

### 3 Joint effects of risk factors

#### 3.1 Joint contribution of risk factors to specific diseases

Many diseases are caused by more than one risk factor, and thus may be prevented by reducing any of the risk factors responsible for them. As a result, the sum of the mortality or burden of disease attributable to each of the risk factors separately is often more than the combined mortality and burden of disease attributable to the groups of these risk factors.

For example, of all infectious and parasitic child deaths (including those caused by acute lower respiratory infections), 34% can be attributed to underweight; 26% to unsafe water, hygiene and sanitation; and 15% to smoke from indoor use of solid fuels. The joint effect of all three of these risk factors is, however, 46%. Similarly, 45% of cardiovascular deaths among those older than 30 years can be attributed to raised blood pressure, 16% to raised cholesterol and 13% to raised blood glucose, yet the estimated combined effect of these three risks is about 48% of cardiovascular diseases.

##### *Risks for child health*

In 2004, 10.4 million children under 5 years of age died: 45% in the WHO African Region and 30% in the South-East Asia Region. The leading causes of death among children under 5 years of age are acute respiratory infections and diarrhoeal diseases, which are also the leading overall causes of loss of healthy life years. Child underweight is the leading individual risk for child deaths and loss of healthy life years, causing 21% of deaths and DALYs. Child underweight, together with micronutrient deficiencies and suboptimal breastfeeding, accounted for 35% of child deaths and 32% of loss of healthy life years worldwide. Unsafe water, sanitation and hygiene, together with indoor smoke from solid fuels, cause 23% of child deaths. These environmental risks, together with the nutritional risks and suboptimal breastfeeding, cause 39% of child deaths worldwide.

##### *Risks for cardiovascular disease*

The two leading causes of death are cardiovascular – ischaemic heart disease and cerebrovascular disease;

cardiovascular diseases account for nearly 30% of deaths worldwide. Eight risk factors – alcohol use, tobacco use, high blood pressure, high body mass index, high cholesterol, high blood glucose, low fruit and vegetable intake, and physical inactivity – account for 61% of loss of healthy life years from cardiovascular diseases and 61% of cardiovascular deaths. The same risk factors together account for over three quarters of deaths from ischaemic and hypertensive heart disease.

Cardiovascular deaths occur at older ages in high-income countries than in low- and middle-income countries. DALYs account for this difference by giving a higher weight to deaths at younger ages. Among adults over 30 years of age, the rate of DALYs attributed to the eight cardiovascular risk factors is more than twice as high in middle-income European countries than in high-income countries or in the Western Pacific Region, where rates are lowest. In all regions, the leading cause of cardiovascular death is high blood pressure, which causes between 37% of cardiovascular deaths in the South-East Asia Region to 54% of cardiovascular deaths in middle-income European countries. The eight cardiovascular risk factors cause the largest proportion of cardiovascular deaths in middle-income European countries (72%) and the smallest proportion in African countries (51%).

##### *Risks for cancer*

Cancer rates are increased by many of the risks considered in this report, and some leading cancers could be substantially reduced by lowering exposure to these risks. Worldwide, 71% of lung cancer deaths are caused by tobacco use (lung cancer is the leading cause of cancer death globally). The combined effects of tobacco use, low fruit and vegetable intake, urban air pollution, and indoor smoke from household use of solid fuels cause 76% of lung cancer deaths. All deaths and unhealthy life years from cervical cancer are caused by human papillomavirus infection from unsafe sex. Nine leading environmental and behavioural risks – high body mass index, low fruit and vegetable intake, physical inactivity, tobacco use, alcohol use, unsafe sex, urban and indoor air pollution, and unsafe health-care injections – are responsible for 35% of cancer deaths.

Cancers are also caused by infections. Worldwide,

63% of stomach cancer deaths are caused by infection with *Helicobacter pylori*, 73% of liver cancer deaths are caused by infection with viral hepatitis or liver flukes, and 100% of cervical cancer deaths are caused by infection with human papillomavirus. The combined effects of seven infectious agents – blood and liver flukes, human papillomavirus, hepatitis B and C, herpesvirus and *H. pylori* – cause 18% of cancer deaths. Together with the nine environmental and behavioural causes of cancer, these infections explain 45% of cancer deaths worldwide. For specific cancer sites, the proportion is higher: more than three quarters of deaths from mouth and oropharynx cancer, liver cancer, lung cancer and cervical cancer can be explained by infections, and environmental and behavioural exposures.

### 3.2 Potential health gains from reducing multiple risk factors

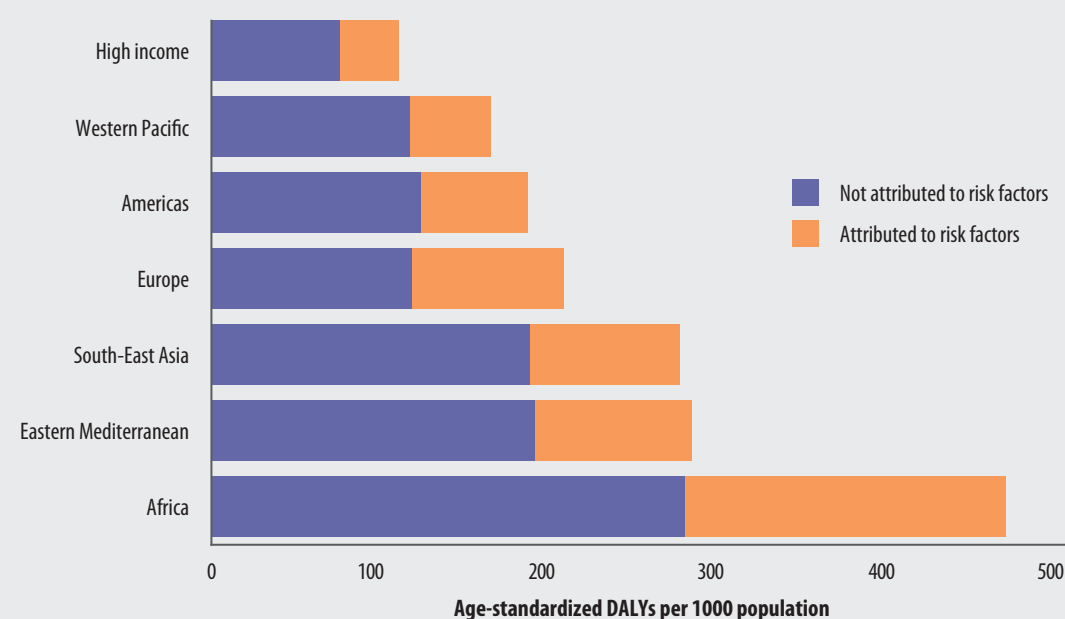
Reducing or eliminating the risks described in this report could reduce by three quarters or more the deaths and DALYs caused by leading diseases such as ischaemic heart disease, diabetes, diarrhoea and

HIV/AIDS (Figure 12). Nearly one half (44%) of deaths in the world in the year 2004 could be attributed to the 24 risk factors analysed in this report, when joint effects were taken into account (Table 7). One third (33%) of global deaths could be attributed to the leading 10 risk factors (defined by total attributable burden), and more than one quarter to the leading five risk factors (25%). The leading 10 risk factors were responsible for one quarter of the total loss of healthy years of life globally.

The risks considered in this report explain a larger proportion of loss of healthy years of life in Africa and low- and middle-income European countries (40% and 45%) than in other regions, where these risk factors cause about one third of the loss of healthy years of life. This is because of the importance of cardiovascular risk factors, including alcohol, in Europe, and child risks, as well as risks for HIV/AIDS, in Africa.

Had these 24 risks not existed, life expectancy would have been on average almost a decade longer in 2004 for the entire global population (Figure 13). Low and middle income countries have much more to gain than the richest countries: for example, life

Figure 12: Disease burden attributable to 24 global risk factors, by income and WHO region, 2004.



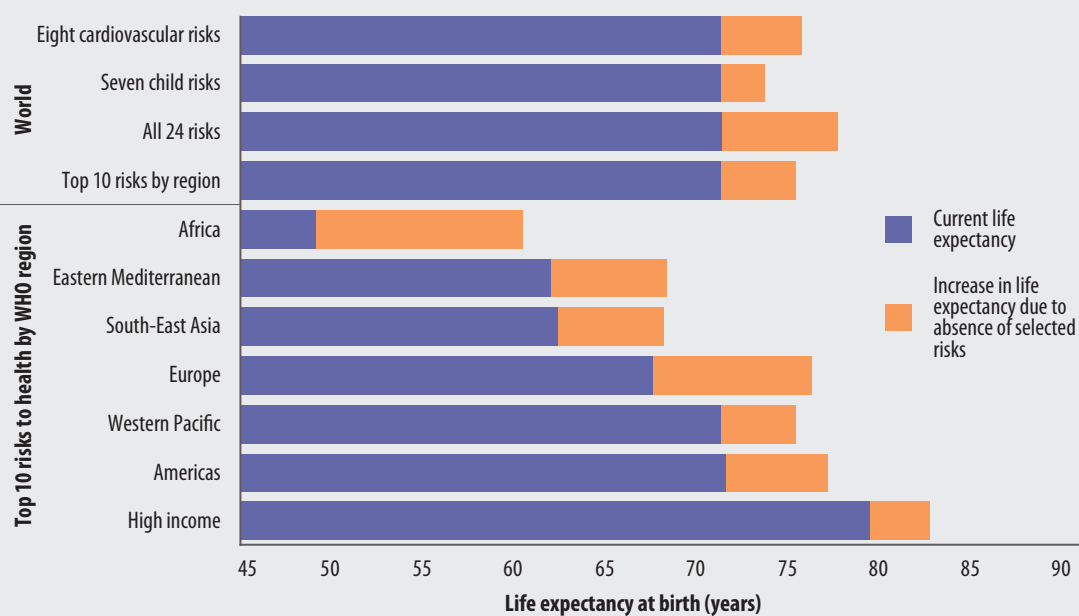
**Table 7: Percentage of total disease burden due to 5 and 10 leading risks and all 24 risks in this report, world, 2004**

	5 leading risks	10 leading risks	24 risks
Attributable deaths (%)	25	33	44
Attributable DALYs (%)	20	25	35
Attributable life expectancy loss (years)	4.9	6.8	9.3

**Table 8: Percentage of total disease burden due to 10 leading risks, by region and income group, 2004**

	Region						
	High income	Africa	Americas	Eastern Mediterranean	Europe	South-East Asia	Western Pacific
Attributable deaths (%)	28	40	34	31	49	29	29
Attributable DALYs (%)	21	34	24	21	34	22	19
Attributable life expectancy loss (years)	3.3	11.3	5.6	6.4	8.8	5.8	4.0

**Figure 13: Potential gain in life expectancy in the absence of selected risks to health, world, 2004.**



expectancy would have grown by nearly 13 years in the African Region, but by less than 6 years in the high-income countries. The five leading risks alone shortened life expectancy by about 9 years in Africa in 2004.

### 3.3 Conclusions

It is clear that the world faces some large, widespread and certain risks to health. The five leading risk factors identified in this report are responsible for one quarter of all deaths in the world; all 24 risk factors are responsible for almost one half of all deaths. Although some of these major risk factors (e.g. tobacco use or overweight and obesity) are usually associated with high-income countries, in fact, more than three quarters of the total global burden of diseases they cause already occurs in low- and middle-income countries. Health risks are in transition – and health has become globalized – as patterns of consumption change markedly around the world and populations contain higher proportions of older people, as a result of successes against infectious diseases and decreasing fertility levels.

Developing countries increasingly face a double burden from the risks for communicable diseases and maternal and child outcomes that traditionally affect the poor combined with the risks for noncommunicable conditions. The poorest countries still

face a high and concentrated burden from poverty, undernutrition, unsafe sex, unsafe water and sanitation, iron deficiency and indoor smoke from solid fuels. At the same time, dietary risk factors for high blood pressure, cholesterol and obesity, coupled with insufficient physical activity, are responsible for an increasing proportion of the total disease burden. Had the risks considered in this report not existed, life expectancy would have been on average almost a decade longer in 2004 for the entire global population, with greater increases in the low-income countries than in the high-income countries.

The results from the report provide powerful input for policy actions when combined with information about interventions, their costs and their efficacy. Although risk exposure estimates are based on less-than-perfect data, they are often conservative because, as health improves, gains can multiply. For example, reducing the burden of disease in the poor may raise income levels, which, in turn, will further help to reduce health inequalities. Many cost-effective interventions are also known, and prevention strategies can be transferred between similar countries. Much of the necessary scientific and economic information, evidence and research is already available for guiding policy decisions that could significantly improve global health.

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Annex A

References