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## Noncommunicable Diseases

### Noncommunicable Diseases Now Account for a Majority of Deaths in Low- and Middle-Income Countries

Developing countries are now undergoing the same dramatic shift in the causes of illness and death that developed countries experienced after 1900. Communicable diseases are no longer the only threat: Because of changes in diet and lifestyle as well as rapid population aging in developing countries, major noncommunicable diseases (NCDs)—such as circulatory system diseases, cancers, diabetes, major psychiatric disorders, and chronic respiratory diseases—are now quickly adding to the worldwide burden of disease (see table).

These diseases, which in the past were largely confined to industrialized countries, now account for over one-half of all deaths in low- and middle-income countries (LMICs). Cardiovascular disease (CVD) alone killed nearly three times as many people in 2001 in these countries as did AIDS, malaria, and tuberculosis combined. And because communicable diseases, undernutrition, and maternal mortality still account for 40 percent of deaths in developing countries, the rise of NCDs is creating a “dual burden” of disease that many developing country health systems are ill-equipped to confront.

The international public health research and policy community, however, has been surprisingly silent about these NCD epidemics. But there are approaches to prevention and treatment of these conditions that can be adapted to the tighter budget constraints of developing countries. Controlling tobacco use, particularly through taxation, is the single most important intervention developing countries can take to reduce rates of NCDs. Providing aspirin and other inexpensive drugs to those people at high risk for heart attacks or strokes is a cost-effective, long-term way to manage that risk and would benefit tens of millions of individuals. Yet more low-cost effective approaches to long-term management of NCDs need to be developed and implemented.

Below are summaries of the major NCDs afflicting developing countries, the role that high blood pressure, high cholesterol, and increased bodyweight are playing in the rise of some of these NCDs, and a set of interventions that policymakers and citizens should consider to reduce NCD rates.

#### Cardiovascular Disease

A global cardiovascular disease epidemic is upon us: Whereas CVD was once largely confined to high-income countries, it is now the number one cause of death worldwide as well as in low- and middle-income countries, where 80 percent of the world's 13 million annual CVD deaths occur. And at least 21 million years of disability-adjusted life years (or DALYs, a measure of future productive life) are lost globally because of CVD each year.

The vast majority of CVD can be attributed to conventional risk factors such as tobacco use, high blood pressure, high blood glucose, lipid abnormalities, obesity, and physical inactivity. Even in Sub-Saharan Africa, high blood pressure, high cholesterol, extensive tobacco and alcohol use, and low vegetable and fruit consumption are already among the top risk factors for disease. And because of the time lag associated with CVD risk factors, the full effect of exposure will be seen years from now. More 13- to 15-year-olds across the world smoke than ever before, and obesity levels in children are increasing markedly in countries as diverse as Brazil, China, India, and almost all island states.

Although some risk factors such as age, ethnicity, and gender obviously cannot be modified, most risk is attributable to lifestyle and behavioral patterns, which can be changed. Population-wide efforts now to reduce risk factors through

multiple economic and educational policies and programs will reap savings later in medical and other direct costs as well as indirectly in terms of improved quality of life and economic productivity. The most important of these efforts include:

**Curtailling tobacco use**, which accounts for a substantial and wholly avoidable fraction of CVD and of cancers. Reasonable projections show the number of tobacco-related deaths to be not only large but also growing, particularly in developing countries. In 2000, the number of tobacco-related deaths in developing countries approximately equaled the number in high-income countries; projections suggest that by 2030 developing countries will have more than twice as many as will high-income countries.

Controlling smoking is a key element of any national strategy for preventing CVD or for promoting health more generally. Reducing smoking levels is well demonstrated to be within the control of public policy, with the principal instrument being raising taxes on tobacco products by at least 33 percent.

**Drug interventions** to manage two major components of cardiovascular risk—hypertension and high cholesterol levels—are well established and are highly cost-effective for individuals at high risk of a stroke or heart attack. Researchers have long recognized that the low cost and high effectiveness of drugs to prevent the reoccurrence of a cardiovascular event made their long-term use potentially cost-effective in low-income environments.

Even if sustained behavior change proves difficult to achieve, medications have the potential to reduce CVD risk by 50 percent or more. The medical interventions that are most likely to be cost-effective in developing countries include benzathine penicillin injections as secondary prevention for those who have had rheumatic fever; ACE inhibitors for congestive heart failure; and various drugs (e.g., beta-blockers and off-patent statins, otherwise known as cholesterol-lowering drugs) for long-term care following a myocardial infarction.

A key problem, however, concerns the health care personnel and other systems requirements associated with the need for lifelong medication use, a problem also faced with antiretroviral therapy for AIDS and the use of medications to target several major psychiatric disorders. How to achieve effective long-term management of lifesaving drugs is a key delivery and research challenge for health system reformers.

In contrast to the lifelong requirement for drug use associated with CVD risk reduction in high-risk individuals, treatment of acute heart attacks with inexpensive drugs such as aspirin is both less demanding of system resources and highly cost-effective. The incremental cost per disability-adjusted life year (DALY)<sup>1</sup> averted is less than US\$25 for all six regions for interventions consisting of aspirin alone or aspirin plus a beta-blocker. Given the high incidence of these problems, systemwide efforts to achieve high rates of appropriate drug use in response to acute heart disease are a high priority.

## Cancer

Cancer imposes a major and growing disease burden worldwide. The number of new cancer cases is projected to increase from 10 million in 2000 to 15 million in 2020, 9 million of which would be in developing countries.

The epidemiology of cancer in developing countries clearly differs from that in developed countries in important respects. While developed countries often have relatively high rates of lung, colorectal, breast, and prostate cancer (some of which is tied to tobacco use, occupational carcinogens, and diet and lifestyle), up to 25 percent of cancers in developing countries is associated with chronic infections.

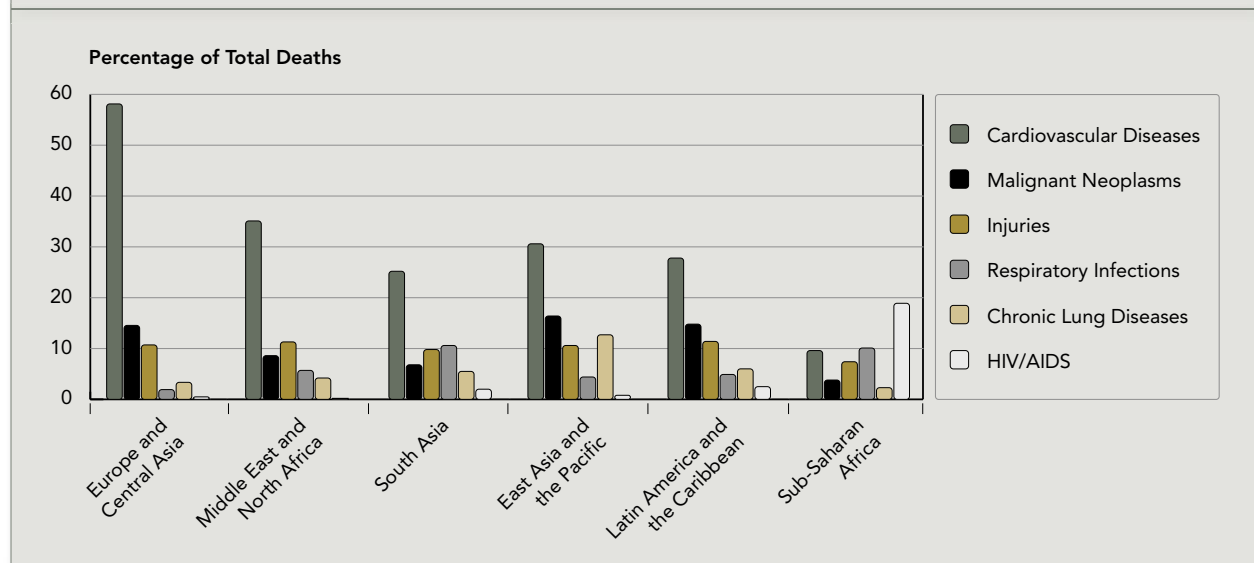
Seven types of cancers account for approximately 60 percent of all newly diagnosed cancer cases and cancer deaths in developing countries: cervical, liver, stomach, esophageal, lung, colorectal, and breast. It costs between US\$1,200 to US\$6,200 per year of life saved (YLS) for initial treatment of the more treatable cancers—cervical, breast, oral cavity, and colorectal cancer.

A number of specific interventions have proven to be cost-effective in developing countries:

- Controlling tobacco and alcohol consumption—through increased taxation, smoking bans, and regulation of advertising and promotion—would decrease the incidence of several major cancers, including lung, esophageal, and liver.
- To reduce the risk factors for cancer associated with certain foods and obesity, governments should conduct school and public education campaigns on diet and work with the food and agricultural sectors.
- Cervical cancer screening conducted up to three

<sup>1</sup> DALY (disability-adjusted life year) is a composite measure that combines the number of years lived with a disability and the number of years lost to premature death.

## Major Causes of Death in Persons of All Ages in Low- and Middle-Income Regions



times in a lifetime can have a significant effect on the lifetime risk of cervical cancer compared with no screening. For countries with limited resources, screening efforts should target women ages 35 and older and focus on screening all women at least once.

- Annual clinical breast examination results in almost the same number of life years saved as twice yearly mammography screening at 36 percent of the cost.

In addition, developing countries need to consider the following steps in enhancing their cancer treatment, prevention, and research programs:

- Because of the lack of primary treatment in low-income, low-cost countries with high mortality rates, the provision of basic cancer treatment may be a cost-effective first step toward cancer control, especially for highly treatable cancers (such as colorectal cancer). Developing countries should start small—with well-documented and well-monitored pilot programs—that can then be scaled up after they perform well.
- While LMICs cannot afford to make the newest drugs widely available to cancer patients, there is a need to periodically update available chemotherapy options along with evaluation of the incremental costs and benefits associated with them.
- Most cost-effectiveness studies in cancer research have been conducted in developed countries. Much more research is needed to better understand which interventions are most cost-effective in developing

countries, particularly in low-income versus middle-income countries.

## Mental Disorders

Although neurological and mental disorders lead to only about 1.4 percent of deaths in low- and middle-income countries (1.8 percent in high-income countries), they cause suffering and disability far beyond what the mortality numbers suggest. About 10 percent of disease burden in DALYs in low- and middle-income countries results from these conditions. And three major psychiatric diseases—unipolar major depression (3.1 percent of DALYs); bipolar disorder (0.6 percent); and schizophrenia (0.8 percent)—account for much of this burden.

The immediate challenge for developing countries is generating sufficient resources for primary mental health care to ensure correct diagnosis and treatment of these disorders.

For mental disorders such as schizophrenia, bipolar affective disorder, major depressive disorder, and panic disorder, the proper drugs and counseling can be cost-effective interventions. For neurological disorders such as dementia, epilepsy, Parkinson's disease, and acute ischemic stroke, interventions (such as phenobarbital to treat Parkinson's and aspirin for stroke) are inexpensive and effective, with the added benefit that they can be applied on a large scale through primary care.

The populations of most developing countries are aging rapidly, and many neurological disorders occur more frequently in the elderly—posing a growing public health problem in these countries. Developing countries should begin or expand their research and development agendas to address issues related to the prevention, identification, and management of neurological disorders. Specific areas for research and development include:

- Conducting population-based epidemiological studies;
- Enhancing existing health care delivery systems, especially in rural areas using community-based health care providers;
- Developing cheaper and more efficacious medicines; and
- Studying and promoting the use of indigenous systems of medicines, and launching stigma removal campaigns.

## Diabetes

A global diabetes pandemic is unfolding with rapid increases in the prevalence of type 2 (adult onset) diabetes. Developing countries—which have 141 million people with the disease, or 72.5 percent of the world’s total—have more than 80 percent of the DALYs resulting from the diabetes and spend between 2.5 and 15.0 percent of their annual direct health budgets on diabetic care. In 2025, over 6 percent of the world’s population is projected to be diabetic—a rise of 24 percent from 2003 levels. In the Middle East and North Africa, South Asia, and Sub-Saharan Africa, the number of people with diabetes is expected to double between 2003 and 2025.

The quality of diabetes care generally remains suboptimal worldwide, regardless of a particular country’s level of development, health care system, or population. But a wide array of effective interventions to prevent diabetes and its complications is available. Some of the most cost-saving and highly feasible include: glycemic control through insulin, oral glucose-lowering agents, diet, and exercise; blood pressure control medications; and foot care through patient and provider education, foot examination and hygiene, and appropriate footwear.

Diabetes education for both patients and providers—which reduced the cost of drugs by 62 percent in one study of 10 Latin American countries—is also an essential intervention. And further research should be launched into the effectiveness

of a polypill of aspirin, beta-blocker, thiazide diuretic, ACE inhibitor, and statin.

## Respiratory Diseases of Adults

Chronic adult respiratory diseases—such as chronic obstructive pulmonary disease (COPD) and asthma—are a major and growing burden in terms of morbidity and mortality in the developing world.

COPD (which includes emphysema, chronic bronchitis, and obstructive airways disease) is largely linked with cigarette smoking as well as exposure to unvented coal-fired cooking stoves; it accounts for 2 percent of lost DALYs on a worldwide basis. While asthma’s prevalence worldwide is lower than other adult respiratory diseases, studies of some middle-income countries such as Estonia and Singapore show that medical costs for asthma constitute over 1 percent of total health care costs.

The most cost-effective therapies in developed countries (inhaled salbutamol and first-generation corticosteroids for asthma and ipratropium bromide for COPD) are also likely to be cost-effective in the wealthier developing countries—or more broadly if inexpensive drug supplies are available. But it is important to consider preventive strategies—namely, smoking prevention and reduction programs—that will have greater societal effect than will the management of the manifestations of diseases as they arise in individuals.

## Growing Burden of Risk From High Blood Pressure, Cholesterol, and Bodyweight

High blood pressure, cholesterol, and bodyweight are responsible for a large and increasing proportion of the global burden of disease. Although historically these risks have been regarded as “western,” their impact is now recognized as global: They are already leading causes of disease in middle-income countries and of emerging importance in low-income countries.

Globally, 7.1 million deaths were attributed to high blood pressure in 2000, 4.4 million to high cholesterol, and 2.6 million to high body mass index (BMI). More of the total DALY burden was experienced in developing countries than in developed countries, reflecting the large populations

in developing countries and their already high risk-factor levels. For all regions, more than two-thirds of the CVD burden is attributable to the combined effects of high blood pressure, cholesterol, and body weight levels. In addition, more than three-quarters of type 2 diabetes is related to by high bodyweight. Obesity-related diseases alone are responsible for 2 to 8 percent of all health care expenditures in developed countries.

Providing off-patent blood pressure and cholesterol-lowering drugs targeted at those individuals at high risk for CVD seems to be a cost-effective strategy in developing countries. But this approach will still leave some people at risk of progression of vascular disease, underscoring the need for parallel improvements in population-based prevention programs that address the root causes of CVD—in particular, high salt and saturated fat as well as high-energy diets coupled with decreasing physical activity. Preventing and reducing these root causes in developing countries will reduce the need for medication-based treatment strategies in the coming decades.

## **Prevention of NCD by Means of Diet and Lifestyle Changes**

Successful programs in Finland, Singapore, and other high-income countries strongly suggest that reducing identified, modifiable dietary and lifestyle risk factors could prevent most cases of CVD, diabetes, and many cancers among populations in developing countries. Reducing these factors involves changes in behaviors related to smoking, physical activity, and diet. In addition, investments in education, food policies, and urban physical infrastructure are needed to support and encourage these changes.

### **Recommended Personal Lifestyle Changes**

**Avoid tobacco use.** Avoidance of smoking by preventing initiation or by cessation for those who already smoke is the single most important way to prevent CVD and some cancers.

**Maintain a healthy weight.** Rates of overweight and obesity are increasing rapidly worldwide and carry elevated risk for many diseases, including CVD and type 2 diabetes.

**Maintain daily physical activity.** In addition to its key role in maintaining a healthy weight, regular physical activity

reduces the risk of CVD, type 2 diabetes, colon and breast cancer, and other diseases.

**Eat a healthy diet.** Diet affects one's risk of CVD, specific cancers, diabetes, and other illnesses and conditions. Healthy diets replace saturated and trans fats with unsaturated fats, including sources of omega-3 fatty acids; ensure generous consumption of fruits and vegetables and adequate folic acid intake; consume cereal products in their whole-grain, high-fiber form; limit consumption of sugar and sugar-based beverages; limit excessive caloric intake from any source; and limit sodium intake.

## **Recommended Government Interventions**

Interventions aimed at changing diet and lifestyle factors include educating individuals, changing the environment, modifying the food supply, undertaking specific approaches to community interventions, and implementing economic policies. An overall objective is to develop comprehensive national and local plans that take advantage of every opportunity to encourage and promote healthy eating and active living. Some of the most cost-effective interventions include:

**Tobacco tax.** Boosting tobacco prices by at least 33 percent through additional taxation could potentially prevent up to 66 million lives over the next 50 years—90 percent of which would be in developing countries. Other effective interventions include banning tobacco advertising and promotion, restricting smoking in public places and workplaces, and providing nicotine replacement therapy and other cessation tools.

**Transportation policy and environment design.** Transportation policies and the design of urban environments are fundamental determinants of physical activity and therefore influence the risks of obesity and other chronic diseases. People who live in densely developed cities that promote walking and bicycle riding and invest in public transportation are much more likely to weigh less and be less likely to suffer from hypertension. In a prospective study in eight provinces in China, the likelihood of men becoming obese was twice as great in households that acquired a car than in those that did not.

**Improved food supply.** Altering the food manufacturing process can rapidly and effectively improve diets because such action does not require the relatively slow process of

behavioral change. Reducing saturated fat content in food could avert one DALY for as little as US\$1,865 in South Asia. And reducing the salt content of manufactured foods through legislation and an accompanying education campaign would cost US\$1,325 per DALY averted in South Asia to US\$3,056 per DALY averted in the Middle East and North Africa.

Other interventions to promote healthy diets include:

- Developing comprehensive school programs that integrate nutrition into core curricula and healthy nutrition into school food services;

- Using tax policies to encourage the consumption of healthier foods, such as fully taxing high-sugar sodas;
- Implementing folic acid fortification in foods; and
- Setting standards that restrict the promotion of foods high in sugar, refined starch, and saturated and trans fats to children.

## For More Information

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