

2 Results

2.1 Global patterns of health risk

More than one third of the world's deaths can be attributed to a small number of risk factors. The 24 risk factors described in this report are responsible for 44% of global deaths and 34% of DALYs; the 10 leading risk factors account for 33% of deaths (see Section 3.2). Understanding the role of these risk factors is key to developing a clear and effective strategy for improving global health.

The five leading global risks for mortality in the world are high blood pressure, tobacco use, high blood glucose, physical inactivity, and overweight and obesity. They are responsible for raising the risk of chronic diseases, such as heart disease and cancers. They affect countries across all income groups: high, middle and low (Table 1 and Figure 6).

This report measures the burden of disease, or lost years of healthy life, using the DALY: a measure that gives more weight to non-fatal loss of health and deaths at younger ages (Box 1). The leading global risks for burden of disease in the world are underweight and unsafe sex, followed by alcohol use and unsafe water, sanitation and hygiene (Figure 7). Three of the four leading risks for DALYs – underweight, unsafe sex, and unsafe water, sanitation and hygiene – increase the number and severity of new cases of infectious diseases, and particularly affect populations in low-income countries, especially in the regions of South-East Asia and sub-Saharan Africa (Table 2). Alcohol use has a unique geographic and sex pattern: it exacts the largest toll on men in Africa, in middle-income countries in the Americas, and in some high-income countries.

Geographical patterns

Substantially different disease patterns exist between high-, middle- and low-income countries. For high- and middle-income countries, the most important risk factors are those associated with chronic diseases such as heart diseases and cancer. Tobacco is one of the leading risks for both: accounting for 11% of the disease burden and 18% of deaths in high-income countries. For high-income countries,

alcohol, overweight and blood pressure are also leading causes of healthy life years lost: each being responsible for 6–7% of the total. In middle-income countries, risks for chronic diseases also cause the largest share of deaths and DALYs, although risks such as unsafe sex and unsafe water and sanitation also cause a larger share of burden of disease than in high-income countries (Tables 1 and 2).

In low-income countries, relatively few risks are responsible for a large percentage of the high number of deaths and loss of healthy years. These risks generally act by increasing the incidence or severity of infectious diseases. The leading risk factor for low-income countries is underweight, which represents about 10% of the total disease burden. In combination, childhood underweight, micronutrient deficiencies (iron, vitamin A and zinc) and suboptimal breastfeeding cause 7% of deaths and 10% of total disease burden. The combined burden from these nutritional risks is almost equivalent to the entire disease and injury burden of high-income countries.

Demographic patterns

The profile of risk changes considerably by age. Some risks affect children almost exclusively: underweight, undernutrition (apart from iron deficiency), unsafe water, smoke from household use of solid fuels and climate change. Few of the risk factors examined in this report affect adolescent health per se, although risk behaviours starting in adolescence do have a considerable effect on health at later ages. For adults, there are considerable differences depending on age. Most of the health burden from addictive substances, unsafe sex, lack of contraception, iron deficiency and child sex abuse occurs in younger adults. Most of the health burden from risk factors for chronic diseases such as cardiovascular disease and cancers occurs at older adult ages.

Men and women are affected about equally from risks associated with diet, the environment and unsafe sex. Men suffer more than 75% of the burden from addictive substances and most of the burden from occupational risks. Women suffer all of the burden from lack of contraception, 80% of the deaths caused by iron deficiency, and about two thirds of the burden caused by child sexual abuse.

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Figure 6: Deaths attributed to 19 leading risk factors, by country income level, 2004.

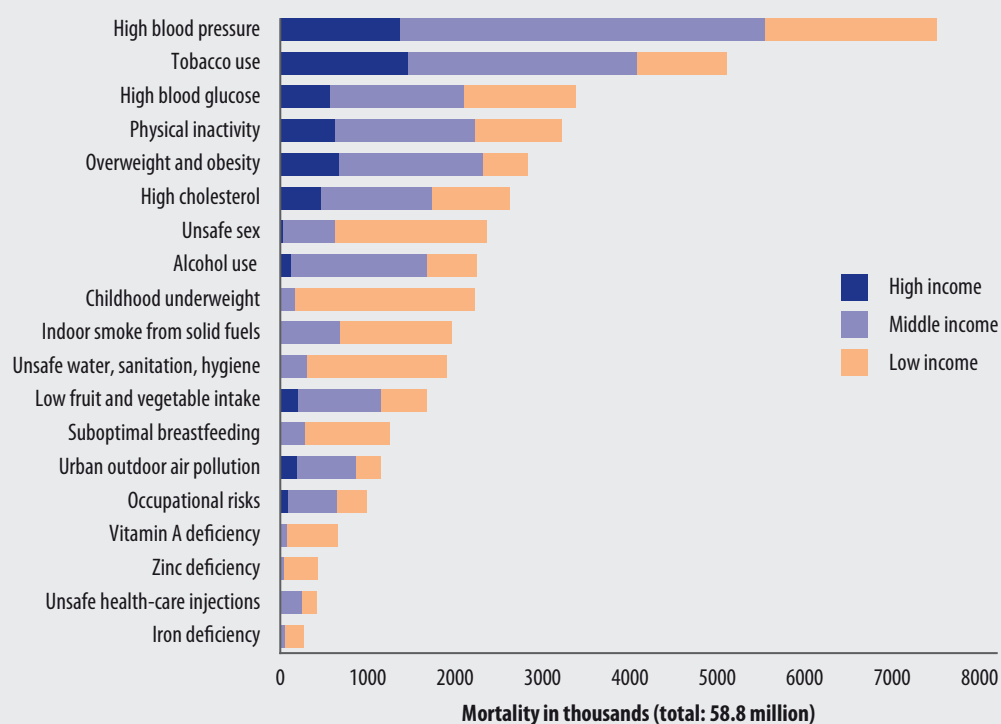


Figure 7: Percentage of disability-adjusted life years (DALYs) attributed to 19 leading risk factors, by country income level, 2004.

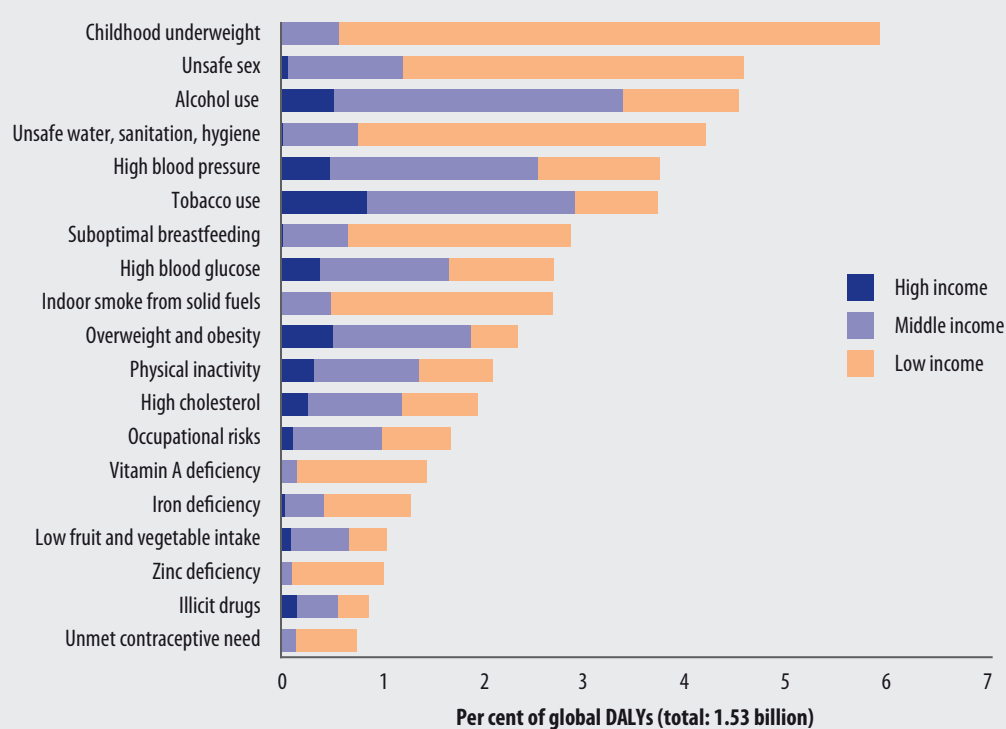


Table 1: Ranking of selected risk factors: 10 leading risk factor causes of death by income group, 2004

Risk factor		Deaths (millions)	Percentage of total	Risk factor		Deaths (millions)	Percentage of total
World				Low-income countries^a			
1	High blood pressure	7.5	12.8	1	Childhood underweight	2.0	7.8
2	Tobacco use	5.1	8.7	2	High blood pressure	2.0	7.5
3	High blood glucose	3.4	5.8	3	Unsafe sex	1.7	6.6
4	Physical inactivity	3.2	5.5	4	Unsafe water, sanitation, hygiene	1.6	6.1
5	Overweight and obesity	2.8	4.8	5	High blood glucose	1.3	4.9
6	High cholesterol	2.6	4.5	6	Indoor smoke from solid fuels	1.3	4.8
7	Unsafe sex	2.4	4.0	7	Tobacco use	1.0	3.9
8	Alcohol use	2.3	3.8	8	Physical inactivity	1.0	3.8
9	Childhood underweight	2.2	3.8	9	Suboptimal breastfeeding	1.0	3.7
10	Indoor smoke from solid fuels	2.0	3.3	10	High cholesterol	0.9	3.4
Middle-income countries^a				High-income countries^a			
1	High blood pressure	4.2	17.2	1	Tobacco use	1.5	17.9
2	Tobacco use	2.6	10.8	2	High blood pressure	1.4	16.8
3	Overweight and obesity	1.6	6.7	3	Overweight and obesity	0.7	8.4
4	Physical inactivity	1.6	6.6	4	Physical inactivity	0.6	7.7
5	Alcohol use	1.6	6.4	5	High blood glucose	0.6	7.0
6	High blood glucose	1.5	6.3	6	High cholesterol	0.5	5.8
7	High cholesterol	1.3	5.2	7	Low fruit and vegetable intake	0.2	2.5
8	Low fruit and vegetable intake	0.9	3.9	8	Urban outdoor air pollution	0.2	2.5
9	Indoor smoke from solid fuels	0.7	2.8	9	Alcohol use	0.1	1.6
10	Urban outdoor air pollution	0.7	2.8	10	Occupational risks	0.1	1.1

^a Countries grouped by gross national income per capita – low income (US\$ 825 or less), high income (US\$ 10 066 or more).

Table 2: Ranking of selected risk factors: 10 leading risk factor causes of DALYs by income group, 2004

Risk factor	DALYs (millions)	Percentage of total	Risk factor	DALYs (millions)	Percentage of total
World			Low-income countries^a		
1 Childhood underweight	91	5.9	1 Childhood underweight	82	9.9
2 Unsafe sex	70	4.6	2 Unsafe water, sanitation, hygiene	53	6.3
3 Alcohol use	69	4.5	3 Unsafe sex	52	6.2
4 Unsafe water, sanitation, hygiene	64	4.2	4 Suboptimal breastfeeding	34	4.1
5 High blood pressure	57	3.7	5 Indoor smoke from solid fuels	33	4.0
6 Tobacco use	57	3.7	6 Vitamin A deficiency	20	2.4
7 Suboptimal breastfeeding	44	2.9	7 High blood pressure	18	2.2
8 High blood glucose	41	2.7	8 Alcohol use	18	2.1
9 Indoor smoke from solid fuels	41	2.7	9 High blood glucose	16	1.9
10 Overweight and obesity	36	2.3	10 Zinc deficiency	14	1.7
Middle-income countries^a			High-income countries^a		
1 Alcohol use	44	7.6	1 Tobacco use	13	10.7
2 High blood pressure	31	5.4	2 Alcohol use	8	6.7
3 Tobacco use	31	5.4	3 Overweight and obesity	8	6.5
4 Overweight and obesity	21	3.6	4 High blood pressure	7	6.1
5 High blood glucose	20	3.4	5 High blood glucose	6	4.9
6 Unsafe sex	17	3.0	6 Physical inactivity	5	4.1
7 Physical inactivity	16	2.7	7 High cholesterol	4	3.4
8 High cholesterol	14	2.5	8 Illicit drugs	3	2.1
9 Occupational risks	14	2.3	9 Occupational risks	2	1.5
10 Unsafe water, sanitation, hygiene	11	2.0	10 Low fruit and vegetable intake	2	1.3

^a Countries grouped by 2004 gross national income per capita – low income (US\$ 825 or less), high income (US\$ 10 066 or more).

2.2 Childhood and maternal undernutrition

In low-income countries, easy-to-remedy nutritional deficiencies prevent 1 in 38 newborns from reaching age 5.

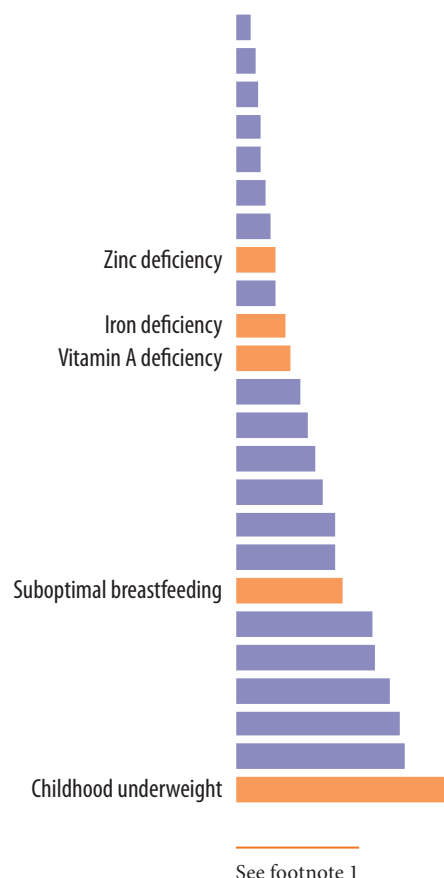
Many people in low- and middle-income countries, particularly children, continue to suffer from undernutrition¹. They consume insufficient protein and energy, and the adverse health effects of this are often compounded by deficiencies of vitamins and minerals, particularly iodine, iron, vitamin A and zinc. Insufficient breast milk also puts infants at an increased risk of disease and death.

Of the risk factors quantified in this report, underweight is the largest cause of deaths and DALYs in children under 5 years, followed by suboptimal breastfeeding (Table 3). These and the other nutrition risks often coexist and contribute to the same disease outcomes. Because of overlapping effects, these risk factors were together responsible for an estimated 3.9 million deaths (35% of total deaths) and 144 million DALYs (33% of total DALYs) in children less than 5 years old. The combined contribution of these risk factors to specific causes of death is highest for diarrhoeal diseases (73%), and close to 50% for pneumonia, measles and severe neonatal infections (Figure 8).

Other important vitamin and mineral deficiencies not quantified in this report include those for calcium, folate, vitamin B₁₂ and vitamin D. Calcium and vitamin D deficiency are important causes of rickets and poor bone mineralization in children. Maternal folate insufficiency increases the risk of some birth defects and other adverse pregnancy outcomes. Maternal B vitamin deficiencies may also be associated with adverse pregnancy outcomes and development disabilities in infants.

Underweight

Underweight mainly arises from inadequate diet and frequent infection, leading to insufficient intake of calories, protein, vitamins and minerals. Children under 5 years, and especially those aged 6 months to 2 years, are at particular risk. In 2004, about 20% (112 million) of children under 5 years were underweight (more than two standard deviations below the WHO Child Growth Standards median weight-for-age) in



developing countries (see Annex A for details).

Underweight children suffer more frequent and severe infectious illnesses; furthermore, even mild undernutrition increases a child's risk of dying. Chronic undernutrition in children aged 24–36 months can also lead to long-term developmental problems; in adolescents and adults it is associated with adverse pregnancy outcomes and reduced ability to work. Around one third of diarrhoea, measles, malaria and lower respiratory infections in childhood are attributable to underweight. Of the 2.2 million child deaths attributable to underweight globally in 2004, almost half, or 1.0 million, occurred in the WHO African Region, and more than 800 000 in the South-East Asia Region.

Iron deficiency

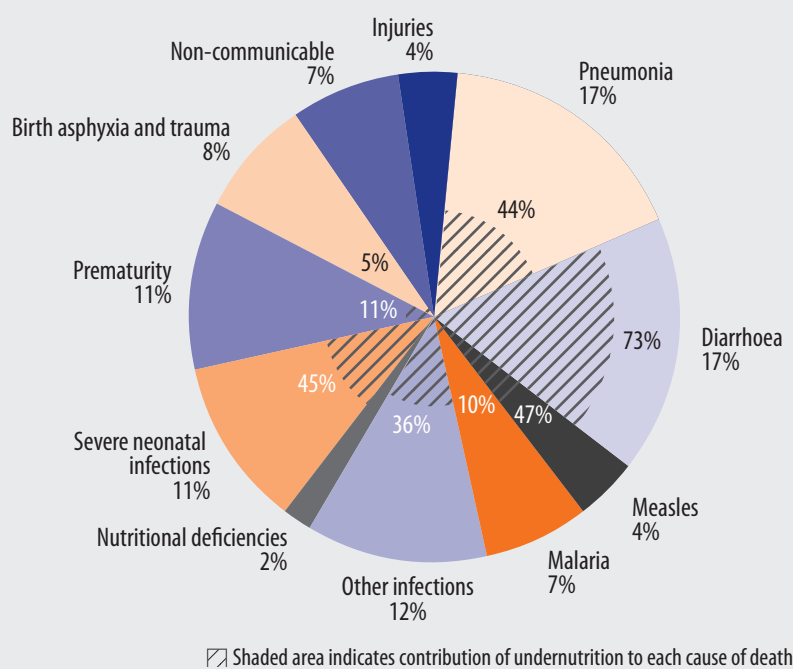
Iron is critically important in muscle, brain and red blood cells. Iron deficiency may occur at any age if diets are based on staple foods with little meat, or people are exposed to infections that cause blood

¹ The schematic shows where the health burden of risk factors in this section fall in comparison to other risks in this report. It is repeated in each section; the full values can be found in Table A4.

Table 3: Deaths and DALYs attributable to six risk factors for child and maternal undernutrition, and to six risks combined; countries grouped by income, 2004

Risk	World	Low income	Middle income
Percentage of deaths			
Childhood underweight	3.8	7.8	0.7
Suboptimal breastfeeding	2.1	3.7	1.1
Vitamin A deficiency	1.1	2.2	0.3
Zinc deficiency	0.7	1.5	0.2
Iron deficiency	0.5	0.8	0.2
Iodine deficiency	0.0	0.0	0.0
All six risks	6.6	12.7	2.1
Percentage of DALYs			
Childhood underweight	6.0	9.9	1.5
Suboptimal breastfeeding	2.9	4.1	1.7
Vitamin A deficiency	1.5	2.4	0.4
Zinc deficiency	1.0	1.7	0.3
Iron deficiency	1.3	1.6	1.0
Iodine deficiency	0.2	0.2	0.3
All six risks	10.4	15.9	4.4

Figure 8: Major causes of death in children under 5 years old with disease-specific contribution of undernutrition, 2004.



loss; young children and women of childbearing age are most commonly and severely affected. An estimated 41% of pregnant women and 27% of pre-school children worldwide have anaemia caused by iron deficiency (11).

Iron deficiency anaemia in early childhood reduces intelligence in mid-childhood; it can also lead to developmental delays and disability. About 18% of maternal mortality in low- and middle-income countries – almost 120 000 deaths – is attributable to iron deficiency. Adding this disease burden to that for iron deficiency anaemia in children and adults results in 19.7 million DALYs, or 1.3% of global total DALYs. Forty per cent of the total attributable global burden of iron deficiency occurs in the South-East Asia Region and almost another quarter in the African Region.

Vitamin A deficiency

Vitamin A is essential for healthy eyes, growth, immune function and survival. Deficiency is caused by low dietary intake, malabsorption and increased excretion due to common illnesses. It is the leading cause of acquired blindness in children. Those under 5 years and women of childbearing age are at most risk. About 33% of children suffer vitamin A deficiency (serum retinol $<0.70 \mu\text{mol/l}$), mostly in South-East Asia and Africa. The prevalence of low serum retinol is about 44% in African children and reaches almost 50% in children in South-East Asia (12). The prevalence of night blindness caused by vitamin A deficiency is around 2% in African children, and about 0.5% in children in parts of South-East Asia. About 10% of women in Africa and South-East Asia experience night blindness during pregnancy.

Vitamin A deficiency raises the risk of mortality in children suffering from diarrhoeal diseases: 19% of global diarrhoea mortality can be attributed to this deficiency. It also increases the risk of mortality due to measles, prematurity and neonatal infections. Vitamin A deficiency is responsible for close to 6% of child deaths under age 5 years in Africa and 8% in South-East Asia.

Iodine deficiency

Iodine is essential for thyroid function. Iodine deficiency is one of the most easily preventable causes

of mental retardation and developmental disability. Maternal iodine deficiency has also been associated with lower mean birth weight, increased infant mortality, impaired hearing and motor skills.

Although salt iodization and iodine supplementation programmes have reduced the number of countries where iodine deficiency remains a problem, about 1.9 billion people – 31% of the world population – do not consume enough iodine. The most affected WHO regions are South-East Asia and Europe (13). The direct sequelae of iodine deficiency, such as goitre, cretinism and developmental disability, resulted in 3.5 million DALYs (0.2% of the total) in 2004.

Zinc deficiency

Zinc deficiency largely arises from inadequate intake or absorption from the diet, although diarrhoea may contribute. It increases the risk of diarrhoea, malaria and pneumonia, and is highest in South-East Asia and Africa (9). For children under 5 years, zinc deficiency is estimated to be responsible for 13% of lower respiratory tract infections (mainly pneumonia and influenza), 10% of malaria episodes and 8% of diarrhoea episodes worldwide.

Suboptimal breastfeeding

Breast milk is the healthiest source of nutrition for infants. WHO recommends that infants should be exclusively breastfed during their first 6 months, and continue to receive breast milk through their first 2 years. In developing countries, only 24–32% of infants are exclusively breastfed at 6 months on average, and these percentages are much lower in developed countries. Rates of any breastfeeding are much higher, particularly in Africa and South-East Asia, with over 90% of infants aged 6–11 months breastfed.

Breastfeeding reduces the risk of many perinatal infections, acute lower respiratory infections and diarrhoea in infants below 23 months. Despite the higher prevalence of breastfeeding found in the developing world, developing countries bear more than 99% of the burden of suboptimal breastfeeding. Suboptimal breastfeeding is responsible for 45% of neonatal infectious deaths, 30% of diarrhoeal deaths and 18% of acute respiratory deaths in children under 5 years.

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2.3 Other diet-related risk factors and physical inactivity

Worldwide, overweight and obesity cause more deaths than underweight.

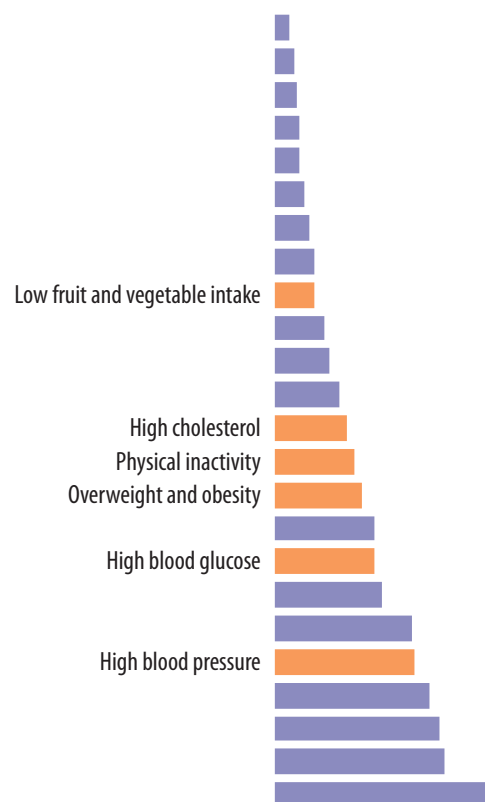
The combined burden of these diet-related risks and physical inactivity in low- and middle-income countries is similar to that caused by HIV/AIDS and tuberculosis.

Over time, the risks that populations face tend to shift from risks (such as undernutrition) for infectious disease to risks for chronic disease, many of which are discussed in this section. This is because of past successes combating infectious diseases and their risks, and because populations worldwide are ageing, and these risk factors are more important for adults. Today, 65% of the world's population live in a country where overweight and obesity kills more people than underweight (this includes all high-income and most middle-income countries). The six risk factors discussed in this section account for 19% of global deaths and 7% of global DALYs. These risk factors have the greatest effect on cardiovascular diseases – 57% of cardiovascular deaths can be traced back to one of these risk factors. High blood pressure, which itself is caused by high body mass index (BMI) and physical inactivity, is the leading risk factor in this group (Table 4).

The DALYs lost per 10 000 population due to high cholesterol, high body mass index, high blood pressure, and all six risk factors combined are shown in Figure 9 for high-income countries and for low- and middle-income countries grouped by WHO region. In all regions other than the Western Pacific, the low- and middle-income populations lose more DALYs because of these risks than populations in high-income countries. The attributable burden of disease per capita is greatest in the low- and middle-income countries of Europe.

High blood pressure

Raised blood pressure changes the structure of the arteries. As a result, risks of stroke, heart disease, kidney failure and other diseases increase, not only in people with hypertension but also in those with average, or even below-average, blood pressure. Diet – especially too much salt – alcohol, lack of exercise and obesity all raise blood pressure, and these effects



accumulate with age. In developing and developed countries, most adults' blood pressure is higher than the ideal level. Average blood pressure levels are particularly high in middle-income European countries and African countries.

Globally, 51% of stroke (cerebrovascular disease) and 45% of ischaemic heart disease deaths are attributable to high systolic blood pressure. At any given age, the risk of dying from high blood pressure in low- and middle-income countries is more than double that in high-income countries. In the high-income countries, only 7% of deaths caused by high blood pressure occur under age 60; in the African Region, this increases to 25%.

High cholesterol

Diets high in saturated fat, physical inactivity and genetics can increase cholesterol levels. Recent research shows that levels of low-density lipoproteins and high-density lipoproteins are more important for health than total cholesterol. Nevertheless, we calculated the risk of elevated total blood cholesterol because there is more information available

Table 4: Deaths and DALYs attributable to six diet-related risks and physical inactivity, and to all six risks combined, by region, 2004

Risk	World	Low and middle income	High income
<i>Percentage of deaths</i>			
High blood pressure	12.8	12.1	16.8
High blood glucose	5.8	5.6	7.0
Physical inactivity	5.5	5.1	7.7
Overweight and obesity	4.8	4.2	8.4
High cholesterol	4.5	4.3	5.8
Low fruit and vegetable intake	2.9	2.9	2.5
All six risks	19.1	18.1	25.2
<i>Percentage of DALYs</i>			
High blood pressure	3.8	3.5	6.1
High blood glucose	2.7	2.5	4.9
Physical inactivity	2.1	1.9	4.1
Overweight and obesity	2.4	2.0	6.5
High cholesterol	2.0	1.8	3.4
Low fruit and vegetable intake	1.1	1.0	1.3
All six risks	7.0	6.5	12.6

about average total cholesterol levels in populations worldwide than about average low-density lipoproteins and high-density lipoprotein levels.

Cholesterol increases the risks of heart disease, stroke and other vascular diseases. Globally, one third of ischaemic heart disease is attributable to high blood cholesterol. High blood cholesterol increases the risk of heart disease, most in the middle-income European countries, and least in the low- and middle-income countries in Asia.

High blood glucose

Changes in diet and reductions in physical inactivity levels increase resistance to insulin, which, in turn, raises blood glucose. Genetics play an important role in whether individuals with similar diets and physical activity levels become resistant to insulin. Individuals with high levels of insulin resistance are classified as having diabetes, but individuals with raised blood glucose who do not have diabetes also face higher risks of cardiovascular diseases.

Globally, 6% of deaths are caused by high blood glucose, with 83% of those deaths occurring in

low- and middle-income countries. The age-specific risk of dying from high blood glucose is lowest in high-income countries and the WHO Western Pacific Region. Raised blood glucose causes all diabetes deaths, 22% of ischaemic heart disease and 16% of stroke deaths.

Overweight and obesity (high body mass index)

WHO estimates that, in 2005, more than 1 billion people worldwide were overweight (BMI ≥ 25) and more than 300 million were obese (BMI ≥ 30). Mean BMI, overweight and obesity are increasing worldwide due to changes in diet and increasing physical inactivity. Rates of overweight and obesity are projected to increase in almost all countries, with 1.5 billion people overweight in 2015 (14). Average BMI is highest in the Americas, Europe and the Eastern Mediterranean.

The risk of coronary heart disease, ischaemic stroke and type 2 diabetes grows steadily with increasing body mass, as do the risks of cancers of the breast, colon, prostate and other organs. Chronic overweight contributes to osteoarthritis – a major

cause of disability. Globally, 44% of diabetes burden, 23% of ischaemic heart disease burden and 7–41% of certain cancer burdens are attributable to overweight and obesity. In both South-East Asia and Africa, 41% of deaths caused by high body mass index occur under age 60, compared with 18% in high-income countries.

Low fruit and vegetable intake

Fruit and vegetable consumption is one element of a healthy diet (15, 16). Fruit and vegetable intake varies considerably among countries: reflecting economic, cultural and agricultural environments.

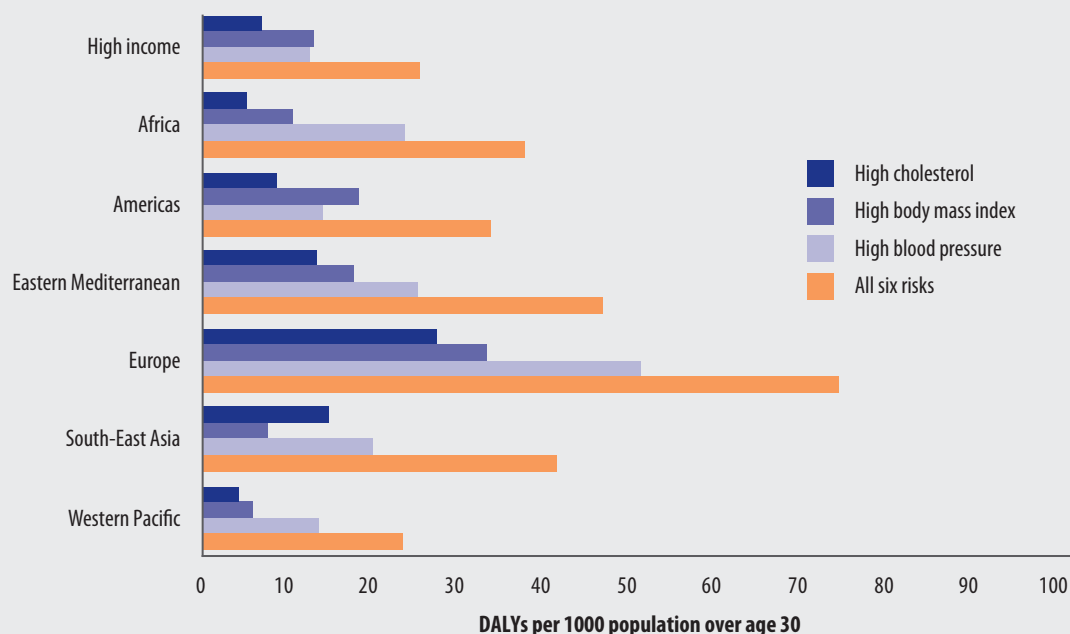
Insufficient intake of fruit and vegetables is estimated to cause around 14% of gastrointestinal cancer deaths, about 11% of ischaemic heart disease deaths and about 9% of stroke deaths worldwide. Most of the benefit of consuming fruits and vegetables comes from reduction in cardiovascular disease,

but fruits and vegetables also prevent cancer. Rates of deaths and DALYs attributed to low fruit and vegetable intake are highest in middle-income European countries and in South-East Asia.

Physical inactivity

Physical activity reduces the risk of cardiovascular disease, some cancers and type 2 diabetes. It can also improve musculoskeletal health, control body weight and reduce symptoms of depression. Physical activity occurs across different domains, including work, transport, domestic duties and during leisure. In high-income countries, most activity occurs during leisure time, while in low-income countries most activity occurs during work, chores or transport. Physical inactivity is estimated to cause around 21–25% of breast and colon cancer burden, 27% of diabetes and about 30% of ischaemic heart disease burden.

Figure 9: Attributable DALY rates for selected diet-related risk factors, and all six risks together, by WHO region and income level, 2004.



2.4 Sexual and reproductive health

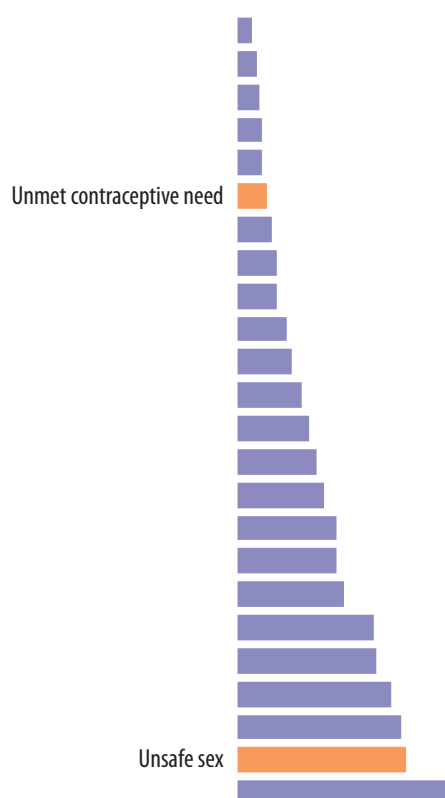
Unsafe sex is the leading risk factor for mortality in African women: 1 million African women are killed annually by HIV, human papillomavirus and other sexually transmitted infections.

We consider sexual behaviours that increase the risk of contracting a sexually transmitted disease as a risk factor – “unsafe sex” – separate from the risk of unintended pregnancy, and its health consequences, associated with non-use and use of ineffective methods of contraception. Using certain forms of contraception, such as condoms, reduces both these risks, but other forms of risk reduction are quite different. Other factors involved in reducing unsafe sex include number of partners, who the partners are, the type of sex involved, knowledge of infection status of partners and use of barrier contraceptives.

Unsafe sex

People’s sexual behaviour varies greatly between countries and regions. In 2004, unsafe sex was estimated as being responsible for more than 99% of human immunodeficiency virus (HIV) infection in Africa – the only region where more women than men are infected with HIV or acquired immunodeficiency syndrome (AIDS). Elsewhere, the proportion of HIV/AIDS deaths due to unsafe sex ranges from around 50% in the low- and middle-income countries of the WHO Western Pacific Region to 90% in the low- and middle-income countries of the Americas. In virtually all regions outside Africa, HIV transmission due to unsafe sex occurs predominantly among sex workers and men who have sex with men.

HIV/AIDS is the world’s sixth biggest cause of death, and was responsible for 2.0 million deaths in 2004. HIV/AIDS deaths have stabilized and begun to decline in the last few years, partly due to increasing access to HIV treatment and also partly because of changing patterns of sexual behaviour in heavily affected African countries. Currently, 22 million (67%) of the 33 million people with HIV live in Africa, and HIV/AIDS continues to have a heavy impact: life expectancy at birth in the African Region was 49 years in 2004 (without AIDS it would have been 53 years).



All cervical cancer is attributed to sexual transmission of the human papillomavirus. Cervical cancer accounts for 11% of global deaths due to unsafe sex, and is the leading cause of cancer death in the African Region. Almost three quarters of the global burden of unsafe sex occurs in sub-Saharan Africa, and another 15% in India and other countries of the South-East Asia Region. Other sexually transmitted infections such as syphilis, gonorrhoea and chlamydia are entirely attributable to unsafe sex.

Lack of contraception

Non-use and use of ineffective methods of contraception increase the risk of unintended pregnancy and its consequences, including unsafe abortions. The proportion of women aged 15–44 years who used modern contraception (such as the pill, barrier methods, sterilization or intrauterine device) ranged from 14% in the WHO African Region to 64% in high-income countries. If all women who wanted to space or limit future pregnancies used modern

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References

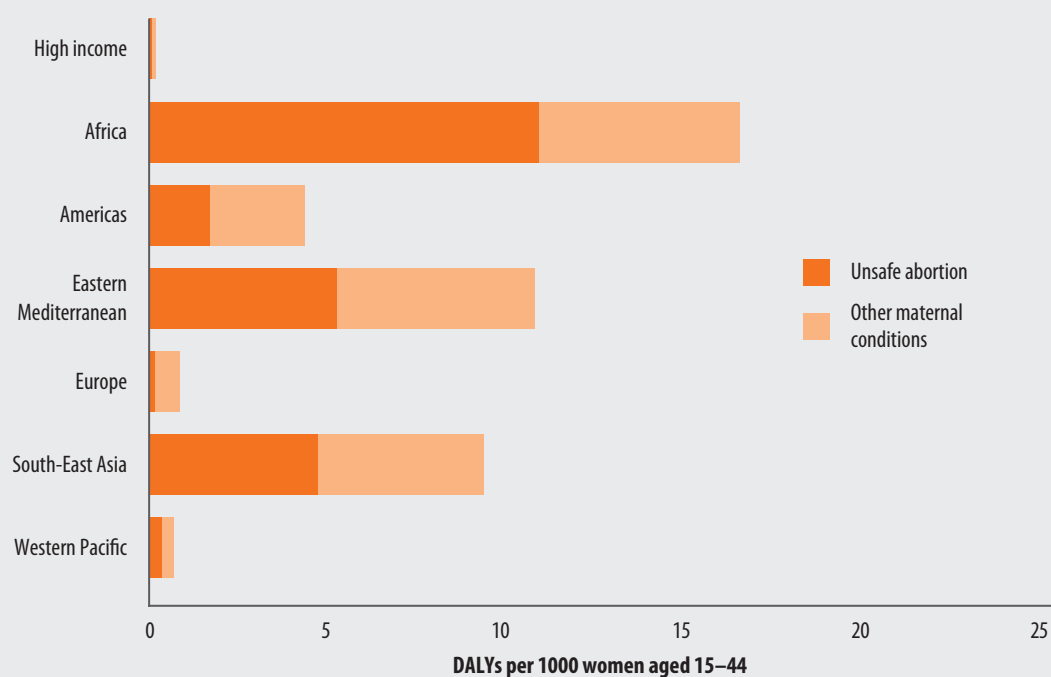
methods, usage would range from 46% in the African Region to 83% in the low- and middle-income countries of the Americas.

Unintended pregnancy leads to unwanted and mistimed births, with the same maternal and perinatal complications as planned births. The risk of abortion-related complications is proportional to the risk of unsafe abortion, which is strongly related to the legality of abortion in the country concerned. Unplanned pregnancies are estimated to be

responsible for 30% of the disease burden associated with maternal conditions and around 90% of unsafe abortions globally.

Globally, lack of modern contraception caused around 0.3% of deaths and 0.8% of DALYs. Africa, South-East Asia and low- and middle-income countries in the Eastern Mediterranean Region had the highest disease burden due to lack of contraception – accounting for around 0.5% of deaths and 1.0–1.2% of DALYs in those regions ([Figure 10](#)).

Figure 10: Burden of disease attributable to lack of contraception, by WHO region, 2004.



2.5 Addictive substances

In 2004, 70% of deaths caused by tobacco use occurred in low- and middle-income countries.

Smoking and oral tobacco use

Smoking substantially increases the risk of death from lung and other cancers, heart disease, stroke, chronic respiratory disease and other conditions. Environmental tobacco smoke and smoking during pregnancy also harm others. Smoking is increasing in many low- and middle-income countries, while steadily, but slowly, decreasing in many high-income countries (17).

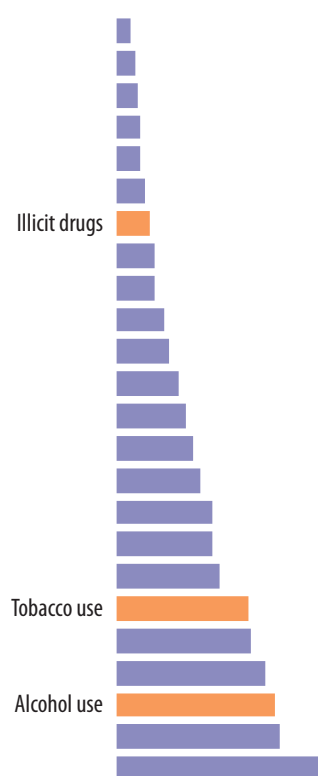
Globally, smoking causes about 71% of lung cancer, 42% of chronic respiratory disease and nearly 10% of cardiovascular disease. It is responsible for 12% of male deaths and 6% of female deaths in the world. Tobacco caused an estimated 5.1 million deaths globally in 2004, or almost one in every eight deaths among adults aged 30 years and over (Table 5). In India, 11% of deaths in men aged 30–59 years were caused by tobacco smoking.

Death rates for smoking-caused diseases are lower in low-income countries than in middle- and high-income countries (Figure 11), reflecting the lower past smoking rates in low-income countries and the higher past smoking rates in high-income countries. Because of the long time lags for development of cancers and chronic respiratory diseases associated with smoking, the impact of smoking-caused diseases on mortality in low- and middle-income countries – and for women in many regions – will continue to rise for at least two decades, even if efforts to reduce smoking are relatively successful.

Alcohol

Alcohol contributes to more than 60 types of disease and injury, although it can also decrease the risk of coronary heart disease, stroke and diabetes. There is wide variation in alcohol consumption across regions. Consumption levels in some Eastern European countries are around 2.5 times higher than the global average of 6.2 litres of pure alcohol per year. With the exception of a few countries, the lowest consumption levels are in Africa and the Eastern Mediterranean.

The net effect of alcohol on cardiovascular disease



in older people may be protective in regions where alcohol is consumed lightly to moderately in a regular fashion without binge drinking. Ischaemic stroke deaths, for example, would be 11% higher in high-income countries if no one drank alcohol. However, even in high-income countries, although the net impact on cardiovascular disease is beneficial, the overall impact of alcohol on the burden of disease is harmful (Table 5).

The regions with the highest proportions of deaths attributed to alcohol were Eastern Europe (more than 1 in every 10 deaths), and Latin America (1 in every 12 deaths). Worldwide, alcohol causes more harm to males (6.0% of deaths, 7.4% of DALYs) than females (1.1% of deaths, 1.4% of DALYs) reflecting differences in drinking habits, both in quantity and pattern of drinking. Besides the direct loss of health due to alcohol addiction, alcohol is responsible for approximately 20% of deaths due to motor vehicle accidents, 30% of deaths due to oesophageal cancer, liver cancer, epilepsy and homicide, and 50% of deaths due to liver cirrhosis.

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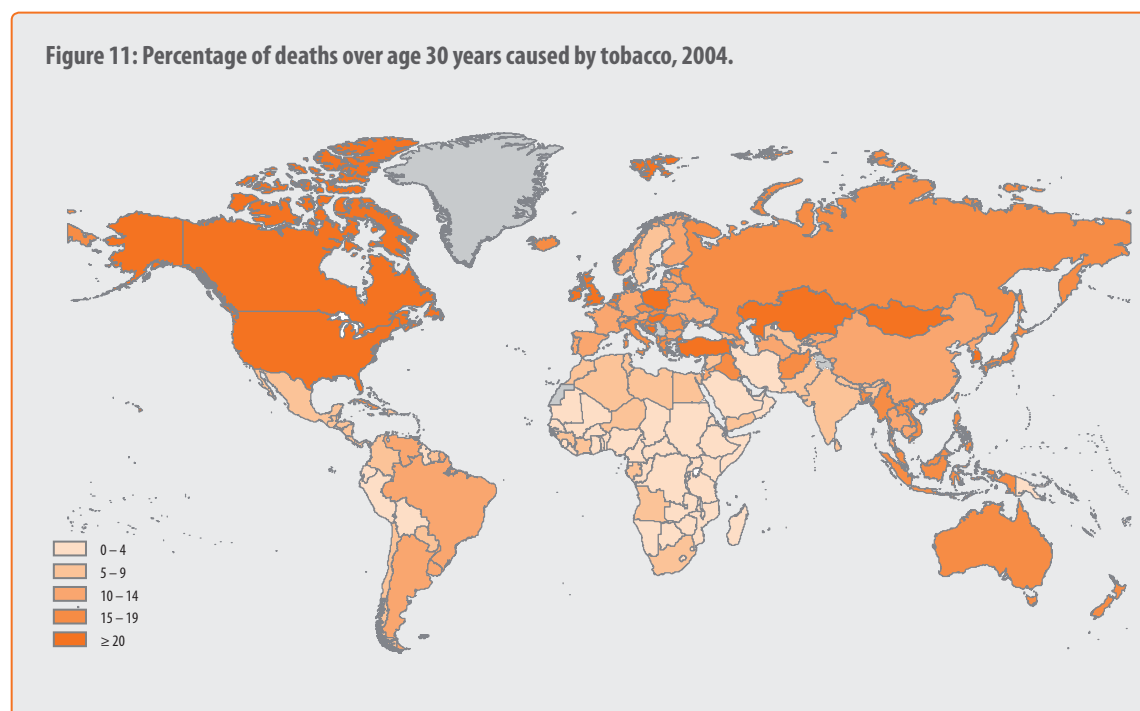
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Table 5: Deaths and DALYs attributable to alcohol, tobacco and illicit drug use, and to all three risks together, by region, 2004

Risk	World	Low and middle income	High income
<i>Percentage of deaths</i>			
Alcohol use	3.6	4.0	1.6
Illicit drugs	0.4	0.4	0.4
Tobacco use	8.7	7.2	17.9
All three risks	12.6	11.5	19.6
<i>Percentage of DALYs</i>			
Alcohol use	4.4	4.2	6.7
Illicit drugs	0.9	0.8	2.1
Tobacco use	3.7	3.1	10.7
All three risks	9.0	8.1	19.2

Figure 11: Percentage of deaths over age 30 years caused by tobacco, 2004.



Illicit drug use

Illicit opiate use rose slightly over the period 2000 to 2004, partly due to increased production in Afghanistan, which accounts for 87% of the world's illicit heroin (18). Opiate users are estimated to have risen slightly to around 16 million (11 million using heroin), mostly due to increases in Asia, which contains half of the world's opiate users.

It is difficult to estimate the extent of illegal drug

use, and there is considerable uncertainty in the estimated 245 000 deaths attributable to illicit drug use. Dependent users injecting daily for years run the greatest hazard, particularly of HIV/AIDS, overdose, suicide and trauma. Globally, 0.4% of deaths and 0.9% of DALYs were attributed to illicit drug use in 2004. The highest per capita burdens of illicit drug use were in the low- and middle-income countries of the Americas and the Eastern Mediterranean.

2.6 Environmental risks

Unhealthy and unsafe environments cause 1 in 4 child deaths worldwide.

The environment influences the health of people in many ways – through exposures to various physical, chemical and biological risk factors. The five environmental exposures quantified in this report together account for nearly 10% of deaths and disease burden globally (Table 6), and around one quarter of deaths and disease burden in children under 5 years of age.

Unsafe water, sanitation and hygiene

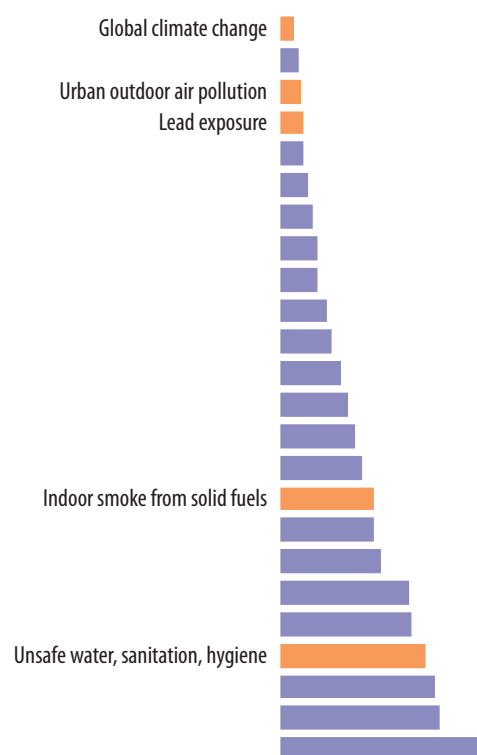
In 2004, 83% of the world's population had some form of improved water supply, while 59% (3.8 billion) had access to basic sanitation facilities (19). Improved drinking-water sources include piped water to the house or yard, public taps or standpipes, boreholes, protected dug wells, protected springs and rainwater collection. Improved sanitation facilities include flush or pour-flush toilets connected to a piped sewer system, septic tanks or pit latrines, and composting toilets.

Inadequate sanitation, hygiene or access to water increase the incidence of diarrhoeal diseases. The highest proportion of deaths and DALYs, as well as the highest absolute numbers, occur in countries with high mortality patterns, such as in Africa and parts of South-East Asia. Most diarrhoeal deaths in the world (88%) is caused by unsafe water, sanitation or hygiene. Overall, more than 99% of these deaths are in developing countries, and around 84% of them occur in children.

Urban outdoor air pollution

Industries, cars and trucks emit complex mixtures of air pollutants, many of which are harmful to health. Of all of these pollutants, fine particulate matter has the greatest effect on human health. Most fine particulate matter comes from fuel combustion, both from mobile sources such as vehicles and from stationary sources such as power plants (20).

Fine particulate matter is associated with a broad spectrum of acute and chronic illness, such as lung cancer and cardiopulmonary disease. Worldwide, it is estimated to cause about 8% of lung cancer deaths,



5% of cardiopulmonary deaths and about 3% of respiratory infection deaths. Particulate matter pollution is an environmental health problem that affects people worldwide, but middle-income countries disproportionately experience this burden.

Indoor smoke from solid fuels

More than half the world's population still cooks with wood, dung, coal or agricultural residues on simple stoves or open fires. Especially under conditions of limited ventilation, solid-fuel use leads to high exposures to indoor smoke and large associated health risks, particularly for women and children.

Indoor smoke from solid-fuel use contains a range of potentially harmful substances, from carcinogens to small particulate matter, all of which cause damage to the lungs. Indoor smoke from solid fuel causes about 21% of lower respiratory infection deaths worldwide, 35% of chronic obstructive pulmonary deaths and about 3% of lung cancer deaths. Of these deaths, about 64% occur in low-income countries, especially in South-East Asia and Africa.

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Table 6: Deaths and DALYs attributable to five environmental risks, and to all five risks combined by region, 2004.

Risk	World	Low and middle income	High income
Percentage of deaths			
Indoor smoke from solid fuels	3.3	3.9	0.0
Unsafe water, sanitation, hygiene	3.2	3.8	0.1
Urban outdoor air pollution	2.0	1.9	2.5
Global climate change	0.2	0.3	0.0
Lead exposure	0.2	0.3	0.0
All five risks	8.7	9.6	2.6
Percentage of DALYs			
Indoor smoke from solid fuels	2.7	2.9	0.0
Unsafe water, sanitation, hygiene	4.2	4.6	0.3
Urban outdoor air pollution	0.6	0.6	0.8
Global climate change	0.4	0.4	0.0
Lead exposure	0.6	0.6	0.1
All five risks	8.0	8.6	1.2

A further 28% of global deaths caused by indoor smoke from solid fuels occur in China.

Lead exposure

Because of its many uses, lead is present in air, dust, soil and water. Exposure to lead in the womb and during childhood reduces intelligence quotient (IQ), among other behavioural and developmental effects; for adults, it increases blood pressure. Blood lead levels have been steadily declining in industrialized countries following the phasing-out of leaded fuels. However, where leaded petrol is still used, lead can pose a threat, primarily to children in developing countries. Certain populations in industrialized countries are still exposed to high lead levels: mainly from degraded housing. Overall, 98% of adults and 99% of children affected by exposure to lead live in low- and middle-income countries.

Climate change

Average global temperatures are likely to rise by 1.1–6.4 °C between 1990 and 2100 (21). Physical, ecological and social factors will have a complex

effect on climate change. Because of this complexity, current estimates of the attributable and avoidable impacts of climate change are based on models with considerable uncertainty.

Potential risks to health include deaths from thermal extremes and weather disasters, vector-borne diseases, a higher incidence of food-related and waterborne infections, photochemical air pollutants and conflict over depleted natural resources. Climate change will have the greatest effect on health in societies with scarce resources, little technology and frail infrastructure. Only some of the many potential effects were fully quantifiable; for example, the effects of more frequent and extreme storms were excluded. Climate change was estimated to be already responsible for 3% of diarrhoea, 3% of malaria and 3.8% of dengue fever deaths worldwide in 2004. Total attributable mortality was about 0.2% of deaths in 2004; of these, 85% were child deaths. In addition, increased temperatures hastened as many as 12 000 additional deaths; however these deaths were not included in the totals because the years of life lost by these individuals were uncertain, and possibly brief.

2.7 Occupational and other risks

Occupational noise exposure causes about 16% of adult-onset hearing loss.

Unsafe health-care injections cause more deaths in low- and middle-income countries than colon and rectum cancer.

People face numerous hazards at work, which may result in injuries, cancer, hearing loss, and respiratory, musculoskeletal, cardiovascular, reproductive, neurological, skin and mental disorders. This report evaluates only selected risk factors because of the lack of global data, but these occupational risks alone account for 1.7% of DALYs lost worldwide. In addition, there is increasing evidence from industrialized countries to link coronary heart disease and depression with work-related stress (3, 22).

Occupational injuries

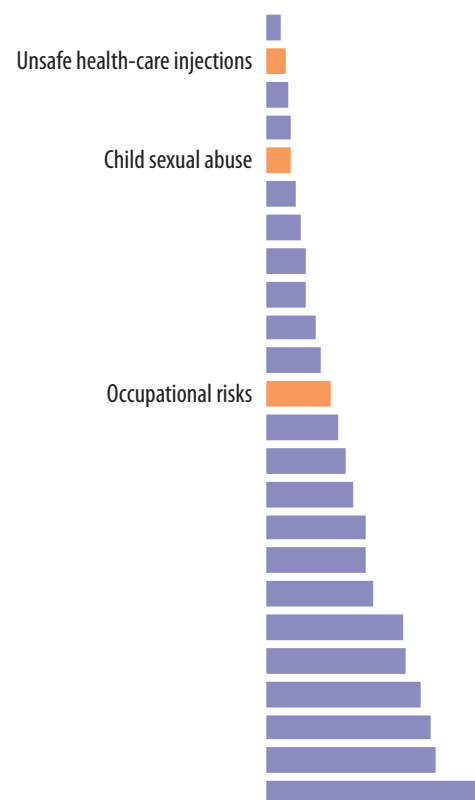
Overall, more than 350 000 workers lose their lives each year due to unintentional occupational injuries. More than 90% of this injury burden is borne by men and more than half of the global burden occurs among men working in the WHO South-East Asia and Western Pacific regions. In men aged 15–59 years, 8% of the total burden of unintentional injury is attributable to work-related injuries in high-income countries, and 18% in low- and middle-income countries.

Occupational carcinogens

At least 150 chemical and biological agents are known or probable causes of cancer. Many of these are found in the workplace, even though occupational cancers are almost entirely preventable through eliminating exposure, substituting safer materials, enclosing processes and ventilation. Worldwide, these occupational exposures account for an estimated 8% of lung cancer, which is the most frequent form of occupational cancer.

Occupational airborne particulates

Workplace exposure to microscopic airborne particles can cause lung cancer, chronic obstructive pulmonary disease, silicosis, asbestosis and pneumoconiosis. These diseases take a long time to develop, so,



even in countries where the risk has been recognized and controlled, the rate of decline in disease burden has been slow. In developing countries, trends are mostly unknown, but the problem is substantial. Occupational exposure to airborne particulates is estimated to cause 12% of deaths due to chronic obstructive pulmonary disease. Additionally, an estimated 29 000 deaths are due to silicosis, asbestosis and pneumoconiosis caused by silica, asbestos and coal dust exposure.

Ergonomic stressors

Low back pain can be caused by lifting and carrying heavy loads, demanding physical work, frequent bending, twisting and awkward postures. Such pain is rarely life-threatening, but can limit work and social activities. An estimated 37% of back pain is attributable to occupational risk factors. Although not a cause of premature mortality, low back pain causes considerable morbidity and is a major cause of work absences, resulting in economic loss.

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Occupational noise

Excess noise is one of the most common occupational hazards, particularly for mining, manufacturing and construction workers, especially in developing countries. Its most serious effect is irreversible hearing impairment, which is completely preventable. Most exposure can be minimized by engineering controls to reduce noise at its source. About 16% of adult-onset hearing loss worldwide is attributable to occupational noise exposure. According to the WHO definition of hearing loss (23), this corresponds to 4.5 million DALYs for moderate or greater levels of hearing loss. Mild hearing loss was not included in this estimate.

Unsafe health-care injections

The complexity of modern health care inevitably brings risks as well as benefits. Patient safety is a serious global public health issue. Estimates show that, in developed countries, as many as 1 patient in 10 is harmed while receiving hospital care.

The probability of patients being harmed in hospitals is higher in developing countries than in industrialized nations. The risk of health-care associated infection in some developing countries is up to 20 times higher than in developed countries. Mortality rates associated with major surgery are also unacceptably high in many developing countries (24). The situation in developing countries may also be made worse because of the use of counterfeit and substandard drugs, and inappropriate or poor equipment and infrastructure.

Injections are overused in many countries, and unsafe injections cause many infections: in particular hepatitis B and C, and HIV. Unsafe injections result mainly from the reuse of injection equipment without adequately sterilizing it. Unsafe injections account for an estimated 30% of hepatitis B infections, 24% of hepatitis C infections, 27% of liver cancer, 24% of liver cirrhosis deaths and 1.3% of HIV deaths worldwide. An estimated 417 000 people died as a result of disease transmitted by unsafe injections in 2004.

Child sex abuse

Child sex abuse increases the risk of a range of mental disorders in adult life, including depression, anxiety disorders, drug or alcohol abuse, and suicide. The

percentage of adults who have been sexually abused during childhood ranged from around 4% of men in high-income countries to more than 40% of women in parts of Africa and Asia. About one third of post-traumatic stress disorder cases in women and one fifth in men are attributable to child sex abuse (25). Between 5 and 8% of alcohol and drug use disorders are attributable to child sex abuse. Much of the burden of child sex abuse is disabling rather than fatal, and occurs in the young. Applying these fractions to DALY estimates for 2004 resulted in 0.6% of the global burden of disease being attributable to child sex abuse.

Other health risks

Many thousands of other threats to health exist within and outside the categories considered in this report. They include risk factors for tuberculosis and malaria (together responsible for 4.5% of the global disease burden), family environment risk factors for mental disorders, risk factors for injuries, and a complex range of dietary risks. Some important risks associated with exposure to infectious disease agents or with antimicrobial resistance are also not included. Genetics play a substantial role, although this report has not attempted to quantify the attributable burden of disease from genetic causes. In general, this report's approach and methodology can be applied more widely; as a result, the potential for prevention of other risks to health can be brought to the attention of health policy-makers.

More than 90% of road deaths occur in low- and middle-income countries, where the death rates (20 and 22 per 100 000 population, respectively) are almost double those for high-income countries. Because many deaths occur in young adults, the loss of potential healthy life is great (26).

Crashes are largely preventable using engineering measures – such as traffic management – vehicle design and equipment such as helmets and seat belts, and road-user measures such as speed limits (27). When used correctly, seat belts reduce the risk of death in a crash by 61%. In Thailand, a motorcycle helmet law cut deaths by 56%, and it has been estimated that lowering average speeds by 5 km per hour would cut deaths by 25% in Western Europe. If countries with high rates of road injury were able to reduce road death rates to the best levels achieved

in their regions, global road fatalities would fall by 44%.

Intentional injuries caused 1.6 million deaths in 2004: 51% of these by suicide, 37% by violence between individuals, and 11% in wars and civil conflict. Interpersonal violence was the second leading cause of death in 2004 among men aged 15–44 years, after road traffic accidents. There is a close relationship between violence and poverty; countries with lower per capita income have higher homicide rates, but rates were substantially higher in the low- and

middle-income countries of Africa and the Americas than in other regions. Other risk factors for interpersonal violence include alcohol and availability of weapons, particularly firearms.

Collective violence, including war, caused an estimated 184 000 deaths in 2004 – more than half of these in the WHO Eastern Mediterranean Region, and half of the remainder in Africa (2). Risk factors for collective violence include the wide availability of small arms, political and socioeconomic inequalities, and abuse of human rights.

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