

# 7. Analysing risks to human lives

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## I. Introduction

During 2006, world governments spent roughly \$1200 billion on the military sector. This spending generates significant business for the arms industry, with the 100 largest arms-producing companies making domestic and foreign arms sales worth \$290 billion and global arms exports amounting to \$39–56 billion in 2005.<sup>1</sup> An important question is whether this spending achieves the stated purpose—the provision of security. The answer depends on many factors, including the definition of security and the means that are most cost-effective in attaining this security.

If the ultimate objective of security is to save human beings from preventable premature death and disability, then the appropriate security policy would focus on prevention instruments and risk-reduction strategies for their causes. Furthermore, if it is assumed that the pattern of causes of premature death and disability will not change significantly in the near future, then the historic pattern can be used to identify principal causes and risk factors as well as to develop strategies of prevention and risk reduction.

While collective violence causes a great many premature deaths and disabilities, other types of injury cause an even greater number. Moreover, the major cause of premature death and disability is a range of diseases that could be prevented relatively easily (see table 7.2 below). There are also linkages between different causes of death and between their respective risk factors. Thus, the impact of collective violence on humans is not limited to the number of deaths that it causes but extends to the poverty and ill health that it brings. Equally, poverty and ill health create the circumstances in which violence is likely to break out.

In this chapter the risks to human lives are reviewed in a concrete way, by focusing on the actual causes of death and disability worldwide. Particular attention is paid to low-income countries, where mortality rates and premature deaths are well above the world average, and where a great proportion of these deaths could be prevented at relatively low cost. This review is based on studies conducted in the fields of epidemiology and public health economics, which analyse actual risks to human lives with a view to identifying measures for their prevention and the costs of such measures.

<sup>1</sup> See chapters 8–10 in this volume. The figure of \$290 billion refers to the combined arms sales of the SIPRI Top 100 arms-producing companies in the world excluding China.

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This section continues with a discussion of the much contested definition of security. Section II provides an overview of actual causes of death and disability and the associated risk factors, along with recommended preventive interventions or risk-reduction strategies. The links between risks to human lives from disease and from collective violence are discussed in section III, with a view to assessing their implications for security analysis and policy and, therefore, also for resource allocation. The conclusions are presented in section IV.

### Concepts of security

Security is a contested concept. Traditionally, security has been thought of in terms of external military threats or risks posed to a state by another state or by internal armed threats from non-state actors. Changes in the contemporary security environment have resulted in a plethora of attempts to define and conceptualize—both politically and theoretically—these changes and their implications for states, societies and individuals. The traditional conception of security has been joined by others which both broaden the nature of possible threats (adding to armed threats such threats as terrorism, organized crime and disease, which are associated with risk factors in the economic, political, societal and environmental domains) and deepen the objects that are being threatened (to include global security, sub-national groups and individuals).<sup>2</sup>

The reconceptualizations of security that involve the broadening of state security to include new risks and threats beyond attack by military force have given birth to such concepts as homeland security, functional security and environmental security. The deeper concepts of security which relate to the protection of human individuals from threats to their security as individuals require the building of a social framework in which humans can live free from both fear and want.<sup>3</sup> The broader concepts of security also require that the diverse threats are addressed in a comprehensive manner, which necessitates examination of the interlinkages among those threats from a human perspective.<sup>4</sup>

<sup>2</sup> Sköns, E., 'Financing security in a global context', *SIPRI Yearbook 2005: Armaments, Disarmament and International Security* (Oxford University Press: Oxford, 2005), pp. 285–306.

<sup>3</sup> This perspective was embodied in the UN Millennium Declaration of Sep. 2000 and first spelled out by UN Secretary-General Kofi Annan in May 2000. United Nations, 'United Nations Millennium Declaration', UN General Assembly Resolution 55/2, 8 Sep. 2000, URL <<http://www.un.org/millennium/goals/>>; and United Nations, 'Secretary-General salutes international workshop on human security in Mongolia', Press Release SG/SM/7382, 8 May 2000, URL <<http://www.un.org/News/Press/docs/2000/20000508.sgsm7382.doc.html>>. For a critical discussion of this perspective, which is one way of conceptualizing 'human security', see Owen, T., 'Conspicuously absent? Why the Secretary-General used human security in all but name', *St Anthony's International Review*, vol. 1, no. 2 (Nov. 2005), pp. 37–42; and Paris, R., 'Human security: paradigm shift or hot air?', *International Security*, vol. 26, no. 2 (fall 2001), pp. 87–102.

<sup>4</sup> Owada, H., 'The United Nations and the maintenance of international peace and security: the current debate in the light of reform proposals', Keynote speech at the Research Forum on International Law, European Society of International Law and Graduate Institute of International Studies, Geneva, 26 May 2005, URL <<http://www.esil-sedi.eu/english/forum2005.html>>.

The result is that there is no longer a universally accepted definition, in theory or in practice, of security. Different theoretical perspectives stress different values and there is always an element of subjectivity in interpretations of what an objective definition of security should entail. Realist theories focus on international problems and stress conflict; transnational corporate-globalist views emphasize economic aspects and the preservation of the existing international economic system; and the emerging human security perspectives focus on the conditions of individuals and the planet.<sup>5</sup> In addition, risk analysis is emerging as a complementary way of addressing security problems in order to overcome the contradiction between different types of security concepts.<sup>6</sup> Table 7.1 lists the security threats and risks covered in five recent studies as an illustration of the different security analyses that result from different theoretical approaches.

Different conceptions of security can be represented in a matrix with the rows representing the different types of threat to security and the columns the various referent objects of security. One representation of such a security matrix is shown in figure 7.1. However, the rows and columns of any such matrix are not fixed and the choice of threats and referent objects made in the figure is by no means the only one possible when thinking about new security concepts. Perceived security threats include not only military threats, but also a number of additional phenomena that have been ‘securitized’, including political, economic, societal, environmental and ecological threats.<sup>7</sup> The referent object of security is who or what is threatened and needs protection; it ranges from global and collective security via national, state and regime security and sub-national security linked to class, religion or ethnicity to the security of the individual. In recent years, the security of the individual has been emphasized over national security, as can be observed, for example, in the notion of the ‘responsibility to protect’ as a norm guiding international humanitarian interventions.<sup>8</sup>

Different concepts of security are represented by the different cells in this matrix, which represent different choices of threat and referent and thus also require different instruments or interventions to address security threats and risks. The choice between different security concepts has often been seen as a zero-sum game, in which the enhancement of security for one type of actor—for example, the state or regime—from one type of threat decreases the secur-

<sup>5</sup> Alternative values in the main theories are set out in Gurtov, M., *Global Politics in the Human Interest*, 4th edn (Lynne Rienner: Boulder, Colo., 1999), pp. 25–26. See also Rojas Aravena, F., ‘Human security: emerging concept of security in the twenty-first century’, *Disarmament Forum*, no. 2, 2002, pp. 5–14.

<sup>6</sup> E.g. ‘reflexive security studies’ is a risk-based research strand within international security studies that applies sociological theories on ‘risk society’ to understand contemporary security problems. See the Introduction in this volume.

<sup>7</sup> Buzan, B., Wæver, O. and de Wilde, J., *Security: A New Framework for Analysis* (Lynne Rienner: Boulder, Colo., 1998).

<sup>8</sup> International Commission on Intervention and State Sovereignty, *The Responsibility to Protect* (International Development Research Centre: Ottawa, Dec. 2001), URL <<http://www.iciss.ca/report-en.asp>>.

**Table 7.1.** Select studies of security threats and risks, 2004–2006

Security object/ Purpose of study	Major threats and risks identified
<b>United Nations High-level Panel, 'A more secure world: our shared responsibility', 2004</b>	
Collective security	Economic and social: poverty; infectious disease; environmental degradation
To suggest collective approaches to meet the challenges of global, national, regional and human security threats	Interstate conflict Internal conflict: civil war; genocide; other large-scale atrocities Nuclear, radiological, chemical and biological weapons Terrorism Transnational organized crime
<b>US National Intelligence Council, <i>Mapping the Global Future</i>, 2004</b>	
US national security	<i>Insecurity trends</i> : international terrorism; intensifying internal conflicts: rising powers (e.g. China); weapons of mass destruction
To analyse developments up to 2030 which might warrant US policy action	<i>Non-security trends</i> : Globalization: an expanding and integrating global economy; the technological revolution; lingering social inequalities; Changing geopolitical landscape: rising Asia and other rising states; the ageing powers; growing energy demands; the duration of US unipolarity New challenges to governance: halting progress of democratization
<b>Human Security Centre, <i>The Human Security Report 2005, 2005</i></b>	
Human security	Armed conflicts Genocides and 'politicides'
To examine major trends in global political violence, and their consequences	Refugee flows Military coups Human rights abuse International terrorism
<b>World Economic Forum, <i>Global Risks 2006, 2006</i></b>	
Corporate security	Economic: energy supply, indebtedness, the US dollar, China, critical infrastructure
To assess systemic risks to global business and their likely effects on markets and industries	Societal: regulations, corporate governance, intellectual property rights, organized crime, global pandemics, chronic disease in industrial countries, epidemic disease in developing countries Environmental: tropical cyclones, earthquakes, climate change Technological: technological convergence, nanotechnology, electromagnetic fields, ubiquitous computing Geopolitical: terrorism, European dislocation, hotspots
<b>European Union Institute for Security Studies, <i>The New Global Puzzle</i>, 2006</b>	
State and human security	Demographic trends Economic trends Energy trends
To analyse relevant trends for future EU security policy	Environmental trends Science and technology

*Sources:* United Nations, ‘A more secure world: our shared responsibility’, Report of the High-level Panel on Threats, Challenges and Change, UN document A/59/565 and Corr. 1, 4 Dec. 2004, URL <<http://www.un.org/secureworld/>>; US National Intelligence Council (NIC), *Mapping the Global Future*, Report of the NIC’s 2020 Project (Government Printing Office: Washington, DC, Dec. 2004), URL <[http://www.dni.gov/nic/NIC\\_globaltrend2020.html](http://www.dni.gov/nic/NIC_globaltrend2020.html)>; University of British Columbia, Human Security Centre, *Human Security Report 2005: War and Peace in the 21st Century* (Oxford University Press: New York, N.Y., 2005), URL <<http://www.humansecurityreport.info/>>; World Economic Forum, *Global Risks 2006* (World Economic Forum: Geneva, 2006), URL <<http://www.weforum.org/en/initiatives/globalrisk/>>; and EU Institute for Security Studies (EU-ISS), *The New Global Puzzle: What World for the EU in 2025?* (EU-ISS: Paris, 2006), URL <<http://www.iss-eu.org/public/content/bookse.html>>.

ity of another actor at another level—for example, a religious or ethnic minority in that state or even all or some of its citizens. In the contemporary security environment, security at the human and other sub-national levels is increasingly becoming a major concern in the international system at the expense of national security and additional perceived threats are continuously emerging. In this environment, traditional security analysis is insufficient to correctly address security problems, largely because it cannot deal with the dangers of zero-sum thinking that seem to invariably result from such analysis.

The potential to mitigate the seemingly zero-sum results that traditional security theory often generates may be offered by applying a risk analysis across the cells of the security matrix. The basic rationale of this chapter is to argue that a risk-based approach in combination with cost–benefit analysis of the methods of risk reduction and prevention—in this case at the level of the individual—is a useful complement to traditional security analysis. Such an approach opens up the potential for an improved trade-off between security concerns at different levels, allowing for a win–win outcome. It also makes it necessary to explore the interlinkages between different types of security, threats and risk factors in order to identify such trade-offs.

This chapter’s focus on threats and risks to human lives that have traditionally not been classified as security threats has two major implications. First, it suggests that the opportunity costs of military spending are very high. This is especially the case in terms of regime security lost through lack of social investments—such investment would increase individual security and thus gain the regime higher levels of legitimacy from both citizens and the international community. Second, this type of evidence may lead not only to normative and well-intentioned recommendations at the level of individual and human security but might also be interpreted as strengthening security at several levels and in several dimensions simultaneously—that is, it would also have a realist, rational-choice based appeal.

Human	State	System	Network	Global	
					Warfare
					Terrorism and crime
					States at risk
					Resource conflict
					Pandemics
					Environment
					WMD proliferation
					Infowar

**Figure 7.1.** A representation of the security matrix

The shaded cell represents the traditional concept of state security.

Source: Brown University, Watson Institute for International Studies, Global Security Matrix website, URL <<http://www.globalsecuritymatrix.org/>>.

## II. Major risks to human lives

In its most generic form, risk refers to a potential negative impact on an asset or some characteristic of value that may arise from some present process or future event. Assessments of risks to human lives are made in the discipline of epidemiology, a branch of medicine that studies the causes, distribution, and control of disease in populations and serves as the foundation for preventive interventions. The concept of risk used in epidemiological studies is based on the actual outcome of disease in a population during a given time period, such as mortality (annual number of deaths in a certain number of population at risk) or, more recently, years of healthy life lost owing to premature death and disability related to a given disease, condition or injury.<sup>9</sup>

Global patterns of death and disability, risk factors underlying them and recommended prevention strategies are reviewed in this section. This review is based on official statistics on reported causes of death and disability and on major studies of risk factors and related prevention strategies.

<sup>9</sup> Rothman, K. J. and Greenland, S. (eds), *Modern Epidemiology*, 2nd edn (Lippincott–Raven: Philadelphia, Pa., 1998).

## World Health Organization data on causes of death and disability

The patterns of death and disability described in this section are based on statistics of the World Health Organization (WHO). Three types of indicators are used: numbers of death, rates of mortality and numbers of disability-adjusted life years (DALYs). The DALY is a measure developed in order to quantify the global burden of disease and injury. It combines in a single indicator years of life lost due to premature death and years of healthy life lost as a result of disability.

### *Problems with the data*

While providing a rough assessment of the causes of death and disability, the WHO statistics suffer from several weaknesses. First, complete death registration data are available for only one-third of those who die. Some information on another third is available through the urban death registration systems and national sample registration systems of China and India. For the remaining one-third, only partial information is available from epidemiological studies, disease registers and surveillance systems.<sup>10</sup> These problems are worst for data on death and disability from violence, and in particular from collective violence, for which no accurate data exist. Therefore, a number of estimation methods are employed in producing these statistics. Second, the accuracy of the diagnoses of the cause of death is often questionable for several reasons, including death registration without medical opinion, under-reporting of causes of death of a sensitive nature, misinterpretation of the rules for selecting underlying causes and difficulties of identifying a single cause of death.<sup>11</sup> Third, the selection of factors used as the ultimate causes of death and disability in the WHO data appear somewhat arbitrary. In principle, the cause of death should refer to factors inherent in the human body, while factors external to it are generally regarded as risk factors. However, the dividing line between these two is difficult to define. While nutritional deficiency is among the causes of death and disability in WHO data, hunger is not; and while traffic accidents and collective violence are considered to be causes of death, disasters are not. The problem can be illustrated by a question posed by two researchers on food security: ‘What, for example, is the “cause” of death of a starving person, caught in a civil war, who ends up in a refugee camp, and then dies of measles?’<sup>12</sup> As mentioned above, the inclusion of unintentional and intentional injury (i.e. accidents and violence) as causes of death also involves severe difficulties in obtaining reliable data, a problem that is discussed in more detail in section III.

<sup>10</sup> Mathers, C. D., Lopez, A. D. and Murray, C. J. L., ‘The burden of disease and mortality by condition: data, methods, and results for 2001’, eds A. D. Lopez et al., World Bank, *Global Burden of Disease and Risk Factors* (Oxford University Press: New York, N.Y., Apr. 2006), URL <<http://www.dcp2.org/pubs/GBD/>>, p. 51.

<sup>11</sup> Mathers, Lopez and Murray (note 10), pp. 53–55.

<sup>12</sup> Falcon, W. P. and Naylor, R. L., ‘Rethinking food security for the twenty-first century’, *American Journal of Agricultural Economics*, vol. 87, no. 5 (Nov. 2005), p. 1114.

**Table 7.2.** Causes of death and disability, worldwide and by income group, 2005

Cause	Deaths (th.)	Mortality rates (deaths/100 000) by country income group					Burden of disease (m. DALYs)
		World	High	Upper middle	Lower middle	Low	
<i>Communicable diseases</i>	17 258	268	57	91	110	509	566
Infectious/parasitic	10 262	159	16	41	65	312	325
Tuberculosis	1 411	22	1	5	16	37	31
HIV/AIDS	2 830	44	2	16	29	76	83
Diarrhoeal diseases	1 682	26	1	5	8	55	58
Malaria	888	14	0	0	0	32	34
Respiratory infections	3 757	58	37	22	23	103	87
Perinatal conditions	2 331	36	3	21	18	66	93
Maternal conditions	460	7	0	1	1	16	30
Nutritional deficiencies	448	7	2	6	2	13	31
<i>Non-communicable diseases/conditions</i>	35 367	549	752	517	583	456	720
Cardiovascular diseases	17 528	272	325	242	292	242	153
Cancers	7 586	118	225	117	126	73	79
Respiratory diseases	4 027	63	55	39	85	51	58
Digestive diseases	1 995	31	37	37	30	29	46
Neuropsychiatric conditions	1 167	18	43	14	11	16	198
Diabetes	1 118	17	25	36	13	15	18
Other	1 946	30	42	33	26	29	168
<i>Injuries</i>	5 403	84	50	67	86	97	184
Unintentional (accidents)	3 700	57	34	41	57	69	134
Road traffic accidents	1 313	20	12	17	22	22	42
Other unintentional	2 387	37	22	24	35	47	92
Intentional (violence)	1 703	26	16	27	29	28	50
Self-inflicted violence	912	14	13	8	18	12	21
Interpersonal violence	593	9	2	18	9	10	22
Collective violence	184	3	0	0	2	5	7
<b>Total</b>	<b>58 028</b>	<b>901</b>	<b>859</b>	<b>675</b>	<b>778</b>	<b>1 062</b>	<b>1 471</b>

DALY = Disability-adjusted life year.

Source: World Health Organization, 'Projections of mortality and burden of disease 2006: projected deaths by income group, age, sex and cause for the years 2005, 2015 and 2030', Spreadsheet, Nov. 2006; and World Health Organization, 'Projections of mortality and burden of disease 2006: projected DALYs by income group, age, sex and cause for the years 2005, 2015 and 2030', Spreadsheet, Nov. 2006—both available at URL <<http://www.who.int/healthinfo/statistics/bodprojections2030/en/>>.

Assessing the global burden of disease and injury (i.e. the years lost due to premature death and disability) is even more problematic, since it involves at least two additional estimation methodologies: identifying the number of disabled, and relating death and disability to an estimated length of healthy life in



the absence of death and disability.<sup>13</sup> Finally, WHO also makes projections into the future. While the most recent year for which original data on mortality and the burden of disease have been produced is 2002, projections have been made for 2005, 2015 and 2030. These projections are highly uncertain, in particular for 2015 and 2030, because of the uncertainties associated with the assumptions underlying the projections.<sup>14</sup> Thus, while these data provide rough indications of causes of death and disability, the interpretation of these data should consider their weaknesses.<sup>15</sup>

While all these difficulties have an impact on the accuracy of the data, the data nevertheless indicate the rough magnitude and pattern of different causes of death. Since this type of data is essential for any analysis of the pattern of risk factors and for the identification of prevention strategies that mitigate both freedom from want and freedom from fear, more investment in its production is needed.

### *Patterns in WHO data on causes of death and disability*

According to WHO estimates, around 58 million people died in 2005, of whom 9.6 million were children younger than five and 35.7 million were younger than 70.<sup>16</sup> Of the total number of deaths, roughly 35 million died from non-communicable diseases, 17 million from communicable diseases, and 5 million from injuries (see table 7.2).

The global burden of disease and injury amounted to an estimated 1471 million DALYs in 2005, almost half of which were caused by non-communicable diseases, while communicable diseases accounted for 38 per cent and injuries for 13 per cent. The mortality rates differ significantly between country income groups. In high-income countries non-communicable diseases account for a 13-times higher mortality rate than communicable diseases, a difference which is to a great extent due to high mortality from cardiovascular diseases and cancer. In low-income countries communicable diseases generate slightly higher mortality than non-communicable diseases, with very high death rates from infectious diseases—most profoundly from HIV/AIDS, but also from

<sup>13</sup> The DALY indicator uses the same life expectancy ‘ideal’ standard for specifying years of life lost for all population subgroups, whether or not their current life expectancy is lower than that of other groups. Similarly, premature death is defined as all deaths earlier than the standard life expectancy. The techniques used in calculating DALYs are described and discussed in Mathers, Lopez and Murray (note 10).

<sup>14</sup> The models used to project future health trends are ‘based largely on projection of economic and social development’, ‘using the historically observed relationships of these with cause-specific mortality rates’. Mathers, C. D. and Loncar, D., ‘Projections of global mortality and burden of disease from 2002 to 2030’, *PLoS Medicine*, vol. 3, no. 11 (Nov. 2006), pp. 2011–30.

<sup>15</sup> One criticism of the WHO projections is that they are too optimistic because they cannot take into account unpredictable new developments. Another issue is the uncertainty of the socio-economic forecast of the World Bank, on which they are based, and a third source of uncertainty is whether socio-economic developments will have the same impact on disease and injury in all countries. ‘Disease plans must expect the unexpected’, *New Scientist*, 2 Dec. 2006, p. 3.

<sup>16</sup> World Health Organization (WHO), ‘Projections of mortality and burden of disease 2006: projected deaths by WHO region, age, sex and cause for the years 2005, 2015 and 2030’, Spreadsheet, Nov. 2006, URL <<http://www.who.int/healthinfo/statistics/bodprojections2030/en/>>.

diarrhoeal diseases, tuberculosis and malaria—respiratory infections and perinatal conditions.

### **Risk factors**

The key to prevention is identification of risk factors. WHO has identified 10 leading risk factors behind the global burden of disease. These are (in order of importance): being underweight, unsafe sex, high blood pressure, tobacco consumption, alcohol consumption, unsafe water, sanitation and hygiene, iron deficiency, indoor smoke from solid fuels, high cholesterol, and being overweight and obesity.<sup>17</sup> Together, these risk factors account for more than one-third of all deaths worldwide.

The importance of different risk factors varies significantly between poor and rich countries. In the developed countries, almost half of all the disease burden is caused by tobacco (12.2 per cent), blood pressure (10.9 per cent), alcohol (9.2 per cent), cholesterol (7.6 per cent) and being overweight (7.4 per cent). In high-mortality developing countries, mainly located in sub-Saharan Africa and South-East Asia, one-third of the disease burden results from four risk factors: being underweight (14.9 per cent), unsafe sex (10.2 per cent), unsafe water, sanitation and hygiene (5.5 per cent), and indoor smoke from solid fuels (3.7 per cent).<sup>18</sup> There is a strong concentration of risks in high-mortality developing countries, which represent roughly two-fifths of the world's population. In these countries, the rates of disease and injury are particularly high and these are largely caused by a few risk factors. Being underweight and micronutrient (vitamin and mineral) deficiencies together account for about one-quarter of the disease burden in these countries. The disease burden in high-mortality developing countries resulting from these risks is close to the total disease and injury burden in developed countries.<sup>19</sup>

The chain of events leading to death and disability includes both proximal and distal factors, where proximal factors act directly to cause disease and injury, while distal factors are further back in the causal chain and act via a number of intermediaries. Thus, it is important to consider the entire causal chain in the assessment of risks to health. Furthermore, many risks cannot be considered separately because they do not act in isolation from other risks.<sup>20</sup> In fact, the complex, multi-causal nature of disease may often mean that different preventive strategies are possible, and thus that parallel actions can potentially bring reinforced benefits.

Among the 10 leading global risk factors identified for high-mortality developing countries, four are related to undernourishment—being underweight and zinc, iron and vitamin A deficiencies—and two are related to the physical environment—unsafe water, sanitation and hygiene and indoor

<sup>17</sup> WHO, *The World Health Report 2002: Reducing Risks, Promoting Healthy Life* (WHO: Geneva, 2002), URL <<http://www.who.int/whr/2002/en/>>, Overview, p. 7.

<sup>18</sup> WHO (note 17), table 5.1, p. 102.

<sup>19</sup> WHO (note 17), pp. 82–83.

<sup>20</sup> WHO (note 17), pp. 13–14, 26–27.

smoke from solid fuels.<sup>21</sup> While different types of undernutrition and environmental factor are major proximal causes, poverty is a distal cause.

### *Hunger as a risk factor*

Hunger is a major risk factor for disease. Underweight children are at increased risk of mortality from infectious illnesses, such as diarrhoea and pneumonia. An estimated 50–70 per cent of the burden of diarrhoeal diseases, measles, malaria and lower respiratory infections in childhood is attributable to childhood undernutrition. Being underweight was estimated to have caused 3.7 million deaths in 2000, accounting for about 1 in 15 deaths. Since deaths from undernutrition occur almost exclusively among young children, the share in the loss of healthy life years is even higher: about 9.5 per cent of global DALYs were attributed to being underweight.<sup>22</sup>

The high number of lives that are threatened by hunger has led to the state of hunger being termed as ‘food insecurity’.<sup>23</sup> The Food and Agricultural Organization (FAO) has estimated that 10 million people die every year of hunger and hunger-related diseases.<sup>24</sup> In developing countries, more than 20 million low-birthweight children are born every year, and almost one-third of all children in developing countries are stunted, with heights in the range that suggests chronic undernutrition. According to the FAO, more than 5 million children die from hunger-related causes every year.<sup>25</sup>

The most recent estimates by the FAO show that in 2001–2003 there were 854 million undernourished people worldwide, of whom 820 million were in developing countries, 25 million in transition countries and 9 million in industrialized countries.<sup>26</sup> The agreed goals of halving the number of undernourished people by 2015 (the 1996 World Food Summit target) and halving their proportion of population by 2015 (one of the Millennium Development Goals, MDGs) are still far from being achieved, in particular for African countries.<sup>27</sup> Hunger occurs in three different forms: acute, chronic and hidden.

<sup>21</sup> WHO (note 17), table 5.1, p. 102.

<sup>22</sup> WHO (note 17), pp. 53–54.

<sup>23</sup> Following the literature on hunger, the term ‘hunger’ is used here to mean undernourishment. Undernourished persons are defined as those ‘whose food intake falls below the minimum requirement or food intake that is insufficient to meet dietary energy requirements continuously’. United Nations Statistics Divisions, Common Database, URL <[http://unstats.un.org/unsd/cdb/cdb\\_dict\\_xrxx.asp?def\\_code=433](http://unstats.un.org/unsd/cdb/cdb_dict_xrxx.asp?def_code=433)>. Precise definitions in terms of calorie intake are contested. See Mason, J. B., ‘Measuring hunger and malnutrition’, Keynote Paper presented at the International Scientific Symposium on Measurement and Assessment of Food Deprivation and Undernutrition, Food and Agricultural Organization, Rome, 26–28 June 2002, URL <<http://www.fao.org/docrep/005/y4249e/y4249e0d.htm>>.

<sup>24</sup> World Food Programme (WFP), ‘Faces of the hungry’, WFP website, 2007, URL <[http://www.wfp.org/aboutwfp/introduction/hunger\\_who.asp](http://www.wfp.org/aboutwfp/introduction/hunger_who.asp)>.

<sup>25</sup> FAO, *The State of Food Insecurity in the World 2004: Monitoring Progress towards the World Food Summit and Millennium Development Goals* (FAO: Rome, 2004), URL <<http://www.fao.org/docrep/007/y5650e/y5650e00.htm>>, p. 8.

<sup>26</sup> FAO, *The State of Food Insecurity in the World 2006: Eradicating World Hunger—Taking Stock Ten Years after the World Food Summit* (FAO: Rome, 2006), URL <<http://www.fao.org/docrep/009/a0750e/a0750e00.htm>>, p. 8.

<sup>27</sup> FAO (note 26), pp. 8–12. See also the UN Millennium Developments Goals website, URL <<http://www.un.org/millenniumgoals/>>.

While those suffering from acute hunger are those most visible through reports on famines and disasters, acute hunger accounts for only about 10 per cent of the total number of hungry people. The chronically undernourished are the great majority (90 per cent) of the hungry.<sup>28</sup>

While hunger is a risk factor for disease, it also has its own risk factors. Chronic hunger is caused by a constant or recurrent lack of access to food. However, there is more than enough food available to feed the world population of 6.54 billion people. Thus, the cause of hunger is that the hungry do not have the money to buy food or the means to produce it. The reasons for this constitute the risk factors for hunger. The World Food Programme identifies five such factors: poverty, the agricultural infrastructure, overexploitation of the environment, natural disasters and armed conflicts.<sup>29</sup> The United Nations Millennium Project points to overlapping, although slightly different, risk factors: poverty, low food production, mothers' lack of education, poor water, sanitation and health facilities, and climatic shocks. It adds to this a number of identified vulnerabilities to crises, such as disasters and wars, and other hazards, such as insecure rights to land, lack of proper agricultural technology, inability to store produce after harvest, weather variations, environmental degradation, poor health, food shortages and lack of income-earning opportunities.<sup>30</sup>

Since 1992, the proportion of food crises that can be attributed mainly to human causes, such as violent conflict and economic failures, has increased from around 15 per cent to more than 35 per cent, and the number of food crises requiring emergency assistance has also been rising, from an average of 15 per year during the 1980s to more than 30 per year since 2000.<sup>31</sup> Most of the specific crises as well as the increase were concentrated in Africa. Natural and human-induced factors tend to reinforce each other, producing complex crises. Nevertheless, only 8 per cent of the 10 million people who die from hunger and hunger-related diseases each year are the victims of major disasters and wars.<sup>32</sup>

While poverty is a major risk factor for hunger, historical trends show that undernourishment does not decrease at the same rate as poverty. Although the reasons for the slower rate of decline in hunger are not clear, the FAO suggests that an important factor may be that hunger itself acts as a barrier to escaping poverty—the 'hunger trap'.<sup>33</sup> Thus, hunger is not only a consequence, but also a cause of poverty.

<sup>28</sup> Sanchez, P. et al., UN Millennium Project, Task Force on Hunger, *Halving Hunger: It Can be Done* (Earthscan: London, 2005), URL <[http://www.unmillenniumproject.org/reports/tf\\_hunger.htm](http://www.unmillenniumproject.org/reports/tf_hunger.htm)>, p. 2. Another 2 billion people experience hidden hunger, caused by a lack of essential micronutrients, although they consume adequate amounts of calories and protein.

<sup>29</sup> World Food Programme (WFP), 'Why does hunger exist?', WFP website, 2007, URL <[http://www.wfp.org/aboutwfp/introduction/hunger\\_causes.asp](http://www.wfp.org/aboutwfp/introduction/hunger_causes.asp)>.

<sup>30</sup> Sanchez et al. (note 28), p. 5.

<sup>31</sup> FAO (note 25), p. 16.

<sup>32</sup> World Food Programme (note 24).

<sup>33</sup> FAO (note 26), p. 13.

Paradoxically, being a farmer reportedly constitutes a major risk factor for hunger. Three-quarters of the hungry live in rural areas, mainly in the villages of Asia and Africa. About half of the hungry are smallholder family households unable either to grow or to buy enough food to meet the family's requirements, and another 20 per cent are landless rural people.<sup>34</sup>

### *Environmental risk factors*

Environmental conditions constitute important risk factors, particularly in developing countries, playing a major role in more than 80 per cent of the diseases regularly reported by WHO. Globally, an estimated 24 per cent of the disease burden and 23 per cent of all deaths can be attributed to environmental factors.<sup>35</sup> In some areas these figures are much higher; for example, in sub-Saharan Africa such factors accounted for nearly 35 per cent of the disease burden.<sup>36</sup>

The leading environmental risk factor is unsafe water, poor sanitation and hygiene, accounting for about 3 per cent of all deaths (1.7 million) and 3.7 per cent of all DALYs. Indoor smoke from solid fuels causes another 1.6 million deaths per year, and accounts for 2.7 per cent of all DALYs. Nearly half the world's population cooks with solid fuels. Several diseases are strongly related to indoor use of solid fuels, which is estimated to cause 36 per cent of lower respiratory infections. Urban air pollution, generated by motor vehicles, industries and energy production, causes about 5 per cent of tracheal, bronchial and lung cancer globally, causing about 1.4 per cent of all deaths (0.8 million) and 0.8 per cent of all DALYs. Climate change has been estimated to have been responsible in 2000 for 6 per cent of malaria in some middle-income countries and approximately 2.4 per cent of worldwide diarrhoea. Globally, it was estimated to account for 0.3 per cent of all deaths (154 000) and 0.4 per cent of all DALYs. Other environmental factors include excessive exposure to toxic chemicals and pesticides (0.35 million deaths). There are thus important links between disease and environmental factors.<sup>37</sup>

### *Poverty as a risk factor*

Poverty is a third major risk factor for disease. Furthermore, both hunger and environmental risk factors for disease are also strongly associated with absolute poverty.

The greatest burden of disease and injury is borne by the poor countries and by the disadvantaged in all societies. The vast majority of threats to health are more commonly found among poor people, particularly those with little

<sup>34</sup> Sanchez et al. (note 28), pp. 3–4; and World Food Programme (note 24).

<sup>35</sup> Prüss-Üstün, A. and Corvalán, C., *Preventing Disease through Healthy Environments: Towards an Estimate of the Environmental Burden of Disease* (WHO: Geneva, 2006), URL <[http://www.who.int/quantifying\\_chimpacts/publications/preventingdisease/en/](http://www.who.int/quantifying_chimpacts/publications/preventingdisease/en/)>, p. 9.

<sup>36</sup> WHO and UN Environment Programme, Health and Environment Linkages Initiative (HELI), 'Priority risks: the human toll', HELI website, URL <<http://www.who.int/heli/risks/en/>>.

<sup>37</sup> WHO (note 17), pp. 67–73.

formal education and with low-status occupations. This is the case because poverty, while being a key determinant of health status in itself, is also an underlying risk factor of several proximal risk factors. Thus, there is a strong relationship between underweight children and absolute poverty. People living on less than \$1 per day are generally at a 2–3 times higher risk of having underweight children compared with people living on more than \$2 per day.<sup>38</sup> Unsafe water, sanitation and hygiene and indoor air pollution are also strongly related with absolute poverty.

Thus, the links between poverty and disease are well established. Poverty not only increases the risk of becoming ill, but poor people are also at higher risk of dying from their illness than are wealthier people. The impact of poverty on health was summarized in the 2001 report of the Commission on Macroeconomics and Health (CMH), according to which poor people have a disproportionate burden of avoidable deaths; they are more susceptible to diseases because of malnutrition, inadequate sanitation and lack of clean water; they are less likely to have access to medical care; and they are less reached by existing life-saving interventions, including preventive measures and access to essential medicines.<sup>39</sup>

## Prevention

Preventive interventions can be categorized according to when in a negative development they take place: (a) primary interventions are those aiming to prevent an event before it occurs; (b) secondary interventions consist of emergency measures providing an immediate response to the negative impact of an event; and (c) tertiary intervention involve long-term treatment of the effects of an event or processes.

Effective health interventions to either prevent or cure the diseases which have the highest premature death and disability outcomes have already been identified. What is lacking is investment and institutional reforms to implement them adequately. In its 2001 report the CMH estimated the costs involved in reducing deaths from the most common causes in low-income countries and among the poor in middle-income countries, which have far lower life expectancies and far higher age-adjusted mortality rates than the rest of the world. It estimated that by 2010 around 8 million lives could be saved each year by a set of essential health interventions against infectious diseases—HIV/AIDS, malaria, tuberculosis and childhood infectious diseases—and nutritional deficiencies. The recommended programme for prevention and cure was estimated to require an increase of \$57 billion (at constant 2002 prices) in annual health outlays by 2007 for this group of countries. Given the

<sup>38</sup> WHO (note 17), p. 50.

<sup>39</sup> Commission on Macroeconomics and Health (CMH), *Macroeconomics and Health: Investing in Health for Economic Development* (WHO: Geneva, 2001), URL <<http://www.cmhealth.org/>>; and WHO, CMH Support Unit, 'Investing in health: a summary of the findings of the Commission on Macroeconomics and Health', Geneva, 2003, URL <<http://www.emro.who.int/cbi/cmh-documents.htm>>, p. 10.

low income in these countries, domestic resource mobilization would fall short of need, thus requiring also increased donor financing for health. According to the proposed burden-sharing concept, the national governments in the targeted countries would need to increase their annual domestic spending on health by 1 per cent of their gross national product (GNP) by 2007 and by 2 per cent of GNP by 2015, resulting in domestically financed additional health spending of \$35 billion in 2007 and \$63 billion by 2015, while the annual external aid required would be \$22 billion in 2007 and \$31 billion in 2015 in the form of country-level programmes. In addition, allocations to the development of 'global public goods' were recommended (\$5 billion in 2007 and \$7 billion in 2015) to be spent on research and development focused on the health needs of the poor (e.g. new affordable drugs and vaccines) and on epidemiological data collection and analysis and surveillance of infectious diseases at the international level.<sup>40</sup> Five years after the publication of the report some progress had been made towards these goals.<sup>41</sup>

Similarly, WHO has examined the extent to which the global disease burden could be eased over a 20-year period if the most important risk factors to human lives could be reduced. Data on the costs and effectiveness of a set of interventions targeting different risk factors were developed for different regions and subregions, with the aim of helping policymakers identify which interventions should be selected for given levels of resource availability if the goal were to minimize the burden of disease. The conclusion was that 'Very substantial health gains can be made for relatively modest expenditures on interventions to reduce risks'.<sup>42</sup> For example, in Africa, one of the regions with the highest mortality rates and highest burden of disease, a number of recommended interventions could reduce the burden of disease by over 140 million DALYs, at an annual cost of about I\$6.8 billion.<sup>43</sup> These include interventions to prevent HIV and the provision of vitamin, iron and zinc supplements in combination with treatment for diarrhoea and pneumonia in children. Another example, based on cross-country research on neonatal mortality, is a set of interventions that could reduce death rates by 59 per cent in 75 high-mortality countries, saving 2.3 million lives, at a cost of \$4 billion.<sup>44</sup>

<sup>40</sup> Commission on Macroeconomics and Health (note 39), pp. 6, 11; and WHO (note 39), p. 20. On 'global public goods' see the websites of the Global Network on Global Public Goods, URL <<http://www.sdnip.undp.org/gpgn/>>, and the International Task Force on Global Public Goods, URL <<http://www.gpgtaskforce.org/>>.

<sup>41</sup> A 2006 follow-up to the CMH report showed that external funding for health was increasing and that, although health expenditure as a share of GDP and of general government expenditure had increased in several of the countries with CMH follow-up programmes, many countries were progressing too slowly to reach their national health spending targets by 2015. WHO, *Tough Choices: Investing in Health for Development—Experiences from National Follow-up to the Commission on Macroeconomics and Health* (WHO: Geneva, 2006), URL <<http://www.emro.who.int/cbi/cmh-documents.htm>>, pp. 26–28.

<sup>42</sup> WHO (note 17), p. 137.

<sup>43</sup> I\$ means international dollar, which is the US dollar value of a local currency figure converted at the purchasing power parity rate.

<sup>44</sup> United Nations Development Programme (UNDP), *Human Development Report 2005: International Cooperation at a Crossroads—Aid, Trade and Security in an Unequal World* (UNDP: New York, N.Y., 2005), URL <<http://hdr.undp.org/reports/global/2005/>>, p. 33.

Provision of health services can be seen as a tertiary form of prevention. The number and quality of health workers are positively correlated with immunization coverage, outreach of primary care, and infant, child and maternal survival. At least 1.3 billion people worldwide lack access to the most basic health care, often because there are no health workers. Shortages are most severe in sub-Saharan Africa, which has 11 per cent of the world population and 24 per cent of the global burden of disease but only 3 per cent of the world's health workers. While there are a total of 59 million full-time paid health workers worldwide, there is a serious shortage of health workers in 57 developing countries, where an estimated 4.3 million additional doctors, nurses, midwives and other public health workers are needed. For these countries to build up such health workforces, an annual increase in health budgets corresponding to at least \$20 per person would be needed.<sup>45</sup>

### *Hunger*

Approaches to preventing hunger include tertiary interventions, such as specific nutrition measures, secondary interventions, such as food emergency aid in crises, and primary interventions, aiming at preventing hunger itself.

In the short term, food aid can help break the cycle of hunger and poverty. Nutrition interventions such as breastfeeding and providing vitamin A and zinc supplements are important tertiary prevention measures which have the potential to reduce child mortality significantly at a low cost.<sup>46</sup> Food aid can also help to slow down the impact of HIV/AIDS, since without sufficient food and nutrition the infected lack one of the main defences against HIV and other AIDS-related infections, such as tuberculosis. The effectiveness of drug treatment and the body's drug tolerance are greatly improved by good nutrition.<sup>47</sup>

The hunger trap suggests that per capita income growth is not always sufficient to eradicate hunger, and thus that poverty reduction does not benefit proportionately those among the poor who are also undernourished. The concentration of hunger in rural areas suggests that no sustained reduction in hunger is possible without special emphasis on agricultural and rural development. Agricultural growth appears to be critical for hunger reduction, since reportedly over 70 per cent of the poor in developing countries live in rural areas and depend on agriculture for their livelihoods, directly or indirectly. Particularly in the countries with the least food security, agriculture is crucial for income and employment generation. According to the FAO, improved technology can also contribute to agricultural growth if it is adapted to local conditions that favour small-scale farmers, increases their incomes and reduces food prices. Similarly, trade can contribute to hunger reduction. How-

<sup>45</sup> WHO, *The World Health Report 2006: Working Together for Health* (WHO: Geneva, 2006), URL <<http://www.who.int/whr/2006/en/>>, pp. xv, 8, 12–15.

<sup>46</sup> FAO (note 25), p. 9. In the 42 countries where more than 90% of child deaths occur, these relatively inexpensive and effective nutrition interventions could reduce child mortality by 25% and save the lives of 2.4 million children each year.

<sup>47</sup> World Food Programme (note 29), p. 5.



ever, trade gains are neither automatic nor universal but need to be coupled with measures to improve market infrastructure, local institutions and safety nets.<sup>48</sup>

In outlining a strategy for hunger reduction, the FAO recommends a twin-track approach, combining longer-term interventions to enhance productive potential and rural development (primary prevention) with programmes and policies that respond to the immediate needs of poor and food-insecure people (tertiary prevention).<sup>49</sup> The FAO recommends that the former should focus on agricultural and rural development, creating employment and ensuring access by the poor to productive assets—physical, human and financial. The latter interventions, for tertiary prevention, may include social safety nets, cash transfers, health interventions and food and nutrition programmes. Promoting agricultural growth would require public investment in infrastructure, agricultural research and education. It would also benefit from more targeting of foreign development assistance to agriculture and rural development and greater focus on the countries with high levels of undernourishment.

### *Environmental factors*

Public and preventive health strategies based on environmental interventions have been found to be cost-effective and can also yield benefits for the overall well-being of communities, according to a 2006 WHO report.<sup>50</sup> One of the key UN Millennium Development Goals is to halve the proportion of people without sustainable access to safe drinking water and sanitation by 2015. The global economic benefits of investments in meeting this target have been estimated to outweigh costs by a ratio of 8:1.<sup>51</sup> These benefits include gains in economic productivity, as well as savings in health care costs and in healthy life years lost. Reducing the disease burden of environmental risk factors would also contribute significantly to many of the other MDGs.

### *Poverty*

While the standard criterion for defining poverty is level of income, it can also be defined as the deprivation of basic capabilities.<sup>52</sup> This perspective does not deny the fact that low income is one of the major aspects of poverty, but rather argues that lack of income can be a principal reason for capability deprivation. Furthermore, adherents of this perspective also argue that improvement of capability is likely to be a determinant of greater earning power, since enhanced capabilities would tend to expand a person's ability to be more productive and earn a higher income. This is of particular importance for the removal of income poverty. While improved education and health care can

<sup>48</sup> FAO (note 26), pp. 13, 29.

<sup>49</sup> FAO (note 26), p. 29.

<sup>50</sup> Prüss-Üstün and Corvalán (note 35).

<sup>51</sup> Prüss-Üstün and Corvalán (note 35), p. 67.

<sup>52</sup> Sen, A., *Development as Freedom* (Oxford University Press: Oxford, 1999), p. 87.

improve the quality of life directly, they can also increase a person's ability to earn an income.<sup>53</sup> Thus, in this perspective, the provision of education, health care and other entitlements has a more direct impact on poverty.

The poverty-reduction strategies of the Organisation for Economic Co-operation and Development (OECD) focus on broad-based growth and improved access to social services. Reduction of inequalities is also seen as important, since increased inequalities is the main reason why the number of poor people does not decrease in spite of economic growth in developing countries.<sup>54</sup> The OECD poverty-reduction strategy rests on the perception that poverty is caused by economic structures and availability and access to resources. The main policy interventions thus fall into three categories: pro-poor economic growth; empowerment, rights and pro-poor governance; and basic social services for human development. The goal of these interventions is to generate economic, political, human and social capabilities.<sup>55</sup>

### *Interdependence in preventive interventions*

The above review shows that there is a significant overlap and interdependence between three major risk factors for death and disability—hunger, environment and poverty—and therefore also great synergies between the risk-reduction and prevention strategies for addressing these factors. This is apparent also in the Millennium Development Goals, which cover several of the interventions recommended for the reduction and prevention of these three risk factors: reduction of poverty, hunger, mortality rates for children under five, the incidence of major diseases (including HIV/AIDS and malaria), and the number of people without access to safe drinking water and sanitation, as well as increased environmental sustainability.<sup>56</sup> The annual cost of attaining these goals by 2015 for a typical low-income country has been estimated as \$70–80 per capita in 2006, rising to \$120–160 per capita in 2015.<sup>57</sup> While part of the required investment is expected to be financed through domestic resource mobilization, part will need to be financed through official development assistance (ODA) from foreign governments. This would require an increase in total global ODA for direct MDG support from \$16 billion in 2002 to \$73 billion in 2006 and \$135 billion by 2015 (in constant 2003 dollars).<sup>58</sup>

<sup>53</sup> Sen (note 52), p. 90.

<sup>54</sup> Organisation for Economic Co-operation and Development (OECD), Development Assistance Committee, *The DAC Guidelines: Poverty Reduction* (OECD: Paris, 2001), URL <<http://www.oecd.org/dac/guidelines/>>, p. 31.

<sup>55</sup> Organisation for Economic Co-operation and Development (note 54), pp. 50–51.

<sup>56</sup> UN Millennium Development Goals (note 27).

<sup>57</sup> UN Millennium Project, *Investing in Development: A Practical Plan to Achieve the Millennium Development Goals* (Earthscan: London, 2005), URL <<http://www.unmillenniumproject.org/reports/>>, pp. 239–40.

<sup>58</sup> While total ODA has increased from \$58.3 billion in 2002 to \$106.8 billion in 2005 (at current prices and exchange rates), ODA for direct support of the MDGs fell short of the target according to the UN. For ODA data for 1996–2005 see Manning, R., *Development Co-operation Report 2006* (Organisation for Economic Co-operation and Development: Paris, 2007), URL <<http://www.sourceoecd.org/developmentreport/>>, 'Statistical annex', table 8, p. 146. For an evaluation of the progress towards the

This is a small investment compared with military expenditure, which was \$1200 billion in 2006. Furthermore, this type of investment may also have an impact on the incidence of collective violence and on the consequences of violence.

### III. The links between disease and violence prevention

Having established the synergies between different interventions to reduce the risk factors for death and disability from disease, the remaining question to address is the links between these and the prevention of death and disability from violence. This section provides an account of data and reports on violence from a public health perspective.

#### **Violence as a cause of death and disability**

According to WHO projections for 2005, 5.4 million deaths were caused by injuries (see table 7.2). Of these, unintentional injuries (accidents) accounted for 3.7 million deaths, the main cause being road traffic accidents, while intentional injuries (violence) accounted for 1.7 million deaths. Suicides accounted for slightly more than half of violence-related deaths, murder for roughly one-third and collective violence for about one-fifth.<sup>59</sup>

The WHO data show that most of the reported overall violence-related deaths occur in low-income countries (45 per cent in 2005) and lower-middle-income countries (38 per cent), while less than 10 per cent of all violence-related deaths occur in high-income countries.<sup>60</sup> Country income group has no strong influence on suicide rates, while murder rates are much lower in high-income countries than in low- and middle-income countries (see table 7.2). Comparing regions, the highest suicide rates are found in the Western Pacific and European regions, where suicides accounted for around 20 deaths per 100 000 people in 2005. The rates of murder show great variation between regions with very high rates for the African and American regions (20 and 18 deaths per 100 000, respectively) compared with all other regions, which all have fewer than 10 murders per 100 000 people.<sup>61</sup> Deaths caused by collective violence are concentrated in low-income countries. WHO pro-

MDGs, including analysis of the ODA, see United Nations, *The Millennium Development Goals Report 2006* (UN: New York, N.Y., 2006), URL <<http://mdgs.un.org/unsd/mdg/>>.

<sup>59</sup> Collective violence is defined by WHO as 'the instrumental use of violence by people who identify themselves as members of a group—whether this group is transitory or has a more permanent identity—against another group or set of individuals, in order to achieve political, economic or social objectives'. WHO, 'Collective violence', Fact sheet, Geneva, 2002, URL <[http://www.who.int/violence\\_injury\\_prevention/violence/world\\_report/factsheets/en/](http://www.who.int/violence_injury_prevention/violence/world_report/factsheets/en/)>. On definitions of armed conflict and collective violence see appendix 2C in this volume.

<sup>60</sup> WHO, 'Projections of mortality and burden of disease 2006: projected deaths by income group, age, sex and cause for the years 2005, 2015 and 2030', Spreadsheet, Nov. 2006, URL <<http://www.who.int/healthinfo/statistics/bodprojections2030/en/>>.

<sup>61</sup> WHO (note 16).

jections for 2005 show that low-income countries account for 78 per cent of all deaths caused by collective violence.<sup>62</sup>

Data on violence-related deaths are highly uncertain for several reasons.<sup>63</sup> While deaths from self-inflicted and interpersonal violence are at least reported in official statistics on causes of death, the WHO data on deaths caused by collective violence are based on a variety of other sources.<sup>64</sup> The latter data have been criticized as being too high compared with estimates of deaths from armed conflicts in other sources.<sup>65</sup> Data on deaths from armed conflict and wars are compiled by researchers, are based on reports in the media and are selected according to definitions developed for this purpose.<sup>66</sup> However, the WHO data on collective violence have a broader coverage than just armed conflict in that they cover any form of instrumental use of violence by one group against another, including genocide.<sup>67</sup>

Nevertheless, it is likely that WHO underestimates the overall mortality caused by collective violence, owing to the linkages between violent conflict and health. The increased mortality rates of civilians during violent conflict, as mapped in a major study on violence and health, are usually caused by (a) injuries, (b) decreased access to food, leading to poor nutrition, (c) increased risk of communicable diseases, (d) diminished access to health services, (e) reduced health services, (f) reduced public health programmes, (g) poor environmental conditions and (h) psychosocial distress.<sup>68</sup> Thus, the impact of collective violence on death can be great in terms of mortality, morbidity and disability.

These linkages have been demonstrated in a major study on the impact of the war in Iraq on mortality rates. In a cooperative effort between Iraqi and US public health researchers and medical doctors, mortality rates were compared

<sup>62</sup> WHO (note 60).

<sup>63</sup> Krug, E. G. et al. (eds), *World Report on Violence and Health* (WHO: Geneva, 2002), URL <[http://www.who.int/violence\\_injury\\_prevention/violence/world\\_report/en/](http://www.who.int/violence_injury_prevention/violence/world_report/en/)>, p. 9.

<sup>64</sup> The WHO statistics uses country-specific estimates of war deaths from a variety of published and unpublished databases, primarily data from Project Ploughshares's *Armed Conflicts Report*, as cross-checked against historical and current estimates by other research groups. Mathers, Lopez and Murray (note 10), pp. 56, 65–66; and Mathers, C. D. and Loncar, D., 'Updated projections of global mortality and burden of disease, 2002–2030: data sources, methods and results', Working Paper, WHO, Geneva, Oct. 2005, revised Nov. 2006, URL <<http://www.who.int/healthinfo/statistics/bodprojections2030/en/>>.

<sup>65</sup> The basis for this criticism is that the WHO figures are 2–9 times higher than those reported in other data sets on armed conflicts and WHO has not provided a credible explanation for this difference. University of British Columbia, Human Security Centre, *Human Security Report 2005: War and Peace in the 21st Century* (Oxford University Press: New York, N.Y., 2005), URL <<http://www.humansecurityreport.info/>>, p. 30.

<sup>66</sup> On the availability of data on armed conflict see appendix 2C in this volume; and Melander, E., Öberg, M. and Hall, J., *The 'New Wars' Debate Revisited: An Empirical Evaluation of the Atrociousness of 'New Wars'*, Uppsala Peace Research Papers no. 9 (Uppsala University, Department of Peace and Conflict Research: Uppsala, 2006). An example of a data set on armed conflicts is that of the Uppsala Conflict Data Program, from which the data reported in appendix 2A in this volume are drawn. See the Uppsala Conflict Data Program website at URL <<http://www.pcr.uu.se/research/UCDP/>>.

<sup>67</sup> WHO (note 17), p. 79.

<sup>68</sup> Krug et al. (note 63), p. 225.

before and after the US-led coalition invasion in March 2003.<sup>69</sup> Significantly, by taking a public health approach this study shows the strong impact of violent conflict on overall mortality. It found that during the period March 2003–June 2006 about 655 000 more Iraqi people died than would be expected in a non-conflict situation. About 601 000 of these excess deaths had violent causes. These were distributed as follows: 56 per cent gunshots, 13 per cent car bombs, 14 per cent other explosives/ordnance, 13 per cent air strikes, and 4 per cent unknown and accidents. This study showed much higher casualties caused by the conflict than those reported through passive surveillance measures, such as the Iraq Body Count, which by October 2006 had recorded a range of 43 937–48 783 media-reported civilian deaths in Iraq resulting from the military intervention by the US-led coalition in March 2003.<sup>70</sup> In December 2005, US President George W. Bush said that approximately 30 000 Iraqis had died during the invasion and in the violence since.<sup>71</sup>

### **Violence: risk factors and instruments of prevention**

Identification of risk factors for collective violence is an extremely complex task. While WHO has undertaken to do this, based on studies by researchers in the field, the resulting list of risk factors should be regarded as a preliminary contribution. These are: (a) a lack of democratic processes and unequal access to power; (b) social inequality marked by grossly unequal distribution of, and access to, resources; (c) control by a single group of valuable natural resources, such as diamonds, oil, timber and drugs; and (d) rapid demographic change that outstrips the capacity of the state to provide essential services and job opportunities.<sup>72</sup> Based on these risk factors, WHO's recommended measures to prevent collective violence and lessen its impacts include: (a) reducing poverty, both in absolute and relative terms, and ensuring that development assistance is targeted so as to make the greatest possible impact on poverty; (b) reducing inequality between groups in society; (c) reducing access to weapons; and (d) ensuring that promotion and application of internationally agreed treaties, including those relating to human rights. More specific measures include investing in health development. This is based on the assessment that a strong emphasis on social services can help maintain social cohesion and stability and that early manifestations of situations that can lead to conflicts can often be detected in the health sector.<sup>73</sup>

<sup>69</sup> Burnham, G. et al., 'Mortality after the 2003 invasion of Iraq: a cross-sectional cluster sample survey', *The Lancet*, vol. 368, no. 9545 (21 Oct. 2006), pp. 1421–28.

<sup>70</sup> Thieren, M., 'Deaths in Iraq: how many, and why it matters', Open Democracy, 18 Oct. 2006, URL <[http://www.opendemocracy.net/conflict-iraq/iraq\\_deaths\\_4011.jsp](http://www.opendemocracy.net/conflict-iraq/iraq_deaths_4011.jsp)>. See also the Iraq Body Count website at URL <<http://www.iraqbodycount.org/>>.

<sup>71</sup> The White House, 'President discusses war on terror and upcoming Iraqi elections', Press release, Washington, DC, 12 Dec. 2005, URL <<http://www.whitehouse.gov/news/releases/2005/12/>>. See also King, N., 'Iraqi death toll exceeds 600,000, study estimates', *Wall Street Journal*, 11 Oct. 2006, p. A4.

<sup>72</sup> Krug et al. (note 63), p. 220.

<sup>73</sup> Krug et al. (note 63), pp. 228–29.

The risk factors and recommended prevention instruments for collective violence identified by WHO are confirmed by studies on armed conflicts. There is general agreement that such violence is related to both socio-economic factors—local as well as global—and political factors, such as local governance and the global world order. This conclusion is independent of the perspective—such as the ‘new wars’ paradigm or more locally rooted perspectives<sup>74</sup>—from which the new dynamics of internal collective violence in Africa and elsewhere are studied. Furthermore, armed conflict has a strongly detrimental impact on the economy and on development, which increases the risk of renewed violent conflict, catching affected countries in a ‘conflict trap’.<sup>75</sup>

### Implications for security assessments

Some of these risk factors for collective violence and armed conflict and the recommended prevention strategies overlap with those for disease. Collective violence also has an indirect impact on death and disability through its effects on disease, access to health services and food security. Thus, the relative utility of devoting resources directly to reduce human vulnerability to disease, by investment in measures to reduce hunger, bad environment and poverty, is potentially doubled: it limits unnecessary deaths from disease while giving populations a better chance of survival when exposed to the consequences of violent conflict. Because of this double utility, potential belligerents in an intra-state conflict, such as the government or rebels, might find themselves less prone to seek violent solutions to internal issues because the popular legitimacy of the regime will be heightened, and so it will be more difficult to mobilize people to fight against it.

More generally, the strong interlinkages between and within risk factors and prevention strategies suggest that there is potentially great scope for security policies that cover a broader spectrum of threats. Such broad policies, extending beyond the normal bounds of what is traditionally considered security policy, may also bring reinforced benefits for traditional security concerns. This is where economists can contribute to the design of security policy, at least in the selection of its constituent elements and the balance between them. Such contributions, which include discussion of trade-offs over a broad range of security objects and threats, are already beginning to emerge.<sup>76</sup> However,

<sup>74</sup> On the new-wars paradigm see Kaldor, M., *New and Old Wars: Organized Violence in a Global Era* (Polity Press: Cambridge, 1999); and Duffield, M., *Global Governance and the New Wars: the Merging of Development and Security* (Zed Books: London, 2001). For a more locally rooted perspective see Mkandawire, T., ‘The terrible toll of post-colonial “rebel movements” in Africa: towards an explanation of the violence against the peasantry’, *Journal of Modern African Studies*, vol. 40, no. 2 (June 2002), pp. 181–215.

<sup>75</sup> Stewart, F. and Fitzgerald, V. (eds), *War and Underdevelopment*, vol. 1, *The Economic and Social Consequences of Conflict* (Oxford University Press: Oxford, 2001); and Collier, P. et al., *Breaking the Conflict Trap: Civil War and Development Policy*, World Bank Policy Research Report (Oxford University Press: New York, N.Y., June 2003), URL <<http://econ.worldbank.org/prtr/>>.

<sup>76</sup> See e.g. Brück, T., ‘An economic analysis of security policies’, *Defence and Peace Economics*, vol. 16, no. 5 (Oct. 2005), pp. 375–89.

for cost–benefit analysis of this cross-cutting type to become a reality, much better data are required, as well as an expansion of risk analysis of the type conducted for and by WHO to all important areas of security concern.

#### IV. Conclusions

This chapter reviews risks to human lives based on epidemiological studies and according to a public health perspective, in which risk factors are identified based on observed historical patterns. By focusing on actual outcomes in terms of death and disability, high-probability negative impacts on human lives are brought into focus, while low-probability future events are neglected. The advantage of using this type of analysis is that it is based on data on what actually kills and disables people today, and the risk factors behind these deaths and disabilities. Its major disadvantage, in particular when related to security problems, is that it does not include potential future risks and threats to human lives which, although they have had a low incidence in the past or may even have a very low probability in the future, are still associated with grave potential outcomes if they occur. This applies to a wide range of security threats, such as attacks by weapons of mass destruction, terrorist incidents, large-scale conventional war, major disasters and incremental climate change. While it is not argued that this type of risk analysis can replace security analysis based on subjective expert assessments of future threats and risks, it is nonetheless one important tool among others for assessing risks to human lives.

The data and risk assessments reported on here inspire two major observations. The first is the simple observation that most of the risks to human life reviewed in this chapter cannot be reduced by the use of weapons—or military expenditure generally. Most risks to human lives identified in this chapter require non-military preventive interventions. The big risks to human lives include hunger, environmental factors and poverty. Few of these risks can be prevented or managed using military means. From this it can be deduced that, if a global security policy existed, and if the objective of that policy were to save lives globally, then a cost-effective approach would include the implementation of the type of recommended health interventions cited in this chapter. For an overall annual investment of around \$57 billion in health interventions, an estimated 8 million lives could be saved each year, many of which would be those of children. The cost of attaining the Millennium Development Goals has been estimated at \$135 billion in annual official development assistance for direct MDG support by 2015. These levels of investment are small in comparison with the level of military expenditure, amounting to \$1200 billion in 2006.

This point can be regarded as wishful thinking or a normative statement, but there are other reasons for shifting priorities in resource allocation for security objectives, which is the second observation that arises from this review. The synergies between risk factors and prevention strategies for disease and for

collective violence suggest that there is an overlap in the agendas of freedom from want and freedom from fear. These synergies have theoretical implications for different conceptions of security. The overlaps between the risk factors in different areas open up the possibility of trade-offs between different types of security strategies. In addressing one type of security threat, other types of security threat can be considered, so that one way of addressing the threats does not have a negative impact on another type. Finally, there is an economic dimension to this line of reasoning, since it also has implications for resource allocation. Risk analysis in combination with cost-benefit analysis can help decision makers to develop more cost-efficient security strategies by exploiting some of these trade-offs and the dual utility offered by some risk-reduction and prevention instruments.

While economic scarcity and competition for resources are potential sources of conflict and violence,<sup>77</sup> using the world's resources constructively to address the kind of issues set out in the MDGs—including by transfers from the richer to those more in need—is an inherently cooperative activity that is likely to improve human survival directly as well as strengthen international security indirectly.

<sup>77</sup> On the potential for conflicts over sources of energy see chapter 6 in this volume.