

Health Buys Wealth

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How health can buy wealth

In low-income countries, rising income can buy better health, through improved nutrition, clean water and greater consumption of healthcare. Improvements in health can also fuel economic growth by improving children's cognitive potential and educational attainment, raising labor-force productivity and, critically, encouraging investment in human capital.

Cost-effective solutions exist

Six preventable and treatable diseases kill more than 11 million people around the world each year, causing 20% of all deaths. These six – pneumonia, diarrhea, HIV/AIDS, tuberculosis, malaria and maternal mortality – hit the world's poorest countries hardest. Much of the knowledge and technology needed to tackle these diseases exists, and many of the most effective preventions and treatments are highly cost-effective. The World Health Organization's expanded immunization package is estimated to cost \$30 per child. Increased coverage is responsible, in part, for the 25+% reduction in child mortality since 1990.

The need to look "beyond disease"

Yet millions remain vulnerable to diseases that are both preventable and treatable. Access to cost-effective healthcare today remains limited, in large part because health systems in low-income countries are woefully understaffed and under-funded. Looking beyond a disease-specific approach, governments and donors also need to strengthen health systems, expand infrastructure and extend education, particularly women's education.

New opportunities: private funding and capital markets

Among the key developments in public health over the past decade are the dramatic expansion of funding and the diversification of funding sources. Public/private partnerships, advance market commitments and fundraising in capital markets are now critical to improving health in low-income countries. We see ample scope for this to expand.

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Exhibit 1: Global health gaps at a glance
Birth remains among the riskiest moments of life in the developing world

- More than half a million women in lower-income countries die each year - one per minute - from complications during pregnancy or childbirth.
- A woman's lifetime risk of maternal death in low-income countries (1 in 75) is more than 100 times higher than in high-income countries (1 in 8,000).
- One in every 24 babies born in a low-income country will die during the first month of life.

Nearly 9 million children continue to die each year - roughly the entire population of Sweden

- Child mortality has fallen by more than 25% since 1990, but nearly 9 million children continue to die each year - more than 1,000 each hour.
- In low-income countries, 1 in 8 children die before reaching the age of 5; in high-income countries, only 1 in 143 have such premature mortality.
- Pneumonia and diarrhea together account for nearly 4 million child deaths each year.

The six preventable and treatable diseases discussed in this paper claim more than 11 million lives each year

- Together, pneumonia, diarrhea, HIV/AIDS, tuberculosis, malaria and maternal mortality kill more than 11 million people each year.
- These 6 diseases are responsible for more than 40% of all deaths in low-income countries, and 20% of deaths worldwide.

Health services remain under-staffed in many countries and unable to meet basic needs

- The number of health workers in too many countries remains well below the minimum level necessary to reach global health targets.
- The number of physicians across all low-income countries, 500,000, is roughly equal to the number of dentists in the United States.
- Health worker density (or the number of physicians, nurses, and midwives for every 10,000 people) is just 14 per 10,000 in low-income countries, roughly one-third of the global average. As a result, one in three pregnant women in low-income countries receives no prenatal care.

Under-funding of health is a concern in many of the same countries

- High-income countries spent nearly \$4,000 per capita on health in 2006, outspending low-income countries nearly 70-to-1.
- Health spending as a share of GDP reflects similar imbalance. High-income countries spend 11.2% of GDP on health, nearly 7 percentage points more than health spending as a share of GDP in low-income countries.
- Private expenditure accounts for nearly two-thirds of total health spending in low-income countries, 85% of which is out-of-pocket.

The cumulative result is that life expectancy in low-income countries continues to trail the global average by more than a decade

- Life expectancy in low-income countries has risen, but continues to lag the global average by 11 years. The gap between low- and high-income countries, 23 years, has not changed since 1990.
- The life expectancy gap between Africa and all other regions has widened. An individual born in the Americas today can expect to live a quarter-century longer than a counterpart born in Africa.

At the same time, a number of cost-effective health interventions and innovative capital markets solutions exist

- Total development assistance for health has more than doubled since 2000, reaching \$16.7 billion in 2006, alongside greater funding diversification.
- Our estimates suggest that investments in health that would halve the life-expectancy gap between low- and high-income countries could add more than 70 basis points to annual GDP growth rates in low-income countries.
- A number of highly cost-effective interventions exist, including immunization, the use of insecticide-treated bednets to prevent malaria, better sanitation and a range of antibiotics and other pharmaceuticals. Thinking beyond disease, investment in health systems and education will reinforce these interventions.
- Capital markets have a critical role to play by improving the predictability of global health finance. The recent use of advance market commitments for vaccine development is one example.

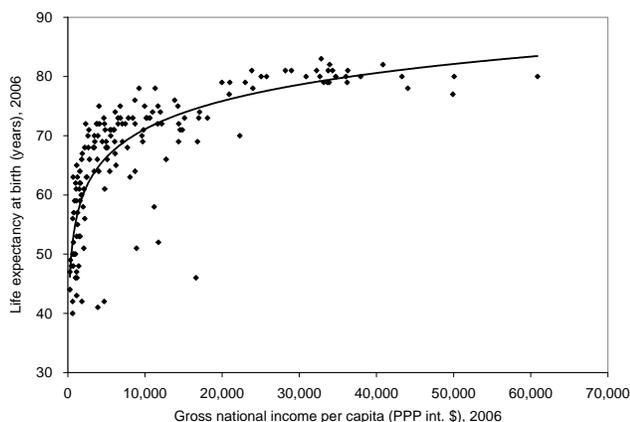
Source: Goldman Sachs Research, World Health Organization.

Introduction: Health can buy wealth

On a global basis, bad health and poverty are deeply intertwined. In the world's poorest countries, life expectancy at birth is just 57 years; 41 of each 1,000 babies born will die within the first month of life; and a woman's lifetime risk of dying during pregnancy or childbirth is on the order of 1 in 75. In the world's richest countries, life expectancy is 80 years; only four of each 1,000 newborns will die in the first month; and the lifetime risk of dying during pregnancy or childbirth is just 1 in 8,000.

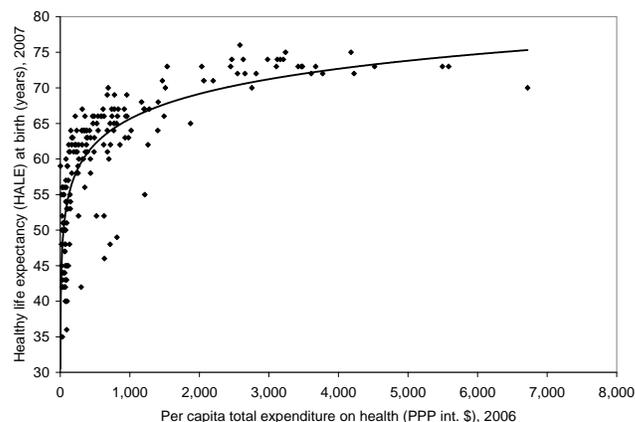
The relationship between health and prosperity is complex. Clearly wealth can buy health. Rising wealth allows for better nutrition and greater access to clean water; it is also associated with increased consumption of healthcare. As Exhibit 2 shows, small improvements in per capita income in poorer countries are associated with large increases in life expectancy. Small increases in per capita health *expenditure* in these countries are associated with similarly strong gains in healthy life expectancy, as Exhibit 3 shows.

Exhibit 2: Life expectancy rises with per capita income ...



Source: World Health Organization, World Bank, Goldman Sachs Research.

Exhibit 3: ... while healthy life expectancy rises with per capita health expenditure



Source: World Health Organization, Goldman Sachs Research.

Is the converse true as well? Can health buy wealth? Politicians, global health organizations and academics alike have blamed poor health for feeble economic growth and, in extreme cases, for consigning poor countries to a "poverty trap." In this view, poor health is a cause as well as a consequence of low income. African heads of state, for instance, have declared that the toll from malaria alone has slowed growth by 1.3% per year since 1965. As a result, GDP in Africa was as much as one-third lower in 2000 than it might otherwise have been.

Better health can buy wealth in the sense that it can reduce suffering, strengthen physical and cognitive development, and allow for longer lives and lower rates of disability. Better health also fuels gains in productivity and living standards. In fact, the Copenhagen Consensus, a think-tank focused on cost-effective solutions to "the world's biggest challenges," identifies six health-related issues in its list of the top ten most cost-effective ways to improve global welfare. Similar reasoning drives global campaigns against communicable diseases, including malaria, tuberculosis, HIV/AIDS and various childhood illnesses.

In this paper we discuss the interactions between health and economic growth, focusing on the ways that improved health can fuel growth. Good health supports economic growth and wellbeing in many ways: by improving children's cognitive potential and educational

attainment, by raising labor-force productivity, and, critically, by encouraging investment in human capital. Interestingly, the demographic effects of improving health mean that the standard indicator of economic well-being, GDP per capita, may take several decades to improve (as rapid population growth in the near-term offsets gains in GDP growth). Nonetheless, the very real near-term improvements in wellbeing are indisputable.

This paper examines the burden of the developing world's greatest health challenges – pneumonia, diarrheal diseases, HIV/AIDS, tuberculosis, malaria and maternal mortality. Together these six kill more than 11 million people each year – roughly the population of metropolitan Beijing – and cause nearly one-quarter of all deaths in the world's low- and lower-middle income countries¹.

These diseases are preventable and for the most part treatable. In fact strategies like malaria nets, oral rehydration and expanded vaccination programs have helped to reduce child mortality rates by more than 25% since 1990 – a remarkable achievement. When evaluated from the perspective of the unit cost per-life or per-healthy-life-year saved, prevention and treatment can be remarkably inexpensive. Yet millions of people remain outside the reach of these interventions. We discuss cost-effective strategies for prevention and treatment, and the obstacles to these strategies, as well as innovative health partnerships and the increasing use of capital markets to address these challenges.

Increasingly, it seems that investments to improve health will need to look “beyond disease” to strengthen health systems, improve infrastructure, broaden education and change behaviors. These investments should yield dividends over the long term, even if they lack the marketability of high-profile global health campaigns.

How health fuels economic growth

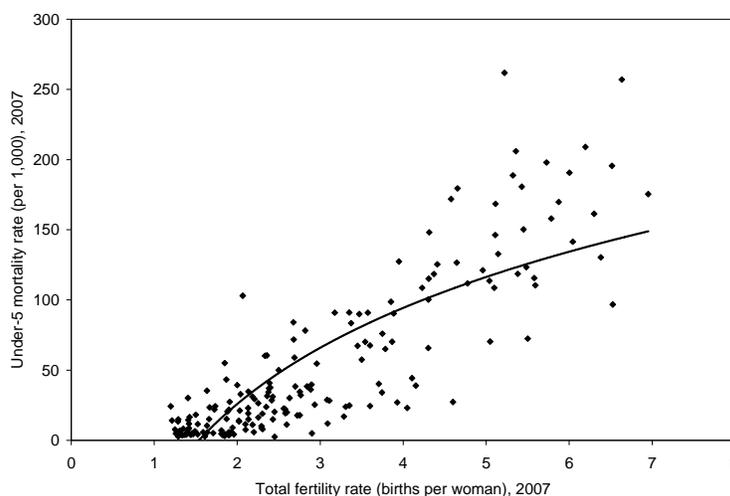
Health supports economic growth and well-being in many ways: by improving children's cognitive potential and educational attainment, by raising the productivity of the labor force and, critically, by encouraging investment in human capital. There are a number of important transmission channels:

- **Parents' own health has a broad and lasting impact on their children's health and education.** As a starting point, healthier mothers give birth to healthier children. Premature birth and low birth weight, both of which are linked to maternal ill health and inadequate prenatal nutrition, are associated with future health problems and cognitive delays. Beyond this, parents' own ill health has direct adverse consequences for their children. In households with sick parents, older children may be forced to miss school to care for both parents and siblings, or to take their parents' place in the labor market. At the extreme, maternal mortality leads to extremely bad outcomes for children. Orphans (even those who have lost only one parent, and especially those who have lost their mothers) fare significantly worse in health and schooling than do children with both parents. The impact of maternal mortality can be especially profound for older girls forced into caregiver roles. Conversely, the presence of healthy parents can have a significant positive impact, particularly on female literacy and girls' schooling.

¹ As categorized by the World Bank. The 43 “low-income countries”, with a total population of slightly more than 900 million people, have a GNI per capita of \$975 or less. This group includes two countries on the Goldman Sachs “Next-11” list: Bangladesh and Vietnam. The 55 countries categorized as “lower-middle-income” have a GNI per capita of \$976-\$3,855 and a total population of nearly 3.6 billion. This group includes two BRICs (China and India), along with six N-11 countries (Egypt, Indonesia, Iran, Nigeria, Pakistan and Philippines). In this paper, we use the term “lower-income” to refer to the two categories together.

- **Health during childhood has life-long physical and cognitive effects**, meaning that safeguarding health during childhood is more important than at any other age. For example, children under five are especially vulnerable to malaria, which can cause learning difficulties and brain damage. Diarrhea, the second leading cause of child mortality, leaves its survivors physically weakened and vulnerable to malnutrition, disrupts their schooling and slows their physical and cognitive development. Healthy children are less likely to miss school, are more able to pay attention and have fewer cognitive delays.
- **Lower infant and child mortality leads to lower fertility rates**. Many of the gains from improved health are first visible in lower rates of infant and child mortality. As child mortality rates fall and parents become more confident that their children will survive to adulthood, fertility rates decline. See Exhibit 4. One analysis of African demographics suggests that reducing child mortality levels to reach the Millennium Development Goal target by 2015 (a reduction of two-thirds from 1990 levels) would lower African fertility rates to about three births per woman, from five on average today. This shift ultimately underpins the demographic transition that will drive economic growth several decades in the future.

Exhibit 4: Where the risk of child mortality is lower, women have fewer children



Source: World Bank, Goldman Sachs Research.

- **Lower fertility rates encourage greater investment in human capital**, as smaller family size and longer life expectancy increase the returns to education, training and work experience. Fewer children in a household means that each child has access to a greater share of resources, notably parental attention, calories and funds allocated for schooling. Gains in life expectancy allow investments in children's education, training and health to be amortized over a longer time horizon, raising the returns to these investments.
- **Better health can increase household resources**. Improved health means fewer days lost directly or indirectly due to illness. This translates into longer working lives and higher earnings, especially for people working in the informal sector (who, in low-income countries, are typically a high share of the labor force). In addition, women who have fewer, and healthier, children have greater opportunity for paid work outside the household. In countries where the majority of private health spending is out of

pocket, better health lowers the risk of catastrophic health expenditure that destroys household savings.

- **A healthier workforce is more productive.** Worker absenteeism due to poor health has negative consequences for productivity. In contrast, healthy employees are not only more likely to be present but are physically and cognitively stronger, which raises their productivity and can hasten the take-up of new technology. There is a gender-specific angle here as well, one we have discussed in our previous research.² As more women enter the workforce (which they can do because child-rearing burdens are reduced), the productivity level of the entire workforce rises.
- **The savings rate should rise,** as life expectancy increases and people anticipate the need to save for a longer life. Higher savings rates allow for higher levels of investment.
- **A healthier population is more internationally competitive.** Health of the labor force can be an important factor for companies making decisions about foreign direct investment (FDI). Research on FDI flows to low-and middle-income countries finds that a one-year gain in life expectancy can boost gross FDI inflows by 9%. FDI is a powerful driver of economic growth, creating jobs and facilitating technology transfer.

Adding up the impact of better health over time

Poor health discourages savings and investments in human capital and limits the scope for productivity gains. But even fairly modest improvements in health can have a significant economic impact among low-income countries.

- Using life expectancy as a proxy for overall health, research indicates that each 10% improvement is correlated with an increase in annual GDP growth rates of 30-40 basis points.
- On this basis, our estimates suggest that investments in health that would halve the life-expectancy gap between low-income and high-income countries (currently 23 years) could add more than 70 basis points to annual GDP growth rates in low-income countries. Given that the average annual growth rate for this group was just 4.3% between 1990 and 2008, this would be a meaningful improvement.
- Other research suggests that each additional year of life expectancy can increase the level of real GDP by approximately 4%.
- At a macro level, health can also explain a meaningful share of the difference in economic growth across regions. Some research attributes as much as 30%-50% of East Asia's economic growth between 1965-1990 to demographic and health changes, including significant declines in infant and child mortality, improvements in reproductive health and declining fertility, all of which are inter-related.

Interestingly, and perhaps counter-intuitively, improved health does not, in the short term, significantly improve the most widely used measure of economic wellbeing, GDP per capita. In fact it appears that gains in life expectancy may actually *reduce* GDP per capita for some time – as much as several decades. The explanation is demographic. In developing countries, the biggest improvements in life expectancy stem from gains not at the end of life but at the *beginning* – from steep declines in child mortality. Over time, lower child mortality usually leads to lower fertility rates. But this shift takes years, during which time population growth accelerates and more children must be supported by a relatively smaller share of working-age adults. It is often only three decades later, or more, that the demographic transition to sustainably lower fertility rates pays off economically

² See "Women Hold Up Half the Sky," *Goldman Sachs Global Economics Paper 164*, March 4, 2008.

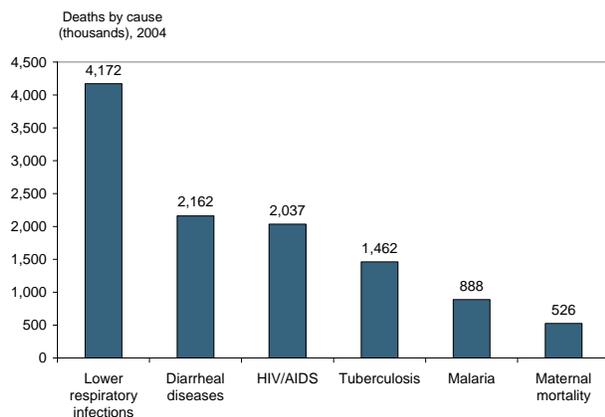
and these countries enter the “demographic window,” a sweet spot for economic growth and higher income per capita.

While the discussion about GDP per capita is important in the debate about whether bad health breeds a poverty trap, in other ways it is also irrelevant. A broader measure of welfare, looking at the toll imposed by disability and physical and emotional suffering, clearly points to significant gains from improved health and longer life expectancy. In some cases better health could pay off immediately. Reducing maternal mortality would dramatically improve the lives of children today, while prevention and improved treatment of infectious disease could reduce spending on emergency health care and, even in the short term, allow for a better allocation of household resources.

The burden of disease falls heavily on the world’s poorest countries

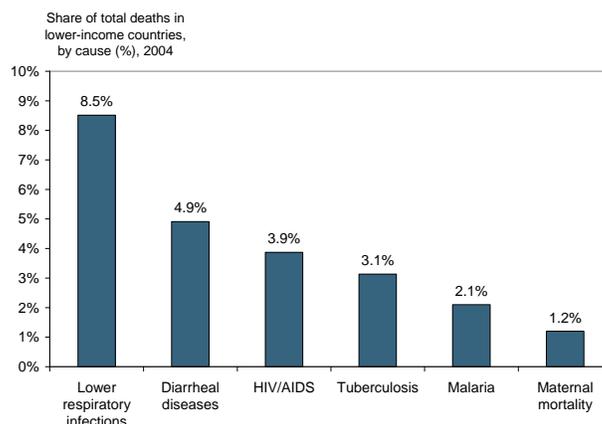
Six diseases – pneumonia, diarrhea, HIV/AIDS, tuberculosis, malaria and maternal mortality³ – are among the worst, if not *the* worst, killers in the developing world. This is not only because of their steep death toll and disability burden, but also because they are preventable and, for the most part, treatable. Together, these half-dozen diseases kill more than 11 million people around the world each year, roughly equivalent to the population of metropolitan Beijing. Ninety percent of these deaths are in low-income and lower-middle-income countries (see Exhibits 5-6).

Exhibit 5: Six preventable and treatable diseases kill more than 11 million people each year



Source: World Health Organization.

Exhibit 6: The same six cause nearly one-quarter of all deaths in low-income and lower-middle-income countries



Source: World Health Organization, Goldman Sachs Research.

³ Maternal mortality is not a disease but is the result of multiple factors that make quality care unavailable, inaccessible or unaffordable. Most of the principal causes of maternal death, which include hemorrhage, infection and obstructed labor, can be prevented or effectively treated by trained health providers. But one-third of the 130 million babies born each year are delivered without the help of trained health workers. Other treatable conditions, including HIV/AIDS, malaria and anemia, increase the risk of maternal mortality.

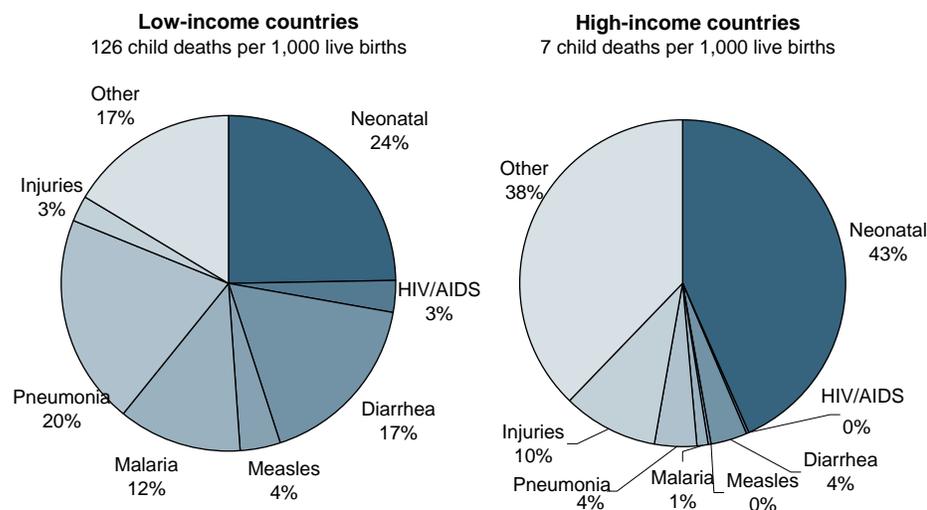
The burden of communicable disease is highly concentrated in poor countries, which suffer enormously from diseases that barely register in the death toll among high-income countries. Pneumonia and diarrhea together cause 5.6 million deaths in lower-income countries, or more than 13% of all deaths, compared to just 4% of all deaths in high-income countries. Similarly, diarrhea and maternal mortality together cause 6% of all deaths in lower-income countries (killing 2.6 million people); they barely register in the death toll among high-income countries (0.2% of the total). Child mortality shows an even more striking divergence by income: pneumonia and diarrhea together cause more than one-third of all under-5 deaths in low-income countries, nearly five times the share in high-income countries. See Exhibits 7-8.

Exhibit 7: The burden of disease falls heavily on low- and lower-middle-income countries

Deaths & DALYs by health condition	Deaths		Death rates (per 100,000 population)		Disability-adjusted life years (DALYs) lost	
	Share of lower-income country deaths	Share of high-income country deaths	Death rates in lower-income countries	Death rates in high-income countries	Share of lower-income country DALYs	Share of high-income country DALYs
Lower respiratory infections	8.5%	3.7%	108.2	31.1	7.4%	1.0%
Diarrheal diseases	4.9%	0.2%	68.0	1.5	5.7%	0.4%
HIV/AIDS	3.9%	0.3%	67.3	2.2	3.9%	0.5%
Tuberculosis	3.1%	0.2%	35.5	1.5	2.6%	0.2%
Malaria	2.1%	0.0%	34.0	0.1	2.8%	0.0%
Maternal mortality	1.2%	0.0%	16.9	0.2	3.0%	0.5%
Sum	23.7%	4.3%	329.8	36.6	25.3%	2.6%

Source: Goldman Sachs Research, World Health Organization.

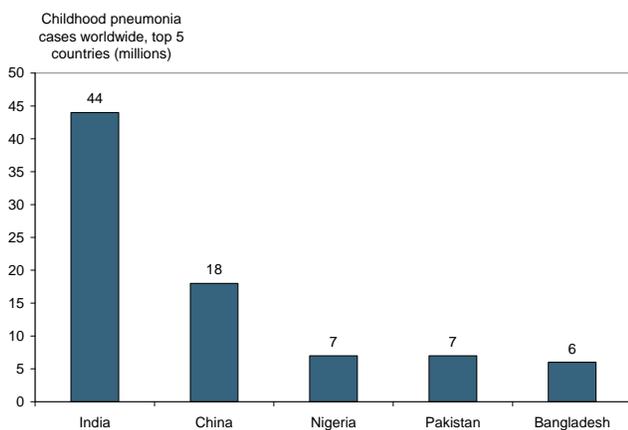
Exhibit 8: Pneumonia and diarrhea cause more than one-third of all child deaths in low-income countries, but less than 10% in high-income countries
Distribution of causes of death among children under 5, 2004



Source: World Health Organization.

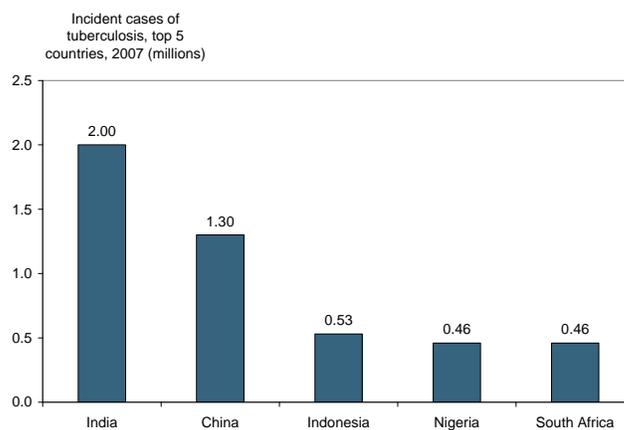
Geographically, the concentration of disease is also striking. More than half of all childhood pneumonia cases occur in five countries: India (with a remarkable 44 million cases, or 30% of the total), China, Nigeria, Pakistan and Bangladesh. Similarly, more than half of the world's tuberculosis cases are found in an overlapping group of five countries (India, China, Indonesia, Nigeria and South Africa). See Exhibits 9-10. The result of this concentrated risk exposure is that 40% of the estimated 8.8 million child deaths in 2008 occurred in just three countries: India, Nigeria and the Democratic Republic of Congo. One-third of the 500,000 maternal deaths occurred in just two countries: India and Nigeria.

Exhibit 9: 30% of the 150 million cases of child pneumonia are in India . . .



Source: World Health Organization.

Exhibit 10: . . . as are more than 20% of the 9 million tuberculosis cases



Source: World Health Organization.

The starkest concentration of communicable disease is in Africa, where the statistics are shocking yet numbing in their monotony. The continent has less than one-quarter of the world's population under age 5, but half of all child deaths worldwide, meaning that roughly one African child in every seven dies before age 5. Africa also has half of the high-risk population for malaria but 90% of global malaria deaths; two-thirds of all HIV infections, 70% of AIDS-related deaths and nearly 90% of all HIV-positive children; and tuberculosis incidence at more than twice the rate seen in any other region. See Exhibits 11-12.

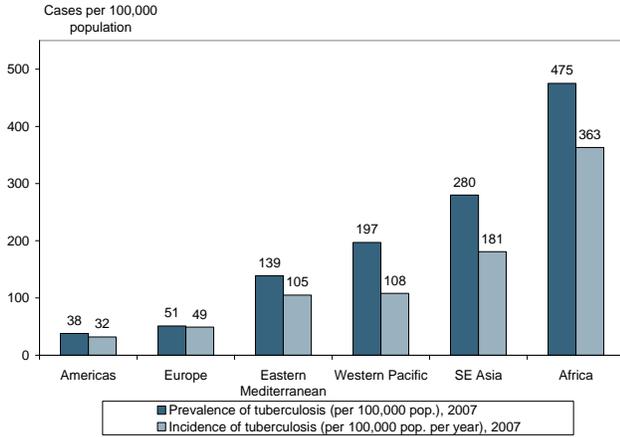
Within Africa, Nigeria stands out, with the world's highest incidence of childhood pneumonia, one-quarter of global deaths due to malaria and, in absolute terms, one-third more AIDS-related deaths than India, a country with eight times as many people. South Africa is also particularly hard hit by AIDS and tuberculosis, with prevalence rates 3.4 and 25 times the global averages, respectively.

Children also suffer disproportionately from communicable diseases. **Although children under the age of 5 make up less than 10% of the global population, they account for almost 20% of the world's deaths each year.** More than 3 million newborns die within the first week of life – when it is too early even to assign a precise cause of death – and nearly 1 million more die by the end of the first month. Two million children die each year from pneumonia, and another 1.8 million from diarrheal diseases. Of the 900,000 deaths from malaria worldwide, 85% are children under age 5; 2,000 children die from malaria in Africa each day.

The Appendix provides detailed information on vulnerability to and the death tolls from these six killers.

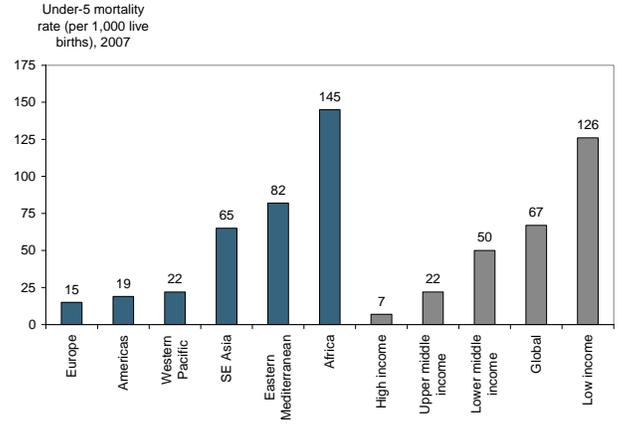
Exhibit 11: On a per capita basis, tuberculosis strikes Africa especially hard

Rates of incidence (the number of new cases in a given year) and prevalence (the total number of cases at a point in time) by region, 2007



Source: World Health Organization.

Exhibit 12: In Africa, roughly one child in every seven dies before age 5



Source: World Health Organization.

Not only death, but disability too

Even when these diseases do not kill, the disability they cause has lasting human and economic effects. This is especially true for the diseases that strike hardest in childhood, including diarrhea and malaria. One way to assess the impact of disease combines both death and disability into “disability-adjusted life years”, or DALYs. As calculated by the WHO, one disability-adjusted life year is equivalent to one lost year of “healthy” life, or one year lost to premature death. Aggregating DALYs shows the gap between today’s reality and the ideal of a long life unaffected by disease or disability. Overall, in low-income countries, life is not only shorter – more than 20 years shorter than in high-income countries – but more of it is spent in ill-health.

Cost-effective prevention and treatment exist, but access is limited

As bad as these death and disability statistics are, they are made worse by the fact that these diseases are largely preventable and treatable. Approximately 3 million people, 75% of whom are children, die each year from diseases that could be prevented by vaccines that are available or expected soon. In fact roughly one-quarter of all child mortality is attributable to vaccine-preventable diseases. When evaluated from the perspective of cost per-life or per-healthy-life-year saved, prevention and treatment options can be remarkably inexpensive. Yet, despite notable progress in recent years, there are still significant gaps in coverage among lower-income economies.

Exhibit 13: Disease-specific interventions could have benefits 30 times greater than costs

Disease / condition	Focus of proposed intervention	Deaths / DALYs averted	Benefit-cost ratio (BCR)
Tuberculosis	appropriate case finding and treatment	1 million adult deaths or 20 million DALYs averted	30:1
Heart attacks	acute management with low-cost drugs	300,000 heart attack deaths averted or 7.5 million DALYs averted	25:1
Malaria	prevention and ACT treatment package	500,000 deaths averted or 7.5 million DALYs averted	20:1
Childhood diseases	expanded immunization coverage	1 million child deaths averted or 20 million DALYs averted	20:1
Cancer, heart disease, other	tobacco taxation	1 million adult deaths averted or 20 million DALYs averted	20:1
HIV	prevention package	2 million HIV infections averted or 22 million DALYs averted	12:1
Injury, difficult childbirth, other	surgical capacity at the district hospital	30 million DALYs averted via surgical care, about 20% of DALYs	10:1

Source: *The Copenhagen Consensus*.

Immunization is the standard form of prevention for many diseases, including pneumonia, influenza and measles. Immunization has prevented approximately 20 million deaths from disease since 1990 and is estimated to avert 2.5 million child deaths each year, according to the World Bank and the World Health Organization (WHO). Immunization is highly cost-effective, with benefits as much as 20 times greater than costs. For example, the WHO declared the eradication of smallpox in 1979 at a 10-year cost of \$100 million, with estimated treatment and prevention cost savings of \$1.3 billion each year since then. The WHO's standard child immunization package is estimated to cost \$18 per child in low-income countries; this cost is projected to rise above \$30 per child as newer vaccines are added. This cost estimate includes immunization against a portfolio of diseases that are collectively responsible for the majority of child deaths. The case of measles provides particularly strong support for the benefits of immunization: since 2000, the number of measles deaths has fallen by 78% thanks to a large-scale immunization campaign which has reached 700 million children and averted an estimated 4.3 million child deaths.

Considerable funds and efforts are now going into expanding childhood immunization programs, both by adding new vaccines and by extending coverage. Newer vaccines that help to prevent childhood pneumonia and diarrhea are benefitting from innovative financing arrangements, as we discuss below. It is estimated that these new vaccines could save the lives of up to 11 million children over the next two decades, and sharply reduce clinic visits and hospital admissions. Efforts are also underway to develop a vaccine for malaria through a market-based program (as we also discuss below), as well as a vaccine for HIV. All indications from leading health organizations, however, are that a vaccine for HIV is at least a decade away.

In the short term, there are a number of reasons why the cost of an expanded immunization program is likely to rise above \$30 per child. New vaccines targeting the leading causes of childhood pneumonia and diarrhea, for example, are costlier than traditional vaccines, and they add to existing cold storage and distribution needs. There are also operational costs associated with expanding coverage, as the population which remains without coverage is more difficult (and costlier) to reach. Each of these factors underscores the importance of strengthening health systems, which we discuss in the next section.

Other major killers – including pneumonia, malaria, and tuberculosis – can be treated by existing antibiotics and other pharmaceuticals. The WHO estimates that the average antibiotic course to treat pneumonia is just \$0.27. Comprehensive pneumonia treatment in South Asia and sub-Saharan Africa – home to 85% of pneumonia-related deaths – could cost as little as \$200 million per year, including antibiotics and the costs of training new health workers. Nonetheless, just half of children with pneumonia receive adequate care, and less than 20% receive the recommended antibiotic treatment.

Availability of the newest and most effective anti-malarial treatment, artemisinin-based combination therapy (ACT), has improved dramatically in recent years. Yet, as with pneumonia, coverage rates are low. The WHO estimates that fewer than 40% of affected children in Africa are treated with *any* anti-malarial drugs, and only 3% are treated with ACT. According to household surveys in 18 African countries, fewer than 20% of pregnant women receive preventive anti-malarial treatment, despite the known risks of malaria during pregnancy.

Availability of antiretroviral therapy (ARV) for HIV/AIDS is now spreading beyond developed economies. Thanks to a substantial increase in coverage during 2008, more than 40% of the 9.5 million affected people in lower-income countries, including an estimated 2.9 million in Africa, were receiving ARV treatment by the end of that year. Coverage across low- and middle-income countries has in fact seen an eight-fold increase between 2003 and 2008.

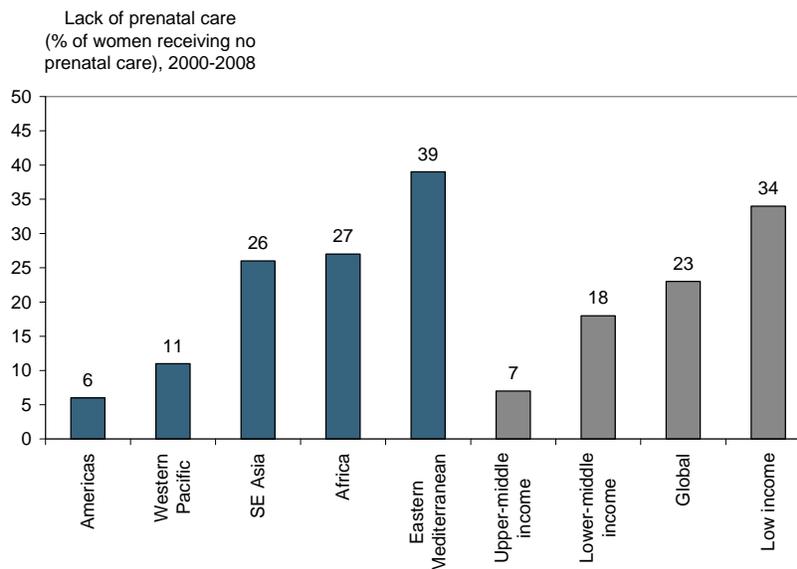
Treatment of tuberculosis offers one of the most vivid examples of potential cost-effectiveness, as Exhibit 13 shows. Effectiveness of the standard TB treatment has improved to about 85%, and is estimated to cost just \$3-\$7 per healthy year of life gained. The Copenhagen Consensus estimates that intervention in this area would be the single most cost-effective option for improving global welfare, with benefits 30 times the costs. Better diagnosis and expanded treatment could avert 1 million deaths and save 20 million disease-adjusted life years.

Thanks to global efforts to expand production and access, **long-lasting insecticide-treated nets (LLINs) to prevent malaria** now cost, on average, just \$1.05 for each person protected each year. Distribution has expanded in recent years, particularly in Africa, where LLIN distribution increased roughly threefold, to 36 million, between 2005 and 2006. However, there is still ample scope to broaden both ownership and use. The WHO's target is to protect 80% of the at-risk population, but a WHO survey of nearly 40 African countries indicates that only one-third of households own an insecticide-treated net, and only one-quarter of the most vulnerable population – children and pregnant women – sleep under them.

Better sanitation – especially the simple act of hand-washing – would do much to reduce the 4 billion episodes of, and 2.2 million deaths from, diarrhea each year. “Sanitation” conjures up visions of expensive infrastructure, in the form of wells and piped water, but hand-washing and point-of-use water treatment can be very powerful forms of prevention. The World Bank estimates that washing hands with soap can reduce the risk of diarrhea by almost half and the risk of respiratory infection by one-third; it calls hand-washing “a better option for disease prevention than any single vaccine.” Moreover, **oral rehydration therapy** – which can prevent death from diarrhea in 95% of cases – costs only \$0.06 per liter, and can be made and administered at home, without healthcare professionals. But fewer than 40% of children under age 5 suffering from diarrhea receive the recommended treatment, while nearly 1 billion people around the world still lack access to the safe drinking water that is also vital to prevention and treatment.

HIV/AIDS and maternal mortality are different. Treatment in particular remains very expensive and does not lend itself to programs like immunization drives and malarial-net distributions. For HIV, the cost of first-line ARVs has come down significantly in recent years, falling by 30%-68% between 2004 and 2008, and the cost of pediatric ARV treatment has also declined. Yet second- and third-line treatments, which are increasingly necessary as survival rates improve, are prohibitively expensive for many low-income countries. Lowering maternal mortality rates will require, among other things, a notable expansion of clinics and obstetric care, especially in rural areas. One-third of pregnant women in low-income countries receive no prenatal care whatsoever, as Exhibit 14 shows.

Exhibit 14: One-third of pregnant women in low-income countries receive no prenatal care at all



Source: World Health Organization.

Averting or treating these conditions could have significant spill-over effects, however, even just in the field of health. Co-infection with HIV reduces the effectiveness of treatment for other diseases, including tuberculosis and malaria, meaning that progress in reducing HIV infections could render these other diseases considerably less virulent. Establishing more obstetrical clinics and expanding the reach of prenatal care would not only make maternal mortality less likely, but would also provide an access point for other health interventions, including HIV testing for pregnant women, programs to prevent mother-to-child transmission of HIV and immunization for infants.

The need to look “beyond disease”

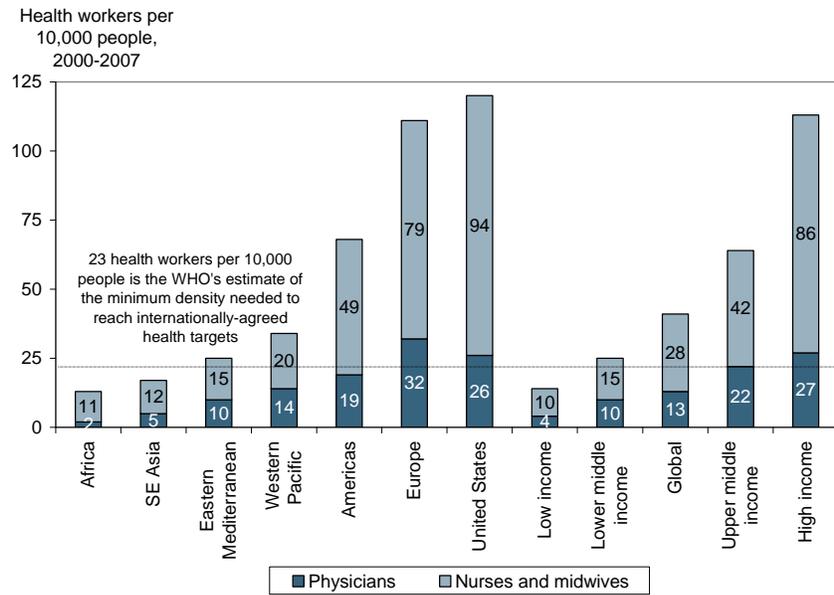
Much of the knowledge and technology needed to significantly improve global health exists today. **More funds, more research and enhanced distribution of vaccines, bednets and pharmaceuticals are critical. But they are not enough.** Persistent challenges such as high rates of maternal mortality, the spread of drug-resistant disease and the gaps between ownership and use of anti-malarial nets will not be resolved simply by spending more money. The shifting burden of disease and problems of co-infection, for example with TB and HIV, also mean that a disease-specific program is unlikely to be the optimal approach. **Increasingly, efforts to improve health need to look “beyond disease” to strengthen health systems, improve infrastructure, broaden education and change behaviors.** We explore these issues below.

Health systems are a critical area for investment, because in many cases the *delivery* of healthcare itself is the key challenge, even when the medicines are available and the treatments known. Health systems in developing countries are understaffed and underfunded. In many cases, the population that remains without health coverage today is outside the reach of existing clinics or local health services. The WHO considers 23 healthcare professionals for every 10,000 people to be the minimum density necessary to

reach internationally-agreed health targets. Yet the average among low-income countries is just 14 per 10,000; in lower-middle-income countries it is 25. This compares to 120 in the United States. See Exhibits 15-16.

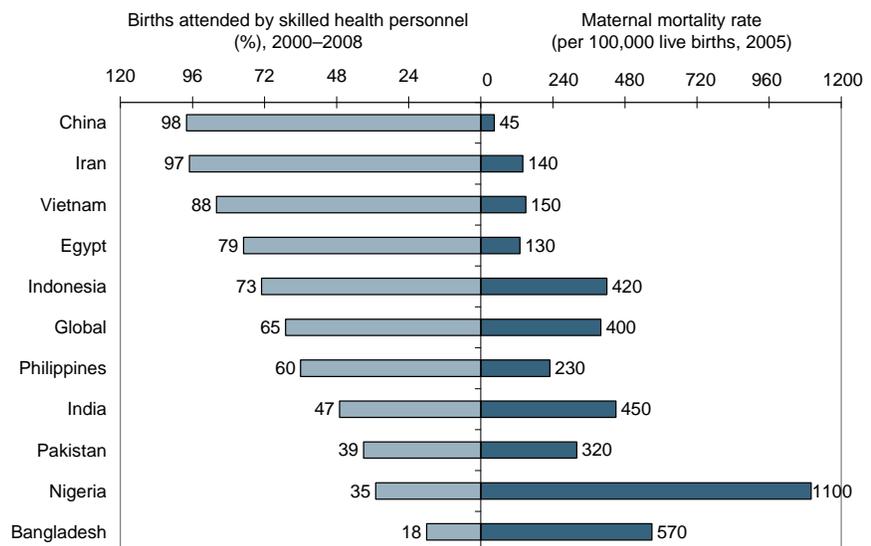
Given the limits on educational capacity broadly and health training in particular, there is a clear need for community-based health workers who can operate outside the traditional and sometimes rigid definitions of doctor, nurse or midwife. There is also a need for more health clinics, especially in rural areas, and especially to provide emergency obstetric care.

Exhibit 15: Health systems are badly under-staffed in most lower-income countries



Source: World Health Organization.

Exhibit 16: Maternal mortality is especially high in countries where trained medical assistance is lacking



Source: Goldman Sachs Research, World Health Organization.

Focusing on health systems also bolsters the opportunities to “piggyback” on successful distribution and education efforts. For example, vaccine delivery campaigns create an opportunity to provide other health services, such as insecticide-treated nets, vitamin supplementation and health-related education.

Gaps in health systems open opportunities to private-sector investment.

Strengthening health systems does not need to mean pouring more resources into state-run bureaucracies with opaque finances. Private sector funds and expertise can be put to good use in creating new modes of healthcare delivery, in the form of mobile clinics or remote-delivery tele-medicine. Mobile phone networks are already being used to track pneumonia cases. There is also potentially a large opportunity for privately offered healthcare training, as part of a broad expansion of for-profit education in emerging economies.

Healthcare suffers from inadequate infrastructure in many ways, especially in rural areas. Bad roads, limited or uneven electricity supply and the lack of refrigeration mean that medical treatment often cannot reach people – and bad roads and the lack of public transport mean that people often cannot reach treatment. For conditions that require immediate treatment, like malaria and obstructed labor, **bad infrastructure itself can be a matter of life or death.** Clean water is vital to health, especially to prevention treatment of diarrhea, but some 900,000 people around the world lack access to “improved sources of water” (which can be as basic as a public standpipe) while more than 2.6 billion lack access to “improved sanitation facilities” (which again can be quite rudimentary). Similarly, improving indoor air quality, which is important in preventing pneumonia, depends largely on the cost (which is often high) and availability (which is often low) of cleaner fuel sources.

Education may be the most important driver behind improvements in health. At a basic level, people need greater awareness of the risks, symptoms and treatments for disease. Recent studies indicate that only 20% of caregivers are aware of the warning signs of pneumonia, while fewer than 40% of people living with HIV and fewer than 20% of TB patients know their HIV status. Expanded testing will help enable more people to understand their risk exposure, and to know it early enough to take effective action. Change in this area can be rapid: for example, the share of pregnant women in low- and middle-income countries who receive HIV testing has risen from 3% in 2003 to 21% in 2008.

Education more broadly – especially women’s education – is also critical to improving health. Women are the primary point of contact between the family and the health system. As we discussed in our previous research on women’s education, studies consistently show that **education improves women’s ability to make better medical decisions and better use of medical services.** Families of educated women are found to have better nutrition and diets, safer sanitation practices and a higher chance of being immunized. Girls’ education is also linked to reduced risk of HIV/AIDS. To prevent maternal mortality in particular, women need expanded access to prenatal care; more autonomy to make their own decisions about whether and when to seek obstetrical treatment; and greater control over the number and spacing of their children.

Changing behaviors. For many diseases, encouraging behavior modifications is not terribly controversial, though implementing these changes may not be easy. For instance, it is widely believed that owners of anti-malarial nets do not always use them effectively. Not everyone washes his or her hands before preparing food. People with HIV need to take anti-retrovirals long after they initially feel better, to maintain their health and avoid affecting others. People with TB need to continue their antibiotic treatments long after signs of the disease disappear, in order to prevent drug resistance. The consequences of not doing so can be severe: there were an estimated 500,000 new cases of multidrug-resistant TB in 2007; in some countries, more than 20% of new cases are multidrug-resistant.

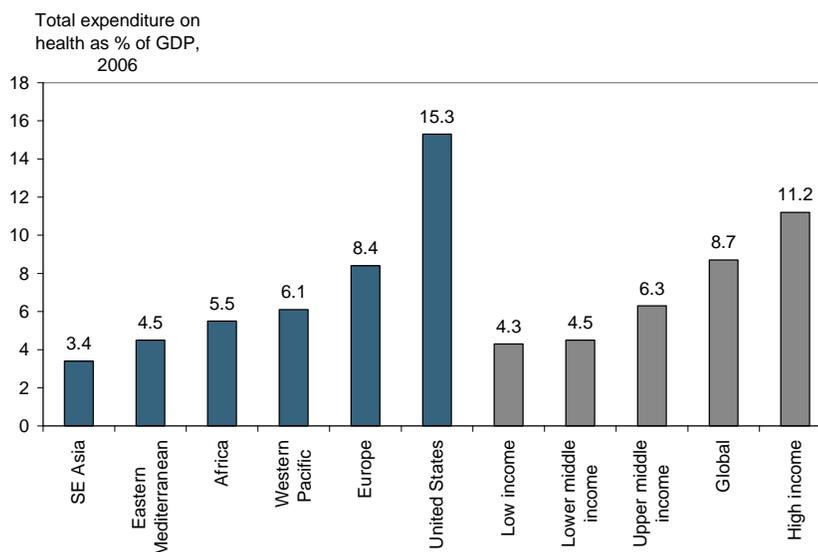
But, for many other diseases, encouraging behavioral changes is more complicated, as it can broach questions of cultural and social values and norms. This is often the case with behaviors that affect the spread of HIV. For example, preventing mother-to-child transmission of HIV may force a woman to reveal her HIV status to her family and in the process risk familial censure (or worse). Encouraging women to make their own decisions about when to seek obstetrical care may challenge traditional views of women’s role in the household. Education is likely to be vital to lasting changes in behaviors, as more people are exposed to the environmental and behavioral risk factors underlying ill health. Relatively modest changes have the potential to save many lives.

Health financing and the role of the private sector

Health systems in developing countries are not only understaffed but are also sorely underfunded relative to the challenges they face. Lower-income countries face an enormous gap between health needs and current health spending, as measured in numerous ways:

- Developing countries account for more than 85% of the global population and, according to the WHO, more than 90% of the global disease burden, but only 12% of global health spending.
- The global average for health spending is 9% of national GDP (with the United States at a remarkable 15% and Europe closer to 8%). In low-income and lower-middle-income countries alike, health spending averages roughly 4.4% of GDP. See Exhibit 17.

Exhibit 17: The move from low-income to lower-middle-income status does not bring a significant increase in the share of GDP spent on health



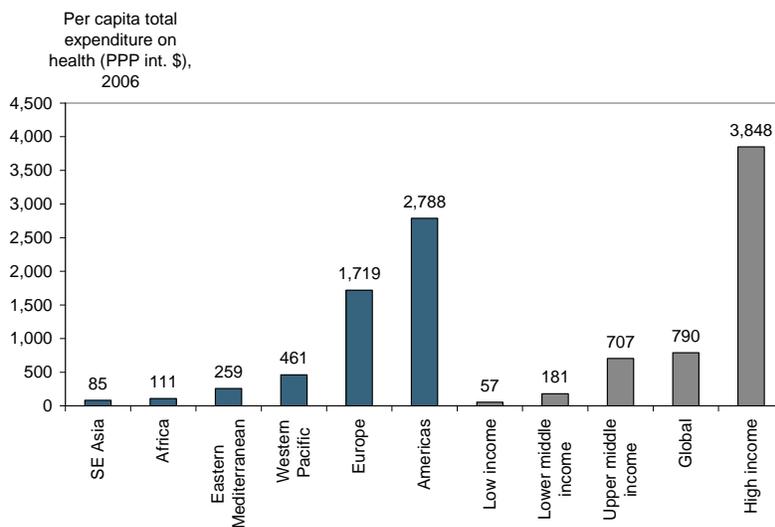
Source: World Health Organization.

- On a per-capita basis, the gap between poor and rich countries looms even larger. Low-income countries spend, on average, just \$57 per capita on health, less than 10% of the global average (of \$790). Lower-middle-income countries spend \$181 per person, roughly one-quarter of the global average. In contrast, per capita health spending in high-income countries averages nearly \$4,000 (\$6,719 in the United States).

States). Adjusted for the cost of living (in PPP terms), high-income countries spend nearly 70 times more per capita than do low-income countries. See Exhibit 18.

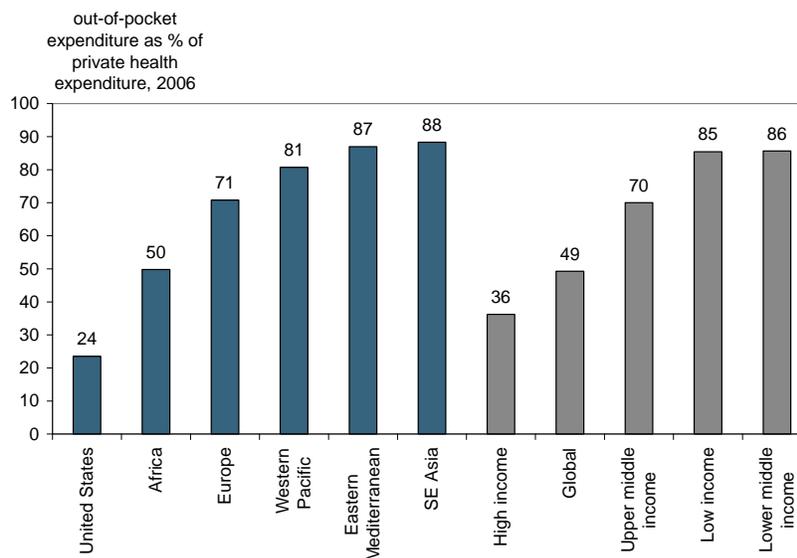
Exhibit 18: On a per capita basis, high-income countries outspend low-income countries on health by nearly 70-to-1

Per capita spending on health in PPP terms



Source: World Health Organization.

The burden of health spending falls heavily on households in lower-income countries. The government’s share of total spending tends to rise with income. On a global basis, it averages 58%; in poorer countries, government spending covers just slightly more than one-third. Private spending must make up the balance. As Exhibit 19 shows, in lower-income countries, the majority of this private spending is out-of-pocket (95% or more in Egypt, Iran and Pakistan). **Limited insurance and risk-pooling arrangements today point to a private-sector opportunity ahead; in the meantime, low-income households remain vulnerable to catastrophic health expenses.**

Exhibit 19: In low-income countries, 85% of private health spending is out-of-pocket

Note: The United States has been used in place of Americas for comparative purposes.

Source: World Health Organization.

Global health finance: new sources and a growing role for markets

This decade has seen a significant expansion of funds dedicated to public health and a greater diversification of funding sources. Total development assistance for health has more than doubled since 2000, from \$6.8 billion to \$16.7 billion in 2006. In addition, the sources of funding have diversified to include non-governmental organizations, private foundations and public/private partnerships, whether designed around specific diseases (like malaria) or products (like vaccines).

Many of the key players in global health today did not exist a decade ago. Some are public/private partnerships; nearly all involve the private sector in some important capacity. Among the recent health initiatives:

- **The Global Fund to Fight AIDS, Tuberculosis and Malaria**, founded in 2002, is a public-private financing facility. Using performance-based criteria, the Global Fund supports large-scale prevention, treatment and care programs and has committed \$18.7 billion to nearly 600 programs in 140 countries. It is estimated to be the source of approximately one-quarter of all international financing for AIDS, two-thirds for TB and three-quarters for malaria. Working with local health systems and multilateral organizations, the Global Fund has helped to detect and treat 4.6 million cases of TB and to deliver 70 million insecticide-treated bednets and 74 million malaria drug treatments.
- **The GAVI Alliance** was launched in 2000 as a public-private partnership to support immunization coverage in low-income countries. GAVI focuses on improving vaccination supply and uptake, improving the predictability of long-term immunization finance, and strengthening national health systems. According to GAVI, since 2000, the program has reached more than 200 million children who would not otherwise have been vaccinated. GAVI has disbursed more than \$2.7 billion and is increasingly focused on introducing new vaccines against the leading causes of diarrhea and pneumonia.
- **The Bill & Melinda Gates Foundation**, established in 1994, is now one of the largest private foundations in the world. Its current annual expenditure is nearly \$3 billion,

65% of which goes towards global health. The Gates Foundation focuses on diarrheal diseases, HIV/AIDS, malaria and TB, as well as neglected infectious diseases, and is involved in large health programs in India and China. It also works with health systems to improve nutrition as well as maternal, neonatal and child health.

- **Public/private campaigns to target specific diseases**, particularly malaria, TB and HIV/AIDS. Typically these draw heavily on private funding and work through existing public health systems, with support from international health organizations. These include the Stop TB Partnership (1998), the Roll Back Malaria Partnership (1998), the Medicines for Malaria Venture (1999), the TB Alliance (2000).
- Even traditional public sources of financing are now working in conjunction with the private and non-profit sectors. For example, the **US President's Emergency Plan for AIDS Relief (PEPFAR)**, launched in 2003, works with national governments as well as the Global Fund, university research programs, corporates and faith-based organizations. The initial five-year commitment to PEPFAR was \$15 billion; in 2008 it was renewed and expanded with a \$48 billion commitment for another five years. The program's original focus was strictly on HIV/AIDS; recognizing the challenges of co-infection, the expanded program will also combat TB and malaria. The goal is to support treatment of 2 million HIV-infected people, prevention of 7 million infections and care for 10 million people affected by HIV/AIDS.

Health financing is also turning to innovative financing structures, including use of global capital markets:

- The **International Finance Facility for Immunization (IFFIm)** uses international capital markets to front-load aid commitments. Under the program, legally binding long-term sovereign aid commitments underpin triple-A rated bonds; this front-loading allows public health investments to be made more quickly and, importantly, on a more predictable basis. IFFIm was launched in 2006 with government pledges to contribute \$5.3 billion over 20 years. To date, IFFIm bonds have raised \$2.3 billion in global capital markets, and IFFIm has distributed more than \$1.2 billion to support the immunization work of the GAVI Alliance.
- Public/private collaboration is central to **advance market commitments (AMCs)** to fight diseases including diarrhea, malaria, TB and HIV/AIDS. The goal is to create a market for vaccines that developed-world pharmaceutical firms overlook, by narrowing the gap between returns from these projects and returns from wealthier markets. Sponsors commit in advance of product development to finance vaccine purchases at a set price; in exchange, pharmaceutical companies provide long-term binding supply commitments. Research suggests that AMCs for vaccines against malaria, tuberculosis and even HIV/AIDS could be highly cost-effective. See Exhibit 20. With a commitment to pay \$13-15 per person immunized for the vaccine, an overall immunization campaign could cost just \$15-\$17 per DALY saved in the case of malaria and HIV/AIDS, and approximately \$30 in the case of tuberculosis. See Exhibit 20. Earlier this year, several governments, along with the Gates Foundation, launched the pilot \$1.5 billion AMC against pneumococcal disease, the leading killer of children worldwide.

Exhibit 20: Advance market commitments could help make immunization both affordable (for the recipient countries) and profitable (for the vaccine developers)

Disease	Financing assumption	Cost per DALY saved (including vaccine purchase and delivery costs)	NPV of revenues that would accrue to the vaccine developer
Malaria	\$15 for the first 200mn people immunized (\$5/dose for a 3-dose vaccine)	Less than \$15	\$3.2bn
Tuberculosis	\$13 for the first 200mn people immunized	\$31	\$3.3bn
HIV/AIDS	\$14 for the first 200mn people immunized	Less than \$17	\$3.3bn

Source: *Advance Market Commitments for Vaccines Against Neglected Diseases: Estimating Costs and Effectiveness*, BREAD Working Paper No. 127, July 2006.

- The **Taskforce on Innovative Financing for Health Systems**, launched in 2008 by the UK government and the World Bank, recently announced \$5.3 billion in financing commitments. Its goals include a further \$1 billion expansion of IFFIm and new debt conversions, through which the cancellation of debt would fund current investments in health systems. New commitments by the governments of Nepal, Malawi, Ghana, Liberia and Sierra Leone are expected to provide access to free healthcare for an additional 10 million women and children.
- The **World Bank's Health Results Innovation Trust Fund** is a multi-donor fund focused on strengthening health systems. The fund currently supports six pilot programs in Africa, which provide incentives either to healthcare providers (for achieving performance targets) or directly to patients (for taking steps to improve the health of themselves or their families). The World Bank estimates that interventions to strengthen health systems in emerging markets could ultimately channel up to \$2 billion per year, including conditional cash transfers.

Conclusions

The immediate impact of improving public health comes quickly, through in less suffering, fewer deaths and lower rates of disability. Over the longer term, the most important impact may be the greater opportunity – and incentive – to invest in human capital. Ultimately, these investments will be essential to raising living standards and improving international competitiveness.

If this is to happen, countries will need to invest significant resources in education at the same time as they spend more on health. Better health is likely to be seen first in lower rates of child mortality, while the drop in fertility rates that typically accompanies lower child mortality takes several decades to play out. This is especially true in Africa, where the demographic transition seems to be much more prolonged than the transition in East Asia has been. During this time, the share of children in the population will grow, raising the dependency ratio until they enter the workforce. Complementary investments in education, particularly for girls, will be needed if countries are to make the most of the potential these children embody.

Health will not disappear as a major challenge, even if the six major killers we profile in this paper are contained. As life expectancy rises and the population ages, the burden of disease will shift toward non-communicable diseases such as cancer, heart disease and diabetes. This is already becoming evident in lower-middle-income countries, where the list of leading causes of death includes many of the major killers in high-income countries, including cardiovascular diseases and cancer. The risk is that developing economies will need to confront “rich” country diseases at the same time that they face the unfinished agenda of communicable diseases, which themselves may well be exacerbated by urbanization and increased mobility. Sustained progress against the health challenges discussed in this paper is a prerequisite for tackling the health challenges that are likely to accompany economic development.

Appendix: The burden of disease

Children are especially vulnerable to five of the six diseases we profile in the paper. (And while they are obviously not directly exposed to the risk of maternal mortality, they do suffer from its consequences.) **Although children under the age of 5 make up less than 10% of the global population, they account for almost 20% of the world's deaths each year.** Child mortality has fallen by more than 25% since 1990 – a remarkable achievement. But even now, nearly 9 million children die each year – 25,000 each day.

In lower- and lower-middle-income countries together, nearly 3 million newborns die within the first week – when it is too early even to assign a precise cause of death. Nearly 1 million more children die by the end of the first month.

Children who survive that risky first month remain vulnerable throughout their early years to diseases that are both preventable and treatable.

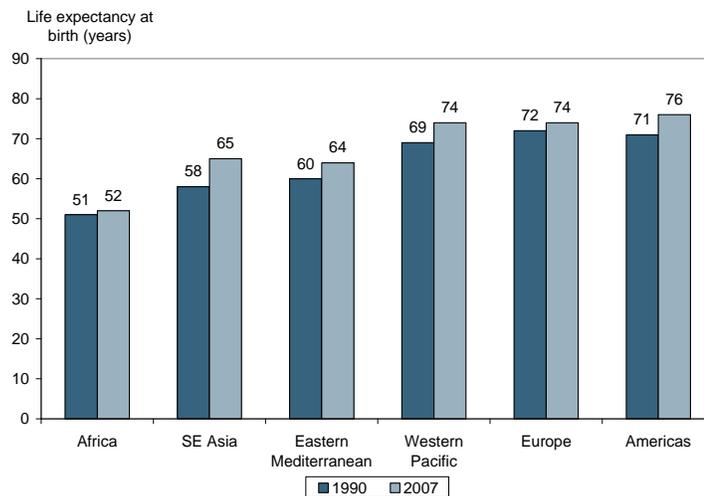
- **Pneumonia** is the leading cause of death in children worldwide, killing approximately 2 million directly each year and causing nearly 20% of all child deaths.
- The second leading cause of child mortality is **diarrheal diseases**, which kill 1.8 million children each year.
- Young children are especially at risk of **malaria** (those who survive beyond 5 acquire partial immunity). Globally, there were roughly 250 million cases of malaria and 900,000 deaths in 2007, with children accounting for 85% of the death toll. In Africa, 2,000 children die from malaria each day.
- Mother-to-child transmission is the overwhelming source of **HIV infection** in children. Overall, children account for less than 6% of global HIV cases, but in 2007 they accounted for 17% of new infections and 14% of HIV-related deaths.

People who survive these childhood killers typically go on to face a further set of health challenges as adults.

- **HIV/AIDS** is the leading cause of adult death from infectious disease in the world. It is also the leading cause of mortality among women of reproductive age globally, the leading cause of death in sub-Saharan Africa, and the fourth leading cause of death in low-income countries, where it claims more than 1.5 million lives each year. New infection rates have fallen by about one-quarter over the past 15 years, but, as treatment improves, the number of people living with HIV continues to climb. It now stands at roughly 33 million people, the vast majority of whom are in sub-Saharan Africa. Due largely to HIV/AIDS, the gap in life expectancy between Africa and all other regions has actually widened since 1990 (see Exhibit 21).

Exhibit 21: Over the past two decades, the life expectancy gap between Africa and all other regions has widened

Life expectancy has stagnated in Africa but continues to lengthen elsewhere, especially in Asia

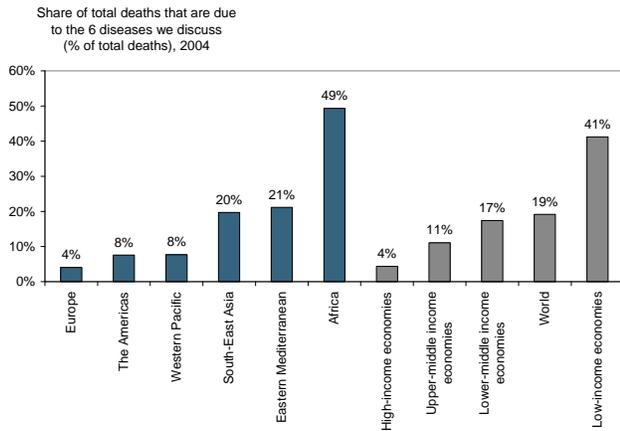


Source: World Health Organization.

- Tuberculosis** is the second leading cause of adult death from infectious disease, causing 1.8 million deaths each year. More than three-quarters of TB-related disease and death occurs among young adults during their most productive years, ages 15-54, and nearly two-thirds of the 9 million new cases each year occur in men.
- Co-infection with HIV** heightens the risk of and lowers the effectiveness of treatments against other diseases, particularly pneumonia, TB and malaria. For example, more than 1 in 4 TB deaths are among HIV-positive people. People infected with both HIV and TB are up to 50 times more likely to develop active TB than those who are infected only with TB. In addition, standard malaria treatments are less effective in people who are infected with HIV or pneumonia.
- Pregnancy and childbirth are among the riskiest times of women's lives. **More than half a million women in lower-income countries die each year – one per minute – from complications during pregnancy or childbirth.** A woman's lifetime risk of maternal death is 1 in 75 in developing countries, more than 100 times higher than the comparable risk in developed countries. Maternal mortality causes roughly 1.5% of all deaths in lower-income countries, which is remarkable given that women of childbearing age are just one-quarter of that total population. Adjusted for this, maternal mortality is a killer on the scale of diarrhea. Another 10 million women suffer injury, infection or disease during childbirth. Pregnancy also puts women at greater risk for other health problems, notably malaria: some 10,000 women (along with 200,000 children) will die as a result of malaria in pregnancy.
- "Childhood killers" remain a risk long past childhood.** Only half of the 4 million pneumonia-related deaths each year occur among children under the age of 5. Moreover, an additional 400,000 people die from diarrhea and more than 120,000 die from malaria each year.

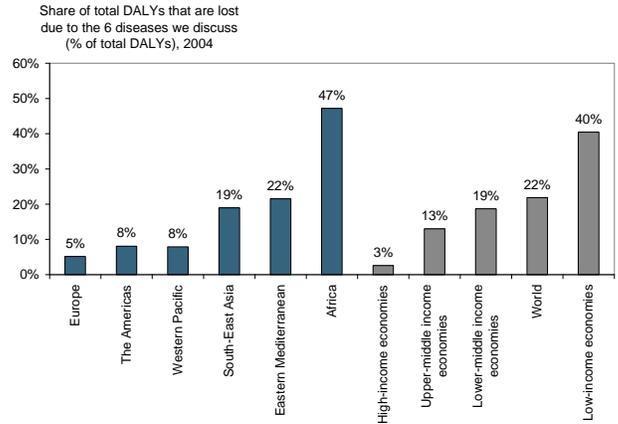
Exhibits 22-26 chart the deaths and disability-adjusted life years (DALYs) lost, as well as death and DALY rates, due to the six health conditions we discuss in this paper.

Exhibit 22: Share of total deaths attributable to 6 health challenges profiled (%)



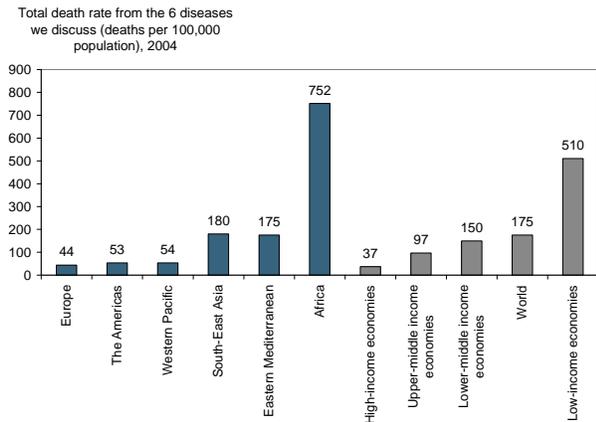
Source: Goldman Sachs Research, World Health Organization.

Exhibit 23: Share of disability due to 6 health challenges profiled (% of total disability-adjusted life years)



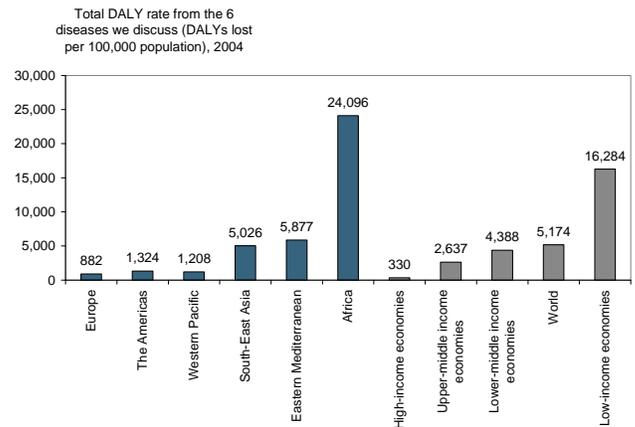
Source: Goldman Sachs Research, World Health Organization.

Exhibit 24: Total death rates attributable to 6 health challenges profiled (deaths per 100,000 population)



Source: Goldman Sachs Research, World Health Organization.

Exhibit 25: Total disability rates attributable to 6 health challenges profiled (disability-adjusted life years lost per 100,000 population)



Source: Goldman Sachs Research, World Health Organization.

Exhibit 26: Death and disability by region and income aggregate

Rates and relative share of death and disability (disease-adjusted life years) caused by the 6 diseases covered in this paper

Death shares. Estimated share of total deaths (%), by cause, 2004

	Europe	The Americas	Western Pacific	South-East Asia	Eastern Mediterranean	Africa	High-income economies	Upper-middle income economies	Lower-middle income economies	World	Low-income economies
Tuberculosis	0.8%	0.7%	2.5%	3.4%	2.6%	3.6%	0.2%	1.6%	2.9%	2.5%	3.7%
HIV/AIDS	0.3%	1.2%	0.4%	1.3%	0.7%	14.7%	0.3%	4.8%	1.8%	3.5%	9.6%
Diarrheal diseases	0.4%	1.1%	0.9%	4.5%	6.0%	8.9%	0.2%	1.0%	3.6%	3.7%	8.5%
Malaria	0.0%	0.0%	0.0%	0.2%	0.9%	7.2%	0.0%	0.0%	1.2%	1.5%	4.7%
Lower respiratory infections	2.5%	4.2%	3.7%	9.1%	9.6%	12.6%	3.7%	3.4%	7.0%	7.1%	12.6%
Maternal conditions	0.0%	0.3%	0.1%	1.1%	1.4%	2.3%	0.0%	0.2%	0.9%	0.9%	2.1%
Sum of all 6 death shares	4.1%	7.6%	7.7%	19.7%	21.2%	49.3%	4.3%	11.1%	17.4%	19.2%	41.2%

Death rates. Estimated deaths per 100,000 population, by cause, 2004

	Europe	The Americas	Western Pacific	South-East Asia	Eastern Mediterranean	Africa	High-income economies	Upper-middle income economies	Lower-middle income economies	World	Low-income economies
Tuberculosis	8.8	5.2	17.5	31.0	21.3	55.0	1.5	13.9	25.2	22.8	45.8
HIV/AIDS	3.5	8.4	2.6	12.3	6.0	223.8	2.2	41.6	15.4	31.7	119.2
Diarrheal diseases	4.4	8.0	6.2	40.9	49.3	136.3	1.5	9.0	31.1	33.6	104.9
Malaria	0.0	0.2	0.3	2.2	7.4	109.3	0.1	0.3	10.0	13.8	58.0
Lower respiratory infections	26.6	29.6	26.0	83.4	79.8	192.2	31.1	30.0	60.5	64.9	155.9
Maternal conditions	0.4	1.9	1.0	10.1	11.7	35.1	0.2	1.9	7.5	8.2	26.3
Sum of 6 death rates	43.6	53.3	53.7	179.9	175.5	751.7	36.6	96.8	149.7	175.1	510.0

DALYs shares. Estimated share of total DALYs lost (%), by cause, 2004

	Europe	The Americas	Western Pacific	South-East Asia	Eastern Mediterranean	Africa	High-income economies	Upper-middle income economies	Lower-middle income economies	World	Low-income economies
Malaria	0.0%	0.1%	0.1%	0.3%	1.0%	8.2%	0.0%	0.1%	1.6%	2.2%	5.6%
Tuberculosis	1.1%	0.6%	2.1%	2.8%	1.9%	2.9%	0.2%	1.6%	2.5%	2.2%	2.8%
Maternal conditions	0.6%	1.6%	1.1%	2.9%	3.6%	4.0%	0.5%	1.3%	2.5%	2.6%	4.1%
HIV/AIDS	0.8%	1.5%	0.5%	1.4%	0.6%	12.4%	0.5%	6.0%	1.9%	3.8%	8.3%
Diarrheal diseases	0.9%	1.8%	2.0%	5.2%	5.9%	8.6%	0.4%	1.6%	4.6%	4.8%	8.4%
Lower respiratory infections	1.7%	2.5%	2.1%	6.4%	8.5%	11.2%	1.0%	2.4%	5.7%	6.2%	11.2%
Sum of all 6 DALY shares	5.1%	8.1%	7.9%	19.0%	21.5%	47.2%	2.6%	13.0%	18.7%	21.9%	40.4%

DALY rates. Estimated DALYs lost per 100,000 population, by cause, 2004

	Europe	The Americas	Western Pacific	South-East Asia	Eastern Mediterranean	Africa	High-income economies	Upper-middle income economies	Lower-middle income economies	World	Low-income economies
Malaria	0	10	10	80	272	4,193	4	15	376	528	2,242
Tuberculosis	196	102	324	741	523	1,468	19	330	575	532	1,140
HIV/AIDS	134	246	84	365	177	6,326	65	1,218	452	910	3,347
Maternal conditions	98	258	167	771	978	2,021	68	274	581	605	1,637
Diarrheal diseases	158	295	301	1,375	1,606	4,366	46	323	1,071	1,130	3,402
Lower respiratory infections	296	414	323	1,694	2,321	5,722	128	477	1,333	1,469	4,516
Sum of all 6 DALY rates	882	1,324	1,208	5,026	5,877	24,096	330	2,637	4,388	5,174	16,284

Source: Goldman Sachs Research, World Health Organization.

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