

MORTALITY AND THE GLOBAL BURDEN OF DISEASE

Refining metrics is an important task for global health: only recently have there been solid assessments of the global burden of disease. The first study to look seriously at this issue, conducted in 1990, laid the foundation for the first report on *Disease Control Priorities in Developing Countries* and for the World Bank's 1993 World Development Report *Investing in Health*. Those efforts represented a major advance in the understanding of health status in developing countries. *Investing in Health* has been especially influential: it familiarized a broad audience with cost-effectiveness analysis for specific health interventions and with the notion of disability-adjusted life years (DALYs). The DALY, which has become a standard measure of the impact of a specific health condition on a population, combines absolute years of life lost and years lost due to disability for incident cases of a condition. (See Fig. 2-1 and Table 2-1 for an analysis of the global disease burden by DALYs.)

In 2012, the IHME and partner institutions began publishing results from the Global Burden of Diseases, Injuries, and Risk Factors Study 2010 (GBD 2010). GBD 2010 is the most comprehensive effort to date to produce longitudinal, globally complete, and comparable estimates of the burden of diseases, injuries, and risk factors. This report reflects the expansion of the available data on health in the poorest countries and of the capacity to quantify the impact of specific conditions on a population. It measures current levels and recent trends in all major diseases, injuries, and risk factors among 21 regions and for 20 age groups and both sexes. The GBD 2010 team revised and improved the health-state severity weight system, collated published data, and used household surveys to enhance the breadth and accuracy of disease burden data. As analytic methods and data quality improve, important trends can be identified in a comparison of global disease burden estimates from 1990 to 2010.

GLOBAL MORTALITY

Of the 52.8 million deaths worldwide in 2010, 24.6% (13 million) were due to communicable diseases, maternal and perinatal conditions, and nutritional deficiencies—a marked decrease compared with figures for 1990, when these conditions accounted for 34% of global mortality. Among the fraction of all deaths related to communicable diseases, maternal and perinatal conditions, and nutritional deficiencies, 76% occurred in sub-Saharan Africa and southern Asia. While the proportion of deaths due to these conditions has decreased significantly in the past decade, there has been a dramatic rise in the number of deaths from NCDs, which constituted the top five causes of death in 2010. The leading cause of death among adults in 2010 was ischemic heart disease, accounting for 7.3 million deaths (13.8% of total deaths) worldwide. In high-income countries ischemic heart disease accounted for 17.9% of total deaths, and in developing (low- and middle-income) countries it accounted for 10.1%. It is noteworthy that ischemic heart disease was responsible for just 2.6% of total deaths in sub-Saharan Africa (Table 2-2). In second place—causing 11.1% of global mortality—was cerebrovascular disease, which accounted for 9.9% of deaths in high-income countries, 10.5% in developing countries, and 4.0% in sub-Saharan Africa. Although the third leading cause of death in high-income countries was lung cancer (accounting for 5.6% of all deaths), this condition did not figure among the top 10 causes in low- and middle-income countries. Among the 10 leading causes of death in sub-Saharan Africa, 6 were infectious diseases, with malaria and HIV/AIDS ranking as the dominant contributors to disease burden. In high-income countries, however, only one infectious disease—lower respiratory infection—ranked among the top 10 causes of death.

The GBD 2010 found that the worldwide mortality figure among children <5 years of age dropped from 16.39 million in 1970 to 11.9 million in 1990 and to 6.8 million in 2010—a decrease that surpassed predictions. Of childhood deaths in 2010, 3.1 million (40%) occurred in the neonatal period. About one-third of deaths among children <5 years old occurred in southern Asia and almost one-half in sub-Saharan Africa; <1% occurred in high-income countries.

The global burden of death due to HIV/AIDS and malaria was on an upward slope until 2004; significant improvements have since been documented. Global deaths from HIV infection fell from 1.7 million

in 2006 to 1.5 million in 2010, while malaria deaths dropped from 1.2 million to 0.98 million over the same period. Despite these improvements, malaria and HIV/AIDS continue to be major burdens in particular regions, with global implications. Although it has a minor impact on mortality outside sub-Saharan Africa and Southeast Asia, malaria is the eleventh leading cause of death worldwide. HIV infection ranked thirty-third in global DALYs in 1990 but was the fifth leading cause of disease burden in 2010, with sub-Saharan Africa bearing the vast majority of this burden (Fig. 2-1).

The world's population is living longer: global life expectancy has increased significantly over the past 40 years from 58.8 years in 1970 to 70.4 years in 2010. This demographic change, accompanied by the fact that the prevalence of NCDs increases with age, is dramatically shifting the burden of disease toward NCDs, which have surpassed communicable, maternal, nutritional, and neonatal causes. By 2010, 65.5% of total deaths at all ages and 54% of all DALYs were due to NCDs. Increasingly, the global burden of disease comprises conditions and injuries that cause disability rather than death.

Worldwide, although both life expectancy and years of life lived in good health have risen, years of life lived with disability have also increased. Despite the higher prevalence of diseases common in older populations (e.g., dementia and musculoskeletal disease) in developed and high-income countries, best estimates from 2010 reveal that disability resulting from cardiovascular diseases, chronic respiratory diseases, and the long-term impact of communicable diseases was greater in low- and middle-income countries. In most developing countries, people lived shorter lives and experienced disability and poor health for a greater proportion of their lives. Indeed, 50% of the global burden of disease occurred in southern Asia and sub-Saharan Africa, which together account for only 35% of the world's population.

HEALTH AND WEALTH

Clear disparities in burden of disease (both communicable and noncommunicable) across country income levels are strong indicators that poverty and health are inherently linked. Poverty remains one of the most important root causes of poor health worldwide, and the global burden of poverty continues to be high. Among the 6.7 billion people alive in 2008, 19% (1.29 billion) lived on less than \$1.25 a day—one standard measurement of extreme poverty—and another 1.18 billion lived on \$1.25 to \$2 a day. Approximately 600 million children—more than 30% of those in low-income countries—lived in extreme poverty in 2005. Comparison of national health indicators with gross domestic product per capita among nations shows a clear relationship between higher gross domestic product and better health, with only a few outliers. Numerous studies have also documented the link between poverty and health within nations as well as across them.

RISK FACTORS FOR DISEASE BURDEN

The GBD 2010 study found that the three leading risk factors for global disease burden in 2010 were (in order of frequency) high blood pressure, tobacco smoking (including secondhand smoke), and alcohol use—a substantial change from 1990, when childhood undernutrition was ranked first. Though ranking eighth in 2010, childhood undernutrition remains the leading risk factor for death worldwide among children <5 years of age. In an era that has seen obesity become a major health concern in many developed countries—and the sixth leading risk factor worldwide—the persistence of undernutrition is surely cause for great consternation. Low body weight is still the dominant risk factor for disease burden in sub-Saharan Africa. Inability to feed the hungry reflects many years of failed development projects and must be addressed as a problem of the highest priority. Indeed, no health care initiative, however generously funded, will be effective without adequate nutrition.

In a 2006 publication that examined how specific diseases and injuries are affected by environmental risk, the WHO estimated that roughly one-quarter of the total global burden of disease, one-third of the global disease burden among children, and 23% of all deaths were due to modifiable environmental factors. Many of these factors lead to deaths from infectious diseases; others lead to deaths