Data for better health—and to help end poverty

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The World Bank Group welcomes the publication of the new Global Burden of Disease Study (GBD). The Bank commissioned the first GBD in 1990, and continues to make extensive use of this signal contribution to global health. Like its predecessors, the new, methodologically updated GBD 2010 marks a milestone in global health knowledge and our capacity for evidence-based action. It will once again set the terms of health policy, planning, and funding discussions for years to come.

The GBD gives us a data-rich framework for comparing the importance of different diseases, injuries, and risk factors in causing premature death and disability within and across populations. Its value lies not only in the data but the critical discussions it makes possible. Specifically, the GBD has sharpened thinking on issues as diverse as the measurement of comorbidities; the role of culture in mediating the experience of disease; the meaning of disability; and the impact of poverty on health. The GBD challenges us to be rigorous and clear in our arguments about the criteria that should guide programming and investment decisions at country, regional, and global levels.

GBD 2010 shows the remarkable health achievements of the past two decades, as well as the continuing, and emerging, challenges that require action. Life expectancy is rising, and the prevalence of many communicable diseases, including HIV/AIDS, is dropping. Yet in some parts of the world, preventable illnesses, such as diarrhoea, remain stubborn causes of death in childhood. We must confront the growing burden of non-communicable diseases, and the fundamental shift from premature death towards increasing years lived with chronic illnesses and debilitating conditions.

To respond effectively to these challenges, national and local health systems must be strengthened, even transformed, and policy and funding decisions across the development spectrum must be reassessed—from safety nets to urban planning. GBD 2010 is an indispensable resource for public health and development leaders to ensure that their investments yield the greatest possible health benefits, and to help end poverty and boost prosperity. The remarkable body of evidence and analysis in GBD 2010 will help us foster the conversations that are needed across the whole of government, not just in ministries of health, to fulfil this responsibility.

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GBD 2010: a multi-investigator collaboration for global comparative descriptive epidemiology

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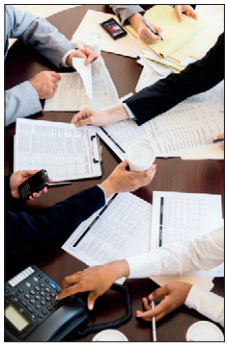
The data, methods, and findings of the Global Burden of Disease Study 2010 (GBD 2010) are described in detail in *The Lancet*. This large collaboration is an evolution of a body of work that began with GBD 1990.[1] The number of diseases, injuries, and risk factors evaluated and the geographical units of analysis have greatly expanded in the past 20 years, and change over time has been assessed. Nevertheless, GBD 2010 follows the basic principles of GBD 1990: trying to use all the relevant published and unpublished evidence; capturing fatal and non-fatal health outcomes with comparable metrics; and separating epidemiological assessment from advocacy concerns or entanglement of agendas.[2] At the time of GBD 1990, the sum of cause-specific deaths presented by different disease groups substantially exceeded the number of deaths in the world, thereby highlighting the importance of firewalling epidemiological assessment from programmatic advocacy and of overcoming the differences in epidemiological traditions for individual diseases and risk factors.

In a 5-year study, the goal of GBD 2010 was to provide the strongest evidence-based assessment of people's health problems around the world. We sought to achieve this by incorporating expert knowledge through the engagement of the global health scientific community, collating the world's data on health outcomes,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substantially strengthening analytical methods, and ensuring comparability across diseases, injuries, and risk factors. The study was organised around four broad components with different functions: expert groups on diseases, injuries, and risk factors; new data collection for disability weights and methods development; a strong analytical core; and the governance of the study.

The first component, expert groups, developed from an open call for participation in *The Lancet* in 2007;[3] experts were selected from the individuals who expressed interest and also through additional recruitment of leading experts. Most of the experts contributed their time and good will with minimal resources. Experts wrote lay descriptions for health states, led or contributed substantially to the review and selection of relevant data sources, provided input on epidemiological models for diseases, injuries, or risk factors, reviewed and reacted iteratively to the estimates of burden by diseases, injuries, and risk factors, and helped guide the interpretation of results in light of broader epidemiological evidence.

Rising expectations for statistical rigour and the need to estimate all quantities of interest with uncertainty led to an ambitious programme of new methods development. Innovations include new methods for analysing mortality data on child and adult survival,[4-6] new model life tables,[7] new methods for data synthesis,[8] new and more detailed methods for analysing garbage coding in causes of death,[9] the Cause of Death Ensemble model (CODEm),[10] the Codcorrect algorithm,[11] the development of a dedicated Bayesian meta-regression framework for disease and risk factor prevalence (DisMod-MR),[12] new methods for collecting and analysing data on assessments of disability, the comorbidity microsimulation environment,[12] new methods for estimating risk factor trends,[13,14] and the extensive computational machinery required to propagate uncertainty from all sources into the final estimates. Field data collection in five countries and an internet survey was also part of this component to provide a strong empirical basis for the new disability weights.

To ensure comparability, a strong analytical core of researchers were used to estimate causes of death, disease incidence and prevalence, risk factor exposure and attributable-burden, and healthy life expectancy.

GBD 2010 was governed by a core team whose charge included guiding the overall study, making decisions when consensus could not be achieved with the relevant expert groups, and approving all final estimates. This role for the core team was defined in the original study protocol given the likelihood that in such a large, complex scientific undertaking there would be topics on which consensus could not be reached.

No results were final until the very end of the study, because of the interconnections between components, such as all-cause mortality, cause-specific mortality, and disease or injury models. Although these interconnections made the work of expert groups and the analytical core more complex and iterative, they are also an important strength for the GBD approach. Evidence on a particular disease or injury is cross-validated against evidence on all-cause mortality with many safeguards built into the estimation process. In GBD 2010, these efforts at cross-validation have been extended to include a range of disabilities, such as vision loss, hearing loss, or anaemia.

For the comparative risk assessment, there are fewer internal validity checks since each risk factor or cluster of risk factors is evaluated on its own; multicausality means the same outcome can be related to multiple risks. To promote comparability and rigour, clear inclusion criteria were developed and applied by the core team, in consultation with epidemiological experts, to proposals on which risk-outcome pairs should be included in the study. The absence of public health or medical interventions such as vaccination or contraception was not considered a risk factor, although these should be included in intervention modelling studies. Other risk factors, such as total caloric intake, vitamin D and folate deficiencies, unsafe sexual behaviours, and personal hygiene could not be assessed because of the extreme lack of data on exposure.

In some cases, there was vigorous debate between the GBD core team and an expert group, and even within the GBD core team or within expert groups themselves, on inclusion or estimation: the potential for residual confounding of dietary risks, air pollution effects in smokers versus non-smokers, the effects of ambient air pollution on birth outcomes, maternal vitamin A deficiency on neonatal mortality, alcohol on tuberculosis, or intimate partner violence on HIV incidence. In each case, after lengthy and vigorous exchanges with the relevant experts, and when possible external experts, the core team—following the GBD protocol—convened and decided on whether the standard of evidence set

for the study had been met. Other groups of scientists might have used a lower bar for evidence or might have made different interpretations and choices on the basis of their knowledge of specific studies or even disciplinary background; nevertheless, a consistent approach was applied across risks in GBD 2010.

The innovations that were essential to modernise GBD methods and provide uncertainty intervals for all quantities of interest also created managerial challenges for the completion of the study. Experts involved in the collaboration were understanding about delays in key components, such as mortality or causes of death or of processing large amounts of disease and risk factor specific data that at times arrived simultaneously. To ensure a standardised approach to expert group consultation, from January, 2012 to June, 2012, every expert group was sent a detailed written report and set of global and regional tables on the results of the analysis for a disease, injury, or risk factor. These expert group reports were the basis of a final round of discussions and iterative corrections, as much as possible within the realm of a study with finite, although extended, time. At the end of GBD 2010, the final papers collectively have 486 authors from 302 institutions in 50 countries who have reviewed the final articles. In some cases, experts chose not be authors, possibly because their scientific interpretation of the evidence differed from the judgment of the GBD core team. This is reasonable and to be expected. Irrespective of the disagreements, these experts' inputs and views contributed to the GBD study and strengthened its findings. When evidence is strong, consensus is usually easy to obtain. When data are limited and there are only one or two studies available on a topic, reasonable scientists will disagree. Inclusion of uncertainty intervals in GBD 2010 conveys to users the limitations of the analysis. However, some choices are not reflected in the uncertainty intervals, such as which disease sequelae or risk-outcome pairs are included in the study or the absence of studies that measure the hazards of a risk factor, such as dietary salt intake or unimproved water, through the full exposure range. To the extent possible, these limitations are qualitatively discussed in the accompanying articles.

Future studies and data will strengthen the evidence, help overcome these limitations, reduce uncertainties, and confirm some of our results and revise others. The key principle is to synthesise and reflect the current state of the evidence using a set of clearly defined criteria and analytical methods; this is what the GBD 2010 collaboration has taken a major step towards. We do not expect that our processes, or the scientific basis that motivates them, will be universally acceptable: vast uncertainty, as we have quantified for some parameters and outcomes, ought to foster legitimate scientific discourse and debate. We welcome this response, which can only strengthen the evidence base and methodological armamentarium for future efforts to measure disease burden. Meanwhile, we believe that our rigorous adherence to established scientific principles and criteria will encourage greater confidence in the comparability of the results of GBD 2010, and thereby greater use of them.

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We are all members of the GBD 2010 core team. ME chaired a session and gave a talk at the World Cardiology Congress (WCC) with travel cost reimbursed by the World Heart Federation. At the WCC, he also gave a talk at a session organised by PepsiCo with no financial or other remuneration. The other authors declare that they have no conflicts of interest.

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AIDS is not over

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Optimism and momentum has been building around the real possibility that an AIDS-free generation is imminent. Public enthusiasm is fuelled by news about the rapid scale-up of antiretroviral therapy, evidence that HIV treatment can prevent new infections, and expanded coverage of programmes to prevent mother-to-child transmission of HIV. Yet, the most recent estimates of HIV prevalence and incidence and of AIDS-related mortality released by UNAIDS[1], together with data from the Global Burden of Disease Study 2010 in *The Lancet*,[2,3] make it clear that AIDS is not over.

The estimates from the Global Burden of Disease Study 2010 confirm that HIV/AIDS remained a leading cause of disease burden and death in 2010.[3] It was ranked 33rd in 1990, but its burden had moved up to fifth by 2004[4] and remained there in 2010, despite major declines in AIDS-related mortality as a result of fewer new infections and the increased availability of antiretroviral therapy, care, and support. Looking at the most common causes of death globally, HIV/AIDS ranked sixth in 2004[4] and held the same position in 2010.[2] The Global Burden of Disease Study 2010 estimates 1·5 million AIDS-related deaths in 2010,[2] whereas UNAIDS data show 1·8 (range 1·6–2·0) million AIDS-related deaths.[1] Both estimates highlight a persistent, significant, and egregious burden of avoidable death.

Worldwide AIDS-related deaths increased dramatically during the late 1980s and peaked in 2005–06, followed by a steep decline to 2010–11. Yet, despite substantial reductions in AIDS mortality rates in many countries, AIDS remains the leading cause of death in southern and eastern Africa, and ranks number three in eastern Europe.[2] Furthermore, AIDS continues to affect young people disproportionately. In 2010, AIDS was the leading cause of death in women aged 15–49 years (14·4%) and the second most common cause of death for men aged 15–49 years (10·7%).[2]

UNAIDS estimated that 34 (range 31·4–35·9) million people lived with HIV in 2011,[1] with substantial geographical variations. Adult prevalence remains highest in sub-Saharan Africa at 4·9% (range 4·6–5·1%).[1]The good news is that since 2001, annual HIV incidence has fallen in 38 countries, most of them in sub-Saharan Africa. However, new infections are on the rise in some countries in eastern Europe, central Asia, the Middle East, and north Africa. It is a cause for concern that 2·5 (range 2·2-2·8) million people were newly infected with HIV in 2011.[1]

One of the great global health achievements of the past decade has been the scale-up of HIV treatment. In 2011, more than 8 million people living with HIV in low-income and middle-income countries received antiretroviral treatment.[1] Largely because of this unprecedented scale-up, supplemented by expanded HIV prevention services, the numbers of AIDS-related deaths and incidence rates worldwide have steadily decreased.[1]

To consolidate and intensify the accomplishments of the past decade, and to save millions of lives now in jeopardy, we must confront four realities. First, it will be impossible to sustain current efforts to tackle HIV and AIDS with current levels of funding. In 2015, when resource needs are expected to peak, an estimated US$22–24 billion per year will be needed,[5] but international AIDS funding has been stagnant since 2009 at about $8·2 billion per year. Many countries have increased their domestic funding for HIV, notably Benin, China, and South Africa, and they are to be supported and further encouraged. However, global solidarity remains essential to sustain HIV efforts in many of the poorest and most affected African countries. Moreover, international resources are critical to support programmes for marginalised populations in many countries. As treatment is scaled up, disability-adjusted