

Section 3

The Human System



Children in Niger.
Image: Arne Hoel World Bank.

Chapter 6
Society





Chapter 6.1

Society | Poverty and urbanisation



Panama City.
Image: Gerardo Pesantez, World Bank.

Summary of poverty and urbanisation indicators

Indicator		Tropics	Central & Southern Africa	Northern Africa & Middle East	South Asia	South East Asia	Caribbean	Central America	South America	Oceania	Rest of the World	World
Poverty	People living in extreme poverty (1981-2008) %*	50-30	53-53	55-29	59-37	63-16	25-28	15-4	21-7	31-28	53-16	52-22
	Undernourished population 1990-2012 (million)	553-508	137-195	34-46	162-139	161-85	9-6	9-9	41-27	1-1	450-360	1002-868
Urbanisation	Urban population 1980-2010 %	31-45	22-35	22-33	24-34	24-47	50-65	57-69	65-81	36-34	44-56	39-51
	Slum population (2001) % of urban population	46	76	73	56	30	25	2	38	15	24	32

Red: Situation is deteriorating
Green: Situation is improving

*% of people living on less than \$1.25 per day

Poverty and urbanisation

Poverty and urbanisation are central to any discussion about wellbeing and development. Poverty relates to and influences all aspects of society. Poverty - insufficient income, food and services - is both the cause and result of poor health, lack of education (especially for women and girls), over-exploitation of natural resources, corruption, conflict and poor governance. Worldwide, there is commitment from all nations to reduce the number of people living in extreme poverty through the Millennium Development Goals.

Although significant progress has been made, poverty remains widespread in sub-Saharan Africa and Southern Asia. Conditions that are conducive for poverty reduction include strong and stable

institutions and governance; sustainable land management and agriculture; social justice and equality; economic growth; and ongoing human development. Additionally, conflict and violence have a powerful and negative influence on poverty reduction.

Ongoing urbanisation and significant declines in poverty rates have been major features of human development in the 21st century, particularly in the Tropics. More people now live in cities than in rural areas and hundreds of millions of people have moved out of extreme poverty. However, in the face of a rising population and changing climate, nations in the Tropics will need to develop innovative ways of providing food and infrastructure (especially clean water and sanitation) to continue this trend into the future.

Headline Indicator

Poverty is pronounced deprivation in wellbeing. Although a limited measure, for the purpose of this report, people living in poverty are those who do not have income or consumption above \$1.25 per day. This is commonly referred to as the extreme poverty line, and reducing the proportion of the population living below this threshold is one of the United Nations' Millennium Development Goals.

Supplementary indicators

Undernourished population; urbanisation; slum population.

Links to other dimensions

Life expectancy, maternal and child mortality, education, gender equality, economic growth, land degradation, agricultural land.

Is it getting better?

The proportion of the population in developing nations of the Tropics living in extreme poverty declined from 51% in 1981 to 28% in 2010. Despite this achievement, more than two-thirds of the world's population that is living in extreme poverty lives in the Tropics. There is considerable regional variation in the prevalence of extreme poverty. Most poverty reduction in the Tropics has occurred in South East Asia and Central America. In contrast, the number of people living in extreme poverty in Central & Southern Africa has more than doubled over the past 30 years although the rate has been stable.

Consistent with the over-representation of poverty, more people experience undernourishment in the Tropics than the Rest of the World. The prevalence of undernourishment declined in the Tropics between 1990 and 2012, down from 27% to 18% of the population, and down from 13% to 9% of the population in the Rest of the World.

In the Tropics the urbanisation rate has increased considerably faster than globally from 30.5% in 1980 to 45% in 2010. Despite this, a greater proportion of people in the Rest of the World (56%) live in cities compared with the Tropics.

In 2001, there were around 925 million people living in slums globally, or 32% of the world's urban population. The proportion of the urban population living in slum conditions was higher in the Tropics at 46% compared with 24% in the Rest of the World. In absolute terms there were almost 470 million slum inhabitants in the Tropics, compared with 460 million in the Rest of the World. The proportions were highest for Central & Southern Africa (76%) and Northern Africa & Middle East (73%).



Favela in Rio. Image: Matt McG.

Extreme and moderate poverty

The concept of poverty is central to any discussion about progress, human development and wellbeing. Conditions which are both a result and cause of poverty include poor health, lack of education, depleted or spoiled environmental resources, corruption, conflict and poor governance. Outside of nations with recent, large scale conflicts, the poorest nations in the world, with the highest poverty rates, are all in the Tropics.

Poverty is pronounced deprivation in wellbeing. The conventional view links wellbeing (and therefore poverty) to money or the command over commodities, so the poor are those who do not have enough income or consumption to put them above some minimum threshold. This one-dimensional view of poverty is, however, being supplanted by a perspective that considers poverty in terms of social dimensions, and the capability of an individual to function in society (Sen 1987). Using this broad approach, poor people often lack key capabilities: they may have inadequate income or education; have poor health; feel powerless; or lack political freedoms.

With this framework, reducing poverty is more complex than just increasing income or consumption, and also requires measures which empower the poor. Most analysis of poverty still relies on income (or consumption) as the underlying measure, as information on these metrics is relatively simple to collect and easy to interpret (see Box 6.1.1). Using income as a base, there are a couple of commonly used poverty benchmarks. Extreme poverty is defined as average daily consumption of \$1.25 or less, which is the mean of the national poverty lines of the poorest 15 nations in the world and, in reality, means living on the edge of subsistence (World Bank 2013).

Another common measure of poverty is average daily consumption of \$2.00 or less, which is the median poverty line of developing nations, and is sometimes referred to as moderate poverty (Baur et al. 2008). The consensus view is that eliminating poverty will require a multifaceted approach which, in addition to increasing income, also empowers the poor by increasing their access to education, employment, health and other social

services (World Bank 2010). It should be noted that the 'poverty line' varies between nations, and particularly between developing and developed nations. In Australia for example one definition of the poverty line is 50% of the median income, meaning that in 2010 the poverty line for a single adult was \$358 per week, and \$750 for a couple with two children (ACOSS 2012).

Trends

Globally, the proportion of people in developing nations that are living in extreme poverty has fallen consistently since the early 1990s (see Figure 6.1.1 and Table 6.1.1). In 1981, 52% of the population living in developing nations was living in extreme poverty, subsequently falling to 21% in 2010¹. In the Tropics the proportion fell from 51% to 28%, while the improvement in the Rest of the World was markedly better, decreasing from 53% to 14% of the population. Globally the number of people living in extreme poverty has also fallen significantly over this period, from 1.85 billion in 1981 to 1.12 billion in 2010.

Nonetheless, rapid population growth in the Tropics and a worsening poverty situation in some nations mean that although the prevalence of extreme poverty has declined, the number of people living in extreme poverty only fell marginally. Slower population growth in the Rest of the World combined with a larger fall in the proportion of people living in extreme poverty resulted in numbers falling from around 1.06 billion to 0.4 billion over the same period.

Globally, the reduction in extreme poverty has been driven by China, where the proportion of the population living in extreme poverty fell from 84% in 1981 to 12% in 2010 and, in numbers, from around 835 million to 155 million. If China is excluded from the analysis of extreme poverty, the prevalence in the Tropics is estimated to fall from 48% in 1981 to 30% in 2010, but the total number increases from 700 million to 760 million people living in extreme poverty. As around 90% of China's population lives outside of the Tropics, its removal from analysis has a greater impact in

the Rest of the World, with the poverty rate in 1981 falling from 53% to 28%, and then declining to 15% in 2010.

Although the number of people living in extreme poverty in the Tropics has only fallen marginally since 1981 (our analysis suggests it is less than five million people), there is considerable variation at the regional level (see Table 6.1.1). South East Asia has had the most dramatic improvement, with numbers falling by almost 65% to 95 million, or almost 175 million fewer people living in extreme poverty. Central America also had a major improvement in percentage terms with a decline of almost 65%, or around 7 million fewer people living in extreme poverty.

South Asia and South America were the only other tropical regions to report a decline in the number of people living in extreme poverty. Although there has been some year-to-year volatility, since 1981 the extreme poverty rate in Central & Southern Africa has increased slightly, and the number of people living in extreme poverty has more than doubled to 360 million in 2010. In fact, all 16 nations considered to be in chronic poverty (or 'desperately deprived') are in tropical sub-Saharan Africa (Handley et al. 2009). However, over the past decade there have been signs of improvement in the percentage of people living in extreme poverty.

Despite the extreme poverty rate falling from 59% to 33% in South Asia, the decline in the number of people living in extreme poverty has been less dramatic, only falling by 30 million to around 255 million. In South Asia, while it is true that economic growth has lifted millions out of extreme poverty, wealth disparities appear to be growing, and the number of people that are extremely poor remains very high.

¹ This is based on data for 124 developing nations. High income nations are not included in the analysis. For further information see <http://iresearch.worldbank.org/PovcalNet/index.htm>.

Box 6.11 PovcalNet

Understanding and monitoring poverty is essential for its eradication, and in recent decades the understanding of national poverty lines, the coverage and quality of household consumption (or income) data, and information on prices have improved greatly (Chen & Ravallion 2010).

Assessing global poverty is complex because its definition varies across nations, and comparisons across nations requires an internationally consistent approach to estimating the purchasing power of a given income and knowledge of prices prevailing at the time of the relevant household survey (World Bank 2013).

The development of the PovcalNet tool by The World Bank has been significant in addressing these issues, and in quantifying the extent of poverty in developing nations. PovcalNet also allows users to define their own poverty line to compare across nations and regions. Despite these improvements there are concerns about the reliability of some of the surveys that inform PovcalNet. Issues relate to the comparability of results over time and across nations, as well as under-reporting and compliance. This means there is still some uncertainty around poverty estimates generated using PovcalNet (Ravallion 2013).



Children in Uganda. Image: World Bank Photo Collection.

Moderate poverty

Between 1981 and 2010 the number of people in the developing world living in extreme poverty fell by around one-third, or almost 600 million, to 1.2 billion. While this is undoubtedly a positive outcome, it has been associated with only a modest decline in the number of people living in moderate poverty, which decreased by around 6%, or 155 million, from 2.47 billion in 1981 to 2.31 billion in 2010.

That is, the transition out of moderate poverty has been markedly slower than the transition out of extreme poverty. This has especially been the case in the Tropics, where the number of people living in moderate poverty increased by almost 300 million (27%) between 1981 and 2010.

Since 1981 the proportion of the population in the Rest of the World living in moderate poverty has more than halved, from 68% to 31% in 2010, and there are 670 million (63%) fewer people

living in moderate poverty (see Table 6.1.2). In the Tropics there was a modest improvement in the proportion, from 72% to 51%, but the number of people living in moderate poverty has increased, and in 2010 almost half of the population of the Tropics was living in moderate poverty.

Moderate poverty generally refers to conditions where basic needs are met, but just barely (Sachs 2005). Currently this poverty line receives little attention by multilateral development agencies, with most focus and attention being on extreme poverty. However with more people moving into this poverty band and fewer moving higher, addressing moderate poverty is becoming an issue that will require greater attention from policy makers.

Moderate and extreme poverty trends are similar in that South East Asia has reported the greatest improvements, while Central & Southern Africa is the worst performing region.

Poverty, growth and equality

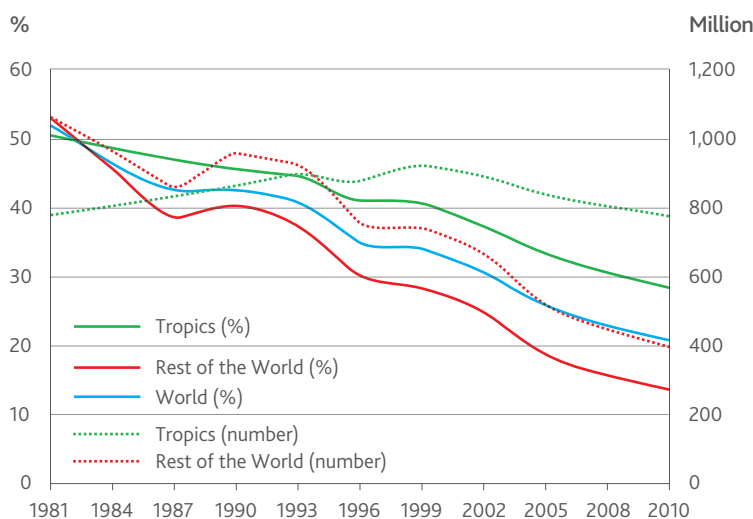
The causes of poverty are manifold, but can be broadly grouped into socio-economic factors such as risk and vulnerability and low capabilities, and political economy factors such as the strength and integrity of political and social institutions and risks of corruption (Handley et al. 2009). Some of these factors are structural while others are cyclical, and may be associated with weather conditions and harvest or changes in prices. Health-status is another key vulnerability which can affect the poverty status of whole families, while low capabilities can limit income-generating opportunities. Where rights are not protected and services such as education and health are not provided, people will have reduced capacity to improve their lives and move out of poverty (Handley et al. 2009).

Notwithstanding this, many regions of the Tropics report quite remarkable achievements in economic growth and poverty reduction since 1981. Not surprisingly, as nations become richer, living standards improve and poverty rates generally fall. Strong growth in GDP per capita since 2000 has been reflected in the extreme poverty rate falling more rapidly than in the 20 years prior to that (see Figure 6.1.2). Similarly, according to World Bank surveys, living standards of the developing world as a whole have been growing at rates much faster than the developed world since 2000 (Ravallion 2013).

Several factors are driving rapid economic growth, including market-oriented reforms, globalisation and technological progress (ADB 2012), which are often complemented by social policy reform and public investment in health, education, social protection and legal empowerment, as well as economic infrastructure (UNDP 2013). It is these actions and innovations, complemented by strong economic growth, which have contributed to the decline of poverty (see Box 6.1.2).

Economic growth alone does not however guarantee fewer people living in poverty, especially where there is significant inequality in income distribution (Fosu 2010). Research

Figure 6.1.1 Population living on less than \$1.25 per day



Source: PovcalNet (2013), State of the Tropics project.

in Latin America suggests that up to 32% of poverty reduction in this region is due to declining inequality (Lustig et al. 2013). Although the concept of inequality is typically considered in terms of income or expenditure, it also relates to non-income dimensions of wellbeing, such as access to education, health, security and other social factors. Rapid economic growth has lifted millions out of poverty in the Tropics, but rising inequality in many nations is constraining the potential improvement.

A factor contributing to rising inequality is that many of the drivers of productivity and income growth – such as technological change, globalisation and market reforms – tend to favour the owners of capital over labour, high skilled over low skilled workers and urban and coastal areas over rural and inland communities (ADB

2012). This contributes to inequalities with respect to income and access to services, and hampers poverty reduction.

According to the Asian Development Bank, between 1990 and 2008, expenditure or income inequality increased in 11 out of 28 nations in Asia representing 82% of the population. In contrast, 14 of the 17 nations in Latin America for which data are available report increased equality since 2000, following a period of high inequality during the 1990s (Lustig et al. 2013). The decline in inequality in Central and South America is attributed to an increase in the supply of educated workers and greater wealth distribution through government transfers. Although in Asia skill levels in the labour force have also increased, this has potentially exacerbated inequality due to the number of jobs for unskilled workers declining (ADB 2012).

In sub-Saharan Africa, where poverty reduction has been the slowest, income inequality has been rising (Fosu 2009). While many factors will contribute to poverty reduction, an improved understanding of the significance of specific factors will help to expedite the process of reducing poverty. For example, in some nations (and notably poorer nations), policies which reduce inequality are likely to have the greatest impact on poverty reduction, while in richer nations sustained economic growth may have a greater impact (Fosu 2009). It is generally accepted though, that investment in infrastructure, health, education and social protection is important if poverty rates and levels are to decline (ADB 2012, Fosu 2010).

Table 6.1.1 People living in extreme poverty

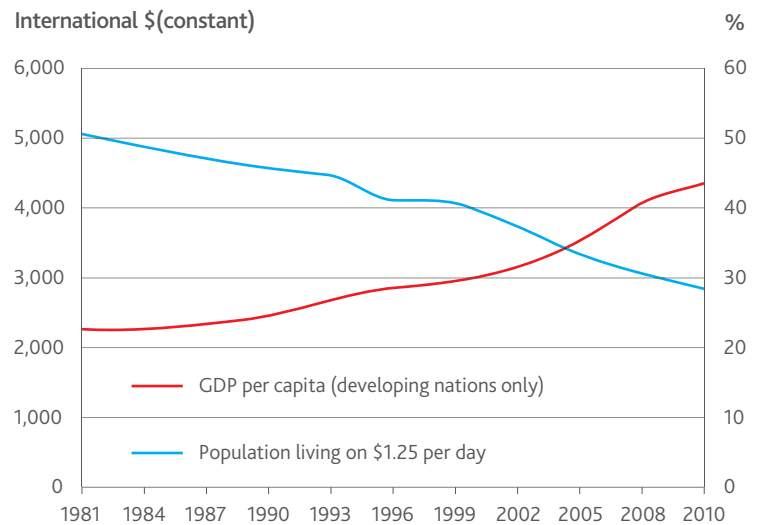
	1981		1990		1999		2010		Change 1981 to 2010		
	Million	% pop.	Million	% pop.	Million	% pop.	Million	% pop.	Million	PPT*	% pop.
Tropics	780	51	864	46	926	41	776	28	-4	-22	-1
Central & Southern Africa	161	53	231	58	310	61	359	54	198	1	123
Northern Africa & Middle East	30	55	40	56	42	46	37	29	7	-26	22
South Asia	284	59	300	51	308	46	253	33	-30	-26	-11
South East Asia	268	63	245	48	212	35	95	14	-173	-49	-64
Caribbean	4	25	4	25	6	27	7	28	3	4	82
Central America	11	14	11	12	11	10	4	3	-7	-11	-63
South America	22	12	31	14	35	14	18	6	-4	-6	-19
Oceania	1	31	2	42	2	34	3	35	1	4	123
Rest of the World	1,065	53	960	41	745	28	397	14	-668	-39	-63
World	1,845	52	1,825	43	1,670	34	1,173	21	-672	-31	-36

Source: PovcalNet (2013), State of the Tropics project.

Looking forward

With around 65% of people who suffer extreme poverty living in the Tropics, there is no doubt that ending poverty is an essential step to improve wellbeing in the Tropics. Although there have been significant reductions in the proportion of the world's population that is living in extreme poverty, the number remains unacceptably high. A major challenge for many tropical nations will be balancing economic growth with environmental sustainability and equality. Improvements to food production and distribution will be essential. Approaches to alleviate poverty must not only consider how the poor can benefit from economic growth, but also how they contribute to it. As more people rise out of extreme poverty, the cost of eradicating poverty will fall.

Figure 6.1.2 Poverty and economic activity, the Tropics



Source: PovcalNet (2013), World Bank (2012), State of the Tropics project.

Box 6.1.2 Using technology to address poverty in India and Bolivia

New technology is assisting people living in poverty in rural and remote regions of the Tropics to join the formal economy and rise above the poverty line. In rural India the introduction of 'smart cards' which store information such as address, income and microfinance history have enabled social programmes to better target those in need, and to reduce opportunities for corruption and fraud. Those living below the poverty line in rural India can use their smart card to access aid, government and social services, microfinance and highly subsidised food. Streamlining access to services has contributed to improvements in India's poorest areas (World Bank 2011, Mohan 2008).

A different kind of smart card has been successful in Bolivia. A microfinance organisation has overcome the problem of operating expensive mobile telecommunications by using multi-lingual smart card ATMs. Smart cards store personal details, account numbers, transaction histories and a fingerprint which allows cash dispensers to operate without the need for a permanent network connection (Prahald & Hammond 2002). Additionally, the machines offer voice commands in Spanish and local dialects, so the services can be used by illiterate and semi-literate people.

These cards use readily accessible technologies which also allow for more efficient and detailed data collection and management. Using this information will allow policy makers and service providers to better target future programs and monitor outcomes.



Female farmers, India. Image: Bill and Melinda Gates Foundation.

Undernourished population

Nutrition is a fundamental factor underlying health and wellbeing (see Box 6.1.3). Despite progress over the past 30 years a significant number of people still do not have access to adequate food and water, which can contribute to the occurrence of preventable diseases like diarrhoea, pneumonia and measles (UNICEF 2012). Women, infants, and children are the most at risk from undernourishment, including from micronutrient deficiencies. Undernutrition is responsible for almost one-half of child deaths globally and has a substantial impact on general wellbeing and economic productivity (Black et al. 2013).

Although there have been important reductions in the proportion of undernourished people in the Tropics, a number of issues continue to cause and exacerbate undernourishment, and have increased global food insecurity in recent

years. The growing population, poor governance and political instability, changes in food production and consumption and the effects of climate change are affecting food prices and the availability of food, and are adding pressure to already food insecure regions (CFS 2012). Producing and distributing enough food to satisfy growing populations will be a major challenge for all nations in the future.

Trends

Globally the undernourished population has declined steadily over the past 20 years, from around 1 billion people in 1990-92 (19% of the global population), to 870 million people in 2010-12 (15%) (see Figure 6.1.3). Over this period the undernourished population in the Tropics fell from 553 million to 508 million, a decline of

8%, while in the Rest of the World it declined by nearly 20% to 360 million (see Table 6.1.3).

Five of the eight tropical regions have reported a decline in the undernourished population since 1990-92, and all regions reported a decline in the proportion of the population that is undernourished. South East Asia had the greatest success in alleviating undernourishment, with the undernourished population almost halving, from 161 million in 1990-92 (28% of the population), to 85 million in 2010-12 (11%).

There were also significant reductions in the number of undernourished people in South Asia (where the number fell by 19 million (12%) to 139 million) and South America (where it declined by 13 million (32%) to 27 million).

Table 6.1.2 People living in moderate poverty

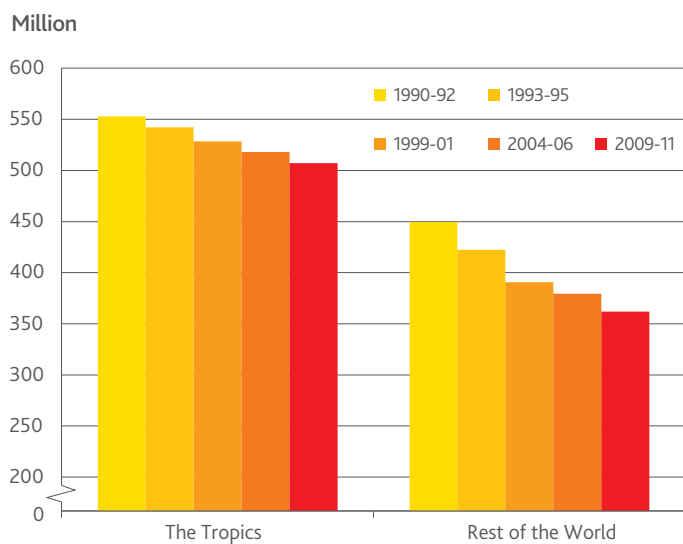
	1981		1990		1999		2010		Change 1981 to 2010		
	Million	% pop.	Million	% pop.	Million	% pop.	Million	% pop.	Million	PPT*	% pop.
Tropics	1,102	71	1,303	69	1,469	65	1,396	51	293	-20	27
Central & Southern Africa	225	74	308	78	406	81	500	75	275	1	122
Northern Africa & Middle East	43	78	55	78	64	70	70	56	28	-23	65
South Asia	415	86	480	82	527	78	529	68	113	-18	27
South East Asia	345	81	374	74	374	62	240	34	-106	-47	-31
Caribbean	6	39	7	41	8	37	9	38	3	-1	56
Central America	22	28	19	20	24	21	11	9	-10	-20	-49
South America	45	25	57	26	62	24	33	11	-12	-14	-26
Oceania	2	52	3	63	3	56	4	56	2	4	111
Rest of the World	1,065	68	960	61	745	51	397	31	-668	-37	-63
World	2,467	69	2,740	65	2,818	58	2,311	41	-155	-29	-6

Source: PovcalNet (2013), State of the Tropics project.

*Percentage point

Although prevalence in Central & Southern Africa has declined marginally since 1990-92, the undernourished population has increased significantly, from 137 million in 1990-92 to 195 million in 2010-12. In 2012 almost half of the nations in Central & Southern Africa had prevalence rates of 30% or more. The undernourished population in Northern Africa & Middle East has also increased, from 34 million in 1990-92 to 46 million 2010-12, despite prevalence falling by almost nine percentage points.

Figure 6.1.3 Undernourished population



Source: FAO (2013a), State of the Tropics project.

Box 6.1.3 Hunger, undernourishment and malnutrition

Hunger, undernourishment and malnutrition are terms used to describe a range of physical health effects caused by diets lacking in food quantity, calories, or nutritional quality. These terms are often used interchangeably to describe the causes and symptoms that result from a lack of food and nutrition, but each has a specific meaning. Hunger is defined on two levels. Firstly, as a physical signal from the body that food intake is required, and secondly as a subjective feeling of discomfort as the result of a lack of food (WFP 2013). Prolonged hunger can lead to 'chronic hunger', undernourishment and malnutrition. Women and children in developing nations are considered the most vulnerable to undernourishment.

Undernourishment occurs when a person's diet does not provide sufficient energy to perform daily tasks. Undernourishment can compromise the immune system and increase the risk of acquiring illnesses, which can diminish the body's ability to absorb food and nutrients (Burgess & Danga 2008). The physical consequences of undernourishment include body and muscle wasting, and atrophy of vital organs. Estimates of the prevalence of undernourishment are essentially a measure of food deprivation based on the calculation of three key parameters for each nation: the average amount of food available for human consumption per person, the level of inequality in access to that food and the minimum number of calories required for an average person.

Malnutrition arises from deficiencies in specific micro-nutrients and is not necessarily related to calorific intake, as it may be the result of a nutritionally poor diet. That is, malnutrition can affect people suffering from undernutrition (prolonged food and nutritional deprivation), or overnutrition (excessive food intake relative to energy requirements). Diseases like anemia, goitre and scurvy are forms of malnutrition caused by diets lacking in iron, iodine and vitamin C respectively (Shetty 2003).



A child recovering from malnutrition in Niger. Image: Jonathan Hyams, Save the Children.

Factors contributing to undernourishment

At a global level there is enough food to feed the world's population, but undernourishment persists (FAO 2002). While the root cause of undernourishment is a lack of food, the reasons for the uneven availability of food can vary. The reality is that hunger and undernourishment are not caused by global scarcity, but by poverty, inequality and unaffordable food prices. Long term solutions need to address this, as well as issues around food storage and distribution. Women and children are particularly vulnerable to undernourishment (see Box 6.1.4).

Roughly one-third of all food produced in the world for human consumption is lost or wasted – around 1.3 billion tonnes per annum (da Silva 2012). Losses and waste occur at all stages of food production,

distribution and consumption – from the farm to the market, and within the home. Food losses occur mainly in developing nations, and are associated with underinvestment in the production, harvest, storage, post-harvest and processing phases as well as in general infrastructure. On the other hand, food waste is more common in wealthier nations. Consumers waste between 95 and 115 kilograms a year per person in Europe and North America, while in sub-Saharan Africa and South and South East Asia, consumers throw away only 6 to 11 kilograms a year (da Silva 2012).

Most often the reason people are undernourished is because they cannot grow enough food for themselves, or do not have enough money to buy it. With over 70% of the world's poor living in rural areas, improving their capacity to produce food will improve wellbeing and help to secure food security (da Silva 2012).

Agricultural productivity

Improvements in agricultural productivity over the past 60 years have played a central role in reducing undernourishment rates. Strong growth in agricultural productivity has also supported the process of economic restructuring and the movement away from agriculture based economies to industrialised, knowledge based economies (OECD 2012). Economic growth has increased household incomes and, combined with increased agricultural productivity, has made food more available and affordable in many societies (FAO 2013b).

Nonetheless, many tropical nations continue to rely on agriculture for employment, subsistence, and to sustain GDP. For example, in sub-Saharan Africa most nations still have agricultural based

Table 6.1.3 Undernourished population

	1990-92		1995-97		2000-02		2005-07		2010-12	
	Million	% pop.	Million	% pop.	Million	% pop.	Million	% pop.	Million	% pop.
Tropics	553	27	527	24	530	22	511	19	508	18
Central & Southern Africa	137	33	154	32	170	31	173	31	195	28
Northern Africa & Middle East	34	38	34	33	36	30	39	28	46	29
South Asia	162	28	153	24	147	22	147	2%	139	18
South East Asia	161	28	129	21	123	18	104	14	85	11
Caribbean	9	29	8	27	7	22	7	20	6	18
Central America	9	9	9	9	8	7	8	6	9	7
South America	41	18	39	16	37	14	32	11	27	9
Oceania	1	15	1	14	1	12	1	11	1	10
Rest of the World	450	13	402	11	389	10	372	10	360	9
World	1,002	19	930	16	919	15	883	13	868	13

Source: FAO (2013a), State of the Tropics project.

economies, with agriculture employing on average 65% of the labour force and generating nearly one-third of GDP (World Bank 2008). Most farms in sub-Saharan Africa are relatively small in scale and, with limited access to capital, technology and markets, farmers have had limited capacity or incentive to boost productivity (Jaffee et al. 2011).

At the other end of the spectrum, agricultural productivity has increased rapidly in South America, especially in the past 30 years. Brazil is a prime example of the impact of productivity improvements, and is the first tropical 'food giant', going from a food importer 30 years ago to the world's largest exporter of beef, poultry, sugar cane and ethanol (The Economist 2010). South Asia and South East Asia have also reported strong growth in agricultural productivity, which has supported the transition from agrarian to industrial and more modern economies for many nations in these regions (Turrall et al. 2011). In South East Asia however, recent years have seen stagnation in yield growth, particularly in China and Indonesia (Ray et al. 2012)

Perhaps the single most important factor separating nations that have sustained long-term agricultural productivity growth from those that have not is national agricultural research and development capacity, with nations that are able to produce a steady stream of new technologies suitable for local conditions performing better. Local research and development capacity also creates an environment that is more conducive to capturing 'technology spillovers' from research and development undertaken in other nations and regions (Fuglie & Wang 2012). Although there are conflicting assessments regarding the status of global agriculture (The Economist 2011), the reality is that population increases will require additional food production. Competing demands in the agriculture industry between food and non-food products are growing. Yields will need to be increased and waste losses decreased to balance the environmental, social and economic objectives associated with sustainability.

Food security

The world's population is expected to increase by 30% by 2050, with food demand expected to increase by 70%, and double in developing nations (Turrall et al. 2011). Improving food security will be a critical development goal for many of these nations. Importantly, this will need to occur in an environment where the use and consumption of food is changing, where competition from non-food uses of agricultural production is increasing, climate change is influencing rainfall and temperature patterns, and where sustainable use of land and water resources will have greater prominence in decision making (The Royal Society 2009).

Part of the food security story relates to energy prices and affordability. Currently around 30% of global energy demand is used for the production and distribution of food, of which around 70% is associated with farming (FAO 2011). Increased demand for energy and rising oil prices are expected to raise the cost of agricultural production and contribute to higher food prices. Rising energy costs combined with policies which encourage use of less CO₂-intensive biofuels are seeing more farming area being used to produce these fuels. In 2007-08 biofuels were a significant factor contributing to higher food prices, which increased by up to 75% in some cases (The Guardian 2008). Between 2006 and 2030 biofuel use is expected to increase at an average rate of 6.8% per annum (IEA 2008).

Rising incomes, urbanisation and lifestyle are driving changes in the demand for foods, with a greater emphasis on meat, dairy products and fats. As a consequence, demand for grains and cereals to feed livestock has also increased, with up to two-thirds of cereal production in the developed world being used as animal feed (Erb et al. 2012). This has, and will continue to, put pressure on food prices and availability. Urbanisation also has the potential to affect food availability as the urban footprint expands into arable land, and as farmers move away from agriculture to pursue other opportunities.

A potentially profound impact on food security may come from climate change, and particularly its impact on water availability (Ludi 2009). In some parts of the world it is suggested that climate change could reduce yields by one-third (The Economist 2011). Although impacts will vary by location and geography, temperatures could rise by 0.3 - 4.8° Celsius by 2100, and rainfall patterns will be less predictable (IPCC 2013), with major impacts on agricultural output. Adaptation to climate change will be an important objective for water and agriculture policies.

Demand for water intensive foods such as meat, milk, fruit and vegetables is increasing, and water-use efficiency will need to improve if food demand and environmental objectives are to be met. Around 40% of the world's food is currently produced using irrigation, and as the available water per person decreases, food will need to be produced by using less water, or by applying more sustainable irrigation techniques (Turrall et al. 2011). Other long term strategies could include increased trade, through market liberalisation and integration, managing price volatility of key commodities, increasing urban agriculture to supplement rural food production, and agricultural innovation.

Looking forward

Globally, undernourishment is a critical human development issue. Long-term strategies to reduce undernourishment and improve food security will require working with a number of significant and, in some cases, unpredictable factors. These include changing patterns of human food consumption, adapting to the impacts of climate change (including extreme weather events), and sustainably maximising land and water resources to maintain and increase agricultural productivity (The Royal Society 2009).

Unless issues around food loss and waste are addressed, great productivity improvements will need to be made to meet the requirements of an increasingly large and affluent population. Additionally, ecological impacts of these improvements will need to be managed and minimised.

Also, unless current inequalities in access to food are resolved, undernutrition will continue to be a barrier to increased wellbeing and development, notably in the Tropics.

Box 6.1.4 Women and children

Women of maternal age and children are more susceptible than other groups to the health impacts of undernourishment and micro-nutrient deficiencies. Undernutrition was linked to 45% of child deaths in 2011 (Black et al. 2013), and 11% of the total disease burden world-wide is due to maternal and childhood undernourishment (Black et al. 2008). For women the risks of undernourishment are especially acute during pregnancy and lactation when they require up to three times more nutrition to support fetal growth, metabolic changes, tissue growth and lactation (Labuschagne et al. 2012, Picciano 2003). Undernourishment at these times can also increase the chance of anemia and depression. During pregnancy undernourishment risks are not confined to the mother, and can also have major impacts on the fetus, increasing the risk of fetal death or defects and low birth weight (CORE Group 2004).

Beyond birth, the nutrition of infants and children is also critical, and undernourishment can increase the risks

of neonatal disorders, and impact long-term cognitive development. Unfortunately, the extent of many of these problems is linked to the mother's nutritional status during pregnancy. Undernourishment in infants and children also increases their vulnerability to infectious diseases, including diarrhoea, measles and pneumonia (UNICEF 2012), and is linked to increased risk of becoming overweight and developing non-communicable diseases in later life (Black et al. 2013).

This suggests that some of the foundations that underpin human development potential are affected by early life nutritional status. Reflecting this, there is now a greater focus on improving nutrition during the first 1,000 days of life from conception to a child's second birthday, as it is during this period that good nutrition and healthy growth have lasting benefits throughout life (Horton & Lo 2013).



Child with symptoms of edema, a consequence of undernutrition. Image: Oxfam International.

Urban populations in the Tropics

For most of human history people have lived in rural environments. However, a transition to urban living has been underway since industrialisation commenced, and the world's urban population exceeded the rural population for the first time in 2007.

Large-scale urbanisation initially occurred as technology improvements in the agricultural sector reduced demand for labour, which was absorbed by emerging industrial activities. The process of industrialisation also encouraged urbanisation, as factories needed large, locally based labour pools. The prospect of diverse and rewarding employment and business opportunities in cities are still key factors which, coupled with greater access to services such as education and health care and social and cultural activities, encourage ongoing migration from rural to urban areas. In many regions of the world cities also offer an escape from unsustainable rural livelihoods affected by conflict, natural disasters and environmental and social change (UN-ESCAP 2011).

The process of urbanisation has supported economic development in many regions of the world, and one estimate suggests that 80% of the world's gross domestic product is generated by urban areas (UN 2011a). Nations that are more highly urbanised also tend to have higher life expectancy and literacy rates. This may relate to economy of scale advantages in the provision of infrastructure and services in urban areas and, with this, the possibility of better access to social infrastructure and improved living conditions. For example, in 2010 it is estimated that 79% of the world's urban population had access to improved sanitation facilities, compared with 47% for the rural population (WHO/ UNICEF 2012). Cities are also known as centres of culture and heritage, as well as social and political innovation.

The development and growth of cities has also had adverse environmental, social and health impacts, which tend to be exacerbated where growth is not adequately planned. For example, cities are responsible for natural habitat and biodiversity loss and the majority of global carbon

emissions, while health risks in urban slums from sub-standard housing, water and sanitation facilities are significant, and air pollution can be a major health issue.

Trends

Reported urbanisation rates – the proportion of the population living in urban areas – are influenced by the definition of 'urban'. The definition can vary significantly across nations, though it is usually based on factors such as population size or density, administrative boundaries or economic organisation. All nations regard settlements of 20,000 or more as urban (consistent with the United Nations' interpretation), though many nations classify settlements ranging in size from 500 to 20,000 as urban. As such, caution should be exercised when comparing urbanisation rates across nations. The impact of these definitional variations is less significant when analysing trends at regional and global scales.

The world's urban population has grown rapidly over the past 30 years, with the urbanisation rate increasing from 39.4% in 1980 to 51.6% in 2010. Over the same period the urban population doubled from 1.8 billion to 3.6 billion, a growth rate of 2.4% per annum (see Figure 6.1.4).

In the Tropics the urbanisation rate has increased considerably faster than globally, up from 30.5% in 1980 to 45% in 2010, with the urban population increasing from 0.5 billion to 1.3 billion (or 3.3% per annum). In the Rest of the World the urbanisation rate increased from 44.3% to 56.2%, and the urban population from 1.3 billion to 2.3 billion, a growth rate of 2% per annum (see Figure 6.1.4). Though growth in the urbanisation rate has been significantly faster in the Tropics, in 2010 it is still 11.2 percentage points lower than in the Rest of the World. The higher urbanisation rate in the Rest of the World's reflects the larger proportion of its population in developed nations, which experienced major rural-to-urban transitions during earlier phases of industrialisation (UN-HABITAT 2010). With the exception of Oceania, all regions of the Tropics report increasing

urbanisation rates since 1980, with the most notable increases in South East Asia (24.1% to 47.2%), South America (65% to 81.4%), and the Caribbean (50.5% to 65.7%). Nonetheless, across the Tropics urbanisation rates vary significantly, and in 2010 ranged from 33.8% in Northern Africa & Middle East to 81.4% in South America (see Table 6.1.4).

South East Asia accounted for almost one-third of growth in the urban population in the Tropics since 1980, with the number of urban dwellers increasing from 110 million to 360 million in 2010. Tropical China has been a major contributor to this growth, with its urban population increasing from around 14 million to 90 million (its urbanisation rate increased from 15.1% to 56.5%). Rural-to-urban migration accounted for around 75% of the growth in China's urban population, and is linked to economic reforms since the late 1970s, including the relaxation of restrictions on worker mobility.

Since 1980 South America has maintained its position as the most urbanised region in the Tropics, followed by Central America and the Caribbean (see Table 6.1.4). In the Tropics these are the only regions to consistently report urbanisation rates above those of the Rest of the World. Factors contributing to these relatively high rates of urbanisation have included the consolidation of land holdings away from small peasant plots, government policies favouring industrialisation and import substitution, and the influence of landowners in setting agricultural policy. Poor working conditions and low wages in rural areas combined with manufacturing-related employment opportunities in urban areas have also encouraged the transition to cities (Kay 1998).

In contrast, all other regions of the Tropics remain mostly rural and, with the exception of South East Asia, each has an urbanisation rate of around 35%. In South East Asia the proportion of the population living in urban areas is almost 50%, having increased from 24% in 1980. Despite relatively low urbanisation rates, these five regions accounted for around 75% of growth in the urban population in the Tropics in the 30 years to 2010, with the

majority of this growth in South East Asia (249 million), Central & Southern Africa (175 million) and South Asia (154 million).

Low rates of urbanisation in these regions is consistent with many nations having an ongoing dependence on subsistence agriculture and being at a relatively early stage of industrial development – two factors which impact rural to-urban migration. Some governments are concerned about the capacity of infrastructure to cope with this influx. Some 77% of African nations claimed in 2009 to have implemented policies to reduce migration into urban agglomerations, up from 54% in 1996 (UN DESA 2010).

Oceania is the only region of the Tropics to report a decline in the urbanisation rate, down from 36.3% in 1980 to 34.3% in 2010. This result is skewed by Papua New Guinea which accounts for over half of Oceania's population, and which reported a decline in its urbanisation rate from 13% in 1980 to 12.4% in 2010. If Papua New Guinea is removed from the analysis the proportion of the Oceania population that is urbanised increases to 57.1% in 1980 and 62.1% in 2010 – well above rates in the Rest of the World. Low urbanisation rates in Papua New Guinea reflect cultural diversity and attitudes, and an agriculture-based economy with low rates of industrialisation (Jones 2012).

Urban growth

Changes in the spatial distribution of a nation's population are primarily due to economic growth and technological advances, with economic and social economies of scale generated in urban areas creating a dynamic range of opportunities. Urban areas also support high-productivity and high-growth activities in ways that rural areas cannot (Spence et al. 2009). In the industrial age no nation has sustained high rates of economic growth driven primarily by agriculture (Annez & Buckley 2009). This relationship appears to hold in both developed and developing nations. Research also indicates that no nation has reached middle income status without a significant population shift to cities, and nearly all nations

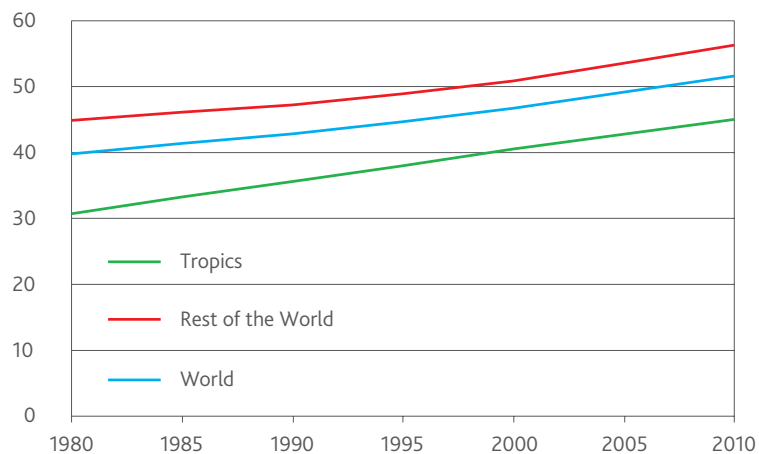
to have achieved middle income status have had urbanisation rates of at least 50% (Spence et al. 2009). There are some exceptions, though these are typically small, resource-rich nations. In addition to higher per capita incomes, in both more and less developed regions, nations with higher urbanisation rates tend to have more stable economies and stronger political institutions (UN DESA 2010).

Urbanisation can be a significant contributor to economic growth, but it is not sufficient in itself. Urbanisation without economic growth is uncommon though, and is largely restricted to some small African nations which have low levels of urbanisation or are failed states. In some African nations agricultural stress associated with poor soils or rainfall can also be 'push' factors for urbanisation, and this may be an influence in nations that are experiencing both slow economic growth and rapid urbanisation (Barrios 2009). Urbanisation's initial contribution to economic growth is thought to arise from the difference in

productivity levels between rural and urban areas. This encourages employment shifts from lower value agricultural labour to higher value skilled jobs in manufacturing, services and finance. As cities expand they generate further efficiency gains in production and consumption, which attracts investors, creates new opportunities for entrepreneurs and contributes to further productivity gains and economic growth. São Paulo in Brazil and Bangkok in Thailand each hosts around 10% of the national population but account for more than 40% of national economic output (UN DESA 2011). It is estimated that a five percentage point increase in a nation's urbanisation rate is associated with a 10% increase in GDP per capita (Credit Suisse 2012). This suggests that, if well managed, higher rates of urbanisation can improve societal wellbeing and provide the means to promote sustainable development and reduce poverty – in both urban and rural communities.

Figure 6.1.4 Urban population

% Total population



Source: World Bank (2012), State of the Tropics project

Box 6.1.5 Urbanisation in Colombia

Colombia's urbanisation has its roots in the modernisation of the agriculture sector, and also civil unrest which saw people move to the relative safety of cities, with large migrations to urban centres in the 1950s and 1960s.

Rapid urbanisation outstripped the government's capacity to provide infrastructure and services and, in the absence of affordable housing, most low-income immigrants to cities acquired housing through land invasion or acquisition of illegal land partitions and self-settlement in the urban periphery. Despite the illegal tenure and violations of building and other regulations, local governments could not intervene because they would be violating private land property rights or their own rules (Betancur 2007). By 1990 around one-third of Colombia's urban population (seven million people) was living in informal settlements.

In the mid-1980s the national government developed policies to eliminate absolute poverty. The government introduced laws that made it mandatory for local governments to integrate informal settlements into formal city planning and to initiate development plans to improve quality of life, environmental conditions and community participation in urban life. Colombia's 1991 Constitution essentially recognised housing as a human right (Everett 1999) and provided the basis for further

legislation to develop urban plans and programs to address the slums issue.

In Medellin the Integrated Slum Upgrading Program of Medellin (PRIMED) and Integral Urban Project (IUP) were implemented in the early 1990s as part of the reforms. These projects have focused on the granting of land title to informal settlers and improving the provision of infrastructure and other government services. PRIMED has benefited around 110,000 (Betancur 2007) people, and IUP around 170,000 (Arcila 2008).

In Bogota the Programme of 'Demarginalisation' benefited 620,000 of the city's poorest residents by improving living conditions and infrastructure in illegal settlements. MetroVivienda has been established as a land banking agency to ensure the supply of urban land on the city's periphery for Integrated Affordable Housing (IAH) projects (Rueda-Garcia 2003). Since 1990 Colombia's urban population has increased by more than 50%, to be 35 million in 2010. Nonetheless, reforms have contributed to the slum population decreasing by 2 million, or 15% of the urban population. The government has also committed to reducing the proportion of the urban population living in slums to 4% by 2020 (UN-HABITAT 2008).

In reality, rapid urbanisation also places an enormous strain on governments and planning resources. As urban populations increase so too does demand for land, housing, infrastructure and services. Rapid urbanisation can precede the planning and resources necessary to ensure orderly urban development. This can lead to inadequate provisioning of social and economic infrastructure (e.g. water, sanitation and roads) and sharp increases in land prices as demand outstrips supply, with housing often beyond the reach of the poor (Spence et al. 2009). Additionally, land is often acquired for development without due compensation (Ghatak & Mookherjee 2013).

One of the most visible consequences of rapid and unplanned urbanisation is slums, which emerge when low income segments of the population are unable to afford conventional housing. Slums are characterised by poor quality housing, overcrowding, unsafe drinking water, a lack of basic sanitation and limited access to education and health services. These factors have health consequences, particularly for children (IHC 2009). Slums also make the maintenance of law and order difficult which, when coupled with unemployment and poverty, provide a fertile environment for social unrest, violence and crime (UN 2011b). It is estimated that in 2007 around 1 billion urban dwellers (almost 30% of the urban population) were living in slums (Satterthwaite 2007).

Slums are largely an issue in developing nations, with 33% of the urban population (830 million) in developing regions estimated to be living in slum conditions in 2010, with the rate as high as 62% (200 million) in sub Saharan Africa (UN-HABITAT 2010). Globally this is an improvement in the proportion (down from 46%), but the number of slum dwellers has increased by 170 million since 1990, and is expected to increase by more than 60 million by 2020 (UN-HABITAT 2010). Urbanisation rates in Central & Southern Africa, South Asia and South East Asia will increase rapidly in the period to 2050 (these three regions represent almost half of the United Nations' projected 2.7 billion increase in the urban population globally). Thus, adequate planning and resourcing will be required to curb the expansion of slum populations (see Box 6.1.5).



Bogota, Columbia. Wolfgang Steneck.

Environmental issues

Urbanisation contributes to economic development, but without adequate planning it can also have adverse impacts on the natural environment and the health of people living in and around cities (commonly referred to as environmental health). These issues exist in both developed and developing nations, but tend to be more pronounced in developing nations which are urbanising rapidly, where there are limited resources to manage the planning and investment needed for sustainable urban growth.

For the natural environment the process of urbanisation results in changes in land cover and land use, hydrological systems, biogeochemistry, climate and biodiversity and, worldwide, is a

primary driver of habitat loss and species extinction (Seto et al. 2011). In addition to the impacts of land use change necessary to build cities, the resources needed to support the demands of the urban population also drive other types of environmental change (Grimm et al. 2008). These impacts can be felt locally, regionally or globally for factors such as for urban waste discharge (which can affect global biogeochemical cycles) and climate (see Figure 6.1.5).

To put this in context, rapid growth in the urban population has occurred on less than 3% of the global land surface – but the impacts have truly been global. Cities are estimated to account for 78% of global carbon emissions, 60% of residential water use, and 76% of wood used for industrial purposes (Brown 2001). Cities, and especially those

in the developing nations, can expose people to a range of environmental health risks related to a lack of safe drinking water, poor sanitation and waste management and air pollution (UN-HABITAT 2008). For urban dwellers the risk of being exposed to many of these environmental health issues is influenced by household wealth (WHO/UNICEF 2012) with risks greatest for people living in slums.

Inadequate planning, investment and limited use of public transport combined with a reliance on fossil fuels are the main factors contributing to high rates of urban air pollution and greenhouse gas emissions. Recent trends indicate that high growth developing nations such as China and India are suffering outdoor air pollution levels significantly higher than the global average (See Chapter 2). It is estimated that 1 billion people in

Table 6.1.4 Urbanised population

	1981		1990		1999		2010		1980 to 2010		
	Million	% pop.	Million	% pop.	Million	% pop.	Million	% pop.	PPT* change	Million	Av. An. Growth (pop)
Tropics	485	31	708	36	980	41	1,285	45	14.5	800	3.3
Central & Southern Africa	67	22	107	26	163	31	242	35	13.3	175	4.4
Northern Africa & Middle East	15	23	25	29	36	31	52	34	11.3	37	4.2
South Asia	116	25	161	28	208	31	270	35	10.1	154	2.8
South East Asia	110	24	177	32	269	40	359	47	23.1	249	4.0
Caribbean	14	51	18	55	22	60	26	66	15.1	12	2.0
Central America	45	58	59	62	75	66	90	69	11.2	45	2.4
South America	114	6	158	72	203	78	242	81	16.4	127	2.5
Oceania	2	3	3	37	4	35	4	35	-1.8	2	1.8
Rest of the World	1,267	44	1,571	47	1,876	51	2,271	56	12.0	1,004	2.0
World	1,752	39	2,279	43	2,856	47	3,556	51	12.2	1,804	2.4

Source: World Bank (2012), State of the Tropics project
*Percentage Point

Asia are exposed to outdoor air pollutants that exceed World Health Organisation guidelines, causing half a million premature deaths annually (UN-HABITAT 2008).

One strategy to decrease emissions is to improve transport infrastructure and public transport systems. It is encouraging that many developing nations recognise the social and economic costs of urban air pollution and are looking to reduce emissions through legislative and policy frameworks (see Box 6.1.6).

A lack of planning for rapid urban growth can also affect access to safe drinking water and sanitation facilities, leading to significant health risks from infectious diarrhoea and diseases such as cholera. Notwithstanding that the majority of people without access to safe drinking water and sanitation live in rural areas, of the urban population, the majority of people without access to these human rights² live in the Tropics, and primarily in Africa (see Figure 6.1.6 & Figure 6.1.7).

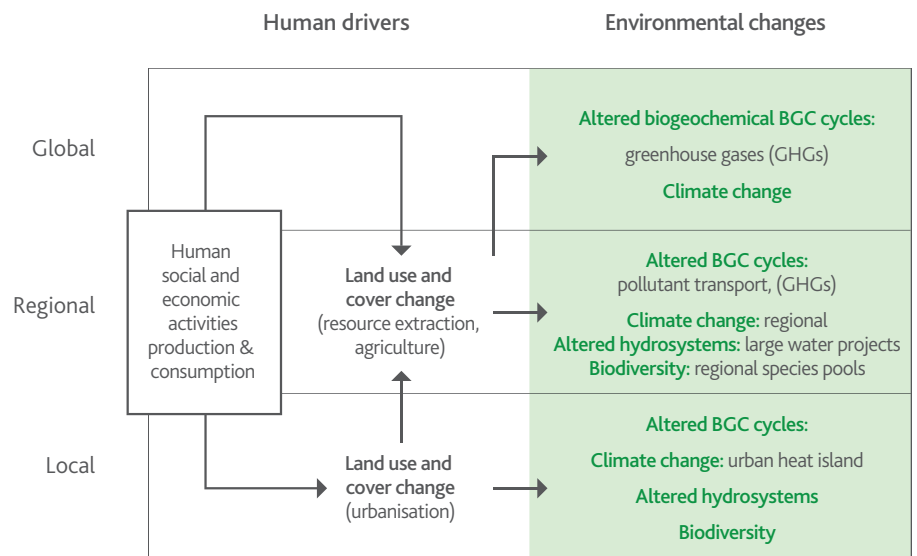
As most of the negative impacts of urban growth – such as air, water and noise pollution, congestion, risk of disease etc – are unpriced, without intervention to manage growth, cities tend to develop beyond optimal levels.

Looking forward

In the 40 years to between 2010 and 2050 global urban population is estimated to increase from 3.6 billion to 6.3 billion. Almost 95% of this growth will be in the developing world, and around 1.6 billion of the increase (or 60%) in developing nations in the Tropics. Additionally, urban land expansion is growing faster in low elevation coastal zones than in other areas, and without adequate planning, this is likely to put millions of people at risk from climate change impacts such as storm surge and rising sea levels (Seto et al. 2011).

A fundamental issue to sustainable urbanisation will be planning. To date attention has focused on the immediate problems arising from rapid urbanisation such as how to accommodate the

Figure 6.1.5 Framework of environmental impacts of urbanisation



Source: Adapted from Grimm et al (2008).

poor and generate employment (Obaid 2007). The scale of the projected increase suggests more comprehensive approaches are needed to deal with the long term and globally significant consequences of urban growth (Grant 2010). In addition to planning authorities, this will require input from other disciplines, including agencies responsible for environmental, transport, energy and economic and social development policy.

The manner in which the world's urban centres are managed in the coming decades will influence patterns of economic growth, settlement and the social and political stability of many developing nations. How cities grow will also influence the extent of environmental impacts and health outcomes for urban residents. For example, future patterns of greenhouse gas emissions and consequent climate change will be driven substantially by activities in urban areas; similarly, the ways in which climate change impacts the lives and livelihoods of more than half the world's

population will be mediated through actions that are taken – or not taken – in towns and cities (Dodman 2009).

² In 2010 the UN General Assembly recognised that safe, clean drinking water and sanitation are human rights derived from the right to an adequate standard of living. Fundamental to the human rights framework is the concept of progressive realisation: Governments cannot solve the drinking water and sanitation situation overnight, but they must make tangible progress towards the realisation of this right.

Figure 6.1.6 Sanitation coverage in urban areas, 2010

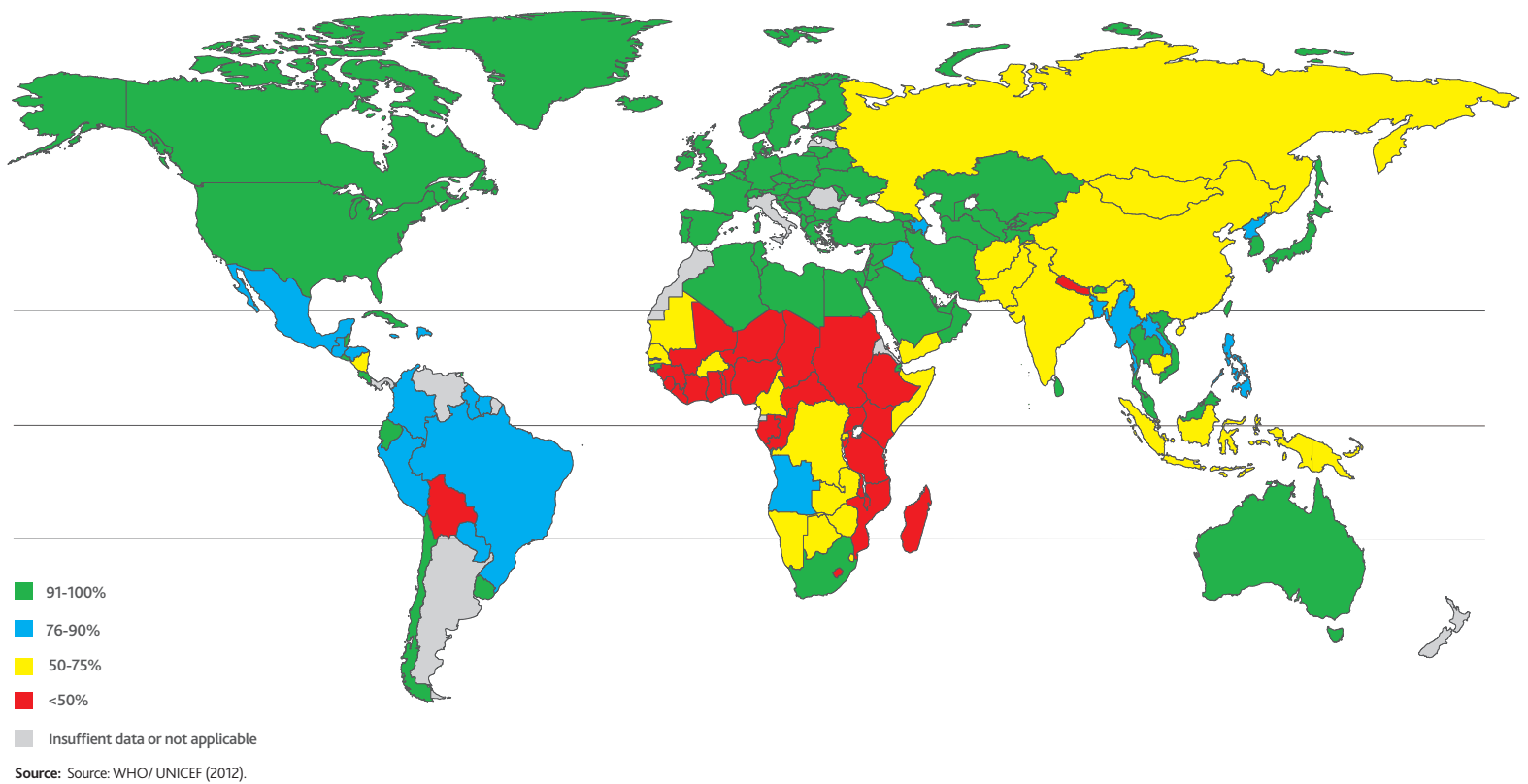
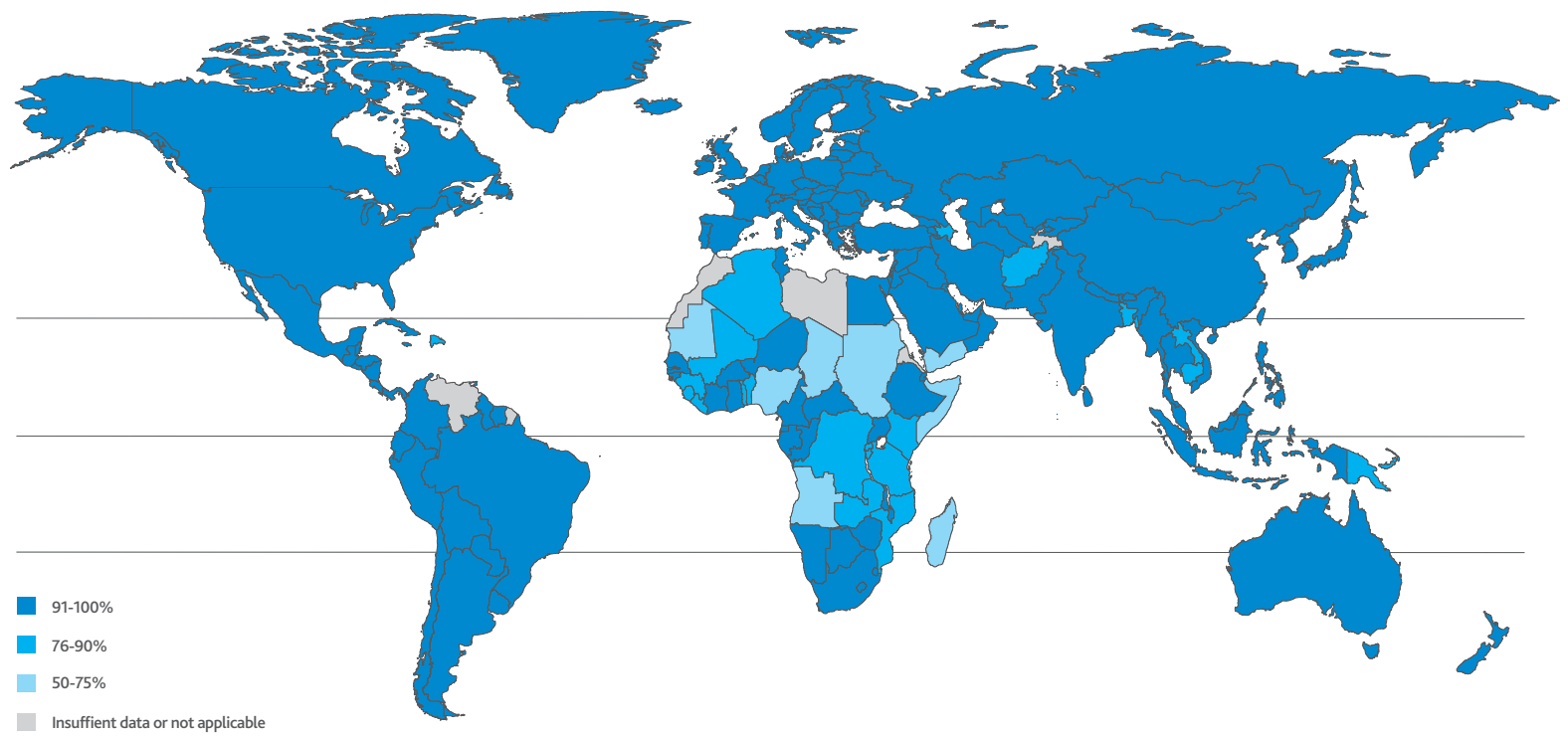


Figure 6.17 Drinking water coverage in urban areas, 2010



Source: WHO/ UNICEF (2012).

Box 6.1.6 Improving air quality in Bangkok

Since the 1960s Bangkok has undergone rapid urbanisation. Its population is estimated at around 8.2 million people, though seasonal inflows can see this almost double with the internal migration of non-residents during the dry season. Rapid growth with little urban planning or regulation has resulted in inadequate transport infrastructure and an over reliance on private transport. Motor vehicle numbers increased from 600,000 in 1980 to 7.4 million in 2012 – almost 8% per annum – and Bangkok has a high number of vehicles per capita compared with many other large Asian cities. Transport is the greatest source of air pollutants in Bangkok, and creates some of the most severe traffic congestion in the world.

Beginning in the early 1990s a number of initiatives were introduced to mitigate Bangkok's air pollution, including progressive introduction of cleaner fuels and stricter emissions standards, roadside vehicle inspections, upgrading public transport and improving air quality monitoring and traffic management. The taxation system was also used to encourage behavioural change. The Pollution Control Department was established in 1992 to monitor and reduce pollution.

Early attempts to reduce traffic congestion by developing road and expressway infrastructure were ineffective as car numbers increased

rapidly. Subsequent initiatives have included investment in public transport infrastructure including the above ground Skytrain and the MRT subway. Skytrain passenger numbers have increased from around 200,000 passengers per day when it commenced operations in 1999 to 600,000 per day in 2012. The MRT commenced operations in 2004 and currently serves around 240,000 passengers per day. Each 1,000 passengers per journey on public transport is estimated to take around 800 vehicles off Bangkok's roads. These mass transport systems have helped contain fuel emissions, but their impact has been constrained by limited route coverage, although there are ongoing extensions.

Even as the number of motor vehicles on Bangkok's roads continues to increase, the impact of anti-air pollution initiatives has seen average levels of pollution fall. For example, levels of PM_{10} – a dangerous type of air pollution which consists of small dust particles that can embed themselves in the lungs – fell between 1997 and 2010, from 81 to 38 micrograms/ m^3 (53%) in general areas, and from 90 to 55 (39%) for roadside areas (PCD 2010, PCD 2012). These impressive improvements now see Bangkok in line with the national standard of 50 micrograms/ m^3 , but exceeding the World Health Organisation's air quality guideline of 20 micrograms/ m^3 .



Bangkok traffic jam. Image: Dreaming Yakker.

Slum population

Slums have been a dimension of the urban landscape since the 19th century, and the basic features of slum life have changed little over time. The difference today is one of scale, and the extent of the 'concentrated disadvantage' (Vlahov et al. 2007). Slum dwellers of the new millennium are no longer limited to a few thousand residents confined to a few cities undergoing rapid industrialisation. Even though the proportion of slum dwellers has reduced, today's slums are unprecedented in their magnitude. In recent decades growth in the slum population has been most notable in developing nations where 863 million people were living in slum conditions in 2012, up from 650 million in 1990 (UN 2012). The significant increase in urban populations during this period has been a major contributor to the increase in the slum population, which has been exacerbated by a lack of planning and rapid increases in inequality in many developing nations.

Slums are characterised by inadequate access to safe water, sanitation and other infrastructure, poor structural quality of housing, insecure residential status and overcrowding (UN-HABITAT 2006). Dwellings in these settlements are diverse and can vary from traditional inner city houses which have been left in a state of decline, subdivided and rented out to lower income groups as original owners relocate to better areas, to poorly built and maintained housing projects and the self-constructed squatter settlements and illegal subdivisions which evolve at the periphery of cities.

In contrast to the beneficial consequences normally associated with urban social organisation, urban slum dwellers live in conditions akin to poverty in the majority of cases. In fact large sections of the urban population in developing nations suffer from extreme levels of deprivation that are often more debilitating than those experienced by the rural poor. Lacking a legal address they are often unable to access most of the formal institutions of society, with the result that they exhibit poorer health outcomes, lower life expectancies, lower levels of education and diminished employment, social and economic opportunities relative to non-slum urban populations (Jorgenson & Rice 2012). Slum conditions are made worse by economic decline, inequality, loss of formal-sector jobs, rapid immigration, poor governance

and exclusionary actions (UN-HABITAT 2003). Although urbanisation generally has positive effects on wellbeing and economic growth, rapid, unplanned growth which results in slum expansion can be a negative side effect.

Trends

Slums encompass a broad range of living situations and populations with correspondingly disparate origins and identities, making them very difficult to survey. As a result, very little data about slum populations has been collected to date, with a lack of an agreed definition a major impediment (see Box 6.1.6). Consequently, slum populations are yet to be incorporated in mainstream monitoring instruments such as national population censuses, demographic and health surveys and global surveys.

Most slum population data sets have their origins with UN-HABITAT, the agency tasked to measure and monitor MDG slum targets. These data sets are characterised by a short time series with many missing data points and nations. The data sets also focus on the slum populations of developing nations (where the majority of the urban poor reside), and exclude slum numbers from developed regions. These issues make trend analysis difficult.

The UN-HABITAT's Global Urban Observatory in collaboration with the African Population and Health Research Centre produced a comprehensive global data set of slum populations in 2001 which included numbers for both developed and developing nations. This data set has been used in our analysis because it offers broader national coverage than in more recently published data sets.

In 2001, there were reportedly 924 million people residing in slums globally, or 32% of the world's urban population at the time (see Figure 6.1.8). The proportion of urban population living in slum conditions was higher in the Tropics at 46% compared with 24% in the Rest of the World. In absolute terms there were 467 million slum inhabitants in the Tropics, compared with 457 million in the Rest of the World.

In the Tropics there was considerable variation in regional slum populations. In Central & Southern Africa 76% of the urban population resided in slums in 2001, followed by Northern Africa & Middle East at 73%, and South Asia at 56%. Oceania reported the lowest rate at 15%, making it the only tropical region with slum population rates lower than the Rest of the World.

Central & Southern Africa also has the largest slum population in the Tropics, estimated at 132 million in 2001. Political instability and conflict in Central & Southern Africa can affect basic service provision and shelter conditions, while large numbers of refugees can affect slum numbers (UN-HABITAT 2010).

At 30 million, the slum population of Northern Africa & the Middle East was one-quarter that of Central & Southern Africa. South Asia's slum population was the second highest in the Tropics at 115 million, with India accounting for 91% of this figure. Regional patterns of slum prevalence also reflect the degree of access to basic services such as water and sanitation, as well as the nature of urban development policies. Those regions with the least ability to provide a proportional increase in basic urban infrastructure in response to rapid urban growth appear to be the most affected.

Looking at a less comprehensive data set for 2005 (UN 2011a), despite a number of missing data points the spread of slum populations within the Tropics broadly reflects the 2001 data, though Northern Africa & the Middle East replaces Central & Southern Africa as the region with the highest slum rate. South Asia again reports the third highest slum rate, though it is considerably lower than in the 2001 dataset. South America and Central America were the only tropical regions to achieve slum rates below 30% (see Figure 6.1.9).

In terms of numbers the tropical region with the largest slum population was still Central & Southern Africa in 2005, with 132 million people living in substandard housing conditions, followed by South East Asia with 105 million.

Slums

Slum dwellers frequently live in difficult social and economic conditions that manifest different forms of material, physical, social and political deprivation. That said, not all slum dwellers suffer the same magnitude of deprivation, nor are all slums the same – some provide better living conditions than others. Rather the degree of deprivation experienced by slum dwellers is thought to be dependent upon how many of the five indicators used to measure slums, otherwise known as shelter deprivations (see Box 6.1.7) are experienced by a particular slum household (UN-HABITAT 2008).

One of the shortcomings of current data sets is that they do not identify the number of deprivations experienced by slum populations. This information would be useful to policymakers to assess the severity of living conditions and to identify priority areas for improvement. For example, where inhabitants suffer from one or two deprivations, improvements in these areas will have a significant impact in reducing slum populations. Programs that promote access to improved sanitation tend to be less costly and complex to implement than those aimed at reducing in overcrowding. This suggests that a better understanding of the shelter deprivations suffered by slum dwellers would make it possible to design interventions that better target the most vulnerable urban populations.

Tropical Africa is not only home to the largest slum population, but its slum dwellers are also the most deprived. Almost 85% of slum households in tropical Africa experienced one or two shelter deprivations in 2005, 50% suffered from at least two shelter deprivations and, it had the largest percentage of slum dwellers lacking three or more basic shelter needs at 17% (UN-HABITAT 2010). One of the major reasons for slum households having multiple deprivations is because local authorities do not or cannot extend their services to slum settlements. Many of these

authorities do not have the capacity to keep step with the rate of urban growth, or to spatially direct urban growth (Voigtlander et al. 2008).

Throughout Asia most slums are the consequence of only one shelter deprivation, reflecting fewer problems with infrastructure and housing policy than in sub-Saharan Africa. Nonetheless, in South Asia it is still quite common for slum dwellers to suffer similar levels of deprivation as in sub-Saharan Africa, with a lack of sanitation and overcrowding the two most common deprivations. In Latin American cities neither the magnitude of slums nor the degree of severity is as daunting as in many other developing nations. However, the proportion of slum households that suffer from at least one shelter deprivation is quite high at 66% (UN-HABITAT 2010).

Health in tropical slums

Improved health is possibly one of the greatest success stories of the second half of the 20th century, with life expectancy increasing by up to 40% in the least developed nations, and major declines in infant mortality rates. In fact the World Health Organisation reported fairly similar death rates for both developed and developing nations as recently as 2000. The major causes of death between the two groups vary considerably however, and people living in the developing world continue to die at a much younger age. What is of greatest concern is that the majority of deaths in developing nations could be prevented if living conditions were less dangerous and if better health care was available (UN-HABITAT 2003a).

Recent studies of the links between housing conditions and rates of illness and child mortality suggest that good-quality housing conditions are essential to ensuring a healthy, productive population (UN-HABITAT 2008). Urban slums in particular comprise a social cluster that engenders a distinct set of health problems (Riley et al. 2007). Inadequate

shelter and poor living conditions in slums are related to a host of health risks that reduce the life span of slum dwellers, including exposure to infectious diseases and indoor air pollution (UN-HABITAT 2006). The number of shelter deprivations experienced by slum dwellers has a direct impact on human development, including health, child mortality, education and employment (UN-HABITAT 2006). Multiple housing deprivations can lead to a 25% greater risk of disability or severe ill health across an individual's life, with the risk increasing if the exposure to substandard housing is during childhood (UN-HABITAT 2004). A large proportion of households in the developing world reside in dwellings that lack two or more basic shelter amenities, threatening the health, safety and wellbeing of their residents, with many of these located in the Tropics (UN-HABITAT 2010).

A significant share of ill health experienced by slum dwellers stems from a lack of access to clean drinking water and poor sanitation. Contaminated water sources in slum areas are associated with an increased prevalence of diarrhoea and life threatening infectious diseases such as typhoid, cholera and hepatitis (Unger & Riley 2007). Inadequate infrastructure in the form of open sewers and an absence of waste collection bring an array of environmental hazards to slum areas which also contributes to the incidence of these diseases and many others. In cities featuring a large number of households suffering from four shelter deprivations the prevalence of diarrhoea rises three fold compared to the non-slum areas of the same city (UN-HABITAT 2010). Almost half the city dwellers in Africa, Asia and Latin America suffer from at least one disease caused by a lack of safe water and sanitation. In sub-Saharan Africa poor households spend at least one-third of their incomes on treatment of waterborne and water related diseases such as malaria, diarrhoea and parasitic infections (WHO/ UN-HABITAT 2010).

Box 6.1.7 Slum indicators

Slums are a multidimensional concept which have housing quality and tenure, overcrowding and access to services dimensions. Estimates of slum populations are typically based on data for a set of these dimensions.

In the UN-HABITAT Global Urban Observatory a slum household is defined as a group of individuals living under the same roof lacking one or more of the following five amenities, otherwise known as shelter deprivations:

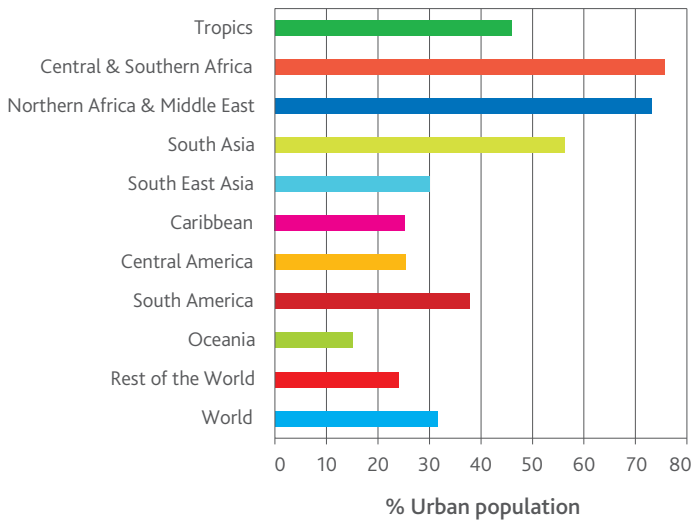
- a) Access to improved water of a sufficient amount (20 litres/person/day), at an affordable price (less than 10% of total household income) and obtainable without extreme effort (less than one hour per day to source the minimum quantity);
- b) Access to improved sanitation facilities either in the form of a private toilet or a public toilet shared with a reasonable number of people;
- c) Sufficient-living area, not overcrowded, with fewer than three persons per habitable room (minimum of four square metres);
- d) Durable dwellings of a sound structural quality adequate enough to protect its inhabitants from extreme climatic conditions, in non-hazardous locations; and
- e) Security of tenure, otherwise known as protection by government from unlawful eviction (UN-HABITAT 2003).

More recent datasets published by the UN-HABITAT and MDG exclude the secure tenure dimension because of the difficulty in acquiring this data, and its lack of comparability across nations when it is available.

National Household Surveys are a primary source of data used to estimate slum populations, often supplemented with Demographic and Health Surveys and Multiple Cluster Survey data. Where data are limited, the Human Development Index has also been used to estimate slum populations (UN-HABITAT 2003).

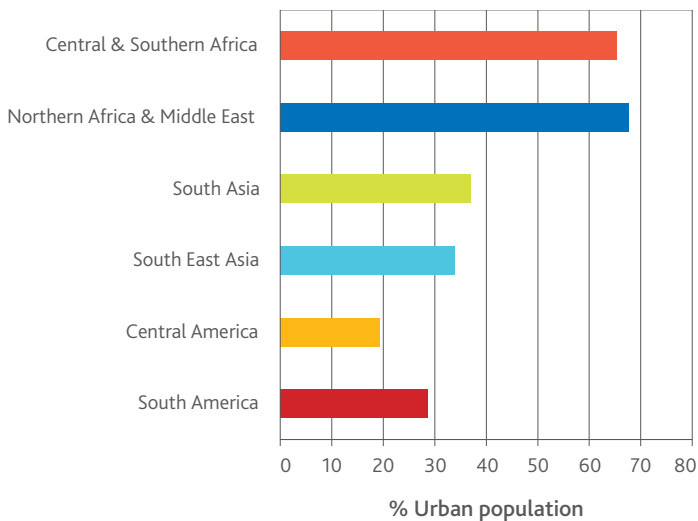


Figure 6.18 Slum population, 2001



Source: UN-HABITAT (2010), State of the Tropics project.

Figure 6.19 Slum population, 2005



Source: UN (2011a), State of the Tropics project

Note: Oceania and the Caribbean are excluded due to limited data availability. Nations for which data are not available include: Botswana, Cape Verde, Liberia, Mauritius, Sao Tome & Principe and Seychelles in Central & Southern Africa; Djibouti, Eritrea and Mauritania in Northern Africa & Middle East; Maldives and Sri Lanka in South Asia; and China, Hong Kong, Macao, Malaysia and Timor-Leste in South East Asia.

Box 6.18 Ahmedabad, India

Ahmedabad's Slum Networking Program (SNP) was initiated in 1995 to provide basic infrastructure services at the household and slum level in an affordable and sustainable way. At the time Ahmedabad had a population of approximately 3 million people, with 41% living in slums. Most slum dwellers had limited or no access to basic infrastructure services, were exposed to a high level of public health risk and lived under the constant threat of eviction. The focus of the SNP was to upgrade the city's slums with a set of interventions which focused on basic infrastructure at the household level: connections to a water supply, toilets and underground sewage for individual households; storm water drainage; stone paving of internal and approach roads; solid waste management and street lighting.

The program is funded by a combination of government, community, private sector and beneficiary investment. Local government financed the development of the basic infrastructure services to the entrance of the slums (80% of the project), and the other stakeholders covered the remaining 20% of costs necessary for service provision within the slum. Households were required to pay for access to the improved infrastructure, which was set at \$US40. This cost was seen as being affordable, and loans were also offered to households to encourage connection. The government also provided a written assurance that residents would not be evicted for 10 years, providing at least some tenure security (Butala et al. 2010).

By 2008, 45 slum communities covering 10,400 households and approximately 39,000 people had benefitted from the project, though this represents only 3% of the city's slum population. Progress has been slow, but the slum communities that have benefited from the program have experienced improvements in health and wellbeing, and 82% of households report a decrease in health-related expenditure (Anand 2008). A lack of data has made it difficult to assess the impact of the SNP on general health outcomes, but a study evaluating the causal impact of slum upgrades by assessing micro-health insurance claims as a proxy for illness episodes indicates the SNP contributed to a statistically significant decrease in waterborne illness claims from 32% to 14% between 2001 and 2008 (Butala et al. 2010).



Ahmedabad India. Image: Emmanuel Dyan.

Overcrowding is also a major contributor to poor health outcomes in slums. The risk of infectious disease transmission and respiratory illness is much greater in highly concentrated populations of low-income households typical in slums, owing to a lack of ventilation and hygiene and exposure to environmental contaminants. Epidemic prone infections tend to cluster in areas of urban poverty, and overcrowding has the potential to fuel both traditional illnesses such as tuberculosis and emerging diseases such as the SARS virus in 2003 (Riley et al. 2007). The prevalence of overcrowding in inadequate dwellings has also been linked to increases in negative social behaviours such as substance abuse and domestic violence. The highest proportions of urban residents without sufficient living space are in Africa and Asia, the regions where the largest slum populations are concentrated (WHO/ UN-HABITAT 2010).

Given that the majority of slum dwellings are constructed outside of formal building codes they also tend to suffer from a range of structural deficiencies. Many are made of flimsy materials that are prone to ignite, frequently collapse or offer scant protection against the elements. This can leave their residents vulnerable to injury, illness, violence and death. High mortality rates are further compounded by the fact that millions of slum dwellings are located on hazardous sites that are more prone to the effects of natural disasters such as floods and earthquakes, or are located in toxic areas such as garbage dumps, quarries or factories.

Children bear a disproportionate burden of disease in slums. The ratio of child deaths in slum areas compared to non-slum areas is consistently high in all developing nations, even in nations that have made significant progress in reducing overall child mortality. Studies undertaken of urban slum populations in 80 developing nations between 1990 and 2005 determined a positive relationship between the population living in urban slum conditions and child mortality (Jorgenson &

Rice 2012). Households living under conditions of severe shelter deprivation experience child mortality rates three times higher than families that have access to safe water, improved sanitation, durable housing and decent living conditions. Children under the age of five are the most vulnerable.

Higher morbidity and mortality among urban slum children is not simply the consequence of household level deficiencies (e.g. infrastructural problems, lack of access to basic amenities) but also because of health issues arising in the context of the broader slum settlement (Jorgenson & Rice 2012). Children are particularly at risk as a result of exposure to hazards and toxins, as they tend to have greater contact with soil and contaminated water than adults, and spend a greater portion of their time in overcrowded, poorly ventilated dwellings. By virtue of their low body weight children are also more quickly and adversely harmed by any toxins they are exposed to. Exposure to parasite-borne infectious illnesses can also create a cycle where children are constantly malnourished as a consequence of unhealthy living conditions further increasing their susceptibility to disease (UN-HABITAT 2010).

Despite the tremendous need, health care services are generally difficult to access in slums, and this inequality exacerbates the health issues of slum dwellers (Riley et al. 2007). Even where health care is available it does not automatically lead to reduced mortality rates in slums. Where medical services are not freely available, high access costs in the context of other competing household expenditures often results in the deferral of healthcare until the onset of late stage complications especially for preventable chronic diseases (Riley et al. 2007). Preventative measures that eliminate shelter deprivations which contribute to illness and disease prevalence could assist in improving health outcomes for slum dwellers (Butala et al. 2010).

Over the past 15 years a consistent commitment to the large-scale upgrading of services to the urban poor has enabled tropical nations such as Colombia, Dominican Republic and India to reduce or stabilise their slum populations (UN-HABITAT 2010). The health benefits of upgrades to water and sanitation systems for slum households are yet to be rigorously evaluated, though studies undertaken in Ahmedabad in India are encouraging (see Box 6.1.8).

Looking Forward

Reducing slum populations is complex and costly, and experience suggests that to be successful, programs require a consistent political commitment to improve living conditions. Affordable access to key infrastructure and services and improved security of tenure are typical examples of improved living conditions. Nonetheless, despite significant investment in basic services, housing, health and education over many years, the number of slum dwellers in developing nations is increasing, and is predicted to reach 889 million by 2020, 26 million more than in 2012 (UN-HABITAT 2010).

In 2005 the cost to upgrade the housing of 100 million slum dwellers was estimated at \$74 billion (UN Millennium Project 2005). This suggests the complicated and costly nature of future slum upgrading efforts will require innovative collaborations involving the public and private sectors, non-governmental organisations as well as the slum dwellers themselves to be effective. (Riley et al. 2007). The prevalence of overcrowding in inadequate dwellings has also been linked to increases in negative social behaviours such as substance abuse and domestic violence. The highest proportions of urban residents without sufficient living space are in Africa and Asia, the regions where the largest slum populations are concentrated (WHO/ UN-HABITAT 2010).

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Kibera slum.
Image: University of Denver.



*'Progress in health is central to human
development and poverty reduction'*

World Health Organisation

Chapter 6.2
Society | Health

Summary of health indicators

Indicator		Tropics	Central & Southern Africa	Northern Africa & Middle East	South Asia	South East Asia	Caribbean	Central America	South America	Oceania	Rest of the World	World
Life expectancy (years) 1950-55 – 2005-10		41–65	36–54	34–59	37–65	45–71	53–72	49–75	50–73	49–67	53–73	47–69
Maternal and child mortality	Maternal mortality ratio* 1990-2010	574–308	865–482	863–564	603–204	370–133	277–196	116–69	149–78	281–178	238–104	395–211
	Under-five mortality rate** 1950-55 to 2005-10	263–80	313–126	351–120	285–63	227–32	188–44	207–25	198–30	186–52	186–35	214–59
Obesity and non-communicable diseases	Obesity prevalence (%) 2002-2010 [□]	4–6.8	2–3	5–6	0.9–2	2–3	15–23	23–32	14–21	14–18	10–13	8–11
HIV and AIDS	HIV prevalence (%) 1990-2010 [#]	0.7–1	3–4	0.4–0.7	0.1–0.3	0.2–0.3	0.8–0.9	0.2–0.4	0.2–0.4	0.2–0.5	0.1–0.4	0.3–0.7
	AIDS mortality rate 1990-2010 ^{##}	15–39	68–131	6–13	1–13	1–9	16–28	3–6	3–8	2–11	1–11	6–23
Tuberculosis	Incidence 1990-2010 ⁺	204–172	262–237	171–115	214–189	225–182	98–79	69–29	109–51	193–214	110–95	145–127
	Mortality rate 1990-2010 ⁺⁺	35–21	43–26	20–10	40–27	46–23	10–9	8–2	10–4	46–31	16–10	24–15
Malaria Prevalence 2010 ^β		7,402	23,181	15,431	2,448	999	488	28	279	10,802	203	3,182
Dengue and other neglected tropical diseases	Incidence of dengue 2010 ^f	2,303	1,803	719	2,714	2,792	3,264	2,008	2,742	1,429	652	1,381

Red: Situation is deteriorating
Green: Situation is improving

*Deaths per 100,000 live births. **Deaths per 1,000 live births. [□]Percentage of population aged 15+. [#]Cases as % of population aged 15-49 years. ^{##}Deaths per 100,000 population aged 15-49 years. ⁺New cases per 100,000 population. ⁺⁺Deaths per 100,000 population. ^βCases per 100,000 population. ^fNew infections per 100,000.

Health

The World Health Organisation defines health as a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity. The biological, psychological and social determinants of wellbeing impact on an

individual's life expectancy and disease burden, which are measurable and provide a degree of insight into health at national and regional levels.

The term 'tropical health' is used to describe the unique range of health issues that are primarily prevalent in the Tropics and sub-tropics. Climate

is a factor in the increased prevalence of some infectious diseases in the Tropics (for example, malaria and dengue), while the relatively poor performance of many tropical nations across a range of social and environmental factors – broadly referred to as the social determinants of health – also contributes to the higher prevalence

of many diseases in the Tropics. Many infectious and non-communicable diseases are closely linked with conditions of poverty, and consequently have a higher burden in the Tropics. Undernutrition, overcrowding and limited access to health care are key factors, and a characteristic of health in the Tropics is its correlation with broader development inequities.

As a fundamental human right, health reflects the hope of people to live a long life that is free from illness, pain and disability. Health reflects individual, family and community wellbeing as well as the numerous social, economic and environmental factors that underlie it.

Headline indicator

Life expectancy is comparable across populations, and is one of the most commonly used indicators of a population's health.

Supplementary indicators

Maternal and child mortality; obesity and non-communicable diseases; HIV and AIDS; tuberculosis; malaria; dengue and neglected tropical diseases.

Links to other dimensions

Poverty, education, economic output, work, urbanisation, human security, infrastructure, crime and corruption, gender equality, science and technology, international trade and investment, atmosphere, land and inland water, oceans, biodiversity.

Is it getting better?

Outcomes are improving rapidly for the majority of health indicators and for the majority of regions in the Tropics. Despite these improvements the Tropics tends to bear a disproportionate share of the global burden of many communicable and preventable diseases.

- **Life expectancy** increased across all regions of the Tropics in the past 60 years, and the gap between the Tropics and the Rest of the World has narrowed considerably. Nonetheless, in 2010 life expectancy in the Tropics was 7.7 years lower than in the Rest of the World.
- All regions in the Tropics have experienced significant decreases in **maternal mortality ratios** and **child mortality rates**. Nonetheless, the Tropics represent the vast majority of these deaths, accounting for 76% of maternal deaths and 72% of under-five deaths in 2010.
- The adult **obesity** rate in the Tropics is lower than in the Rest of the World, but is increasing at a faster rate. **Non-communicable diseases** are a growing cause of illness, disability and death in both the Tropics and the Rest of the World.
- **HIV prevalence** among people aged between 15 and 49 years is higher than in 1990 but has stabilised or declined in most regions of the Tropics after peaking in the mid to late 1990s, and the **AIDS mortality rate** has been declining in all regions since 2005. Compared with the Rest of the World prevalence and mortality rates were higher in the Tropics in 2010.
- Except in Oceania, **tuberculosis** incidence decreased in all regions of the Tropics between 1990 and 2010. The Tropics represented 56% of new cases globally in 2010.
- There are no time series data for **malaria**, but in 2010 the Tropics represented 96% of cases and 99% of deaths from malaria, with the greatest burden in Central and Southern Africa
- There are no time series data for **dengue**, but in 2010 72% of infections occurred in the Tropics, with South Asia and South East Asia having the highest number of cases, and the Caribbean the highest incidence rate. Other **neglected tropical diseases** such as soil transmitted helminthiases, schistosomiasis and lymphatic filariasis cause significant disability, disfigurement and death, especially in impoverished communities in the Tropics.



Nurses at Vaiola Hospital, Tonga. Image: Tom Perry, World Bank.

Life expectancy

Life expectancy at birth is the average number of years a person can expect to live given existing mortality patterns, and considers a fundamental health question: “How long can I expect to live?” As a measure of health, life expectancy is readily comparable across nations and regions and is one of the most commonly used indicators of a population’s general health status.³

Globally, health and life expectancy outcomes have improved substantially over the past 60 years. A major factor contributing to increased life expectancy has been significant reductions in infant and child mortality rates, as well as improvements in many of the social determinants of health. The social determinants of health are the conditions in which people are born, grow, live, work and age, and include aspects such as nutrition, sanitation, water supply and living conditions as well as the health system (WHO 2008b). These factors are shaped by the distribution of power and resources at global, national, local and household levels, which are themselves influenced by policy choices. Advances in medical technology and infectious disease control have also been important in improving health outcomes.

Globally, deaths are increasingly concentrated at older ages, and a shift is occurring from communicable to non-communicable diseases (Wang et al. 2012). While infectious disease rates have declined substantially, the burden remains higher in the Tropics than in the Rest of the World, and particularly in sub-Saharan Africa. A range of factors is influencing this, including vector control challenges and slower improvements in nutrition and other social determinants of health (see Box 6.2.1). Most low and middle-income nations, many of which are located in the Tropics, are burdened with both a high prevalence of infectious diseases and rising rates of non-communicable diseases, and this is presenting new public health challenges.

Trends

Life expectancy in the Tropics increased by from 41.3 to 65.2 years in the 60 years to 2010, and from 53.4 to 72.9 years in the Rest of the World, increases of

23.9 years (58%) and 19.5 years (36%) respectively (see Figure 6.2.1). Over this period, the life expectancy gap between the Tropics and the Rest of the World decreased from 12.1 years to 7.7 years – representing a significant improvement in health outcomes in the Tropics. The relatively larger increase in life expectancy in the Tropics reflects greater access to vaccines and major improvements in many of the social determinants of health, including increased access to potable water and sanitation facilities, and enhanced public health infrastructure. Nonetheless, the gap of 7.7 years is an indicator of the substantial health deficit in the Tropics when compared with the Rest of the World.

Life expectancy varies significantly across the regions of the Tropics and the gap has generally been increasing over time (see Figure 6.2.2). In 1950-55 life expectancy was highest in the Caribbean at 53.3 years and lowest in Northern Africa & Middle East at 34.1 years – a gap of 19.2 years. By contrast, in 2005-2010 life expectancy was highest in Central America at 75.1 years and lowest in Central & Southern Africa at 53.5 years – a gap of 21.6 years.

In 1950-1955 life expectancy in three regions in the Tropics was less than 40 years: 34.1 years in Northern Africa & Middle East, 36.3 years in Central & Southern Africa, and 37.2 years in South Asia. Life expectancy in these regions increased significantly to 2010, particularly in South Asia where it increased by 28.2 years to 65.4 years. Nonetheless, in 2005-2010 these three regions still had the lowest life expectancy in the Tropics, and Central & Southern Africa and Northern Africa & Middle East are the only regions in the Tropics where life expectancy is less than 60 years.

AIDS is a contributing factor to lower life expectancy in these regions, particularly Central & Southern Africa which comprises 17 of the 21 nations for which AIDS accounted for more than 10% of deaths in 2008 (WHO 2011a). In 2002 AIDS accounted for more than 60% of deaths in the worst affected nations in Central & Southern Africa (WHO 2004) and contributed to life expectancy at birth falling by more than 15 years between 1990 and 2005 in some nations.

Over the 60 years to 2010 South Asia experienced the greatest increase in life expectancy of 28.2 years, followed by 26.4 years in South East Asia, 26.0 years in Central America and 24.8 years in Northern Africa & Middle East. These four regions represent around two-thirds of the population in the Tropics, and are major contributors to the overall improvement in life expectancy in the region.

Infant mortality

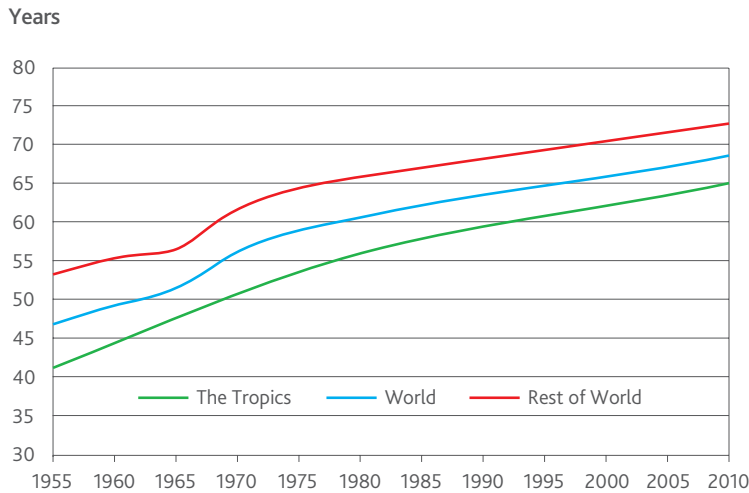
Lower life expectancy in developing nations, many of which are located in the Tropics, reflects higher mortality rates at younger ages, and especially in infancy. Across the world infant mortality rates (the number of deaths of infants under one year old per 1,000 live births) have fallen significantly over the past 60 years, but are still considerably higher in the Tropics than in the Rest of the World. In the Tropics the infant mortality rate fell from 160 in 1950-55 to 54 in 2005-10, a fall of 106 or 66% (see Table 6.2.1). In the Rest of the World the rate fell from 119 deaths per 1,000 live births to 29 over the same period, a fall of 90 or 76%.

Many factors are contributing to lower infant mortality rates, though they can be broadly grouped into factors associated with economic growth, poverty reduction and expanded social services, including improved access to education and health care. Household income and a mother’s education level are key factors determining infant and child mortality rates. Increased immunisation rates are also an important factor, especially for measles, as are improvements in nutrition, hygiene and public health infrastructure (UN 2010b).

Although the decline in the infant mortality rate has been greater in the Tropics than in the Rest of the World, to some extent this reflects its considerably higher starting point. In percentage terms the Rest of the World has actually experienced a faster rate of improvement. In the 60 years to 2010 the infant

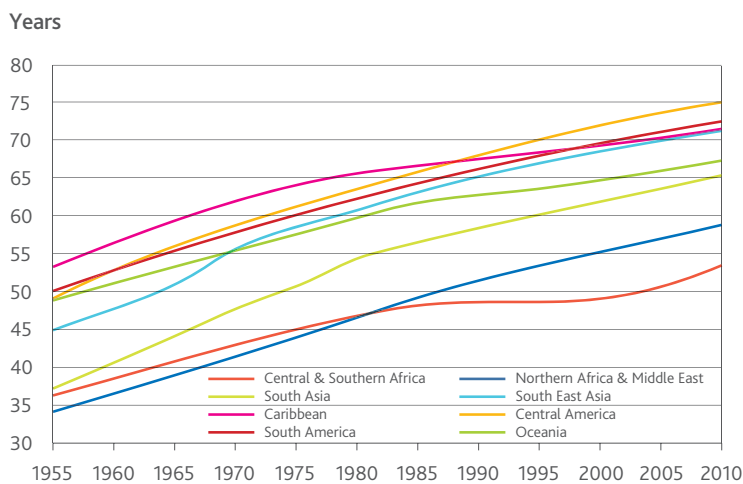
³ An important limitation of life expectancy is that it measures length of life rather than quality of life, as it does not account for the burden of illness and disability. Alternative measures of disease burden such as ‘disability-adjusted life years’ and ‘healthy life expectancy’ quantify disability from diseases, although time series data by nation are as yet unavailable.

Figure 6.2.1 Life expectancy at birth



Source: UN (2013a), State of the Tropics project.

Figure 6.2.2 Life expectancy at birth – the Tropics

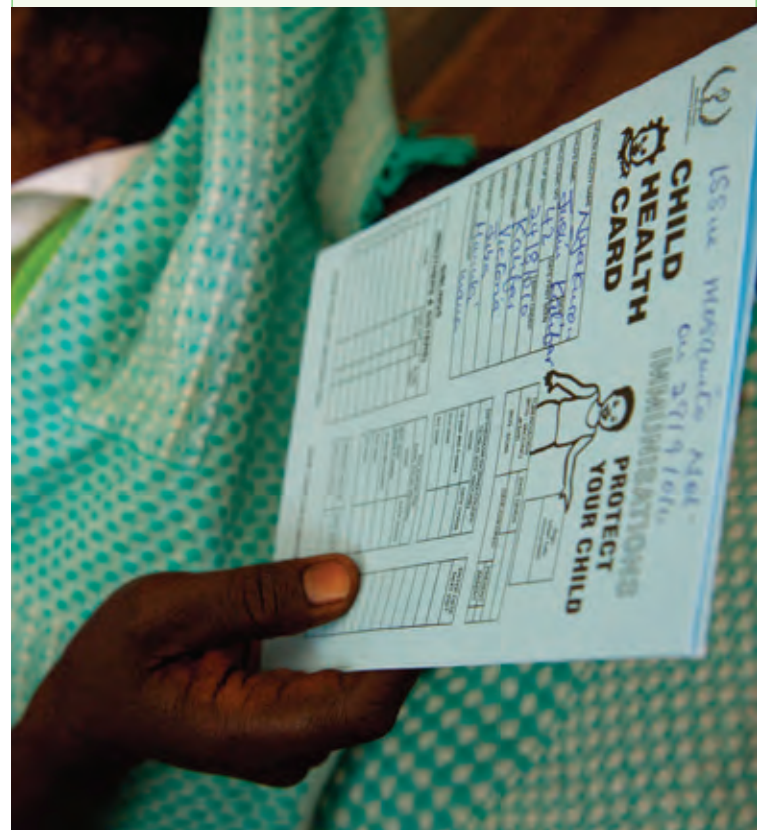


Source: UN (2013a), State of the Tropics project.

Box 6.2.1 Burden of disease impacts

Health outcomes are a complex mix of ecological, economic, social, historical and genetic characteristics of the population. In the Tropics the burden of disease is considerably higher, with health outcomes significantly better in the temperate zones, even after controlling for the level of GDP per capita (Sachs 2000).

The Tropics experience a higher burden of infectious disease for many interacting reasons: a physical ecology that supports a high level of disease transmission; poor nutrition resulting from the low productivity of food production; and multiple feedbacks through poverty (for example, illiteracy, lack of access to medical care and poor sanitation). Poorer health outcomes directly and indirectly impair economic performance: directly through reduced labour productivity due to lost workdays and reduced physical and cognitive capacities; and also indirectly through the effect of diseases on fertility rates, population age structure, and overall population growth rates (Sachs 2000).



Child health in South Sudan. Image: Arne Hoel, World Bank Photo Collection.

mortality rate in the Rest of the World decreased at an average rate of 2.5% per annum, compared with 1.9% per annum in the Tropics. That is, a significant gap persists, and there is considerable scope for infant mortality rates to decrease in the Tropics. The correlation between infant mortality and life expectancy is shown in Table 6.2.2. Regions that experience large falls in the absolute infant mortality rate tend to also experience large increases in life expectancy. The exception is Central & Southern Africa, where, although infant mortality rates have fallen significantly, high mortality rates in the non-infant population – largely attributable to HIV/ AIDS – have constrained overall improvements in life expectancy.

Adult mortality

As infant and child mortality rates have fallen, a larger proportion of global deaths now occur

in adults. Also, as people tend to live longer the proportion of deaths at older ages is increasing. Globally, 54% of deaths in 2005-10 were of people aged 60 or over, compared with 26% in 1950-1955 (UN 2010b). As life expectancy has increased, so too has the burden of chronic, degenerative non-communicable diseases such as heart disease, cancer and diabetes that are associated with the ageing process (Wang et al. 2012).

Between 1950-1955 and 2005-2010 the death rate for the population aged 15 to 59 years (the adult mortality rate) has decreased. In 2005-2010 the adult mortality rate in the Tropics was 232 per 1,000 people aged between 15 and 59, higher than the rate of 148 per 1,000 in the Rest of the World (see Table 6.2.2). The gap between the Tropics and Rest of the World has decreased marginally over time, from 92 in 1995-2000 to 86 in 2005-2010. Unlike child and maternal mortality rates, the spread in adult mortality rates across the best and worst

performing nations has been increasing over time (Rajaratnam et al. 2010).

Despite declines in adult mortality across all regions of the Tropics, there are substantial differences between them. Adult mortality rates are highest in Central & Southern Africa (367 in 2005-2010), followed by Northern Africa & Middle East (270), Oceania (232) and South Asia (209). Factors such as disaster, famine, the level of socioeconomic development and the prevalence of disease risk factors will influence mortality rates. For example, armed conflict, malaria and HIV are significant contributors to higher rates of adult mortality in Central & Southern Africa, while in Oceania cardiovascular disease is a major factor. The adult mortality rate in Central America is the lowest in the Tropics, and is lower than in the Rest of the World.

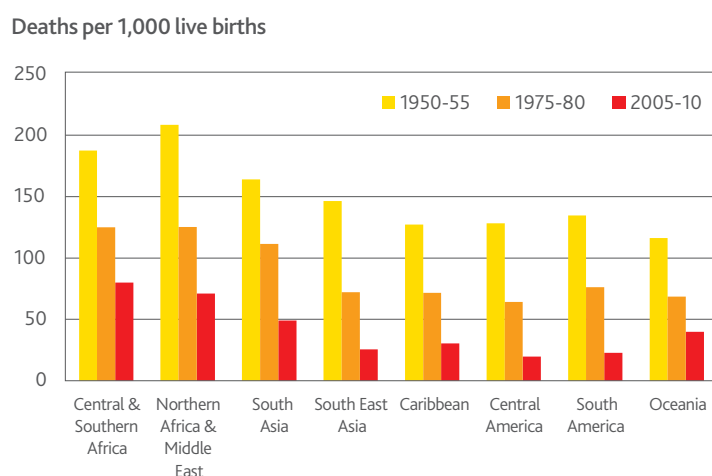
Table 6.2.1 Life expectancy and infant mortality rate, 1950-55 and 2005-10

	Life expectancy (years)			Infant mortality rate*		
	1950-55	2005-10	Change	1950-55	2005-10	Change
Tropics	41	65	24	160	54	-106
Central & Southern Africa	36	53	17	188	80	-107
Northern Africa & Middle East	34	59	25	209	71	-137
South Asia	37	65	28	164	49	-115
South East Asia	45	71	26	146	26	-121
Caribbean	53	72	18	127	30	-97
Central America	49	75	26	128	20	-108
South America	50	73	23	135	23	-112
Oceania	50	67	19	116	40	-76
Rest of the World	53	73	20	119	29	-90
World	47	69	22	135	42	-92

Source: UN (2013a), State of the Tropics project.

*The number of deaths of infants under one year old per 1,000 live births.

Figure 6.2.3 Infant mortality rate – the Tropics



Source: UN (2013a), State of the Tropics project.

Looking forward

Life expectancy has increased globally over the past 60 years, reflecting significant global investment in infectious disease control, public health infrastructure and medical technology. Life expectancy remains lower in the Tropics than in the Rest of the World, and mortality patterns vary substantially between the different regions and nations. Continuing increases in life expectancy will both reflect and influence development across the Tropics.

As life expectancy continues to increase, new public health challenges are emerging, such as the growing burden of non-communicable diseases. This represents a particular challenge for many nations in the Tropics where infectious diseases and undernutrition are still significant public health concerns.

Table 6.2.2 Adult mortality rate*

	1950-55	1955-60	1965-70	1975-80	1985-90	1995-00	2005-10	Change 1950-55 to 2005-10
Tropics	472	434	351	290	260	257	232	-240
Central & Southern Africa	495	471	422	378	363	410	367	-128
Northern Africa & Middle East	521	495	443	379	321	296	270	-250
South Asia	551	503	393	292	262	239	209	-342
South East Asia	430	395	302	259	211	188	158	-272
Caribbean	312	276	228	205	195	203	181	-131
Central America	362	319	269	238	195	153	133	-230
South America	352	320	268	233	214	192	165	-187
Oceania	499	463	388	326	302	271	232	-267
Rest of the World	349	321	237	198	176	169	148	-201
World	386	352	270	226	201	193	170	-215

Source: UN (2013a), State of the Tropics project

* Deaths under age 60 per 1,000 alive at age 15

Maternal and child mortality

The health of women and children is strongly linked, and is an important key to progress across all human development goals (UN 2010a). Despite this recognition, millions of women continue to die in pregnancy and childbirth; millions of children also die in childbirth and during the first five years of their lives from preventable causes. Maternal and child mortality are closely associated with development challenges such as poverty, gender inequality and human rights violations (IFRC 2011), and are thus important indicators of a society's health, and of a nation's level of social and economic development.

Maternal mortality – which is when a woman dies while pregnant or within 42 days of the end of pregnancy, from any cause related to or aggravated by pregnancy or its management (WHO 2012b) – is the leading cause of death among females aged 15–49 years old globally (Asamoah et al. 2011). Major causes of maternal death and disability include haemorrhage, infection, high blood pressure, unsafe abortion,

and obstructed labour (WHO 2013c). Globally the number of maternal deaths is decreasing, but there were still 288,000 maternal deaths in 2010. Under-five mortality (which incorporates infant mortality) is also decreasing, although 8 million children under five died every year in the five years to 2010.

The poorest nations and poorer populations within nations experience the highest maternal and child mortality rates. It is estimated that 99% of maternal deaths occur in developing nations, with sub-Saharan Africa alone accounting for 56% of maternal deaths worldwide (WHO 2012b). Similarly, less than 1% of under-five deaths occur in high-income nations (Rajaratnam et al. 2010), with a child from a low income nation 18 times more likely to die before the age of five than a child from a high income nation (WHO 2013g). Within developing nations, children born to the poorest 20% of households are around twice as likely to die before the age of five as those from the wealthiest 20% (IFRC 2011). The link with poverty shows that the vast

majority of maternal and child deaths can be prevented by implementing interventions that are commonly available in the developed world.

Trends

Reported data on maternal and child mortality are limited as only one-third of nations have a complete civil registration system with good attribution of cause of death (WHO 2012b). Estimates are produced using a combination of civil registration and census data, and household surveys.

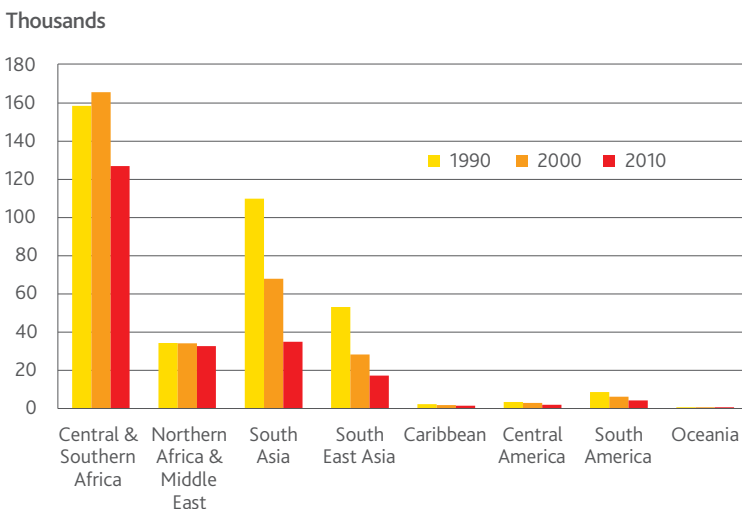
Maternal mortality

Number of deaths

Globally there were 288,000 maternal deaths in 2010, a 47% decline from 546,000 in 1990. In the Tropics the number of maternal deaths declined by 41% over this period to 220,000 in 2010, while in the Rest of the World the number of deaths fell by 61% to 68,000. The different rates of decline are reflected in the increasing proportion of global maternal deaths occurring in the Tropics, from 68% in 1990 to 76% in 2010. A contributing factor to the slower rate of decline in maternal deaths in the Tropics is the increasing proportion of global births occurring in this region. Within the Tropics, the three regions with the highest fertility rates (Central & Southern Africa, Northern Africa & Middle East and Oceania) have had the slowest rates of decline in the number of maternal deaths (see Figure 6.2.4). The slower decline in maternal deaths in Central & Southern Africa increased the region's proportion of maternal deaths in the Tropics from 43% in 1990 to almost 60% in 2010. Relative to other regions in the Tropics, large falls in fertility rates in South Asia and South East Asia have contributed to the greater decline in the number of maternal deaths in these regions.

A large proportion of maternal deaths in sub-Saharan Africa and the Caribbean are attributable to HIV – 10% and 6% respectively (WHO 2012b). In the 18 nations most affected by HIV (most of which are in tropical Africa), between 20% and

Figure 6.2.4 Maternal deaths, the Tropics



Source: Maternal Mortality Estimate Inter-Agency Group (2013), State of the Tropics project.

67% of maternal deaths are attributed to HIV (WHO 2012b). The number of maternal deaths among women with HIV is expected to decrease in these nations as access to antiretroviral therapy continues to expand.

Maternal mortality ratio

The maternal mortality ratio (MMR) is the number of maternal deaths per 100,000 live births, and it reflects the risk of maternal death from a single live birth (and is therefore independent of fertility trends). Millennium Development Goal 5 (MDG 5) aims for the MMR in 2015 to be three-quarters (75%) lower than in 1990. The World Health Organisation considers an MMR greater than 300 to be 'high' (WHO 2012b).

Globally, the MMR nearly halved between 1990 and 2010, from 395 deaths per 100,000 live births to just over 211 (see Table 6.2.4). The Tropics experienced a 46% decline from 574 in 1990 to 308 in 2010, compared with a 56% decline in the

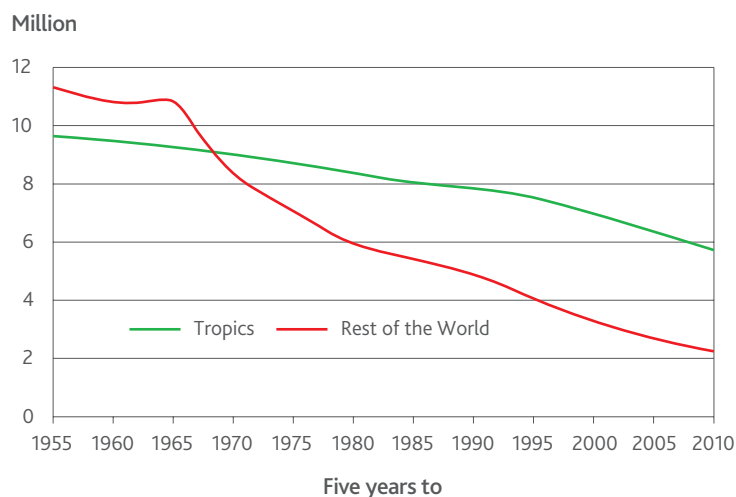
Rest of the World, from 238 to 104. In 2010 the MMR in the Tropics is almost three times higher than in the Rest of the World. Nonetheless, the number of tropical regions with a 'high' MMR has fallen from four in 1990, to two in 2010.

The MMR has been declining in all regions of the Tropics, although at different rates (see Table 6.2.3). Since 1990 the rate of decline has been slowest in the Caribbean, Northern Africa & Middle East and Oceania, at 29%, 35% and 37% respectively. Despite consistent MMR declines since 1990, Central & Southern Africa and Northern Africa & Middle East are the only two tropical regions where the MMR remains 'high' at 482 and 564 respectively in 2010. Central America and South America have consistently had the lowest MMRs in the Tropics (69 and 78 respectively in 2010), below that in the Rest of the World (104 in 2010). In South Asia and South East Asia declines of around 65% over the two decades to 2010 have reduced the MMR from 603 and 370 respectively in 1990, to 204 and 133. In these regions Lao People's Democratic Republic,

Cambodia, Maldives, Bangladesh, Vietnam and Timor-Leste each had declines of 70% or more.

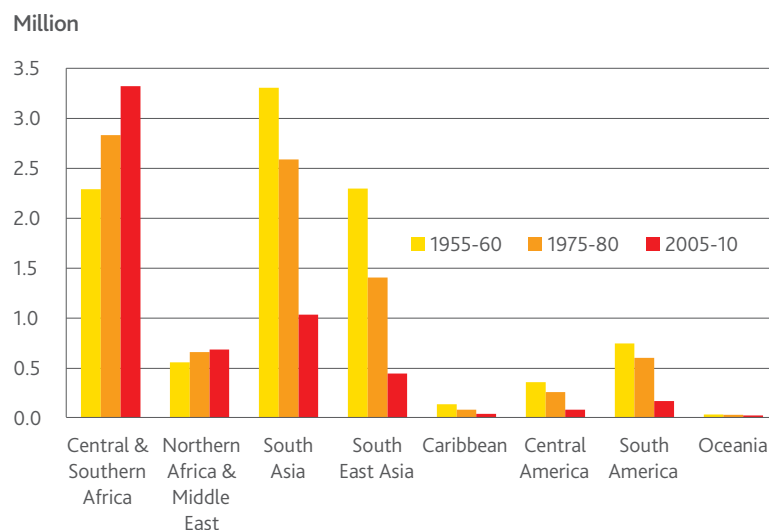
MMR declines across the two decades can be attributed to improved access to skilled health personnel and socioeconomic factors outside of the health sector (WHO 2012b). Across all developing regions, access to family planning and contraception, antenatal care and skilled health personnel attendance at deliveries has increased since 1990, though at different rates in different regions (UN 2010a). In general, nations that have the lowest access to health services have the highest maternal mortality rates (UN 2010a). Notwithstanding significant global progress since 1990, MDG 5 is unlikely to be achieved, largely due to the ongoing limitations of antenatal and obstetric services and facilities in developing nations (Karlsen et al. 2011). As the scope for MMR reduction is much greater in these nations, investing in maternal health in the developing world will be critical to making global progress towards the target.

Figure 6.2.5 Deaths per year of children under five years



Source: UN (2013a), State of the Tropics project.

Figure 6.2.6 Deaths of children under five years – the Tropics



Source: UN (2013a), State of the Tropics project.

Child mortality

Young children are more susceptible to infectious diseases than adults and are especially vulnerable to environmental threats that are more common in poor communities, such as contaminated water. Under-five mortality relates directly to child survival, reflecting the social, economic and environmental conditions in which children live.

Number of deaths

Globally, the number of deaths of children under the age of five has declined by 62% since 1950-55, from 21.0 million per year in the five years to 1955, to 8.0 million per year in the five years to 2010 (see Figure 6.2.5). Even though the Tropics represented 50% of the global population of children under the age of five in 2010, it accounted for 72% of under-five death – 5.7 million per year in the five years to 2010, compared with 2.2 million in the Rest of the World.

In the period between 1950 and 1965, however, under-five mortality was higher in the Rest of the World than in the Tropics at around 11 million deaths per year, before falling dramatically, to 5.9 million per annum, by 1975-80. The rapid decline in the Rest of the World over this period can be attributed to a combination of factors, including sharp declines in the impact of some infectious diseases, public health measures and better nutrition (Hill 1990), with improvements in China having a major impact on global outcomes. Under-five mortality has continued to decline in the Rest of the World at a faster rate than the Tropics.

In the Tropics only Central & Southern Africa and Northern Africa & Middle East experienced an increase in the number of under-five deaths between 1950-55 and 2005-10 (see Figure 6.2.6). These are the only two regions where fertility rates are still above five births per woman, and since the mid-1970s Central & Southern Africa has consistently had the highest number of under-five deaths in the Tropics, recording 3.3 million deaths per annum in 2005-10. In 2005-

Table 6.2.3 Maternal mortality ratio*

	1990	1995	2000	2005	2010	% Change 1990-2010
Tropics	574	516	454	381	308	-46
Central & Southern Africa	865	842	742	627	482	-44
Northern Africa & Middle East	863	794	715	644	564	-35
South Asia	603	479	386	278	204	-66
South East Asia	370	263	211	163	133	-64
Caribbean	277	259	214	208	196	-29
Central America	116	107	98	74	69	-40
South America	149	124	106	88	78	-48
Oceania	281	240	231	206	178	-37
Rest of the World	238	204	172	134	104	-56
World	395	356	315	262	211	-47

Source: Maternal Mortality Estimate Inter-Agency Group (2013), State of the Tropics project
*Maternal deaths per 100,000 live births.

10, under-five deaths in tropical India and Nigeria combined accounted for almost one-quarter of under-five deaths worldwide.

Under-five mortality rate

The under-five mortality rate is the probability of a child born in a specific year dying before reaching the age of five, and is expressed as deaths per 1,000 live births. An under-five mortality rate of 40 or more is considered 'high' (UNICEF 2012a). Globally the under-five mortality rate decreased by 72% between 1950-55 and 2005-10, from 214 deaths per 1,000 live births to 59 (see Figure 6.2.5). In the Tropics the under-five mortality rate fell by 69% to 80, while in the Rest of the World it fell by 81% to 35. In 2005-10 the under-five mortality rate in the Tropics was more than double that in the Rest of the World. Although mortality rates have declined significantly, the

Millennium Development Goal to reduce 1990 levels of under-five mortality by two-thirds by 2015 is unlikely to be met at the current rate of improvement (WHO 2013g).

In all regions of the Tropics the under-five mortality rate has declined steadily over the past 60 years (see Table 6.2.5 and Figure 6.2.7). Central America, South America and South East Asia each recorded reductions in the under-five mortality rate of over 80% between 1950-55 and 2005-10, while progress has been slowest in Central & Southern Africa and Northern Africa & Middle East, with declines of 60% and 66% respectively. By a long margin, these two regions had the highest under-five mortality rates in the Tropics in 2005-10, at 126 and 120 respectively. This largely reflects the high child mortality burden in sub-Saharan Africa, where one in nine children dies before the age of five

(UNICEF 2012a). Sub-Saharan Africa also bears an increasing share of global under-five deaths, as mortality rates are falling more slowly than in other regions (UN 2012a).

Child mortality declines worldwide can be attributed largely to expanded efforts to reduce infectious diseases which cause the majority of under-five deaths (see Box 6.2.2) (UNICEF 2012b). In some nations, decentralised nutrition programmes and policies that promote free and universal health care access for pregnant women and children have also accelerated the rate of improvement (Amouzou 2012).

Infant Mortality

The risk of death among children under the age of five is highest closest to birth, and then decreases steadily (WHO 2013g). In 2010 an estimated 71% of all under-five deaths occurred in the first year of life, and 40% within the neonatal period (from birth to one month old) (WHO 2013g). While infectious diseases cause the majority of deaths of children under five, they are responsible for a smaller proportion of neonatal deaths, where 73% of deaths are from preterm birth complications, birth asphyxia, congenital abnormalities and sepsis (Black et al. 2010).

As with under-five mortality, the number of neonatal deaths is decreasing worldwide, but the global proportion of these deaths among all under-five deaths is increasing (UN 2012a). Neonatal deaths are declining more slowly because different interventions are needed to improve neonatal versus under-five health outcomes (UNICEF 2012a). The proportion of neonatal deaths among under-five deaths also varies widely across different regions of the world, ranging from 29% in Africa to 54% in parts of Asia (Black et al. 2010). Preventive interventions such as early postnatal home visits that target both mothers and babies have been shown to be highly effective (UNICEF 2012a), and targeting resources to these types of interventions is recognised as necessary to accelerate the under-five mortality rate decline, especially in nations that are highly burdened with neonatal deaths (UN 2012a).

Health care and education

Access to health care is a critical factor influencing both maternal and child mortality. Key health services and interventions that are still limited in many low income populations include family planning information, antenatal, newborn and postnatal care, emergency obstetrics, vaccination and immunisation services and access to nutritional and rehydration supplements (UN 2010a). Appropriate resourcing and management is essential for these services to reach populations most in need, and despite global funding for maternal, newborn and child health increasing from US\$2.5 billion in 2003 to around US\$6.5 billion in 2010, the rate of funding increases has now slowed (Hsu et al. 2012).

The expansion of maternal and child health care services and interventions has contributed to substantial health gains. In Sri Lanka for example the maternal mortality rate has been reduced by 87% since the 1970s, largely as a result of efforts to ensure that 99% of pregnant women receive four antenatal visits and give birth in a health facility (UN 2010a). In developing nations investments in maternal health care have led to the proportion of births attended by skilled health personnel rising from 55% in 1990 to 65% in 2010, and the proportion of women attended at least once by skilled health personnel during pregnancy increasing from 63% to 80% (UN 2012a).

However, even within nations, coverage of maternal and child health interventions can vary significantly. In Guatemala the national coverage of key maternal and child interventions is 59%, but for those in the poorest quintile coverage is only 38% (Bhutta et al. 2010).

Family planning interventions can have a substantial impact on maternal health by reducing lifetime exposure to the risks of pregnancy and birth, lowering the risk of having an unsafe abortion, delaying first pregnancy in young women and reducing the health risks associated with closely spaced pregnancies. Child survival is also enhanced by lengthened birth intervals.

Contraceptive use is estimated to have averted 44% of global maternal deaths in 2008 (Ahmed et al. 2012), although the unmet need for family planning (that is, the proportion of partnered women reporting the desire to delay or avoid pregnancy but who are not using contraception) remains high in 2010 at around 13% across all developing nations, though this is a modest improvement on the 16% reported in 1990 (UN 2012a). If the unmet need for contraception were satisfied it is estimated that maternal deaths could have been reduced by a further 29% in 2008 (Ahmed et al. 2012).

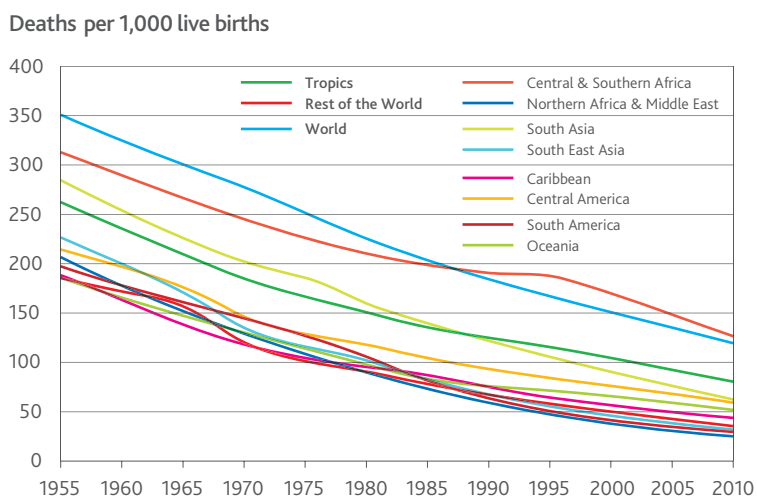
A mother's access to formal education is also a key survival factor for women and children under five. Children whose mothers have been educated for at least five years are 40% more likely to live beyond the age of five (UN 2010), and the chances of survival increase with the mother's level of education. A child whose mother has no education is 2.7 times more likely to die before the age of five than a child whose mother has secondary education or higher, and a child whose mother has only primary school education is 1.5 times more likely to die (UN 2012a).

Lower levels of maternal education are also associated with higher maternal mortality, even among women with access to postnatal care (Karlsen et al. 2011). Compared with women with more than 12 years of education, women with no education are 2.7 times more at risk of maternal death, and for those with between one and six years of education the risk is double (Karlsen et al. 2011). Globally, in 2011, women accounted for 61% of young people (aged between 15 and 24) who lacked basic reading and writing skills. (UN 2013c).

Looking forward

There is a growing awareness that investments in maternal and child health can reduce poverty in families and stimulate economic productivity and growth (UN 2010a). Nonetheless, of the eight Millennium Development Goals relating to health goals maternal and child health are the furthest from being achieved (WHO 2013g), and there are still significant disparities both between and within nations. In response to slow progress against MDGs 4 and 5 the United Nations launched the Global Strategy for Women's and Children's Health in 2010, which has been successful in securing increased commitments to achieve these goals (Lozano et al. 2011). Defining the post-2015 development agenda, including maternal and child health targets, is also a key priority of the United Nations at present (UN 2013b).

Figure 6.2.7 Under-five mortality rate



Source: UN (2013a), State of the Tropics project.

Table 6.2.4 Under-five mortality rate*

	1950-55	1955-60	1965-70	1975-80	1985-90	1995-00	2005-10	% Change 1950-55 to 2005-10
Tropics	263	235	184	151	123	105	80	-182
Central & Southern Africa	313	290	246	210	191	171	126	-186
Northern Africa & Middle East	351	324	278	226	185	153	120	-231
South Asia	285	253	201	159	122	91	63	-222
South East Asia	227	199	133	103	65	46	32	-195
Caribbean	188	165	118	95	74	56	44	-144
Central America	207	176	133	90	59	37	25	-182
South America	198	176	142	106	66	43	30	-168
Oceania	186	165	128	98	79	66	52	-134
Rest of the World	186	172	118	91	65	52	35	-150
World	214	197	145	119	91	79	59	-155

Source: UN (2013a), State of the Tropics project.

*Number of deaths per 1,000 live births.

Box 6.2.2 Impact of infectious diseases

Infectious diseases disproportionately affect poor people who lack access to basic prevention and treatment services (UNICEF 2012b). As such, the proportion of deaths due to infectious diseases is a marker of health equity. Although the civil registration systems in many nations are insufficient to accurately attribute cause of death, in developing nations infectious diseases are estimated to be responsible for a substantial proportion of child deaths.

Infectious diseases are preventable and can most often be treated effectively, yet are estimated to be responsible for around two-thirds of under-five deaths worldwide (UNICEF 2012b). The most important infectious causes of death in children under five are pneumonia (responsible for 18% of deaths), diarrhoeal diseases (11%) and malaria (7%).

More than half of the global under-five deaths caused by pneumonia or diarrhoea occur in just four nations – India, Nigeria, the Democratic Republic of the Congo and Pakistan (UNICEF 2012b). Africa is disproportionately affected by some infectious diseases, and bears 92% of child deaths due to malaria and 90% of child deaths due to AIDS in 2008 (Black et al. 2010). Undernutrition increases susceptibility and risk of death from infectious diseases and, while rarely recorded as a cause of death, is estimated to be a contributing factor in one-third of all under five deaths (Black et al. 2010).

In the decade to 2010 greater efforts against infectious diseases contributed to substantial declines in child deaths from a number of infectious diseases. For example, since 2000, increased measles immunisation coverage contributed to a 74% decline in child deaths from the disease to 2010 (UN 2012a). While progress is being made, millions more young children's lives can be saved through appropriate nutrition combined with programs to prevent and manage diarrhoea, pneumonia, malaria and HIV infection (WHO 2013g).

While many maternal deaths have direct obstetric causes (such as haemorrhage or abortion), infectious diseases are an important indirect cause of maternal death in developing nations, with studies suggesting they are often under-diagnosed in relation to maternal mortalities (Ordi et al. 2009). In Mozambique for example, infectious diseases were found to account for a higher proportion of maternal deaths than direct obstetric causes, with HIV-related complications and malaria being key contributors (Menendez et al. 2008).

Acknowledging the impact of infectious diseases on women's and children's health the United Nations Global Strategy for Women's and Children's Health stresses the need to strengthen linkages between disease-specific programs (such as for HIV, malaria and tuberculosis), and maternal and child health interventions.



Immunising children in Cambodia. Image: Chhor Sokuntha, World Bank Photo Collection.



Mothers in Mali at a breastfeeding clinic.
Image: Dominic Chavez, World Bank Photo Collection.



Obesity and non-communicable diseases

Non-communicable diseases (NCDs) include heart disease, stroke, cancer, chronic respiratory diseases and diabetes. Unlike infectious diseases, NCDs are not passed from person to person, and are also known as chronic diseases as they are of long duration and generally progress slowly. As the global burden of infectious diseases, malnutrition and maternal and child illness has decreased over the past two decades, the burden of NCDs has increased. NCDs are now the major cause of disability and premature death, responsible for 54% of global disability adjusted life years (DALYs)⁴ in 2010, up from 43% in 1990 (Murray et al. 2012). In addition to human costs, the economic costs of NCDs entrench poverty in low income families and reduce national income. The magnitude of the epidemic was highlighted at the United Nations (UN) General Assembly High-Level Meeting on the prevention and control of NCDs held in September 2011, which was only the second time that a high-level UN meeting has been dedicated to a health topic after the meeting on HIV/AIDS in 2001.

The epidemic of NCDs is being driven by demographic ageing, rapid urbanisation and the global spread of unhealthy lifestyles, including increasingly energy-dense diets and low levels of physical activity (WHO 2010c). Obesity⁵ is a major risk factor for a number of NCDs such as type 2 diabetes, many cancers and cardiovascular diseases, and is generally detrimental to longevity, disability-free life years, quality of life and productivity (Wang et al. 2011). Obesity has increased rapidly since the 1970s and now affects more than 500 million people worldwide, and is responsible for at least 2.8 million deaths annually (WHO 2013j). Obesity is also becoming more prevalent in children, with implications for the future health and development of nations (de Onis et al. 2010). In some regions obesity has overtaken tobacco as the largest preventable cause of disease burden (Swinburn et al. 2011).

Although obesity as a public health problem has historically been limited to high income nations it has now reached epidemic proportions in many developing nations, and is a major factor in the rapid increase in NCDs across all segments of society worldwide (WHO 2013j). Significantly for

the Tropics, low- and middle-income nations now bear 80% of the global NCD burden (WHO 2010c).

Trends

Almost 530 million adults across the world were obese in 2010, up from 350 million in 2002, as the obesity rate increased from 7.9% to 10.5% (see Table 6.2.5). In the Tropics the adult obesity rate increased from 4.4% to 6.8%, while in the Rest of the World it increased from 10% to 12.8%. The obesity rate in the Tropics is around half that in than the Rest of the World, but is increasing at a faster rate.

Obesity rates increased in all regions of the Tropics in the eight years to 2010, with the greatest increases in Central America (23.1% to 31.6%), the Caribbean (14.7% to 22.9%) and South America (13.9% to 21.4%). Since 2002 these three regions have consistently reported the highest obesity rates, and in 2010 South America had the largest number of obese adults in the Tropics, at 46 million. Within regions however there is considerable variation across nations, particularly in the Caribbean where obesity rates range from 11% in Haiti to 37% in Trinidad & Tobago. In Central America obesity rates range from 12% in Honduras to 36% in Mexico.

In Oceania, Micronesia, Tonga and Samoa had obesity rates of 72%, 71% and 51% respectively in 2010 – the highest national rates in the world. A shift towards more calorie-dense diets and less physical activity is driving the obesity epidemic in the region (see Box 6.2.3). By contrast, Papua New Guinea and the Solomon Islands, which are also in Oceania, had obesity rates of 5% and 12% respectively, and are a major influence on the regional obesity rate of 18%. If these two nations are removed from Oceania, the obesity rate doubles to be 36% in 2010 – the highest rate among the tropical regions. In both Papua New Guinea and the Solomon Islands, relatively low national obesity rates mask significant variation within each nation, with undernutrition coexisting with an increasing prevalence of overweight and

'Non-communicable diseases are a major barrier to economic growth and social development. Their prevention and control must, therefore, be integrated into national and global development agendas.'

Mwai Kibaki,
President of Kenya (2011)

obesity, especially in urban areas (Andersen et al. 2013, Sakaue 2003).

At 1.7%, South Asia had the lowest obesity rate in 2010, though this equates to more than 9 million obese adults. Other tropical regions where obesity rates are relatively low are South East Asia, Central & Southern Africa and Northern Africa & Middle East.

Determinants and prevention

A defining feature of NCDs is that the major risk factors – such as obesity, high blood pressure and high cholesterol – can be prevented or lessened by modifying underlying behaviours such as tobacco use, physical inactivity, unhealthy diet and harmful use of alcohol. It is estimated that up to 80% of heart disease, stroke and type 2 diabetes, and over one-third of cancers could be prevented through healthy diet, regular physical activity and avoidance of tobacco use (WHO 2008a).

Historically, obesity was predominantly associated with individual behaviour, but as the obesity epidemic has spread over the past decades there has been an increasing focus on the external determinants of energy imbalances (Caballero 2007). Economic growth (see Box 6.2.4), greater food availability and more effective marketing of energy-dense foods are the major factors contributing to higher obesity rates, but a range of other factors are also important. These include social and cultural norms, environmental impacts such as the degree of urbanisation, psychological motivations for physical activity (Gortmaker et al. 2011) and income inequality (Swinburn

et al. 2011). Complex genetic and epigenetic mechanisms are also a factor, with adult obesity and risk of chronic disease increasingly linked with maternal obesity and undernutrition in early life (Barker 2012, Drake & Reynolds 2010), and the risk of chronic disease increasing at a lower BMI in some Asian and Latin American populations than in other populations (James 2008).

Obesity is the only major cause of preventable death that public health measures are yet to reverse in any population (Swinburn et al. 2011). Initiatives to address obesity have largely focused on influencing consumer decision making through information dissemination, health promotion and marketing strategies. Nonetheless, there is little consensus on the most effective approach, due partly to the range and complexity of obesity determinants (Gortmaker et al. 2011). What is clear though is that as the health, social

and economic impacts of obesity mount there is greater awareness of the need for effective solutions, and recognition that collaboration between industry, government and the community will be necessary to strike a balance between commercial and public policy objectives. Strategies may include changes in food production and marketing, as well as new approaches to urban planning and transportation (Caballero 2007).

The double burden of disease

Most low- and middle-income nations now face a 'double burden' of disease where the prevalence of NCDs is increasing rapidly while infectious diseases and under-nutrition remain major public health issues (Remais et al. 2013). Low- and middle-income nations bear 80% of the global burden of NCDs, and comprise 29 million (around 80%)

of the 36 million deaths from NCDs each year (WHO 2013d). Over 80% of global cardiovascular and diabetes deaths, almost 90% of deaths from chronic obstructive pulmonary disease and more than two-thirds of all cancer deaths occur in these nations (WHO 2010c). NCD-related mortality also occurs at an earlier age in developing nations – of the 9 million annual NCD deaths of people aged less than 60 years, more than 90% are in low- and middle-income nations (WHO 2013d). Different levels of access to adequate chronic health care services between developing and developed nations contribute to the higher mortality rates and premature deaths. The high NCD burden in low- and middle-income nations is driven by an increasing prevalence of risk factors, including obesity. Globally, 44% of the diabetes burden, 23% of the ischaemic heart disease⁶ burden and between 7% and 41% of certain cancer burdens are attributable to excessive weight (WHO 2013j). At the same time as around 2 billion adults worldwide are overweight and obese, a further 1 billion people are undernourished. Undernutrition and obesity now co-exist in many developing nations, even within households (WHO 2013j). While obesity in lower income nations has traditionally been associated with wealthier and urban populations, there is evidence that this is changing, and that obesity rates in many low income and rural populations are increasing rapidly (Popkin et al. 2012).

Increasing rates of obesity and NCDs among lower income nations present considerable challenges for both families and nations. Economic estimates suggest that the cumulative output loss of cardiovascular disease, chronic respiratory

⁴ DALYs are a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death.

⁵ The World Health Organisation defines obesity as a body mass index (BMI) greater than or equal to 30, and overweight as a BMI of 25 or more. BMI is calculated as a person's weight in kilograms divided by the square of their height in metres.

⁶ Ischemic heart disease (IHD) is characterised by reduced blood supply to the heart muscle, usually due to coronary artery disease. The risk of IHD increases with age, smoking, high cholesterol levels, diabetes, and high blood pressure. It is more common in men, and people who have close relatives with ischaemic heart disease.

Table 6.2.5 Adult obesity rates^A

	2002	2005	2010	PPT* change 2002-10	Average Annual Growth
Tropics	4.4	5.2	6.8	2.3	5.5
Central & Southern Africa	2.2	2.6	3.3	1.2	5.5
Northern Africa & Middle East	4.7	5.4	6.2	1.5	3.6
South Asia	0.9	1.1	1.7	0.8	8.0
South East Asia	1.9	2.3	3.4	1.5	7.7
Caribbean	14.7	17.9	22.9	8.1	5.6
Central America	23.1	26.0	31.6	8.5	4.0
South America	13.9	16.3	21.4	7.5	5.6
Oceania	14.3	15.7	18.2	3.9	3.1
Rest of the World	10.0	10.9	12.8	2.8	3.1
World	7.9	8.8	10.5	2.6	3.6

Source: WHO (2012a), State of the Tropics project
^APercent of population *Percentage point

disease, cancer, diabetes and mental health will be US\$47 trillion over the next 20 years (Bloom et al. 2011). This loss, divided by the 20-year period, is equivalent to about 5% of global GDP in 2010. Developing nations are predicted to assume an increasing share of this economic burden as their economies and populations grow. A further challenge stems from the structure of health systems in many developing nations, which are historically shaped around acute care rather than chronic care. In these nations NCDs are often detected at a late stage when treatment costs are typically higher (WHO 2010c). As access to these interventions is costly, families can struggle to afford them, further entrenching poverty by reducing the resources available for food, shelter and education (WHO 2010c). As NCDs affect people over long periods of time a key challenge for developing nations will be to develop health promotion and primary care capacity to address risk factors, detect NCDs early, reverse disease progression and prevent complications (WHO 2010c).

If current trends persist the prevalence of NCDs globally is predicted to increase by 15% between 2010 and 2020 (WHO 2008a). The greatest increases are anticipated in Africa (27%), the Middle East (25%) and in Asia and the Pacific (21%). NCDs therefore represent a significant challenge for the Tropics, with implications for other development challenges in the region such as poverty reduction (WEF 2010).

Diabetes

Obesity is responsible for 44% of the global diabetes burden (WHO 2013j). Around 90% of people with diabetes have type 2 diabetes, which is caused by a combination of genetic and lifestyle factors, including excess body weight, high blood pressure, physical inactivity and a diet high in fat and sugar. There is no cure for type 2 diabetes, but it can generally be prevented through moderate diet and lifestyle changes and, once acquired, it can be managed through a combination of lifestyle modifications and medication to control blood glucose levels. If unmanaged, the disease

Box 6.2.3 Obesity in Pacific Island nations

Many tropical Pacific Island nations are suffering an obesity crisis, with the highest adult obesity rates in the world. Compared with a global rate of 10% in 2010, obesity rates in Tonga and the Federated States of Micronesia were over 70%, and over 50% in Samoa.

A unique array of factors contributes to these high and growing obesity rates. In many of these island nations Western influences have increased since World War II, and traditional diets of fresh fish, meat, and local fruits and vegetables have been replaced by imported products such as rice, sugar, flour, canned meats, canned fruits and vegetables, soft drinks and beer (Curtis 2004). At the same time urbanisation and the increasing use of motor vehicles have decreased physical activity, and a cultural preference for a large physical size has amplified the epidemic in some nations (Curtis 2004). Research suggests that Pacific Islanders may also have a genetic predisposition to obesity (Walley et al. 2006).

Obesity in Pacific Island nations is resulting in increases in NCDs such as diabetes, stroke and heart disease. NCDs are now the leading cause of death in many of these nations, frequently accounting for 70% of all deaths (World Bank 2012). Rates of adult diabetes are among the highest in the world, and the average age at which Pacific Islanders develop diabetes and cardiovascular disease is getting lower (WHO 2010d). NCDs present a particular threat to future health in these nations as obesity is occurring at an early age – for example, nearly one in four boys and one in five girls in Tonga is obese (World Bank 2012).

The growing burden of NCDs in these nations also presents significant financial and health system challenges, with many still experiencing a high burden of communicable, maternal, neonatal and nutritional conditions.



Exercise program to combat obesity in Nauru. Image: Lorrie Graham, DFAT.

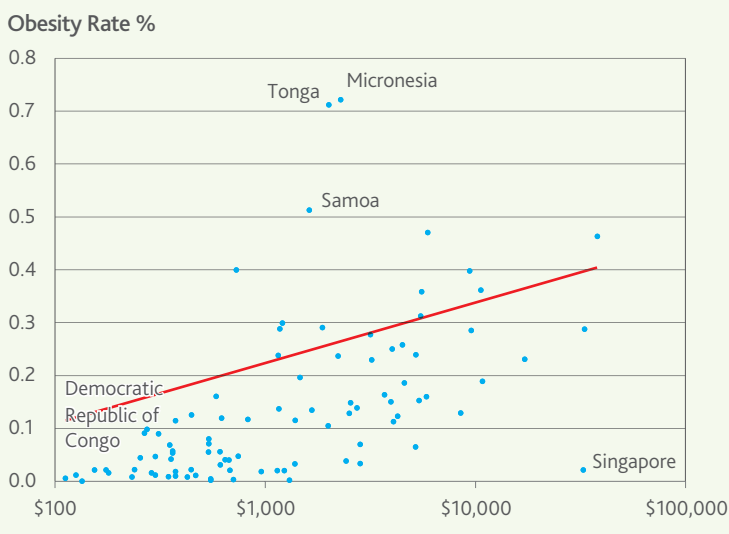
Box 6.2.4 Obesity and economic growth

A range of demographic, epidemiological and technological transitions are linked with obesity, and many are also associated with economic growth and rising wealth. For example, urbanisation tends to occur as economies modernise, contributing to changes in nutritional intake and activity levels, and a shift from infectious to non-communicable diseases (Swinburn et al. 2011).

Gross domestic product (GDP) per capita is an indicator of economic prosperity and, as such, obesity risk. In the Tropics, the general relationship between GDP per capita and obesity rates (see chart below) indicates that obesity and the risk of developing NCDs is likely to increase for millions of people as low- and middle-income nations develop.

However, a high level of prosperity is not required for obesity to become a public health issue, as there are also many other factors that influence obesity risk – as reflected in the considerable variation in obesity rates between nations that have similar GDP per capita. For example, the Pacific Island nations of Tonga, the Federated States of Micronesia and Samoa have the highest obesity rates in the world yet are lower-middle income nations with GDP per capita of around US\$2,000. Conversely, Singapore is one of the wealthiest nations in the world, yet has an obesity rate of 2.1%.

Figure 6.2.8 Obesity and GDP per capita in the Tropics, 2010



Source: WHO (2012a), World Bank (2013), State of the Tropics project

can lead to serious damage of nerves and blood vessels, and premature death. Until recently type 2 diabetes was only a disease in adults, but it is now increasingly diagnosed in children (Walley et al 2006).

Diabetes affects 6.4% of adults worldwide, or 285 million adults in 2010, with the number doubling since 1980 due to a combination of population ageing and rising obesity rates. By 2030 diabetes is predicted to affect 7.7% of the world's adult population, with a 69% increase in the number of adults with diabetes in developing nations, and a 20% increase in developed nations (Shaw et al. 2009). This highlights the particular relevance of the disease to low- and middle-income nations which already shoulder more than 80% of global diabetes deaths (WHO 2013n). In addition, diabetes in these nations presents a unique public health threat as it increases the risk of developing tuberculosis – which is still highly prevalent in many impoverished communities – by a factor of three (Baker et al. 2011). With diabetes accounting for 11% of global health care expenditure in 2011 (World Bank 2012), diabetes also presents a significant financial challenge for developing nations.

Looking Forward

Obesity is contributing to the growing global prevalence of NCDs and is emerging as one of the greatest global public health challenges. International recognition of the burden of NCDs and key risk factors such as obesity is increasing, with a number of resolutions, targets and action plans being developed and implemented.

NCDs present a particular challenge for low income nations that also face a significant burden from communicable diseases and undernutrition. NCDs are presenting significant human, social, economic and health system challenges in these nations, and growing rates of obesity have major implications for global development and unquestionable significance for the Tropics, which is home to 75% of the world's low-income population.

HIV and AIDS

Acquired Immune Deficiency Syndrome (AIDS) was first recognised in the early 1980s and has since become a significant public health problem in almost every country. AIDS is caused by the human immunodeficiency virus (HIV) which damages the body's immune system until it can no longer protect itself from infection and disease (WHO 2013b). There is no preventive vaccine for HIV, but antiretroviral therapy suppresses the replication of HIV in the body and significantly increases the life expectancy of people with HIV. Globally, access to antiretroviral treatments has increased since the mid-1990s, transforming HIV from a death sentence to a chronic, manageable disease in many nations.

Transmission of HIV occurs through three routes. Sexual transmission accounts for the vast majority of people who are newly infected. It is also spread through blood (via infected blood or blood products, or the use of non-sterile injecting equipment), and from infected mothers to their babies before birth, during delivery or through breastfeeding. In most regions the HIV epidemic is concentrated among key high-risk populations, while in the most affected regions the epidemic is 'generalised' – that is, more than 1% of the general population is living with HIV (UNAIDS 2009). Misconceptions about HIV transmission (notably that it can be transmitted through day-to-day contact) and the marginalisation of high risk populations contribute to ongoing and widespread HIV-related stigma and discrimination.

The global impact of AIDS is undeniable, and the epidemic has been described as 'an unprecedented human catastrophe' (UN 2011a). Since the 1980s AIDS has significantly affected human and economic development in many nations, claimed over 30 million lives, orphaned more than 16 million children (UN 2011a) and, in the most affected nations, erased decades of progress in reducing mortality (UN 2009). Co-infection with other diseases is also a significant issue (see Box 6.2.5). As HIV primarily affects working age populations it has also had a substantial impact on labour supply, productivity and economic output (Dixon et al. 2002), and has severely undermined agricultural systems and food security in many nations (FAO 2003).

While 2.5 million people acquired HIV in 2011, the number of new infections globally has been declining since the mid-1990s. Nonetheless, in some parts of the world and within some populations the number of new infections is rising. Globally it is estimated that less than half of the people living with HIV are aware of their infection (UN 2011a). As a reflection of the continuing impact of the epidemic, 87% of governments across the world view HIV/AIDS as a major population and demographic concern, and it is a key factor limiting increases in life expectancy in the most affected nations (UN 2009).

Trends

The extent and impact of the HIV epidemic can be measured in terms of incidence (new cases), prevalence (all cases) and AIDS mortality (deaths). The number of new HIV cases provides the clearest indication of the impact of prevention strategies, but available time-series data on this indicator are limited. More comprehensive data are available for HIV prevalence and AIDS mortality, which are useful for understanding the occurrence of HIV and the impact of HIV treatment programs.

Number of People Living with HIV

The number of people between the ages of 15 and 49 living with HIV in the Tropics is higher than in the Rest of the World. In 2010 there were 16.9 million 15 to 49 year olds in the Tropics living with HIV, compared with 9.6 million in the Rest of the World (see Table 6.2.6). That is, the Tropics accounts for around 64% of people in this age group living with HIV, despite representing only 41% of its global population. While the number of new HIV infections is estimated to have peaked globally in 1996 (UN 2009), the number of 15–49 year olds living with HIV continues to increase, including in the Tropics.

In the Tropics Central & Southern Africa is the region most affected by the epidemic, with nearly 13 million 15 to 49 year olds living with HIV in 2010. This is 76% of all 15 to 49 year olds living with HIV in the Tropics, and almost 50% of global infections in this age group.

'We live in a completely interdependent world, which simply means we cannot escape each other. How we respond to AIDS depends, in part, on whether we understand this interdependence. It is not someone else's problem. This is everybody's problem.'

Bill Clinton

Prevalence

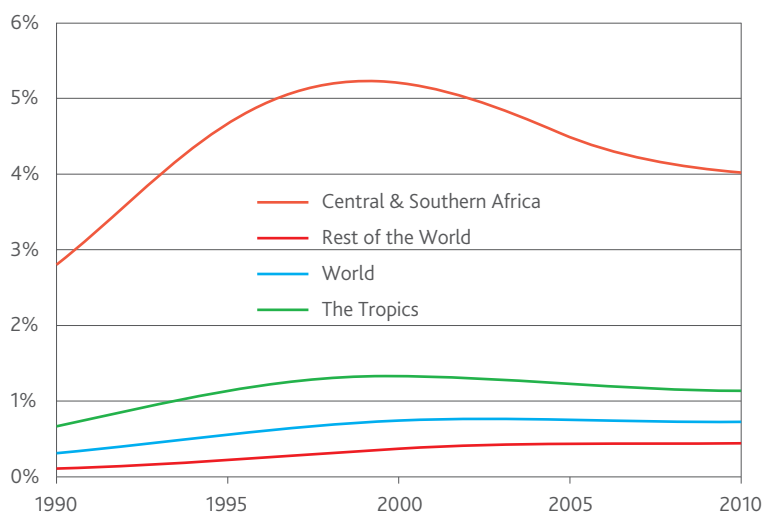
HIV prevalence is the proportion of a population living with the disease. While a useful indicator, HIV prevalence can be challenging to interpret as it is a function of both HIV incidence and AIDS mortality.

HIV prevalence among people aged 15 to 49 years is higher in the Tropics than in the Rest of the World (see Figure 6.2.9). Prevalence increased rapidly in the Tropics in the 1990s, peaking at 1.3% in 2000 before trending down to 1.1% in 2010. In the Rest of the World HIV prevalence in this age group also increased in the 1990s and early 2000s, but unlike the downward trend in the Tropics, has remained relatively steady at just above 0.5% since 2003.

In the Tropics HIV prevalence is highest in Central & Southern Africa where 4% of the population aged 15–49 years were living with the disease in 2010. This is almost four times higher than prevalence in the Tropics as a whole, and reflects the disproportionate burden of HIV in sub-Saharan Africa, where nearly 1 in 20 adults is living with HIV (UNAIDS 2012). After rising sharply through the 1990s, HIV prevalence in Central & Southern Africa has been falling steadily from the peak of 5.2% in 1999. The Caribbean has consistently reported the second highest prevalence in the Tropics.

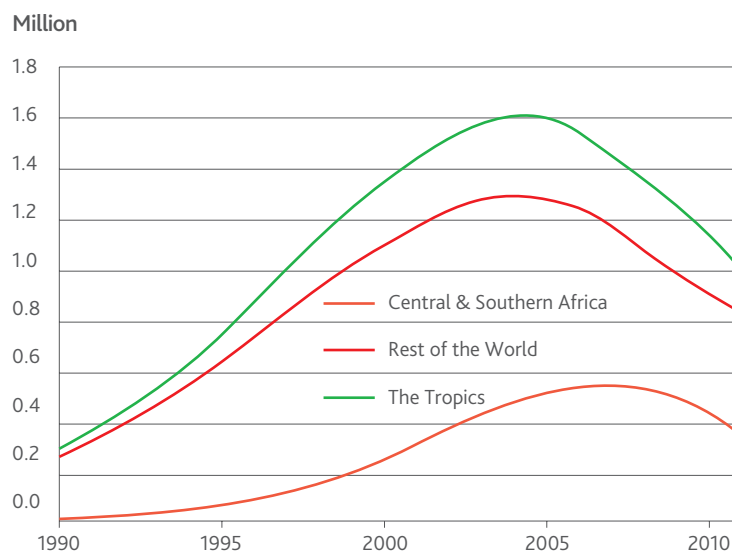
Prevalence in most tropical regions peaked in the 1990s and has since stabilised or declined. Declining prevalence may reflect a combination of fewer new cases of HIV and/or increasing AIDS mortality rates. Looking forward, even if incidence is declining, improved access to

Figure 6.2.9 HIV prevalence (% of population aged 15-49 years)



Source: World Bank (2013a), WHO (2013b), State of the Tropics project.
Note: Calculations exclude China and a number of smaller nations.

Figure 6.2.10 Deaths from AIDS



Source: World Bank (2013b), WHO (2013p), State of the Tropics project.
Note: Mortality rates are not age-standardised. Calculations exclude a number of nations⁹.

antiretroviral therapy in low- and middle-income nations is likely to result in HIV prevalence increasing as people with the disease live longer, as has been occurring in many high-income nations over the past 15 years (WHO 2012f).

Mortality

In 2011 around 1 million people in the Tropics died from AIDS, down from a peak of over 1.6 million people in 2004 (see Figure 6.2.10). AIDS mortality in the Tropics peaked at 62 deaths per 100,000 people in 2003, declining to 40 per 100,000 people in 2010 (see Table 6.2.7). AIDS mortality is also declining in the Rest of the World, down from a peak of 14 deaths per 100,000 people in 2006 to 11 in 2010.

The sharp decline in the AIDS mortality rate in the Tropics since 2003 reflects greater access to antiretroviral therapy in highly affected parts of Africa. In sub-Saharan Africa 30% fewer people are estimated to have died from AIDS in 2010 than in 2004 despite an increase in the number of adults

living with HIV (WHO 2013i). Globally however, improvements have not however been universal, and in some parts of Eastern Europe AIDS mortality rates have been increasing since 2000.

The AIDS mortality rate in Central & Southern Africa has consistently been considerably higher than in other regions of the Tropics. For example, in 2010 the mortality rate in Central & Southern Africa was almost five times higher than in the Caribbean, the region with the next highest mortality rate. In both Central & Southern Africa and the Caribbean the AIDS mortality rate has been declining since the early 2000s, largely attributable to initiatives that have expanded access to antiretroviral therapy. By 2010 the AIDS mortality rate had decreased to 131 deaths per 100,000 people in Central & Southern Africa and to 28 per 100,000 people in the Caribbean. All regions of the Tropics have experienced declining AIDS mortality rates since 2005.

Children and young people

Around 3.4 million children aged between 0 and 14 years were living with HIV in 2011 (WHO 2013r), of which 330,000 were newly infected (UNAIDS 2012). Over 90% of new infections are in sub-Saharan Africa, and most of these children acquire HIV from their mother (WHO 2013r). Transmission of HIV to children can be reduced significantly if pregnant women living with HIV have access to antiretroviral therapy (UNAIDS 2011a). In 2011, 57% of pregnant women with HIV in low- and middle-income nations received

⁹ Based on nations for which the World Bank or WHO report data. By population, China is the largest nation for which data are unavailable. The following exclusions are made in the Tropics (expressed as a percentage of the 2010 regional population): 15% of Oceania (11 nations); 11% of Caribbean (6 nations); 22% of South East Asia (3 nations); less than 1% if China is not included); 13% of Northern Africa & Middle East (2 nations); and 9% of Central & Southern Africa (2 nations). Nations in the Rest of the World for which data were unavailable represent 40% of the population, with China, Russian Federation, Algeria, Uzbekistan, Iraq and Argentina accounted for the greatest proportion.

antiretroviral therapy – an increase from previous years (WHO 2010b). Increased maternal access to treatment combined with fewer newer infections among adults and infant feeding programs resulted in a 43% decrease in the global number of new infections among children in 2011 compared with 2003 (UNAIDS 2012).

Young people between the ages of 15 and 24 years are also significantly affected by HIV, with 10.3 million living with HIV in 2011 (UN 2011a). It is estimated that 50% of global HIV transmission takes place among young people, and factors contributing to this vulnerability include risky sexual behaviour, substance use and a lack of knowledge about HIV and its prevention (Ross et al. 2006).

In the 38 nations with generalised HIV epidemics – of which 35 are in the Tropics, and all but two are in Africa – the number of deaths from AIDS among children under the age of five peaked at over 210,000 in 2003, and has since declined to around 100,000 in 2011. The declining deaths among children are attributable to reduced mother to child transmission rates and, to a lesser extent, the expansion of treatment access for children. While the number of children receiving antiretroviral therapy worldwide has increased from 71,500 in 2005 to 456,000 in 2010, treatment coverage is still less than one quarter of what is required (Zaidi et al. 2013).

High risk populations

The impact of AIDS varies between and within nations. Generalised epidemic conditions exist in the most affected nations and regions, while in less affected areas the epidemic is concentrated in sub-populations engaging in high-risk behaviours (Zaidi et al. 2013). In most parts of the world HIV disproportionately affects men who have sex with men, injecting drug users and sex workers (UNAIDS 2011b). These highly marginalised sub-populations can often face additional stigma if they contract HIV, and the additional risk of HIV-related verbal and physical abuse can impact their willingness to access treatment services

Box 6.2.5 Linked epidemics of HIV and tuberculosis

The HIV epidemic is a major factor driving the global resurgence of tuberculosis (TB), particularly in sub-Saharan Africa (Suther et al. 2012). Infection with HIV has become the strongest risk factor for developing TB. Around one-third of the 34 million people living with HIV worldwide are also infected with TB, and 1.1 million new cases of TB occurred among people living with HIV in 2010 (WHO 2012h). In sub-Saharan Africa almost 900,000 people living with HIV acquired TB in 2011 (UNAIDS 2012). Globally, TB is now the leading cause of death among people living with HIV (UN 2011a).

Combined, TB and HIV are far more damaging to human health than either disease alone, with each disease accentuating the progression of the other. People living with HIV are 21-34 times more likely to become sick with TB than people without HIV (WHO 2012h). Similarly, TB acts to increase the rate at which the HIV

virus replicates in a co-infected person, worsening the course of their HIV infection (Sharma et al. 2005). This co-infection pattern is destabilising global TB control efforts and represents a worldwide public health crisis (Rodwell et al. 2010).

Treatment for both HIV and TB are necessary for the effective management of people co-infected with these diseases. Antiretroviral therapy can reduce the risk of becoming sick with TB among HIV patients by 65%, and significantly reduces the risk of dying from TB (UNAIDS 2012). Initiatives to integrate HIV and TB services are increasing and are estimated to have saved 1.3 million lives between 2005 and 2011 (WHO 2012k). Screening for both TB and HIV is increasing among affected populations, although less than half of all people living with TB and HIV worldwide received antiretroviral therapy in 2011 (UNAIDS 2012).



Preventing the spread of HIV and TB. Image: Trinn Suwannapha, World Bank Photo Collection.

(UNAIDS 2012). In some nations migrants, military personnel, prison populations and truck drivers are also at higher risk of HIV infection (UNAIDS 2009).

Men who have sex with men are at higher risk of HIV infection across all nations and ethnicities (Johnson et al. 2008), with HIV prevalence in capital cities for this group being 13 times higher on average than in national populations (UNAIDS 2012). Similarly, female sex workers have been found to be 13.5 times more likely to be living with HIV than other women. For people who inject drugs, HIV prevalence is 22 times higher than in the general population, though this varies significantly across nations. In the Tropics for example, the prevalence of HIV among people in this group ranged from below 5% in Australia to in excess of 50% in Mauritius.

Despite the variation, drug-related transmission is believed to be driving the expansion of the HIV epidemic in many nations (UNAIDS 2012).

Gender

Globally AIDS is the leading cause of death among women of reproductive age, and women bear a disproportionate share of the HIV care-giving burden (UN 2011a). While the share of women among all persons living with HIV varies significantly between different regions of the world (from 34% in Asia to 58% in sub-Saharan Africa in 2010) (UNAIDS 2012), young women aged between 15 and 24 years account for 66% of the young people living with HIV worldwide (UNAIDS 2010). In many

of the highly affected nations major socioeconomic and political inequalities persist between males and females. The lower status of women in these societies limits their decision-making power and increases their vulnerability to violence and HIV infection. Initiatives that aim to tackle gender inequality – such as combating gender-based violence and fostering economic empowerment of women – are considered critical elements of an effective HIV response (UNAIDS 2012).

The vulnerability of men to HIV infection is an area of increasing focus. Even where there is widespread knowledge of HIV, heightened risk taking among young men can increase their exposure to HIV though risky sexual practices such as multiple partners and not using condoms (Nzewi 2009,

Table 6.2.6 Number of 15-49 year olds living with HIV*

	1990	1995	2000	2005	2010	% of Tropics
Tropics	6,502	13,073	16,564	16,641	16,945	
Central & Southern Africa	5,009	9,883	12,597	12,462	12,881	76.0
Northern Africa & Middle East	156	314	413	447	491	2.9
South Asia	288	896	1,307	1,422	1,152	6.8
South East Asia	543	1,068	1,205	1,228	1,337	7.9
Caribbean	125	195	205	192	183	1.1
Central America	113	165	194	204	278	1.6
South America	260	536	615	656	594	3.5
Oceania	8	16	26	29	31	0.2
Rest of the World	1,866	3,575	7,294	9,163	9,600	
World	8,368	16,649	23,859	25,804	26,545	

Source: World Bank (2013a), WHO (2013b), State of the Tropics project
 Note: Calculations exclude China⁷ and a number of smaller nations⁸. *Thousands ('000s)

⁷ No data are available for China, but its government estimates that HIV prevalence is high (above 1%) in certain regions and in high risk populations, with a substantial proportion of infected people yet to be diagnosed (Ministry of Health 2012).

⁸ Based on nations for which the World Bank or WHO report data. By population China is the largest nation for which data are unavailable. Due to lack of data the following exclusions are made in the Tropics (expressed as a percentage of the 2010 regional population aged 15-49 years): 14% of Oceania (11 nations); 10% of the Caribbean (6 nations); 23% of South East Asia (3 nations; less than 1% if China is not included); 14% of Northern Africa & Middle East (2 nations). Nations in the Rest of the World for which data were unavailable represented 37% of the population of 15-49 year olds.

Plummer 2009). In many societies HIV is also linked to the male taboo of homosexuality, and the stigma associated with having HIV is very real for many men (Plummer 2009). This stigma can discourage men with HIV from admitting ill health, seeking medical advice and accessing antiretroviral therapy, and contributes to higher AIDS mortality rates among men (UNAIDS 2012). These behaviours can also act to amplify the epidemic across the community (Plummer 2009). These issues highlight the need to consider social context, and in particular gender norms and inequalities, in the development and implementation of effective HIV prevention initiatives.

Looking forward

The devastating global impact of AIDS continues to mobilise significant resources, and dramatic progress has been made in combatting the disease over the

past two decades (UNAIDS 2012). The number of people receiving antiretroviral therapy worldwide is increasing, new infection rates are falling in many of the most highly affected nations and new, bold targets are being set (see Box 6.2.6). In fact, the goal of eliminating HIV and AIDS is now seen as feasible (UN 2011a), with global efforts being targeted towards the vision of ‘a world with zero new HIV infections, zero discrimination, and zero AIDS-related deaths’ (UNAIDS 2011c).

Despite the numerous gains, significant challenges need to be overcome if HIV is to be eliminated. These include improving the targeting of strategies and programs to match country-specific needs, better understanding the factors that contribute to HIV vulnerability and that impede service access and identifying the most efficient and effective use of limited AIDS resources. As the region most highly affected by the AIDS epidemic, the Tropics has a lot to gain from global HIV elimination initiatives.

Box 6.2.6 HIV and health systems

The role of the health system in combating the HIV/AIDS epidemic has changed over time. Prior to the introduction of antiretroviral therapy health systems delivered short-term acute care for AIDS patients, but as more people across the world are living longer with HIV, health systems are now also required to deliver integrated, long-term HIV care and treatment services (Atun 2011). Many nations – and especially low- and middle-income nations – are facing significant challenges in making this transition.

HIV is a communicable disease, yet it now shares common health system requirements with non-communicable diseases. These requirements include long-term diagnostic and monitoring capacity, regular medication and adherence support, and patient education capability (Rabkin et al. 2012).

For people living with HIV, co-morbidities (e.g. HIV and TB), opportunistic infections and much longer life expectancies now mean that effective treatment requires long-term, individualised care (Atun 2011). Care for people living with HIV is becoming more complex, requiring greater resourcing and better integration of services.

Policy makers and service providers face a number of planning challenges to ensure that health systems adequately meet patient needs, particularly in developing nations. An adequate health workforce, new competencies to manage increasingly complex care and integrating HIV and mainstream health services are necessary to optimise patient outcomes (Atun. 2011).

For most patients the key challenges relate to access and affordability of treatment. Health system capacity to meet these challenges can be enhanced by the development of efficient and innovative models of care that are tailored to community needs.

Effective care strategies that are developed for people living with HIV can also have broader health system benefits (Rabkin et al. 2012). For example, in Ethiopia the lessons learned in developing HIV care programs are now informing the clinical management of diabetes (UNAIDS 2012).

Table 6.2.7 AIDS mortality rate*

	1990	1995	2000	2005	2010
Tropics	15	34	56	60	40
Central & Southern Africa	68	139	208	213	131
Northern Africa & Middle East	11	22	34	35	24
South Asia	1	2	10	16	13
South East Asia	1	5	12	12	9
Caribbean	16	38	55	52	28
Central America	3	7	11	9	6
South America	3	6	10	9	8
Oceania	2	12	15	20	11
Rest of the World	1	2	7	14	11
World	6	15	26	33	23



Source: World Bank (2013b), WHO (2013p), State of the Tropics project.

*Deaths per 100,000 population

Note: Mortality rates are not age-standardised.

**AIDS IS JUST A
DISEASE PREVENT IT**

**ABSTAIN AND BE SAFE
HAVE MORALS AND STICK
TO THEM
BE POSITIVE IN LIFE NOT
HIV POSITIVE. HELP US FIGHT
FEAR SHAME IGNORANCE AND
INJUSTICE AT
KUTLWANO CTSS ON THOSE
AFFECTED AND
INFECTED BY AIDS**



Tuberculosis

Tuberculosis (TB) is a serious but treatable infectious disease caused by the bacterium *Mycobacterium tuberculosis* that has potentially killed more people through history than any other microbial pathogen (Daniel 2006). In ancient Greece Hippocrates introduced the name 'phthisis', or consumption, to describe the physical wasting caused by the disease. Despite its long presence in human society and significant efforts to control it, TB is the second leading cause of death from infectious diseases worldwide – after HIV– and is a major global public health problem (WHO 2012e).

Around one-third of the world's population is estimated to have a latent infection with the TB bacterium, of which around 10% will develop the disease during their lifetime (WHO 2012i). Nine million people develop TB each year, and around 1.4 million people die from the disease each year (WHO 2012e). Without treatment the infection is almost always fatal. TB most commonly affects the lungs (pulmonary TB), but it can also affect other parts of the body (extra-pulmonary TB) such as the central nervous and lymphatic systems. People at higher risk of TB disease include elderly people, infants and people with compromised immune systems, such as people with HIV or diabetes.

The introduction of antibiotic treatments for TB in the 1950s resulted in cure rates of up to 90% (WHO 2012e), and contributed to incidence and mortality rates declining up until the 1980s, particularly in developed nations. The emergence of drug-resistant strains and HIV co-infection has however seen a global resurgence of TB. The disease burden is now concentrated in developing nations, and over 80% of the world's TB cases are in just 22 nations, 18 of which are in tropical Asia and Africa (WHO 2012e).

Trends

Incidence, prevalence and mortality data are essential to understanding TB risk and burden. Accurate reporting of TB cases is however a major challenge, particularly in low income nations with

under-resourced health systems (see Box 6.2.7). Global reporting rates have improved from 40% in 1995 to 66% in 2011, and TB burden estimates are calculated using models that consider the number of notifications, the estimated degree of underreporting, mortality data and trends in neighbouring nations (WHO 2012e).

Number of new cases

The Tropics bears a disproportionate share of the global TB burden, with an estimated 4.9 million new cases in 2010 (see Table 6.2.8). This represents 56% of new cases, despite the Tropics representing 41% of the world population. The number of new cases in the Tropics peaked in 2003 at 5.2 million, and has since declined by 5%. The number of new cases in the Rest of the World also peaked in 2003 at 4.2 million, and has since declined by 8%.

The global decline in new TB cases is attributable to a combination of global TB diagnosis and treatment programs, as well as biological, social and economic factors such as increased access to improved sanitation and higher per capita health expenditure (Dye et al. 2009). Globally, treatment success rates (that is, the proportion of people who are cured or who complete their treatment) for TB have improved from 57% in 1990 to 85% in 2010 (WHO 2012e). However, success rates vary significantly between nations. In the Russian Federation for example, drug resistant TB is more prevalent and treatment failure rates are high. In the Tropics, Northern Africa & Middle East and Oceania the number of new cases per year has not peaked as yet.

Although the number of new cases has been declining in recent years, in most tropical regions there were more new cases in 2010 than there were in 1990, with the exceptions of the Caribbean, Central America and South America. Across the Caribbean the number of new cases varies considerably by nation, with regional aggregates dominated by Haiti which accounted for almost 75% of new cases in 2010. TB control efforts in Mexico, Brazil and Peru since 1990 have contributed to the consistent downward trend in the number of new cases of TB in Central America

'Let us vow to end the neglect of TB and to end deaths from this disease in our lifetime.'

Ban Ki Moon
Secretary-General of the United Nations (2013)

and South America, with decreases of 36% and 42% respectively from 1990 to 2010.

Central & Southern Africa, South Asia and South East Asia consistently account for around 90% of new cases in the Tropics, with Central & Southern Africa's proportion increasing from 26% in 1990 to 33% in 2010. The number of new cases of TB in all three regions peaked in the early 2000s, and has since fallen most rapidly in South Asia (see Table 6.2.9). However, the number of new TB cases in Northern Africa & Middle East and Oceania has been increasing since 1990.

Incidence

Globally TB incidence (the number of new cases per 100,000 population) was relatively stable in the 10 years to 2000, but has since been in steady decline, falling by 13% since 2000 to be 127 in 2010. In the Tropics TB incidence decreased by 16% to 172, and in the Rest of the World it decreased by 14% to 95. The TB incidence in the Tropics is consistently around 80% higher than in the Rest of the World.

Despite the declining global trend TB incidence is still higher than in 1990 in around 25% of nations, many of which were suffering from a high TB burden in 1990. In the Tropics TB incidence was highest in Central & Southern Africa in 2010 at 240 new cases per 100,000 population (see Figure 6.2.11). Although this is significantly higher than in most other tropical regions it represents a 23% decline from the peak of 313 in 1999. Except for Oceania, which experienced an increase, TB incidence fell in all tropical regions between 1990 and 2010, at rates of between 0.4% and 4.2% per annum. Since 1990 the most dramatic declines have occurred in Central America and South America, where TB incidence fell by 58% and 53% respectively to 2010 (from 71 and 109 cases

per 100,000 respectively in 1990 to 30 and 52 in 2010). In 2010 these two regions had the lowest TB incidence in the Tropics.

Oceania is the only region in the Tropics where TB incidence has increased since 1990, from 193 to 214 in 2010. This was due to increasing rates in Papua New Guinea where TB incidence increased from 308 to 348 (13%), and was supported by increases in three small Pacific Island nations – two of which had increases of more than 200%. PNG has the greatest number of TB cases in Oceania and accounted for 92% of new cases in the region in 2010.

Around 3,600 people die from TB in Papua New Guinea each year, and the high and growing prevalence of drug resistant TB is a significant public health concern (Simpson et al. 2011). Limited health service capacity and coverage,

inadequate drug supplies, poor treatment adherence (Amini et al. 2012) and overcrowded living conditions (Government of Papua New Guinea 2010) are contributing factors.

Deaths

Worldwide an estimated 1.4 million people died from TB in 2011, a 26% decline from 1.9 million in 1990 (WHO 2012e), with the Tropics consistently representing around 60% of global TB deaths. TB is also a major cause of child mortality globally (see Box 6.2.8).

Globally the TB mortality rate (deaths per 100,000 people) has fallen faster and for longer than TB incidence, decreasing by nearly 40% from 1990 to 2010. Between 1990 and 2010 the mortality rate decreased by 42% to 21 per 100,000 in the Tropics, and by 39% to 10 in the Rest of the World. The mortality rate in the

Tropics is more than double that in the Rest of the World.

In the 20 years to 2010 the TB mortality rate has fallen in all regions of the Tropics (see Figure 6.2.12), though the pace of decline has varied considerably – from a 9% decline in the Caribbean to 75% in Central America. South America, Central America, Northern Africa & Middle East and South East Asia each experienced declines in the TB mortality rate of 50% or more. Oceania overtook South Asia in 2009 as the region with the highest TB mortality rate, with 31 deaths per 100,000 people in 2010.

Drug resistance

Drug-resistant TB is a major threat to global TB control (Raviglione et al. 2012), with two levels

Table 6.2.8 Number of new tuberculosis cases*

	1990	1995	2000	2005	2010	% change since 1990	% change since peak
Tropics	4,061	4,533	5,015	5,117	4,911	21	-5
Central & Southern Africa	1,057	1,367	1,661	1,728	1,642	55	-6
Northern Africa & Middle East	147	159	166	172	177	21	n.a
South Asia	1,246	1,355	1,464	1,519	1,452	17	-5
South East Asia	1,255	1,336	1,426	1,427	1,390	11	-11
Caribbean	32	31	34	34	31	-3	-12
Central America	67	57	48	41	40	-42	-42
South America	240	210	196	172	153	-36	-36
Oceania	16	18	22	24	27	63	n.a
Rest of the World	3,664	3,901	4,073	4,105	3,850	5	-8
World	7,725	8,435	9,088	9,222	8,761	13	-6

Source: WHO (2013f), UN (2013a), State of the Tropics project.
*Thousands ('000s)

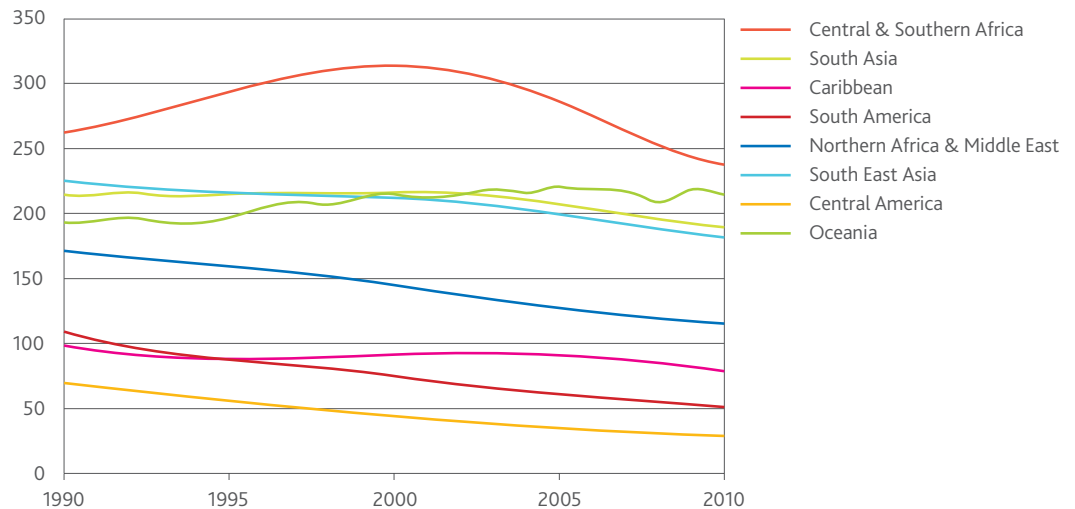
of resistance: multi-drug resistant TB (MDR-TB) and extensively drug-resistant TB (XDR-TB). The major factor contributing to TB drug resistance is inappropriate treatment, including poor compliance (Liang 2012). It is estimated that only 7% of MDR-TB cases are reported and that of these less than one-fifth are managed according to international guidelines (Nathanson 2012). These low detection and treatment rates increase the risk of drug resistant TB spreading, and represent a major challenge for global control efforts.

Compared with the treatment regimen for 'common' TB, MDR-TB requires more expensive and toxic drugs that need to be provided for a prolonged period (20 months, compared with six months). Cure rates are also lower and the treatment can have multiple and serious side-effects. Of the 12 million cases of TB in 2011 an estimated 630,000 (around 5.3%) were MDR-TB (WHO 2012e). The highest proportion of new TB cases that are MDR-TB are in nations of the former Soviet Union, where it can be up to 32% as in Belarus. In China and India the proportion of new TB cases with MDR-TB is much lower (5.7% and 2.1% respectively), but they account for the largest number of MDR-TB cases, together representing 50% of the global burden (Nathanson 2012).

Incidence of MDR-TB is thought to be rising in some nations, but accurate assessments of global trends are hampered by data availability. Diagnosis and treatment of MDR-TB is a particular challenge in many low- and middle-income nations where resources and laboratory capacity are constrained. High rates of drug susceptibility testing and the provision of appropriate treatment for all TB patients with drug-resistant strains are key factors that report declining MDR-TB incidence. XDR-TB is virtually untreatable, and was reported in 77 nations in 2010. In a number of nations with high incidence of XDR-TB – typically in Africa and former states of the Soviet Union – over 10% of drug resistant cases are estimated to be XDR-TB (Nathanson 2012).

Figure 6.2.11 Tuberculosis incidence – the Tropics

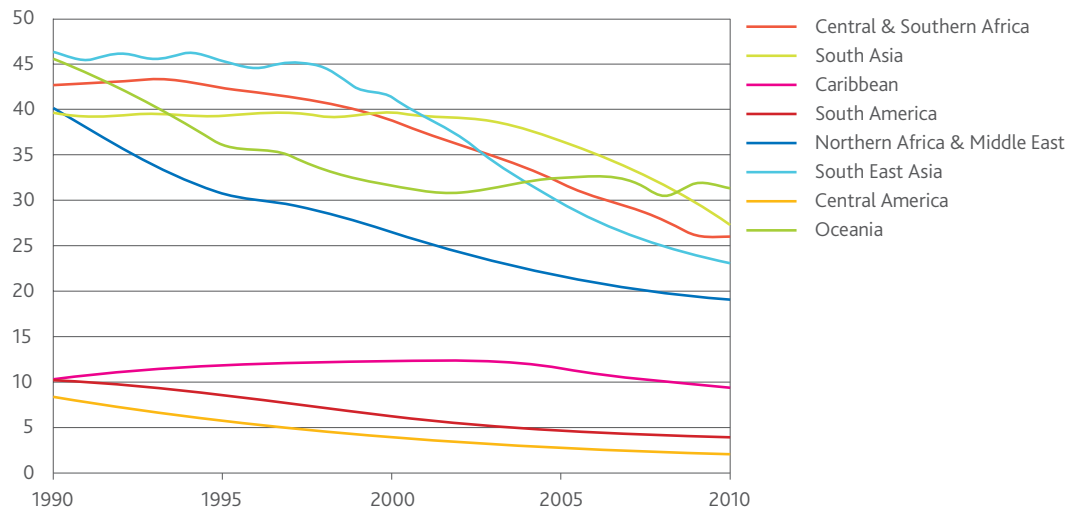
New cases per 100,000 - population



Source: WHO (2013f), UN (2013), State of the Tropics project.

Figure 6.2.12 Tuberculosis deaths – the Tropics

Deaths per 100,000



Source: WHO (2013f), UN (2013), State of the Tropics project.

Note: Figures exclude deaths where HIV is a co-morbidity. Rates are not age-standardised.

Box 6.2.7 Tuberculosis diagnostics

Effective TB control is underpinned by fast and accurate diagnostic capacity. The limitations of conventional diagnostic methods, however, are constraining TB control efforts, particularly in developing nations.

Sputum smear microscopy is the most commonly used diagnostic test for TB in low- and middle-income nations, while diagnosis using culture techniques in a laboratory is the 'gold reference' standard. Despite their widespread use, both methods have a number of limitations. Sputum smear microscopy was developed more than 100 years ago and is only able to detect 50% of positive cases (Chaisson & Martinson 2008), is unable to detect extra-pulmonary TB and cannot identify drug resistance (WHO 2012e). Culture techniques are more expensive, require advanced laboratory facilities (which are limited in many high-burden nations) and can take weeks for results. Both methods have additional limitations when it comes to detecting TB in children. Most children have extra-pulmonary TB (which is harder to detect than pulmonary TB), tend to present

with a lower number of the TB bacteria (again, making it harder to detect), and many are unable to expectorate sputum (WHO 2012e).

The lack of rapid, effective and affordable diagnostics for TB is a significant bottleneck in control efforts (Raviglione et al. 2012). Limited laboratory infrastructure, particularly in developing nations, is also a major factor contributing to low TB detection and notification rates globally (66% of TB cases, 7% of MDR-TB cases and an even smaller proportion of XDR-TB cases) (WHO 2012e, WHO 2013l).

New diagnostic tests for TB – such as 'Xpert MTB/RIF', a new rapid and accurate molecular test that is able to detect drug resistance – are currently being developed and rolled out (WHO 2012e). The effectiveness of TB control efforts will be enhanced as new tests become more readily available among vulnerable populations globally, and as laboratory capacity (including trained personnel) is increased.

Key risk factors for tuberculosis

Key risk factors for TB include low socioeconomic status, HIV infection, diabetes, smoking and alcohol and drug abuse (WHO 2011c). The importance of these risk factors to TB control is most clearly highlighted by the links between HIV and TB. The HIV epidemic was a significant contributor to the global resurgence of TB in the 1980s, and currently around 10% of the people who develop TB each year also have HIV, with most of these people living in Africa.

TB is often referred to as a 'disease of the poor', and its burden is greatest in developing nations and among people with limited access to health services and medicines (Broekmans & Paluzzi 2004). Crowded housing and poor working conditions can increase the risk of TB transmission while factors such as chronic malnutrition can weaken the immune system of people with latent TB, and increase the risk of developing the disease.

Diabetes is also a key risk factor for TB. People with diabetes are around three times more likely to develop TB than people without diabetes (Baker et al. 2011). The global burden of diabetes is increasing, notably in nations with a high TB burden. With diabetes incidence predicted to increase by 69% in developing nations and by 20% in developed nations between 2010 and 2030 (Shaw et al. 2010), the convergence of diabetes and TB may hamper TB control efforts.



Daru Hospital and TB Testing Centre. Image: DFAT, AusAID.

Looking forward

With TB incidence declining globally the United Nations has achieved its Millennium Development Goal to halt and begin to reverse the spread of TB by 2015. But significant challenges remain. The Stop TB Partnership (hosted by the World Health Organisation), aims to halve 1990 TB death rates by 2015 and to eliminate TB as a public health problem by 2050 (Stop TB Partnership 2013). While death rates are decreasing globally, in a number of highly-burdened nations the HIV co-epidemic, drug resistance and poor socio-economic conditions are hampering the rate of improvement.

Looking forward, a key factor in reducing the burden of TB is improving access to timely, reliable and affordable diagnostic and treatment services, especially in high-burden developing nations (Keshavjee & Farmer 2012). In addition, the close association between TB and poverty and linkages with other chronic diseases suggests that TB control efforts need to be multidisciplinary, and must address key social determinants of health.

Box 6.2.8 Tuberculosis in children

TB is in the top 10 causes of child mortality worldwide (Swaminathan & Rekha 2010), but it has been a low global public health priority for many years as adults with infectious pulmonary TB have received the greatest attention (WHO 2012e). With less than 4% of estimated cases among children reported – compared with 66% of all cases – TB in children is referred to as a ‘hidden pandemic’ (WHO 2012l).

Diagnostic difficulties contribute to underreporting of TB in children (see Box 6.2.7). Poor linkages between paediatric clinicians and surveillance systems also contribute (WHO 2012e). For these and other reasons the inclusion of children in national TB surveys is not recommended by the World Health Organisation, meaning that global datasets incorporate estimates of the TB burden among children that have a high degree of uncertainty.

The World Health Organisation’s 17th annual Global TB Report 2012 is the first to include estimates of the burden of TB in children, estimating 490,000 new cases and 64,000 deaths each year (WHO 2012e). In high

burden nations a high proportion of TB cases are children (estimated at around 20–40%) compared with less than 5% in nations with effective TB control programs (Swaminathan & Rekha 2010). While in developed nations most childhood TB cases are detected and have good outcomes, children with TB in developing nations are more likely to be poor and malnourished leading to higher death and lower treatment success rates.

Apart from the direct impacts that TB has on children with the disease, children are also affected by TB in families and communities. In 2009 almost 10 million children were orphans as a result of losing a parent to TB (WHO 2012e). Women are particularly at risk as they account for a large proportion of the world’s poor, and because TB tends to progress more quickly in women of childbearing age. TB is a leading cause of death in women during pregnancy, and particularly among women living with HIV (WHO 2012l). TB also increases the risk of premature birth and low birth weight babies, and young children whose mothers die are vulnerable to premature death (WHO 2012l).



Young TB patients in PNG. Image: DFAT, AusAID.

Malaria

Malaria is a serious and sometimes fatal disease caused by four *Plasmodium* parasite species that are spread to people by *Anopheles* mosquitoes. An ancient disease, malaria is likely to have had a substantial influence on human populations over thousands of years (CDC 2012a). At the height of its global distribution an estimated 90% of the world's population was at risk, with the disease extending as far north as the Arctic Circle. Since the 1897 discovery that mosquitoes transmit the disease control efforts have dramatically reduced its global distribution. In 1900 around 77% of the global population was at risk of malaria, while today it is around 50%, with the vast majority living in the Tropics (Cibulskis et al. 2011).

Provided that mosquito control, diagnosis and treatment programs are properly implemented, malaria is an entirely preventable and treatable disease (WHO 2012c). However, malaria remains a leading cause of death globally, particularly among children who account for around 85% of deaths from the disease (WHO 2013a). Reflecting that malaria is a globally significant health issue with a disproportionate impact on children, in 2010 it was the fifth highest cause of years of life lost due to premature death, up from sixth highest in 1990 (Lozano et al. 2012).

Malaria is currently considered endemic (that is, it is able to maintain itself within a population) in 104 nations and territories worldwide – five of which are in a prevention of reintroduction phase, with the transmission of malaria ongoing in the other 99 (See Figure 6.2.17). Partly due to more intense malaria transmission occurring in warmer climates near the equator (CDC 2010b), 80 of the 99 nations are wholly or partly in the Tropics. The disease is also strongly correlated with conditions of poverty, with mortality rates higher in low-income nations and in poorer populations within nations. Around 80% of malaria cases occur in just 17 nations and 80% of deaths in just 14 nations, with sub-Saharan Africa accounting for 91% of the world's malaria deaths (WHO 2012c).

A range of factors such as emerging drug and insecticide resistance led to the abandonment of many malaria eradication efforts from the 1970s

and, since then, initiatives have tended to focus on malaria 'control', or reducing transmission to a level where it is no longer a public health issue (CDC 2012a). Significant investments in control and treatment programs since 2000 have substantially reduced the global burden of malaria. The number of new cases has decreased by 17% since then, and the mortality rate has fallen by 25% (UN 2012a). However, monitoring trends is a major challenge as current surveillance systems do not detect the vast majority of cases.

Trends

Limited surveillance data, particularly for high-burden nations, means that estimates are used to assess the distribution of malaria across nations and over time (see Box 6.2.9). Estimates are derived from reported cases and modeled relationships between malaria transmission, incidence and mortality trends and intervention coverage. Of the 99 nations with ongoing malaria transmission, 58 report sufficient data to allow trend assessments for the period 2000 to 2011. These data suggest that the World Health Assembly (WHA) malaria burden reduction target of 75% between 2000 and 2015 is likely to be met in 50 nations, and reductions of between 50–75% are likely to occur in a further four (WHO 2012c). However, the 50 nations that are likely to meet the target are low burden nations, accounting for only 3% of cases in 2000. Nonetheless, even in high burden nations where reporting and data are generally of poor quality, greater disease control efforts over the past 15 years are recognised to have had a substantial impact in averting a large number of cases and deaths, though greater investment is needed to reach the WHA target (WHO 2012c).

Malaria cases

Malaria case estimates for the 99 nations with ongoing malaria transmission (80 of which are wholly or partly in the Tropics) are provided in the World Malaria Report 2012. Globally, there were 219 million cases of malaria in 2010, with more

'We know there are still many things to do in the village and in other villages to get rid of this illness from the whole world.'

Pesseyi, 15 years old
Togolese national (2013)

than 211 million of these cases (96%) occurring in the Tropics. In the Tropics, Central & Southern Africa carries the highest malaria burden, with nearly 160 million cases at a rate of 23,181 cases per 100,000 people in 2010 (see Figure 6.2.13 and Figure 6.2.14). This region accounted for 75% of malaria cases in the Tropics and, combined, the six highest burden nations in the region (Nigeria, Democratic Republic of the Congo, Tanzania, Uganda, Mozambique and Cote d'Ivoire) accounted for 47% of global malaria cases in 2010.

Northern Africa & Middle East had the second highest number and rate of cases, with over 24 million cases at a rate of 15,431 per 100,000 population. Tropical India had the highest number of cases among the Asian nations in the Tropics. Despite relatively few cases of malaria in Oceania it has the third highest rate, at 10,802 cases per 100,000 population, driven by high rates in Papua New Guinea. Central America had both the lowest number and rate of malaria cases in the Tropics.

Malaria mortality

Globally 660,000 people are estimated to have died from malaria in 2010. Over 650,000 of the deaths were in the Tropics (99%), with 534,000 in Central & Southern Africa (see Figure 6.2.15). Central & Southern Africa also has the highest death rate from malaria, at 78 deaths per 100,000 population (see Figure 6.2.16). Combined, the Democratic Republic of the Congo and Nigeria, both of which are located in Central & Southern Africa, account for over 40% of global malaria deaths. Children under the age of five years are particularly vulnerable, accounting for 85% of deaths in 2010.

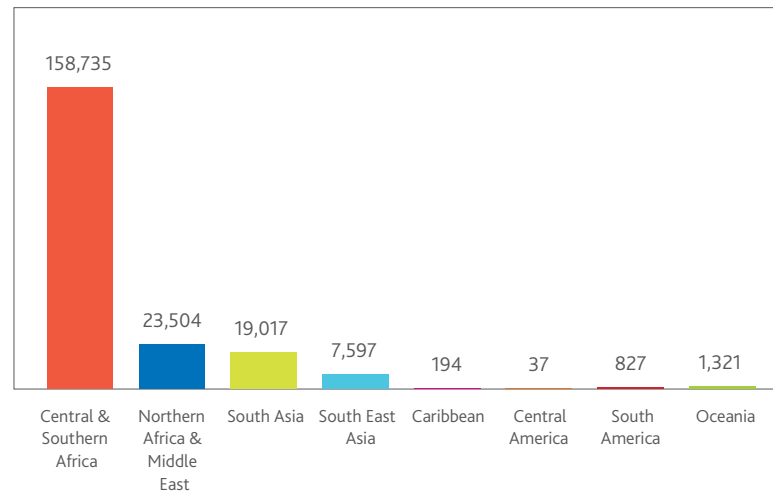
Northern Africa & Middle East had the second highest number and rate of deaths in the Tropics in 2010, with around 76,000 deaths and a mortality rate of 50 in 100,000. The third highest mortality rate was in Oceania with 26 deaths per 100,000 people, reflecting the high malaria burden in Papua New Guinea. Central America had both the lowest number and rate of deaths from malaria in the Tropics.

Malaria diagnosis and treatment

In addition to vector control (see Box 6.2.10), effective malaria control relies on early diagnosis and prompt treatment with effective medicines (WHO 2010a). The type of treatment depends on infection severity, drug susceptibility and the species of parasite that causes the infection. *P. falciparum* is the malaria parasite responsible for 85% of malaria cases worldwide and almost all malaria fatalities. *P. vivax*, the second major parasite species, is responsible for 70-90% of cases in Asia and South America. *P. vivax* is less life-threatening than *P. falciparum*, but has a wider geographic range as it is tolerant of lower ambient temperatures, is more transmissible and can reside undetected in the liver for years (CDC 2010b). With early detection and correct treatment malaria cure rates can exceed 90% (WHO 2010a).

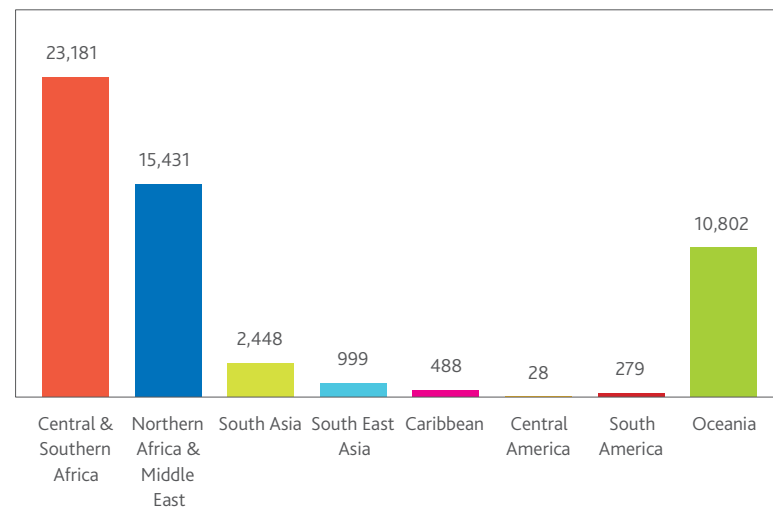
Diagnostic testing for malaria is essential to confirm suspected cases and to detect the parasite type. Common tests include malaria microscopy (which requires laboratory capacity) and rapid diagnostic testing (such as finger-stick blood testing, which does not require a laboratory). While the number of patients examined by microscopy remains very low in some regions, it is generally increasing. In addition, the distribution of rapid diagnostic tests increased 370-fold between 2005 and 2011, mostly in Africa (WHO 2012c). Increased availability of diagnostic tools has facilitated expansion of parasitological testing globally, from 68% of suspected cases in 2005 to 77% in 2011 and, in Africa, from 20% to 47% (WHO 2013k). However, the number of treatments distributed still outweighs the number of diagnostic tests performed, indicating that

Figure 6.2.13 Number of malaria cases – the Tropics, 2010 (thousands)



Source: WHO (2012c), Cibulskis et al (2011), State of the Tropics project.

Figure 6.2.14 Malaria prevalence – the Tropics, 2010 (cases per 100,000 population)



Source: WHO (2012c), Cibulskis et al (2011), State of the Tropics project.

Box 6.2.9 Limited malaria data

Time series data on the global malaria burden are critical for effective planning and evaluation of malaria control efforts (Cibulskis et al. 2011). However, generating reliable estimates is a major challenge due to insufficient surveillance and incomplete reporting of data.

Surveillance systems that record malaria cases and deaths are present in all nations where malaria is endemic, but case detection rates vary considerably between nations. Globally it is estimated that only 10% of malaria cases were detected in 2010, with the rate even lower in high burden nations (WHO 2012c). Even where surveillance data are provided it is often not sufficiently reliable to assess trends. Diagnostic difficulties can also be a contributing factor, notably in nations where health system capacity is limited (Bremen 2001).

As a result, reliable assessments of malaria trends is not currently possible in 41 nations which, combined, account for around 85% of estimated cases (WHO 2012c). The subsequent need to generate estimates for these nations can lead to wide variations in global estimates from different organisations. For example, the World Malaria Report 2012 estimates 660,000 deaths from malaria in 2010, while different predictive models estimate between 929,000 and 1,685,000 deaths (Murray et al. 2012).

An urgent task for the international community is to assist high burden nations to improve diagnostic testing, surveillance and routine health information systems (WHO 2012c). Improved data collection will allow for more informed decision making in global malaria control.

many patients still receive treatment without confirmatory diagnosis (WHO 2013k).

Emerging malaria parasite resistance to treatment drugs is compounding malaria control challenges. Poor treatment practices, inadequate patient adherence to prescribed medications and continuing availability of non-recommended drugs are contributing factors. In response to the challenge of drug resistance the World Health Organisation launched the Test, Treat, Track initiative in 2012 to focus attention on evidence-based approaches to malaria control and the need for better surveillance systems. International funding for malaria control continues to increase, although at a slower rate than in the decade from 2000 to 2010 when malaria funding increased dramatically, from less than US\$100 million to US\$1.7 billion (WHO 2012c).

Key populations at risk

Around 50% of the global population is at risk of malaria infection (Hay et al. 2004), with the vast majority living in the Tropics. Although a range of factors affect distribution and transmission risks (see Box 6.2.10), malaria is strongly correlated with poverty. More than any other significant public health disease, malaria disproportionately affects the poorest 20% of the global population (Barat et al. 2004). Poorer populations tend to have less access to preventive tools such as insecticide-treated nets or diagnostic and treatment services (Barat et al. 2004), putting them at greater risk of infection and death.

In high burden areas malaria poses a particular risk to people who have little or no immunity, particularly children, pregnant women, people living with HIV and international travelers from non-endemic areas). Children in high burden nations are particularly at risk as partial immunity to malaria develops over years of exposure to malaria parasites. In 2010 malaria was the single greatest cause of death among children aged between one and four years, causing around 21% of deaths (Lozano et al. 2012), and children under five accounted for 85% of malaria deaths globally (WHO 2013a).



Malaria testing training in Nigeria. Image: Rick Scarvetta, US Army.

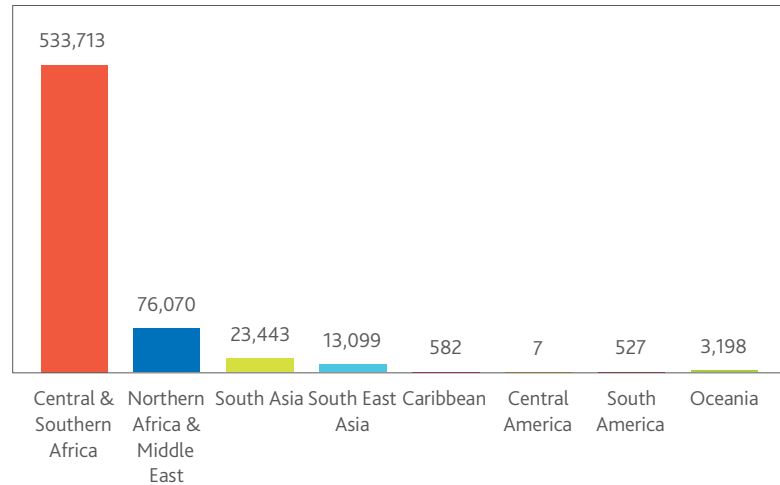
Malaria infection in pregnant women is associated with greater risk of severe illness and death than in non-pregnant women due to a reduced immune response and the tendency for malaria parasites to reside and replicate in the placenta (CDC 2011b). In addition to maternal mortality, the disease is associated with a high risk of miscarriage, premature delivery and low birth weights. Due to the higher risk of death from malaria among children and pregnant women, malaria control and elimination efforts are essential if Millennium Development Goals to reduce maternal and child mortality are to be met.

Looking Forward

The World Health Assembly target is to reduce the global malaria burden by 75% from 2000 levels by 2015, and the Millennium Development Goals aim to halt and begin to reverse the incidence of malaria by 2015. While the global malaria burden has been decreasing since 2000 (WHO 2012c, UN 2012a), estimates suggest that progress among nations is mixed. An accurate assessment of trends is hampered by a general lack of reliable surveillance data from the most affected nations.

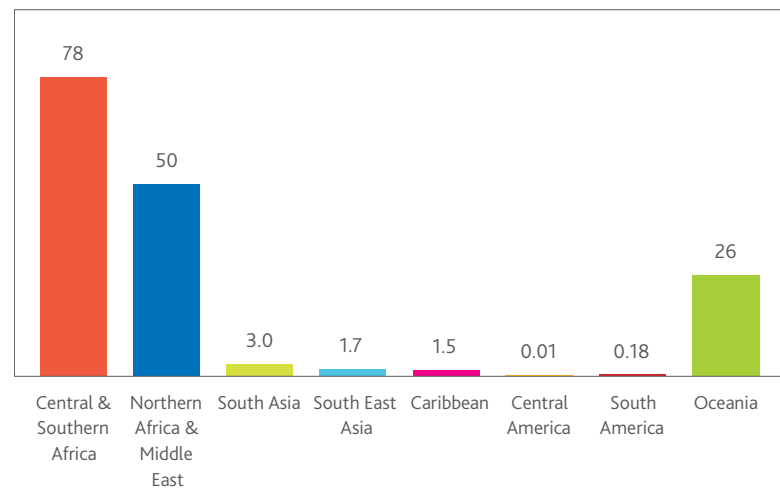
Global funding for malaria control has increased dramatically over the past 15 years. However, it is unlikely to be sufficient to reach reduction targets (WHO 2012c). Beyond current control efforts the more ambitious goal of malaria elimination and eradication will require as yet undeveloped tools such as vaccines and new generation drugs. In addition, as previous malaria control and elimination efforts have demonstrated, progress can only be sustained if nations are able to build health system capacity and improve socioeconomic conditions (WHO 2011b).

Figure 6.2.15 Deaths from malaria - the Tropics 2010



Source: WHO (2012c), Cibulskis et al (2011), State of the Tropics project.

Figure 6.2.16 Malaria mortality rate - the Tropics 2010 (deaths per 100,000 population)



Source: WHO (2012c), Cibulskis et al (2011), State of the Tropics project.

Box 6.2.10 Vector distribution and control

Malaria is transmitted to people through mosquito bites, with around 50 species of *Anopheles* mosquito recognised as the main malaria 'vectors' (Hay et al. 2010). These mosquitoes are found in every nation except Antarctica (CDC 2012b), although a number of other critical factors affect malaria distribution and transmission risks. Urbanisation, rainfall, temperature, changes in land use and housing type all influence mosquito abundance, species composition and mosquito biting rates (Cibulskis et al. 2011).

Vector control is the main way to prevent malaria transmission at the population level, and to date has contributed significantly to malaria control successes (WHO 2013a). Significant reductions in the global distribution of malaria through the 20th century were largely attributable to the control of mosquito breeding sites from 1900 and the large-scale use of insecticides from the 1940s (Hay et al. 2004). Modern vector control mechanisms include the use of insecticide-treated mosquito nets (ITNs), indoor residual spraying (IRS) and larval control.

Among malaria-endemic nations access to ITNs is increasing. In sub-Saharan Africa for example, the percentage of children sleeping under ITNs is

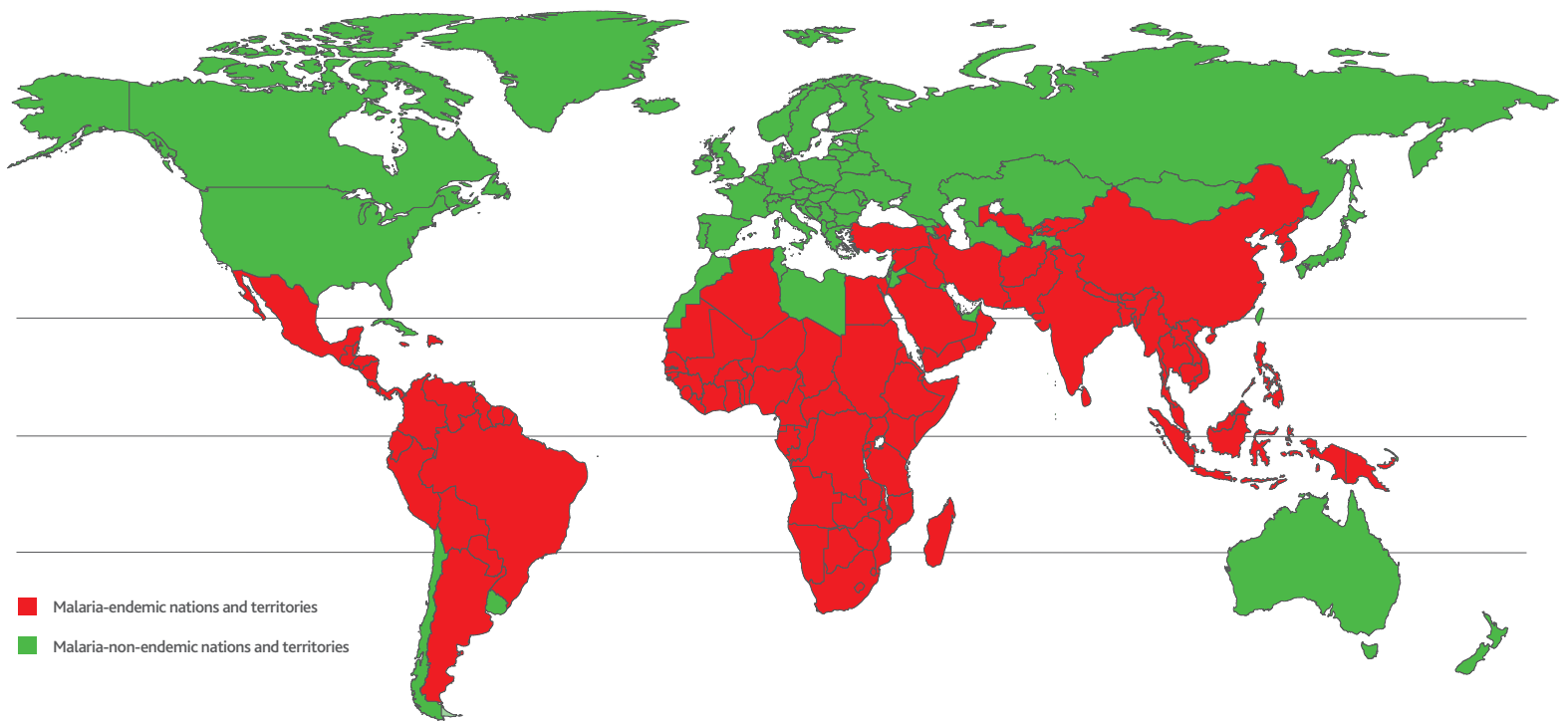
estimated to have increased from 2% in 2000 to 39% in 2010 (UN 2012a). In addition, the proportion of at-risk populations protected by IRS has increased from less than 5% in 2005 to 11% in 2010. However, global funding for malaria control has plateaued since 2010, affecting ITN distribution and other initiatives (WHO 2012c). A growing challenge to control efforts is mosquito resistance to the insecticides used in ITNs and IRS, which has been detected in 64 nations.

Climate change is affecting temperature, rainfall, humidity and land use patterns, and is predicted to have an effect on vector distribution and malaria control before 2050 (Ermert et al. 2012). While in some areas malaria distribution is predicted to contract over the coming decades, in others (such as highland and sub-tropical areas) it is likely to expand. Climate change will also affect malaria transmission by influencing mosquito longevity and the development of malaria parasites in the mosquito (Fernando et al. 2010). Even without the effects of climate change, the continuing presence of *Anopheles* mosquitoes in nations where malaria has been eliminated (such as in western Europe and the United States) means that reintroduction of the disease is a constant risk (CDC 2010b).



Mosquito nets for malaria control. Image: Bill and Melinda Gates Foundation.

Figure 6.2.17 Malaria endemic nations and territories



■ Malaria-endemic nations and territories
 ■ Malaria-non-endemic nations and territories

Malaria-endemic nations and territories are: Democratic Republic of the Congo, Cameroon, Chad, Congo, Central African Republic, Gabon, Equatorial Guinea, Sao Tome and Principe, Burundi, Comoros, Djibouti, Eritrea, Ethiopia, Kenya, Mayotte, Rwanda, Somalia, Sudan, Tanzania, Uganda, Angola, Botswana, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Zambia, Zimbabwe, Nigeria, Niger, Burkina Faso, Ghana,

Mali, Côte d'Ivoire, Guinea, Senegal, Benin, Sierra Leone, Togo, Liberia, Guinea-Bissau, Mauritania, Gambia, Cape Verde, Algeria, Egypt, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Suriname, Venezuela, Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Mexico, Haiti, Dominican Republic, Jamaica, Argentina, Paraguay, Bangladesh, Bhutan, India, Nepal, Sri Lanka, China, Democratic People's Republic

of Korea, South Korea, Cambodia, Timor-Leste, Indonesia, Lao People's Democratic Republic, Malaysia, Burma/Myanmar, Philippines, Thailand, Vietnam, Papua New Guinea, Solomon Islands, Vanuatu, Afghanistan, Iran, Kyrgyzstan, Pakistan, Uzbekistan, Azerbaijan, Iraq, Oman, Saudi Arabia, Syrian Arab Republic, Yemen, Turkey.

Dengue and other neglected tropical diseases

Neglected tropical diseases¹¹ (NTDs) are a group of 17 infectious diseases¹¹ that affect at least 1 billion people worldwide, primarily the poorest communities in the Tropics and subtropics, and kill more than 500,000 people annually (Hotez et al. 2006). NTDs mostly cause chronic conditions that can lead to long term disabilities or disfigurement, and significantly affect people's productive and social lives which can act to entrench poverty. NTDs have historically received less policy attention and funding than diseases such as HIV and malaria because they generally pose little threat to the populations of developed nations, and are largely concentrated in rural areas (WHO 2012d).

Dengue is a mosquito-borne viral NTD that is most prevalent in tropical and subtropical regions. Its global distribution and public health burden is highly uncertain, but it is estimated that around half of the world's population is at risk of the disease (Brady et al. 2012), and there are no vaccines or drugs to treat it. The incidence of dengue is estimated to have increased 30-fold over the past five decades due to factors such as rapid urbanisation, global travel, environmental change (WHO 2007) and ineffective vector control (Guzman et al. 2010). Dengue is now the most rapidly-spreading mosquito-borne viral disease in the world, and is a major global public health threat (WHO 2012d, WHO 2012n).

A small percentage of people with dengue develop dengue haemorrhagic fever (DHF), which has an average case fatality rate of 5% (Gubler 2004) and is responsible for around 22,000 deaths per year (WHO 2012g). Appropriate disease management with well-trained health personnel and good facilities can reduce DHF mortality to below 1%, compared with case fatality rates as high as 40% in populations that lack access to appropriate health care (Gubler 2004). Although dengue is responsible for fewer deaths than malaria (another mosquito-borne disease), it is a significant cause of disability that places considerable strain on health services and causes substantial economic losses.

Trends

World Health Organisation (WHO) regional offices and the global dengue surveillance system DengueNet publish reported cases of dengue by nation and year, but systemic underreporting mean they significantly understate the true disease burden (Bhatt et al. 2013). Factors contributing to underreporting include low levels of health care access, misdiagnosis and incomplete recording of data in national systems. Studies of hospital case numbers and dengue incidence in the general community suggest that only around 30% of people estimated to have 'apparent'¹² dengue present to formal healthcare facilities (Bhatt et al. 2013). Also, as there are no uniform criteria for reporting dengue cases to WHO, some nations report only severe dengue cases, others report all cases and still others report only cases that have been confirmed in a laboratory (Suaya et al. 2006).

The burden of dengue across Africa is largely unknown due to insufficient data from endemic nations. Low awareness by health care providers, low levels of diagnostic testing and limited surveillance capacity are contributing factors. In parts of Africa where there is recognised over-diagnosis of malaria, dengue may be misdiagnosed as malaria as the cause for febrile illness (Amarasinghe et al. 2011). Nonetheless, there is some evidence that dengue outbreaks in Africa are increasing in size and frequency (WHO 2012g).

Data limitations hinder international comparisons and the assessment of trends over time, which in turn affects resourcing and program development for dengue control. WHO's Global strategy for dengue prevention and control aims to estimate the true burden of dengue by 2015.

Dengue burden

While only 2.4 million dengue infections were reported in 2010 (WHO 2013e), WHO estimates that there are 50-100 million infections worldwide each year across more than 100 endemic nations (WHO 2012g). Recent research suggests that the global burden of dengue is significantly higher

than WHO estimates, with around 390 million infections per year (Bhatt et al. 2013). Of these, 96 million are apparent infections, with the remainder being 'inapparent' infections that are mild or asymptomatic. These inapparent infections have no immediate implications for clinical management but are of public health significance as a reservoir for future infection.

In the period between 2008 and 2011, most of the apparent dengue infections, 72% (or 70 million infections per annum), occurred in the Tropics, with the majority of infections in the Rest of the World occurring in nations that border or straddle the Tropics.

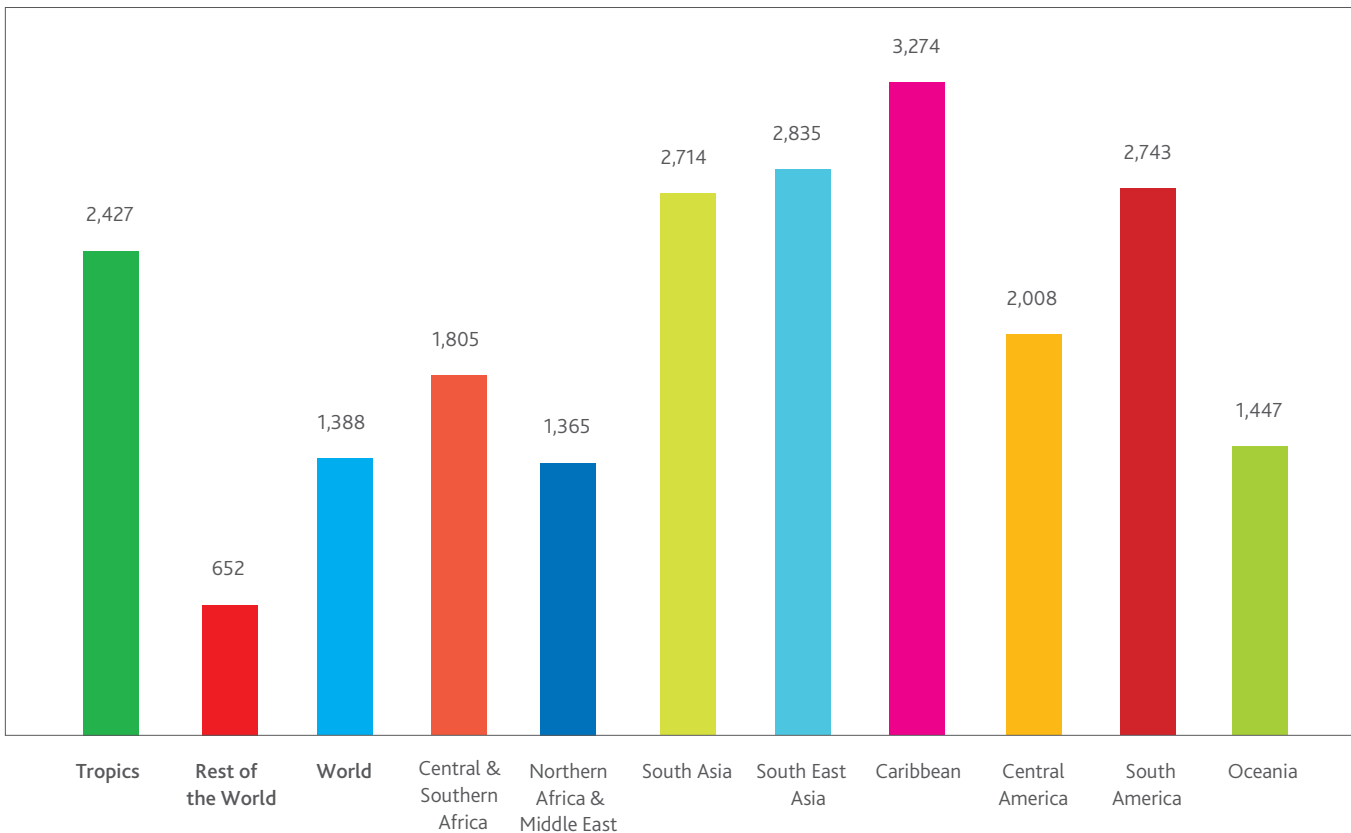
In the Tropics, the Caribbean has the highest rate of dengue infections at 3,274 cases per 100,000 population (see Figure 6.2.18). South East Asia and South Asia carry the greatest number of infections with around 20 million infections per year which, combined, account for 61% of infections in the Tropics. With around 19 million infections each year, tropical India alone accounts for 27% of dengue infections in the Tropics. Other nations with more than 1 million infections each year are Indonesia, Brazil (see Box 6.2.11), Nigeria, China, Philippines, Vietnam, Thailand, Mexico, Bangladesh and Colombia.

More than 12 million apparent infections occur each year in Central & Southern Africa, indicating a substantial burden in a region where dengue is largely hidden (that is, there are no reported cases). Oceania carries the lowest number with around 170,000 infections per year, or 0.3% of infections in the Tropics. The number of cases reported to WHO represents a very small fraction of estimated apparent infections in the Tropics – ranging from 0% in the African regions to 11% in South America (see Figure 6.2.19).

¹¹The 17 NTDs are: dengue, rabies, trachoma, Buruli ulcer, endemic treponematoses (yaws), leprosy (Hansen disease), Chagas disease, human African trypanomiasis (sleeping sickness), leishmaniasis, cysticercosis, dracunculiasis (guinea-worm disease), echinococcosis, foodborne trematode infections, lymphatic filariasis, onchocerciasis (river blindness), schistosomiasis and soil-transmitted helminthiases.

¹²Dengue infections that result in visible symptoms sufficient to disrupt a person's daily routine (Bhatt et al. 2013).

Figure 6.218 Apparent dengue infections, 2008-11 (infections per 100,000 population)



Source: Bhatt et al (2012), State of the Tropics project.

The incidence of apparent dengue infections per 100,000 population is 2,427 in the Tropics and 652 in the Rest of the World. In the Tropics, after the Caribbean, the highest incidence is in South East Asia with 2,835 cases per 100,000, South America with 2,743 and South Asia with 2,714. Northern Africa & Middle East has the lowest incidence at around 1,365 infections per 100,000.

Data on dengue mortality are limited, but is estimated to be increasing as people are being exposed to different virus types more often, which increases the risk of developing DHF (Mangold &

Reynolds 2013, WHO 2013h). In some Asian and Latin American nations severe dengue is already a leading cause of serious illness and death among children.

Vector distribution and control

While effective diagnostics have recently been developed, there is currently no vaccine or drugs to treat dengue. As such, transmission of the disease can only be prevented by reducing human-vector contact. Substantial vector control efforts over

time have not stemmed the spread of dengue, but continuing efforts in this area are important as many health systems are not adequately resourced or prepared for dengue outbreaks, especially in developing nations. A single person with dengue entering an area populated by both a dengue vector and human hosts can lead to a dengue outbreak, further underscoring the significance of vector control.

The primary vector of dengue is the *Aedes aegypti* mosquito, which is found in tropical climates in urban habitats, and breeds mostly in

Box 6.2.11 Dengue in Brazil

Dengue is a major public health problem in Brazil, where outbreaks have caused significant illness, death and economic burden. Brazil is now cited as an example of the worsening global situation (WHO 2012g). Along with India, Indonesia and Nigeria, Brazil is one of the most highly endemic nations in the world, with more than five million apparent infections each year (Bhatt et al. 2013).

Between January and April 2008 an outbreak of dengue in the state of Rio de Janeiro alone saw more than 158,000 reported cases, over 9,000 hospital admissions and 230 deaths, with the military mobilised to assist with the vector control and health care response. Although around US\$1 billion was being spent annually in the nation on dengue prevention and control, another outbreak in 2010 resulted in more than 1.2 million reported cases across the nation, and further outbreaks have been reported in 2011 and 2013 (WHO 2012g).

The extent of these dengue outbreaks is particularly significant given the Americas was virtually free of dengue from the 1950s to the 1970s, following the purported eradication of *Aedes aegypti* in a continent-wide vector control campaign (Shepard et al 2011). Uncontrolled urbanisation and waste management in major cities in Latin America from the 1970s have contributed to the return of the vector, and the resurgence of dengue across the region.

As well as the direct impacts on human health dengue also has an economic impact in terms of health system costs and lost productivity. Excluding surveillance and vector control activities, the average cost of dengue illness in the Americas between 2000 and 2007 was estimated at US\$2.1 billion per annum, with Brazil accounting for 42% (Shepard et al. 2011). Brazil commits around US\$500 million each year to vector control, but efforts to stem the spread of *Aedes aegypti* continue to be unsuccessful.

man-made containers. Because the mosquito is highly adapted to the domestic environment its abundance is correlated with increasing urbanisation. Dengue is also spread by *Aedes albopictus*, which is found in both tropical and temperate regions. Once unique to Asia, the geographic range of *Aedes albopictus* – and dengue – has expanded globally as a result of international trade (Higa 2011). The increased range of dengue vectors has also expanded the geographic range of all four types of dengue virus (serotypes), so that epidemics caused by multiple serotypes are more frequent. This has significant public health relevance as prior infection with one virus type increases the risk of developing severe dengue in subsequent infection with a different virus type (Chen & Vasilakis 2011).

The emergence of insecticide resistance is a major challenge for the control of dengue vectors, and climate change is likely to increase the endemic range of dengue as global temperatures increase (Racloz et al. 2012). Higher temperatures also enhance reproduction of the vector mosquitos, shorten the incubation period of dengue viruses and make transmission to humans more likely. To address the many vector control challenges greater effort is now being taken to integrate programs across dengue and other mosquito-borne NTDs such as Chagas disease and lymphatic filariasis.

Global burden of neglected tropical diseases

Neglected tropical diseases are caused by a variety of viruses, bacteria and parasites, and represent a diverse set of diseases and pathologies, but each shares a much higher prevalence and persistence among impoverished communities (WHO 2013e). NTDs are among some of the most common infections in the 2.5 billion people who live on less than \$2 a day, although the true burden of these diseases is uncertain. While NTDs are commonly estimated to affect over 1 billion people (WHO 2012m), other estimates suggest that soil-transmitted helminth infections alone affect around 2 billion people (WHO 2013w). There is growing international recognition that a large



Dengue control education in Brazil. Image: Fotos GOVBA.

Box 6.2.12 Eradication, elimination and control of neglected tropical diseases

Until recently NTDs have received limited global attention or funding relative to their global burden. For example, between 2003 and 2007 only 0.6% of overseas development assistance for health was dedicated to NTDs (Liese & Schubert 2009), and NTDs are not directly mentioned in the United Nations Millennium Development Goals.

The release by WHO in 2010 of its first global report on NTDs was a turning point in raising global awareness and funding for the prevention and control of NTDs. Reducing the burden of NTDs is now on the post-2015 global development agenda (UN 2013b), and a number of targets have been set for the eradication (permanent reduction of disease incidence to zero), elimination (interruption of disease transmission), and control (reduction of disease incidence and impact) of NTDs (WHO 2013e).

As there is significant diversity among the 17 NTDs in terms of their distribution, transmission, vector involvement and pathology a 'one size fits all' set of interventions is not feasible. Strategies have been developed to reflect

disease characteristics and local conditions, and include vector control, preventive medication, intensified disease management and collaboration between human and veterinary public health services. Increased attention and funding has already expanded access to low-cost packages of essential medicines (referred to as 'preventive chemotherapy') for millions of people at risk of some of the most prevalent NTDs. At less than US\$0.50 per person annually, this intervention is recognised as one of the world's most cost-effective public health strategies (Hotez 2013).

Poverty and environmental exposure to pathogens are primary risk factors for NTDs, and progress towards the eradication of these diseases will only be achieved if the key social determinants of health are addressed, such as access to safe water, waste disposal and treatment, basic sanitation and improved living conditions (WHO 2012n). Improving health systems in endemic areas is also essential. The eradication of NTDs is therefore closely linked with other development goals, and reducing their burden will benefit broader socioeconomic development in many impoverished communities.

proportion of the world's population suffers the devastating health and socioeconomic impacts of NTDs, and this is leading to a greater commitment to research as well as the development of global eradication, elimination and control targets and programs (see Box 6.2.12).

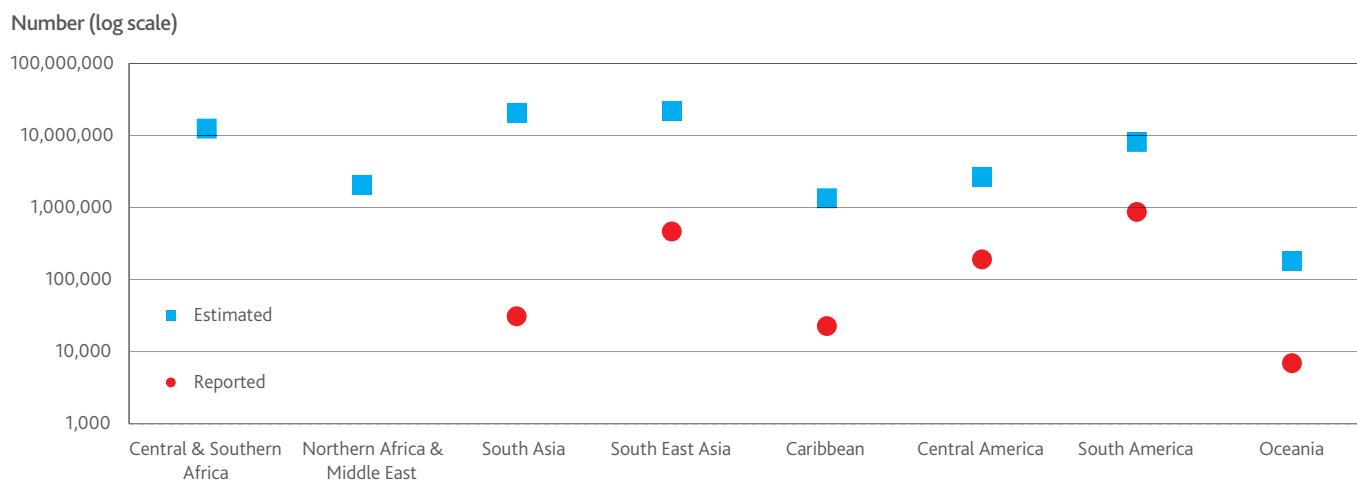
The most common NTDs are the three main soil-transmitted helminth (STH) infections (hookworm, ascariasis, and trichuriasis), dengue, schistosomiasis and lymphatic filariasis. Co-infection with multiple NTDs is also common. STH infections are contracted through contact with worm eggs in contaminated soil and, although fatal in only the most serious cases, they threaten the nutritional status of around 2 billion people worldwide, many of whom are already undernourished (WHO 2013w). STH infections can have long term health, social and economic impacts by retarding the growth and development of children, compromising maternal and infant health and reducing the productivity of workers (Hotez 2009). Schistosomiasis is contracted through contact with larval forms of trematode worms released by freshwater snails and is responsible for around 280,000 deaths each year in Africa (CDC 2011a), where it is the most significant water-based disease from a public health perspective (Steinmann et al. 2006). Lymphatic filariasis, a mosquito-borne parasitic infection, is responsible for millions of people suffering from elephantiasis and urogenital swelling, which significantly impacts the quality of life of sufferers through disability and social and economic marginalisation (Litt et al. 2012). An overview of the 17 NTDs and their general epidemiological trends is provided in Table 6.2.9.

In 2010 it is estimated that NTDs were responsible for over 26 million Disability Adjusted Life Years (DALYs)¹³, or around 5% of all DALYs caused by communicable diseases worldwide, up from 4% in 1990 (Murray et al. 2012). The global distribution of this burden varies considerably, and is greatest in sub-Saharan Africa.



Administering albendazole, Sri Lanka. Image: GSK.

Figure 6.2.19 Apparent and reported dengue cases 2008-2011 – the Tropics (annual average)



Source: Bhatt et al. (2012), WHO (2013m), State of the Tropics project.

Looking forward

NTDs are closely linked with a number of social determinants of health, particularly poverty, which is considered to be the 'root cause' as well as consequence of many of these diseases (Aagaard-Hansen et al. 2010). Reflecting this, the elimination, eradication and control of NTDs has been described as 'the ultimate expression of fairness' (WHO 2013e). In the past decade there has been a significant increase in commitment from major pharmaceutical companies, governments and non-government organisations to reduce the burden of these diseases among the world's poorest populations.

A key dengue control target is, by 2020, to reduce mortality and morbidity by at least 50% and 25% respectively from 2010 levels (WHO 2012g). However, the global dengue burden is increasing and major challenges include limiting the public health risk posed by the expanding dengue vector range and demographic changes favourable to

dengue transmission. Limited surveillance data to assess progress also presents a challenge. New tools are urgently needed for dengue diagnosis and vector control, and further research is required to develop medicines and vaccines (WHO 2012n). Experience suggests that vector control is feasible and, despite the challenges, novel vector management strategies (Hoffmann et al 2011) are being developed, suggesting that real reductions in dengue transmission are possible in the near future.

¹³ A disability adjusted life year (DALY) is a composite measure of disease burden which is calculated as the sum of years of life lost due to premature death, and the years of life lived with chronic ill-health or disability, taking into account the severity of ill-health. While a useful metric to quantify disability from diseases, the number of DALYs caused by NTDs may not fully reflect their chronic health impact, the effects of poverty on the disease experience and the role of NTDs in increasing the incidence of malaria, tuberculosis and HIV (King & Bertino 2008).

Table 6.2.9 Neglected tropical diseases

NTD	Disease type, health impact	Geographic distribution
Dengue	Mosquito-borne viral disease. Mild to severe flu-like symptoms. DHF case fatality rate 5%.	Primarily in tropical & sub-tropical regions.
Rabies	Zoonotic viral infection of the central nervous system. Initially flu-like, progressing to acute brain inflammation. Fatal without treatment.	Present on all continents except Antarctica. Most prevalent in Asia & Africa.
Trachoma	Bacterial infection of the eye. Similar to conjunctivitis. Leading cause of blindness worldwide.	Endemic in 53 nations across Africa, Asia, Central America, South America & Middle East, and also in Australia.
Buruli ulcer	Bacterial infection. Ulceration, usually on legs and arms. Can cause deformity and disability. Exact mode of transmission unknown.	Found in 33 nations mainly in the Tropics & subtropics.
Endemic treponematoses (including yaws)	Bacterial infections comprising yaws, endemic syphilis & pinta. Skin lesions. Can cause deformity and disability.	Global extent not accurately known. Most cases are in the Tropics & subtropics.
Leprosy (Hansen disease)	Bacterial infection. Skin lesions. Can cause progressive & permanent damage to skin, nerves, limbs and eyes.	Endemic in areas of Brazil, Indonesia, Philippines, Nepal, Congo, India, Madagascar, Mozambique & Tanzania.
Chagas disease	Protozoal parasitic disease. Initially flu-like, progressing to cardiac, digestive and/or neurological alterations. Potentially fatal.	Endemic in 21 Latin American nations, but range is spreading.
Human African trypanomiasis (sleeping sickness)	Protozoal parasitic disease transmitted by tsetse flies. Initially flu-like, progressing to neurological symptoms. Fatal without treatment.	Endemic in over 30 African nations.
Leishmaniasis	Protozoal parasitic disease transmitted by phlebotomine sandflies. Skin lesions in cutaneous disease. Fever & enlarged spleen or liver in visceral disease. High fatality rate in visceral cases.	Prevalent in around 100 nations across every continent except Australia & Antarctica. Predominantly in Tropics, subtropics & southern Europe.
Cysticercosis	Parasitic infection caused by larval cysts of pork tapeworm. Muscle swelling, cysts, vision changes. Seizures in neurocysticercosis. Leading preventable cause of epilepsy. Can be fatal.	Endemic in parts of Latin America, South Asia, South East Asia & sub-Saharan Africa.
Dracunculiasis (guinea-worm disease)	Parasitic infection with long thread-like worm. Pain in subcutaneous tissue progressing to ulcer, nausea, fever, vomiting. Can result in reduced mobility.	Reduction from 20 endemic nations across Africa, Middle East & South Asia in 1980s, to four in Africa in 2012.
Echinococcosis	Zoonotic parasitic infection with tiny tapeworms. Symptoms depend on location of cysts in body (liver, lungs, brain, or other organs). Can be fatal.	Present worldwide. Highly endemic in parts of Mediterranean, Africa, eastern Europe, South America & central Asia.
Foodborne trematode infections	Parasitic infection with flatworms. Symptoms can be mild to severe depending on number of worms and location in body. Some parasites carcinogenic.	Cases reported in more than 70 nations. Most cases are in Asia & Latin America.
Lymphatic filariasis	Mosquito-borne parasitic infection with filarial worms. Elephantiasis, skin rashes, abdominal pain. Can cause disfigurement & loss of mobility.	Endemic in 72 nations. Most common in Tropics & subtropics.
Onchocerciasis (river blindness)	Parasitic infection with filarial worm transmitted by blackflies. Skin disease and visual impairment/blindness.	Most prevalent in sub-Saharan Africa, but also present in some Latin American nations.
Schistosomiasis (bilharzia, or snail fever)	Parasitic infection with trematode flatworms. Inflammatory immune responses can result in significant disability.	Prevalent in Tropics & subtropics. 90% of people requiring treatment live in sub-Saharan Africa.
Soil-transmitted heminthiasis	Parasitic infections with intestinal roundworms. Heavy infections can lead to physical or cognitive growth retardation.	Widely distributed in Tropics & subtropics. Greatest numbers in sub-Saharan Africa, the Americas & Asia.

Source: Beaumier et al. 2013, Bhatt et al. 2013, CDC 2010a, CDC 2011a, CDC 2013, Hu et al. 2010, WHO 2012g, WHO 2012m, WHO 2012n, WHO 2012o, WHO 2012p, WHO 2013e, WHO 2013r, WHO 2013s, WHO 2013t, WHO 2013u, WHO 2013v, WHO 2013w.

	Prevalence, mortality	Key trends	Treatment
	Up to 390 million infections annually, with 22,000 deaths.	Incidence & distribution increasing worldwide.	No vaccine or specific medication for treatment.
	More than 15 million cases annually, with around 55,000 deaths.	Number of deaths decreasing over past decade.	Vaccine-preventable. No treatment once symptoms present.
	More than 40 million infected, over 8 million at risk of irreversible blindness.	Significant reduction in prevalence over past two decades.	No vaccine. Curable with antibiotics.
	Between 5,000-6,000 cases reported from 15 of 33 nations yearly.	Less than 1 million cases globally, but trend increasing in some nations.	No vaccine. Curable with antibiotics, surgery may be required.
	Around 460,000 infectious cases of yaws in 1995.	Yaws eliminated in many nations including India.	No vaccine. Curable with antibiotics.
	Approximately 219,000 new cases in 2011.	Significant reduction from 5.2 million cases in 1985 to less than 1 million.	No vaccine. Curable with multi-drug therapy.
	Around 7-8 million infected in 2006-10.	Increasingly detected in some developed and Western Pacific nations.	No vaccine. Treatment more effective in acute than in chronic phase.
	Around 20,000 cases per year.	Burden decreasing since 2000.	No vaccine. Curable with treatment but less effective at later stage.
	12 million infected, with around 50,000 deaths.	Distribution and number of cases have increased since 1993.	No vaccine. Curable with drug treatment.
	Around 50-100 million infections worldwide. Neurocysticercosis in around 30% of people with epilepsy in endemic nations.	Frequency declining in developed nations. Prevalent in areas where pig tapeworm is common.	No vaccine. Treatment with anti-parasitic drugs and/or surgery.
	Only 1,058 reported cases in 2011.	Approaching global eradication.	No treatment drugs available.
	More than 1 million infected worldwide.	Distribution increasing. Re-emerging as a public health problem.	No vaccine. Curable with treatment drugs and/or surgery.
	More than 56 million reported infections and 7,000 deaths in 17 nations in 2005.	Magnitude of public health problem largely unknown.	Preventive chemotherapy in endemic communities. Curable with treatment drugs.
	Approximately 115 million cases.	Progress being made to eliminate as a public health problem.	Curable with treatment drugs. Chronic cases may require surgery.
	More than 25 million infected.	Burden has decreased significantly since 1970s.	Preventive chemotherapy in endemic communities. Treatment available.
	At least 243 million people required treatment in 2011. Responsible for 280,000 deaths annually in Africa.	Control successful in several nations, but spreading into previously low or non-endemic areas.	Preventive chemotherapy in endemic communities. Curable with treatment.
	Up to 2 billion infected worldwide.	Number of school-age children receiving treatment in endemic areas increasing.	Preventive chemotherapy in endemic communities. Curable with treatment.

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Classroom in Laos.
Image: WB_Bart Verweij.



Working at Port au Prince Power station.
Image: Dominic Chavez, World Bank.

'Education is the linchpin of human development. It helps people fight poverty, and empowers them with the knowledge, skills and confidence they need to shape a better future.'

UNESCO 2011



Chapter 6.3

Society | Education and work



Workers in Vietnam.
Image: Mai Kai, World Bank Photo Collection.

Summary of education and employment indicators

	Tropics	Central & Southern Africa	Northern Africa & Middle East	South Asia	South East Asia	Caribbean	Central America	South America	Oceania	Rest of the World	World
Mean years of schooling 1980 to 2010	3–6	2–5	1–3	2–5	4–7	5–8	4–8	4–7	6–8	6–9	5–8
Youth literacy (%) 1989-1993 to 2005-10	80–86	67–72	52–66	69–84	95–98	86–89	90–96	92–98	80–78	88–94	85–90
Adult literacy (%) 1975-80 to 2006-10	55–77	37–63	23–56	42–65	71–94	75–84	76–90	77–91	65–76	72–88	66–84
Unemployment Rate (%) 2000 to 2011	6–5	7–6	9–9.4	4–4	5–4	10–9	3–5	10–8	4–3	7–7	6–6

Red: Situation is deteriorating

Green: Situation is improving

Education is the process of communicating knowledge, reasoning and judgment, and encompasses both teaching and learning. Literacy – which is a particular set of skills that are gained through formal or non-formal education – is considered essential to successful human development as it underpins active and informed citizenship, improved health outcomes and a greater range of options for employment. Reflecting the importance of education to individual empowerment and freedom, education is recognised as a fundamental human right¹⁴.

At a national and regional level, education and literacy are key drivers of economic development, reflecting a nation's stock of human capital. Poverty, inequality, poor health and limited education opportunities are significant obstacles to increasing education rates, and are also challenges facing many nations in the Tropics. Basic literacy and numeracy skills increase a person's chances of finding paid employment and escaping poverty. Education is also strongly

correlated with health and wellbeing, and the economic productivity of nations.

Employment is an important determinant of wellbeing at an individual, community and national level. Levels of occupation whether formal or informal have long been known to determine the relative happiness or wellbeing of people. Additionally, like education, employed people represent human capital; investments that businesses and governments make in order to promote growth and development. Unemployment represents under-utilised economic resources. At an individual and societal level, unemployment can have adverse impacts if large sections of the population are unemployed. Employment and unemployment are key economic and social indicators of an individual's wellbeing, providing income and self-actualisation benefits.

¹⁴Article 26 of the 1948 Universal Declaration of Human Rights states that 'everyone has the right to education'.

Headline indicator

Mean years of schooling of adults measures the average number of years of education received by people aged 25 years and older in their lifetime, based on education attainment levels of the population converted into years of schooling. Mean years of schooling is an indicator of the aggregate stock of human capital available in an economy and society, and is comparable across populations.

Supplementary indicators

Youth literacy; adult literacy; unemployment rate

Links to other dimensions

Poverty; health; economic output; crime and corruption; gender equality; science and technology; international trade and investment; communication.

Is it getting better?

Mean years of schooling of adults almost doubled in the Tropics between 1980 and 2010, and although in 2010 adults in the Tropics had 2.5 fewer years of schooling than adults in the Rest of the World, mean years of schooling increased faster in the Tropics.

Youth literacy rates increased in all regions of the Tropics between 1989-1993 and 2005-10, except for in Oceania where youth literacy decreased slightly, and were overall consistently lower in the Tropics than in the Rest of the World. The number of illiterate youth in the Tropics decreased over this period but the number of illiterate youth increased by around 50% in Central & Southern Africa and Oceania.

The adult literacy rate increased in all regions of the Tropics between 1975-80 and 2006-10, and increased faster in the Tropics than in the Rest of the World, although rates remained considerably lower in the Tropics than in the Rest of the World in 2006-10. Despite these improvements, the number of illiterate adults in the Tropics increased.

The global unemployment rate increased slightly between 2000 and 2002 before falling consistently to 2007, in line with stronger economic growth. In 2008 and 2009 the global financial crisis resulted in major falls in economic activity and confidence, and a sharp increase in the global unemployment rate. In the Tropics however, the unemployment rate has declined steadily and only showed a small increase in 2009 before returning to pre-crisis levels.



Classroom in Guatemala. Image: Maria Fleishman, World Bank Photo Collection.

Mean years of schooling

Schooling contributes to a nation's stock of human capital, with greater levels of education linked to improved economic growth, increased labour productivity, greater social mobility and equality (Hannum & Buchmann 2005).

The most direct benefits of education relate to personal health and income, as well-educated individuals tend to live longer, make more informed health choices and have higher incomes, with one extra year of schooling increasing an individual's earnings by up to 10% (UNESCO 2011a). Globally it is estimated that people with only primary school education earn on average 77% less than those who finished secondary school, and 240% less than university graduates (Barro & Lee 2010). A mother's education level has also been shown to be more important to a child's survival than household income (UNDP 2013).

Trends

Globally the proportion of people who attended school has increased significantly over the past 50 years, from 57% in 1960 to 85% in 2010 (UNDP 2010a), as has the mean years of schooling. For adults the mean years of schooling¹⁵ increased from 4.9 years in 1980 to 7.6 years in 2010 (see Figure 6.3.1). The years of formal schooling received by an adult in the Rest of the World is consistently higher than in the Tropics, and the gap has narrowed only marginally since 1980. In the Tropics the mean years of schooling increased from 2.9 years in 1980 to 5.9 years in 2010, and in the Rest of the World from 5.7 to 8.5 years.

All regions in the Tropics increased the adult mean years of schooling in the 30 years to 2010, with Central America, South America and the Caribbean having the largest increases, at 4.1, 3.8 and 3.3 years respectively (see Figure 6.3.2). Oceania had the smallest improvement, increasing by 1.2 years but from a higher base. In percentage terms Northern Africa & Middle East, Central & Southern Africa and South Asia had the strongest growth, though for each it was from a very low base. Northern Africa & Middle East

tripled its adult mean years of schooling between 1980 and 2010 but, at 3.3 years in 2010, it is still well below all other regions of the Tropics.

Improvements in adult mean years of schooling varied substantially across the tropical regions, and there has been considerable change in the rankings since 1980. Notably, Oceania has fallen from having the highest level of adult mean years of schooling in the Tropics in 1980 to third in 2010, behind the Caribbean and Central America.

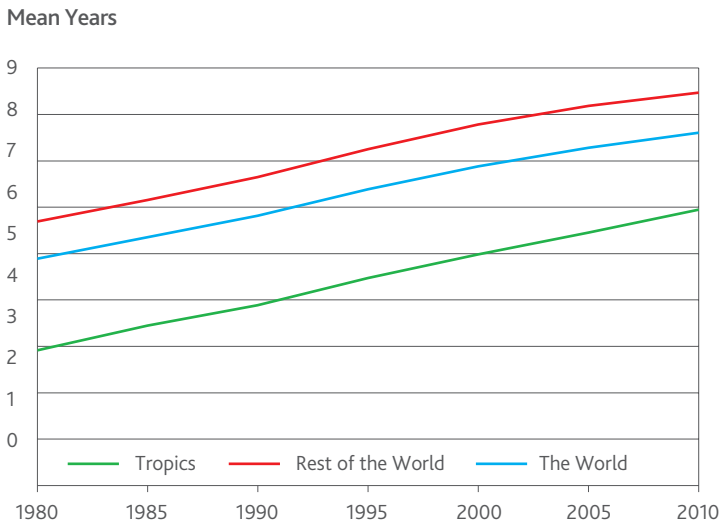
Human capital and economic growth

The concept of human capital arose in the 1960s out of recognition that people's knowledge, skills, health or values cannot be separated from economic value. Education, training, and health are considered to be the most important investments in human capital, and the connection between education and training and economic growth has received increasing attention over the past few decades (Izushi & Huggins 2004). Nations that have sustained high economic growth over the long-term have generally invested considerably in the education of their citizens (UNDP 2013).

Education can contribute to economic growth by encouraging innovation, improving labour productivity, and by creating an environment that is better able to create, disseminate and apply new technologies. Increases in mean years of schooling tend to coincide with increases in economic output, and each additional year of average schooling has been shown to increase the average annual economic growth rate by almost 0.4 percentage points (Hanushek et al. 2008). Reflecting this, there is a clear relationship between adult mean years of schooling and gross national income per capita (see Figure 6.3.3).

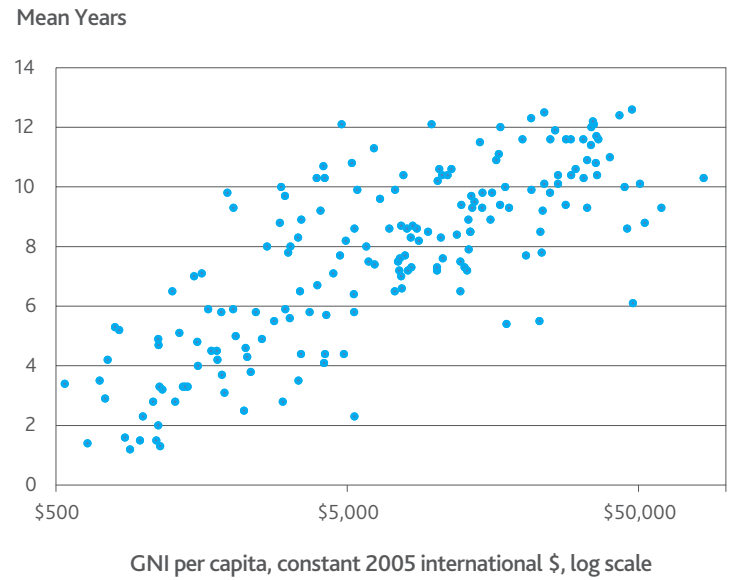
¹⁵ Mean years of schooling of adults is the 'average number of years of education received by people aged 25 and older in their lifetime, based on education attainment levels of the population converted into years of schooling based on the theoretical durations of each level of education attended' (UNDP 2010).

Figure 6.3.1 Adult mean years of schooling



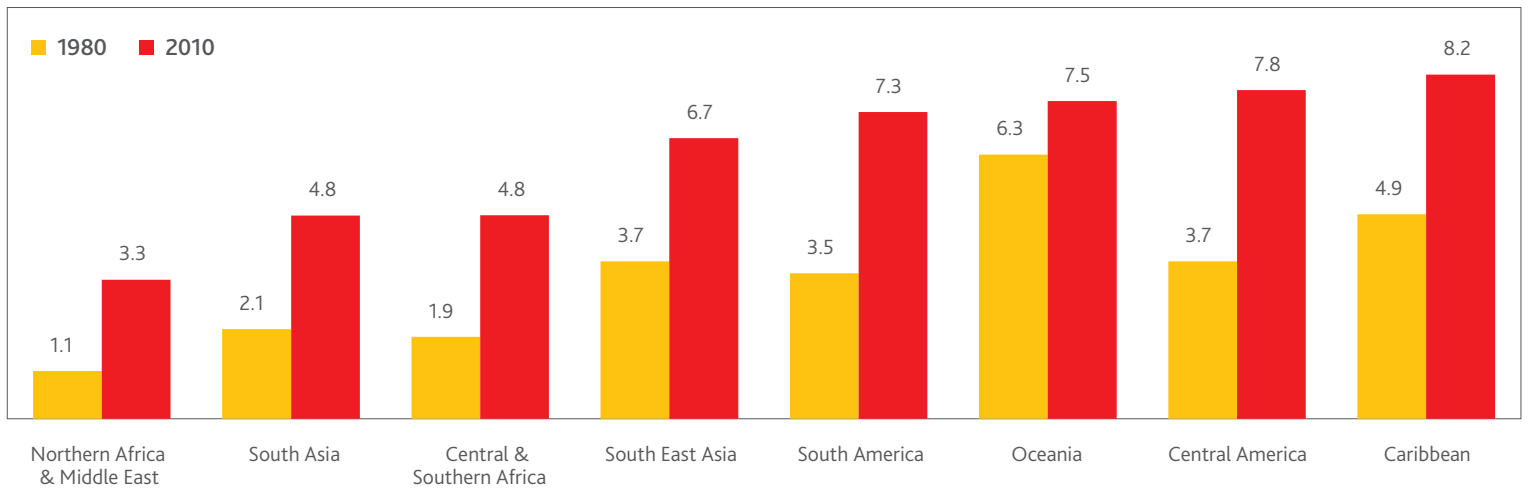
Source: Barro & Lee (2010), State of the Tropics project.

Figure 6.3.3 Mean years of schooling of adults and gross national income per capita, 2011



Source: Barro & Lee (2010), UNDP (2011), State of the Tropics project.

Figure 6.3.2 Adult mean years of schooling



Source: Barro & Lee (2010), State of the Tropics project.

Box 6.3.1 Human capital and economic growth in Cuba and Singapore

Cuba has developed substantial human capital through investment in education, with expenditure on education averaging about 9% of GDP between 1980 and 2010 (UNESCO 2012b). At 10.2 years, Cuba's adult mean years of schooling was in the top 25% of nations in 2010 (Barro & Lee 2010), and it also has universal youth literacy and near universal adult literacy. Cuba's highly educated stock of human capital has not however translated into stronger economic growth, and it ranks 103rd out of 187 nations in terms of gross national income (GNI) per capita (UNDP 2011). Cuba's relatively weak economic performance is attributed to poor management across a range of policy areas including exchange rates, micro-enterprise, agriculture, labour, foreign investment infrastructure renewal and trade embargoes (Ritter 2010).

Singapore also has a strong education system with mean years of schooling at 8.8 years in 2010. In contrast to Cuba though, education has driven economic growth by successfully matching supply with demand for education

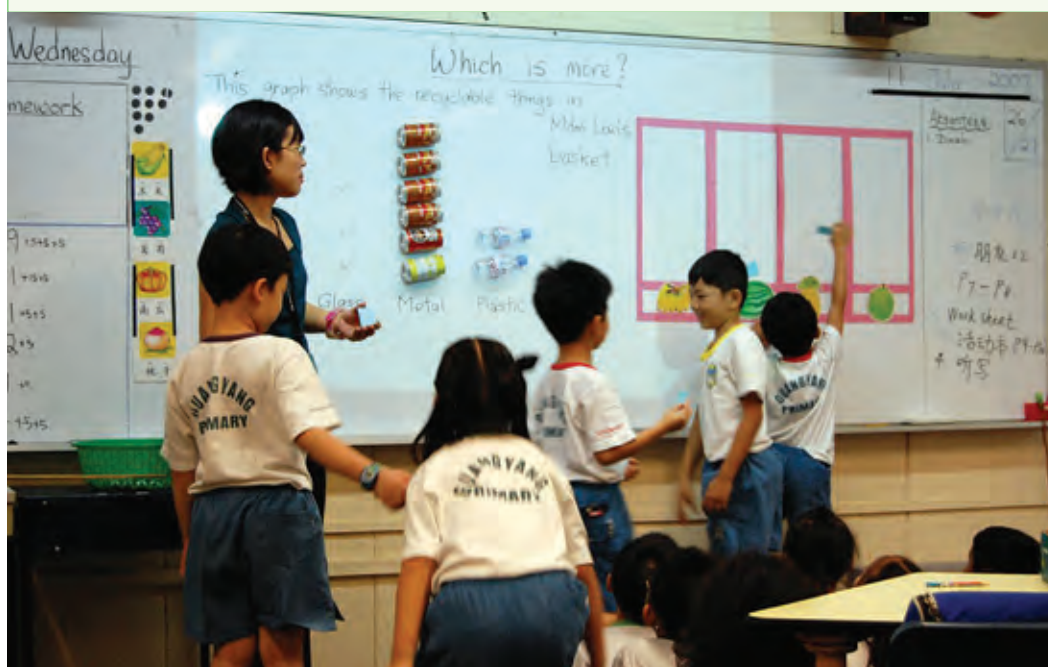
and skills (OECD 2011). Singapore is one of the wealthiest nations in the world, ranking 4th among 187 nations in GNI per capita (UNDP 2011). Between 1959 and 1978 the education system successfully expanded basic education to support Singapore's labour-intensive manufacturing sector, and between 1979 and 1996 the shift to a skill-intensive economy was supported by an emphasis on producing a more technically-skilled labour force (OECD 2011). From the 1990s, Singapore's education system has responded to the growth of the global knowledge economy by focusing on innovation, creativity and research, and has been successful in producing highly-skilled, flexible workers with advanced critical thinking and self-learning skills (OECD 2011). The complementary relationship between education and economic development in Singapore has also been supported by factors such as investment in teacher and leadership capacity, ambitious standards and assessments, and a culture of continuous improvement (OECD 2011).

Mean years of schooling may not however fully reflect a nation's stock of human capital as it does not consider quality of education, which is a key factor in expanding human capabilities (UNDP 2013). Research suggests that increased quality of schooling (as measured by improved cognitive skills of students), accounts for a large proportion of the economic growth traditionally attributed to additional years of schooling (Hanushek et al 2008).

The contribution of education to economic growth is influenced by many other factors, including the structure of the economy, the distribution of wealth and government policy settings (Ranis et al. 2000), while 'social capital' associated with cultural norms, interpersonal trust and social networks also influence economic growth and its prospects (Woodhall 2001). Case studies of Cuba and Singapore indicate that strong management across a range of policy areas is necessary to maximise the economic and social return from investments in human capital (see Box 6.3.1).

Looking forward

Mean years of schooling has increased globally over the past 30 years, including a significant increase in the Tropics. However, in 2010, adults in the Tropics received 2.6 years less of formal education than adults in the Rest of the World, suggesting a lower level of human capital in the Tropics. Challenges for low income nations in the Tropics to increase education levels include reaching marginalised and disadvantaged groups, reducing income and gender inequality, increasing participation in post-primary education, providing training for out-of-school and adult students and improving the quality of provided education (World Bank 2011).



Classroom in Singapore. Image: Cassandra Turner.

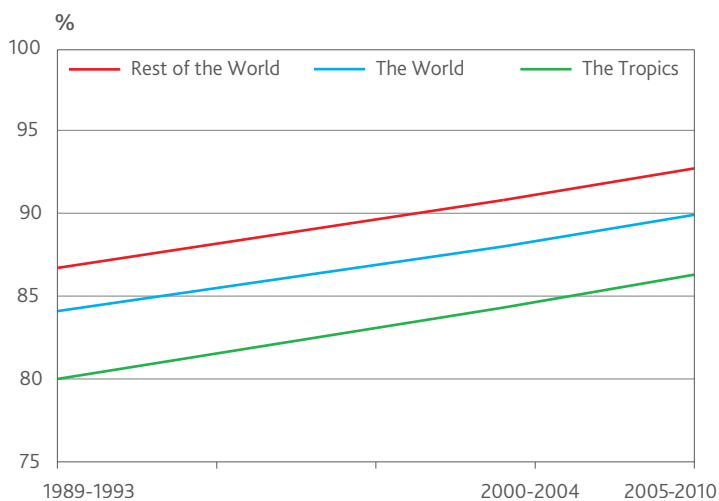
Young adults represent a major global resource. As a group, young adults aged between 15 and 24 years (referred to here as 'youth') are at a stage of life where they are acquiring greater independence, awareness and involvement in social, economic and political issues. Teenagers and adults in their early 20s are beginning to act as agents for innovations that will affect development prospects at the local, national and international levels. Education and training can help to prepare young adults for their expanded roles in society, and literacy – as it is the foundation for most learning – plays an important role in maximising an individual's capacity to gain employment, as well as to engage in and influence society.

In 2010 there were around 1.2 billion people aged 15-24 (17% of the global population), with one out of ten people in this group lacking basic writing, reading and numeracy skills. Primary school is where most people acquire basic literacy skills, and although the proportion of children attending primary school has seen significant improvement, globally around 67 million primary school age children were not enrolled in school in 2009 (UNESCO 2011b). Youth literacy remains a significant problem in many nations.

The youth literacy rate¹⁶ reflects the quality of basic education and its degree of inclusiveness. Some children are excluded from educational opportunities due to social inequalities linked with gender, ethnicity, wealth or location, each of which can increase the likelihood of illiteracy. While inequalities between girls and boys can influence school attendance rates, the most significant inequalities exist between rural and urban children, with rural children twice as likely to be out of school as children from urban areas (UNESCO 2011b).

As a basic requirement for future learning and thus human capital creation, high literacy rates are critical to the future development of both individuals and nations.

Figure 6.3.4 Youth literacy rate



Source: UNESCO (2007, 2012a), UN (2013), State of the Tropics project.

Trends

In the Tropics the youth literacy rate increased from 80% in the period 1989-93 to 86.3% in 2005-10, while in the Rest of the World it increased from 86.7% to 92.7% (see Figure 6.3.4). There has been little convergence in the literacy rates between the Tropics and the Rest of the World over this period, with the gap consistently around 5.6 percentage points.

In the 20 years to 2010 the youth literacy rate in the Tropics increased at an average rate of 0.4% per annum compared with 0.3% in the Rest of the World, increasing by 6.3 percentage points in the Tropics compared with 5.3 percentage points in the Rest of the World. As the proportion of the youth population living in the Tropics increased from 39% in 1990 to 44% in 2010, literacy rates in the Tropics had a slightly greater impact on global outcomes in 2010.

Of the tropical regions Northern Africa & Middle East had the greatest improvement in

the youth literacy rate, with average growth of 1.9% per annum (more than six times the global rate), although this was from a low base of 52%. Modest improvements in Central & Southern Africa over this period has seen it being overtaken by Northern Africa & Middle East by 2005-10, and it now has the lowest youth literacy rate of the tropical regions. South Asia also had considerable growth, with the youth literacy rate in the region increasing by 1% per annum on average, more than three times the global rate of growth.

With the exception of Oceania, where the youth literacy rate declined marginally, the remaining tropical regions experienced growth of 0.1% to 0.4% per annum in the 20 years to 2010. In Central & Southern Africa the youth literacy rate increased modestly despite starting from a low base, while for the other regions the modest rates of improvement reflected a relatively high starting point in 1989-1993. In 2010 South East Asia, Central America and South America each had youth literacy rates above the global rate

of 89.9%. The fall in the youth literacy rate in Oceania was due to Papua New Guinea, where the increase in the literate youth population did not keep pace with the increase in the youth population. Poverty, relatively poor health outcomes and rural geography present range of unique education challenges in Papua New Guinea (see Box 6.3.2).

Globally the number of illiterate youth decreased from 157 million in 1990 to 121 million in 2010. In the Rest of the World the number of illiterate youth fell from 80 million to 49 million (-39%), while the Tropics had only a modest decrease, from 77 million to 72 million (-7%). The gap in the number of illiterate youth between the Tropics and the Rest of the World increased significantly, and in 2010 the Tropics had almost 50% more illiterate youth than in the Rest of the World.

Nonetheless, the number of illiterate youth declined in six of eight tropical regions in the 20 years to 2010. The largest falls were in in South

America (-62%), South East Asia (-49%), Central America (-45%) and South Asia (-33%). The number of illiterate youth increased in Central & Southern Africa and Oceania, by 12 million (50%) and 134,000 (47%) respectively.

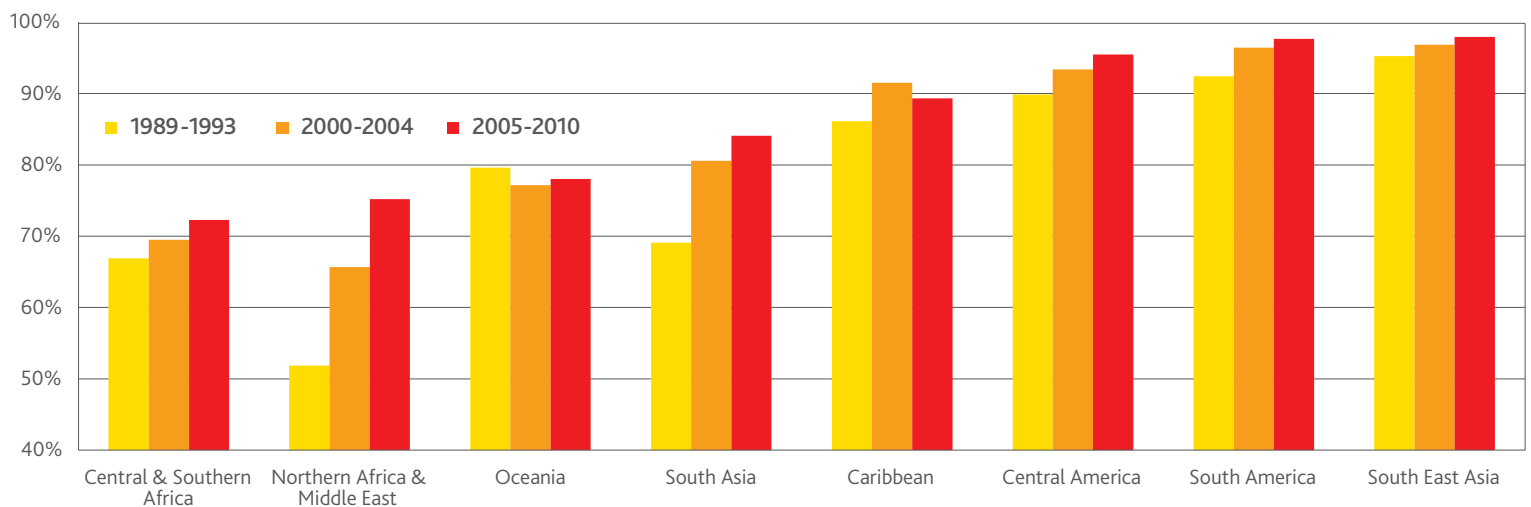
Primary school education

Attendance at primary school is the most effective way of increasing youth literacy, with out-of-school youth having limited opportunities to develop or maintain literacy skills (UN 2012). Primary education provides children with basic reading, writing and mathematics skills, as well as elementary-level understanding of subjects such as history, geography and science. Recognising the importance of primary education to creating opportunities in life, the Millennium Development Goals aim to ensure that all children will be able to complete a full course of primary schooling by 2015 (UN 2003).

Primary school enrolment rates have increased worldwide since 1999, and in 2010 it was 97% in developed regions and 90% in developing regions. Global primary school completion rates have also increased, from 81% in 1999 to 90% in 2010 (UN 2012). Nonetheless, progress in reducing the number of out-of-school children has slowed considerably since 2004 (UN 2012), and the number of illiterate youth is considerable. Substantial barriers to improved education and literacy also persist, especially with respect to urban/ rural status, gender, ethnicity and disability. For example, girls of lower secondary school age are less likely to be in school than boys, even though girls and boys have similar chances of completing primary school education in most nations. Encouragingly though, the gender gap in youth literacy rates

¹⁶ The youth literacy rate is 'the number of persons aged 15 to 24 years who can both read and write with understanding a short simple statement on their everyday life, divided by the population in that age group. Generally, 'literacy' also encompasses 'numeracy', the ability to make simple arithmetic calculations' (UNESCO 2009).

Figure 6.3.5 Youth literacy – the Tropics



Source: UNESCO (2012a), UN (2013), State of the Tropics project

tends to be narrowing with the global focus on universal access to primary education (UN 2012).

The contribution of basic primary school education to youth literacy rates can be complemented with age-specific out-of-school programs aimed specifically at reducing youth illiteracy. Despite global recognition that young adults are critical to future development prospects, there is a general lack of youth-targeted literacy programs (UNESCO 2008). As a consequence, many young people tend to participate in adult literacy programs which may not be effective or suitable (UNESCO 2008). The need for targeted programs is underscored by the significant problems faced by illiterate youth, such as low self-esteem and self-knowledge, as well as limited basic life, communication and money management skills (Butler & Ignatowski 2010). Each of these factors can significantly affect the opportunities that an individual has to reach their potential.

Box 6.3.2 Youth literacy in Papua New Guinea

Oceania is the only region in the Tropics where youth literacy decreased between 1990 and 2010, from 79.6% to 78.0%, which was due to declining rates in Papua New Guinea (PNG). With one in three young people in the nation illiterate, youth illiteracy is recognised as a major problem, and the number of illiterate youth is predicted to increase to 2015 (UNICEF 2011).

PNG accounts for a large and increasing proportion of Oceania's youth population, estimated at 60% in 2010. This cohort is critical to making the nation more economically productive and socially resilient, but obstacles such as poverty, limited employment opportunities and rural/urban inequalities continue to limit young people's access to opportunities and resources (UNICEF 2011). Increasing literacy rates in PNG is a major challenge. A largely rural population, poor

health outcomes and a diverse culture with more than 800 languages provide multiple barriers. The government of PNG considers literacy to be at the 'heart of human development and lifelong learning (necessary) to alleviate poverty', and has achieved some recent progress in broadening access to formal education.

Organisations such as AusAID and the World Bank have also sponsored investments in vocational education and training and 'second chance' education opportunities, but the reach and impact of these investments have been limited (UNICEF 2011). Increasing youth literacy rates alone will not be sufficient to ensure better prospects for young people, and will need to be accompanied by policies which improve governance and strengthen and broaden economic activity and employment opportunities (UNICEF 2011).



Buk blong Pikinini (Books for Children), PNG. Image Ness Kerton, AusAID.

Literacy | Adult literacy

The adult literacy rate¹⁷ is a basic measure of a nation's stock of human capital that is readily comparable across nations. In a rapidly changing, technology-driven world adult literacy is an essential underpinning of a nation's economic development, yet around 16% of the world's adult population is illiterate.

As awareness about the importance of literacy to individual and societal wellbeing grows, there has been a rapid expansion in formal schooling, mass literacy campaigns and, to a lesser extent, adult learning programs. Adult literacy programs have tended to be overshadowed by a greater focus on improving child and youth literacy rates through primary and secondary education. Globally, adult literacy programs typically receive only around 1% of national education budgets (UNESCO 2006). Nonetheless, investments to improve child and youth literacy rates have contributed to significant improvements in adult literacy rates in most nations. The rate of improvement has not been universal across nations however, and those with low literacy rates are generally characterised by prolonged conflict, economic decline or other major social issues (UNESCO 2011c).

At the household level adult literacy can have a major impact on family income and wellbeing. Literate parents, and particularly mothers, tend to have healthier children who are 50% more likely to survive past the age of five (UNESCO 2011a), and literate people tend to earn higher incomes and to have better employment opportunities (Cree et al. 2012).

Trends

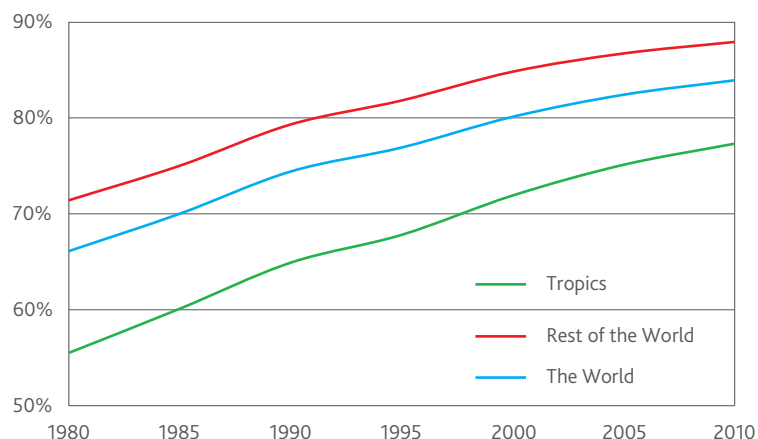
Adult literacy rates in the Tropics are considerably lower than in the Rest of the World, though the gap has narrowed since 1975-80. In 1975-80 the adult literacy rate in the Tropics was 55% compared with 71% in the Rest of the World – a 16 percentage point difference. In the 30 years to 2010 the gap narrowed to 11 percentage points, with the Tropics having an

adult literacy rate of 77% and the Rest of the World 88% (see Figure 6.3.6).

The Tropics experienced a threefold growth in the number of literate adults in the period between 1975-80 and 2006-10 – from 0.5 billion to 1.5 billion. The Rest of the World started from the significantly higher position of 1.4 billion literate adults in 1975-80, doubling to 2.7 billion in 2006-10. Compared to 1975-80, in 2006-10 there were 1 billion more literate adults in the Tropics and 1.3 billion more in the Rest of the World.

In the 30 years to 2010 the literacy rate in the Tropics increased at an average rate of 1.1% per annum compared with 0.7% in the Rest of the World. Adult literacy rates improved significantly in all regions of the Tropics, and those with the lowest starting point (Northern Africa & Middle East, Central & Southern Africa and South Asia) report the greatest improvements (see Figure 6.3.7). Despite the gap reducing slightly, adult literacy rates in

Figure 6.3.6 Adult literacy rate



Source: Source: UNESCO (2012a), UN (2013), State of the Tropics project.
* Six years to 1980.

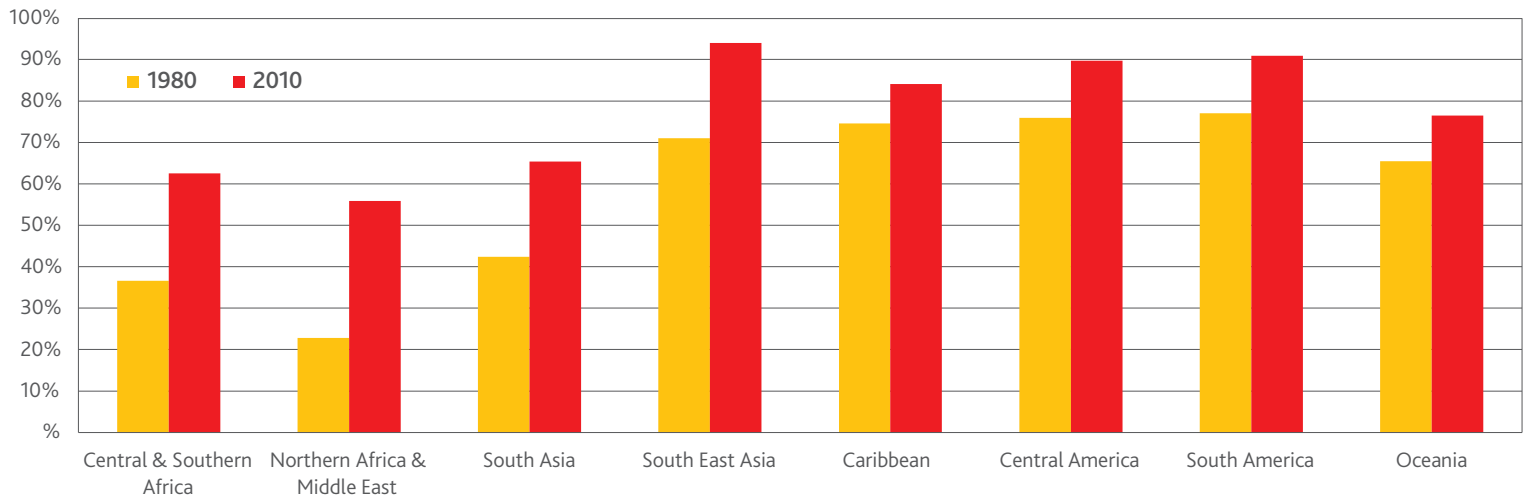
these three regions are still well below the other tropical regions. South East Asia also reported a strong improvement, with the adult literacy rate increasing by 23 percentage points to 94%.

South East Asia has had the highest adult literacy rate of the tropical regions since 1990, when it first exceeded the Caribbean, Central America and South America. This followed ten years of significant improvements in adult literacy rates. The major movement in the ranking of the tropical regions is that South East Asia has moved from fourth in 1980 to first in 2010.

Comparing growth in the adult population with the adult literate population provides an

¹⁷ The adult literacy rate is 'the percentage of population aged 15 years and over who can both read and write with understanding a short simple statement on his/her everyday life. Generally, 'literacy' also encompasses 'numeracy', the ability to make simple arithmetic calculations' (UNESCO 2009).

Figure 6.3.7 Adult literacy rates – the Tropics



Source: UNESCO (2012a), UN (2013), State of the Tropics project.

indication of the success of post-primary school adult education programs. Where the increase in the number of literate adults exceeds the increase in adult population, it suggests that adult literacy programs have been implemented successfully. In the Tropics, South East Asia had the strongest result with growth in the adult literate population more than 15% greater than growth in the adult population. South America and Central America also experienced a greater increase in the number of literate adults relative to the adult population. This did not occur in the other regions of the Tropics.

In the Tropics the number of illiterate adults increased from 420 million in 1975-80 to 430 million in 2006-10, an increase of just over 2%. Over the same period the illiterate population in the Rest of the World fell from 550 million to 375 million, a decrease of 32%. As such, the Tropics' proportion of the global illiterate population increased from 43% in 1975-80 to 53% in 2006-10.

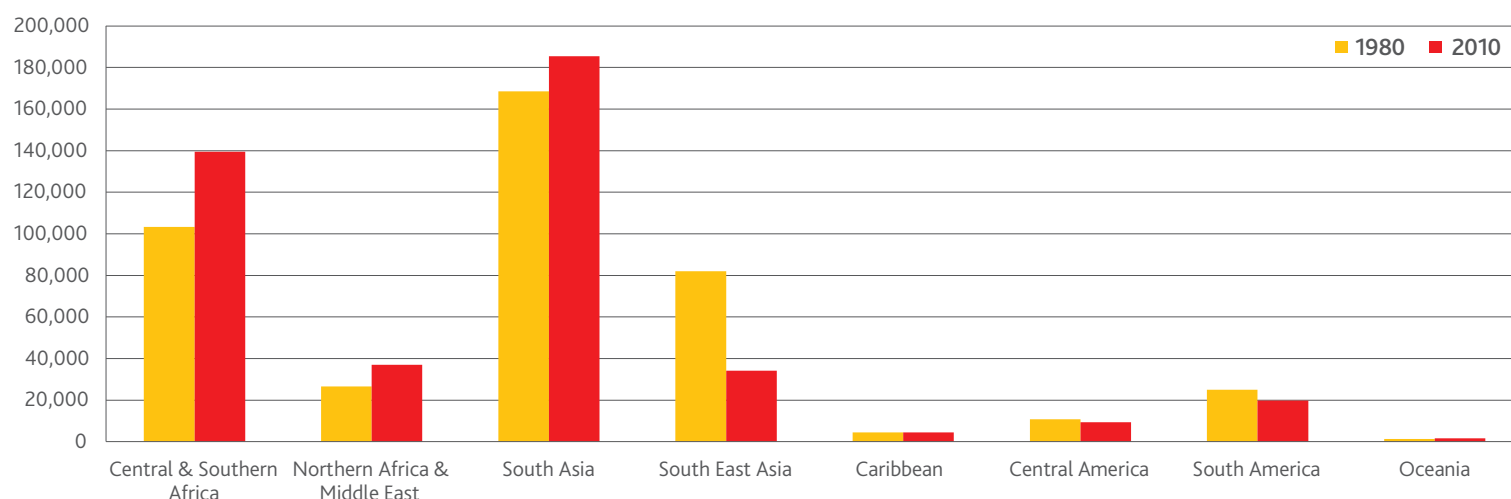
Despite international efforts, the number of illiterate adults increased in four of the eight tropical regions in the 30 years to 2010, with only South East Asia, South America, Central America and the Caribbean experiencing a decline. The number of illiterate adults in South East Asia declined by 58% over this period (see Figure 6.3.8).

South Asia, Central & Southern Africa and Northern Africa & Middle East accounted for almost 85% of the adult illiterate population in the Tropics in 2006-10. Despite significant improvements in adult literacy rates, these regions have had a substantial increase in the number of illiterate adults. In South Asia the adult illiterate population increased from 169 million in 1975-80 to 185 million in 2006-10, from 103 million to 139 million in Central & Southern Africa, and from 27 million to 37 million in Northern Africa & Middle East. Improvements in adult literacy rates in these regions have coincided with significant

increases in primary education net enrolment rates (though from a low base). Improved enrolment rates are not matched by primary school completion rates, which is an indicator of literacy, education system quality and student progression. Nonetheless, nations in sub-Saharan Africa have the lowest primary education enrolment and completion rates in the world (UN 2012).

Despite significant improvements in adult literacy rates, the legacy of high fertility rates has contributed to the high number of illiterate adults in these regions. The African regions of the Tropics had an average fertility rate of 5.6 children per woman in 2010 (compared with 2.1 in the Rest of the World). Coupled with relatively low primary education enrolment and completion rates, this means a significant number of children in Africa enter the adult population illiterate. With life expectancy increasing, adult literacy programs are essential to reduce the number of illiterate

Figure 6.3.8 Adult illiterate population (thousands) – the Tropics



Source: UNESCO (2012a), UN (2013), State of the Tropics project.

adults in Africa, particularly if primary school net enrolment and completion rates remain relatively low.

The Education for All movement

The Education for All (EFA) initiative was established by the United Nations and World Bank in 1990 with a commitment to provide basic education to all people. In the absence of a literacy-specific Millennium Development Goal, in 2000 the EFA committed to closing the gap between existing and full literacy by 50%. As the global illiteracy rate was 20% in 2000, the target is for 90% literacy by 2015. Governments of 164 nations have committed to this adult literacy goal.

In 2003 the United Nations' Literacy Decade was established with a goal to increase literacy rates. The Literacy Decade highlighted the literacy crisis in many nations and also placed

adult literacy on the agenda of governments (see Box 6.3.3).

To meet the EFA target the global community has focused on improving outcomes in those nations with the lowest literacy rates and significant illiterate populations. Running between 2006 and 2015 the United Nations' Literacy Initiative for Empowerment (LIFE) specifically targets the 36 nations with adult literacy rates below 50% or an illiterate adult population of more than 10 million. Of the 36 targeted nations, 29 are located in the Tropics. In the period 1995-2004 to 2005-09 adult literacy rates in the target nations increased by 3.1 percentage points on average compared with a 1.9 percentage point increase globally (UNESCO 2012a). However, even with global support three of the 32 LIFE nations for which data are available experienced a decrease in adult literacy rates, and 24 reported an increase in the illiterate population.

National progress towards the EFA adult literacy goal is mixed, and globally the adult literacy rate has only increased from 80% in 2000 to 84% in 2010, well below the 90% targeted for 2015. Despite widespread government support for the adult literacy goal, often this has not translated to improved outcomes.

Costs of illiteracy

Economic and social inequalities can contribute to unequal access to education and literacy programs, and marginalised social groups often have higher rates of illiteracy (UNESCO 2010). Factors contributing to adult illiteracy include poverty, malnutrition, poor health, migration, child labour and lack of access to education services tailored to adults (Martinez & Fernandez 2010). An inability to read or write can trap individuals in a poverty cycle from a young age, which can limit opportunities for employment or career progression. Completing the cycle, the factors associated with illiteracy

increase the chances of poor health and a greater reliance on welfare or crime for income (Cree et al. 2012).

In addition to impacts at the individual level, illiteracy incurs major costs at the national level in terms of lost productivity, as well as impacts on health and many other social outcomes. Research quantifying the impacts of illiteracy highlight that literacy programs represent an investment in human capital and long-term social and economic productive capacity. In 2012 the cost of illiteracy to the global economy was estimated at US\$1.19 trillion, representing 2% of gross domestic product in developed nations, 1.2% in emerging nations and 0.5% in developing nations (Cree et al. 2012). The economic costs of illiteracy are associated with lost earnings, limited employability, lost business productivity and lost wealth creation opportunities. Illiterate adults tend to earn 30-42% less than literate adults and their income is unlikely to grow significantly through their working life (Cree et al. 2012). The social costs of illiteracy are mostly associated with health issues, increased crime and welfare payments.

Box 6.3.3 Literate Brazil program

Despite having a relatively high adult literacy rate, Brazil is one of the top ten nations in terms of the number of illiterate adults. To address this, in 2003 the government initiated the Literate Brazil Program (LBP), with a goal to provide learning opportunities for citizens that had not received basic primary education (that is the first eight years of schooling) or had failed to complete it (UNESCO 2012b). The LBP targets disadvantaged groups such as the indigenous population, fishers, small farmers, seasonal workers, prison inmates, child laborers and people with disabilities. Municipalities with adult illiteracy rates higher than 25% are assigned priority status.

The LBP provides financial support to existing and successful local literacy initiatives. This decentralised approach allows literacy programs to be tailored to the needs of participants. For example, literacy textbooks can be published in local languages and reflect local circumstances. Classes last between 6 and 12 months and, to 2012, around 8 million people had participated in the program. On graduation participants are encouraged to continue their education.

The LBP has contributed to the rise in adult literacy in Brazil from 86% in 2000 to 90% in 2009.



Adult education, Brazil. Image: Gui Tamburus.

Literacy | Youth and adult literacy rates

Youth literacy rates tend to be higher than adult literacy rates, largely reflecting increased access to primary and secondary education among younger generations. Globally, the gap between youth and adult literacy rates has narrowed from 9.5 percentage points in 1989-1993 to 5.8 percentage points in 2005-10¹⁸. Although the gap between youth and adult literacy rates is larger in the Tropics, adult literacy rates in the Tropics are converging on youth literacy rates considerably more rapidly than in the Rest of the World.

In the Tropics the gap between youth and adult literacy rates narrowed in all regions, though at varying rates. In the Caribbean the gap varied by less than by one percentage point, while in Central & Southern Africa and Oceania it closed by more than eight percentage points.

In Oceania this was associated with modest improvements in adult literacy rates combined with a fall in the youth literacy rate. Youth and adult literacy rates in the Tropics are shown in Figure 6.3.9, with the largest disparities being in South Asia, Central & Southern Africa and Northern Africa & the Middle East.

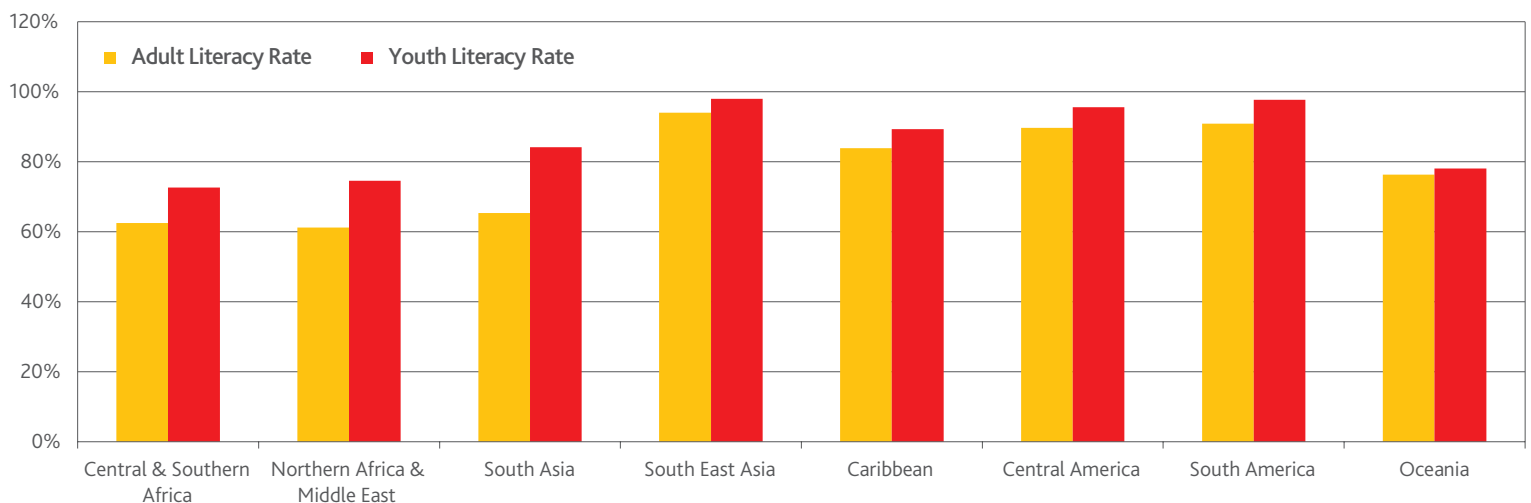
Looking forward

Reducing the number of illiterate people requires an ongoing commitment to strategies that both minimise illiteracy among children and deliver programs to address adult illiteracy. This commitment is especially needed in the Tropics where, despite significant improvements in literacy rates, the number of illiterate youth and adults continues to increase. In addition

to education-specific policies, strategies that combat poverty are also likely to contribute to improved educational and literacy outcomes, and contribute to economic and social development.

¹⁸When comparing youth and adult literacy rates a consistent list of nations and time periods is used. This may result in slight variations in adult literacy rates reported here and in the adult literacy section.

Figure 6.3.9 Youth and adult literacy – the Tropics, 2005-10



Source: UNESCO (2012a), UN (2013), State of the Tropics project.

Unemployment rate

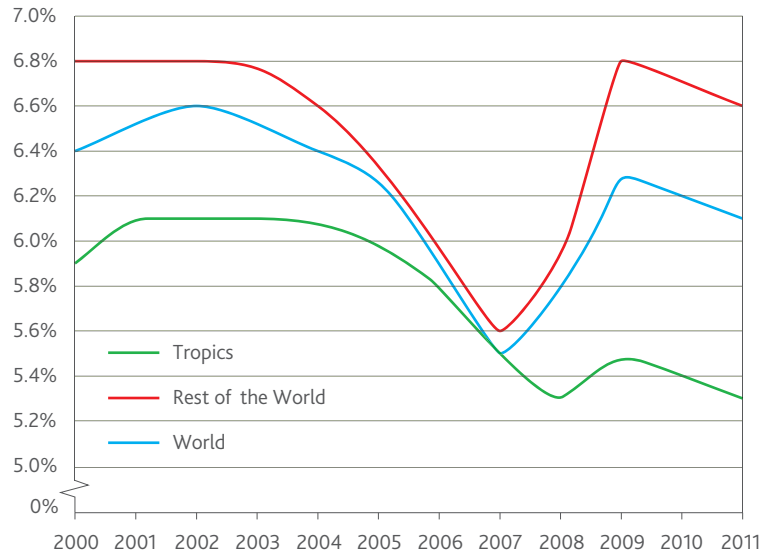
Unemployment is the excess supply of labour relative to demand, and represents the under-utilisation of labour resources in the economy. The unemployment rate is the proportion of the labour force that is unemployed. Rising unemployment is indicative of future falls in national output, the loss of tax revenue and increased government spending on social benefits where such benefits exist. High unemployment can also have social impacts if it increases the risk of crime or leads to xenophobia. At the individual level, for people that were previously employed the loss of a job can result in lower income and living standards, the loss of marketable skills and, in the case of prolonged unemployment, increased risk of health and psychological problems (McKee et al. 2005).

Globally around 40 million new people enter the labour market each year (ILO 2012a), and the prospects of gaining employment are heavily influenced by an individual's skill levels and importantly, economic conditions. Weak economic conditions generally mean greater competition amongst job seekers for employment, particularly amongst low skill workers. In that sense, the global financial crisis in 2008 had profound and widespread consequences for employment creation. The global employment to population ratio was 60.3% in 2011, a 0.9 percentage point drop compared with pre-crisis levels, or a reduction of around 50 million jobs (ILO 2012b). The International Labour Organization (ILO) estimates that the global labour force was 3.3 billion in 2012. In the same year, 200 million people were unemployed and a further 900 million people were employed, but living on less than \$2 a day. That is, more than one in three labour force participants were either unemployed or in the group referred to as the 'working poor' (ILO 2012a).

Trends

The unemployment rate tends to be countercyclical to economic activity, meaning

Figure 6.3.10 Unemployment rate



Source: ILO (2011b), State of the Tropics project.

that when the economy is booming the unemployment rate tends to be low, and when economic growth is weak the unemployment rate is high. The global unemployment rate increased slightly between 2000 and 2002 before falling consistently to 2007, in line with stronger economic growth. In 2008 and 2009 the global financial crisis resulted in major falls in economic activity and confidence, and a sharp increase in the global unemployment rate. Economic conditions have improved since then and the unemployment rate has started to fall, if only modestly (see Figure 6.3.10).

Changes in the unemployment rate in the Tropics and the Rest of the World have followed a broadly similar pattern over the past 10 years, but with a notable difference in the rate itself (see Figure 6.3.10). Since 2000 the unemployment rate in the Tropics has, on average, been 0.7 percentage points lower than in the Rest of the World, and economic growth has been 2.2 percentage points (or 65%) higher

on average. In the Tropics the unemployment rate increased from 5.9% in 2000 to 6.1% in 2002, followed by a fall to 5.3% in 2008. There was a one-year lag between the worst impacts of the financial crisis on labour markets in the Rest of the World and the Tropics, and the impacts in the Tropics were quite modest compared with what transpired in many developed nations in the Rest of the World. By 2011 the unemployment rate in the Tropics had returned to pre-crisis levels, while in the Rest of the World it was still a full percentage point higher.

The unemployment rate for the Tropics is principally driven by the three most populous regions – Central & Southern Africa, South Asia and South East Asia – which represent around 70% of the labour force. Although there have undoubtedly been GFC-related impacts, relative to the Rest of the World, each of these regions has experienced strong economic growth since 2000, and this is reflected in unemployment rates.

Box 6.3.4 Youth employment

Compared with adults, young people aged 15 to 24 are almost three times as likely to be unemployed as adults (ILO 2013a). In times of high unemployment this can translate to significant swings in the number of youth that are looking for work. At the peak of the financial crisis in 2009 around 76 million youths were unemployed (with a youth unemployment rate of 12.7%), up from 70 million in 2007 (11.5%).

The adverse labour market conditions for youth are also evident in employment rates. Globally the share of the working age population that is employed (referred to as the employment-to-population ratio), declined by one percentage point between 2007 and 2012 due to falling labour force participation and rising unemployment (ILO 2013b). Disaggregation by age group shows that rising youth unemployment and falling youth participation accounted for around half of the decline, despite accounting

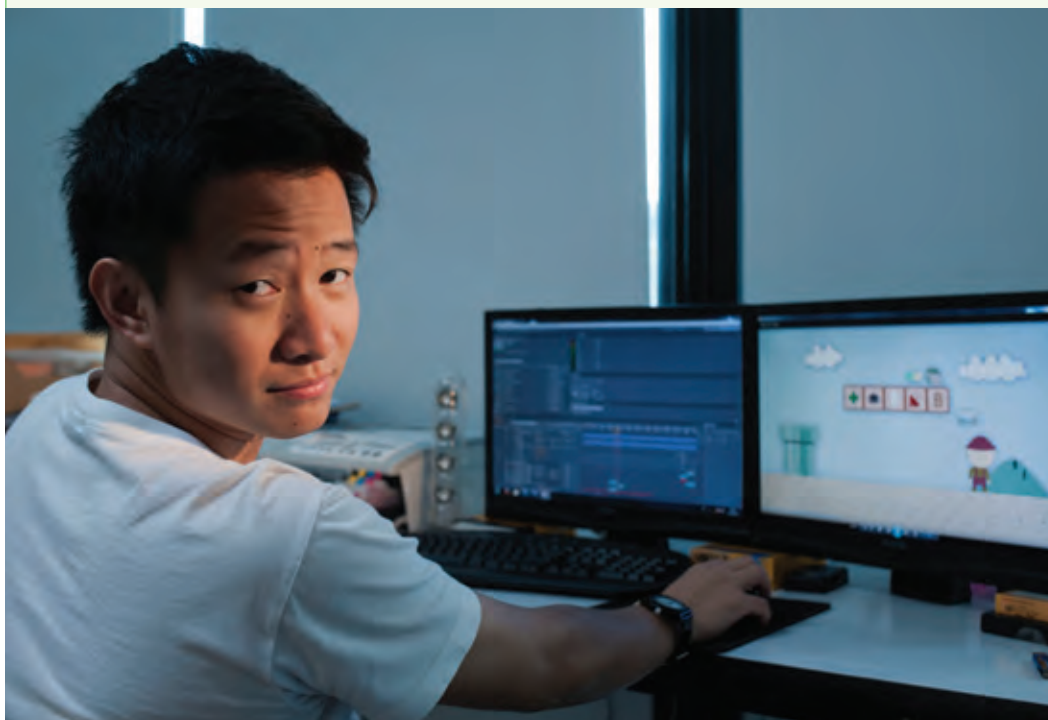
for less than 20% of the global labour force before the crisis. In other words, the contribution of youth to deteriorating labour market outcomes was disproportionate to its size (ILO 2013b). At the global level the youth employment-to-population ratio fell from 44.2% in 2008 to 42.3% in 2013, with the decline particularly pronounced in developed nations and in East Asia.

Factors contributing to young people finding it harder to secure work include a lack of experience and limited professional networks. For those in work there is also a higher risk of dismissal, as a lack of experience often translates into lower productivity. In the post-GFC environment it is estimated that more than 6 million young people have withdrawn from the labour force globally, preferring to continue their education or giving up on securing a job altogether.

Unemployment rate movements in the Rest of the World have been more significant, falling by 1.2 percentage points to 5.6% between 2003 and 2007. The impact of the GFC on the unemployment rate in the Rest of the World was swift and severe, especially in 2009. By 2009 the unemployment rate was back at 6.8%, though there have been some modest declines since then. The United States of America accounts for 8% of the labour force in the Rest of the World, and has a strong influence on reported outcomes. The financial crisis had a significant impact on labour markets in the US, with the unemployment rate increasing from 4.6% in 2007 to 9.6% in 2010. In China – which accounts for nearly 40% of the total labour force in the Rest of the World – increases in the unemployment rate were modest, increasing from 3.9% in 2007 to 4.3% in 2010.

There is considerable variation in unemployment rates between regions in the Tropics, with the Caribbean, Northern Africa & Middle East and South America consistently reporting higher unemployment rates during the reporting period (see Figure 6.3.11). With the exception of Cuba, unemployment rates are relatively high in all nations in the Caribbean. Most nations in South America contribute to the high regional rate, while in Northern Africa & Middle East movements in the unemployment rate have been very modest for all nations.

In Central America where tropical Mexico accounts for around 70% of the regional labour force, the North American Free Trade Agreement and remittances means that economic conditions are heavily influenced by events in the US (Villarreal 2010), with the unemployment rate falling steadily to 2007, before increasing rapidly. Unemployment rates in Central & Southern Africa, South Asia, South East Asia and Oceania have largely been unaffected by the financial crisis.



Young professional in Thailand. Image: Gerhard Jörén, World Bank Photo Collection.

Economic growth and labour markets

Higher unemployment is associated with weakening economic conditions, falling demand for goods and services and deteriorating business conditions and consumer confidence. In this environment, firms are hesitant to invest or hire, and there is a negative feedback loop between labour markets and the macro-economy, with the impacts typically being greater for the unskilled and the young (see Box 6.3.4). There also tends to be a considerable lag from the start of an economic recovery and employment growth (ILO 2012b). This is because there is already some degree of under-utilised labour in the workforce, and employers will tend to delay employment decisions until there is some degree of certainty regarding the strength and sustainability of the recovery.

The global financial crisis affected each nation in a different way. The extent of these effects was dependent on a nation's vulnerability to external shocks and its integration with the global economy (UNIDO 2011). As such, many developed nations were impacted more severely when compared with developing and emerging nations.

Long-term unemployment, underemployment and decent work

The unemployment rate alone does not reveal the full status of labour markets, as the duration of unemployment also matters. The longer that an individual is not working, the greater is the risk that they become less attached to labour markets and suffer from skills erosion and reduced employability. Long term unemployment can also increase the risk of social exclusion as, for many people, their identity, social networks and sense of connection with society revolves around work.

Long term unemployment refers to being unemployed for a year or more. The risk of long term unemployment is greatest during recessions, especially where there are also significant structural changes occurring in an economy. As

economies are restructuring, a mismatch may arise between the supply of skills that is available in the stock of unemployed – and the demand of skills.

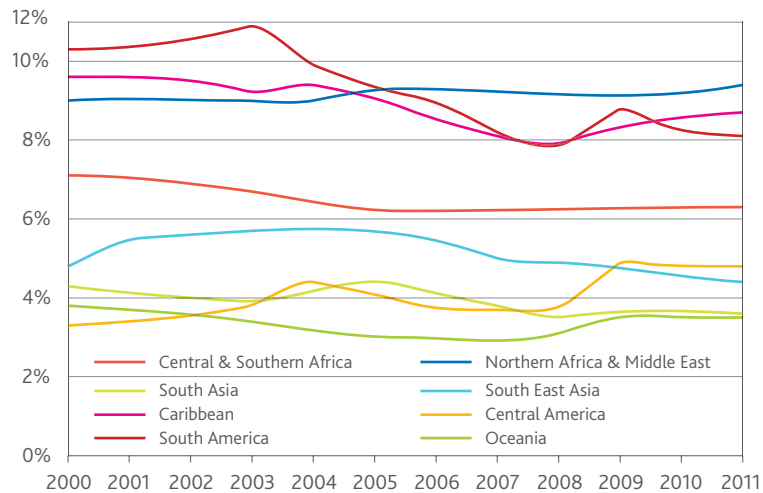
Unemployment rates should be interpreted with caution, as low unemployment rates in highly flexible labour markets can disguise extensive poverty if individuals simply cannot afford to be out of work. That is, high unemployment rates are more likely to exist in developed nations with low poverty rates, where people can afford to remain unemployed for longer periods of time (ILO 2011). Additionally, the ILO considers a person who has worked for at least an hour a week to be employed, which does not capture the reliability or the quality of the work.

The ILO introduced the concept of 'decent work' in 1999 and since then it has gained worldwide acceptance. It encompasses the view that "work is a source of personal dignity, family stability, peace in the community, democracies that deliver for people, and economic growth that expands opportunities for productive jobs and enterprise

development" (ILO 2012c). It implies a certain level of social protection for workers, including guarantees of a safe working environment and facilitation of adequate retirement. The United Nations Millennium Development Goals also recognise the role of employment in poverty reduction, and include a target to achieve full and productive employment and decent work for all, including women and young people (ILO 2009).

The increase in informal employment¹⁹ in many developing nations and temporary and precarious employment in developed nations suggests a shift in not just the number of jobs, but also the quality of those jobs (ILO 2012b). There is a growing demand from firms for increased flexibility in hiring and firing practices as a precaution for unexpected changes in economic activity, which results in an increase in the proportion of new jobs that are temporary or part time (ILO 2012b). Additionally, recent austerity measures introduced in some nations include labour market reforms which decrease social protections for workers and erode the power of collective bargaining.

Figure 6.3.11 Unemployment rates in the Tropics



Source: ILO (2011b), State of the Tropics project.

Box 6.3.5 Unemployment and decent work in Indonesia

Indonesia is one of the most populous nations in the Tropics and accounts for around 9.5% of its labour force. In recent years, there has been some progress towards the goal of increased 'decent' work but many challenges remain.

Assessments of employment quality in Indonesia suggest there are several significant challenges, including gender issues, youth unemployment and informal employment. In 2010 the employment-to-population rate and labour force participation rate for women were 31.4 and 32 percentage points below those of males respectively, and the unemployment rate for women was 2.6 percentage points higher (ILO 2011a). Also, the youth unemployment rate was 17.7 percentage points higher than the adult rate in 2009 (ILO 2013c).

More broadly there remain significant issues with respect to the stability and security of work, though there have been improvements in wages and conditions in recent years. For example, the working poverty rate²⁰ in Indonesia has declined from 25% in 1999 to 14% in 2010 and there have been significant improvements in occupational safety. The number of reported work-related injuries fell from 99,023 in 2005 to 10,034 in 2009, and there was also a significant drop in fatal injuries. The proportion of people working more than 48 hours a week has also decreased, from 41% in 1996 to 31% in 2010. However, these improvements have occurred in a labour market where there is no unemployment insurance, where many workers simply cannot afford to be unemployed, and where the share of workers in informal employment is around 60% of non-agricultural employment (ILO 2011a).

Decent work is recognised as being instrumental in the reduction of poverty, and as a means of achieving equitable, inclusive and sustainable development (Pereira 2010). Monitoring it is difficult however due to a scarcity of data. In 2008 the ILO initiated its Monitoring and Assessing Progress on Decent Work (MAP) project. MAP covers 10 nations including Indonesia (see Box 6.3.5), and facilitates the identification and analysis of national decent work indicators for input to policy development (ILO 2011a). The aim is to increase full and productive employment, rights at work, social protection and social dialogue.

Looking forward

Although the unemployment rate in the Tropics is not as high as the Rest of the World, unemployment rate alone does not provide information on the conditions of employment, such as wages and hours of work.

Looking forward, economic prospects in many nations of the world are uncertain, affected by fragile banking sectors, weak aggregate demand and sovereign debt risks, notably in developed nations (UN 2011). Deterioration in any one of these areas can have flow-on effects to developing nations through trade and financial channels. Implementation of targeted and effective labour market policies is crucial to maintaining balanced economies, and reducing unemployment rates.

¹⁹ Informal employment is employment that in law or practice is not covered or sufficiently covered by formal arrangements such as national labour legislation, income taxation, social protection or entitlement to certain employment benefits. This includes unregistered employees who do not have explicit, written contracts or are not subject to labour legislation; workers who do not have paid annual or sick leave or social security and pension schemes; most paid domestic workers employed by households; and most casual, short term and seasonal workers.

²⁰ Poverty status is defined at the household level: members of households that live on less than US\$2 at purchasing power parity per person, per day are considered to be poor.



Nursing students in Indonesia. Image: Nugroho Nurdikiawan Sunjoyo World Bank Photo Collection.

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Making artificial limbs Cambodia.
Image: Masaru Goto, World Bank.



Essay 3

Health in the Tropics

Professor Janet Hemingway

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Professor Hemingway initially trained as a geneticist and is currently Professor of Insect Molecular Biology and Director of the Liverpool School of Tropical Medicine, with 360 staff based in Liverpool, Malawi and several other tropical locations. She has 30 years of experience working on the biochemistry and molecular biology of specific enzyme systems associated with xenobiotic resistance. She is principal investigator on current projects well in excess of £55 million including the Bill and Melinda Gates Foundation funded Innovative Vector Control Consortium.

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Health in the Tropics

Professor Janet Hemingway

Key Messages

- Life expectancy has increased in the Tropics over the last 50 years
- Non-communicable diseases now account for more global deaths than infectious diseases, but infectious diseases still kill two thirds of people in sub-Saharan Africa.
- Major global initiatives to control or eradicate a number of high burden infectious diseases, such as malaria, TB and NTDs mean that this trend towards NCDs should accelerate throughout the Tropics in the next decade.
- Resistance to front line interventions may become a constraint to progress unless the pipeline of new interventions is refreshed.

- Our ability to generate accurate data with which to monitor progress and drive initiatives is a major issue that needs to be addressed.

Introduction

Health is an essential requirement for all individuals. Poor health has a detrimental impact on an individual's quality of life and productivity. Across the world there are major disparities in life expectancy, causes of mortality, and risk factors in health that are linked to environmental, social and economic factors.

The World Health Organisation (WHO) collates global data according to income or WHO region rather than tropical or non-tropical. These data highlights the obvious inequalities in many

health indicators between high, middle and low income countries. As a significant proportion of low and middle income countries are in the Tropics, this variation is quite obvious when health indicators across tropical and non-tropical regions are compared. While these disparities are well documented, there is evidence the gap is narrowing for a number of key health indicators. The improvements are driven by economic development, increased advocacy and funding for tackling a number of major infectious diseases that are preventable and treatable, and increased political will to achieve key performance indicators that drive major improvements in health, both internationally and nationally. This overview outlines the major progress achieved in the last decade and the underlying agents for change. Major beneficial shifts in health can readily be tracked by monitoring shifts in life expectancy and

Table E3.1 Major causes of mortality 2000 – 2011.

Mortality cause	Low income	Lower middle income	Upper middle income	High income	World
1	Lower respiratory infection	Ischaemic Heart Disease	Stroke	Ischaemic Heart Disease	Ischaemic Heart Disease
2	HIV/AIDS	Stroke	Ischaemic Heart Disease	Stroke	Stroke
3	Diarrhoea	Lower respiratory infections	Chronic Obstructive Pulmonary Disease (COPD)	Lung Cancer	Lower respiratory infections
4	Stroke	COPD	Lung Cancer	Alzheimers	COPD
5	Ischaemic Heart Disease	Diarrhoea	Lower respiratory infections	COPD	Diarrhoea
6	Premature birth	Premature birth	Road injury	Lower respiratory infections	HIV/AIDS
7	Malaria	HIV/AIDS	Diabetes	Colon Cancer	Lung cancer
8	TB	TB	Liver Cancer	Diabetes	Diabetes
9	Malnutrition	Diabetes	Hypertensive heart disease	Hypertensive heart disease	Road Injury
10	Birth Asphyxia or trauma	Road injury	Stomach cancer	Breast Cancer	Premature birth

Source: WHO (2013)

causes of mortality. Improvements in quality of life through improved health are harder to quantify accurately at scale.

Life Expectancy

Life expectancy is covered in detail elsewhere in the State of the Tropics, and reports that between 1950 and 2010 the gap between life expectancy in the Tropics and the Rest of the World has narrowed. Over this period life expectancy in the Tropics increased by 22.8 years to 64.4 years and infant mortality reduced by 36%. The rate of change of mortality and morbidity has increased over the last two decades influenced by a range of different factors.

Underlying life expectancy data are aggregated data, collected by the WHO to document the

changing patterns of mortality. Table E3.1 provides the top ten causes of mortality in rank order over the last decade.

Non-communicable diseases (NCDs) accounted for two-thirds of global deaths in 2011 and infectious diseases for one-third. In 2000 the relative proportions were 60% NCDs and 40% infectious diseases. This rapid shift reflects the massive scale up in recent efforts to prevent and treat a number of major infectious diseases.

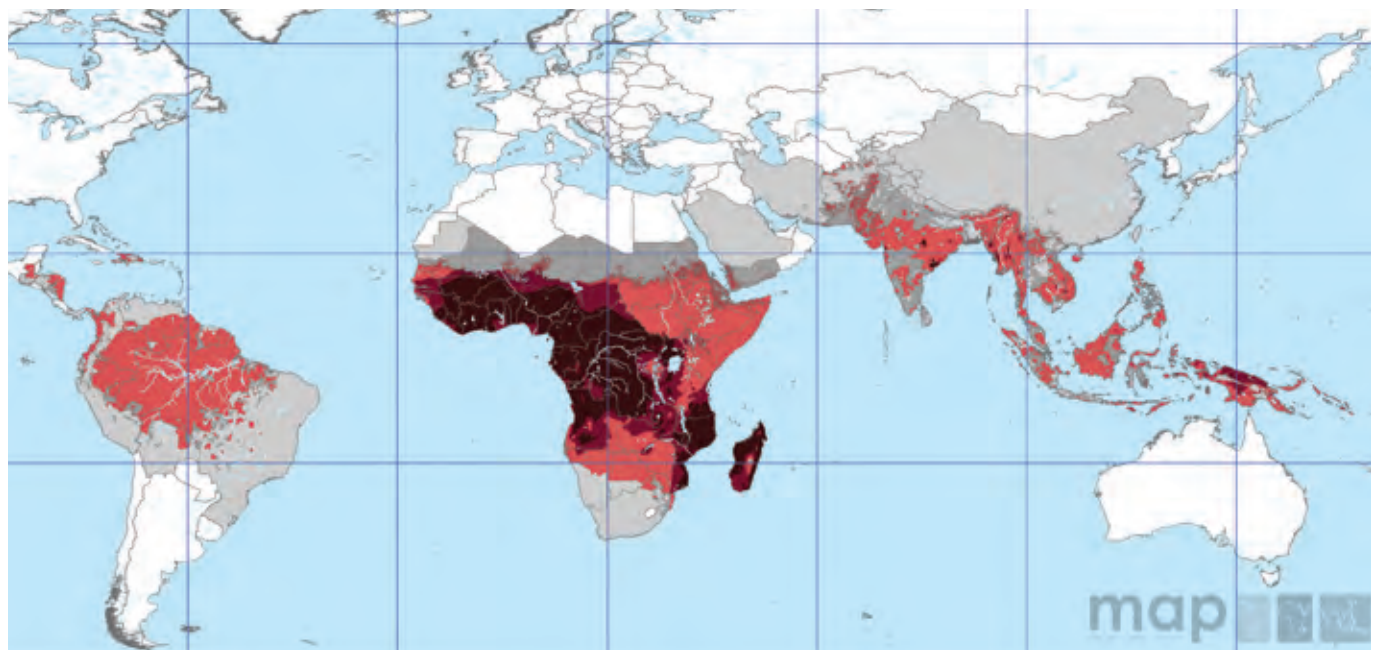
Although improvements in maternal and child mortality have been made these still remain unacceptably high. In 2011, 6.9 million children under the age of five died, 99% of these in low and middle income countries. Malaria, despite the enormous scale up in control activities still accounted for 14% of the under-five mortality in the Tropics.

There are differences in the age at which mortality occurs stratified by income. In high income countries 70% of deaths occur in the over 70s and only one in 100 occurs in an individual under 15 years of age. In low income countries 40% of deaths occur in individuals under 15 years and 20% in those over 70. The differences are predominantly due to the higher burden of infectious diseases and lower levels of access to appropriate maternal, neonatal and child health care. Efforts are being made to address these issues in many countries.

Infectious diseases

A number of infectious diseases occur at high levels in many parts of the Tropics. Many of these diseases are transmitted by insect vectors such as mosquitoes, sandflies or blackflies, and are ideally suited to transmission in warm, high

Figure E3.1 The spatial distribution of *Plasmodium falciparum* malaria stratified by endemicity class in 2010.



Source: Malaria Atlas Project (2014).

humidity environments. The spatial distribution of these diseases in some cases is now confined to the Tropics (see Figure E3.1 for *Plasmodium falciparum* malaria endemicity) and is largely driven by climate, as illustrated in Figure E3.2 for *P. vivax* malaria. Prevention of transmission of these diseases is significantly more difficult in the Tropics than in more temperate climates at the limits of the disease distribution. However, the figures, particularly in South East Asia and Latin America where the intensity of transmission of *P. falciparum* malaria has fallen dramatically despite having suitable climates for transmission, are encouraging.

The big three infectious diseases, AIDS, tuberculosis and malaria, are all preventable and treatable. The success rates of prevention and treatment for these diseases have been variable across the Tropics.

HIV

Improvements in HIV treatment have been dramatic since the HIV epidemic was first recognised in 1981. Individuals infected with HIV are now able to have relatively normal lives with access to the correct drugs and treatment regimes, but social stigma associated with HIV, inability to access treatment, sub-standard and/or counterfeit drugs entering the supply chain, and the potential of resistance developing to first line treatments are major threats to long term HIV prevention and treatment.

There were an estimated 35 million people living with HIV in 2012. As access to anti-retroviral therapy in low and middle income countries has improved, with 9.7 million people in these countries receiving treatment in 2012, the population living with HIV will continue to grow as fewer people die as rapidly from HIV and AIDS related causes. Expansion of long term treatment programmes, many with imperfect drug distribution channels and poor compliance will inevitably increase the rate at which resistance to essential HIV drugs is acquired.

While challenges persist in preventing new

infections, there are opportunities to dramatically lower HIV incidence. These represent a mixture of drug treatment for those who are infected and behaviour change and prophylactic treatment for those at greatest risk. Antiretroviral therapies can reduce the risk of HIV transmission by as much as 96%, voluntary medical male circumcision by approximately 60%, pre-exposure antiretroviral prophylaxis by more than 40% among men who have sex with men and by 49% among people who inject drugs. The success with which these changes can be implemented will be highly variable given the highly heterogeneous nature across nationalities, cultural groups and their customs and practises.

HIV remains a major issue in the Tropics although in many countries there have been dramatic improvements over the last decade. This has been underpinned by better access to voluntary counselling and testing and high level advocacy for improved access to appropriate and timely treatment. Across sub-Saharan Africa, many countries have reduced HIV prevalence among young people (15–24 years), with HIV prevalence among young women and men falling by 42% from 2001 to 2012. However, HIV prevalence among young women remains more than twice as high as among young men throughout sub-Saharan Africa. Trends are mixed elsewhere, with the Caribbean experiencing substantial declines, but with no clear downward trend apparent in the Middle East or North Africa.

The epidemic continues to have a profound effect on female, male and transgender sex workers. Globally, female sex workers are 13.5 times more likely to be living with HIV than other women. In Uganda, Swaziland and Zambia, 7–11% of new infections are attributable to sex workers, their clients and clients' regular partners. HIV prevalence among sex workers varies across the world, from 22% in Eastern and Southern Africa (eight countries) and 17% in Western and Central Africa (17 countries) to less than 5% in all other regions. These surveys are typically conducted in capital cities and are not nationally representative, so the findings may not be applicable to the entire

population. Such problems with data capture, analysis and extrapolation are common across the health sector.

While these downward trends are promising, increased political commitment and strategic action are still needed to reduce the number of adults who acquire HIV sexually. Globally sexual transmission will not be halved by 2015. In particular, key HIV prevention programme elements – including social-behavioural approaches, condom and lubricant promotion, male circumcision and HIV prevention programmes focused on key populations, such as men who have sex with men and sex workers – need to be scaled up and strategically combined to maximise the impact of finite funding and continue to drive down the rate of new infections.

Tuberculosis (TB)

TB is a major global health problem which has seen a resurgence in many countries. In 2012, an estimated 8.6 million people developed TB and 1.3 million died from the disease (including 320,000 deaths among HIV-positive people). Twenty-two high burden countries, many of which are in the Tropics, account for 80% of worldwide TB cases.

Estimates of TB infections have changed substantially since the 1990s, mainly with the recognition of the link between HIV and TB. In 1997 incidence per capita was highest in sub-Saharan Africa at 259 per 100,000 people. South East Asia had the highest number of cases (2.95million), followed by the Western Pacific (1.96 million). Africa had the highest rates of HIV cases that are co-infected with TB (1.2%) and the highest number of TB cases that were HIV positive (32%).

Resistance towards the drugs used for TB treatment is a threat to sustainable progress in driving down TB rates. There are internationally agreed targets for diagnosis and treatment of multidrug-resistant TB (MDR-TB), and new diagnostic technologies that are being rolled

out into resource poor settings to facilitate this. Despite these technological improvements, in most countries with a high burden of MDR-TB, less than 25% of the people estimated to have MDR-TB were detected in 2012.

Malaria

Malaria, which can be caused by infection with several *Plasmodium* parasites, has been a major cause of mortality and morbidity in the Tropics for centuries. Since 2000 expansion in the funding and coverage of malaria control operations has reduced malaria related incidence and mortality. Between 2000 and 2012 malaria mortality rates fell by 42% in all age groups and by 48% in children under 5. Malaria transmission still occurs in 103 countries, of these 59 have managed to reverse the trend of malaria

incidence and 52 are on track to meet the Roll Back Malaria and World Health Assembly targets of reducing malaria incidence rates by 75% by 2015 compared to the 2000 baseline.

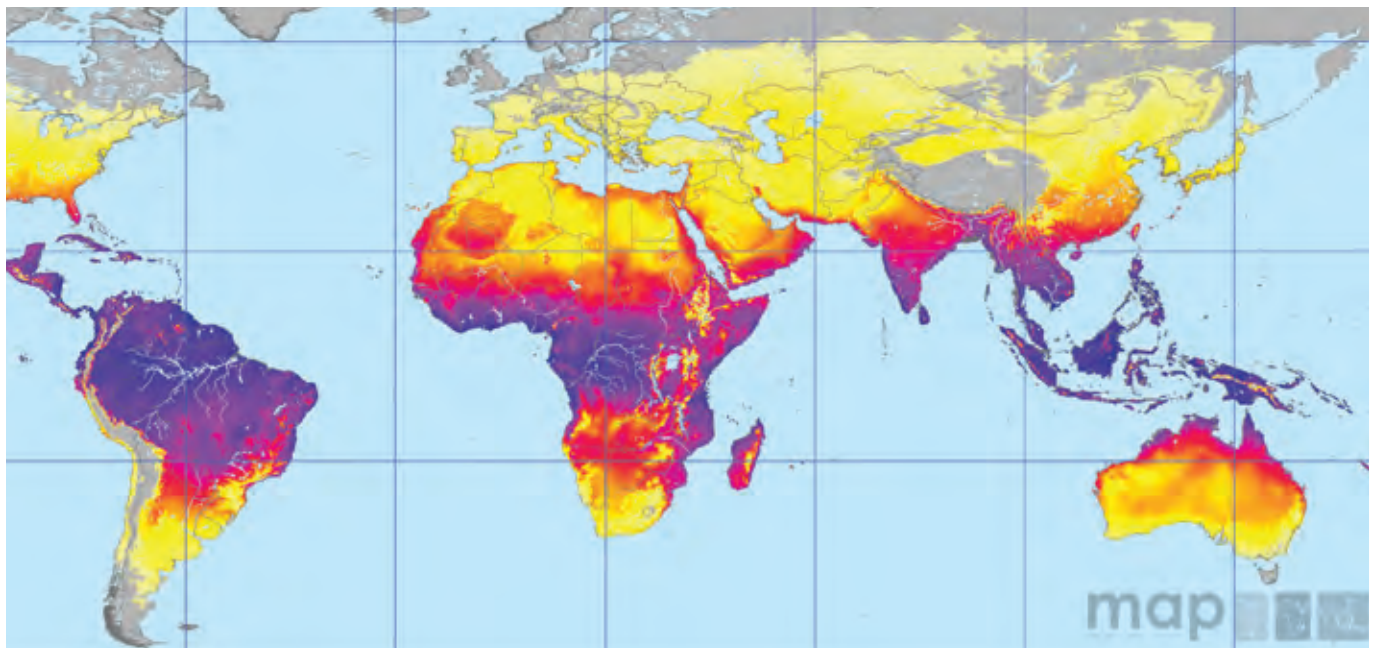
There is currently major debate on if, how and when malaria could be eradicated. A major WHO led programme in the 1960s was widely seen as a failure, despite notable successes in many countries. Renewed impetus for eradication of malaria has come from the Bill and Melinda Gates Foundation. They concluded that internationally the annual cost of sustaining malaria control was not achievable indefinitely, but scaling up over a finite period for eradication with the right tools, technologies, funding and political will was more feasible. To mark World Malaria Day 2014 (25 April), WHO published a manual to enable malaria-endemic countries to assess the feasibility of moving towards malaria elimination.

Since 2000 many countries have declared elimination as a national goal. The new guide will provide countries with a comprehensive framework to assess different scenarios and timelines for reducing the disease burden and moving towards elimination, depending on programme coverage and funding availability.

Neglected tropical diseases (NTDs)

The term neglected tropical diseases was coined by Kenneth Warren of the Rockefeller Foundation in the early 1980s through his Great Neglected Disease Initiative. The concept was revived in 2003, when the first of two WHO meetings was convened to suggest that these diseases should be taken forward as a group, because they shared considerable geographical overlap and could better be addressed by creating synergies

Figure E3.2 Temperature suitability index for *Plasmodium vivax* transmission in 2010



Source: Malaria Atlas Project (2014).

between existing programmes. The term neglected comes from the disparity between the catastrophic impact in terms of disability-adjusted life years (DALYs) attributed to these diseases and the attention and funding they receive (0.6% of official development assistance for health).

The 17 NTDs identified by the WHO are given in Table E3.2. They result from four different causative pathogens. These diseases affect more than 1 billion people and are endemic in 149 countries.

Although these are a medically diverse group of infections caused by different pathogens, combining the advocacy and call to action on these diseases under a single banner has had a dramatic effect. In 2012 the WHO produced

a road map aimed at accelerating the work to overcome the global impact of NTDs. Progress towards these end goals is now being closely monitored with encouraging but variable results. A large part of these programmes is an unprecedented mass drug distribution programme in all endemic countries. Table E3.3 shows the scale of this drug programme detailing the major donations that are being made by the pharmaceutical industry to support this global effort.

While these large scale efforts should dramatically improve health outcomes for many in the Tropics a worrying trend is the rapid spread and increased transmission of dengue in urban areas. This expansion is linked to changes in the range of one of the two main *Aedes* mosquito vectors and difficulties in predicting and stopping

epidemic sweeps of new serotypes of dengue into naïve populations.

Emerging and re-emerging diseases

About 75% of recently emerging infectious diseases affecting humans are diseases of animal origin, and approximately 60% of all human pathogens are zoonotic.

Zoonoses

Zoonotic diseases are contagious diseases spread between animals and humans. These diseases are caused by bacteria, viruses, parasites, and fungi that are carried by animals and insects. Examples are anthrax, dengue, Ebola haemorrhagic fever, *Escherichia coli* infection, Lyme disease, Plague, Q fever, salmonellosis, and West Nile virus infection

Transmission occurs where people come into contact with infected live poultry, rodents, reptiles, amphibians, insects, and other domestic and wild animals. A common way for these diseases to spread is through the bite of a mosquito or tick.

Recent emergence of such conditions as bovine spongiform encephalopathy (BSE) due to beef ingestion has alerted the medical profession to the dangers to humans of poor animal husbandry practices, such as feeding meat offal waste to cattle. Thankfully transmission has been limited as BSE can only be contracted by eating infected spine or brain tissue from infected animals.

Important bacterial zoonoses which remain problems in many tropical countries include brucellosis, bovine tuberculosis and listeriosis which can be contracted from unpasteurised dairy products.

Leptospirosis is a bacterial zoonosis of worldwide distribution. In tropical regions, the severe Weil's disease is caused by *Leptospira* carried by rodents and passed in their urine onto soil, water etc with humans being infected through the skin. Weil's disease may present with fever, jaundice, eye haemorrhages and renal failure and is a major

Table E3.2 The 17 Diseases that make up the NTDs.

Virus	Protozoa	Helminth	Bacteria
Dengue/Severe dengue	Chagas disease	Cysticercosis/Taeniasis	Buruli ulcer
Rabies	Human African trypanosomiasis (sleeping sickness)	Dracunculiasis (guinea-worm disease)	Leprosy (Hansen disease)
	Leishmaniasis	Echinococcosis	Trachoma
		Foodborne trematodiasis	Endemic treponematoses (including yaws)
		Lymphatic filariasis	
		Onchocerciasis (river blindness)	
		Schistosomiasis (bilharzia or snail fever)	
		Soil-transmitted helminthiasis	

Source: WHO (2013)

hazard for banana farmers and sugar cane workers.

Important protozoan zoonotic infections include the human trypanosomiasis. The African forms are transmitted by the bite of the tsetsefly (*Glossina* spp) while the South American form (Chagas' disease) is transmitted by triatomid bugs

Non-communicable diseases (NCDs)

Chronic conditions kill people at economically and socially productive ages and have a major effect throughout the Tropics. Much of the burden of chronic diseases is attributable to environmental and lifestyle factors, including tobacco consumption and decreased physical activity. NCDs are the major contributor to burden of disease in terms of disability adjusted life years (DALYs) in all regions apart from Sub-Saharan Africa. They are the underlying cause of more than half of deaths in adults aged 15-59 in all regions except South Asia and sub-Saharan Africa, where infectious diseases, result in one-third and two-thirds of deaths, respectively.

A similar trend of increased visibility and importance of NCDs is also been seen in Africa. The Global Burden of Disease Study, conducted in 2001, showed that 20% of deaths in sub-Saharan Africa were caused by NCDs. The majority (80%) of chronic disease deaths occur in low- and middle-income countries, reflecting both the size of these populations and the epidemiologic transition from infectious to chronic diseases.

Simple extrapolation from high to middle and low income settings to predict future trends may however be misleading. Cardiovascular disorders, cancer and injuries are consistently highly ranked NCDs. Half of cardiovascular disease deaths in low and middle income settings occur among people 30-69 years of age, which is >10 years younger than in more developed regions.

The NCD research agenda in the Tropics has evolved from learnings in high income countries. The current agenda focusses on evaluations of public health interventions (e.g. monitoring impact of tobacco control measures, voluntary restrictions

Table E3.3 Major donations of medicines for controlling neglected tropical diseases made by the pharmaceutical industry

Medicine Donation
Albendazole: Unlimited supply from GlaxoSmithKline for lymphatic filariasis worldwide and up to 400 million doses per year for soil-transmitted helminthiasis school-age children worldwide; donations made through WHO
Amphotericin B liposome 445 000 vials from GILEAD for control of visceral leishmaniasis in highly endemic countries in South-East Asia and East Africa; donation made through WHO – combined with preferential price for WHO for other countries (US\$18 per vial)
Azithromycin Donated by Pfizer in the context of a full SAFE strategy for the elimination of blinding trachoma; donated through the International Trachoma Initiative
DEC (diethylcarbamazine) Up to 2.2 billion tablets of 100 mg tablets by Eisai Co., Ltd., for the period 2013–2020; donation made through WHO
Eflornithine Unlimited quantity until 2016 from Sanofi for human African trypanosomiasis; donation made through WHO
Ivermectin Unlimited supply for as long as needed donated directly to countries by Merck & Co., Inc., for lymphatic filariasis and onchocerciasis; donated through the Mectizan Donation Program
Multidrug therapy (rifampicin, Unlimited supply for leprosy and its complications from Novartis; clofazimine and dapson in blister donation made through WHO packs) and loose clofazimine
Mebendazole 200 million tablets annually from Johnson & Johnson for soil-transmitted helminthiasis control programmes for children
Melarsoprol Unlimited quantity until 2016 from Sanofi for human African trypanosomiasis; donation made through WHO
Nifurtimox 900 000 tablets (120 mg) per year by 2017 from Bayer for treatment of Chagas disease and human African trypanosomiasis; donation made through WHO
Pentamidine Unlimited quantity by 2016 from Sanofi for human African trypanosomiasis; donation made through WHO
Praziquantel In 2007, Merck KGaA had committed to donating 200 million tablets of 600 mg praziquantel for distribution primarily to African school children. Having originally planned to end the project in 2017, Merck KGaA will continue its efforts to fight schistosomiasis indefinitely with an amount of 250 million tablets per year; donation made through WHO
Suramin Unlimited quantity by 2016 from Bayer for human African trypanosomiasis; donation made through WHO
Triclabendazole From Novartis for fascioliasis; donation made through WHO

Source: WHO (2013)

in salt and saturated fat in processed foods) and household and individual interventions (e.g. detection and treatment of high blood pressure; smoking cessation, diet and exercise advice; substitution of saturated with polyunsaturated cooking fats) in low- and middle-income countries. This may need to change substantially over the next decade, as most currently available interventions are appropriate for only a minority (i.e. the urban high-income populations of low- and middle-income countries) with scant attention paid to NCD prevention and control in urban poor and rural populations which still comprise the majority of the population in the Tropics.

Currently, health services for chronic diseases are fragmented, organisationally weak and are not rising to the challenge of preventing or managing chronic diseases in many low and middle income countries. As these diseases become increasingly important attention will need to shift to reform of the health services, although models will not be able to be adopted directly from those in high income countries.

Monitoring and evaluation

Significant progress has been made in improving health in the Tropics, but the ability to gather and analyse accurate data in the right formats and timescales can be an impediment to effective policy setting. While improvements to monitoring and evaluation systems have been made the implementation of these new systems is highly variable in different parts of the Tropics.

Health management information systems

Public health decision-makers, National health departments and other health professionals require accurate and timely information on the burden to the health service of disease-specific treatments, so they can accurately monitor and plan resource needs. A basic requirement is reliable national and sub-national data detailing the number of treatment events for a given disease or condition occurring at health facilities each month or year. In most tropical settings, this requirement is addressed with a health management

information system (HMIS) that coordinates the routine acquisition of treatment records from health facilities and the transfer, compilation, and analysis of these data through district, regional, and national levels.

A perfect HMIS requires all health facilities to report promptly in all months, allowing a comprehensive quantification of treatment events through time and space across the health system. The reality of HMIS in many countries is far from this ideal. Typically, many facilities never report, or report only intermittently, resulting in spatially and temporally incomplete national data. Even following several decades of national government and donor investment in HMIS, the incomplete nature of routine national reporting remains an issue in many countries. There is an expectation that mobile phone technology may improve these systems, reducing the reliance on paper based record keeping and reporting, with information subsequently needing to be keyed into electronic systems, the full benefits of this technology have however yet to be realised.

Data quality

To evaluate the benefit of different health interventions and establish evidence-based policies and practises it is essential that data at local, national, regional and global levels are collected in a timely, appropriate and accurate format. Data are highly variable in type, quality and availability for many health indicators. This can lead to major discrepancies in the quoted global incidence, prevalence and deaths attributed to many causes. Faced with poor data coverage, national treatment burdens are often estimated using rudimentary methods to account for missing values. National and global trends are then calculated by extrapolating available data.

Data quality and consistent formats for data collation and reporting can be a major barrier to assessing trends and developing appropriate national and international policies. For example in 41 of the 103 countries where malaria transmission occurs it is not possible to assess trends in malaria transmission due to a combination of poor data quality, changes in diagnostic methods

and different patterns of health service use. Unfortunately these countries account for 80% of all malaria transmission. Until these issues are addressed, progress towards reducing the burden of many diseases will be slowed. Lack of data may also make it difficult if not impossible to eradicate many of the major infectious diseases that are currently being targeted.

Drivers of recent progress

General trends for many health indicators have been improving in the Tropics in the past two decades. There has been greater advocacy for resourcing better health care and a major shift in emphasis on setting, tracking and achieving major targets for improvement in health. This has changed the landscape for how a number of diseases, which carry a significant level of mortality and morbidity in the Tropics, are tackled. These combined initiatives have accelerated the rate of change, but much still remains to be done. In particular, initiatives aimed at driving the elimination of a number of infectious diseases need to be driven to completion, or the risk of disease rates rebounding when special efforts are withdrawn will remain.

The millennium development goals

The United Nations Millennium Development Goals (MDGs) are eight goals that the UN member states agreed to achieve by 2015. These were contained within the United Nations Millennium Declaration resolution that was adopted by the General Assembly in September 2000. The goals are simply represented pictorially in Figure E3.3. The MDGs were crafted to commit world leaders to combat poverty, hunger, disease, illiteracy, environmental degradation and discrimination against women. Alongside a 2015 target for each MDG, there are a series of indicators to track progress from the 1990 baseline towards these targets. Many of these relate directly to health.

While many countries have made impressive gains in achieving their health related targets, others will fall far short of the targets by 2015. Many of the countries making the least progress are those afflicted by a high prevalence of HIV/ AIDs, conflict and economic hardship.

Specific health related targets include:

4A: Reduce the under-five mortality rate by two thirds. The 1990 baseline was an estimated 12.6 million under-five deaths, this had declined by 47% by 2012. The global rate of decline has also accelerated from 1.2% per annum in 1990 – 1995 to 3.9% per annum between 2010 – 2012.

5A: Reduce the maternal mortality rate by three quarters. In 1990 there were an

estimated 543,000 deaths, while this had declined to 287,000 by 2010 the rate of decline is less than half that required to achieve the MDG target by 2015. Maternal mortality rates are highest where women have poor access to reproductive health care and effective interventions. While this has improved globally over the period there are still major disparities in access. The starkest of these is in the proportions of births that are attended by skilled personnel. While this is above 90% in three of the six WHO regions, the figure in the African Region is less than 50%.

6A: To halt and begin to reverse the spread of HIV/ AIDs, TB and malaria

6B: Achieve Universal access to treatment by 2010
The rate of new HIV infections has clearly declined with an estimated 2.3million people

newly infected in 2012 a reduction of 33% on the new infection rate in 2001. Sub-saharan Africa accounted for 70% of all people who acquired HIV infections.

6C: To halt and reverse the incidence of malaria and other major diseases. In 2010 an estimated 219 million cases of malaria resulted in approximately 660,000 deaths. The majority of deaths are still in African children under the age of five.

The number of new TB cases worldwide has been falling slowly since 2006. In 2011 there were an estimated 8.7million new cases, of which about 13% were in people living with HIV. Mortality due to TB has fallen 41% since 1990. TB incidence rates have fallen in all six WHO regions. At 2% per year the rate of decline is slow. Globally by 2012, the TB

Figure E3.3 Simplified overview of the eight Millennium Development Goals.



Source: United Nations (2014).

mortality rate had been reduced by 45% from the 1990 baseline. Hence, the target to reduce deaths by 50% by 2015 is within reach.

7C: To halve the number of people without sustainable access to safe drinking water and sanitation. Globally the access to safe drinking water target has been met, with 89% of people in 2011 having access to an improved source of drinking water. Access however has been uneven between regions, urban and rural areas and rich and poor.

The basic sanitation target will not be met by 2015. In 2015, approximately 2.5 billion people still did not have access to basic sanitation facilities. There has been an increase of people living in urban areas without access to sanitation as shanty towns grow and migration trends into urban areas continue to increase.

8E: In co-operation with pharmaceutical companies, to provide access to affordable essential medicines in developing countries. This still remains an issue in much of the Tropics. Surveys in 2007 – 2102 showed that access to affordable generic medicines in low and middle income countries was only 57% via public sector outlets. Lack of availability forces patients to try and access medicines through the private sector where costs are five to 16 times higher.

The Global Fund

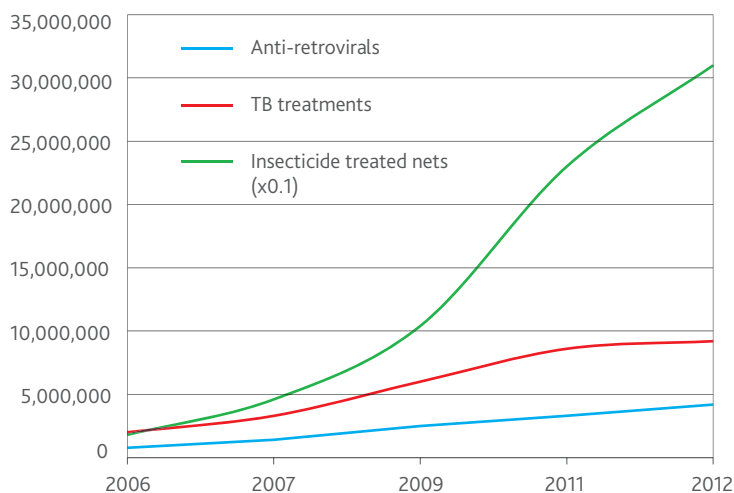
In many low and middle income nations the significant resources required to fund large scale campaigns to control major diseases are often not available. Numerous bilateral aid mechanisms exist to try and cover this gap, but these are often poorly co-ordinated in the disease endemic country. A different model of supporting efforts to control three major diseases which are prevalent in the Tropics was created in 2002. The idea of establishing a global fund was discussed at a G8 summit in Okinawa, Japan, in 2000. The real commitment began to coalesce at the African Union summit in April 2001, continued at the United Nations General Assembly Special Session

in June of that year, and was finally endorsed by the G8 at their summit in Genoa in July 2001. A Transitional Working Group was established to determine the principles and working modalities of the new organization, and the Global Fund came into being in January 2002.

The Global Fund to Fight AIDS, Tuberculosis and Malaria was created to dramatically increase resources for the fight against these diseases. The Global Fund provides a coherent and co-ordinated large scale funding package for each eligible country, linked to endemic county needs, through a managed application process. It does not manage or implement programs on the ground, relying instead on local experts.

Figure E3.4 shows the numbers of insecticide treated bednets for malaria control and treatments for TB and HIV that have been funded by this programme since 2006.

Figure E.3.4 Numbers of insecticide treated bed nets and treatments for TB and HIV funded by the The Global Fund to fight AIDS, tuberculosis and malaria.



Source: UN (2013a), State of the Tropics project.

Philanthropic foundations

A notable trend over the last two decades has been the increased engagement of high net worth individuals in global health, either by direct donations or through foundations. The most notable of these is the Bill and Melinda Gates Foundation with annual disbursements of around US\$6 billion.

These foundations have not only started to address the funding gap for research and development activities in health related areas that principally affect the poor, but they have also catalysed a new way of working with industry and the normative agencies. For example they have influenced the corporate social responsibility offerings of major pharmaceutical companies, who now donate millions of doses of drugs for NTD treatment and the country distribution systems through NGOs.

Alongside donations of existing products there is now a network of product development partnerships (PDPs) supported by public and philanthropic funding that work with industry to develop new drugs, vaccines, diagnostics, devices and public health insecticides. These PDPs have a portfolio of new products that will be needed to counteract resistance to drugs, antibiotics and insecticides, to improve diagnosis of many tropical diseases and to improve our ability to monitor and evaluate different interventions.

Conclusion

Health in the Tropics has broadly shown a number of dramatic improvements over the last two decades. The shift from infectious diseases to NCDs will force a move away from large scale vertical programmes into a network of health systems and health services strengthening as the population needs change. The level of interest and funding currently addressing global health issues is at an unprecedented high and the R & D and implementation bodies operating in this space have a responsibility to ensure that health benefits for all populations are maximised in a sustainable format from these initiatives. If these inputs are sustained the next decade should see further improvements in health throughout the Tropics. However, if interest, resources and advocacy decline then we will see resurgence in many infectious diseases.



San Juan de Dios Hospital in Guatemala.
Image: Maria Fleischmann.

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