A Race Against Time

The Challenge of Cardiovascular Disease in Developing Economies

The University of Sydney

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This report derives from a project conducted at Columbia University during 2003, which examined the economic and social consequences of cardiovascular disease in developing economies. The project followed on from the work of the Commission on Macroeconomics and Health, chaired by Professor Jeffrey Sachs.

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The principal investigators on the project were **Stephen Leeder, Susan Raymond** and **Henry Greenberg. Hui Liu** was a research associate. **Kathy Esson** served as a research associate and as contributing editor.

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Forewords

The Report of the World Health Organization (WHO) Commission on Macroeconomics and Health (CMH) in 2001 called attention to the two-way causation between health and economic development. Investments in health not only reduce the burden of disease, but also stimulate economic growth, which in turn raises a society's ability to invest in public health. On the other hand, when an economy is too impoverished to invest in health, it is likely to experience a devastating downward spiral of rising disease burden and deepening poverty. The CMH focused much of its attention on the urgent public health crises of sub-Saharan Africa, a region ravaged by HIV, malaria and tuberculosis. It did note, however, that cardiovascular deaths were set to increase from 3 million in 1998 to almost 5 million in 2020 in the WHO Demographically Developing Regions (without interventions), a year in which the number of deaths from infectious diseases and related conditions would equal the number of deaths due to chronic diseases. A central message of the CMH Report was that scaling up the investment in health, both from the resources available within a country, and with foreign aid when needed, was vital to enable the world's poorest places to escape from the trap of extreme poverty.

Following the work of the CMH, energetic efforts by the WHO with technical support from Columbia University have led to the formation of national macroeconomics and health commissions within many countries. These commissions examine ways to mutually enhance public health investment and economic development, based on the active cooperation of ministries of health and finance. Several of these national commissions have stressed that health concerns of macroeconomic consequence are not limited to infectious diseases, nutrition, and maternal health (the main areas of concern that formed the CMH agenda). Indeed, in many middle-income countries, physical injury and the non-communicable serious and chronic illnesses are of great significance. Not only do they translate into direct health care and social security costs, but they also reduce economic productivity by removing people from the active workforce. The following report on cardiovascular disease estimates that more than 6 million years of potentially productive life are lost in China each year because of heart disease and stroke. Thus, countries experience the economic impact of these

cardiovascular disorders far beyond the health portfolio, including in industry and commerce, in households and in communities.

The report, sponsored by the Australian Health Policy Institute at the University of Sydney, the Earth Institute and Mailman School of Public Health at Columbia University, and the Initiative for Cardiovascular Health Research in the Developing Countries, seeks to integrate cardiovascular disease into the health-and-development framework adopted by the Commission on Macroeconomics and Health. This pioneering report is a first glimpse at the topic, using health and economic information, and the authors correctly stress the limits imposed by the available data. We now need more work to relate the impact of cardiovascular disease to the costs of interventions on a country-by-country basis. Likewise, large-scale attention to agricultural and food policy, tobacco control and city planning, all activities that could reduce heart disease and stroke, will need to be explored for their economic and political costs and benefits by each country.

This report paints a clear and strong argument, albeit in broad-brush strokes, that we need now to increase the attention we give to cardiovascular disease in low- and middle-income countries because of the combined health and economic impacts. This argument becomes even stronger in light of the emerging demographic profile of the world, where virtually every nation is now facing a change in the age structure of its population. The globalization of health-related knowledge and technology, although patchy, has been spectacular, and we are now enjoying the fruits of our success as life expectancies grow following decreased infant and child mortality. The time to act to minimize the impact of chronic disease is now, both to protect today's workforces and to diminish the burden of costly disability in the future.

I am very pleased that the team headed by Stephen Leeder has written this report, and I am most delighted that the Earth Institute has been able to support the project.

I commend the report to all those with an interest in health and development, and I expect that on the basis of this pioneering work, researchers and policy makers in public health and development will make important progress towards improved interventions regarding cardiovascular disease in many places in the world.

Jeffrey D. Sachs
Director, The Earth Institute
Columbia University
New York

When the WHO published the initial Report of the Commission on Macroeconomics and Health (CMH), many in the public health community were concerned that the Commission had not highlighted cardiovascular disease (CVD) and many other chronic diseases of global significance. The CMH Report did stress the importance of tobacco control as a priority for low- and middle-income countries but did not discuss other looming risks to the health of people in developing countries – like unhealthy diets and a lack of physical activity. This report by Stephen Leeder, Susan Raymond, Henry Greenberg, and their colleagues will start to dispel many myths that hamper progress in CVD and other chronic diseases. It will do so at a time when health has attracted the highest possible level of political interest globally – but for a rather narrowly selected number of infectious diseases.

Among the myths often cited and used as a rationale for inaction are that chronic diseases are mainly diseases of affluence affecting older people; that risks like smoking, unhealthy diets and a lack of physical activity are freely acquired and therefore government action is not warranted; and that infectious diseases should be controlled before addressing chronic diseases.

Leeder et al. emphasize the epidemiological and economic impact of CVD now and in the future. CVD will affect people in developing countries at younger ages than in developed countries; cause higher age-specific death and disability rates among them than those reported from developed countries when they experienced the peak of their CVD epidemics; and increasingly impact on poor people. Ischemic heart disease alone is anticipated to increase by 120% for women and 137% for men in developing countries between 1990 and 2020, compared to age-related increases of between 30% and 60% in developed countries. And the authors point out that this does not take account of increases in the prevalence of risks over time. Already information from over 100 countries shows that more 13 to 15 year olds smoke then ever before, and studies show that obesity levels in children are increasing markedly in countries as diverse as Brazil, China, India, and almost all small island states.

The economic and social dimensions of CVD are described in stark terms. For example, of the expected 9 million CVD deaths in China in 2030, over half will occur in the prime working ages 35-64. Figures are not much different for the other countries highlighted, namely, South Africa, Brazil, India and Russia. Overall, the authors state, "The proportion of CVD deaths occurring in prime labor years will greatly exceed the experience of U.S. and Portugal". And along with higher mortality goes higher morbidity and lower productivity.

While there is now a firmer basis to advocate for action, in my opinion the reality on the ground remains bleak for chronic disease control. As far back as 1956 at the Ninth World Health Assembly, a Resolution was proposed by India requesting the Director-General to set up an expert committee on CVD and hypertension. Almost 50 years later the capacity of countries to prevent and treat chronic diseases remains extremely weak. A recent assessment by the WHO[1] of 185 Member States provided information on various aspects of capacity. Most countries do not have budget lines for chronic diseases and report that essential chronic diseases medicines are not available in their primary health care clinics. The ability to develop integrated approaches to chronic disease prevention, surveillance and control remains rudimentary despite awareness of the need to act. Only a few developing countries, such as Brazil, Iran, South Africa and Thailand, have committed significant resources to chronic disease control. Developing countries often take their lead from donor and development agencies' priorities which to date have been largely neglectful of chronic diseases.

The intervention strategies outlined by Leeder et al. to address CVDs will contribute substantially to reducing the impact of other chronic diseases that share common risk factors with CVD. Thus many cancers, diabetes and chronic respiratory diseases could be prevented by stronger action against tobacco, unhealthy diets and physical inactivity. The rapid and full implementation of the Framework Convention on Tobacco Control and development of its protocols needs support that is more decisive. As well, significant financial and political support for the implementation of the WHO's new Global Strategy on Diet, Physical Activity and Health, has the potential to assist greatly in the control of three of the major risk factors driving the CVD and other chronic disease epidemics.

[1] Alwan, A., MacLean, D., and Mandil, A. Assessment of National Capacity for Noncommunicable Disease Prevention and Control. Geneva: the WHO; 2002

In addition, several academics as well as Leeder and his team have highlighted the potential for secondary prevention of CVD and diabetes in developing countries to prevent end organ damage and save lives in the short-term. We now need large-scale demonstration projects of impact to show the effectiveness of such approaches. The establishment of a health system that makes much use of primary care facilities to cope with both communicable and chronic diseases would improve overall population health. The new financing opportunities for chronic infectious diseases like HIV/AIDS and TB create a chance to build such integrated systems in the poorest countries.

At last, the public health community has a report that could stimulate debate and lead to action that will address CVD in much the same way in which Jeffrey Sach's original Report has helped to turn the tide on HIV/AIDS, malaria and TB.

Derek Yach
Representative of the Director-General
World Health Organization
Geneva

The last decade of the twentieth century greatly enhanced our awareness of the hitherto unrecognized global dimensions of the cardiovascular disease (CVD) epidemic. The Global Burden of Disease Study made it clear that accompanying the gratifying gains in cardiovascular health that occurred in the industrially developed nations towards the end of that century was an alarming escalation of the CVD epidemic in other and more populous regions of the world.

While the turbulence of political and economic transition unleashed an upswing in former socialist states, a post-colonial spurt in catch-up growth marked the health transition in the developing countries. While recent urbanization and delayed industrialization brought about sharp demographic and lifestyle shifts, globalization, the tail wind of the twentieth century, propelled the developing countries into the vortex of the global CVD epidemic. Events are now writing the history of these nations on the hearts of their people.

The first decade of the twenty first century offers us an opportunity to initiate action to counter these growing epidemics. The knowledge that is required to provide a comprehensive public health response is, for the most part, readily available. We need the effective application of that knowledge, through interventions aimed at populations as well as individuals, to reduce the risk of CVD across the lifespan in all regions of the world. Never before in the course of the cardiovascular epidemic have so many people been at risk of premature death, but also never before has such a vast body of knowledge been available which empowers us to reduce that risk. It is a challenge to human intellect and enterprise to apply that knowledge creatively and cost-effectively to minimize the future burdens of CVD in all regions of the globe.

A major barrier to the initiation of such action has been the lack of a compelling case, made to policy makers, that the CVD epidemics in low- and middle-income countries pose a serious threat to their development. The economic costs of neglected CVD epidemics were not apparent to influential opinion makers around the globe who assumed that CVD was principally a problem of the affluent and elderly in most nations. This study, on the macroeconomic effects of CVD in developing economies,

helps to dispel that misconception by marshalling evidence on the adverse impact of mid-life deaths on economic and social development in those countries. The depletion of productive person power by CVD-related deaths and disabilities, which affect people in the labor force aged 35-64 years, should constitute a strong argument for initiating and implementing effective CVD prevention programs. The unaffordable demands that an unchecked rise in the numbers of people requiring high cost, technology-intensive, clinical care would place on health systems would also make CVD prevention the prudent choice.

Continued neglect of the CVD epidemic would mean that the poor among nations and the poor within nations would be the most vulnerable victims in the twenty first century. The low- and middle-income countries currently contribute about 80% of global CVD-related deaths and 87% of CVD-related disabilities. As the CVD epidemic matures, social gradients are reversing and the poor are becoming the major victims in all societies. The equity argument, too, works in favor of increased allocation of resources for CVD prevention and control.

The report also profiles pathways of action for cost-effective interventions that can provide a comprehensive response to the CVD epidemic in developing economies. These include macroeconomic interventions involving governmental policies, population-based health promotion and provider-based secondary prevention in individuals at high risk of CVD events. Recommended research pathways include in-depth country studies in four or more countries, to provide comprehensive economic analyses of CVD in their countries and to develop preventive strategies, as well as comprehensive community-based intervention trials to reduce hypertension and cardiovascular risk in at least three countries.

The Initiative for Cardiovascular Health Research in The Developing Countries (IC Health) is proud to be associated with this landmark study, as a sponsor and collaborator. IC Health will also be supporting the in-depth country studies that will follow and is developing projects for community-based intervention trials for CVD risk reduction in low resource settings. This report should help to break down the barriers of apathy towards the accelerating global epidemic of CVD and initiate much awaited but long delayed action for countering the threat it poses to developing economies.

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The Initiative for Cardiovascular Health Research in The Developing Countries

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Definitions and abbreviations used in this report

Definitions

More-developed countries: The richer, industrialized countries of the world; basically, the countries of North America, Europe, Japan, Australia, New Zealand, and countries of the former Soviet Union.

Less-developed countries: There is no fixed definition for these countries. They comprise the less rich and less industrialized countries of the world, but not those conforming to the definition of least-developed countries. They have already reached UN health and fertility goals or they will do so by 2050.

Least-developed countries: Countries designated by the UN using criteria of low per capita GDP, weak human resources (life expectancy, calorie intake, etc.), and a low level of economic diversification (share of manufacturing and other measures).

Middle-income countries: Countries having an annual gross national product (GNP) per capita equivalent to more than $760 but less than $9,360 in 1998. The standard of living is higher than in low-income countries, and people have access to more goods and services, but many people still cannot meet their basic needs for food and shelter. In 2003, the cutoff gross national income (GNI) for middle-income countries was adjusted to more than $745, but less than $9,206. At that time, there were about 65 middle-income countries with populations of one million or more. Their combined population was approximately 2.7 billion.

Low-income countries: Countries having an annual (GNI) per capita of equivalent to $760 or less in 1998. The standard of living is lower in these countries; there are few goods and services; and many people cannot meet their basic needs. In 2003, the cutoff for low-income countries was reduced to $745 or less. At that time, there were about 61 low-income countries with a combined population of about 2.5 billion people. All dollars are U.S. dollars.

Abbreviations

CGHED	Center for Global Health and Economic Development (Columbia University)
CHD	Coronary heart disease
CHF	Congestive heart failure
CMH	Commission on Macroeconomics and Health
CVD	Cardiovascular disease
DALY	Disability adjusted life-year
GDP	Gross domestic product
GNI	Gross national income
GNI PPP	Gross national income adjusted to purchasing power parity in U.S. dollars
GNP	Gross national product
HIV/AIDS	Human immunodeficiency virus/acquired immunodeficiency syndrome
IC HEALTH	Health Initiative for Cardiovascular Health Research in The Developing Countries
IHD	Ischemic heart disease
Mm Hg	Millimeters of mercury
mmol	Millimole chemical concentration
MONICA	Multinational Monitoring of Trends and Determinants in Cardiovascular Disease
MRFIT	Multiple Risk Factor Intervention Trial
NCD	Non-communicable disease
OECD	Organization for Economic Cooperation and Revelopment
PPYLL	Potentially productive years of life lost
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization

A

Introduction

This report examines the social and economic impact of cardiovascular disease (CVD) in one low-income and four middle-income countries, now and for the next forty years. It also reviews strategies for the prevention of CVD in terms of their costs and benefits, where such data exist.

CVD is a major cause of morbidity and mortality in the world today and will become the leading cause of death and disability worldwide by 2020. (1) The diseases constituting its range of fatal expression (end organ CVD) include heart attack, myocardial infarction, acute coronary syndrome, congestive heart failure, strokes, kidney disease, and peripheral vascular disease.

The origins of CVD are located in society. High levels of CVD are found in environments where there is an abundance of food, where tobacco smoking is prevalent, where people do not take much exercise and where various strains and stresses operate. The dominant risk factors for CVD divide into modifiable and non-modifiable factors. Non-modifiable risk factors include age, gender, and genetic predisposition. The most important modifiable risks are tobacco smoking, high blood pressure, elevated blood lipids (hyperlipidaemia), obesity, and lack of exercise. The American Heart Association considers diabetes mellitus and its precursor condition – abnormal glucose metabolism due to insulin resistance, as seen especially in the metabolic syndrome discussed later – to be major risk factors for cardiac and vascular disease, as well as kidney disease. (2,3) Their increasing prevalence among children and adults in association with rising levels of obesity is of special concern.

These risk factors for CVD also constitute diseases in their own right; hypertension, hyperlipidemia, obesity and abnormal glucose metabolism are disorders that require medical intervention. These precursor conditions are major targets of CVD prevention in both populations and individuals. They accelerate the progression of pathological processes in vascular, cerebral and myocardial biology that over decades lead to end

organ diseases such as stroke, heart attack and kidney failure, as well as the fatal arrhythmias that account for many of the sudden deaths that occur due to heart attack. These risk factors account for about 75% of coronary heart disease. (4) There is widespread agreement that risk factors are an appropriate focus of preventive efforts in relation to CVD in both developed and developing countries, because to the degree that an individual's risk factor profile is reduced, his or her susceptibility of developing end organ disease also decreases. The ability to treat these risk factors in individuals does not exclude interest in finding ways to counteract the forces in society that lead to high risk. These forces operate in the arenas of commerce, the economy and the environment. The impact of job strain, job demands and decision latitude has also been shown by Marmot and colleagues in the Whitehall studies of British civil servants to be additional determinants of CVD risk. (5) There is no reason to suppose that these risks are peculiar to one cultural context or one occupation.

The aging of all populations heightens the importance of CVD both in people of working age and in those who are beyond working age. Given the aging of the world's population from 1980 to 2040, we examine in detail the implications for selected developing countries. By 2020, the median age of the population in much of the developing world will begin to approach that of the West. In several developing countries this will create an age profile much like the West, but in so-called 'young' countries – those with a higher proportion of people aged less than 65 than found in, say, Europe – it will first produce a bulge of people of working age. The death and Δdisability attributable to CVD in labor force age groups in many of these countries may be much higher than that appreciated previously, and is certainly much higher than in Western nations now, and even in the past. Projections for the next two decades show that the mortality and disability rates attributable to these diseases will also rise.

The world has paid little attention to the chronic disease and disability profile of labor force, aged populations in the developing world. Even less has been paid to the economic implications of failing to stem current trends in the development and expression of these diseases.

In many countries undergoing rapid urbanization, the next twenty years will be ones in which the effects of rising CVD risk factors do their damage. Yet, because of the demographics of these countries, these years may not see the highest disease expression of these risks. CVD develops over several decades and is most prevalent in people as they grow older, and most of these countries are only slowly accumulating a significant number of older working people, or older retired people. In addition,

the dependency rate (the number of dependants per working adult) will be low over the next twenty years, due to a combination of falling birth rates and a relatively small number of dependent elderly citizens.

There is an urgent need to act to stem the tide of risk factors that lead to CVD, in order to prevent a massive increase in the number of people with end stage illness. In our estimation, in young countries, while the levels of CVD risk factors are high, a two-decade window of opportunity exists to reduce their progression to end organ disease. If successful, the future costs of death and disability due to CVD will not become an intolerable burden. We have called this interval 'a race against time' to emphasize the importance of taking action now to prevent catastrophic levels of CVD twenty to forty years hence.

Fortunately, demonstrably effective interventions are already available for individuals at high risk of CVD. These disease prevention and management strategies significantly slow the progress of risk factors and prevent or postpone expression of their most serious end organ consequences. In addition, affordable public health and other public policy measures can readily be applied at the level of the population to ameliorate CVD's effects. These measures have been used to good effect in curtailing CVD in countries such as the U.S., Australia, the U.K. and other European nations since the mid 1960s. (6,7,8,9)

We explore the significance of CVD from both an epidemiological and an economic perspective. In reconciling the epidemiological projections with their likely economic consequences, we address the macroeconomic question: what will be the likely cost of CVD if we do nothing about it? Because there are now effective strategies for preventing and treating CVD, health officials can take decisions about investment in these strategies by considering the costs and benefits of intervention versus the costs and savings of doing nothing. Assuming that these explorations favor investment in intervention, health officials can make microeconomic choices – such as drug therapy or public health measures or a combination of both – based on cost-effectiveness data. They can choose among alternate investment strategies and determine budgets. We do not provide a detailed costing of the microeconomic implications of specific interventions to reduce CVD in this study. However, we do examine the limited evidence available in relation to both the cost and feasibility of individual and population-based interventions and locate it within the context of national government macroeconomic decision-making. For a complete analysis, we would need a lot more data on costs, especially those that concern the impact of CVD on the workforce.

The document begins by reviewing the derivation of this project from the work of the World Health Organization (WHO) Commission on Macroeconomics and Health. It then assesses the global significance of CVD. Five developing countries provide a case study to view the prevalence of CVD in low- and middle-income countries. Next, the macroeconomic implications of CVD are examined. Possible strategies to reduce the impact of CVD are then explored. And finally, we offer an agenda for action.

A-1. Origins and rationale of this report

In December 2001, the WHO received the Report of its Commission on Macroeconomics and Health (CMH). (10) The Director-General of the WHO, Gro Harlem Brundtland, had established the Commission to produce a comprehensive analysis of the relation between health and economic development. Seven working parties performed this work, and the CMH published a principal Report with six supplementary volumes. Professor Jeffrey Sachs, a professor of economics and then director of the Center for International Development within the Kennedy School of Government at Harvard University, oversaw the work of the Commission as its chair. Over 500 people expert in health and economics contributed.

The Commission strongly linked health to a macroeconomic perspective, portraying both health and health care as critical elements in country development, sufficiently important to engage the close attention of those responsible for overseeing each country's macroeconomic agenda. This departs from a conventional view of health expenditure that sees it as a sunk cost, and then assigns decisions about health service spending to the ministry of health, which then makes microeconomic choices about how best to invest the allocation they have received.

Central to the purpose of the Report of the CMH is the question so often asked by governments – why should we invest in health? Competition for public money is intense, even when it is for indisputably humane purposes. If investments in health and health services are to be justified, then the likely yield from those investments should compare favorably with benefits that would follow from the commitment of these funds to other purposes, including education, urban development, public transport, trade and industry, and defense.

Investments in health not only reduce the burden of disease, but also stimulate economic growth, which in turn raises a society's ability to invest in public health. On the other hand, lack of investment in health, due to overall economic impoverishment, has

devastating consequences. The CMH Report focused much of its attention on the urgent public health crises of sub-Saharan Africa, a region deeply wounded by HIV, malaria and tuberculosis. It argued that increasing investment in health, harnessing a country's own resources and drawing on foreign aid when required, is essential if the world's poorest nations are to break out of a never-ending cycle of poverty.

The CMH Report argued that to improve economic well-being, more countries would need to invest more in public health measures including immunization, and in primary health care. It also confronted the uncomfortable reality that the necessary investment to achieve health gains and subsequent economic improvement is beyond the capacity of many of the poorest nations. In these cases, donor nations who sense the humane, economic and strategic importance of helping these countries out of their poverty must match or exceed the national financial contributions. The Report thus called for a manifold increase in donor commitment.

Whatever the source of the increased investments in health and health care, their management necessitates the involvement of ministries of finance and development, and even presidential/prime ministerial commitment to better health. The Report called on all nations to consider establishing their own commissions on macroeconomics and health where ministers of health and finance and their bureaucratic counterparts can meet to establish agendas for health and development. Several countries (e.g. Rwanda, Thailand, Djibouti, Jordan and the Sudan) have done this, the better to pursue these purposes.

The WHO, supported by a grant from the Bill and Melinda Gates Foundation, accepted the responsibility for implementing the recommendations of the Report. A technical support team in the Center for Global Health and Economic Development at Columbia University works with the WHO Commission on Macroeconomics and Health Secretariat in Geneva. The Center for Global Health and Economic Development (CGHED) within Columbia University is a joint venture of the Mailman School of Public Health and the Earth Institute. The present report on the challenge of CVD is a logical sequel to the CMH Report. We have examined the impact of CVD on the health and economic well-being of developing countries using the same mindset that led to the original recommendations from the CMH.

We are at a strangely paradoxical historical moment with regard to global health. Old problems coexist with new ones, and solutions to yesterday's crises provide the vehicle for tomorrow's threats. For example, under-nutrition remains by far the greatest risk factor for premature mortality among the world's least-developed countries. (11)