:

- strengthen and standardize national health systems to generate disaggregated data on NCDs, their risk factors and determinants and monitor their magnitude, trends, and impact ;
- use all appropriate means including information and communication technologies to promote, intensify and increase health awareness and empowerment of individuals and communities;
- develop and implement NCD prevention and control strategies, guidelines, policies, legislations and regulatory frameworks including the WHO FCTC to protect individuals, families and communities from unhealthy diets, harmful use of alcohol, tobacco use and exposure to tobacco smoke and unsafe food; and from violence and injuries, advertising of unhealthy products;
- reorient national health systems towards the promotion and support of healthy lifestyles by individuals, families and communities within the primary health care context in order to effectively respond to complex social, cultural and behavioral aspects associated with NCDs;
- further strengthen health systems with appropriate attention to, among other things, health financing; training and retaining the health workforce; procurement and distribution of medicines, vaccines, medical supplies and equipment; improving infrastructure; and, evidence-based and cost-effective service delivery for NCDs;
- identify and harness existing health initiatives, including Global initiatives, to accelerate the prevention and control of NCDs and address integrated care in the context of primary health care and health systems strengthening;
- support and encourage partnerships, alliances and networks bringing together national, regional and global players including academic and research institutions, public and private sectors, and civil society in order to collaborate in NCD prevention and control and to conduct innovative research relevant to the African context;
- allocate, from national budgets, financial resources that are commensurate to the burden of NCDs to support NCD primary prevention and case management using primary health care approach and establish sustainable innovative and new financing mechanisms at national and international levels.

In the Declaration, the ministers also committed to develop national NCD action plans and strengthening institutional capacities for NCD prevention an d control; urged the United Nations to include NCD prevention and control in all future global development goals, and called on WHO, partners and civil society organizations to provide technical support to Member States for implementing, monitoring, and evaluating recommendations contained in the Declaration.

The Declaration specifically requested Heads of State and Government in the region to endorse the Declaration, and present it to the upcoming September 2011 UN General Assembly High-Level Summit on NCDs as the position of the region on NCDs.

The Ministers also requested the UN Secretary General to establish a mechanism to monitor progress of the commitments taken at the UN High-level Summit ion NCDs , and called on the WHO Regional Director for Africa to include the regional NCD strategic plan in the agenda of the 62nd session of the WHO Regional Committee for Africa and report progress made in the implementation of the Declaration to Regional Committee in 2014.

Declaration of port-of -spain: uniting to stop the epidemic of chronic ncds

We, the Heads of Government of the Caribbean Community (CARICOM), meeting at the Crowne Plaza Hotel, Port-of-Spain, Trinidad and Tobago on 15 September 2007 on the occasion of a special Regional Summit on Chronic Non-Communicable Diseases (NCDs);

Conscious of the collective actions which have in the past fuelled regional integration, the goal of which is to enhance the well-being of the citizens of our countries;

Recalling the Nassau Declaration (2001), that "the health of the Region is the wealth of Region", which underscored the importance of health to development;

Inspired by the successes of our joint and several efforts that resulted in the Caribbean being the first Region in the world to eradicate poliomyelitis and measles;

Affirming the main recommendations of the Caribbean Commission on Health and Development which included strategies to prevent and control heart disease, stroke, diabetes, hypertension, obesity and cancer in the Region by addressing their causal risk factors of unhealthy diets, physical inactivity, tobacco use and alcohol abuse and strengthening our health services;

Impelled by a determination to reduce the suffering and burdens caused by NCDs on the citizens of our Region which is the one worst affected in the Americas;

Fully convinced that the burdens of NCDs can be reduced by comprehensive and integrated preventive and control strategies at the individual, family, community, national and regional levels and through collaborative programmes, partnerships and policies supported by governments, private sectors, NGOs and our other social, regional and international partners;

Declare -

- Our full support for the initiatives and mechanisms aimed at strengthening regional health institutions, to provide critical leadership required for implementing our agreed strategies for the reduction of the burden of Chronic, Non-Communicable Diseases as a central priority of the Caribbean Cooperation in Health Initiative Phase III (CCH III), being coordinated by the CARICOM Secretariat, with able support from the Pan American Health Organisation/World Health Organisation (PAHO/WHO) and other relevant partners;
- That we strongly encourage the establishment of National Commissions on NCDs or analogous bodies to plan and coordinate the comprehensive prevention and control of chronic NCDs;
- Our commitment to pursue immediately a legislative agenda for passage of the legal provisions related to the International Framework Convention on Tobacco Control; urge its immediate ratification in all States which have not already done so and support the immediate enactment of legislation to limit or eliminate smoking in public places, ban the sale, advertising and promotion of tobacco products to children, insist on effective warning labels and introduce such fiscal measures as will reduce accessibility of tobacco;
- That public revenue derived from tobacco, alcohol or other such products should be employed, inter alia for preventing chronic NCDs, promoting health and supporting the work of the Commissions;
- That our Ministries of Health, in collaboration with other sectors, will establish by mid-2008 comprehensive plans for the screening and management of chronic diseases and risk factors so that by 2012, 80% of people with NCDs would receive quality care and have access to preventive education based on regional guidelines;
- That we will mandate the re-introduction of physical education in our schools where necessary, provide incentives and resources to effect this policy and ensure that our education sectors promote programmes aimed at providing healthy school meals and promoting healthy eating;
- Our endorsement of the efforts of the Caribbean Food and Nutrition Institute (CFNI), Caribbean Agricultural Research and Development Institute (CARDI) and the regional inter-governmental agencies to enhance food security and our strong support for the elimination of trans-fats from the diet of our citizens, using the CFNI as a focal point for providing guidance and public education designed toward this end;
- Our support for the efforts of the Caribbean Regional Negotiating Machinery (CRNM) to pursue fair trade policies in all international trade negotiations thereby promoting greater use of indigenous agricultural products and foods by our populations and reducing the negative effects of globalisation on our food supply;
- Our support for mandating the labelling of foods or such measures as are necessary to indicate their nutri-

tional content through the establishment of the appropriate regional capability;

- That we will promote policies and actions aimed at increasing physical activity in the entire population, e.g. at work sites, through sport, especially mass activities, as vehicles for improving the health of the population and conflict resolution and in this context we commit to increasing adequate public facilities such as parks and other recreational spaces to encourage physical activity by the widest cross-section of our citizens;
- Our commitment to take account of the gender dimension in all our programmes aimed at the prevention and control of NCDs;
- That we will provide incentives for comprehensive public education programmes in support of wellness, healthy life-style changes, improved self-management of NCDs and embrace the role of the media as a responsible partner in all our efforts to prevent and control NCDs;
- That we will establish, as a matter of urgency, the programmes necessary for research and surveillance of the risk factors for NCDs with the support of our Universities and the Caribbean Epidemiology Centre/Pan American Health Organisation (CAREC/PAHO);
- Our continuing support for CARICOM and PAHO as the joint Secretariat for the Caribbean Cooperation in Health (CCH) Initiative to be the entity responsible for revision of the regional plan for the prevention and control of NCDs, and the monitoring and evaluation of this Declaration.

We hereby declare the second Saturday in September "Caribbean Wellness Day," in commemoration of this landmark Summit.

Seoul declaration on noncommunicable disease prevention and control in the western pacific region

Recognizing the serious and rapidly increasing adverse impact of noncommunicable diseases (NCDs), including cardiovascular diseases, cancers, diabetes and chronic respiratory diseases, on individuals, families, communities, health systems and national economies, and the high prevalence of the risk factors, the countries and areas of the WHO Western Pacific Region participating at the Regional High-level Meeting on Scaling Up Multisectoral Action for Noncommunicable Disease Prevention and Control, declare their commitment to:

1. provide strong and sustained high-level political support for NCD prevention and control programmes to reduce premature NCD death and disability and health inequalities;

2. ensure a supportive multisectoral whole-of-government policy environment and a coordinating process to mainstream the response to NCDs involving all stakeholders, including civil society and, where appropriate, the private sector to protect health and to ensure that healthy choices are the easier choices;

3. reduce the common NCD risk factors (tobacco use; diets high in total fat, saturated and or trans-fats, salt and sugar; the harmful use of alcohol; and physical inactivity); and

1. in line with WHO action plans and using the full range of options including legislation, regulation, fiscal measures and healthy public policies and, in particular, accelerate towards the full implementation of the Framework Convention on Tobacco Control; and

2. by addressing the social determinants of health and by leveraging the power of local governments and civil society actions;

3. (4) strengthen and integrate health systems, based on primary health care to ensure that NCD prevention and control is part of a funded, coherent, balanced, realistic and comprehensive health planning process that is financially feasible and to:

4. deliver services for NCD and their risk factors utilising team based care and the most appropriate health professional for the patient's needs and including affordable and cost-effective drugs, technologies and services to support evidence-based priority interventions;

5. work towards continuity of quality care from prevention to palliative care across the whole health system and promote a people-centred approach with synergies with other programmes;

6. (5) prioritise human and financial resources and infrastructure to ensure equitable coverage of priority evidence-based NCD programmes; and

7. (6) provide integrated but practical monitoring and accountability systems based on strengthened health information systems and, as appropriate, a small number of quantified and timed targets and indicators to assess progress nationally to be reported publicly and to WHO and, if appropriate, the United Nations General Assembly.

In support of these commitments, participating countries and areas request the global community, through the UN High-level Meeting on the Prevention and Control of NCDs, to act in a coordinated way to support global and national multisectoral efforts by:

1. raising the priority of NCDs on their agendas

2. strengthening synergies between NCD programmes and other development priorities, including the Millennium Development Goals and the future global development agenda; and

3. mobilising additional resources and supporting innovative approaches to financing NCD prevention and control.

Latin American Declaration on the health emergency due to Non-Communicable Diseases (NCDs). March 2011

The civil society organizations working on the promotion of health and human rights, within the framework of the United Nations resolution that calls forth States to a summit of the General Assembly for the prevention and control of NCDs in September 2011, do hereby declare that:

- The WHO has identified the following chronic diseases as the main threats to human health: cardiovascular diseases, cancer, diabetes and chronic respiratory diseases.
- These four diseases are the main causes of death and disability worldwide, representing about 60% of deaths and 44% of early deaths (35 Million deaths every year, 80% of which occur in low- and middle-income countries).
- NCDs represent a serious public health issue and are a health emergency worldwide. In spite of the severity of the situation, the funding to fight NCDs is only 1% of the total funding dedicated to development.
- The main risk factors of NCDs are tobacco use, inadequate eating habits, physical inactivity and alcohol misuse, all of which are avoidable and preventable social determinants that also increase high blood pressure, dyslipidemia and obesity.
- The impact of NCDs has increased due to the modifications of lifestyles, economic power of corporations that promote the use of harmful substances (tobacco, alcohol and unhealthy food), social inequality and poverty, difficulty in access to health systems, and political and social inaction.
- NCDs deepen social inequality since they have a greater impact on poor, less educated people, members of certain ethnic groups and women, all of whom have lower access to health services, thus hindering human development, counteracting the efforts in the fight against poverty and increasing health inequalities.
- Despite this, NCDs are still not part of the political agenda of most countries and the Millennium

Development Goals

Prevention and control of NCDs is a key action in ensuring sustainable human rights and human development. There are several international treaties where States have assumed obligations and commitments to guarantee essential human rights that are directly connected to the pre-

vention and control of NCDs. However, implementation of the treaties is insufficient.

In addition to the prevention and control of NCDs, treatment and access to effective and accessible health systems of people suffering from these diseases is essential to reduce morbid-mortality and to improve quality of life.

Policies required to reduce and control NCDs demand efforts and contributions from all sectors of society including governments, civil society, and the private sector, mass media, health professionals and the education sector, among other social stakeholders.

In accordance with the statements mentioned above, the undersigned organizations do hereby decide to create the Health Latin American Coalition (Coalición Latinoamérica Saludable - CLAS) for the prevention and control of NCDs.

1. Although PAHO has established these four disease groups as priorities for reducing and controlling NCD, there are other contributing diseases such as severe mental illness, chronic osteopathy, chronic renal disease which also require an integrated health response.

2. Framework Convention on Tobacco Control, International Agreement for Economic, Social and Cultural rights. Treaty for the prevention of discrimination against women, Interamerican Convention on Human Rights, International Treaty for Children's Rights.

Due to the magnitude and severity of the health, social and economic problems caused by NCDs in our countries, we urge Heads of State and Governments to participate in the September 2011 NCD Summit, in accordance with General Assembly resolution 64/265 adopted on 20 May 2010. We request the Assembly of the United Nations gathered in New York on September 2011 to include the following recommendations in the resolution it may adopt.

General recommendations

1. To implement NCD promotion, prevention and control policies and actions in all governmental sectors and levels thus guaranteeing allocation of resources to that purpose, as an essential strategy to reduce poverty and promote development

2. To develop and implement a plan of action and execute appropriate surveillance mechanisms of NCDs, its consequences and risk factors and to evaluate policy impact.

3. To Foster the creation of intersectoral bodies for the prevention and control of NCDs.

4. To incorporate civil society organizations in formal participation stages before, during and after the summit in order to guarantee effective intersectoral cooperation.

5. To inform the community by means of large mass media campaigns about the prevention, early detection and treatment of NCDs

Recommendations on population-based public policies for the prevention of NCDs

6. To ratify and accelerate the implementation process of the Framework Convention on Tobacco Control throughout the region, following the recommendations of the Conference of the Parties.

7. To promote healthy eating habits by means of legislation and policies that guarantee an adequate sodium, sugar and trans fat reduction in processed foods, that require labeling and packaging providing accurate content information and orientation, that restrict unhealthy foods and drinks advertising targeted to young, that guarantee healthy eating environments for children and that promote fruit, vegetable, and whole-grain cereal consumption and water consumption, among other measures.

8. To promote physical activity by means of community-based actions, evidence-based legislation and public policies that reduce barriers to physical activity.

9. To promote the reduction of harmful alcohol use by means of effective public policies reducing access and restricting advertising, promotion and sponsorship, among others.

10. To eliminate the interference of corporations that promote tobacco use, the consumption of alcohol and unhealthy foods by reducing access to such products and protecting the health of the population beyond the commercial interests of such corporations.

Health care policy recomendations

11. To guarantee the availability of accessible, affordable and effective services for the prevention, early detection and treatment of NCDs and their risk factors, with special emphasis on primary health care. Also, it is crucial to guarantee access and universal coverage to essential technology and medication which are cost-effective for the treatment of NCDs to all the population with special focus on the vulnerable groups.

12. To guarantee education and training to health professionals regarding the comprehensive treatment of NCDs with special focus on health promotion and disease prevention.

13. To strengthen urgency and emergency networking to provide care of acute events that are a consequence of NCDs and are frequently causes of death or disability.

Annex IV
Contact information

World Health Organization
http://www.who.int

Cardiovascular disease
http://www5.who.int/cardiovascular-diseases/

http://www.afro.who.int/

http://new.paho.org/

http://www.emro.who.int/index.asp

http://www.euro.who.int/en/home

http://www.searo.who.int/

http://www.wpro.who.int/

World Heart Federation
http://www.worldheart.org/

World Stroke Organization
http://www.world-stroke.org/

Centers for Disease Control and Prevention, USA
http://www.cdc.gov/

International and Regional Organisations

African Medical and Research Foundation (AMREF)
http://www.amref.org/

African Networks for Health Research and Development
http://www.afronets.org/

American Association of Cardiovascular and Pulmonary Rehabilitation
http://www.aacvpr.org/

American College of Cardiology
http://www.cardiosource.org/Science-And-Quality.aspx

American Heart Association
http://www.heart.org/HEARTORG/

Bill and Melinda Gates Foundation: Global Health Program
http://www.gatesfoundation.org/global-health/Pages/overview.aspx

British Heart Foundation
http://www.bhf.org.uk/heart-health/conditions/cardiovascular-disease.aspx

Campaign for Tobacco-Free Kids
http://www.tobaccofreekids.org/

Chain of Hope
http://www.chainofhope.org/

Childrens Heartlink
http://www.childrensheartlink.org/

Childrens Hearts
http://www.childrenshearts.org.uk

Children's Heart Foundation
http://chfn.org/

Coeurs pour Tous (Hearts for All)
http://www.cptg.ch/fr/start.htm

Congenital Heart Information Network
http://www.tchin.org/

Council on Health Research for Development
http://www.cohred.org/

Eastern Mediterranean Network on Heart Health, (EMNHH)
http://emnhh.homestead.com/files/index.htm

European Heart Institute
http://www.euro-acad.eu/

European Heart Network
http://www.ehnheart.org/

EMASH European Medical Association on Smoking and Health
http://emash.globalink.org/

ENSP European Network for Smoking Prevention
http://www.ensp.org

European Network of Young People and Tobacco
http://www.ktl.fi/enypat/

European Network of Quitlines
http://www.enqonline.org/public/index.php

European Society of Cardiology
http://www.escardio.org/

European Society of Hypertension
http://www.eshonline.org/

European Union of Non-smokers
http://www.globalink.org/tobacco/docs/eu-docs/uene.htm

Framework Convention Alliance (FCA)
http://www.fctc.org/

Gift of Life International Inc.
http://www.giftoflifeinternational.org/

Global Connection International
http://www.gciworld.org

Global Cardiovascular Infobase (in English and Spanish)
http://www.cvdinfobase.ca/

Global Healing
http://www.globalhealing.org

Global Health Information Network
http://www.healthnet.org/

Global Partnerships for Tobacco Control
http://www.essentialaction.org/tobacco/

Global Youth Action on Tobacco Network
http://gyatnetwork.blogspot.com/

Globalink, Global Tobacco Control
http://www.globalink.org/

Healing the Children
http://www.healingthechildren.org/

Heart Care International
http://www.heartcareintl.org

HeartGift Foundation
http://www.heartgift.org/

Heart Foundation
http://www.heartfoundation.org.au/Pages/default.aspx

The Heart of Child Foundation- Little Hearts of the Mend
http://www.heartofachild.org/

Heart-to-Heart International
http://www.hearttoheart.org/

The Heart of a Child Foundation- Little Hearts of the Mend
http://www.heartofachild.org/

Heart-to-Heart International
http://www.hearttoheart.org/

InterAmerican Heart Foundation
http://www.interamericanheart.org

InterAmerican Society of Cardiology
http://www.siacardio.org/default.asp

International Academy of Cardiology
http://www.cardiologyonline.com

International Cardiovascular Health Alliance
http://www.ichaonline.org/

International Children's Heart Foundation
http://www.ichf.org/

International Children's Heart Fund
http://www.ichfund.org/

International Diabetes Federation
http://www.idf.org/

International Network of Women against Tobacco (INWAT)
http://www.inwat.org/

International Obesity Task Force
http://www.iotf.org/

International Society for Adult Congenital Cardiac Disease
http://www.isaccd.org/

International Society of Hypertension
http://www.ish-world.com/Default.aspx?Home

International Society of Nephrology
http://www.isn-online.org/

International Society on Hypertension in Blacks (ISHIB)
http://www.ishib.org/AI_index.asp

International Task Force for the Prevention of Coronary Heart Disease
http://www.chd-taskforce.de/

International Tobacco Evidence Network (ITEN)
http://www.tobaccoevidence.net/

Medical Research Council of South Africa (Focus on Low-Income Countries)
http://www.mrc.ac.za/home.htm

The NCD Alliance
http://www.ncdalliance.org/

Network for Equality in Health for Southern Africa (EQUINET):
http://www.equinetafrica.org/

Partners in Health
http://www.pih.org/

Physicians for Peace
http://www.physiciansforpeace.org

ProCOR:Conference on Cardiovascular Health
http://www.procor.org/

Project Hope
http://www.projecthope.org

Project Kids Worldwide
http://www.projectkidsworldwide.org

Project Open Hearts
http://www.poh.org

Quality Assurance (QA) Project
http://www.qaproject.org/

RedR (Focus on Low-Income Countries)
http://www.redr.org.uk/

Repace's site, especially on passive smoking (Jim Repace)
http://www.repace.com/

Research Center for Stroke and Heart Disease
http://www.strokeheart.org/

Save A Child's Heart Foundation
http://www.saveachildsheart.com

Society for Research on Nicotine and Tobacco (SRNT)
http://www.srnt.org/

Spanish Heart Foundation
http://www.fundaciondelcorazon.com/

Southeast Asian Tobacco Control Alliance
http://www.tobaccofreeasia.net/

Support for Analysis and Research in Africa (SARA) (Focus on Low-Income Countries)
http://sara.aed.org/

The Stroke Association
http://www.stroke.org.uk/

Stroke Awareness for Everyone
http://www.strokesafe.org/

Stroke Net
http://www.strokenet.info/resources/stroke/internationalsites.htm

The Congenital Heart Foundation
http://www.supportcongenitalheart.org/index.htm

The European Atherosclerosis Society
http://www.eas-society.org/

The Primary Care Cardiovascular Society
http://www.pccs.org.uk/

Tobacco Control journal
http://www.tobaccocontrol.com

Tobacco Control Resource Center/Tobacco Products Liability Project (TCRC/TPLT)
http://tobacco.neu.edu/

TCRC Tobacco Control Resource Centre, BMA, UK
http://www.tobacco-control.org/

Tobacco Control Supersite
http://www.health.usyd.edu.au/tobacco/

Union for International Cancer Control
http://www.uicc.org/

WomenHeart: The National Coalition for Women and Heart Disease
http://www.womenheart.org/

World Federation of Neurology
http://www.wfneurology.org/

World Heart Failure Society
http://www.worldheartfailure.org/

World Heart Foundation
http://www.world-heart.org/

World Hypertension League
http://www.worldhypertensionleague.org/Pages/Home.aspx

World Kidney Foundation
http://www.worldkidneyfund.org/

World Medical Association
http://www.wma.net/

World Society for Pediatric and Congenital Heart Surgery
http://www.wspchs.org/

Vascular Disease Foundation
http://www.vdf.org/

Annex V
Age-standardized death rates per 100 000 both sexes by cause and Member State, 2008 (*1*)

Country	Ischemic heart disease	Cerebrovascular disease
Afghanistan	328.6	109.5
Albania	154.1	171.6
Algeria	75.2	91.4
Andorra	45.4	32.7
Angola	128.1	156.4
Antigua and Barbuda	85.7	52.4
Argentina	70.6	43.5
Armenia	248.5	132.5
Australia	60.3	28.4
Austria	72.7	26.0
Azerbaijan	232.9	206.9
Bahamas	46.9	47.7
Bahrain	68.8	28.2
Bangladesh	203.7	108.3
Barbados	55.4	41.2
Belarus	348.1	129.3
Belgium	58.0	29.7
Belize	63.5	45.6
Benin	119.3	147.8
Bhutan	221.7	117.7
Bolivia (Plurinational State of)	93.5	70.1
Bosnia and Herzegovina	96.1	115.5
Botswana	93.4	111.9
Brazil	81.2	74.0
Brunei Darussalam	54.3	45.0
Bulgaria	151.4	142.5
Burkina Faso	120.3	146.0
Burundi	121.0	154.7
Cambodia	128.8	101.5
Cameroon	131.8	162.0
Canada	66.2	22.9
Cape Verde	68.7	84.2
Central African Republic	132.2	162.5
Chad	132.2	162.5
Chile	51.5	45.3

Country	Ischemic heart disease	Cerebrovascular disease
China	79.7	161.9
Colombia	85.8	42.2
Comoros	115.1	143.7
Congo	127.6	149.5
Cook Islands	79.1	71.1
Costa Rica	74.0	29.5
Côte d'Ivoire	148.8	171.6
Croatia	133.6	89.1
Cuba	111.3	58.5
Cyprus	77.4	35.9
Czech Republic	144.0	56.9
Democratic People's Republic of Korea	113.2	61.6
Democratic Republic of the Congo	125.9	155.9
Denmark	55.9	39.3
Djibouti	232.3	81.1
Dominica	72.8	86.7
Dominican Republic	127.8	95.7
Ecuador	39.9	34.5
Egypt	174.0	110.4
El Salvador	88.6	28.0
Equatorial Guinea	129.7	158.6
Eritrea	99.6	122.6
Estonia	173.3	57.8
Ethiopia	133.1	164.6
Fiji	140.2	136.4
Finland	93.8	33.5
France	29.2	21.7
Gabon	104.8	121.3
Gambia	108.5	131.5
Georgia	285.9	168.5
Germany	75.0	31.2
Ghana	120.1	125.5
Greece	60.3	61.6
Grenada	76.7	65.4
Guatemala	58.9	20.8
Guinea	136.9	166.2
Guinea-Bissau	136.5	167.8
Guyana	151.4	118.6
Haiti	55.5	150.1
Honduras	152.4	90.8
Hungary	169.0	68.8
Iceland	68.1	28.7
India	165.8	116.4
Indonesia	150.8	90.0
Iran (Islamic Republic of)	194.5	97.4

Country	Ischemic heart disease	Cerebrovascular disease
Iraq	214.1	81.2
Ireland	79.2	30.4
Israel	46.4	19.7
Italy	51.7	34.9
Jamaica	110.7	62.9
Japan	31.2	36.7
Jordan	162.5	119.4
Kazakhstan	346.5	166.9
Kenya	101.2	116.6
Kiribati	11.8	141.5
Kuwait	109.6	73.8
Kyrgyzstan	349.4	198.8
Lao People's Democratic Republic	194.3	136.3
Latvia	220.8	117.1
Lebanon	164.4	62.7
Lesotho	118.3	139.2
Liberia	113.8	141.8
Libyan Arab Jamahiriya	199.3	72.6
Lithuania	233.7	89.2
Luxembourg	53.6	34.1
Madagascar	100.9	121.7
Malawi	157.9	185.5
Malaysia	138.7	75.8
Maldives	50.9	37.6
Mali	108.5	127.0
Malta	96.3	43.5
Marshall Islands	237.7	240.4
Mauritania	108.2	133.5
Mauritius	118.4	76.7
Mexico	87.7	38.8
Micronesia (Federated States of)	110.3	121.9
Monaco	37.4	26.6
Mongolia	75.7	150.9
Montenegro	68.2	77.8
Morocco	168.0	61.5
Mozambique	137.7	166.4
Myanmar	164.7	97.4
Namibia	127.7	141.1
Nauru	184.1	80.7
Nepal	152.6	82.6
Netherlands	39.8	27.3
New Zealand	76.5	33.3
Nicaragua	95.3	52.6
Niger	100.4	122.4
Nigeria	121.6	148.6

Country	Ischemic heart disease	Cerebrovascular disease
Niue	100.6	89.5
Norway	57.2	32.6
Oman	181.9	51.5
Pakistan	222.9	119.6
Palau	101.0	94.8
Panama	62.4	48.8
Papua New Guinea	186.0	98.9
Paraguay	77.6	70.3
Peru	45.0	33.0
Philippines	121.6	82.8
Poland	122.4	60.8
Portugal	43.8	62.7
Qatar	80.1	10.7
Republic of Korea	34.7	65.1
Republic of Moldova	335.3	152.4
Romania	155.0	127.1
Russian Federation	296.7	195.8
Rwanda	106.9	134.2
Saint Kitts and Nevis	82.5	117.6
Saint Lucia	53.2	68.7
Saint Vincent and the Grenadines	132.5	87.6
Samoa	113.1	125.2
San Marino	52.9	31.1
Sao Tome and Principe	74.2	97.4
Saudi Arabia	180.6	50.0
Senegal	97.3	118.0
Serbia	105.1	118.6
Seychelles	50.3	69.1
Sierra Leone	113.7	134.8
Singapore	82.4	33.7
Slovakia	217.7	74.7
Slovenia	60.0	45.5
Solomon Islands	97.9	105.5
Somalia	219.1	123.0
South Africa	71.0	83.4
Spain	43.5	29.2
Sri Lanka	84.5	42.8
Sudan	212.0	118.0
Suriname	88.8	146.9
Swaziland	136.7	160.0
Sweden	71.0	32.9
Switzerland	52.2	22.0
Syrian Arab Republic	165.3	112.2
Tajikistan	213.7	93.0
Thailand	87.1	123.0

Country	Ischemic heart disease	Cerebrovascular disease
The former Yugoslav Republic of Macedonia	98.1	156.2
Timor-Leste	137.8	75.3
Togo	107.2	131.1
Tonga	101.7	118.6
Trinidad and Tobago	145.7	79.7
Tunisia	124.3	48.8
Turkey	157.1	116.5
Turkmenistan	405.1	76.1
Tuvalu	163.2	175.7
Uganda	130.9	150.6
Ukraine	399.8	125.1
United Arab Emirates	94.5	42.3
United Kingdom	68.8	36.9
United Republic of Tanzania	117.6	137.7
United States of America	80.5	25.4
Uruguay	70.8	71.9
Uzbekistan	323.2	146.5
Vanuatu	111.4	116.1
Venezuela (Bolivarian Republic of)	107.3	53.4
Viet Nam	112.5	173.0
Yemen	238.5	84.4
Zambia	141.3	168.4
Zimbabwe	90.0	107.8

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Global Atlas on cardiovascular disease prevention and control

Published by the World Health Organization in collaboration with the World Heart Federation and the World Stroke Organization.

International efforts aimed at poverty reduction will be derailed if the rapidly growing global cardiovascular disease burden is ignored.

In the absence of prevention strategies, increasing numbers of people will succumb to heart attacks and strokes due to continuing exposure to risk factors.

Millions of premature deaths due to cardiovascular disease can be prevented by scaling up the implementation of affordable, high impact interventions, which already exist.

World Health Organization

20 Avenue Appia
CH-1211 Geneva 27
Switzerland
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