Global Burden of Disease and Risk Factors

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1 2 3 4 09 08 07 06

A copublication of The World Bank and Oxford University Press.

Oxford University Press
165 Madison Avenue
New York NY 10016

This volume was funded in part by a grant from the Bill & Melinda Gates Foundation and is a product of the staff of the International Bank for Reconstruction and Development / The World Bank, the World Health Organization, and the Fogarty International Center of the National Institutes of Health. The findings, interpretations, and conclusions expressed in this volume do not necessarily reflect the views of the executive directors of The World Bank or the governments they represent, the World Health Organization, or the Fogarty International Center of the National Institutes of Health.

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ISBN-10: 0-8213-6262-3
ISBN-13: 978-0-8213-6262-4
eISBN: 0-8213-6263-1
DOI: 10.1596/978-0-8213-6262-4

Library of Congress Cataloguing-in-Publication Data has been applied for.

This book is dedicated to the memory of Sir Richard Doll, Fellow of the Royal Society (born Hampton, United Kingdom, October 28, 1912; died Oxford, United Kingdom, July 24, 2005). It is entirely fitting that an assessment of world health at the end of the 20th century should be dedicated to the memory of a man whose work did so much to improve it.

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Foreword

"Every observer of human misery among the poor reports that disease plays the leading role." Irving Fisher (1909, p. 124)[1]

Before 1990, the global disease landscape was perceived "through a glass darkly." Mortality conditions by cause of death were known with some precision only for the relatively small minority of the world's population residing in countries with adequate vital statistics. Nowhere were estimates of disease incidence, prevalence, survival, and disabling sequelae consistently combined into population-level profiles of morbidity and mortality.

Publication of the *Global Burden of Disease* (1990) was a watershed event in the assessment of health and disease. Through careful synthesis of disease conditions revealed in thousands of piecemeal studies and data systems, it constructed a comprehensive portrait of diseases, injuries, and causes of death. It dealt creatively and carefully with the hundreds of issues that had to be addressed to develop useful, broadly gauged indicators of health. These included establishing terms of trade among disabling conditions, among age groups and generations, and between the living and the dead. At all points that offered tempting shortcuts, the authors decided in favor of comprehensiveness.

Like the microscope, the *Global Burden of Disease* (1990) brought diseases into much sharper focus. Like national income accounts, it connected parts to a whole and measured the whole with unprecedented precision. As a sophisticated measuring device, it could not be ignored by any serious student of epidemiology or development. One might have experimented with its calibrations, but the device itself was irreplaceable.

However, the value of a measuring device lies in its measurements, not in its abstract qualities on the shelf. The world has changed dramatically since 1990, and we must be grateful for the fresh assessment of disease conditions presented in this volume. The picture that it paints is not only updated; it is also more precise. Better data have become available through expanded vital statistics systems, improved surveys, and more extensive population surveillance systems. The measurement instrument has also been improved. Most notably, a critical new layer of physical risk factors and their distribution has been added, providing valuable new tools for policy makers.

This second application of the global burden of disease framework permits an analysis of trends observed since the first application. The intervening period was clearly one of slow progress, impeded by the HIV/AIDS epidemic and setbacks in Eastern Europe. The volume is appropriately cautious in drawing inferences about disease-specific trends because of changes in data sources and, in some instances, improvements in approaches to measurement.

The volume also contains a valuable and admirably frank chapter on the sensitivity of estimates to various sources of uncertainty in methods and data. Some estimates are found to have wide bands of uncertainty. While this outcome is disappointing, uncertainty about the burden of disease in all its dimensions—including the degree of uncertainty itself—would be much greater without the heroic efforts reflected in this volume.

My congratulations to the authors and the sponsoring agencies.

Samuel H. Preston, *Fredrick J. Warren Professor of Demography, University of Pennsylvania*

[1]Irving Fisher. 1909. *Report on National Vitality, Its Wastes and Conservation.* Prepared for the National Conservation Commission. Washington, DC: Government Printing Office.

Preface

This book emerges from two separate, but intersecting, strands of work that began in the late 1980s, when the World Bank initiated a review of priorities for the control of specific diseases. The review generated findings about the comparative cost-effectiveness of interventions for most diseases important in developing countries. The purpose of the cost-effectiveness analysis (CEA) was to inform decision making within the health sectors of highly resource-constrained countries. This process resulted in the publication of the first edition of *Disease Control Priorities in Developing Countries* (Jamison and others 1993). Also important for informing policy is a consistent, quantitative assessment of the relative magnitudes of diseases, injuries, and their risk factors. The first edition of *Disease Control Priorities in Developing Countries* included an initial assessment of health status for low- and middle-income countries as measured by deaths from specific causes; importantly, the numbers of cause-specific deaths for each age-sex group were constrained by the total number of deaths as estimated by demographers. This consistency constraint led to downward revision of the estimates of deaths from many diseases.

These two strands of work—CEA and burden of disease—were further developed during preparation of the *World Development Report 1993: Investing in Health* (World Bank 1993). This report drew on both the CEA work in the first edition of *Disease Control Priorities in Developing Countries* and on a growing academic literature on CEA. In addition, the World Bank invested in generating improved estimates of deaths and the disease burden by age, cause, and region for 1990. Results of this initial assessment of the global burden of disease appeared both in the *World Development Report 1993* and widely in the academic literature (see, for example, Murray and Lopez 1996a, 1996b; Murray, Lopez, and Jamison 1994). Over the past six years, the World Health Organization has undertaken a new assessment of the global burden of disease for 2000–2, with consecutive revisions and updates published annually in its *World Health Reports*. The World Health Organization has also invested in improving the conceptual, methodological, and empirical basis of burden of disease assessments and the assessment of the disease and injury burden from major risk factors (Ezzati and others 2004; Murray and others 2002; World Health Organization 2002).

In 2002, a number of organizations—the Fogarty International Center of the U.S. National Institutes of Health, the World Bank, the World Health Organization, and the Bill & Melinda Gates Foundation—initiated the Disease Control Priorities Project (DCPP), located at the Fogarty International Center. The DCPP's purpose has been to review, generate, and disseminate information that contributes to the scientific evidence base for improving population health in developing countries. A major product is the second edition of *Disease Control Priorities in Developing Countries* (*DCP2*) (Jamison and others 2006), which updates and extends available CEA relevant to developing countries and explores the institutional, organizational, financial, and research capabilities essential for health systems to be able to select and deliver the appropriate interventions.

DCP2 was to have included two major chapters on burden, one dealing with deaths and the disease burden by cause and the other with the burden from major risk factors. Two points quickly became clear. First, even though *DCP2* had allocated substantial space for these chapters, much valuable background, methodology, and results still had to be relegated to a separate document on the Web. Second, this material would generate substantial interest independently of its tie to *DCP2*, because health system activities, including the choice of interventions, depend partly on the magnitude of health problems, and because assessment of the burden of diseases, injuries, and risk factors includes important methodological and empirical dimensions. The sponsors of the DCPP therefore decided to publish this volume, which includes a full account of methods, the complete results of recent work, and an assessment of trends for total mortality and for major causes of death among children under five along with two chapters that cover sensitivity and uncertainty analyses in relation to a broad range of potentially important parameters.

During 1999–2004, the authors of this volume and many collaborators from around the world worked intensively to assemble an updated, comprehensive assessment of the global

burden of disease and its causes. This book provides the definitive, scientific account of that effort and of the health conditions of the world's population at the beginning of the 21st century.

Both *DCP2* and this book are available on the DCPP Web site (http://www.dcp2.org), as well as through the National Library of Medicine's PubMedCentral. From the DCPP Web site, users can download individual chapters or create an ad hoc group of chapters formatted for printing booklets or course packets. We encourage users to construct variants of the book most suited to their work or their teaching. The DCPP Web site also allows access to Excel versions of all global burden of disease tables so that users can freely reanalyze the data to meet their own needs.

REFERENCES

Ezzati, M., A. D. Lopez, A. Rodgers, and C. J. L. Murray. 2004. *Comparative Quantification of Health Risks: The Global and Regional Burden of Disease Attributable to Selected Major Risk Factors.* Geneva: World Health Organization.

Jamison, D. T., J. G. Breman, A. R. Measham, G. Alleyne, M. Claeson, D. B. Evans, P. Jha, A. Mills, and P. Musgrove, eds. 2006. *Disease Control Priorities in Developing Countries*, 2nd ed. New York: Oxford University Press.

Jamison, D. T., W. H. Mosley, A. R. Measham and J. L. Bobadilla, eds. 1993. *Disease Control Priorities in Developing Countries.* New York: Oxford University Press.

Murray, C. J. L,. and A. D. Lopez, eds. 1996a. *The Global Burden of Disease.* Cambridge, MA: Harvard University Press.

———. 1996b. *Global Health Statistics: A Compendium of Incidence. Prevalence, and Mortality Estimates for over 200 Conditions* Cambridge, MA: Harvard University Press.

Murray, C. J. L., A. D. Lopez, and D. T. Jamison. 1994. The Global Burden of Disease in 1990: Summary Results, Sensitivity Analysis, and Future Directions." In *Global Comparative Assessments in the Health Sector: Disease Burden, Expenditures, and Intervention Packages*, eds. C. J. L. Murray and A. D. Lopez, 97–138. Geneva: World Health Organization.

Murray, C. J. L, J. A. Salomon, C. D. Mathers, and A. D. Lopez. 2002. *Summary Measures of Population Health: Concepts, Ethics, Measurement, and Applications.* Geneva: World Health Organization.

World Bank. 1993. *World Development Report 1993: Investing in Health.* New York: Oxford University Press.

World Health Organization. 2002. *Reducing Risks: Promoting Healthy Life. World Health Report 2002.* Geneva: World Health Organization.

Editors

Alan D. Lopez is professor of medical statistics and population health and Head of the School of Population Health at the University of Queensland, Australia. Prior to joining the university in January 2003, he worked for 22 years at the World Health Organization in Geneva, where he held a series of technical and senior managerial posts, including chief epidemiologist in the Tobacco Control Program (1992–5), manager of the Program on Substance Abuse (1996–8), director of the Epidemiology and Burden of Disease Unit (1999–2001), and senior science adviser to the director-general (2002).

Professor Lopez has published widely on mortality analysis and causes of death, including the impact of the global tobacco epidemic, and on the global descriptive epidemiology of major diseases, injuries, and risk factors. He is the coauthor of the seminal *Global Burden of Disease Study* (1996), which has greatly influenced debates about priority setting and resource allocation in health. He has been awarded major research grants in epidemiology, health services research, and population health; chairs the Health and Medical Research Council of Queensland; and is a member of Australia's Medical Services Advisory Committee.

Professor Lopez graduated with an honors degree in mathematics from the University of Western Australia in 1973 and a master of science degree in statistics from Purdue University in the United States. He was awarded a Ph.D. in medical demography from the Australian National University in 1979. His principal research interests are analysis of mortality data; burden of disease methods and applications; and quantification of the health effects of tobacco, particularly in developing countries. He has collaborated extensively with leading researchers throughout the world on these issues, particularly at Harvard and Oxford universities, and he holds an adjunct appointment at Harvard University as professor of population and international health.

Colin D. Mathers is a senior scientist in the Evidence and Information for Policy Cluster at the World Health Organization in Geneva. From 2002 to 2005, he managed the World Health Organization's Epidemiology and Burden of Disease Unit. Prior to joining the World Health Organization in 2000, he worked for the Australian Institute of Health and Welfare for 13 years in technical and senior managerial posts.

Dr. Mathers has published widely on population health and mortality analysis; on inequalities in health, health expectancies, and burden of disease; and on health system costs and performance. He developed the first set of Australian health accounts mapping health expenditures by age, sex, and disease and injury causes (1998) and carried out an influential national burden of disease and risk factors study (1999). At the World Health Organization, he played a key role in the development of comparable estimates of healthy life expectancy for 192 countries, in the reassessment of the global burden of disease for the years 2000–2, and in the development of software tools to support burden of disease analysis at the country level. He recently completed new projections of global, regional, and country mortality and burden of disease from 2002 to 2030.

Dr. Mathers graduated with an honors degree and university medal in physics from the University of Sydney in 1975 and was awarded a Ph.D. in theoretical physics from the University of Sydney in 1979. His principal research interests are the measurement and reporting of population health and its determinants, burden of disease methods and applications, measurement of health state prevalences, and cross-population comparability. He has collaborated with leading researchers throughout the world on issues relating to the development and applications of summary measures of population health.

Majid Ezzati is an assistant professor of international health at the Harvard School of Public Health. He holds bachelor's and master's degrees in engineering from McMaster and McGill Universities and a Ph.D. in science, technology, and environmental policy from Princeton University. Dr. Ezzati's research interests center around understanding the causal determinants of health and disease, especially as they change in the process of social and economic development and as a result of technological innovation and technology management.

His current research focuses on two main areas. The first area is the relationship among energy, air pollution, and health in developing countries, on which he conducts field research projects in Asia and sub-Saharan Africa. This research has led to the identification and design of technological interventions for reducing exposure to indoor air pollution from household energy use. His second area of research is major health risk factors and their role in the current and future disease burden globally and in specific countries and regions. His research on risk factors focuses on environmental risks, smoking, and nutritional risks. He was the lead scientist for the World Health Organization's Comparative Risk Assessment Project, which was reported in the *World Health Report 2002: Reducing Health, Promoting Healthy Life*. He is currently studying the role of major risk factors in health inequalities.

Dean T. Jamison is a professor of health economics in the School of Medicine at the University of California, San Francisco (UCSF), and an affiliate of UCSF Global Health Sciences. Dr. Jamison concurrently serves as an Adjunct Professor in both the Peking University Guanghua School of Management and in the University of Queensland School of Population Health.

Before joining UCSF, Dr. Jamison was on the faculty of the University of California, Los Angeles, and also spent a number of years at the World Bank, where he was a senior economist in the research department, division chief for education policy, and division chief for population, health, and nutrition. In 1992–93 he temporarily rejoined the World Bank to serve as Director of the World Development Report Office and as lead author for the Bank's 1993 *World Development Report: Investing in Health*.

His publications are in the areas of economic theory, public health and education. Dr. Jamison studied at Stanford (B.A., Philosophy; M.S., Engineering Sciences) and at Harvard (Ph.D., Economics, under K.J. Arrow). In 1994 he was elected to membership in the Institute of Medicine of the U.S. National Academy of Sciences.

Christopher J. L. Murray is the Richard Saltonstall professor of public policy, professor of social medicine, and director of the Harvard Initiative for Global Health. Prior to his return to the university, for five years he led the World Health Organization's Evidence and Information for Policy Cluster, which was dedicated to building the evidence base and fostering a culture of evidence to inform health decision making. The cluster was responsible for work on epidemiology and the burden of disease, the World Health Survey, cost-effectiveness analysis, national health accounts, catastrophic health spending, responsiveness, health financing policy, human resources for health systems, coverage of health interventions, quality of care and patient safety, stewardship of health systems, assessment of health system performance, health research policy, and a range of efforts to manage and disseminate information through print and the Web.

A physician and health economist, Dr. Murray's early work focused on tuberculosis control and the development with Alan D. Lopez of global burden of disease methods and applications. During the course of this work, they developed a new metric for comparing deaths and disabilities caused by various diseases and the contribution of risk factors to the overall burden of disease in developing and developed countries. This pioneering effort has been hailed as a major landmark in public health and an important foundation for policy formulation and priority setting. Recently, Dr. Murray has contributed to the development of a range of new methods and empirical studies for strengthening the basis for population health measurement and cost-effectiveness analysis. A main thrust of his work has been the conceptualization, measurement, and application of approaches to understanding the inputs, organization, outputs, and outcomes of health systems. He has authored or edited eight books, many book chapters, and more than 90 journal articles in internationally peer-reviewed publications.

Dr. Murray holds a B.A. from Harvard College, a D. Phil. from Oxford University, and an M.D. from Harvard Medical School.

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The Disease Control Priorities Project is a joint enterprise of the Fogarty International Center of the National Institutes of Health, the World Health Organization, the World Bank, and the Population Reference Bureau.

The Fogarty International Center is the international component of the National Institutes of Health. It addresses global health challenges through innovative and collaborative research and training programs and supports and advances the mission of the National Institutes of Health through international partnerships.

The World Health Organization is the United Nations' specialized agency for health. Its objective, as set out in its constitution, is the attainment by all peoples of the highest possible level of health, with health defined as a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity.

The World Bank Group is one of the world's largest sources of development assistance. The Bank, which provides US$18 billion to $22 billion each year in loans to its client countries, provided $1.27 billion for health, nutrition, and population in 2004. The World Bank is working in more than 100 developing economies, bringing a mix of analytical work, policy dialogue, and lending to improve living standards—including health and education—and reduce poverty.

The Population Reference Bureau informs people around the world about health, population, and the environment and empowers them to use that information to advance the well-being of current and future generations. For 75 years, the bureau has analyzed complex data and research results to provide objective and timely information in a format easily understood by advocates, journalists, and decision makers; conducted workshops around the world to give key audiences the tools they need to understand and communicate effectively about relevant issues; and worked to ensure that developing country policy makers base policy decisions on sound evidence.

Acknowledgments

This volume brings together results of the work of many institutions and individuals spanning a period of more than 15 years. Several contributions to this process should be acknowledged. The Disease Control Priorities Project (DCPP) provided sponsorship for the specific work leading to this volume and for its publication. The DCPP itself resulted from collaboration among the following four institutions and benefited from the contributions of those institutions and the efforts of the responsible individuals within them:

- *The Fogarty International Center of the U.S. National Institutes of Health.* The FIC supported both the senior editor and one of the co-managing editors of this project, as well as support staff. FIC also provided office space for the secretariat and other administrative support. Gerald Keusch, former director of the FIC, initiated and facilitated this effort, and FIC's acting director, Sharon Hrynkow, continued to provide support and counsel.
- *The World Bank.* Successive directors of the World Bank's Health, Nutrition, and Population Department, Christopher Lovelace and Jacques Baudouy, provided support, guidance, and critical reactions and facilitated the involvement of Bank staff as coauthors and reviewers.
- *The World Health Organization.* Successive leaders of the Evidence and Information for Policy Cluster, Christopher Murray and Timothy Evans, coordinated the involvement of the World Health Organization. For much of the past eight years, the Evidence and Information for Policy Cluster has sponsored research and analysis central to this volume and we are particularly grateful for that support.
- *The Bill & Melinda Gates Foundation.* Richard Klausner, Sally Stansfield, and Beth Peterman arranged for the foundation to provide major financial support to the DCPP.

The DCPP was guided by a group of editors for its publication of the second edition of *Disease Control Priorities in Developing Countries.* The editors of this volume wish to thank the following for their inclusion of this book within the DCPP effort: George A. O. Alleyne, Joel G. Breman, Mariam Claeson, David B. Evans, Prabhat Jha, Anne Mills, Philip Musgrove, and, in particular, Anthony R. Measham.

We are grateful to the National Institute on Aging of the U.S. National Institutes of Health, which provided grant support for much of the research reported in this book under PO1–AG17625. Richard Suzman of the National Institute on Aging provided invaluable support and critical reactions.

We benefited from the strong collaboration with the InterAcademy Medical Panel (IAMP), an association of the medical academies or medical divisions of the scientific academies of 44 countries. David Challoner and Guy de Thé co-chaired the Steering Committee of the IAMP and invested much time and effort into facilitating the collaboration. The IAMP sponsored the peer review process for the chapters in this volume. The IAMP's second global meeting in Beijing in April 2006 included the launch of this volume, which was hosted by the Chinese Academies of Engineering and Science. The Institute of Medicine of the U.S. National Academy of Sciences, the U.S. member of the IAMP, played a critical role in facilitating all aspects of the IAMP's collaboration. Patrick Kelley and Dianne Stare of the Institute of Medicine managed this effort and provided critical, substantive inputs.

The Office of the Publisher at the World Bank provided outstanding assistance, enthusiastic advice, and support during every phase of production of this volume and helped coordinate publicity and initial distribution. We particularly wish to thank Dirk H. Koehler, the publisher, and Carlos Rossel, Mary Fisk, Randi Park, Santiago Pombo-Bejarano, Nancy Lammers, Alice Faintich, Nita Congress, Valentina Kalk, and Andres Meneses for their timely, high-quality professionalism.

Donald Lindberg, director, and Julia Royall, chief, International Programs, of the National Library of Medicine of the U.S. National Institutes of Health, graciously offered the competent services of the Information Engineering Branch of the National Center for Biotechnology Information to convert

the text into an electronic product available to all visitors to the National Library of Medicine's PubMed Web site. We would like to extend our gratitude to the National Center for Biotechnology Information team members—David Lipman, Jo McEntyre, Mohammad Al-Ubaydli, and Belinda Beck—for their technical expertise and commitment.

The Harvard Initiative for Global Health and the University of Queensland School of Population Health assisted with the production of chapters and hosted meetings in support of this effort, and we are grateful for their contributions and hospitality. We would like to thank Teri McGuane at Harvard University and Trish Sharkey and Kim Wicks at the University of Queensland for their valuable assistance.

Finally, we would like to acknowledge the critical role that Sonbol A. Shahid-Salles played in the creation of this book. She participated in all the meetings of the editors; she coordinated the peer review process, reacted critically to chapter content and presentation, and reviewed drafts and proofs; she interacted with the World Bank's Office of the Publisher on all aspects of production; and she kept the effort on its extremely tight time line in an environment where editors and authors were dispersed worldwide. The book simply could not have been completed without her efforts and we are very grateful indeed.

The Editors

Abbreviations and Acronyms

ALP	acquisition of life potential
CHERG	Child Health Epidemiology Reference Group
CRA	comparative risk assessment
CVD	cardiovascular disease
DALY	disability-adjusted life year
DCP2	*Disease Control Priorities in Developing Countries*, second edition
DCPP	Disease Control Priorities Project
GBD	global burden of disease
GDP	gross domestic product
HALE	health-adjusted life expectancy
ICD	international classification of diseases
IHD	ischemic heart disease
PAF	population attributable fraction
TB	tuberculosis
UN	United Nations
WHO	World Health Organization
YLD	years of life lost due to disability
YLL	years of life lost due to premature mortality

All dollar amounts are U.S. dollars unless otherwise indicated.