VOLUME 5

DISEASE CONTROL PRIORITIES • THIRD EDITION

Cardiovascular, Respiratory, and Related Disorders

DISEASE CONTROL PRIORITIES • THIRD EDITION

Series Editors

Dean T. Jamison
Rachel Nugent
Hellen Gelband
Susan Horton
Prabhat Jha
Ramanan Laxminarayan
Charles N. Mock

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DISEASE CONTROL PRIORITIES

Budgets constrain choices. Policy analysis helps decision makers achieve the greatest value from limited available resources. In 1993, the World Bank published *Disease Control Priorities in Developing Countries* (*DCP1*), an attempt to systematically assess the cost-effectiveness (value for money) of interventions that would address the major sources of disease burden in low- and middle-income countries. The World Bank's 1993 *World Development Report* on health drew heavily on *DCP1*'s findings to conclude that specific interventions against noncommunicable diseases were cost-effective, even in environments in which substantial burdens of infection and undernutrition persisted.

DCP2, published in 2006, updated and extended *DCP1* in several aspects, including explicit consideration of the implications for health systems of expanded intervention coverage. One way that health systems expand intervention coverage is through selected platforms that deliver interventions that require similar logistics but deliver interventions from different packages of conceptually related interventions, for example, against cardiovascular disease. Platforms often provide a more natural unit for investment than do individual interventions. Analysis of the costs of packages and platforms—and of the health improvements they can generate in given epidemiological environments—can help to guide health system investments and development.

DCP3 differs importantly from *DCP1* and *DCP2* by extending and consolidating the concepts of platforms and packages and by offering explicit consideration of the financial risk protection objective of health systems. In populations lacking access to health insurance or prepaid care, medical expenses that are high relative to income can be impoverishing. Where incomes are low, seemingly inexpensive medical procedures can have catastrophic financial effects. *DCP3* offers an approach to explicitly include financial protection as well as the distribution across income groups of financial and health outcomes resulting from policies (for example, public finance) to increase intervention uptake. The task in all of the *DCP* volumes has been to combine the available science about interventions implemented in very specific locales and under very specific conditions with informed judgment to reach reasonable conclusions about the impact of intervention mixes in diverse environments. *DCP3*'s broad aim is to delineate essential intervention packages and their related delivery platforms to assist decision makers in allocating often tightly constrained budgets so that health system objectives are maximally achieved.

DCP3's nine volumes are being published in 2015, 2016, 2017, and 2018 in an environment in which serious discussion continues about quantifying the sustainable development goal (SDG) for health. *DCP3*'s analyses are well-placed to assist in choosing the means to attain the health SDG and assessing the related costs. Only when these volumes, and the analytic efforts on which they are based, are completed will we be able to explore SDG-related and other broad policy conclusions and generalizations. The final *DCP3* volume will report those conclusions. Each individual volume will provide valuable, specific policy analyses on the full range of interventions, packages, and policies relevant to its health topic.

More than 500 individuals and multiple institutions have contributed to *DCP3*. We convey our acknowledgments elsewhere in this volume. Here we express our particular

gratitude to the Bill & Melinda Gates Foundation for its sustained financial support, to the InterAcademy Medical Panel (and its U.S. affiliate, the National Academy of Sciences, Engineering, and Medicine), and to World Bank Publications. Each played a critical role in this effort.

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EDITORS

Dorairaj Prabhakaran
Shuchi Anand
Thomas A. Gaziano
Jean-Claude Mbanya
Yangfeng Wu
Rachel Nugent

WORLD BANK GROUP

1818 H Street NW, Washington, DC 20433
Telephone: 202-473-1000; Internet: www.worldbank.org

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Foreword

As the world sets its sights on the avidly aspirational Sustainable Development Goals (SDGs) of 2030, the health goal to secure healthy lives for all and well-being at all ages is especially ambitious. The global health agenda of the Millennium Development Goals (MDGs) has been expanded in the SDGs to include noncommunicable diseases (NCDs)—the greatest public health threat of this century. Concerted action on many areas of health has now been positioned on the platform of universal health coverage (UHC) to ensure equitable and effective provision of essential health services.

In this context, cardiovascular diseases (CVDs) collectively pose the greatest challenge as well as the greatest opportunity to health systems across the world. The challenge arises from the fact that CVDs are the largest overall contributor to global mortality, as well as a major cause of premature mortality below the age of 70 years. The Indian experience, with which I am most familiar, has shown how the escalating epidemics of CVDs and other NCDs not only impose a high cost of healthy life-years lost; they also lead to unaffordable financial burdens on both families and health systems.

With coronary heart disease and stroke as the major manifestations, CVDs present a serious threat to health and development across the world. Low- and middle-income countries (LMICs) now not only join high-income countries (HICs) in suffering high proportional mortality from CVDs; these conditions also account for far higher absolute and premature mortality tolls of CVDs. Rising burdens of renal disease share major risk factors, especially high blood pressure and diabetes, with CVDs. Similarly, respiratory diseases share tobacco as a major risk factor for CVDs. Renal and respiratory diseases join CVDs in posing challenges of preventing, as well as providing appropriate acute and chronic care to health systems everywhere.

However, CVDs also offer a major opportunity to all countries—especially LMICs—to reduce the high burden of disease by averting premature mortality and reducing morbidity through interventions that have proven to be highly effective in preventing disease and death in the prime of productive mid-life. These range from policy instruments, like higher taxes on tobacco products, to health service improvements that expand and intensify the coverage of effective secondary prevention to persons who have survived a cardiovascular event but remain at risk of recurrence. Among the major NCDs, CVDs have the largest array of proven interventions that have demonstrated the benefit of substantial reductions in mortality and morbidity. If the goal of reducing premature mortality from NCDs by one-third between 2015 and 2030 is to be attained, the largest contribution has to come from interventions directed at CVDs, since such a high magnitude of benefit is presently demonstrated only for these interventions in the NCD spectrum.

When positioned in the context of UHC, interventions not only need to demonstrate efficacy but also cost-effectiveness and affordability for accommodation in national budgets—especially in the resource-constrained health systems of LMICs. Hence, economic evaluation has to complement biomedical, epidemiological, clinical, and health systems research to identify high-impact interventions that provide best value for money. This is particularly imperative in an environment of rapid technological advancement, when the seductive appeal of high-profile technologies can misdirect priorities in resource allocation. Unless guided by evidence-informed policy, affairs of the heart can be very costly in more than a poetic sense! Renal and respiratory diseases, too, require prioritization of resource-optimizing health interventions.

The Disease Control Priorities Project (DCP), in its two previous editions, provided the best contemporaneous

analysis of major global health challenges and offered policy-enabling cost- effectiveness estimates of interventions that were available to address them. *DCP3* continues that tradition by presenting the best available evidence on cost-effective interventions that will substantially impact and improve global health if earnestly implemented. The reasoned recommendations bridge the often-disconnected realms of rigorous scientific research and real-world policy relevance. Responses to NCDs, long neglected by health systems in LMICs, need to use such evidence to identify prioritized pathways of action and develop efficient delivery systems for the services selected to minimize the health costs of missed or messed opportunities.

This volume on CVDs, renal, and respiratory disorders has particularly high value. It carries the potential to become the most effective game-changer in global health by helping all countries to combat, contain, and control the biggest killer presently prowling the globe and by enabling us to reach the 2030 goals for NCDs and health overall. As one who has witnessed the epidemic of CVDs advance menacingly across the world in the past four decades, I fervently hope that the clear and convincing messages conveyed by the extensively researched and elegantly communicated analyses in this volume will be heard, heeded, and harmonized with policy and practice in all countries. In that hope, this Foreword looks to action moving fast forward.

K. Srinath Reddy
President, Public Health Foundation of India
New Delhi, India

Preface

Cardiovascular, respiratory, and related disorders (CVRDs) and conditions are responsible for a significant portion of the world's health burden. In 2012, 52 percent of global adult deaths were caused by CVRDs, and most occurred in low- and middle-income settings. Most CVRDs and related disorders are preventable or can be treated to reduce morbidity. Doing so, however, requires greater capacity to detect and treat at an early stage, as they are often "silent" diseases. These conditions also threaten economic development due to reduced productivity among those affected with illness and early death, as well as high household treatment costs that are often paid out of pocket in low-resource settings. Combined with the enduring presence of infectious diseases, such as tuberculosis and HIV/AIDS, CVRDs in low-income countries create a double burden of disease.

The *Cardiovascular, Respiratory, and Related Disorders* volume of *DCP3* contributes to existing research efforts in several ways:

- By summarizing the best available evidence for effective and scalable interventions
- By identifying the most effective and cost-effective priority interventions
- By describing the health platforms that can deliver these interventions and thereby curtail the increasing risk for chronic conditions and diseases.

The volume also provides an essential package of policy and health interventions that are cost-effective and feasible in lower-middle-income countries and can significantly reduce the health burden of these diseases.

We focus primarily on cardiovascular diseases and the primary risks—including ischemic heart disease, stroke, and congestive heart failure—as well as secondary risk factors, such as tobacco use, physical activity, and obesity. We also include three other major chronic conditions: respiratory diseases, diabetes, and kidney disease. These conditions share risk factors and are often precursors for one another, and we address treatment and prevention of these conditions together. Cancer and mental health, typically grouped among noncommunicable diseases, are covered in *DCP3* volumes three and four, respectively.

This volume finds that effective prevention strategies are often underused in countries at all income levels. Substantial progress against CVRDs has been achieved in high- and upper-middle-income countries, partly as the result of policies that are applied at the population level—such as tobacco taxation or bans on trans-fats—and partly due to the availability of cost-effective pharmacological treatments. These policies have not been widely implemented in lower-income countries. This volume's essential package recommends 36 policy and health system interventions using primary health service delivery platforms. This set of interventions is focused on population prevention, as well as on targeting high-risk populations in LMICs to prevent and reduce early mortality from CVRDs.

The editors and authors of *Cardiovascular, Respiratory, and Related Disorders* hope that this volume can serve as a basis for universal health care packages. As countries strengthen their health systems and economic resources become more available, this essential package

can be expanded to encompass more resource-intensive, life-saving interventions.

We thank the following individuals who provided valuable comments and assistance on this effort: Brianne Adderley, Kristen Danforth, Dean T. Jamison, Shamelle Richards, and Shivali Suri. We particularly acknowledge Jinyuan Qi for her assistance in preparing the Essential Package cost estimates. The editors also thank the reviewers organized by the U.S. National Academy of Medicine (listed separately in this volume), and the Advisory Committee to the Editors of *DCP3* for thoughtful feedback on the essential package.

Dorairaj Prabhakaran
Shuchi Anand
Thomas A. Gaziano
Jean-Claude Mbanya
Yangfeng Wu
Rachel Nugent

Abbreviations

ABI	ankle-brachial index
ABPM	ambulatory blood pressure measurement
ACE	angiotensin-converting enzyme
ACEi	angiotensin-converting enzyme inhibitors
ACS	acute coronary syndrome
AFB	acid fast bacilli
AKI	acute kidney injury
AMPATH	Academic Model Providing Access to Healthcare
ARB	angiotensin receptor blocker
ARF	acute rheumatic fever
BP	blood pressure
BMI	body mass index
CABG	coronary artery bypass graft
CCC	chronic Chagas cardiomyopathy
CCU	coronary care unit
CD	Chagas disease
CDSS	clinical decision support system
CEA	cost-effectiveness analysis
CET-P	cholesteryl ester transfer protein
CHD	coronary heart disease
CHE	catastrophic health expenditure
CHOICE	Choosing Interventions That Are Cost-Effective
CHWs	community health workers
CI	confidence interval
CKD	chronic kidney disease
COBRA	Control of Blood Pressure and Risk Attenuation
COPD	chronic obstructive pulmonary disease
CPACS	Clinical Pathways for Acute Coronary Syndromes
CRT	cardiac resynchronization therapy
CSMBS	Civil Servant Medical Benefit Scheme
CT	computed tomography
CVD	cardiovascular disease
CVRD	cardiovascular, respiratory, and related disorder
DALYs	disability-adjusted life years

DOHaD	developmental origins of health and disease
DPP	Diabetes Prevention Program
ECEA	extended cost-effectiveness analysis
eGFR	estimated glomerular filtration rate
EML	essential medicines list
ESC	European Society of Cardiology
ESH	European Society of Hypertension
ESRD	end-stage renal disease
FCTC	Framework Convention on Tobacco Control
FEV	forced expiratory volume
FRP	financial risk protection
FVC	forced vital capacity
GBD	Global Burden of Disease Study
GDM	gestational diabetes mellitus
GDP	gross domestic product
GINA	Global Initiative for Asthma
GLP-1s	glucagon-like peptide-1 agonists
GNI	gross national income
HCV	hepatitis C virus
HDL	high-density lipoprotein
HHE	home health education
HICs	high-income countries
HITAP	Health Intervention and Technology Assessment Program
HIV	human immunodeficiency virus
HIV/AIDS	human immunodeficiency virus/acquired immune deficiency syndrome
HR	hazard ratio
HTA	health technology assessment
ICD	implantable cardioverter defibrillator
ICER	incremental cost-effectiveness ratio
IDF	International Diabetes Federation
IFG	impaired fasting glucose
IGT	impaired glucose tolerance
IHD	ischemic heart disease
iIFG	isolated IFG
IPF	idiopathic pulmonary fibrosis
kg/m^2	kilogram per square meter
LABA	long-acting beta2-agonist
LDL	low-density lipoprotein
LICs	low-income countries
LMICs	low- and middle-income countries
LSCTC	London Stroke Carers Training Course
LY	life year
MET	metabolic equivalent of task
MET-h	metabolic equivalent hours
MICs	middle-income countries
mHealth	mobile health
MINIMat	Maternal and Infant Nutrition Interventions in Matlab Trial
mmHG	millimeter of mercury
MMS	multimedia message service

NCDs	noncommunicable diseases
NEML	national essential medicines list
NHI	national health insurance
NHSO	National Health Security Office
NICE	National Institute for Health and Care Excellence
NPH	Neutral Protamine Hagedorn
NRT	nicotine replacement therapy
OBPM	office-based blood pressure measurement
OR	odds ratio
PACK	Practical Approach to Care Kit
PAD	peripheral artery disease
PALSA	Practical Approach to Lung Health in South Africa
PCSK9	proprotein convertase subtilisin/kexin type 9
PD	peritoneal dialysis
PFWD	pain-free walking distance
PCI	percutaneous coronary interventions
PD	peritoneal dialysis
QALYs	quality-adjusted life years
RCT	randomized controlled trial
RF	rheumatic fever
RHD	rheumatic heart disease
RR	relative risk
RRT	renal replacement therapy
SAR	special administrative region
SBP	systolic blood pressure
SDG	Sustainable Development Goal
SGLT-2s	sodium-glucose linked transporters-2
SMS	short message service
SSB	sugar-sweetened beverage
SSS	Social Security Scheme
STEMI	ST-elevation myocardial infarction
T2DM	type 2 diabetes mellitus
tPA	tissue plasminogen activator
UCS	Universal Coverage Scheme
UHC	universal health coverage
UMPIRE	Use of a Multi-drug Pill in Reducing Cardiovascular Events
UN	United Nations