Assessment of global megatrends — an update

Global megatrend 3: Changing disease burdens and risks of pandemics

European Environment Agency

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Europe is bound to the rest of the world through an enormous number of systems — environmental, economic, social, political and others. Such networks enable complex flows of materials and ideas across the globe, producing uncertain feedbacks and knock-on effects over time. Greenhouse gas emissions in Europe today can affect the climate in distant locations and far into the future. Land management choices on the other side of the world can influence food and energy prices in Europe. Global communication and trade networks fuel innovation — sometimes boosting efficiency, sometimes creating new environmental pressures.

Most of these interactions are intimately linked and set to unfold over decades. All are likely to have important implications for living standards and well-being.

The European environment's status, trends and prospects have always depended in part on events outside its borders. Yet the growing importance of global networks and flows has augmented this interdependence, creating complex challenges for traditional governance systems framed within national or regional territories. To design effective ways to manage the environmental changes ahead, societies and governments need to understand the global drivers at work and their potential implications.

With this challenge in mind, the European Environment Agency in 2010 produced its first assessment of emerging global trends as part of its five-yearly flagship report on the European environment's state and outlook (SOER 2010). The exploratory analysis summarised 11 global megatrends grouped into five clusters — social, technological, economic, environmental and governance. Introducing the issues succinctly, it sought to trigger a discussion about how Europe should monitor and assess future changes in order to better inform environmental policymaking.

In preparation for its next report on the European environment's state and outlook (SOER 2015), the EEA has initiated an update of the assessment of global megatrends, analysing each of these drivers in a little more detail than previously in terms of their impacts on the European environment and well-being. During the second half of 2013 and early-2014, the EEA is reassessing the 11 megatrends and publishing the updates separately on its website. In 2014, the chapters will be consolidated into a single EEA technical report and will provide the basis for the analysis of megatrends included in SOER 2015. The present chapter addresses megatrend 3: 'Changing disease burdens and risks of pandemics'.

Again, it needs to be emphasised that the complexity of highly interconnected human and natural systems introduces considerable uncertainty into projections and forecasts. As much as anything, the assessment of megatrends aims to encourage readers to acknowledge this interdependence and uncertainty. In so doing, it may help point the way towards systems of planning and governance better adapted to meeting the challenges ahead.

Global megatrend 3
Changing disease burdens and risks of pandemics

The world is currently experiencing a major shift in health problems related to economic development and changing lifestyles. Since 2000, the global burden of disease from communicable diseases (such as HIV, tuberculosis, and measles) has been outweighed by non-communicable diseases (such as cardiovascular diseases, cancers, chronic respiratory diseases, diabetes). Non-communicable diseases are also the most important cause of death in the world and are typically associated with developed-world lifestyles. But although communicable diseases are globally in decline, they still pose a significant health burden, especially in the developing world. A third factor in changing health conditions is the persistent threat of pandemics.

Many developing countries will find this shift challenging, as they will have to deal with a multiple burden of persistent communicable diseases and the risk of pandemics, combined with the increasing burden of non-communicable diseases.

In addition, significant health disparities still exist between and within countries, in particular between urban and rural areas. Consequently, some vulnerable population groups (e.g. children, poor people) are still at greater risk of poor health, although life expectancy and general health have been continually improving around the world.

A broad range of economic and social trends will influence the future of global public health. While some global environment-related drivers (e.g. access to drinking water) are getting better, others — such as urban air pollution and lack of access to basic sanitation — continue to pose a serious risk to human health. In addition, the incremental effects of climate change are contributing to the global burden of disease (as for example the risk of spreading vector-borne diseases). Another driver is related to accelerating technological innovations which are bringing many health benefits but also unknown health risks. Additionally, the pharmaceutical industry is slowing-down its development of new drugs for the treatment of 'non-profitable' diseases (mostly communicable diseases in developing countries) and diseases resistant to traditional antibiotics.

Actions on the global and national levels can greatly reduce the risks posed by these trends. Increased investment in health and infrastructure, improved education, and better governance are key factors in realising sustained improvements in human health.

The Millennium Ecosystem Assessment underlined that human health depends on healthy ecosystems, and so there are synergies between efforts to address health issues and those to protect the environment, both in Europe and worldwide.

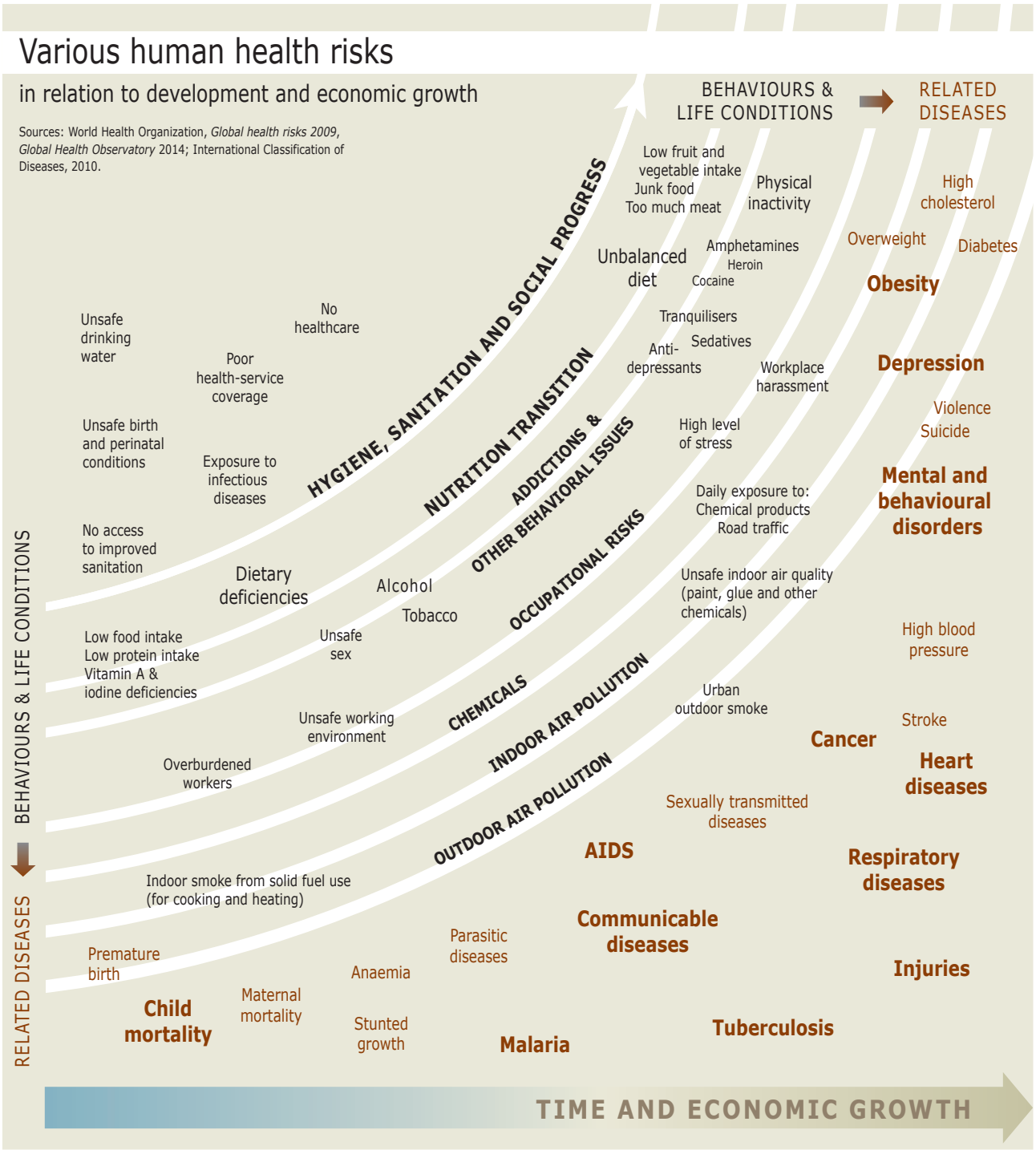
In its constitution, the World Health Organization (WHO) defines health as 'a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity'. It also affirms that the 'enjoyment of the highest attainable standard of health' is a fundamental human right (WHO, 1946 and 2005).

Diverse social, economic, environmental and other factors influence human health, including living and working conditions, and cultural influences. Mediated by social and community networks, these factors interact with innate factors, such as an individual's age, sex and genetic makeup. Changing demography, behaviour and living and working conditions thus directly influence global health, as do changes in environmental burdens (Figure 3.1).

The world population is currently undergoing a major shift in health problems, related to economic development and changing lifestyles. The burden of disease from non-communicable diseases (NCDs) such as diabetes and strokes has since 2000 outweighed the burden from communicable diseases. NCDs, which are typically associated with developed-world lifestyles, are also the most important cause of death in the world (Figure 3.2).

Despite their continuing decline, communicable diseases still pose a significant burden, in particular in developing countries where they remain the

Figure 3.1 Human health risks and health risk factors in relation to development and economic growth



leading cause of mortality and morbidity. The risk of new pandemics also remains a global threat. In addition, major inequalities in health outcomes persist between the countries of the world as well as within them, related to factors such as income, education and health care quality.

3.1 Drivers

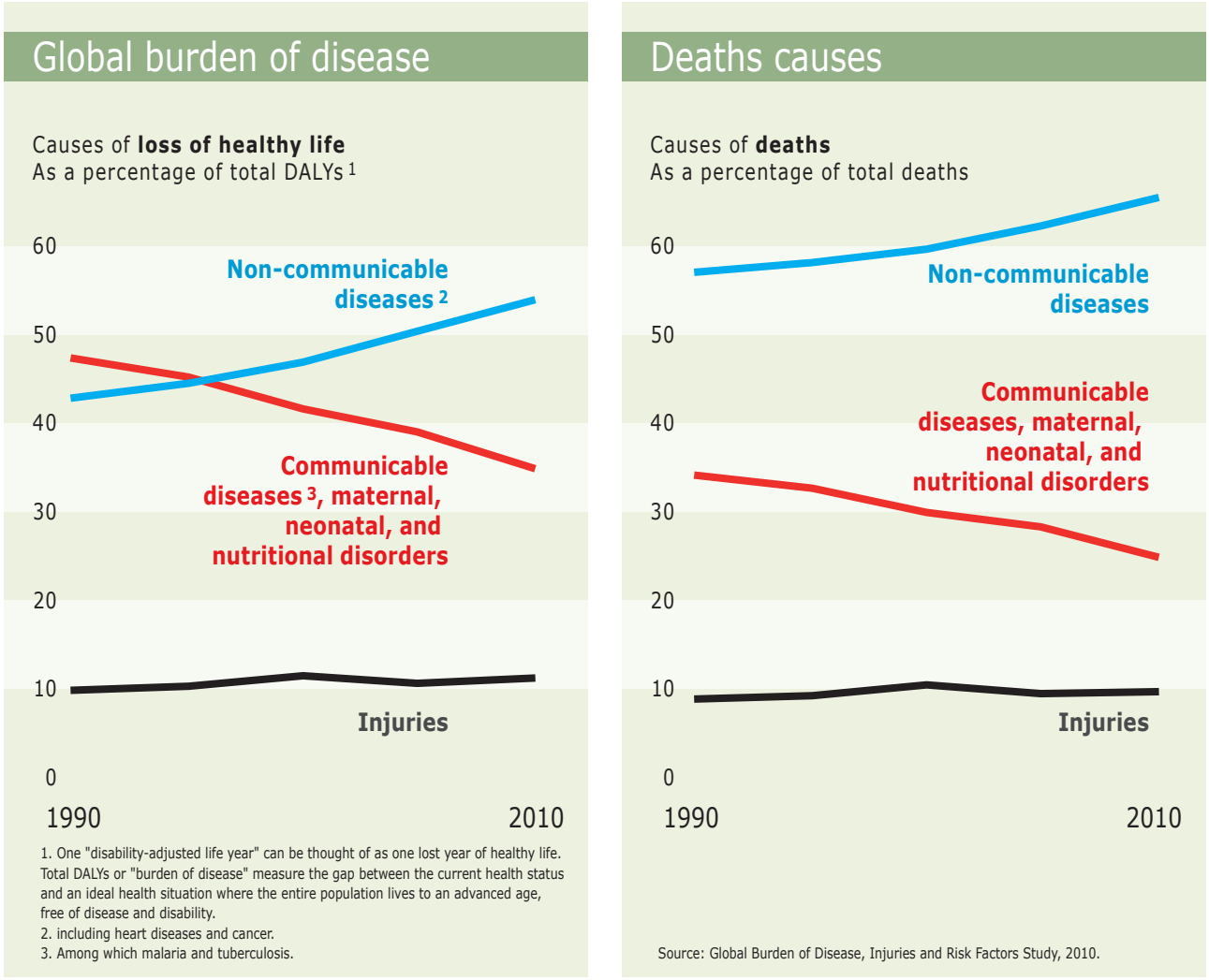
3.1.1 *Economic growth, urbanisation and changing lifestyles and diets*

Economic growth

The coming decades are expected to see huge increases in economic output and urban populations across the world, in particular in developing countries (see GMT 2 and 5). These trends will affect global health outcomes in several important ways. Economic growth will provide resources to finance health research, health care and improved sanitation. Possible further declining global poverty (Edward et al., 2013; EUISS, 2012) and better education (Lutz, 2010) are also linked to better health. However, the increasing global trade and travel that have accompanied economic growth risk spreading communicable diseases and pandemics.

The World Health Organization (WHO, 2014b) has identified four main lifestyle risk factors for non-communicable disease: tobacco consumption, insufficient physical activity, unhealthy diets, and harmful use of alcohol. Wealth and urbanisation can promote lifestyles that exacerbate these risk factors. For example, as people move to service sector jobs and, in cities lacking sustainable transit policies, they increasingly travel by private car then their physical inactivity is likely to grow. Growing food consumption has reduced undernourishment but has also led to higher levels of obesity and lack of some vital vitamins or minerals due to an unbalanced diet.

Figure 3.2 Global burden of disease and death from communicable and non-communicable disease and injuries



Persistent economic inequality (UNDP, 2013) will continue to affect health outcomes within and across countries. Globally, the differences between rich and poor are striking. The top fifth of the global population secured 70 % of world income in 2008, whereas bottom fifth received only 2 % (Ortiz and Cummins, 2011).

Of particular concern for health outcomes are those who live in extreme poverty. The UN Millennium Development Goal target in this area — to halve, from 1990 to 2015, the share of people in the world with an income under USD 1.25 per day — was met by 2010. The share of developing country residents living on less than USD 1.25 a day fell from 47 % in 1990 to 22 % in 2010 (UN, 2013b). Looking ahead, one important uncertainty for health outcomes is the extent to which future economic growth will reduce inequalities and improve the lives of the poorest in society (Edward et al., 2013).

Urbanisation and slums

By 2010, more than half of the world population lived in urban areas. By 2050, this proportion is projected to reach two-thirds, with Asia and Africa accounting for most of the increase (see GMT 2). Urban areas concentrate economic and social opportunities, including better education and higher-paid jobs. Health care opportunities are often also better in urban areas (UN Habitat, 2013).

However, the world's fast-growing cities also concentrate environmental health risks, including air and noise pollution, and allow communicable diseases to spread quickly. In many countries, health inequalities are highest in urban areas, which bring together the very rich and the very poor. Many cities in developing countries are growing faster than governments can provide sanitation or health services. The poor, in particular, suffer from the lack of these services (WHO, 2010b).

Urban health problems are most acute in slums, where residents suffer from poor access to sanitation and safe drinking water, overcrowding, insecure residence and poor housing structures. In 2012, an estimated 863 million people lived in slum conditions, with more than 90 % in developing countries. The target under the Millennium Development Goals to 'achieve, by 2020, a significant improvement in the lives of at least 100 million slum dwellers' — by providing improved water sources and sanitation facilities, more durable housing or sufficient living space — has been met (UN, 2013; UN, 2014). Despite this achievement, the absolute number of slum inhabitants has risen 33 % since 1990. In sub-Saharan Africa, the region of the world with the highest urban growth, 62 % of urban residents lived in slum conditions in 2012 (UN Habitat, 2013). Changes in slum conditions in future decades will depend both on other trends, such as economic trends and policy actions, and thus are uncertain.

Diet and nutrition

The United Nations Food and Agriculture Organization (FAO) has affirmed that 'good nutrition is the foundation for human health and well-being, physical and cognitive development, and economic productivity' (FAO, 2013). In the period 2011–2013, about 842 million people worldwide, 12 % of the world population, suffered from undernourishment ([1]). In at least 26 countries, one-quarter or more of the population faced undernourishment in this period (Figure 3.3).

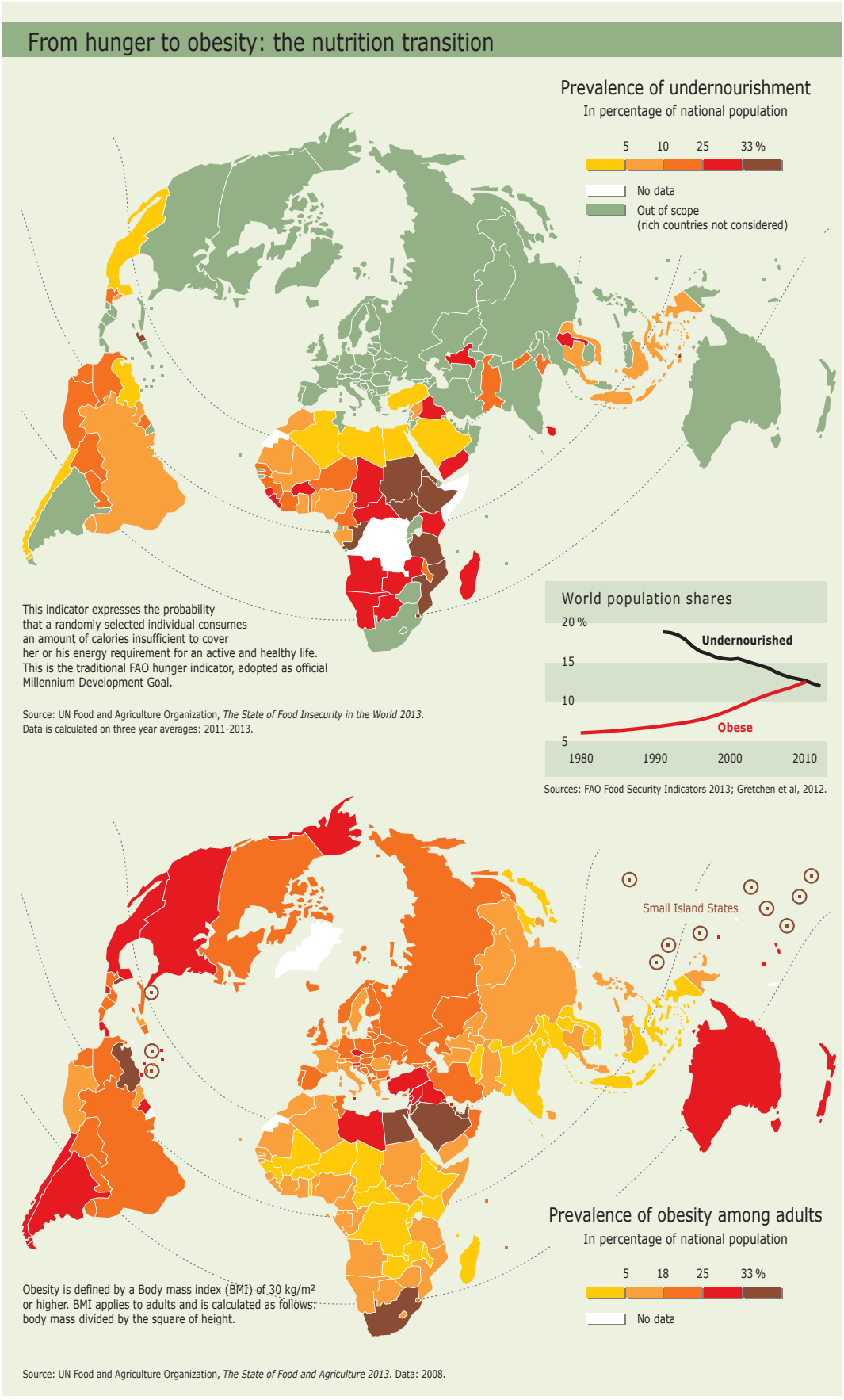
Over the long term, both the share and, more slowly, the total number of undernourished people have fallen. In 1947, about half of the world population suffered from undernourishment (FAO et al., 2013). The UN (2013) reports that the MDG target of halving the share of the world population facing hunger by 2015 (compared to 1990) is 'within reach'. In coming decades, the share and total number of people facing undernourishment is expected to continue to fall as personal incomes rise around the world (FAO, 2012).

While undernourishment is falling, excess body weight and obesity represent growing global health concerns. With rising personal incomes, many developing countries are seeing a move towards 'Western' diets with high levels of fat, sugar, salt and carbohydrates. Over-nutrition can coincide with deficiencies in one or more vitamins and minerals vital for human health, stemming from inappropriate dietary composition and disease. Such micronutrient deficiencies affect about 2 billion people (FAO, 2013).

Future trends in undernourishment and obesity will depend on a range of factors, including the evolution of global agricultural systems. The global growth in intensive production of livestock for meat

([1]) Undernourishment is defined by FAO as a level of food intake over at least a year insufficient to meet dietary needs, i.e. chronic hunger.

Figure 3.3 From hunger to obesity: the nutrition transition



consumption also brings a series of health risks (Liverani et al., 2013) (Box 3.1).

Obesity could be addressed through health and social policies to tackle unhealthy diets and inactivity. Lifestyle trends also vary greatly and in high-income countries many wealthier inhabitants now increasingly seek out high-quality, often organic foods (Dixon et al., 2007).

3.1.2 Demographic change: rising life expectancy and increasing global migration

The global average **life expectancy** at birth rose to 70 in 2011, an increase of six years since 1990. This improvement reflects decreased mortality levels across all age groups as a result of improved economic and social conditions (UN, 2012a). The rise has not, however, been steady in all parts of the world: in Africa, average life expectancy declined in the 1990s due in part to the HIV/AIDS pandemic, though it has since improved (WHO, 2014b). Life expectancy also varies greatly across regions but is projected to converge slowly in coming decades (Figure 3.4).

One consequence of higher life expectancy is that health care for the elderly is a growing issue in many countries, including in Europe (see GMT 1). Around the world, social and demographic changes will mean fewer older people will have the support of families (WHO, 2011). Older populations will face new patterns of disease, such as rising levels of Alzheimer's and dementia (see Section 3.1).

Migration will also affect global health trends (see GMT 1 and 2). The number of migrants between countries increased from 155 million in 1990 to 214 million in 2010. Since 1990, migration flows have become increasingly diverse, with growing migration among developing countries (UN ECOSOC, 2013). Most migration occurs within countries, however, in particular from rural to urban areas.

Migration can enable people access to higher incomes, better health care and improved health outcomes. But migration can also increase risks of increased transfer of infectious diseases. A further concern is that many health professionals migrate to take advantage of opportunities in higher income countries, and in doing so leave a labour shortage in the health care systems of their home countries (IOM, 2013b).

A particular concern is the forced displacement of people due to war and disaster, which reached almost 40 million globally in 2013 (Figure 3.5). Many refugees face mental and physical stress, poor living conditions and lack of health care, and are particularly vulnerable to disease (IOM, 2013).

The coming decades are likely to see continuing migration and growing movements among

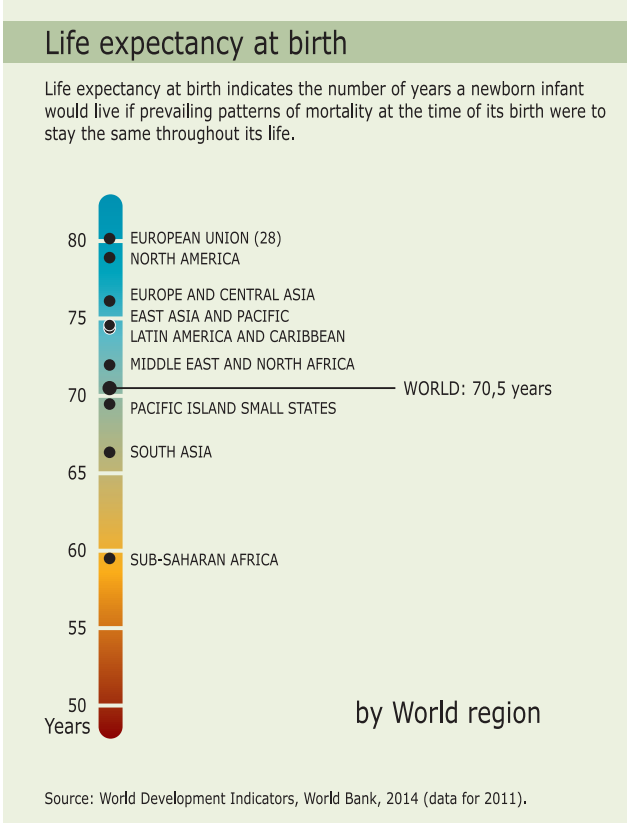
Box 3.1 Intensive livestock raising and risks to human health and environment

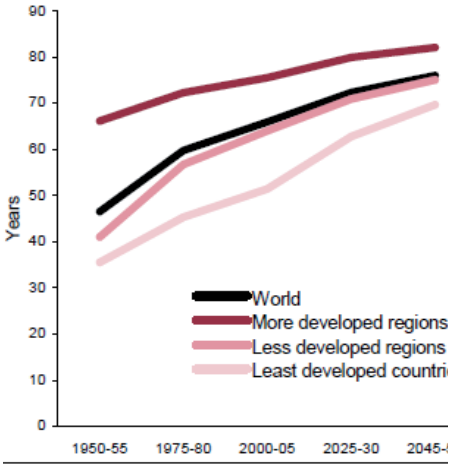
Recent studies indicate that more than three-quarters of communicable human diseases are zoonotic in origin (Woolhouse et al., 2005).

In coming decades, intensive livestock is expected to expand around the globe to meet the rising demands of the world's growing urban middle classes, in particular in developing countries, creating many health risks and environmental impacts. By one estimate, intensive methods already produce about 70 % of the world's poultry and eggs (Liverani et al, 2013). In China, intensive production supplies half of the nation's pork. The co-existence of both small-scale, traditional livestock methods and industrial production in developing countries, together with the conversion of wild areas to agricultural land, can exacerbate the risks of disease transmission from wildlife to livestock and then to humans (Liverani et al., 2013).

Intensive livestock raising creates several health risks, including pandemics. Humans share many infectious diseases, such as influenza, with animals (transmitted from animals to humans or from humans to animals). While this link has always existed, the spread of intensive livestock raising threatens to increase the health risks. Moreover, intensive methods concentrate large numbers of animals in confined units, providing potential 'incubators' for existing and new diseases; the most intensive operations use antibiotics against these threats and also to boost production, a practice that contributes to worrying drug resistance; and the transport of increasing numbers of livestock can also spread disease. Wastes from livestock are also a growing risk to human health and the environment. Already, according to WHO, the world's poultry generate as much faecal pollution as humans, and cattle produce four times as much (Dufour et al. (WHO), 2012).

Figure 3.4 Life expectancy across world regions in 2011 (left) and 1950–2050 (right)





Source: UN, 2002 (http://www.un.org/esa/population/publications/worldageing19502050/regions.htm).

developing countries, in particular those with strong economic growth. Environmental degradation and climate change are expected to play an increasing role in migration (IPCC, 2014). Future trends for conflict-related migrants and refugees are very uncertain.

3.1.3 Growing environmental problems that affect health

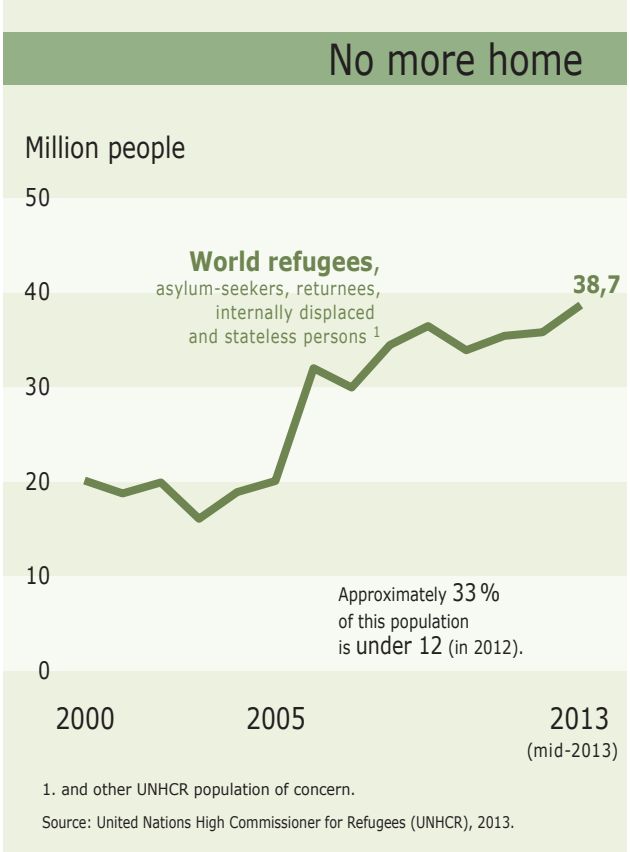
A range of environmental problems affect human health. Overall 24 % of the global burden of disease and 23 % of premature deaths are attributed to environmental causes. Some 36 % of the disease burden in children is caused by environmental factors. Particulate matter, ground-level ozone, indoor air pollution and unsafe water supply and sanitation are the main causes of premature deaths globally.

The most serious health risks come from **outdoor air pollution**. Epidemiological studies attribute the most severe effects to particulate matter (PM_{10}) and fine particular matter ($PM_{2.5}$) and, to a lesser extent, to ground-level ozone. Road transport, industry, power plants, households and agricultural activities are important sources of PM and ozone pollution (OECD, 2012).

Recent WHO work estimates that in 2012 3.7 million premature deaths ([2]) (including urban and rural population) were globally attributed to outdoor air pollution (WHO, 2014a). The Organisation for Economic Co-operation and Development (OECD), which has made forecasts related only to urban

([2]) The new WHO estimates are not only based on more knowledge about the diseases caused by air pollution, but also upon better assessment of human exposure to air pollutants through the use of improved measurements and technology. This has enabled scientists to make a more detailed analysis of health risks from a wider demographic spread that now includes rural as well as urban areas.

Figure 3.5 World refugees, asylum-seekers, returnees, internally displaced and stateless persons



population, projects that if current trends continue, annual global premature deaths from particulate matter will more than double by 2050 and cases of premature deaths caused by ground-level ozone will double by 2050 ([3]).

More than 80 % of those occurred in developing countries (WHO, 2014a) where in many large cities levels of ambient air pollution are very high and are projected to continue rising in the coming decades (WHO, 2014d; OECD, 2012).

WHO has estimated that current levels of **indoor air pollution** are estimated to result in about 4.3 million premature deaths per year in 2012 due to the combustion of coal, wood, dung and other biomass (WHO, 2014a). Almost all occurred in developing countries and about half of these deaths are children, in particular in South-east Asia and Africa, as well as China. The OECD forecasts that this level will decline slowly in coming decades: as people move out of poverty, they switch to using cleaner fuels such as natural gas and live in homes with ventilated stoves. In developed countries, indoor air pollution from chemicals, for example in cleaning fluids, carpets and other products, is a rising concern (OECD, 2012).

Unsafe water supply and sanitation are also major causes of health problems, with the resulting deaths primarily affecting children. Impacts are seen almost entirely in developing countries, in particular in sub-Saharan Africa and India.

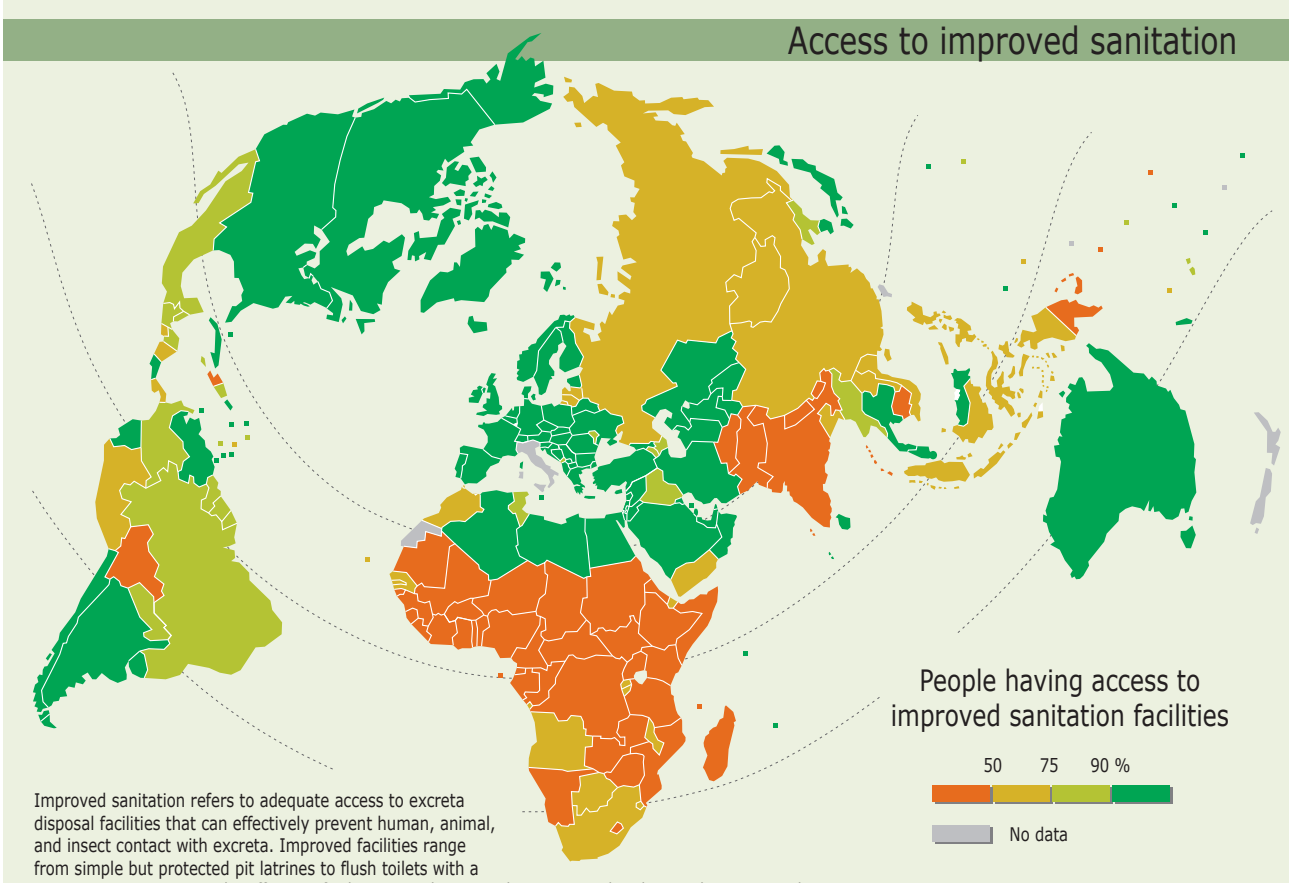
In recent years, access to improved sources of drinking water has risen significantly, from 76 % of the global population in 1990 to 89 % in 2010. As a result, the MDG target in this area — to halve those without access to safe drinking water between 1990 and 2015 — has been met, according to official reporting (UN, 2013b). Poor access remains a problem in particular in developing countries and among disadvantaged groups. More than four-fifths of those without access live in rural areas (UN, 2013b). Moreover, the United Nations notes that there are concerns about the quality of many improved water sources. It is possible that the number of people without access is higher than official estimates. Moreover, many people have access only to public water points, not piped water at home (UN, 2013b).

In contrast, the MDG target to reduce the number of people without access to improved sanitation by half has not yet been met, though it may be achieved by 2015 (UN, 2013b). Coverage rose to 64 % in 2011 but would need to reach 75 % to meet the target (Figure 3.6). The greatest improvements were seen in eastern Asia, where access rose from 27 % in 1990 to 67 % in 2011. Despite these improvements, about half of those without access — approximately one billion people — lack any sanitation facilities and use open defecation, a practice that creates strong risks of disease, in particular in villages and urban areas (UN, 2013b).

Around the world, people are exposed to an increasing number of chemicals, as global chemical production has risen steadily (EEA, 2013). According to the WHO, impacts from acute poisoning, workplace exposure to chemicals and exposure to lead reached about one million premature deaths per year in 2004. Exposure routes include the dismantling of electronic waste in developing countries, a problem

([3]) The OECD's forecasts are based on modelling and thus depend on a range of assumptions about current and future air pollution and its interaction with other determinants of health, including the potential gains from air and climate policies. The forecasts consider only urban population and include the projected ageing of populations in the coming decades. EU countries make up close to half of the OECD population.

Figure 3.6 Proportion of the population with access to improved sanitation, 2011



Improved sanitation refers to adequate access to excreta disposal facilities that can effectively prevent human, animal, and insect contact with excreta. Improved facilities range from simple but protected pit latrines to flush toilets with a sewerage connection. To be effective, facilities must be correctly constructed and properly maintained.

Source: WHO and UNICEF Joint Monitoring Programme, *Progress on sanitation and drinking water*, 2013 update (data for 2011).

that may grow as developing countries consume an increasing number of computers and other electronic and electrical goods (Riederer et al., 2013).

Chemicals used in mining have brought acute exposure to local areas in developing countries. Moreover children and adults around the world are affected by low levels of lead contamination. WHO has estimated that overall, lead poisoning of children accounts for 0.6 % of the world's global disease burden, which can lead to long-term mental retardation and heart risks (WHO, 2010a). Additionally, recent research brought increasing concerns about chemical exposure and brain health. Chemicals such as lead, mercury, polychlorinated biphenyls (PCBs), arsenic, and certain solvents and pesticides pose an insidious threat to the development of the next generation's brains (i.e. 'chemical brain drain') (Philippe Grandjean, http://braindrain.dk).

Exposure to pesticides through inadequate safety measures is another concern, along with stocks of obsolete pesticides (WHO, 2013f). Small-scale mining has led to acute exposure to lead, mercury and other heavy metals in countries from Nigeria to Colombia (Siegel, 2011). Children and adults around the world are also affected by low levels of lead contamination. The WHO has estimated that overall, lead poisoning of children accounts for 0.6 % of the world's global disease burden, due to long-term mental retardation and heart risks (WHO, 2010a), and low-level exposure to mercury and other heavy metals are also a serious health concern (EEA, 2013).

Understanding of the health impacts of persistent exposure to chemicals remains limited. The effects of persistent, bio-accumulative and toxic chemicals are of particular concern. Nanomaterials, made of particles in the range of 1 to 100 nanometres, are of growing concern due to their widespread and growing use in consumer and industrial products, including medical equipment (see GMT 4); little systematic information is available, however, on human exposure and health impacts (EEA, 2013).

Climate change (see GMT 9) can directly and indirectly affect human health via changing weather and extreme events, impacts on ecosystems and agriculture, and contributing to existing problems such as air pollution, water scarcity and poor water quality. In terms of extreme weather events, the Intergovernmental Panel on Climate Change (IPCC) has found some evidence that heat waves, floods and droughts have increased in parts of the world since 1950 (IPCC, 2012). Heat waves in particular are expected to bring further health impacts in coming decades. Climate change can also affect the range of communicable diseases spread by unsafe food and water, by vectors such as mosquitoes (see Section 2.3 and Box 3.1) and by the movement of people (see Section 1.2.). In addition, climate change will create higher risks of under-nutrition in poor regions due to diminished food production. Some health improvements may also be seen, due to a reduction in cold extremes, although such benefits are expected to be much more limited than the negative impacts (IPCC, 2014).

A range of other environmental problems create health risks. These include noise from traffic and other sources, and contamination from poor management of solid waste. Intensified competition for global resources could have indirect impacts; for example, marine fish provide 6 % of global protein and are a vital element of food security for some low-income countries but current pressure on fisheries puts this resource at risk (EMB, 2014).

3.1.4 Expanding medical research and technology

The pace of technological innovation is accelerating, and health care is one of the key areas expected to benefit from the fast-changing fields of nanotechnology, biotechnology and information technologies (see GMT 4). The range of treatable diseases is increasing, moving from infectious diseases to major NCDs, to medical issues which previously would have been considered a normal (if unfortunate) part of life (Heath, 2005). For example, the growing links between nanotechnology and information technology are producing miniature sensors that can be used for healthcare, including wearable and ingestible sensors to monitor the health of chronic patients at home, with results connected via Internet to medical centres.

Artificial intelligence will increasingly be able to support doctors in diagnoses and possibly replace them in some tasks. Crowd-sourced information via cell phones could monitor disease outbreaks (MGI, 2013). Genomic sequencing is being used for drug discovery (MGI, 2013).Techniques are also being developed to improve the delivery of drugs. For example, 'nanocapsules' can delay release of the active molecule until it reaches the desired location within the body (Mitchell Crow, 2013). New human organs to replace or enhance existing ones could be grown from the stem cells of the patient, thus eliminating the risk of organ rejection (Coghlan, 2013; Murphy and Atala, 2012).

While new technologies promise future advances in medicine, drug research and discovery has slowed in particular in the area of antibiotics (as discussed in Section 3.2). A further concern is that new medicines and techniques focus on diseases, particularly non-communicable diseases, in high-income countries that represent business opportunities (see Section 3.2). A number of international activities has been launched recently to address 'neglected' tropical diseases found mainly in developing countries.

3.2 Trends

3.2.1 Growing levels of non-communicable diseases

Non-communicable diseases (NCDs), also known as chronic diseases, constitute one of the major challenges for development in the twenty-first century. NCDs cannot be passed from person to person and are generally of long duration and slow progression. The four main types of non-communicable diseases are cardiovascular disease (such as heart attacks and stroke), cancers, chronic respiratory diseases (such as asthma and chronic obstructed pulmonary disease) and diabetes.

According to projections by the World Health Organization, the total annual number of deaths from NCDs will increase from 36 million in 2008 to 55 million by 2030 if current trends continue (WHO, 2013). The four main types of non-communicable diseases today account for 60 % of deaths worldwide, and their impact is projected to grow in coming decades (Figure 3.7 and Box 3.1). These trends reflect a shift away from traditional health risks such as inadequate nutrition or unsafe water and sanitation, which particularly influence communicable diseases in children, towards unhealthy lifestyles, which increase risks such as obesity and early deaths, particularly in adults (Lim et al., 2012; Lozano et al., 2012).

NCDs have long been predominant in developed countries but they are no longer limited to affluent societies. In 2011, more than two thirds of all premature deaths (individuals between the age

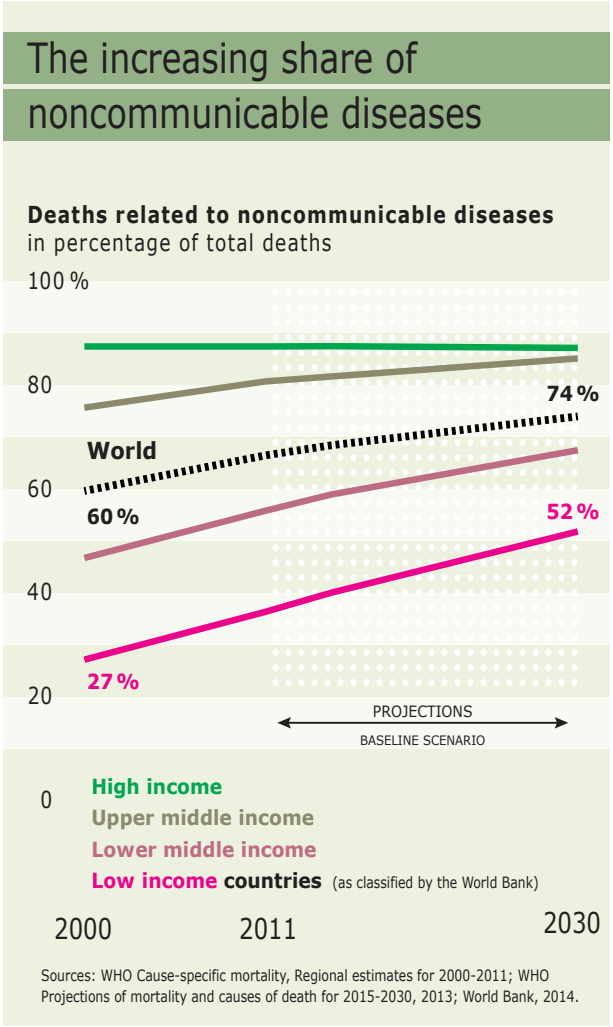
of 30 to 70) due to NCDs occurred in developing countries (WHO, 2011b). The probability of dying from any of the major NCDs ranges from 87 % in developed countries to 58 % in developing countries (Kuipers et al., 2014). The prevalence of NCDs is expected to further increase in developing countries and to continue to accompany socioeconomic development.

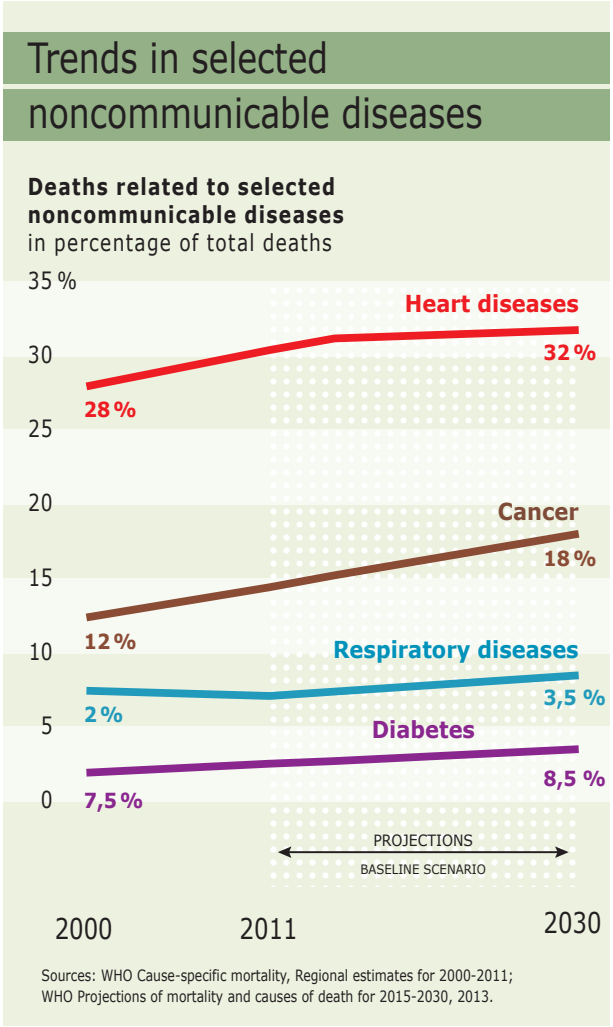
The industrialisation of food production processes combined with the globalisation of food marketing and distribution, has made processed foods, rich in fat, sugar, and salt, yet low in essential nutrients, much more accessible all over the world, and as such contributes to the rise of chronic diseases (non-communicable). Obesity and type 2 diabetes, strongly linked to unhealthy diets, have reached epidemic proportions in Asia, where the nutritional transition has been exceptionally rapid. People in that part of the world are developing diabetes in greater numbers and at a younger age than in Europe and North America, and they are dying sooner. Diabetes is an especially costly disease: costly for societies, costly in terms of chronic care, and extremely costly in terms of hospital care for well-known complications such as health disease (EFT, 2006).

In addition to these four non-communicable disease types, the incidence of mental disorders such as depression, dementia and substance use disorders is rising. The WHO (2011a) cites projections from Alzheimer's Disease International that suggest that 115 million people worldwide will be living with dementia in 2050, with a markedly increasing proportion of that total in developing countries (Figure 3.8).

According to one estimate, these diseases will result in losses of USD 7.3 trillion over the next

Figure 3.7 Trends in non-communicable disease, 2008 to 2030





Box 3.2 Non-communicable diseases: facts and figures

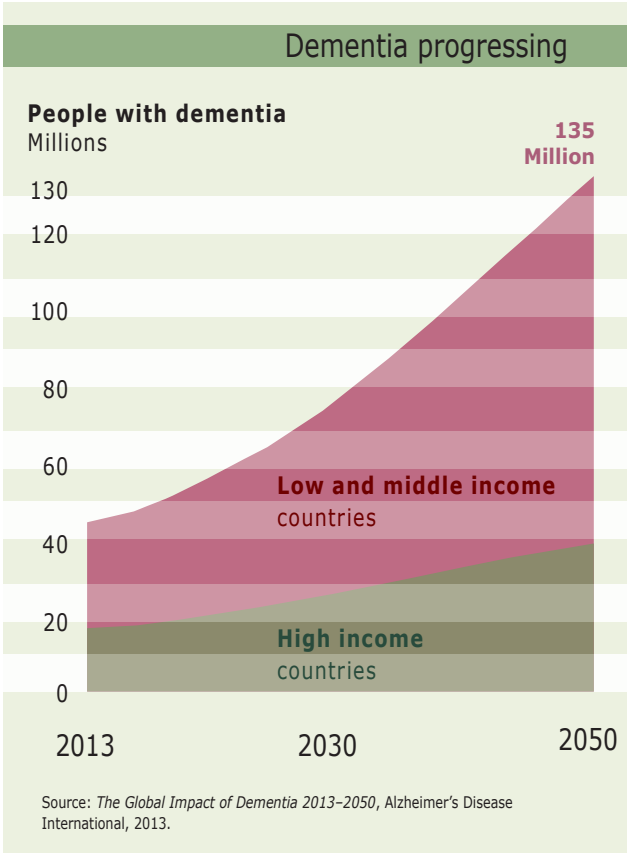
Cardiovascular diseases are the number one cause of death in the world. While deaths from such conditions have actually been declining in high-income countries, they have been increasing at very fast rates in low- and middle-income countries (WHO, 2011d).

A report by the International Agency for Research on Cancer shows that cancer is the biggest cause of mortality worldwide (IARC, 2014). In 2012, 32.6 million people were living with cancer and 8.2 million people worldwide died that year from the disease. Cancer cases are forecast to rise by 75 % over the next two decades.

Chronic respiratory diseases (asthma and respiratory allergies, chronic obstructive pulmonary disease), occupational lung diseases, and pulmonary hypertension are responsible for four million deaths each year. Almost 90 % of deaths due to chronic obstructive pulmonary disease occur in low- and middle-income countries, due to tobacco smoke but also indoor and outdoor air pollution, occupational dust and chemicals and frequent lower respiratory infections during childhood (WHO, 2010d).

The latest edition of the IDF Diabetes Atlas (IDF, 2013) shows that today there are 382 million people living with diabetes globally and this number is set to reach 471 million by 2035. Diabetes is increasing all over the world and 80 % of people with diabetes live in low- and middle-income countries. The socially disadvantaged in any country are the most vulnerable to the disease.

Figure 3.8 Projected number of people with dementia, 2010–2050



Source: *The Global Impact of Dementia 2013–2050*, Alzheimer's Disease International, 2013.

15 years (Table 3.1), including health costs and lost productivity (WEF, 2011). The growing burden of NCDs threatens to impose substantial economic costs on developing countries (the annual loss of approximately USD 500 billion amounts to roughly 4 % of GDP for low- and middle-income countries in 2010) ([4]). In every income group that was analysed, losses from NCDs are greater than public spending on health, assuming that inflation-adjusted levels of such spending remain at their 2009 levels for the period 2011–2025 (Based on *The Global Economic Burden of Non-communicable Diseases* by the World Economic Forum and the Harvard School of Public Health, 2011).

3.2.2 Persistence of communicable disease

While non-communicable diseases are sweeping the globe, communicable diseases still pose a significant burden. In developing countries, infectious diseases remain the leading cause of mortality and morbidity: in 2010, 94 % of all deaths due to communicable diseases occurred in developing countries (WHO, 2011b). However, developed countries are also still affected by communicable diseases and in some cases their incidence is growing. This is mainly linked to drug resistance, as discussed in Section 3.3.

([4]) The focus of analysis in this report is on Low and middle income countries (as defined by World Bank: http://siteresources.worldbank.org/DATASTATISTICS/Resources/CLASS.XLS), which account for 84 % of the world's population and 83% of the non-communicable disease burden (as measured by DALYs (disability-adjusted life years).

Table 3.1 Economic burden of NCDs, 2011–2025 (trillion USD in 2008)

Country income group	Diabetes	Cardiovascular diseases	Respiratory diseases	Cancer	Total
Upper middle	0.31	2.52	1.09	1.20	5.12
Lower middle	0.09	1.07	0.44	0.26	1.85
Low income	0.02	0.17	0.06	0.05	0.31
Total of low and middle	0.42	3.76	1.59	1.51	7.28

Source: WEF, 2011. http://www3.weforum.org/docs/WEF_WHO_HE_ReducingNonCommunicableDiseases_2011.pdf.

At the end of 2012, there were 35.3 million people living with **HIV/AIDS** worldwide (0.8 % of the population aged 15–49). In that year, 1.7 million people died of AIDS-related illnesses, including 230 000 children (UNAIDS, 2012). The burden of this disease varies considerably between countries and regions. Sub-Saharan Africa is the most affected region, with nearly 1 in every 20 adults living with HIV today (UNAIDS, 2012).

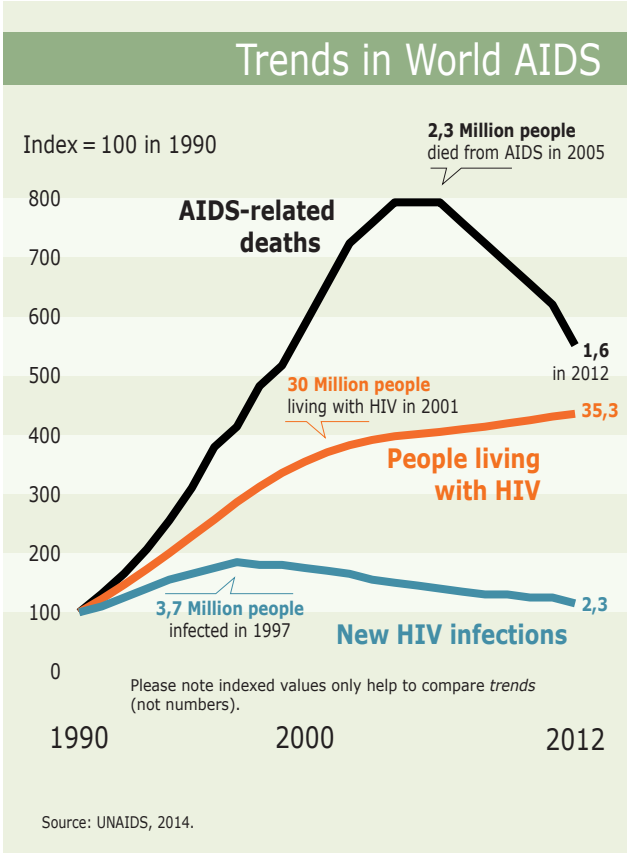
Due to a 40-fold increase in access to anti-retroviral therapy, the number of new HIV infections and deaths due to AIDS is decreasing globally, while the number of people living with HIV is increasing due to better access to anti-viral therapy (Figure 3.9).

Many developing countries face 'neglected tropical diseases', a group of parasitic and bacterial diseases such as dengue and leprosy which often lack adequate vaccination programmes and health responses. Neglected tropical diseases persist especially in the poorest, most marginalised communities and conflict areas where access to treatment is low. Until recently global public health investment has been limited.

At the same time, several contagious diseases persist despite the availability of effective vaccines for over 50 years. One example is measles, a highly contagious disease that remains one of the leading causes of death among young children, particularly in developing countries. In 2012, more than 20 million people were affected by measles, of whom 122 000 died (WHO, 2014b).

Infants and children are particularly affected by communicable diseases. An estimated 6.6 million children under the age of five died in 2012 ([5]). 44 % of all child deaths occur within the first month of life (WHO, 2014b). Poor sanitation, malnutrition and lack of vaccination particularly increase the susceptibility to infections. Additionally, almost two million children die each year because of lower respiratory infections such as pneumonia. For nearly half of these deaths, air pollution, particularly indoor air pollution, is a factor. Children in sub-Saharan Africa are about over 16 times more likely to die before the age of five than children in developed regions (WHO, 2014b).

Figure 3.9 HIV infections and AIDS deaths, 2001–2012



([5]) A child is defined by the Convention on the Rights of the Child (CRC) as 'Every human being below the age of 18 years unless under the law applicable under the child majority is attained earlier'.

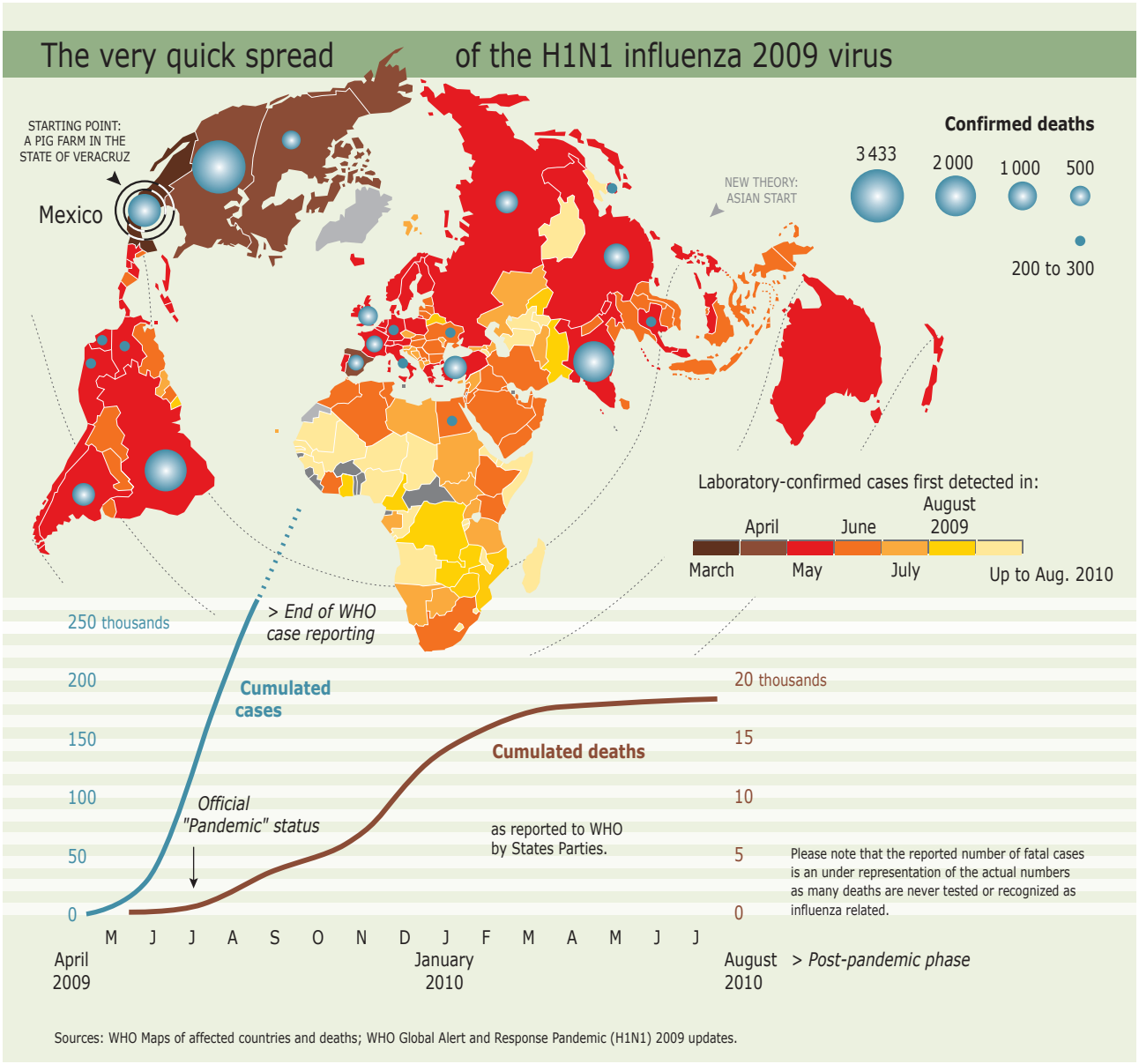
Overall, substantial progress has been made towards achieving Millennium Development Goal (MDG) 4. Since 1990 the global under-five mortality rate has dropped from 90 deaths per 1000 live births in 1990 to 48 in 2012. But the rate of this reduction is still insufficient to reach the MDG target of a two-thirds reduction of 1990 mortality levels by 2015.

Despite the success of vaccination and prevention programmes, communicable diseases are thus a persistent problem. As discussed in Section 3.3, risks of pandemic outbreaks of infectious diseases are a further concern.

3.2.3 Growing risks of pandemics

Emerging and re-emerging infectious diseases that can rapidly spread across continents have always represented a threat to human health. Several pandemics — epidemics that occur worldwide or over a wide area crossing international boundaries and affecting a large number of people (Last, 2001) — have occurred during recent years. Infections can spread quickly due to high levels of international movement and viruses, such as influenza, can rapidly mutate and jump from animals to human (see Box 3.1). The WHO in 2011 described the world as

Figure 3.10 Outbreak and spread of the H1N1 influenza virus in 2009



Sources: WHO Maps of affected countries and deaths; WHO Global Alert and Response Pandemic (H1N1) 2009 updates.

'ill-prepared to respond to severe pandemics or any other similar global, sustained and threatening public health emergency' (WHO, 2011e).

The outbreak of the H1N1 swine-origin influenza virus commenced in April 2009. The first pandemic of the 21st century, it has been estimated to kill more than 18 000 people from more than 214 countries (WHO, 2014c). Figure 3.10 shows the rapid outbreak of the H1N1 virus around the world within a few months. The WHO announced in August 2010 that the H1N1 influenza virus had officially moved into the post-pandemic period but localised outbreaks have continued.

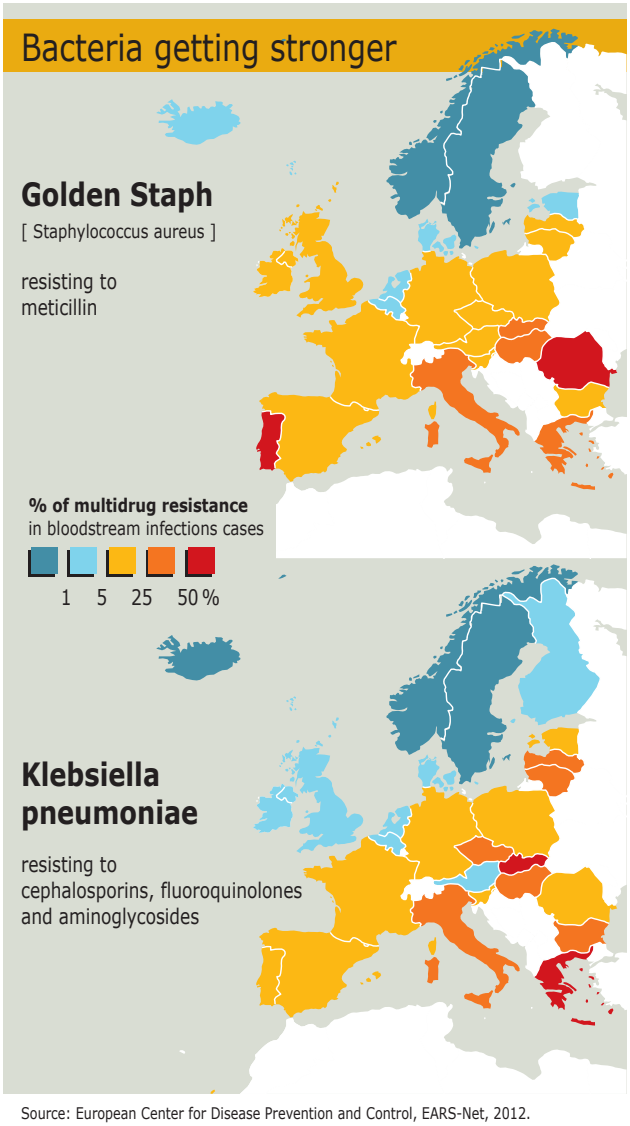
In 2013, the WHO redefined its pandemic alert system, putting in place a four-phase system to track new outbreaks of diseases from the first few infections in humans through to a pandemic (WHO, 2013h). The outbreak of the Severe Acute Respiratory Syndrome (SARS) in 2002 for example, which (as it was registered) infected more than 8 000 people and killed nearly 800, did not reach the pandemic stage. Due to an early disease recognition and rapid implementation of global and national actions, its transmission was slowed and the chain of the transmission broken before it could become pandemic. The disease has not been eradicated, however, and could thus re-emerge.

Another factor that can contribute to or cause outbreaks of infectious diseases is the development of resistance to antibiotics. These medicines have been one of the most effective and common means to protect human health. Bacteria are increasingly showing resistance to existing antibiotics, due in part to their overuse by humans and on livestock. The pace of development of new antibiotics has slowed, however, and not all drugs currently under development are proven effective against bacteria that have developed resistance to current antibiotics (Borer et al., 2009).

In the USA, it is estimated that two million people a year become infected with bacteria that are resistant to at least one antibiotic. Direct deaths are estimated at over 20 000 a year (CDC, 2013). In Europe, meticillin-resistant Staphylococcus aureus, better known as MRSA, a source of infection in particular in hospitals, is stabilising and possibly decreasing, but not as quickly as had previously been projected. Meanwhile, the incidence of Klebsiella pneumonia infections resistant to three classes of antibiotic is growing (Figure 3.11). And a strain of Enterobacteriaceae, a source of bladder, lung and blood infections, has become resistant to all antibiotics (McKenna, 2013). Experts are therefore starting to prepare for situations in which all antibiotics will be ineffective, even for treating the most common infections. Such scenarios could result in higher mortality rates globally (WEF, 2013).

Antibiotic-resistant infections already result in significant costs for the health care systems. In Europe, antibiotic-resistant bacteria infections cause over 20 000 deaths and cost over EUR 1.5 billion per year. Elsewhere losses to GDP have been estimated at 0.4–1.6 % (WEF, 2013; Spellberg et al., 2011; White, 2011). Moreover, antibiotic-resistant bacteria could affect livestock, probably resulting in shortages of food and restrictions on trade (WEF, 2013).

Figure 3.11 Multi-drug resistance in Europe: *Staphylococcus aureus* and *Klebsiella pneumonia*



Source: European Center for Disease Prevention and Control, EARS-Net, 2012.

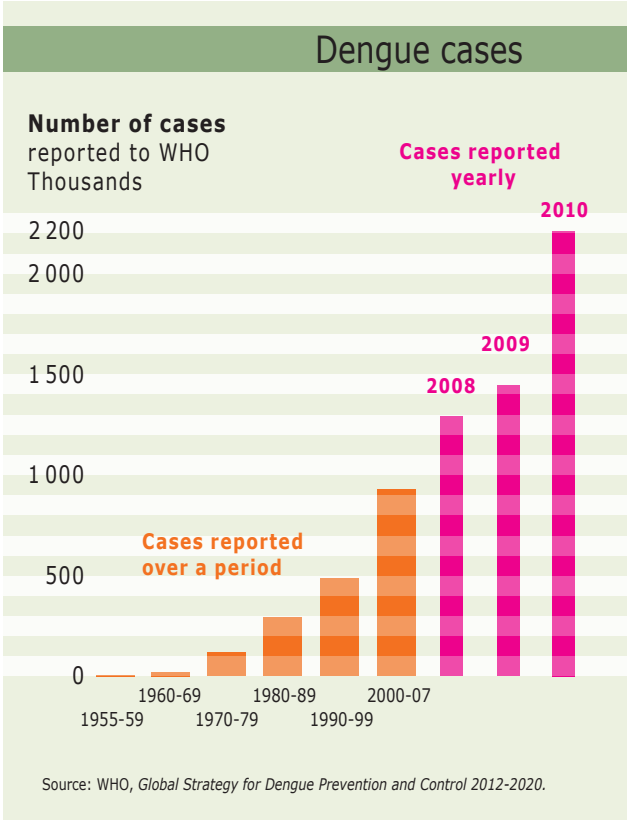
Another concern is **multi-drug resistant tuberculosis**. After HIV, tuberculosis (TB) is the greatest killer globally due to a single infectious agent. In 2012, 8.6 million people developed TB, of whom 1.3 million died. Due to global healthcare efforts, TB rates have declined by more than one-third worldwide since 2004 (UNAIDS, 2013). However, due to drug resistance TB has re-emerged in some developed countries (e.g. Denmark) where it had historically been reduced to very low levels (IOM, 2013). Of particular concern are cases resistant to at least two key drugs used for treatment (isoniazid and rifampicin). These rose to about 5 % all cases in 2011 and are found in over 80 countries. In Russia, for example, more than 15 % of new tuberculosis cases are multi-drug resistant.

Climate change, including natural disasters and extreme weather conditions, will influence the prevalence of communicable diseases, particularly **vector-borne diseases** (i.e. diseases transmitted by bites of infected carriers such as mosquitos). Rising temperatures can influence the distribution patterns and reproduction rates of vectors, and humidity and the availability of water will have an impact on breeding sites, behaviour and longevity. Climate change can also influence the incubation period of pathogens inside the vectors; a warmer temperature often results in a shorter incubation period and thus a more rapid spread of disease. Additionally, human exploitation of tropical rainforests, deforestation, population growth, increasing immigration and international air travel and tourism to tropical regions also contribute to the increased incidence of vector-borne diseases.

Malaria and dengue are two vector-borne diseases that are endemic (i.e. there is a constant or usual presence among a population within a certain geographic area) and sudden outbreaks can occur. For example, periodic flooding linked to the El Nino-Southern Oscillation has been associated with malaria epidemics in the dry coastal region of northern Peru (Gagnon et al., 2002). Dengue caused an explosive local outbreak in the state of Rio de Janeiro in Brazil as a result of heavy rains, with more than 158 000 cases and 230 deaths reported in the first four months of 2008 (WHO, 2012c).

According to estimates released in December 2013, there were around 207 million cases of malaria in 2012 and an estimated 627 000 deaths; 86 % of them were children under the age of five (WHO, 2013c; WHO, 2013e). While malaria mortality rates have dropped by 45 % globally since 2000, drug resistance poses a growing problem. Resistance has developed to every anti-malarial medicine used so far (WHO, 2010c). Resistance to the drug artemisinin — the key component of artemisinin-combination therapies (ACTs), which are currently the best available anti-malarial drugs — has been detected in the Greater Mekong sub-region.

Figure 3.12 Dengue cases reported to WHO annually: averages for 1995–2007 and yearly for 2008 to 2010



Source: WHO, *Global Strategy for Dengue Prevention and Control 2012-2020.*

Dengue fever, together with associated dengue haemorrhagic fever (DHF), is the world's fastest growing vector-borne disease. The worldwide incidence of dengue has risen 30-fold compared to the situation 50 years ago (Figure 3.12), and an increasing number of countries are reporting their first outbreaks (WHO, 2012b). These numbers are probably underestimations, as severe underreporting and misclassification of dengue cases have been documented. Almost half of the world's population lives in areas where dengue is endemic.

3.2.4 Persistent health inequalities between and within countries

While average life expectancies and health standards have improved globally over recent decades, significant differences still exist both

between and within countries. Nearly half the world's deaths under five years old are concentrated in sub-Saharan Africa (UNICEF et al., 2013). Whereas a child born in Sierra Leone has a life expectancy of 47 years, a child in Japan can expect to live 36 years longer (WHO, 2014b). Disparities also exist within countries, as people with lower levels of education, lower occupational classes and lower levels of income have a higher prevalence of health problems and tend to die at a younger age. For example, a child born in Bangladesh to a woman with no education has an infant mortality rate of 71 %, while a child born to a woman with secondary education level or higher has a probability of dying between birth and age one of 41 %. (WHO, 2014e).

Disparities in health outcomes are linked to a wide range of socio-economic determinants. One key factor is access to and differences in health care (Table 3.2).

Large disparities in health are often found between rural and urban areas as well as across urban neighbourhoods. These differences can be influenced by economic conditions as well as social and health policies. For example, in Colombia, a middle-income country, there is little difference in child mortality between rural and urban areas. But in Mali, a low-income country, these differences persist (WHO, 2014b). Further information about how urbanisation is linked with rural-urban disparities in living standards and opportunities can be found in GMT 2.

Around the world, many disadvantaged groups also face higher risks of environmental health impacts due to poor housing conditions, inadequate sanitary equipment, lack of access to clean drinking water, high levels of noise and frequent injuries due to unsafe environments. Slums can concentrate these risks. These groups also have more limited capacities to adapt to a changing climate.

The substantial increase in education, especially of women, and the reversal of the gender gap have important implications not only for health but also for the status and roles of women in society. The continued increase in educational attainment even in some of the poorest countries suggests that rapid progress in terms of Millennium Development Goal 4 might be possible (Gakifou, E. et al., 2010) (Figure 3.13).

Although there is limited quantitative information available relating to inequalities, some data indicate a decline in health inequalities across the world. The UN's Human Development Report (UN, 2013c) found declines in health inequalities between 1990 and 2010 in all regions of the world. These declines were strongest in several developing regions, especially in south Asia; they were weakest in developed countries including European countries (UN, 2013c). Among the factors driving reduced inequality are improvements in education, especially for women, and falling poverty levels.

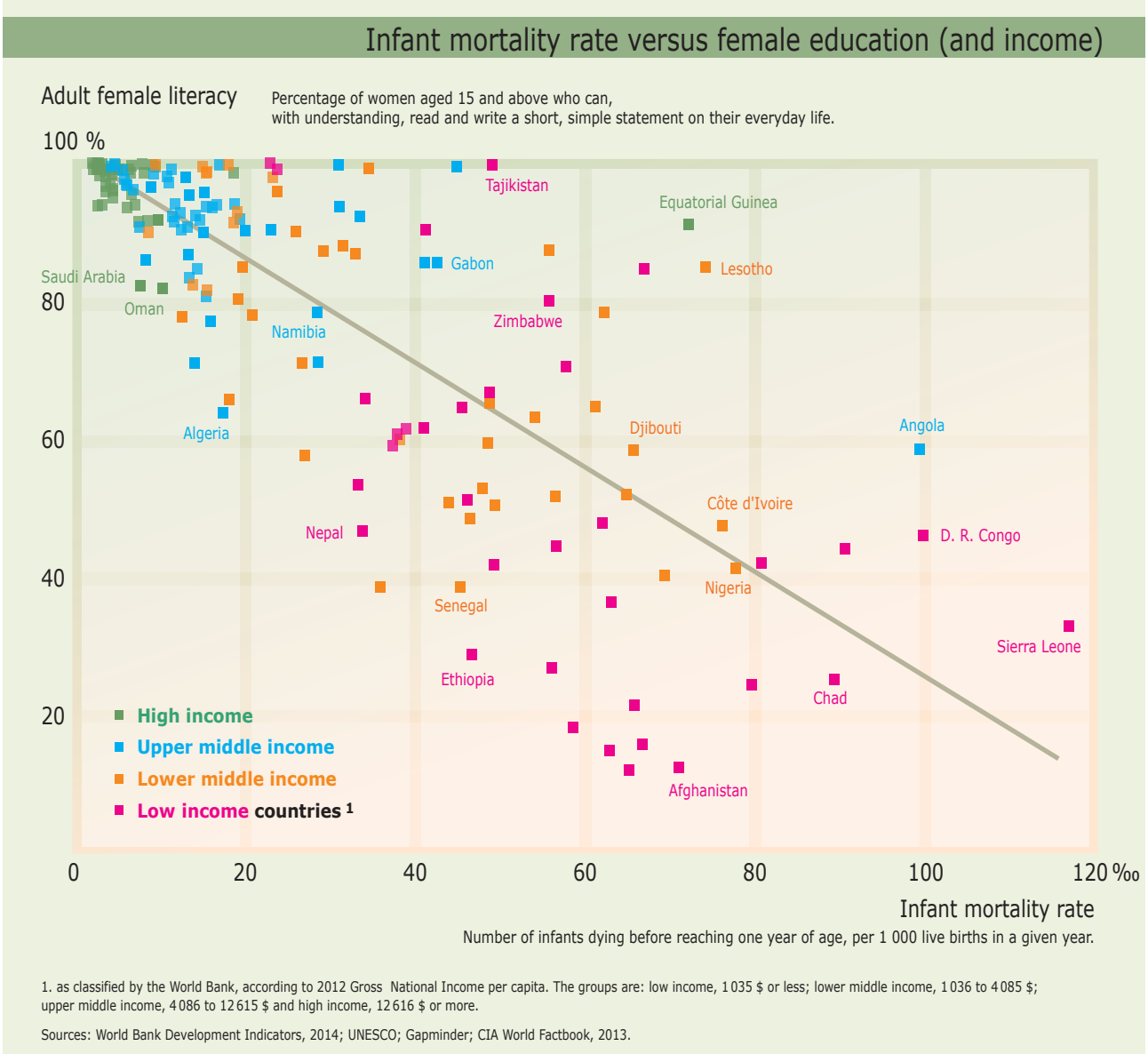
Despite these declines, significant health inequalities remain within and between countries and regions globally. According to the World Health Organization, each year an estimated 150 million around the world face financial ruin to pay for medical expenses (WHO, 2013g). Surveys undertaken by the WHO from 2007 to 2011 indicate that in the public health sector, the average availability of generic medicines in developing countries was only 52 % (WHO, 2011f). Due to this scarcity, people are forced to turn to the private sector to obtain their medication, where prices are often significantly higher. The economic crisis has also taken a toll on households' health care budgets around the world (see Box 3.3).

Table 3.2 Physicians and health expenditures by WHO region, 2010

WHO region	Physicians per 10 000 population	Health expenditures	
		% GDP	USD/cap PPP
African	2.5	6.2	154
Americas	20.4	14.3	3454
South-East Asia	5.5	3.6	125
European	33.3	9.3	2282
Eastern Mediterranean	10.8	4.5	326
Western Pacific	15.2	6.4	650

Source: WHO, 2014f.

Figure 3.13 Infant mortality rates compared with female education levels



1. as classified by the World Bank, according to 2012 Gross National Income per capita. The groups are: low income, 1 035 $ or less; lower middle income, 1 036 to 4 085 $; upper middle income, 4 086 to 12 615 $ and high income, 12 616 $ or more.

Sources: World Bank Development Indicators, 2014; UNESCO; Gapminder; CIA World Factbook, 2013.

Box 3.3 The impact of the global economic crisis

Analysis of the health impacts of the global economic crisis indicates that a common 'coping mechanism' among those impacted by low employment and poverty has been reduced expenditure on healthcare. UNICEF (2012) reports that 'in a number of developing countries, in particular, households have consistently reported lower healthcare spending and service utilization, which has exposed many people to a higher risk of sickness, disability or even death.'

Moreover, the WHO's Twelfth Work Programme reports that reduced public spending in some developed countries following the crisis may affect their ability to respond to outbreaks of infectious diseases. For example, Greece, a country hit hard by the global financial upheaval, has been suffering a variety of health problems since the start of the economic crisis. These include a disproportionately high morbidity and mortality burden of influenza, the emergence and spread of West Nile virus, the appearance of clusters of non-imported malaria and the outbreak of HIV infection among people who inject drugs (Bonovas, 2012).

As stated in the final report of the WHO Commission on Social Determinants of Health: 'Putting health inequities right is a matter of social justice. The right to the highest attainable standard of health is enshrined in the Constitution of the World Health Organization (WHO) and numerous international treaties. But the degree to which these rights are met from one place to another around the world is glaringly unequal. Social injustice is killing people on a grand scale' (EFC, 2006).

Implications

Global health trends have wide-ranging implications, including for economic and social development.

The processes of globalisation are creating new threats to health and its determinants. Health issues that transcend national boundaries include environmental degradation, inequality and lifestyle changes, access to medicines and health knowledge, as well as new and re-emerging diseases. **Global health threats are increasingly described as a generational challenge to sustainable development**, since if they are not addressed now, they will become uncontrollable threats to the health and security of future generations (EFT, 2006). Changes in the make-up of the disease burden worldwide can put a strain on health systems, deepen inequalities and increase poverty and health costs (Lancet, 2013).

Despite the remarkable achievements in improved health care in many parts of the world, a large share of the world's population will continue to face poor health care — as well as poor environmental conditions. Many of these people will live in the growing **mega-cities in developing countries**. These places may **become breeding grounds for further spread of diseases and social unrest**.

Moreover, if current trends continue (including demographic, urbanisation, economic and health trends and related inequalities — GMT 1, 2, 5 and 6) many developing countries will need to deal with the '**multiple burden' of disease**, comprising communicable diseases, pandemics and life-style diseases (non-communicable diseases) with resulting increases in adult mortality and morbidity. This burden will be felt particularly acutely in rapidly-growing urban areas, especially slums (WHO, 2013a), appearing together with high levels of violence and injuries. Health and economic inequalities can have knock-on effects elsewhere in society.

Non-communicable diseases already threaten the **finances** of developing countries, both directly via high healthcare costs and indirectly via lost productivity. For developed countries, costs related to ageing and health could increase fiscal pressures and affect future social cohesion and wellbeing (OECD, 2014). Communicable diseases, maternal, neonatal and nutritional deficits are persisting and are still posing a significant threat to human health, particularly in developing countries. And a global disease outbreak could lead to significant human and financial losses all around the world.

These developments have implications for **global governance systems and structures**. Threats to health are increasingly created, or amplified, by policies made in non-health sectors and require, a coherent response across sectors, governments and geographic boundaries in order to address the global burden effectively. A combination of actions for sanitation, health care, economic development, climate change adaptation and more, are needed to address problems that impact the poor in the world's megacities. The importance of doing so is explicitly acknowledged in the recent Parma Declaration on Environment and Health. That document recognizes the increasingly critical role of economic arguments in developing sound policies across all sectors.

The environment and human health are linked via a complex set of interactions (highlighted in Section 3.1.3). Addressing air and water pollution as well as chemical risks will have direct benefits for human health. Climate change will create a series of direct and indirect impacts for health.

Attention to health and environment in urban areas will be particularly important, as a growing majority of the world's population live in cities. Cities can put in place more sustainable transport systems, provide access to drinking water and sanitation, and ensure health care for all segments of the population (WHO, 2010b). In addition, a range of studies have shown that access to green areas can bring health benefits for urban residents (EEA and JRC, 2013).

In rural areas, an integrated assessment of the health and interactions between wildlife, domestic animals and human health can address growing risks of disease transmission across species (see Box 3.1): this is the goal of the 'one health' approach (Choffnies et al., 2012).

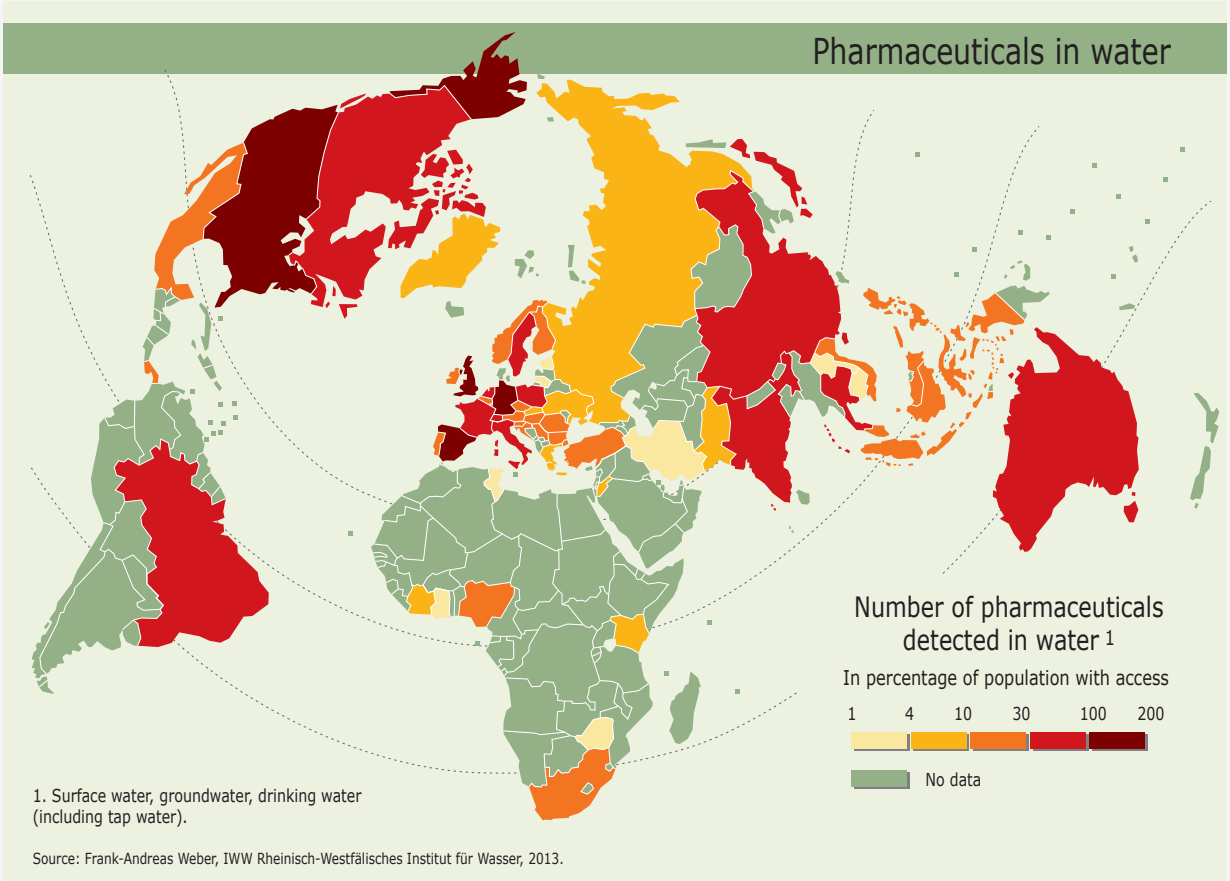
One facet of the link between environment and health is the impact of pharmaceuticals on the environment, in particular via water pollution (Box 3.4), which is receiving growing attention in Europe and elsewhere.

Box 3.4 Pharmaceuticals and the environment

A recent review (Sumpter and Roig, 2012) found that pharmaceuticals have been identified in water bodies in more than 70 countries (Figure 3.14). Information is strongest for developed economies but many pharmaceuticals have also been detected in developing countries.

Most discharges appear to come after human use of pharmaceuticals, often flowing through urban sewer and wastewater treatment systems. Urban wastewater treatment plants usually have only a limited effect, reducing the load of pharmaceutical products by about 20 % before they reach water bodies. While some pharmaceuticals are biodegradable or photodegradable, others are not. Other sources include pharmaceutical production and also use in agriculture and aquaculture. The issue of pharmaceuticals in the environment is being studied by SAICM (the Strategic Approach to International Chemicals Management), a global initiative for the sound management of chemicals.

Figure 3.14 Pharmaceuticals detected in surface water, groundwater and drinking water



These and other interactions call for stronger integration between environmental and health initiatives at all scales, from global to local (EEA and JRC, 2013).

3.2.5 Importance for Europe

European countries have achieved major improvements in public health in recent decades, mostly due to improvements in living and working conditions and progress in medical care. Although most European countries have relatively strong social safety nets and public health care systems, significant health inequalities remain both within and across countries. Worryingly, progress appears to be stalling: health inequalities were as serious in 2013 as they were in 2006 (EC, 2013). Antibiotic resistance, non-communicable diseases, and ambient air pollution levels are of major concern in Europe.

Additionally, health challenges linked to the ageing population and to the impacts of climate change may increase in the coming years (EEA and JRC, 2013) (GMT 1, 2 and 10) (see Box 3.5)

These factors, coupled with the increasing cost of supporting long-term care and the declines in informal care threaten the affordability of technical advances in health and care. It seems likely that many EU countries will not be able to afford the levels of health and care service expected by their citizens unless they can address the underlying causes of poor health, including the influence of globalisation (EFT, 2006).

Box 3.5 European health trends

While communicable diseases impose a relatively low burden in Europe, intensive travel and migration links to all regions of the world increase exposure to possible future pandemics. Moreover, antibiotic resistance is of growing concern in Europe (Figure 3.11). Progress in reducing HIV transmission is positive overall, except among people who inject drugs. Evidence suggests that in several countries in eastern Europe HIV incidence is growing (UNAIDS, 2013).

With its rapidly ageing population, NCDs are of particular concern for Europe. Social and lifestyle factors are also important, including high levels of alcohol and tobacco consumption and growing obesity. As a result, across the WHO European area, including Russia and eastern Europe, five NCDs — diabetes, cardiovascular diseases, cancer, chronic respiratory diseases and mental disorders — cause 86 % of premature deaths and 77 % of the disease burden (WHO Europe, 2014).

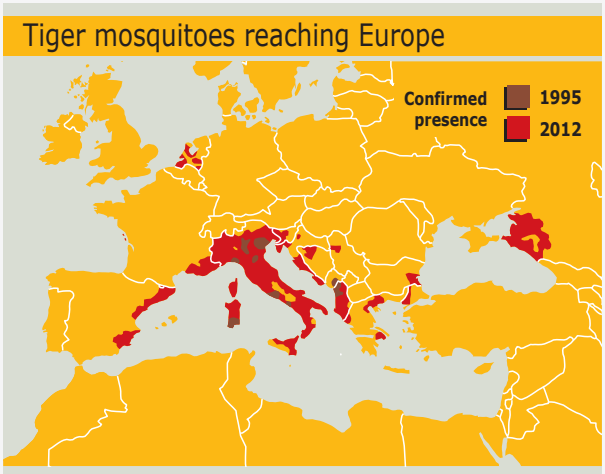
Pollution and other environmental issues remain a concern for health in Europe. While access to safe drinking water and improved sanitation is nearly universal, air pollution levels remain a health concern that particularly affects vulnerable groups such as the ill and ageing, as well as children, for whom it increases sensitivity to respiratory problems such as asthma (EEA and JRC, 2013).

Climate change is a concern for coming decades, as it bring new disease vectors. For example, the geographical distribution of disease-transmitting ticks in Europe has changed since the early 1980s and ticks are now found at higher latitudes and altitudes where the seasons were previously too short or too cold for ticks to survive and establish new populations. Asian tiger mosquitoes, which are capable of spreading dengue fever and other tropical diseases, are now established in southern Europe and parts of the Netherlands and are likely to spread further in Europe with climate change (Figure 3.15).

A recent report by the European Commission (EC, 2013) confirms that significant health inequalities still exist between and within EU Member States, however, some key indicators have improved: for example, infant mortality rates in the EU have decreased by 26 % between 2000 and 2010 and the European population lives longer than in many other parts of the world (EEA and JRC, 2013).

Health inequities also have an environmental dimension, and in 2010, ministers of environment and health of the WHO European Region signed the 'Parma Declaration on Environment and Health', and committed themselves to act on socio-economic and gender inequalities in environment and health as one of the key environment and health challenges (WHO Europe, 2010).

Figure 3.15 Spread of Asian tiger mosquitoes in southern Europe



The Tiger mosquito (*Aedes albopictus*) is an important vector for the transmission of the Yellow fever, Dengue fever and Chikungunya fever.
Source: European Center for Disease Prevention and Control, EARS-Net, 2012.

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