Economic Dimensions of Noncommunicable Diseases in Latin America and the Caribbean

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DCP3 Disease Control Priorities

economic evaluation for health

Economic Dimensions of Noncommunicable Diseases in Latin America and the Caribbean

Contents

Foreword

Economic Dimensions of Noncommunicable Diseases in Latin America and the Caribbean is a companion volume to *Disease Control Priorities, Third Edition (DCP3)*. This volume explores the relationship between and the impact of noncommunicable diseases (NCDs) on development and economic growth in the countries of Latin America and the Caribbean (LAC). This collection of manuscripts examines the complex interplay among NCDs, health expenditures and financial investments in health, poverty, and inequities, using up-to-date information and evidence from the LAC region.

There is compelling proof that NCDs are a major and growing problem for low- and middle-income countries, and that they consume increasingly greater proportions of health care budgets. NCDs are not simply a byproduct of higher incomes and declining infectious disease rates, but are also a major cause of disability and ill health and the leading cause of preventable and premature mortality in the Americas. NCDs are responsible for significant out-of-pocket health expenditures for individuals and families, as well as substantial health outlays in national budgets.

During the last 20 years, many LAC countries have experienced unprecedented economic growth. And in spite of the recent global financial crisis, economic and health indicators have demonstrated overall improvements, especially at the national level. However, NCDs remain a threat to the economic growth and developmental potential of many countries. This is particularly true for low- and middle-income countries that face a greater increase in the NCD burden as a result of rapidly growing and aging populations. These diseases drive inequity; contribute to poorer economic outcomes for individuals, communities, and societies; and create significant challenges to development. The economic impact of NCDs must be better understood, and their negative consequences for societies mitigated.

The impact of NCDs is recognized in the Sustainable Development Goals (SDGs), which include a target of a one-third reduction in premature mortality from NCDs by 2030. Achieving that will require an innovative, health-in-all-policies approach linking global health, efforts to reduce inequity, the world economy, and national development. The Plan of Action for the Prevention and Control of Noncommunicable Diseases in the Americas 2013–2019 of the Pan American Health Organization (PAHO) emphasizes multisectoral initiatives that will contribute to this target through collaboration with relevant sectors of government and society, and also through integrating those initiatives into development, academic, and economic agendas.

Economic Dimensions of Noncommunicable Diseases in Latin America and the Caribbean recognizes the relationship between NCDs and sociodemographic trends in the LAC region. These include unprecedented rates of urbanization, globalization, rapid population aging, and inadequate health system responses to these changes. This volume provides health planners and decision makers with relevant information about how NCDs contribute to economic development and makes a case for greater investments in the prevention and control of chronic conditions.

This book also builds on previous evidence and assesses new empirical work, with the goal of influencing NCD policies, program design, and resource allocation at the regional and country level. The volume also recommends specific, concrete actions and calls for an all-of-society approach to address NCDs as both an urgent economic concern and a development issue. With these objectives in mind, *Economic Dimensions of Noncommunicable Diseases in Latin America and the Caribbean* has been written by PAHO technical advisors and a range of other, specially selected experts, for an audience that ranges from academics and health professionals to policy makers and program managers, as well as the media, lawmakers, and the general public.

In preparing this volume, PAHO has collaborated with the World Bank, the National Institute of Public Health of Mexico, and the Disease Control Priorities Project of the Department of Global Health of the University of Washington. PAHO has also engaged eminent researchers from throughout the LAC region. Each article was independently written, based on the knowledge and experiences of the different authors.

There is much that the LAC countries can do to prevent NCDs from overwhelming their national budgets. A key step towards preventing and mitigating negative economic outcomes is the integration of NCDs into development and health policy agendas. LAC countries must also revisit and expand their current NCD policies and programs beyond health, by convening all sectors and actors within government and across all strata of society, in order to achieve integrated, collective, collaborative efforts on NCDs.

Healthy, productive populations are essential for sustainable development and economic growth. Therefore, it is crucial to optimize both existing and new resources for NCD prevention and control, in order to meet the growing needs in the LAC region. We strongly believe that this book will help the countries of Latin America and the Caribbean to reshape their health policy agendas to more effectively address the economic and development challenges linked to noncommunicable diseases.

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Abbreviations

ADI	Average/Deprivation/Inequality
BMI	body mass index
CARPHA	Caribbean Public Health Agency
CDB	Caribbean Development Bank
CHD	coronary heart disease
CI	concentration index
CRT	cardiac resynchronization pacing therapy
CVD	cardiovascular disease
DALYs	disability-adjusted life years
DCP3	Disease Control Priorities, Third Edition
FRAC	Food Research and Action Center
GBD	(WHO) Global Burden of Disease
GDP	gross domestic product
HDI	Human Development Index
HiAP	Health in All Policies
HPV	human papillomavirus
ICDs	implantable cardioverter-defibrillators
ICER	incremental cost-effectiveness ratio
IMF	International Monetary Fund
IPAQ	International Physical Activity Questionnaire
LAC	Latin American and Caribbean
LICs	low-income countries
LMICs	low- and middle-income countries
MDGs	Millennium Development Goals

MoH	Ministry of Health
MOOCs	massive open online courses
MRI	magnetic resonance imaging
NAFTA	North American Free Trade Agreement
NCDs	noncommunicable diseases
NGO	nongovernmental organization
OECD	Organisation for Economic Co-operation and Development
PAHO	Pan American Health Organization
QALY	quality-adjusted life year
SDGs	Sustainable Development Goals
SDH	social determinants of health
T2D	type 2 diabetes
UHC	universal health coverage
UMICs	upper-middle-income countries
UN	United Nations
UNDP	United Nations Development Programme
UPP	ultraprocessed product
WHO	World Health Organization
WHO-CHOICE	WHO Choosing Interventions that are Cost-Effective
WHO FCTC	WHO Framework Convention on Tobacco Control
WTO	World Trade Organization
YLL	years of life lost

Section 1

INTRODUCTION

Anselm Hennis
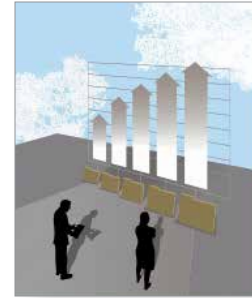
Noncommunicable Disease Prevention and Control in the Americas

Anselm Hennis

SETTING THE SCENE

With an overall population of 991 million persons, the Americas is rapidly approaching the billion-person milestone (PAHO 2015a). The countries of the Americas have been at the forefront of efforts to tackle noncommunicable diseases (NCDs) and related risk factors. With the Declaration of Port of Spain in 2007, Caribbean leaders signaled their resolve on this issue (CARICOM 2007).

In 2011, the countries of the Americas also called for global action at the United Nations General Assembly High-level Meeting on the Prevention and Control of Noncommunicable Diseases (UN 2011). Similarly, the nations of the Americas have played a major role in the effort to include health-related topics in the Sustainable Development Goals and the post-2015 development agenda (WHO 2015).

In 2013, the World Health Assembly endorsed the World Health Organization (WHO) Global Action Plan for the Prevention and Control of NCDs 2013-2020 (WHO 2013). In that same year, the Pan American Health Organization (PAHO) Directing Council approved the Regional Action Plan for NCDs for 2013-2019 (PAHO 2014a). These commitments present a road map and menu of policy options that, when implemented, will collectively help reduce premature mortality from NCDs (namely cardiovascular disease, cancer, chronic respiratory disease, and diabetes) by 2025. The WHO Global Monitoring Framework on NCDs will track the implementation of the Global Action Plan through monitoring and reporting on the attainment of 9 global NCD targets and 25 indicators against a baseline in 2010 (WHO 2013).

Comparisons of the prevalence of risk factors across the six WHO regions highlight the worrying state of health in the Americas (table 1.1) (WHO 2010a; WHO 2014b).

While the overall worldwide prevalence of overweight and obesity is 36.6 percent, 59.0 percent of persons living in the Americas are overweight or are obese (with a body mass index (BMI) ≥ 25 kg/m²). Rates of obesity (BMI ≥ 30 kg/m²) in the Americas are more than double the global average: 24.6 percent versus 11.5 percent. This makes the Americas the most obese region in the world. There is also a gender difference in the Americas, with women more likely to be obese than men. Similarly, rates of physical inactivity in the Americas are nearly one and a half times as high as the global average (32.4 percent versus 23.3 percent).

The Americas ranks second in alcohol consumption per capita, exceeded only by the European region. The Americas also ranks second in the world with respect to heavy episodic drinking, with a prevalence of 14.0 percent, compared to 16.5 percent in Europe and 7.8 percent worldwide.

Risk factor	Worldwide			Americas			Ranking of the Americas among WHO regions
	Both sexes	Female	Male	Both sexes	Female	Male	
Insufficient physical activity	23.3 [16.6-34.5]	26.8 [18.5-38.9]	19.8 [13.4-32.1]	32.4 [22.7-48.1]	37.8 [26.3-54.3]	26.7 [17.4-44.3]	1
Overweight and obesity (BMI ≥ 25 kg/m²)	36.6 [35.3-37.8]	37.3 [35.6-39.1]	35.9 [34.1-37.8]	59.0 [57.1-60.9]	57.8 [55.2-60.4]	60.3 [57.7-63.0]	1
Obesity (BMI ≥ 30 kg/m²)	11.5 [10.8-12.1]	13.7 [12.7-14.7]	9.3 [8.5-10.2]	24.6 [23-26.2]	27.4 [25.2-29.8]	21.7 [19.5-23.9]	1
Alcohol (heavy episodic drinking)	7.8 [6.8-8.8]	3.6 [2.9-4.3]	11.9 [10.6-13.1]	14.0 [12.6-15.4]	7.2 [6.0-8.3]	21.0 [19.3-22.7]	2
Raised total cholesterol	9.8 [8.6-11.2]	10.9 [8.9-13.1]	8.6 [7.3-10.1]	12.6 [10.1-15.4]	13.7 [10.0-18.1]	11.2 [8.6-14.4]	2
Raised fasting glucose	8.3 [7.3-9.4]	7.9 [6.7-9.4]	8.7 [7.2-10.4]	8.1 [6.7-9.4]	7.6 [5.9-9.6]	8.5 [6.5-29.9]	3
Tobacco (smoking)	22.1 [17.5-27.1]	7.3 [5.7-9.0]	36.9 [29.4-45.2]	19.0 [14.9-23.5]	14.2 [11.3-17.4]	24.1 [18.8-17.4]	4
Raised blood pressure	23.2 [21.4-24.8]	21.4 [19.3-23.5]	25.0 [22.6-27.4]	19.3 [17.4-21.3]	16.8 [14.3-19.4]	22.0 [18.9-25.2]	6

Source: Data are from WHO (WHO 2010a and WHO 2014b).

Note: Estimates for all the indicators are for 2010, except for raised total cholesterol (2008). The prevalence rates are age-standardized, except for insufficient physical activity and tobacco smoking. All of the estimates are for persons aged 18+ years except for tobacco (smoking) and alcohol, where the population covered was aged 15+ years. The alcohol (heavy episodic drinking) values are based on surveys, and are age-standardized and not corrected for alcohol per capita.

Populations in the Americas also have the second highest prevalence of elevated serum cholesterol, at 12.6 percent (versus a global average of 9.8 percent).

The mean fasting glucose in the Americas is 8.1 mmol/l (versus a global mean of 8.3 mmol/l). There is a 19.0 percent prevalence rate of current tobacco use (versus a global average of 22.1 percent). The prevalence of elevated blood pressure is 19.3 percent (versus 23.2 percent globally). The respective rankings for the Americas for these three factors are third, fourth, and sixth overall across the WHO regions. In addition, persons living in the Americas have the lowest probability of dying prematurely from the four major NCDs, which perhaps reflects the impact of comparatively better blood pressure control and lower tobacco use. In spite of these rankings in the Americas, there is still much that needs to be done.

The probability of dying between the ages of 30 and 70 years from the four main NCDs (cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes) is the outcome indicator in the Global Monitoring Framework. In 2012 a 30-year-old individual in the Americas had an overall 15.0 percent chance of dying from one of the four main NCDs before his or her 70th birthday. As shown in figure 1.1, in the eight PAHO subregions, this probability ranged from 11.4 percent in the Andean Area to 16.5 percent in Brazil and 18.6 percent in the non-Latin Caribbean countries (PAHO 2016a; WHO 2014b).

While these statistics indicate relative gains in the efforts to reduce NCDs and related risk factors, the stark reality is that approximately 4.3 million people die each year from NCDs in the Americas (80 percent of all deaths), and 35 percent of these deaths are premature, that is, occurring in persons aged less than 70 years old. Cardiovascular diseases (CVDs), including heart attacks and strokes, continue to be the leading cause of death in almost all countries, accounting for 1.63 million deaths (37.5 percent) annually. Cancer is the second cause of death in the Americas, leading to 1.08 million deaths annually (24.8 percent); the most common types are lung, prostate, and colorectal cancer in men and lung, breast, and cervical cancer in women. Recent data indicate that an estimated 62 million people in the Americas have type 2 diabetes, and this condition accounts for around 270,000 deaths annually. Respiratory diseases lead to 372,000 deaths every year (PAHO 2012; PAHO 2016a).

There are several drivers of the NCD epidemic in the Americas. In common with many low- and middle-income nations, the countries of the Americas are undergoing demographic shifts associated with population aging, which affects social development and poses new challenges to health care systems.

Figure 1.1 Probability of a 30-Year-Old Individual Dying from One of the Four Main NCDs before His or Her 70th Birthday, in the Eight PAHO Subregions of the Americas in 2012
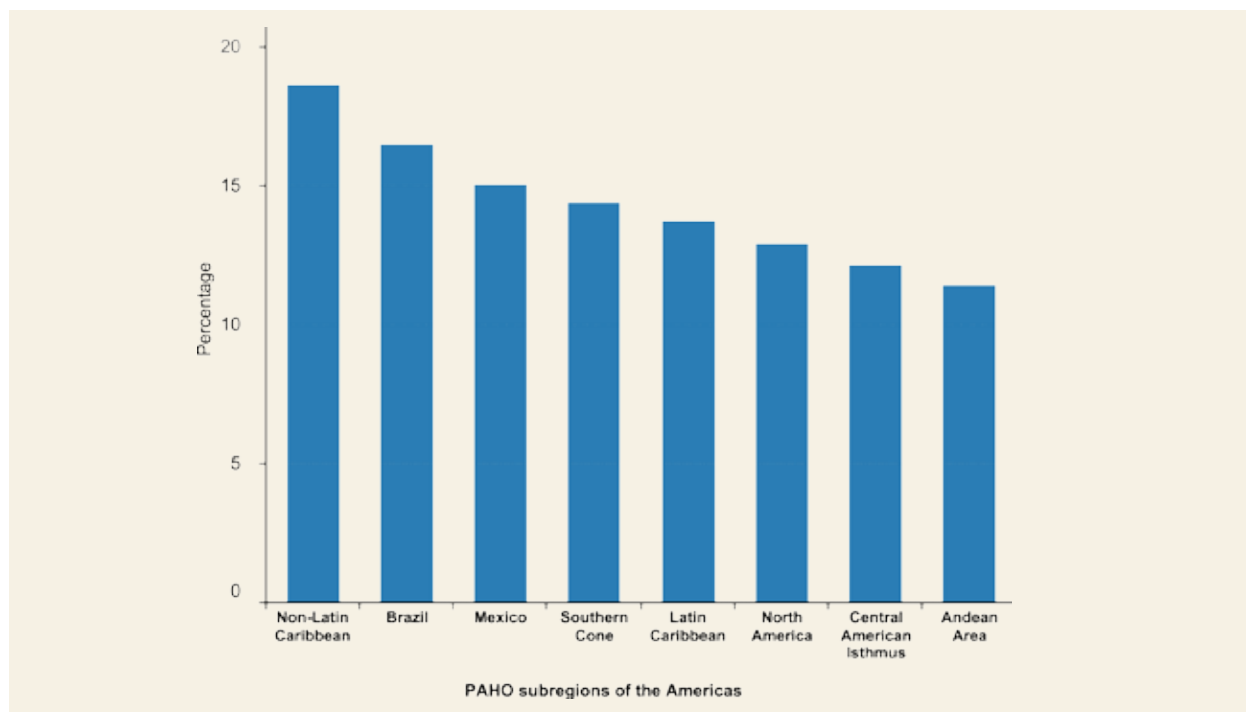
Source: Data are from PAHO (2016a).

Note: In this figure, the information for each subregion includes only its countries with data available for 2012. The eight PAHO subregions of the Americas and their countries are: (1) North America: Bermuda, United States of America; (2) Mexico; (3) Central American Isthmus: Belize, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama; (4) Latin Caribbean: Cuba, Dominican Republic, Puerto Rico; (5) Andean Area: Colombia, Ecuador, Peru, Venezuela (Bolivarian Republic of); (6) Brazil; (7) Non-Latin Caribbean: Anguilla, Antigua and Barbuda, Aruba, Bahamas, Barbados, Dominica, Grenada, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Virgin Islands (U.S.); (8) Southern Cone: Argentina, Chile, Paraguay, Uruguay.

An overview of population projections in the Americas over a 70-year period (1970 to 2040) shows a doubling of the overall population by 2040 (figure 1.2). The greatest increase will take place in the population aged 60+ years (a 5.5 fold increase) (UN 2015). It is therefore clear that the changing demographics will directly affect the health status of the Americas, and all countries need to respond urgently to the burden of NCDs.

Figure 1.2 Demographic Changes in the Population of the Americas, 1970–2040
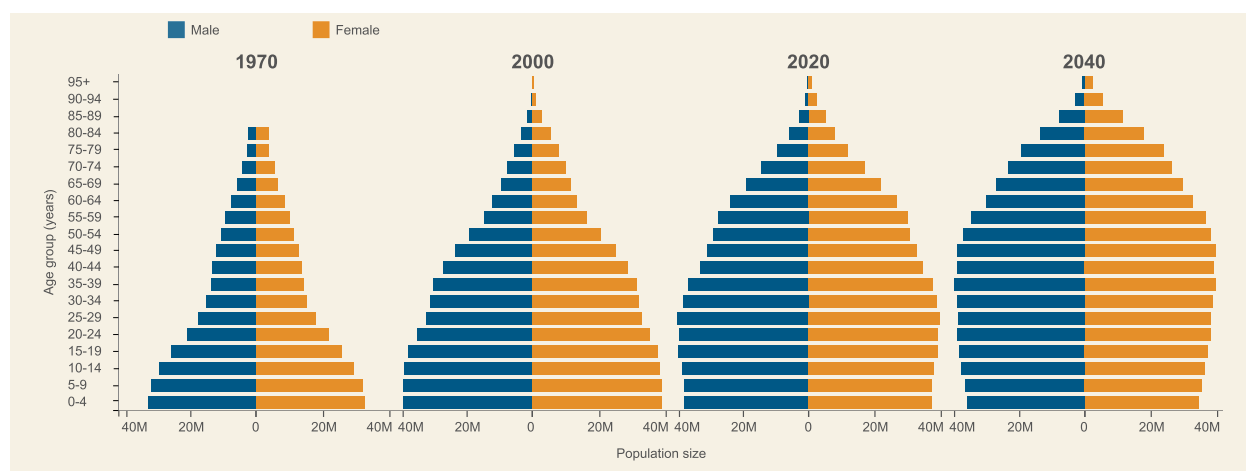
Source: Data are from UN (2015)

Social determinants of health, such as ethnicity, gender, education level, and socioeconomic status, are drivers that underpin NCDs, access to health, and health outcomes (Marmot 2004). The Western Hemisphere is probably the geopolitical area of the world with the greatest socioeconomic disparities. Child undernutrition is still widespread in countries such as Guatemala and Peru, where there is still a high prevalence of stunting (WHO 2014a). The cycle of poverty, undernutrition, illness, and limited opportunity is sustained in turn across generations. And even within wealthy countries such as the United States, there are clear differences in health and social outcomes among various White American subgroups as well as between White Americans and African-Americans and Hispanics (Hunt and Whitman 2014; O'Keefe and others 2015; Mochari-Greenberger and others 2014; Case and Deaton 2015).

The ecological association between life expectancy at birth and per capita GDP shows the heterogeneity within the Americas and highlights the particular challenges faced by nations such as Bolivia, Guyana, and Haiti, which have both the lowest life expectancy and the lowest per capita GDP (figure 1.3). At the other extreme are the higher life expectancies recorded by wealthy countries, such as the United States, Bermuda, and Canada. Overall life expectancy in the Americas is 76.7 years (79.5 years for women and 73.9 years for men) (World Bank 2015).

Figure 1.3 Life Expectancy at Birth and GDP Per Capita, Countries of the Americas, 2013
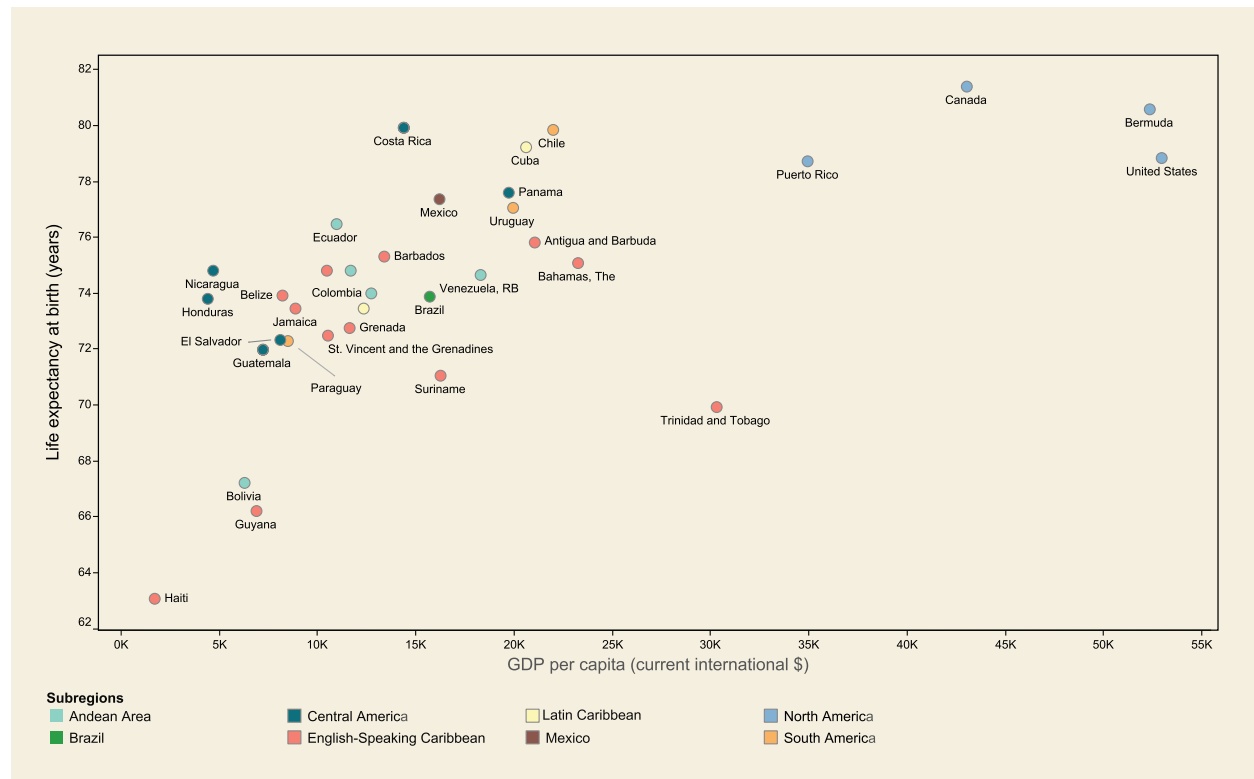
Source: Author's creation based on data from the World Bank (2015).

The epidemiologic transition taking place in the Americas is driven by various factors. These include rapid urbanization; dietary changes underpinned by shifts away from more traditional foods to increased consumption of processed food products; higher prevalences of physical inactivity within populations; and tobacco consumption and harmful use of alcohol (WHO 2010a; WHO 2014b).

In the Americas, 27.4 percent of women and 21.7 percent of men are obese. In 2013, there were an estimated 4 million overweight children aged less than 5 years in Latin America and the Caribbean. Of all the nations in the world, Mexico has the highest prevalence of overweight and obese individuals, followed by the United States (WHO 2010a). This situation in the Americas is compounded by the high prevalence of insufficient physical activity among adults, with 37.8 percent of women and 26.7 percent of men reporting insufficient physical activity (WHO 2010a; WHO 2014a). High obesity prevalence rates have been associated with higher intakes of both ultraprocessed foods rich in sugars, salts, and fats and of sugar-sweetened beverages. Data are now available that confirm the significant growth in annual sales per capita of ultraprocessed products in Latin American countries between 2000 and 2013. This pattern was mirrored by a trend toward increasing annual purchases per capita in fast-food outlets during this time period (Martins and others 2013; Monteiro and others 2011; Moubarac and others 2014; Mozaffarian and others 2011; PAHO 2015b).

INNOVATIVE RESPONSES

There have been innovative responses to the NCD health threats in the Americas. For example, to deal with the growing challenge of obesity in Mexico, the government introduced taxes on beverages with added sugar and on junk foods in January 2014. The country's National Institute of Public Health had projected that a 10-percent increase in the price of sugar-sweetened beverages would reduce consumption by around 10 percent and that this would translate into a 12-percent reduction in new cases of diabetes (Colchero and others 2016; PAHO 2015b). Researchers compared the predicted volumes of taxed and untaxed beverages purchased in January to December of 2014 (the post-tax period) with an estimate of the volumes that would have been purchased in the absence of the tax. In comparison to each month of 2012 and 2013, sales of sugary beverages fell an average of 6 percent in 2014, with the largest decline, 12 percent, during December 2014. The reduced consumption was seen across all socioeconomic groups, but it was greatest

among the low income, whose consumption had fallen 17 percent. At the same time, sales of bottled water increased (Colchero and others 2015).

Similarly, reductions in soda consumption have been seen in the city of Berkeley, California, in response to a soda tax introduced in November, 2014 (Falbe and others 2015). Two Caribbean countries, Barbados and Dominica, have also implemented soda taxes. While it is expected that soda consumption will decrease, the impact on obesity and diabetes will have to be assessed in the longer term. As expected, the beverage industry has robustly challenged these public policies.

Tobacco use, which is a principal risk factor for NCDs, continues to be a challenge in the Americas, with an estimated 127 million adult smokers. However, there has been demonstrable progress in implementing tobacco control interventions. Of the 35 countries in the Americas, 17 of them—representing 49 percent of the overall population—are protected by a national smoke-free law, that is, with smoking forbidden in public enclosed places, workplaces, and public transportation. A total of 16 countries—accounting for 58 percent of the overall population of the Americas—have pictorial health warnings on tobacco packages that cover 50% or more of the main display areas (PAHO 2016b).

Panama has applied various innovative measures to reduce tobacco use. The country raised tobacco taxes in 2009 and subsequently earmarked the resulting funds for key tobacco control actions, both at the national level and for activities that involve other countries in the Americas. These actions have not only helped to reduce tobacco consumption, but have also demonstrated Panama's leadership in fulfilling its commitment under Article 22 of the WHO Framework Convention on Tobacco Control (PAHO 2016).

Another response to NCDs is the front-of-package (FOP) nutrition labels that are easily interpretable at the point of purchase. They can alert consumers to products that are high in salt, sugars, saturated fats, trans fats, and total fats, and thus positively alter food purchasing behaviors (Mehta and others 2012).

In July 2012, the Chilean Senate approved the evidence-based National Law of Food Labeling and Advertising, which will go into effect in July 2016. The new law will require the use of FOP labels in the form of a traffic stop sign to indicate products that are high in sugars, saturated fats, sodium, and calories (Perez-Escamilla and others 2016). When these nutrients are present in amounts that exceed limits set by the Ministry of Health, the label must include the message "high in sugar" or "high in salt." Depending on the composition of the product, it can have up to four traffic stop signs.

THE ECONOMIC BURDEN OF NCDs

Despite innovative responses, the economic consequences of NCDs are continuing to increase in the Americas. Under a "business as usual" scenario, where intervention efforts remain static and rates of NCDs continue to increase as populations grow and age, cumulative losses to the global economy will reach $47 trillion in the two decades following 2010. Current estimates are that the cumulative economic losses to low- and middle-income countries (LMICs) from NCDs will surpass US$7 trillion over the 2011–2025 period (an average of nearly US$500 billion per year). This yearly loss is equivalent to approximately 4 percent of these countries' current annual economic output. On a per-person basis, the annual losses amount to an average of US$25 in low-income countries, US$50 in lower-middle-income countries, and US$139 in upper-middle-income countries (Bloom, Cafiero, Jané-Llopis, and others 2011). These losses will most certainly affect not only health and well-being, but also development.

The urgency of the NCD threat is progressively being recognized. The United States government is the largest funder of global health efforts, and NCDs are a major menace to the effectiveness of existing global health investments made by this country (CFR 2014). It is now clear that the "business as usual" model will not adequately address the global burden of NCDs. Health and education remain the pillars of development, but in a global economy still suffering from the challenges of a recession, these areas are even more than before been seen as "consumers" rather than "producers," exposing these ministries to budget cuts when national resources are constrained.

As PAHO assists nations throughout the Americas in their progress towards universal access and universal health coverage, it is clear that while countries have increased public financing for health, these expenditures still represent less than 5 percent of gross domestic product (GDP) (Dmytraczenko and Almeida 2015). Current evidence shows that when public expenditures for health are below a threshold of 5 to 6 percent of GDP, countries struggle to ensure access to health service coverage for the poor (WHO 2010b).

It is therefore critical that adequate public resources be invested so that universal health is provided as a social, political, and economic entitlement. Approximately 30 percent of the population of Latin America and the Caribbean lack access to health care for economic reasons, and 21 percent do not seek care because of geographical barriers. In addition, populations living in vulnerable conditions, the elderly, and patients with chronic or debilitating diseases are among those most affected by the deficiencies in health services (PAHO 2014b).

THE WAY FORWARD

Among the key responses to these NCD challenges are the "best buy" interventions developed by WHO. These cost-effective interventions are also high-impact and feasible for implementation even in resource-constrained settings. They include interventions related to tobacco control, harmful use of alcohol, diet and physical activity, cardiovascular disease, diabetes and cancer. The price tag for scaled-up implementation of a core set of NCD "best buy" intervention strategies is comparatively low when considered on a per-person basis. The annual investment would range from under US$1 in low-income countries (LICs) to US$3 in upper-middle-income countries (UMICs) (Bloom, Cafiero, Jané-Llopis, and others 2011; WEF 2011). For all the low- and middle-income countries (LMICs) together, the cost for population-based measures to reduce tobacco and harmful alcohol use, improve unhealthy diets, and decrease physical inactivity is estimated at US$2 billion per year, or less than US$0.40 per person annually. Adding individual-based "best buy" interventions, including counselling and drug therapy for cardiovascular disease plus measures to prevent cervical cancer, would bring the total annual cost to US$11.4 billion (WEF 2011).

In health terms, the return on this investment will be many millions of avoided premature deaths. In economic terms, the return will be many billions of dollars of additional output. For example, reducing the mortality rate for ischemic heart disease and stroke by 10 percent would reduce economic losses in LMICs by an estimated US$25 billion per year, which is three times greater than the investment needed for the measures to achieve these benefits (WEF 2011).

Policy makers, members of civil society, and business leaders all face the issue of how best to respond to the challenges posed by NCDs. There is evidence demonstrating not only the economic harm done by NCDs but also the costs and benefits related to addressing them.

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Section

2

SOCIOECONOMIC DIMENSIONS OF THE IMPACT OF NCDs

Branka Legetic, Section Editor
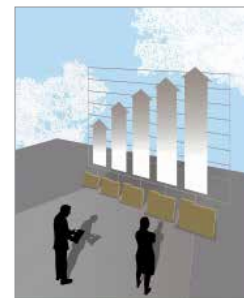
The Burden of Noncommunicable Diseases in the Americas and the Social Determinants of Health

Jose A. Escamilla-Cejudo, Antonio Sanhueza, and Branka Legetic

INTRODUCTION

The relationship between social determinants of health and noncommunicable diseases (NCDs) is still not completely understood. Noncommunicable diseases—mainly cardiovascular disease (CVD), diabetes mellitus, cancer, and chronic respiratory disease—are recognized as the leading causes of preventable disease, disability, and mortality (Alwan and Maclean 2009; Greenberg, Raymond, and Leeder 2011; Strong, Mathers, Leeder, and Beaglehole 2005). The social determinants of health (SDH) are those conditions in which people are born, grow up, live, work, and age, as well as the role of health systems in dealing with illness. These conditions are shaped by economic, social, and political circumstances (CSDH 2008). To better understand the relationship, it is necessary to expand the information collected routinely on mortality and morbidity statistics so as to include data on social determinants that are not difficult to encounter: geographic distribution, employment status, health insurance, and social strata within society. These data are collected in censuses and socioeconomic studies, but they are not broadly included in the reporting of health and mortality statistics.

In this paper we explore the association between SDH and NCDs in the Americas, using publicly available information from countries in the Americas.

METHODS

The paper presents an exploratory analysis of mortality and morbidity related to NCDs in the Americas, which had an approximate total population of 930 million in 2010. For this analysis, the term "NCDs" refers to four diseases: cardiovascular disease, diabetes mellitus, cancer, and chronic respiratory diseases.

The analysis was focused on proportional and premature mortality from NCDs among persons 30 to 69 years of age. The analysis was carried out at the regional level (all of the Americas), at the subregional level, and for selected countries.

For the morbidity analysis, we used indicators included in the WHO Global Burden of Disease (GBD) study and WHO GBD morbidity and disability estimates: disability-adjusted life years (DALYs) and the years of life lost (YLL).

The mortality data were gathered from the regional database on mortality hosted by the Pan American Health Organization (PAHO). That database compiles information from the national death registries on an annual basis from 48 countries and territories in the Americas.

The selection of countries to be used in the analysis was based on the availability and quality of mortality data in the countries. For that purpose, the following selection criteria were used: (a) the country had data on NCD

mortality for at least seven years of the study period of 2001 through 2011 and (b) the country had medium- to good-quality data, as assessed in 2010 by common PAHO health indicators for the Americas (PAHO 2014).

The final selection of countries for the mortality analysis included 23 countries for the overall regional comparison.

The subregional comparison (second level of inference) grouped countries into North America (United States of America and Canada); Mexico; Central America (Costa Rica, El Salvador, Guatemala, Nicaragua, Panama); Latin Caribbean (Cuba, Dominican Republic, Puerto Rico); Non-Latin Caribbean (Guyana, Suriname, Trinidad and Tobago); Andean Region (Colombia, Ecuador, Peru, Venezuela); Brazil; and Southern Cone (Argentina, Chile, Paraguay, Uruguay).

Crude and age-adjusted mortality rates were calculated using the direct method, with the WHO world population age structure as a standard. These rates were a base for assessing the average percent change in mortality over time. The changes were observed from year to year, instead of comparing just the initial and final rates in the series (corrected average annual percent change).

The morbidity analysis, based on GBD estimates of DALYs and YLL, includes six additional countries: Bahamas, Barbados, Belize, Bolivia, Haiti, Honduras,

and Jamaica. This makes a total of 29 countries used for morbidity analysis.

The method to include selected intermediate determinants of health (gender, income, development) (UNDP 2013) in the analysis was the following: stratifying countries according to the World Bank classification of countries (low-income, middle-income, and high-income), as well as by the Human Development Index (HDI) provided by the United Nations Development Programme (UNDP).

After that, the association that gender, income, and development had with mortality, morbidity, and DALYs and/or YLL was analyzed.

RESULTS

The Burden of Noncommunicable Disease

The countries of the Americas are facing an important epidemiological transition (Omran 1983), with increased proportions of deaths due to NCDs, while there are still deaths related to communicable diseases, maternity, accidents, and violent events. For the subregions of the Americas in 2012, the overall proportions of deaths

Figure 2.1 Proportional Mortality in the Americas, by Subregion, Both Sexes, 2012, using the GBD Broad Groups of Diseases
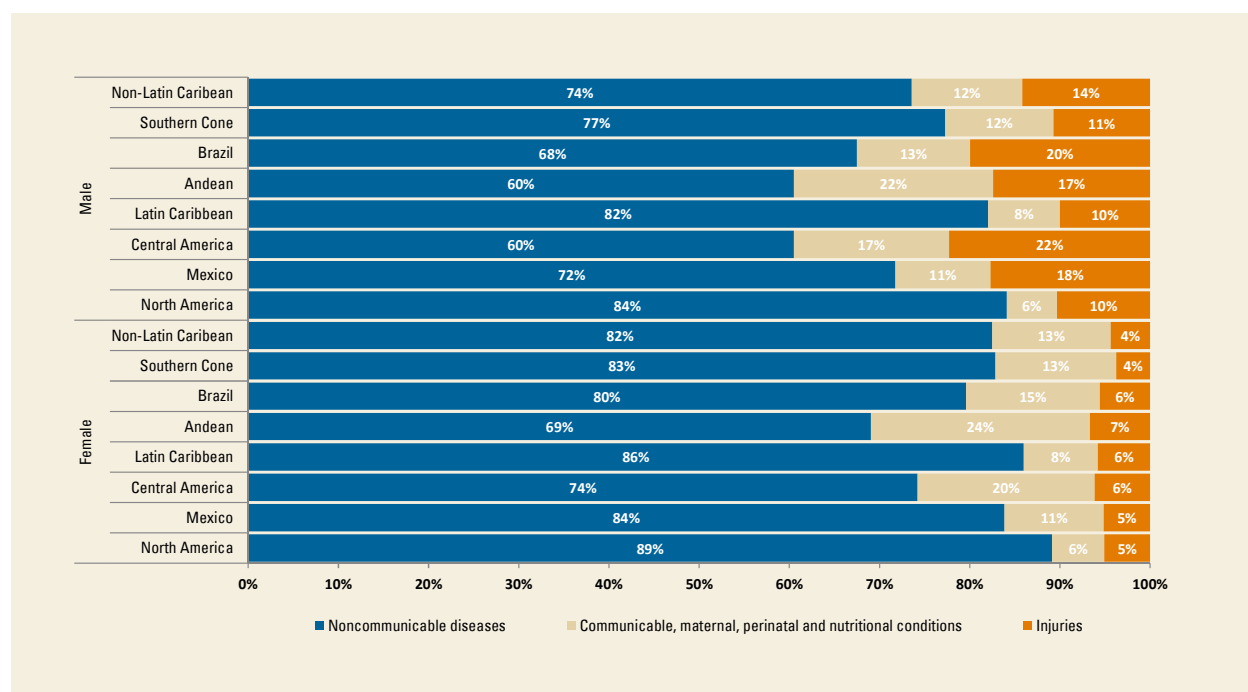
Source: Data are from the PAHO Regional Mortality Information System, 2013

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Table 2.1 Average Annual Percent Change in Premature Mortality from NCDs in Countries of the Americas, by Subregion, Country, and Sex, between 2001 and 2011

Subregion and country/-ies	Male	Female	Overall
North America			
Canada	–2.9	–2.2	–2.6
United States of America	–2.1	–2.2	–2.1
Mexico			
Mexico	0.1	–1.4	–0.7
Central America			
Costa Rica	–2.1	–2.9	–2.5
El Salvador	–0.2	–0.6	–0.5
Panama	–0.5	0.3	–0.2
Guatemala	0.2	0.9	0.6
Nicaragua	1.4	1.0	1.2
Latin Caribbean			
Cuba	–1.3	–1.9	–1.6
Puerto Rico	–1.3	–1.2	–1.4
Dominican Republic	1.4	0.0	0.7
Andean			
Colombia	–3.5	–4.0	–3.8
Ecuador	–1.6	–1.7	–1.7
Venezuela	–1.2	–1.7	–1.4
Peru	0.6	0.5	0.5
Brazil			
Brazil	–1.3	–1.1	–1.2
Southern Cone			
Chile	–2.0	–2.1	–2.0
Uruguay	–1.9	–1.7	–1.8
Argentina	–2.0	–1.0	–1.6
Paraguay	1.6	0.6	1.1
Non-Latin Caribbean			
Trinidad and Tobago	–3.9	–2.5	–3.4
Suriname	0.6	–1.3	–0.3
Guyana	4.2	1.8	2.8
Region overall	–0.8	–1.1	–0.9

Table 2.2 Average Annual Percent Change in Premature Mortality from Specific Diseases in the Americas between 2001 and 2011, by Subregion and Country

Subregion and country/-ies	Cancer	Cardiovascular	Diabetes	Respiratory
North America				
Canada	−2.1	−3.6	−2.6	−1.3
United States of America	−1.9	−2.7	−1.1	−0.6
Mexico				
Mexico	−1.3	−1.0	0.6	−2.4
Central America				
Costa Rica	−1.5	−2.9	−1.8	−4.8
El Salvador	−0.7	−1.0	4.8	−4.9
Panama	0.0	0.5	−0.6	−3.3
Guatemala	−0.9	−0.1	5.3	−2.0
Nicaragua	1.1	−0.8	6.4	2.1
Latin Caribbean				
Cuba	−0.1	−3.0	−0.2	−0.6
Puerto Rico	0.0	−3.3	1.0	−1.3
Dominican Republic	0.1	1.2	0.9	0.2
Andean				
Colombia	−2.4	−4.2	−6.2	−4.5
Ecuador	−0.7	−3.0	0.8	−4.5
Venezuela	−0.7	−2.0	−0.1	−3.2
Peru	1.0	−0.9	2.6	7.3
Brazil				
Brazil	0.1	−1.9	0.3	−3.2
Southern Cone				
Chile	−1.7	−2.4	−0.8	−2.5
Uruguay	−0.9	−3.2	−0.2	−0.5
Argentina	−0.9	−2.5	−2.6	0.6
Paraguay	−0.2	1.6	1.9	5.4
Non-Latin Caribbean				
Trinidad and Tobago	3.3	−5.9	−2.4	0.4
Suriname	2.1	−1.9	4.6	5.3
Guyana	2.5	3.0	4.7	3.3

(considering males and females together) from NCDs ranged between 60 percent and 89 percent, with some areas still having important proportions of mortality due to communicable diseases (figure 2.1).

The proportional mortality from NCDs tends to be higher among women, regardless of the subregion.

Our further analysis includes results presented for the four main NCDs together. We also assessed differences for each of the four diseases by subregion and country.

Table 2.1 presents the annual percentage change in premature mortality rates of all four diseases together. In general, the countries in the Americas have been experiencing declines for both men and women, with an annual average reduction of 0.9 percent (0.8 percent among men and 1.1 percent among women).

This same general pattern can be seen in such countries as Colombia (declines of 3.8 percent overall, 3.5 percent among men, and 4.0 percent among women); Trinidad and Tobago (declines of 3.8 percent overall, 3.9 percent among men, and 2.5 percent among and women); Canada (declines of 2.6 percent overall, 2.9 percent among men, and 2.2 percent among women); Costa Rica (declines of 2.5 percent overall, 2.1 percent among men, and 2.9 percent among women); and the United States (2.1 percent regardless of sex).

In contrast, five countries experienced increases in premature mortality. Guyana had the highest annual average rate increases (2.8 percent overall, 4.2 percent among men, and 1.8 percent among women). Other countries with increases included Nicaragua (1.2 percent overall, 1.4 percent among men, and 1.0 percent among women); Paraguay (1.1 percent overall, 1.6 among men and 0.6 among females); the Dominican Republic (0.7 percent overall, 1.4 percent among men, and 0.02 percent among women); and Guatemala (0.6 percent overall, 0.2 percent among men, and 0.9 percent among women).

Putting all the NCDs together makes it impossible to determine the burden from each specific disease. To

Figure 2.2 Disability-Adjusted Life Years (DALYs) due to NCDs in the Americas in 2000 and 2012, by Country
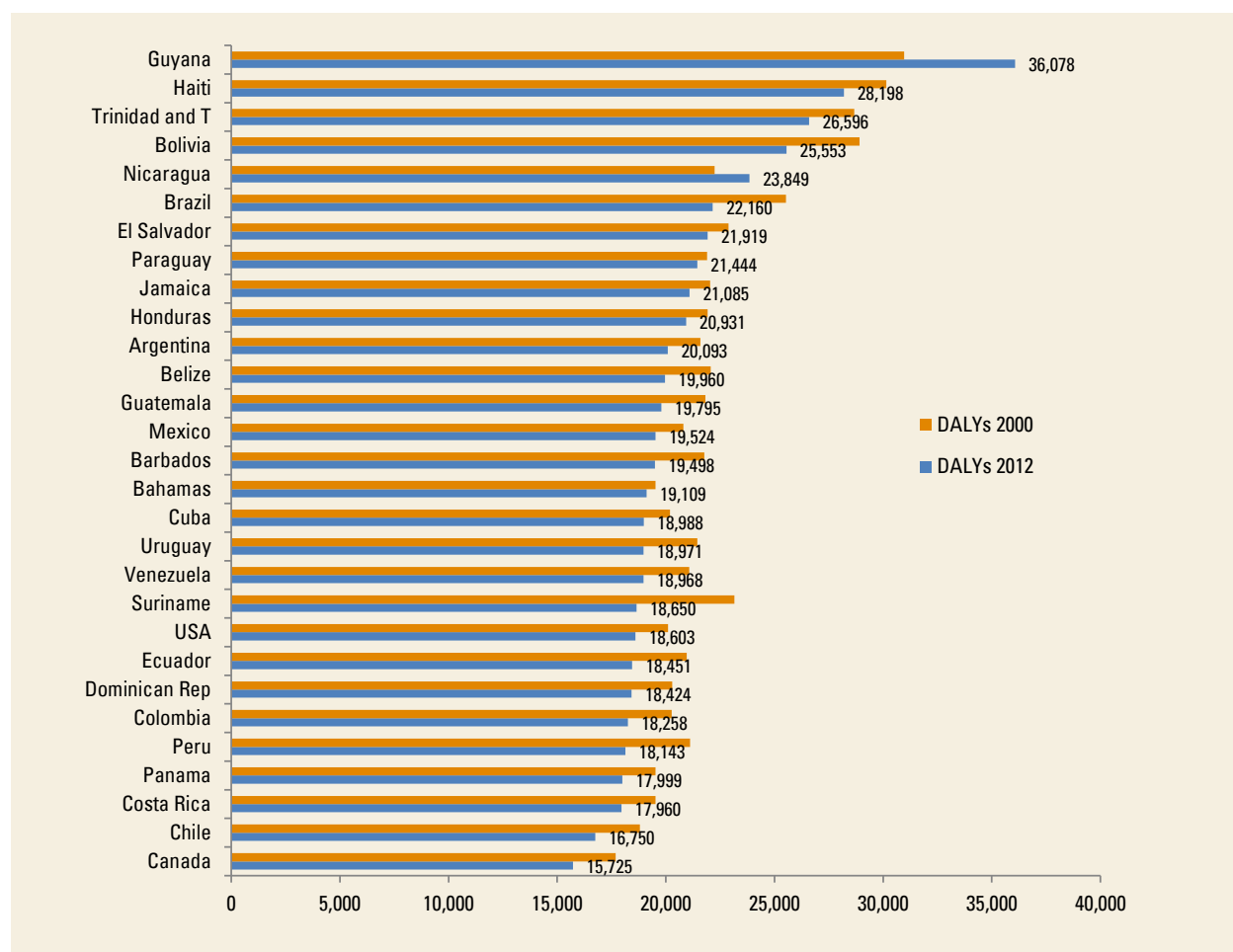
remedy that, we investigated the percentage change in premature mortality rates from cancer, cardiovascular, diabetes mellitus, and respiratory causes over a decade. Table 2.2 shows the average annual percent change between 2001 and 2011, by subregion and country.

From the data in table 2.2, some very different epidemiological patterns can be seen. One example is Peru, where premature mortality from NCDs overall decreased by 0.5 percent annually over the decade. However, there were noticeable average annual increases in premature mortality with some specific diseases: 7.3 percent for respiratory causes, 2.6 percent for diabetes mellitus, and 1.0 percent for cancer. The only group showing a percentage decrease, of 0.9 percent, was cardiovascular diseases.

Another example is Trinidad and Tobago, which, for the decade, had one of the largest decreases in premature mortality from NCDs overall, 3.4 percent. While average annual premature mortality fell for cardiovascular causes (decrease of 5.9 percent) and for diabetes (decrease of 2.4 percent), there were average annual increases for cancer (3.3 percent) and for respiratory causes (0.4 percent).

A premature-mortality measure provides an assessment of the potential role of determinants that predispose an individual to an early death. To extend our understanding of the impact of NCDs beyond mortality and assess the gap between NCDs and an ideal situation, where the entire population lives to an advanced age, free of disease and disability from NCDs (Mathers and Stevens 2013), we used such metrics as DALYs and YLL (http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/).

Figure 2.2 displays the age-standardized disability-adjusted life years (DALYs) per 100,000 population by country for 2000 and 2012. There are substantial differences among the countries. At the low end of the range are Canada (15,725 DALYs), Chile (16,750), Costa Rica (17,960), and Panama (17,999). At the high end are Nicaragua (23,849), Bolivia (25,553), Trinidad and Tobago (26,596), Haiti (28,198), and Guyana (36,078).

Socioeconomic Inequalities, Social Determinants of Health, and NCDs

Noncommunicable diseases are the most relevant group in terms of preventable disease, disability, and mortality. In 2012, NCDs were responsible for more than four million deaths in the Americas and an important proportion of premature deaths (36%). Globally, NCDs accounted for 54 percent of DALYs in 2010 (Murray and others 2012).

Reducing mortality from NCDs requires actions on structural conditions of daily life to curb increases in obesity and diabetes as well as on such NCD risk factors as physical inactivity, tobacco use, harmful use of alcohol, and salt consumption. The structural conditions of daily life (the circumstances in which people are born, grow up, live, work, and age, and the systems put in place to deal with illness) constitute the social determinants of health (SDH), and they are responsible for a major part of health inequities (CSDH 2008).

We compared the proportion of DALYs from NCDs in relation to the total DALYs in 2012 to the same proportion from the year 2000. To assess inequalities, we placed 29

Table 2.3 Percent Change in Proportion of DALYs from NCDs in Relation to the Total DALYs, in Countries of the Americas, by Gender. between 2000 and 2012, according to Country Income Groupings

GBD broad groups	Low- and middle-income countries			High-income countries		
	Total	Male	Female	Total	Male	Female
Communicable, maternal, perinatal, and nutritional conditions	−32.8	−32.5	−33.3	−3.6	−2.9	−4.2
Noncommunicable diseases	13.6	13.6	13.5	2.8	4.3	1.1
Injuries	6.6	7.7	4.1	−16.7	−18.9	−9.1
All causes	100.0	100.0	100.0	100.0	100.0	100.0

Table 2.4 Percent Change in Years of Life Lost in Countries of the Americas, between 2000 and 2012, by Gender, according to Country Income Groupings

GBD broad groups	Low- and middle-income countries			High-income countries		
	Total	Male	Female	Total	Male	Female
Communicable, maternal, perinatal, and nutritional conditions	−34.7	−35.1	−34.0	0.0	0.4	−0.5
Noncommunicable diseases	18.8	17.5	20.7	4.1	5.9	1.6
Injuries	10.6	11.0	6.0	−21.4	−22.7	−15.0
All causes	100.0	100.0	100.0	100.0	100.0	100.0

countries in one of two categories: (a) low- and middle-income countries (Haiti, El Salvador, Guyana, Paraguay, Guatemala, Bolivia, Honduras, Nicaragua, Venezuela, Panama, Argentina, Costa Rica, Suriname, Cuba, Brazil, Ecuador, Mexico, Belize, Dominican Republic, Jamaica, Peru, Colombia) and (b) high-income countries (Canada, United States of America, Uruguay, Trinidad and Tobago, Barbados, Chile, Bahamas). As shown in table 2.3, the proportional change in DALYs from NCDs between 2000 and 2012 for low- and middle-income countries (13.6 percent) was more than four times as high as it was for high-income countries (2.8 percent). When sex was considered, the change for NCDs was similar among males (13.6 percent) and females (13.5 percent) in the low- and middle-income strata. However, in the high-income nations, the rate of change in DALYs for males (4.3 percent) was almost four times as high as that for females (1.1 percent).

Similarly, we analyzed changes in the proportions of years of life lost (YLL) due to NCDs. Among the 29 countries, the increase between 2000 and 2012 in low- and middle-income countries (18.8 percent) was more than four times as high as the change in high-income countries (4.1 percent) (table 2.4). Women experienced a larger increase in the proportion of YLL due to NCDs in low- and middle-income countries (20.7 percent) as compared to males (17.5 percent), but in high-income countries, men experienced a larger rate of change (5.9 percent) than did women (1.6 percent).

In order to approximate an additional socioeconomic gradient variable, we used a second measure, the Human Development Index (HDI). The HDI is a composite index intended to measure average achievement in three dimensions of human development: a long and healthy life, knowledge (years of schooling), and a decent standard of living (UNDP 2014). In a linear statistical modeling for 29 countries, country-level DALYs for 2012 and HDI values for 1990 were correlated, considering as the dependent variable the 2012 DALYs. Given the nature of NCDs, HDI values from 1990 were used, assuming a 20-year time lag between the HDI and the DALYs from NCDs in 2012. An inverse statistically significant correlation was found ($r = -0.58$, $p < 0.05$): the higher the level of the Human Development Index, the lower the age-standardized DALYs rate.

Experience has been gained by using the ecological-contextual approach to understand the role of social and economic factors in the development of NCDs in the Americas. However, there is still a need for more data about individuals, such as gender, income, employment, and education. One example of educational attainment and employment status based on data comes from Argentina's National Risk Factor Survey, which used the Average/Deprivation/Inequality (ADI) framework (De Maio, Linetzky, and Virgolini 2009). From a group of social, economic, and demographic factors considered, low educational attainment had the strongest associations after adjustments for some selected confounding factors. There were higher chances of having unhealthy diet habits, higher prevalence of diabetes mellitus, and medium to low self-rated poor health. More recently, using data from the Global Adult Tobacco Survey in Argentina, De Maio and others (2015) found there was a higher chance of being a current smoker among adult males with lower levels of education. In Uruguay it was only statistically significant for males and females with less than primary education.

DISCUSSION

Several countries in the Americas have experienced declines in mortality from NCDs. When we analyzed premature mortality from NCDs together as a group, we found that Colombia had had the largest decrease in rates between 2001 and 2011. This change was consistent with declining mortality from all four groups of diseases (cancer, cardiovascular, diabetes, and respiratory). In contrast, Guyana had the largest percentage increase in premature mortality from NCDs, and this change was also consistent when the four groups of diseases were considered.

Grouping NCDs could hide different epidemiological patterns among countries, as we noted earlier for Peru and Trinidad and Tobago. Some important interventions might account for the downward trend in Colombia. In recent decades, Colombia has promoted health by encouraging physical activity through public transport improvement, with the ciclovia effort, and by discouraging tobacco consumption. (The ciclovia movement is a multisectoral, community-based program where motorized transport is temporarily excluded, allowing exclusive access for physical activities. It has had a favorable cost-benefit ratio in cities in Colombia, Mexico, and the United States (Montes and others 2012)). In Trinidad and Tobago the substantial decline in premature mortality from cardiovascular causes might be related to increased access to medicines (free of charge) and secondary and tertiary prevention measures targeting cardiovascular diseases, according to an unpublished PAHO report.

However, the impact of NCDs on premature mortality in the Americas is far from expected, especially in relation to the available technology and the level of development of health care systems. Perhaps even worse for the Americas, there are still countries with upward NCD mortality trends.

Looking beyond mortality, the Global Burden of Disease study, with measures of disability and years of life lost, shows the burden that nonfatal NCDs are placing on societies in the Americas. As has been predicted, the burden from NCDs is increasing. By 2030, deaths from ischemic heart disease, cerebrovascular disease, and chronic obstructive pulmonary disease are projected to be the leading causes of mortality globally (Mathers and Loncar 2006), with deaths due to noncommunicable disease expected to rise from 59% to 69% between 2002 and 2030.

NCD surveillance requires the collection and analysis of data to provide appropriate information regarding a country's NCD burden; the population groups at risk; estimates of NCD mortality and morbidity; risk factors; determinants; and the trends over time. We explored the possibilities offered by the PAHO mortality database for retrieving data to analyze SDH. However, in 2014, even though mortality coverage is improving throughout the Americas, only 16 of the 52 PAHO member countries and territories had mortality coverage over 80 percent (PAHO 2014). Although PAHO members provide data on some of the variables with potential for analysis, it is very difficult to compare those nations since their mortality records usually include little or no information on social position, education, occupation, income, gender, race, or ethnicity.

To assess the role of social determinants and socioeconomic inequalities on NCDs in the Americas, we worked hard to search for data beyond the national level, looking for available information at the level of the individual. However, data on living conditions are lacking (few countries perform these studies); even where available, data from national health surveys are not comparable between countries; and even within countries the study methodology tends to change.

In spite of these data limitations, we were able to advance our analysis by stratifying countries by income and by taking advantage of composite indicators such as the HDI and the mortality data available for the Americas by country, sex, and year (for trend analyses). We found important differences in DALY rates between low- and middle-income countries as compared to high-income countries. The former group has higher proportions of DALYs from NCDs, despite the common notion that NCDs are diseases of affluence, affecting mainly wealthy people (De Maio 2011).

Investigations in the Americas assessing the role of SDH and socioeconomic inequalities should continue, including the analyses that address the aggregated four NCDs (cardiovascular, cancer, diabetes, and respiratory diseases) as well as the four individual groups of diseases. Our results showed how aggregating NCD groupings tends to mask information that could be critical for policy and decision making.

CONCLUSIONS

While much more research is needed, knowledge of the role that SDH play in NCDs in the Americas is increasing. For example, we know that men tend to lose more years of life due to CVD because they develop the disease years before women do (Anand and others 2008; Kreatsoulas and Anand 2010). Also, in a study of cardiovascular diseases in Porto Alegre, Brazil, premature mortality from CVD was almost three times higher in poorer districts than in affluent ones (Bassanesi, Azambuja, and Achutti 2008). Higher education is also an important factor for

delaying the onset of NCDs. Low educational attainment has been associated with a higher prevalence of diabetes mellitus in Argentina (Fleischer, Diez Roux, Alazraqui, and Spinelli 2008) and with CVD in 52 high-, middle- and low-income countries in the INTERHEART study (Rosengren and others 2009).

At the level of intermediate social determinants of health, the role of health services is key to limiting biological risk factors. High blood pressure can be controlled by antihypertensive medicines (Flack, Novikov, and Ferrario 1996), and statins are highly effective in managing cholesterol (Baigent and others 2010). Nevertheless, patients can also face social and economic barriers to health care access even in countries where universal health care supposedly prevails (Banks, Marmot, Oldfield, and Smith 2006; Marmot 2006).

Obesity, which is an intermediate social determinant of NCDs, is a major risk factor for CVD and diabetes. In recent decades the prevalence of obesity has been rising (Lim and others 2012), especially in low- and middle-income countries (Swinburn and others 2011). With the nutrition transition, it is expected that as nations develop economically and undergo urbanization, unhealthy diets and physical inactivity will become increasingly prevalent among lower socioeconomic groups but less prevalent among higher socioeconomic groups (Popkin 1994; Popkin 2015). However, evidence suggests that in lower-income countries, obesity also tends to affect those with higher incomes or education. For example, among women from 37 countries, obesity was more prevalent among more educated women in low-income countries but lower among more educated women in upper-middle-income countries (Monteiro, Conde, Lu, and Popkin 2004). Another study shows a positive association between income and overweight/obesity among women (Subramanian, Perkins, Özaltin, and Davey Smith 2011).

Finally, macro-level socioeconomic, political, and cultural factors; policy choices; and contexts are all structural determinants of health. This can be seen in the case of NCDs and the trade liberalization and foreign direct investment in Mexico under the North American Free Trade Agreement (NAFTA). Since coming into force among the United States of America, Canada, and Mexico in 1994, NAFTA has contributed to the nutrition transition in Mexico, as assessed by data on total energy intake among Mexicans before and after the accord was negotiated. Between 1988 and 1999, the percentage of total energy intake from fat among Mexicans increased from 23.5 percent to 30.3 percent. Purchases of refined carbohydrates rose by 37.2 percent, mainly in the wealthier north of Mexico and in Mexico City. Mexico's prevalence of diabetes mellitus is now high, with substantial costs for health care (Barceló, Aedo, Rajpathak, and Robles 2003; Hawkes 2006).

We faced important limitations related to the availability of data to fully assess the role of social determinants of health and their impact on NCDs. Despite that, we were able to evaluate the associations between NCDs and available proxies for the SDH, such as the Human Development Index and socioeconomic status. NCDs are a major factor in health around the world. There is a real epidemic, with a particularly overwhelming impact on vulnerable populations. The roots of this situation go beyond the individual. Responding to the NCD epidemic will require multisectoral efforts to tackle the underlying and interacting social determinants, and the health sector should take the lead in these efforts.

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Article 3
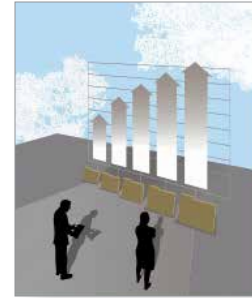
Risk Factors in the Americas: The Sources of the Burden

Adriana Blanco, Enrique Jacoby, Maristela Monteiro, Roberta Caixeta,
Blake Smith, Ruben Grajeda, and Carlos Santos-Burgoa

INTRODUCTION

Four totally modifiable risk factors underlie the occurrence of more than two-thirds of all new cases of noncommunicable diseases (NCDs) throughout the world: unhealthy diet (including ultraprocessed food products high in salt, saturated fats, trans fats, and sugars), tobacco use, harmful use of alcohol, and physical inactivity (Beaglehole and others 2011). In turn, these four risk factors lead to key metabolic/physiological changes that contribute to the development of NCDs: raised blood pressure, overweight/obesity, hyperglycemia, and hyperlipidemia (WHO 2010a).

The economic and social conditions under which people live can increase or decrease the occurrence of these risk factors. These conditions include government policies, urban planning and design, and trade, fiscal, and market policies. Other influences on inequities in vulnerability and exposure to certain risk factors include the stages of life, gender roles, race, and culture.

In this chapter we will address the specific characteristics of the four risk factors in the Americas, discuss the associated conditions, and provide a perspective on controlling the risk factors in order to prevent NCDs.

SITUATION OF RISK FACTORS IN THE AMERICAS

Tobacco

Tobacco use and exposure to secondhand smoke continue to be among the main specific causes of preventable mortality, morbidity, and disability throughout the world, and are responsible for 12 percent of all deaths of adults over 30 years of age. In the Americas, this proportion is even higher than the world average, accounting for 16 percent of adult deaths (WHO 2012).

Tobacco consumption and exposure to secondhand smoke annually kill almost 6 million people in the world, including about 1 million in the Americas. If current trends continue, by 2030, tobacco will kill more than 8 million people around the world every year. Of these deaths, 80 percent will occur in low- and middle-income countries (Mathers and Loncar 2006; Öberg and others 2011).

Of the world's 1.1 billion smokers, 82 percent of them live in low- and middle-income countries. Tobacco use disproportionately affects males and lower socioeconomic groups within countries at all income levels, and that use is increasingly prevalent in poorer parts of the world (figure 3.1). Poor households in low-income countries carry a

particularly heavy burden from tobacco use, with significant health, educational, housing, and economic opportunity costs. Negative social gradients in tobacco use translate into substantial negative gradients in relation to premature death and disease (WHO 2010b).

Figure 3.1 Age-Standardized Prevalence of Current Tobacco Smoking in Persons Aged 15 Years Old and Over, by WHO Region and World Bank Income Group, Comparable Estimates, 2012
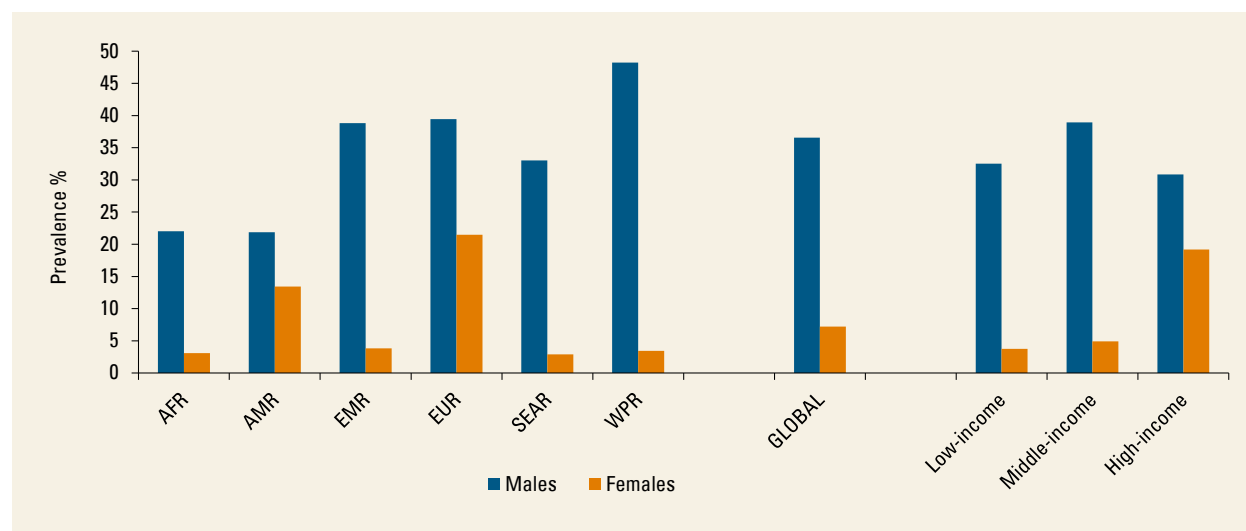
Source: WHO 2014a.

Note: AFR = African Region; AMR = Region of the Americas; SEAR = South East Asia Region; EUR = European Region; EMR = Eastern Mediterranean Region; WPR = Western Pacific Region.

The Americas has a smoking rate of 17.1 percent, and with just a small difference in prevalence rates between adult women and men. The age-standardized prevalence of smoking among adults varies widely among countries, from approximately 40 percent in Chile to around 7 percent in Panama and Barbados (WHO 2015a).

A systematic review of the link between tobacco and poverty revealed a robust trend for higher prevalence of any tobacco consumption in the most economically deprived stratum (WHO 2011). An inverse relationship between socioeconomic status and illness and mortality was also evidenced, with an association between tobacco-related illnesses and low income level, especially for all-cause mortality, lung cancer, coronary disease, and low birthweight for gestational age.

Insufficient physical activity

Insufficient physical activity is one of the 10 leading risk factors for global mortality, morbidity, and reduced quality of life, causing some 3.2 million deaths each year. In 2010, it was responsible for 69.3 million disability-adjusted life-years (DALYs), or 2.8 percent of the worldwide total (WHO 2014a).

Adults who are insufficiently physically active have a 20- to 30-percent increased risk of all-cause mortality

compared to those who do at least 150 minutes of moderate-intensity physical activity per week, or the equivalent, as is recommended by the World Health Organization (WHO). The Americas is one of the WHO regions with the highest levels of insufficient physical activity among adults (WHO 2014a).

Physical activity has been customarily measured in relation to practicing a sport or doing structured exercise. Nevertheless, countries with high levels of sport participation rarely reach levels above 30 percent of people who are considered "physically active." However, in recent years, after the development of the International Physical Activity Questionnaire (IPAQ), it has become possible to ascertain the contribution made to physical activity by the domestic, work, and, increasingly, "active transportation" domains (Hagströmer, Oja, and Sjöström 2006). The last of these is noteworthy since walking is the most popular physical activity worldwide. Walking can be enhanced considerably if there is an enabling and friendly urban environment that includes well-designed sidewalks, more open spaces for people, secure streets, and enforcement of vehicle speed limits (City of New York City 2010).

The prevalence of insufficient physical activity rises with country income. High-income nations have more than double the prevalence of insufficient physical

activity as compared to low-income countries, for both men and women (figure 3.2). These patterns may be associated with higher levels of activity related to work and transportation in the low- and lower-middle-income countries (WHO 2014a). In addition, recent data show a prevalence of insufficient physical activity in the Americas that ranges from 13.3 percent in Guatemala to 63.6 percent in Colombia (WHO 2015b).

Unhealthy diet, overweight, and obesity

Economic development is normally accompanied by improvements in a country's food supply, thus advancing the population's overall nutritional status. At the same time, economic development brings qualitative changes in the production, processing, distribution, and marketing of food. In Latin America, there is evidence of the increasing availability of calories, fat, and animal products, but with smaller increases in the supply of vegetable products (WHO 2003).

The prevalence of obesity and overweight in the Americas is the highest among all five WHO regions (WHO 2014a). In the Americas, over 60 percent of adults of both sexes are overweight, and 25 percent are obese. The countries most seriously affected by this epidemic of overweight are the United States of America, Mexico, and Chile. In those three nations, some 7 of every 10 adults carry excess body weight and bear the ill-health

consequences. There are similar concerns about younger persons in Latin America. In 2013, it was estimated that between 42.5 and 51.8 million children aged 0–19 years were affected, that is, about 20 to 25 percent of the population. The combined prevalence of overweight and obesity in both boys and girls in recent (since 2009) surveys were 33.5 percent in Brazil, 18.9 percent in Colombia, and 34.5 percent in Mexico (Rivera and others 2013)

The marketing and management services company Nielsen found in a worldwide survey that in the Americas, 50 to 60 percent of respondents who consumed ultraprocessed snacks during the preceding month did so as a meal replacement, suggesting a displacement of traditional foods and even cooking at home. In their 2014 global report, which was titled "Snack Attack," Nielsen affirmed that this phenomenon was similar across continents (Nielsen Co. 2014).

Scientific knowledge on obesity today is in fact quite robust. This is particularly true in connection to the influence of a dietary pattern characterized by routine consumption of energy-high and nutrient-poor foods, or ultraprocessed foods, which is clearly and consistently linked to the development of obesity and other NCDs (PAHO 2014; WHO 2003). From a policy perspective, the overall evidence supports the need to protect and promote the consumption of whole and minimally processed foods, which are the mainstay of traditional cuisines, widely popular, and celebrated in the Americas. This is

Figure 3.2 Age-Standardized Prevalence of Insufficient Physical Activity in Persons Aged 18 Years Old and Over, by WHO Region and World Bank Income Group, Comparable Estimates, 2010
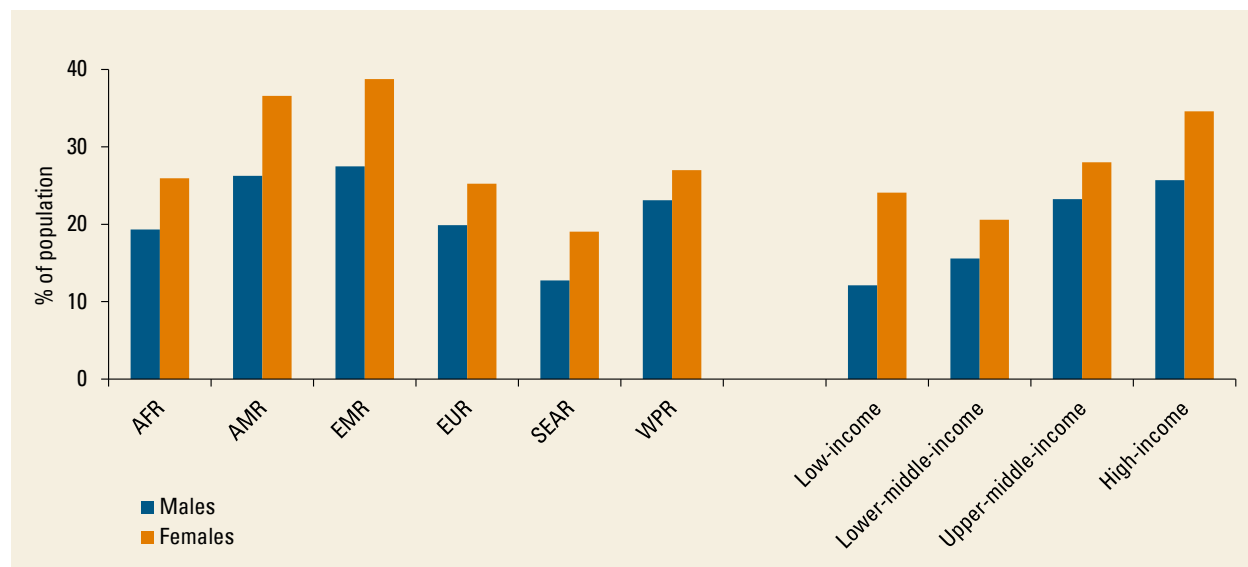
Source: WHO 2014a.

Note: AFR = African Region; SEAR = South East Asia Region; EMR = Eastern Mediterranean Region; EUR = European Region; AMR = Region of the Americas; WPR = Western Pacific Region.

a cultural and social value worth preserving not only because of its inherent health benefits but also because of its favorable economic, social, and environmental effects (PAHO 2015a).

In the Americas, whole or minimally processed foods are being displaced and replaced by ultraprocessed products (UPPs), commonly known as "junk food." The market for snacks and sodas in Latin America in the last decade grew at a pace 15 times greater than in North America. In 2013 alone, the Latin American market for sodas totaled US$80 billion, topping North American sales by US$6 billion (PAHO 2015a).

UPPs are rapidly becoming the main source of calories in several countries in the Americas. Over a two-decade period in Brazil (1987 to 2008), UPPs increased their contribution to families' energy intake from 19 to 32 percent (Monteiro and others 2011). In Chile, over the same period of time as Brazil, the contribution of UPPs to energy went from 42 percent to 57 percent (Crovetto and Uauy 2012). In Mexico, products with high content of added sugars or saturated fat accounted for about 25 percent of total energy intake in the population in 2014 (Pedraza and others 2014). High-income countries in the Americas, such as Canada, have 55 percent of their average family energy consumption coming from UPPs.

It should not be a surprise that the aforementioned changes are significantly associated with important increases in the population's average body mass index (BMI) (kg/m^2) and also their obesity rates. A recent study on obesity and UPP consumption in several Latin American countries indicated that increases in sales of UPPs are strongly, positively, and significantly associated with changes in BMI, after adjustment for population size, urban population, and national income. This study found that each 20-unit increase in average annual sales per capita of ultraprocessed products was associated with an increase of 0.28 kg/m^2 in age-standardized BMI scores (PAHO 2015a).

Harmful use of alcohol

Harmful use of alcohol increases the risk of developing NCDs; reproductive, mental, and behavioral disorders, including alcohol dependence; and unintentional and intentional injuries, such as those due to road traffic accidents and to violence (WHO 2014a). In 2012 it was estimated that 3.3 million deaths, or 5.9 percent of all deaths worldwide, were attributable to alcohol consumption. More than half of these deaths occurred as a result of NCDs. An estimated 5.1 percent of the global burden of disease—as measured in DALYs—is ascribed to alcohol consumption (WHO 2014a).

In the Americas in 2012, over 330,000 deaths were attributed to alcohol, with 59 percent of those deaths coming from such NCDs as liver cirrhosis, cancers, strokes, and mental disorders. Harmful use of alcohol is also one of the leading risk factors for the burden of disease in the Americas, and NCDs make up the majority (63 percent) of alcohol-related DALYs (PAHO 2015b).

At about 8.4 liters per year in 2012, the average per capita consumption of pure alcohol in the Americas is 30 percent higher than the global average (WHO 2014b). The pattern of drinking in the Americas is relatively high-risk; over one in five drinkers engage in heavy episodic drinking at least once a month. Men drink more often and in higher quantities on average and with a higher frequency of heavy episodic drinking than do women in almost all countries in the Americas, and young people drink more than do older persons.

Alcohol consumption is positively associated with economic development, as people have more access to alcoholic beverages and more income to spend on them (PAHO 2007b). Nevertheless, how alcohol consumption translates into disease is not straightforward. For a few conditions (particularly ischemic heart disease and diabetes) among certain age groups, a small amount of alcohol consumption without episodes of excessive drinking can have beneficial effects on the course of those conditions and, at an aggregate level, reduce mortality. However, any amount of alcohol consumption increases the risk of several forms of cancer, and there is also no threshold for hypertension.

Overall, the health effects of alcohol consumption in every society are negative, as any positive effects are greatly outweighed by the negative outcomes (Friesema and others 2008). There is no evidence that drinking small amounts of alcohol starting early (young adulthood) would prevent NCDs in the future. Instead, there is substantial evidence that early initiation into drinking increases the risk of both developing alcohol use disorders as well as heavy episodic drinking among youth, which in turn are a significant risk for acute injuries and early death (WHO 2014b). Holding constant population size and the amount consumed per person, alcohol leads to a greater burden of disease in lower-income countries. Figure 3.3 illustrates the role of alcohol in inequities, comparing the DALYs attributable to alcohol (based on average levels of consumption in 2012) between countries of different income levels.

For the same level of per capita consumption, margi-nalized groups and countries with lower levels of socioeconomic development suffer more relative harm from alcohol. This is possibly due to lack of access to health services, education, and public safety (Room 2004).

Figure 3.3 Alcohol-Attributable DALYs per 100,000 Inhabitants per Liter of Alcohol Consumed per Capita, by Country Income Level, the Americas, 2012
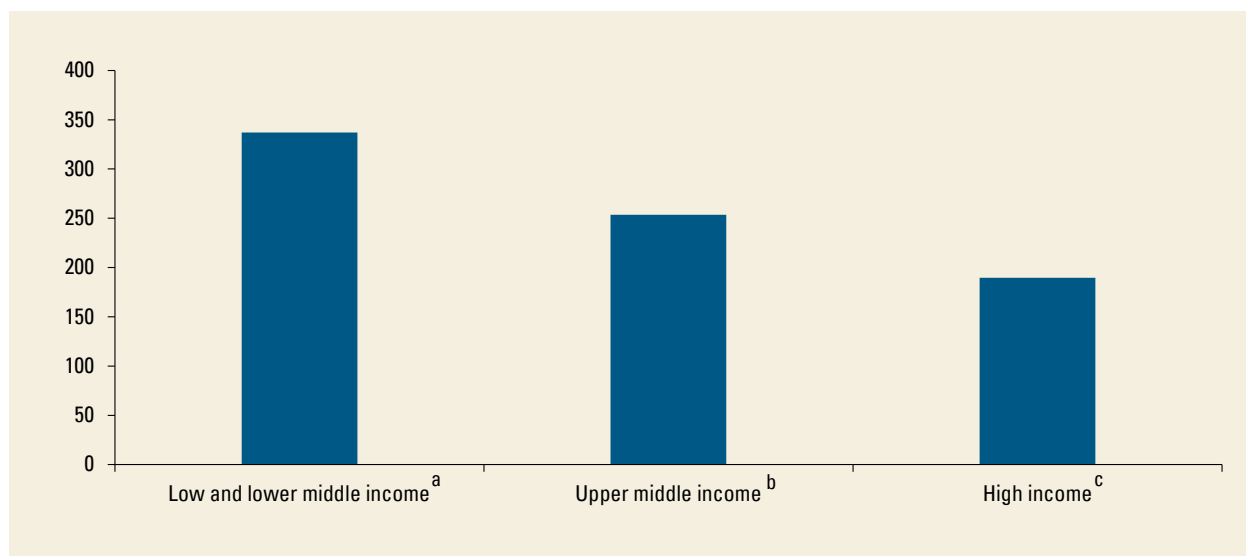
Source: Centre for Addiction and Mental Health 2014.

a. Low- and lower-middle-income countries: Belize, Bolivia, El Salvador, Guatemala, Guyana, Haiti, Honduras, Nicaragua, Paraguay.
b. Upper-middle-income countries: Antigua and Barbuda, Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, Grenada, Jamaica, Mexico, Panama, Peru, St. Kitts and Nevis, St. Lucia, St. Vincent and the Grenadines, Suriname, Uruguay, Venezuela.
c. High-income countries: The Bahamas, Barbados, Canada, Trinidad and Tobago, United States of America.

DISCUSSION

In the Americas, the economic and social conditions under which people live can increase or decrease the four major risk factors described above. These risk factors are "societal risk conditions," rather than individual factors. Government policies (or the lack of them) can either improve or worsen health and health equity. For example, urban planning that leads to limited affordable housing; unsafe, unwalkable sidewalks; unaffordable public transportation; and lack of amenities will not facilitate physical activity. Similarly, encouraging unregulated production, trade, and consumption may promote goods high in fats and sugars, as well as alcohol and tobacco, thus doing little to foster healthy lifestyles. Good public policy can provide widespread health benefits immediately and in the future (CSDH 2008).

Three of the main risk factors for NCDs discussed above are closely influenced by market practices. There are points of tension between public health and trade. For example, the general benefits of liberal trade policies, such as greater competition (usually involving more marketing) and lower prices can generate negative health consequences (McGrady 2011). Studies have shown that trade liberalization may stimulate the demand for tobacco and that increased levels of foreign direct investment would

lead to increased consumption of cigarettes, alcohol, and ultraprocessed food products (Chaloupka and Laixuthai 2011; Stuckler and others 2012). In countries that received major tobacco industry investment, consumption rose by approximately 56 percent, while nations that did not receive such investment saw a 1-percent drop in consumption (Gilmore and McKee 2005). When national governments adopt market deregulation policies and fiscal measures that favor multinationals, the production, sales, and consumption of UPPs tend to increase. The annual retail sales per capita of UPPs, as a function of market deregulation, were analyzed for 74 countries in 2013. As shown in figure 3.4, a positive correlation was found between market deregulation and the per-capita sales of ultraprocessed products (in kilograms). This indicates that the greater the degree of deregulation, the higher the sales of those ultraprocessed products (PAHO 2015a).

Several studies also show empirical evidence of the relationship between trade liberalization and harmful use of alcohol, so trade liberalization may have similar effects in the alcohol sector as in the tobacco and ultraprocessed food products sectors (Baker, Kay, and Walls 2014; Grieshaber-Otto, Sinclair, and Schacter 2000; McGrady 2011).

There are also stages of life where inequities in vulnerability and exposure to certain risk factors are most evident. Targeted tobacco and alcohol marketing and

Figure 3.4 Annual Retail Sales per Capita of Ultraprocessed Food and Drink Products as a Function of Market Deregulation in 74 Countries, 2013

$y = 4.27x - 158.51$
$R^2 = 0.48$
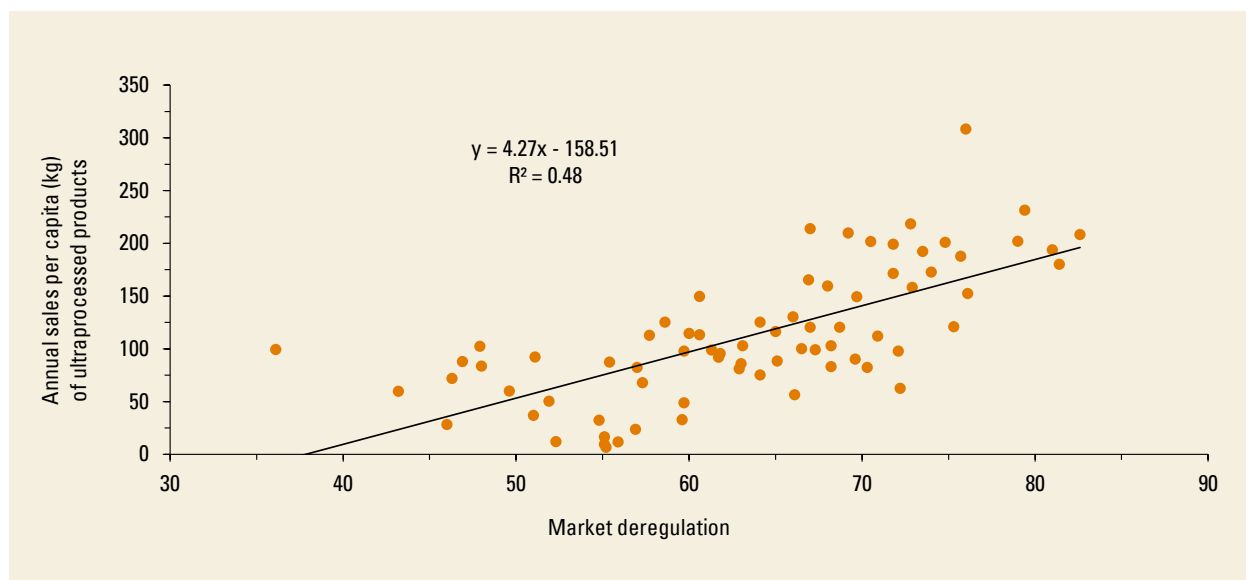
Source: PAHO 2015a

Note: Ultraprocessed products here include carbonated soft drinks, sweet and savory snacks, breakfast cereals, confectionery (candy), ice cream, biscuits (cookies), fruit and vegetable juices, sports and energy drinks, ready-to-drink tea or coffee, spreads, sauces, and ready meals. Quantity in liters is converted into kilograms. Sales data are from the Euromonitor Passport Database (Euromonitor International 2014). The market deregulation value for each country is the one given for it in the Index of Economic Freedom, an annual guide published by the Heritage Foundation and the Wall Street Journal (Miller and Holmes 2009).

permissive social norms leading to use during adolescence and young adulthood pose long-term, disproportionate levels of exposure to the risk. This vulnerability is even greater for younger persons who belong to lower socioeconomic groups (WHO 2010b).

The disaggregated analysis of the prevalence of NCD risk factors in low- and middle-income countries has demonstrated different patterns and varying degrees of socioeconomic inequalities across those settings. For example, smoking and low fruit and vegetable consumption are significantly higher among lower socioeconomic groups (Hosseinpoor and others 2012). While there is less of a correlation between heavy drinking and socioeconomic status, evidence has shown that the socioeconomically disadvantaged experience more harm per liter of alcohol consumed than their wealthier counterparts do (Room 2014).

There is a need to consider how race, culture, and socially constructed gender roles may affect women's and men's risks for NCDs. Women, indigenous peoples, and Afro-descendant populations comprise the majority of the poor in the Americas, and those persons are disproportionally affected by NCDs. Culturally related patterns and practices of food consumption may also influence the incidence and progression of NCDs.

Gender roles and cultural biases also determine the effectiveness of NCD responses. Women have higher rates of heart attack complications and more associated deaths (Women's Heart Foundation 2011).

Afro-descendant populations do not receive timely treatment for and suffer higher rates of death from heart attack than do other racial groups (Jolly and others 2010). Diabetes has important contributions from genetic variants, and it is well documented that diabetes is higher in Latino and Canadian indigenous populations than in other groups (Ghosh and Gomes 2011; SIGMA Type 2 Diabetes Consortium 2014).

CONCLUSIONS

In the Americas, the modifiable risk factors leading to NCDs show a high, and, for some of them, increasing prevalence. Conditions such as overweight and obesity are affecting children and young adults, foretelling further burden of disease. All of these risk factors are the result of economic and development policies that do not protect public health and safety and that involve strong marketing and trade forces. Regulating such factors is within the reach of health authorities where there is political will

and governments consider public health critical for development. Clearly, changes in the policy environment can facilitate the adoption of healthier lifestyles.

If not stopped and reversed, these trends will lead to continued increases in the incidence of disease and to more challenging treatment for patients. That, in turn, will produce more premature mortality and higher health care costs. These trends will have the largest impact on the most vulnerable populations, engendering even greater health inequities.

We know there are effective interventions that can modify the determinants leading to these trends. In the case of tobacco, an international legally binding treaty, the Framework Convention on Tobacco Control, provides scientifically proven, efficient measures to curb the tobacco epidemic. Applying similar reasoning, such measures as marketing restrictions and increased taxes are beginning to be applied to other risk factors as well. Recently, the Health Council of the Union of South American Nations (Unión de Naciones Suramericanas, or UNASUR) has initiated discussions on the need for a food framework convention (Presidencia de la República Oriental del Uruguay 2015). There is a need for research on the impact of different levels of exposure to risk factors and on interventions to address the risk factors in different age, sex, cultural, and socioeconomic groups. Such research should be complemented by the much-needed strengthening of surveillance systems in order to monitor the causal factors of the NCD epidemic. These efforts will produce a fuller picture of the drivers of health and social inequities as related to NCDs, and will hopefully also lead to policy changes at the global, regional, and national levels.

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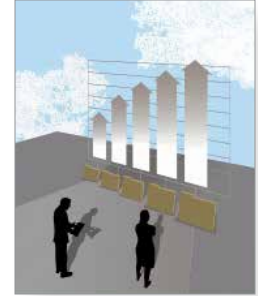
The Social Determinants of NCDs

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INTRODUCTION

During the past two decades, the Latin American and Caribbean (LAC) region has experienced a period of unprecedented economic growth and political stability. At the same time, the region has made great progress in attaining the United Nation's Millennium Development Goals (MDGs). However, the LAC region also continues to be one of the most unequal in the world in terms of income distribution, and economic and health improvements have not been equitably distributed among the population. This is reflected in the intercountry variability in the epidemiologic transition and the coexistence of a high burden of both communicable diseases and noncommunicable diseases (NCDs). NCDs have overtaken other causes of morbidity and mortality to become the primary threat to the health and well-being of the area's population. The Strategy for the Prevention and Control of Noncommunicable Diseases of the Pan American Health Organization (PAHO) acknowledges that three out of every four deaths can be attributed to chronic disease (PAHO 2012b). There are an estimated 726,000 deaths annually from cardiovascular disease (CVD), 436,000 deaths from malignant neoplasms, 181,000 deaths as a result of diabetes, and 159,000 deaths from chronic respiratory diseases (PAHO 2014a). The

resulting economic consequences are staggering. In just four countries within the LAC region during the 2006–2015 period, it was projected that there would be a US$13.5-billion reduction in the gross domestic product (GDP) due to NCDs, largely resulting from lost productivity and the necessary treatment costs (Abegunde and others 2007). The goods and services needed to treat just one of the prominent chronic conditions, diabetes, cost the region US$65 billion in the year 2000 alone (Barcelo and others 2003).

Addressing NCD health challenges of this magnitude will require a comprehensive framework for action at the regional, national, and local levels. There have been several major policy documents and political declarations that acknowledge that factors influencing health and well-being often lie outside the health sector, and thus there is a need for a multisectoral response to NCDs (World Conference on Social Determinants of Health 2011; WHO 2014). The environmental, transportation, agricultural, and other sectors play a central role in determining the health of a population, and they are represented by actors in both the public and private sectors. All of these sectors will need to be involved in developing, implementing, and evaluating policies aimed at both preventing and controlling the negative health and economic impact of chronic diseases.

THE SOCIAL DETERMINANTS OF HEALTH

Negative health consequences that are preventable and are rooted in socioeconomic inequalities (as opposed to biological causes) are designated by the World Health Organization (WHO) Commission on the Social Determinants of Health as health inequities. The avoidable inequalities result from structural determinants of health. These determinants include macroeconomic factors and governance and public policies that translate into social stratification based on socioeconomic status, education level, or such other characteristics as gender and race. These in turn modulate the intermediate determinants of health, such as behaviors, material circumstances, and psychosocial factors. The complex interplay of these health determinants has a profound impact on the global population, with unjust consequences for the most disadvantaged groups, who can expect to experience a shorter life expectancy, higher infant and maternal mortality rates, and a higher prevalence of both communicable and noncommunicable diseases (CSDH 2008).

Some of the most-often-cited health inequities in the world are ones that exist between countries, such as the average life expectancy in Canada (82) versus in Haiti (62) (PAHO 2012a). These inequities underscore the profound differences in the economic, political, and governance context within the global community. However, equally as striking is the deep divide that exists within countries. Many countries in the LAC region have experienced a notable increase in GDP coupled with remarkable political stability, but the most socioeconomically disadvantaged groups have not seen substantial increases in their wages or purchasing power. The gap in earnings between the wealthiest and the poorest continues to grow, and such populations as ethnic minorities and the indigenous continue to be excluded from the political process and economic development. This translates into important inequalities in living and working conditions, education levels, and behaviors, which are often coupled with greater limitations in accessing health services and high-quality medical care.

While these inequalities are ultimately linked to the development of disease and a shorter life expectancy, they also come at a substantial economic cost to the individuals and communities affected. The inequalities are a drag on economic development, prevent populations from fully participating in a country's economy and social institutions, and divert resources to costly treatment regimens provided by ever-growing health systems. This is of particular concern with NCDs, as treatment can be life-long, medically complex, and frequently preventable (UNDP 2013).

NCDs AND THE SOCIAL DETERMINANTS OF HEALTH

While NCDs have historically been linked with high-income countries and a higher socioeconomic status, recent epidemiologic trends in the LAC region reveal a more complex picture. Middle- and lower-middle-income countries are seeing a shift in their disease profiles as they experience economic growth and health system development. The burden of infectious disease and perinatal mortality is receding, and chronic disease is becoming more common. The socioeconomic gradient of disease distribution also tracks with this shift. Populations of a higher socioeconomic status benefit from healthier lifestyles and work and living situations, but people of a lower socioeconomic status are negatively affected by structural determinants of health (UNDP 2013). The amount of evidence linking the social determinants of health and NCDs in the developing world in general and the LAC region in particular is limited, but the complexity of the current situation is apparent.

Urbanization is one of the megatrends that are influential determinants of health in the LAC region. Already the most urbanized area in the world, the LAC region continues to have significant population movement from rural to urban areas. As urban populations grow, urban poor populations increase concurrently. While the proportion of the urban population living in slums in the LAC region fell from 33.7% to 23.5% between 1990 and 2012, the urban slum population increased from 104.8 million to 113.4 million (UN Habitat 2013). The poorest residents of cities often experience an "urban penalty" as they adopt unhealthy lifestyles but do not have access to the health services and infrastructure available to the rest of the population.

Recent studies have shown a rapid increase in chronic diseases and their associated risk factors in urban Latin America (Escobedo and others 2009). One study on urban populations in Argentina found that inverse socioeconomic patterning became stronger or only emerged in more urban settings (Fleisher and others 2011). Research in the LAC region also confirms McLaren's postulate of the gradual reversal of the social gradient in weight seen in urban regions (McLaren 2007). Countries with a higher Human Development Index are more likely to see an inverse relationship between socioeconomic status and body mass index, an important risk factor for many chronic diseases (Boissonnet 2011).

Studies have also shown that the development of risk factors and of chronic disease has a differential impact based on gender. In the LAC region, 15% more men die annually from NCDs than do women (PAHO 2014c).

There are also significantly more preventable deaths of men from NCDs as compared to women. However, the intermediary social determinants of health, which include behavior and living conditions, reveal a much more complex picture of the risk factors associated with chronic disease. Throughout the LAC region, men are more likely to use tobacco products and drink alcohol excessively, while women are much more likely to be obese. At the same time, there is considerable intercountry variability in the levels of risk that men and women face from such factors as sedentary lifestyle, diet, and stress.

RESPONDING TO THE CHALLENGE OF NCDs

In October 2011, WHO convened the World Conference on Social Determinants of Health in Rio de Janeiro, Brazil. The conference was a result of the growing consensus that inequalities pose a threat to health and well-being on an international scale. The complex nature of this challenge meant than a new approach needed to be formulated and articulated to the world. The resulting political declaration stated that the signatories were determined to achieve social and health equity through action on social determinants of health and well-being, by using a comprehensive intersectoral approach (Rio+20 Conference 2011). The emphasis on the determinants of health and on incorporating actors from outside the health sector was key to defining a new framework for action and policy development, both in the Americas and elsewhere. The declaration also identified five areas critical to addressing health inequities:

- Better governance for health and development

- Promoting participation

- Reorienting the health sector towards reducing health inequities

- Strengthening global governance and collaboration

- Monitoring progress and increasing accountability

The Rio conference declaration also highlighted the Health in All Policies (HiAP) approach as a possible vehicle for intersectoral action. That approach builds on a rich history of ideas, actions, and evidence that has emerged since the Declaration of Alma-Ata was adopted at the International Conference on Primary Health Care in 1978 and the Ottawa Charter for Health Promotion was introduced in 1986. HiAP is a method for formulating public policies that cuts across sectors and seeks synergies in order to improve population health and health equity. HiAP attempts to build on the successes of previous health promotion frameworks by using the

social determinants of health as well as equity as guiding principles. The Health in All Policies Framework for Country Action has developed six specific lines of action for nations to consider when developing public policy (WHO 2014):

- Establishing the need and priorities for HiAP

- Framing planned action

- Identifying supportive structures and processes

- Facilitating assessment and engagement

- Ensuring monitoring, evaluation, and reporting

- Building capacity

Increasingly, efforts to address the determinants of health are incorporating multisectoral interventions that target factors outside of the immediate purview of the health sector. This approach requires innovative thinking and management from the health sector, whose work has traditionally focused predominantly on health systems and health services as a means of improving health. Among the key features of a HiAP approach are accounting for the health implications of decisions, seeking synergies, and avoiding harmful health impacts in order to improve population and health equity, and with human rights and obligations as a founding principle (Leppo and others 2013). The health sector can play a pivotal role in terms of assessing and evaluating the health consequences of policy implementation, of building a knowledge and evidence base, and of creating forums for participatory dialogue between the population and the different sectors involved.

There are many examples of HiAP being put into practice around the world. For instance, in the state of South Australia, a model has been developed to work across government to better achieve public policy outcomes and simultaneously improve population health and well-being (Government of South Australia 2013). In Finland, policies have been developed to improve public health by broadly affecting determinants of health on which the health sector has limited influence (Leppo and others 2013).

The effort to control tobacco usage in Brazil is another case of the HiAP approach to addressing a pressing health need related to the determinants of health. Brazil was one of the early signatories of the WHO Framework Convention on Tobacco Control (FCTC). The nation decided to handle the issue of tobacco usage by creating an intersectoral commission called the National Commission for the Implementation of the Framework Convention on Tobacco Control and its Protocols. The commission included representatives from 18 different governmental sectors, who were tasked

with developing and implementing policies to reduce tobacco consumption. The resulting National Policy for Tobacco Control as well as other legislative efforts led to changes in regulations on tobacco marketing, price increases on tobacco products, financial and technical support for small-scale tobacco farmers to diversify their crop production, and other intersectoral actions. These efforts have been lauded for decreasing tobacco usage and have been linked with the decreased mortality from cardiovascular disease, chronic respiratory disease, and neoplasms (PAHO 2014b).

Other HiAP lessons from the LAC region have come from Mexico's strategy to combat obesity through the National Agreement for Healthy Food, Suriname's enactment of antitobacco legislation aligned with the WHO FCTC, and Costa Rica's executive order mandating that schools sell only fresh produce and foods and beverages that meet specific nutritional criteria (PAHO 2013; PAHO 2014b). These examples highlight the successes of an innovative and ambitious HiAP approach in the formulation of public policies on NCDs.

CONCLUSION

There are many examples within the LAC region of intersectoral action to tackle NCDs and their related health determinants. Broader sharing of information on these activities is key to promoting their success in the LAC region and elsewhere around the world. Ensuring that policy makers at the local and national level have access to the tools and technical support needed to successfully implement public health policies is vital to future progress. Additionally, the development of comprehensive data and research around the health benefits and the cost-effectiveness of this approach is central to evaluating and disseminating effective strategies to combat NCDs and to addressing the social determinants of health.

As we reflect on the achievements of the MDGs and engage with the 2030 Agenda for Sustainable Development, it is time to tackle the remaining and evolving challenges facing global health and development. Significant improvements in living conditions, broader economic growth, and reduced maternal mortality and mortality from infectious diseases have changed the landscape of population health.

In order to ensure healthy lives at all ages and for all socioeconomic groups, the post-2015 agenda must include ambitious goals for combating NCDs. The Sustainable Development Goals (SDGs) represent an important transition. The need for the SDGs has become clear, given recent political declarations, changes in public health needs, and the success in meeting the MDGs. The LAC region is well positioned to meet those demands as well as to benefit from the renewed push to prevent and control the growing challenge to population health, well-being, and economic sustainability.

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Indicators for Monitoring the Socioeconomic Dimension of NCDs: A Pilot Study in Chile

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INTRODUCTION

In September 2011, the United Nations set a new international agenda for noncommunicable diseases (NCDs) by adopting the Political Declaration of the High-Level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases (UN 2011). That document acknowledged that NCDs and their risk factors pose a serious threat to public health and economic and social development. In response, the World Health Organization (WHO) has developed global targets and a comprehensive global framework to monitor trends and assess progress on NCD prevention and control. WHO regional offices have considered the implications of the targets and monitoring framework for their own regions, taking into account their specific situations and diversity, as well as their existing commitments and progress to date on NCDs.

In the Americas, this process coincided with development of the Pan American Health Organization (PAHO) Strategy for the Prevention and Control of Noncommunicable Diseases for 2012–2025 and the publication of the Plan of Action for the Prevention and Control of Noncommunicable Diseases in the Americas 2013–2019 (PAHO 2014). The new strategy and the action plan represent a balance of continuity and change, in an effort to achieve various crucial objectives: (1) to put NCDs on the development and economic agenda nationally and regionally, (2) to strengthen the multistakeholder "all-of-society" approach, (3) to strengthen communications using traditional and new media, and (4) to include explicit outcome and exposure goals and targets in alignment with the WHO global monitoring framework and targets.

The UN General Assembly declaration called for addressing the centrality of NCDs to development as well as underscoring the importance of measurement. Paragraphs 40, 45, and 47 of the declaration acknowledged that resources are not commensurate with the magnitude of the problem, called for an increase in and prioritization of budget allocations, and appealed for fulfillment of official development assistance–related commitments. In addition to specifying NCD targets and indicators that are appropriate to the regional situation in the Americas, PAHO convened an expert think tank group to define development-related and multisector policy indicators that would be suitable for the Americas (PAHO 2013).

As a result of these discussions, three indicators were proposed to aid in monitoring the socioeconomic dimension of NCDs. These indicators were chosen based on their policy impact, contribution to development in the Americas, and availability of data for calculating a baseline estimate and conducting subsequent follow-up analyses. This paper reports the results of a pilot study in Chile aimed at measuring these indicators (Cuadrado and García 2015). That study was undertaken as part of

a tripartite cooperative effort by the Chilean Ministry of Health, the United Nations Economic Commission for Latin America and the Caribbean, and PAHO.

THREE INDICATORS

The goal of the pilot study undertaken in Chile was to derive estimates for three socioeconomic indicators of the economic and multisectoral aspects of NCDs. The three indicators were: (1) public sector investment in NCD prevention and health promotion, (2) the affordability of a healthy diet, and (3) the proportion of households experiencing catastrophic health expenditures due to NCDs. This study focused on four NCDs: cancer, cardiovascular disease, chronic respiratory disease, and type 2 diabetes. In the three subsections below, we review the estimation methods developed for each of the indicators, the challenges encountered in making the estimates, and the estimates themselves. We conclude with reflections on lessons learned from this pilot study and future challenges.

Public Sector Investment in NCD Prevention and Health Promotion

The first indicator was the amount of public sector investment in prevention of NCDs and in health promotion, expressed relative to all government spending as well as relative to the gross domestic product (GDP). We estimate that in 2013 that 0.7 percent of Chilean public sector spending was devoted to NCD prevention and health promotion. This represented 4.1 percent of total public health care spending and 0.2 percent of GDP. Tracking public investments in NCD prevention and health promotion builds awareness of the wide array of measures and policies that contribute to prevention, and it also highlights the need for multiple sectors to participate in creating a healthful environment. The value of such an indicator is to clearly embrace a "whole of government" policy for NCD prevention and health promotion, by recognizing that the response of a government extends beyond the ministry of health. This broader perspective in viewing public sector actions also lays the foundation for a "whole of society" response to NCDs, that is, one that extends well beyond a narrow focus on public health activities and well beyond a focus on government activities alone.

Health promotion involves actions aimed at four key activities: (1) eliminating the use of tobacco; (2) eliminating excessive use of alcohol; (3) promoting physical activity; and (4) promoting healthy diets. Government activities aimed at promoting these

healthy lifestyles can range from creation of healthful environments (for example, the construction of bicycle paths) to information dissemination (for instance, dietary recommendations) to market interventions to alter prices (for example, taxation of tobacco products). In this study of Chile, NCD prevention activities refer to primary prevention, that is, activities to prevent the onset of NCDs. Excluded from the analysis are secondary prevention activities aimed at screening the population for early identification of those who already have an NCD, and tertiary prevention activities intended to improve the functioning of those with NCDs.

Several methodological challenges with this indicator were encountered in the pilot study. First, the accounting systems that track government spending were not designed to identify expenditures on health promotion and NCD prevention. Therefore, identification of relevant activities in this area required the review of program-level data and interpretation of programmatic function based on the program's title, description, and stated objectives. Sometimes a program contained multiple activities—some of which were related to health promotion and others not. In such a case, investigators sought out reasonable approximations to determine the share of the program's budget devoted to health promotion. In addition, identifying an expenditure in primary prevention (as opposed to secondary or tertiary prevention) requires knowledge about the NCD status of the population being served, which was not always possible using the budgetary information.

Importantly, within Chile's Ministry of Health (MoH), the overwhelming majority of spending (86.5 percent) on NCD prevention and health promotion was deemed to occur within the Family Health Plan. Under this program, the MoH provides funding to municipalities to support primary care facilities. The amount received by each municipality is based on a per-capita allocation that is adjusted for the particular health needs of each municipality's population. The formula for this calculation is primarily based on an estimate by the MoH of the number of hours of medical attention needed to provide a given set of services (e.g., vaccination, nutritional consultation, etc.). There are currently more than 80 such services provided as part of the Family Health Plan. Based on an analysis of these services, it was concluded that 30 percent of the Family Health Plan was directed toward NCD prevention and health promotion. It is important to stress that our overall estimate of the amount of resources that the government devotes to NCD prevention and health promotion depends heavily on the accuracy of this estimate of 30 percent.

Second, while noting that municipalities made significant investments in health promotion (for example,

in the construction of bike paths in the capital city of Santiago), data on spending by program municipalities were not readily available. An attempt to survey municipalities was largely unsuccessful, with only 14 of 345 municipalities responding. Therefore, the pilot study focused solely on central government investments in NCD prevention and health promotion.

Third, even within the central government, there was difficulty in collecting data from other ministries outside the MoH. Twenty ministries were identified as likely having some programmatic activities related to NCD prevention and health promotion. Of the 20, data from only 7 ministries were available for the estimation in the pilot study: MoH; Social Development; Education; Sports; Interior and Public Security; Environment; and National Assets. In this context, we note that no data were available from the Ministry of Agriculture, which is likely an important partner in a whole-of-government approach to NCD prevention and health promotion. It is also important to mention that a substantial effort was required to define the potential health promotion activities of most ministries outside that of the MoH, with the exceptions of Education and Sports.

Despite these difficulties in collecting the data, an estimate was possible based on the data obtained from these seven ministries. In 2013, the amount the central government of Chile spent on NCD prevention and health promotion was 215 billion Chilean pesos (approximately US$434 million (at an exchange rate of 495 Chilean pesos per U.S. dollar)). This amount represented 4.1 percent of public health spending, 0.7 percent of total government expenditures, and 0.2 percent of GDP.

This indicator serves as a valuable benchmark in assessing future changes in investments. However, it is also useful to compare this figure to other types of current spending, as shown in table 5.1, to aid in interpreting this amount. For example, it is interesting to compare the amount spent on NCD prevention to that spent on NCD treatment. The amount of public investment in NCD prevention in Chile is about one-third of the amount spent (695 billion pesos) under the country's AUGE/GES provisions on NCD treatment by the public health sector (FONASA) and private insurers (ISAPRE). (Under the AUGE/GES system, public and private insurers give Chileans an explicit guarantee of access to quality health care, at an affordable price and within a reasonable time

Table 5.1 Comparison of Public Investments in NCD Prevention and Health Promotion in Chile

Item	Amount (billions of Chilean pesos)	As percent of public spending on health[a]	As percent of public spending[b]	As percent of GDP[c]
Public sector spending on NCD prevention and health promotion[d]	215	4.1%	0.7%	0.2%
Spending on NCD treatment for covered health conditions under AUGE/GES by FONASA and ISAPRE[e]	695	13.3%	2.3%	0.6%
Consumer spending on popsicles and ice cream[f]	387	7.4%	1.3%	0.3%

a. Public spending on health by central government in 2013 was CHL 5,224,724 million.

b. Total public spending by central government was CHL 29,704,287 million.

c. GDP in 2013 was CHL 114,022,307 million.

d. Based on estimate from this pilot study (Cuadrado and García 2015).

e. Based on 13 of the 81 GES that are NCDs (Bitrán y Asociados 2013). (Under the AUGE/GES system, Chileans are given a an explicit guarantee by the public health sector (FONASA) and private insurers (ISAPRE) of their right to access to quality health care at an affordable price within a reasonable time limit for a set of specific health conditions. Currently, 80 health conditions are covered under the system.)

f. Analysis of Chilean ice cream market in 2012 by Euromonitor International, cited in *Estrategia*, November 11, 2013.

limit, for a set of specific health conditions. Currently, 80 health conditions are covered under the system.)

Alternatively, we can also compare the investment in NCD prevention and health promotion to the consumptions of different goods in the economy. For example, the annual amount of popsicle and ice cream sales in Chile exceeds that spent on NCD prevention and health promotion (Estrategia 2013).

As the reader will have noticed in this short comparison, the question of whether investment in NCD prevention and health promotion is "too low" or "too high" or "just right" remains unanswered. Among other things, the answer to this question requires an economic cost-benefit analysis of the current marginal returns to prevention assessed against those for treatment. Currently, there are no international standards or targets with respect to the optimal level of investment in prevention relative to other activities.

We can quantify the extent to which the government is responding to NCDs in a "whole of government" approach by examining the amount invested in NCD prevention and health promotion by each government ministry. On the one hand, the vast majority of government effort is concentrated in the MoH. As shown in table 5.2, this ministry directed 86 percent of the government spending

in this area. On the other hand, it is notable that six other ministries (Sports; Environment; Social Development; Interior and Public Security; Education; and National Assets) reported some expenditure in this area. In fact, from the viewpoint of the ministries themselves, there are two ministries that devote a greater proportion of their resources toward health promotion and NCD prevention than the MoH does. The Ministry of Sports devotes 23 percent of its resource to this area, and the Ministry of Environment devotes 7 percent of its resources. The MoH occupies third place, with 3.5 percent of its budget devoted to these health promotion and NCD prevention efforts. The other four ministries devote less than 1 percent of their budgets to these activities.

As previously noted, several ministries that the group identified as likely important sources of investment in health promotion did not respond to the inquiry, among them the Ministry of Agriculture. Therefore, it is important to view this indicator in the context of that missing information. A more complete response from the other ministries would both raise the estimate of the overall public investment in health promotion and also show a broader response of the government, that is, one less centralized in the MoH.

Table 5.2 Public Investment in NCD Prevention and Health Promotion in Chile, by Ministry

Ministry	As percent of total public sector investment in NCD prevention and health promotion	As percent of ministry's budget
Health	85.7%	3.5%
Sports	8.5%	22.8%
Environment	2.1%	11.8%
Social Development	1.7%	0.7%
Interior and Public Security	1.4%	0.1%
Education	0.5%	0.0%
National Assets	0.1%	0.1%
Total public sector	100%	0.8%

The Affordability of a Healthy Diet

The second indicator calculated the proportion of the population that cannot afford a healthy diet. We estimated that in 2013 about 28 percent of the Chilean population could not afford to purchase a healthy diet based on national dietary recommendations. The appeal of this indicator is its link to poverty, its focus on prevention via nutrition (a high priority as evidenced by major global summits in 2012 and 2013), and its promotion of multisectoral actions. By examining the cost of a healthy diet relative to household income, this indicator can be used to address the issue of finding equitable policy responses to the rise of nutrition-related chronic diseases. Assuring access to nutritional foods, by removing financial and other barriers, is a duty that states must undertake to ensure the exercise of the right to health. It is important to recognize that the inability to purchase a healthy diet is, in and of itself, a form of impoverishment.

This indicator relies on two key measures: the cost of a healthy food basket and the income level of families. Accordingly, there are two main courses of action that societies can undertake to ensure affordability of healthy food for all. Both are aimed at removing financial barriers to healthy diets. The first are antipoverty actions intended to raise incomes among the poor through such state actions as direct income transfers, job training, and minimum-wage laws. The second set of actions are aimed at increasing access to affordable healthy foods. This can be accomplished in a variety of ways. These can range from interventions designed to reduce the price of whole foods relative to processed foods (via farmers markets in urban settings or increasing whole foods in school lunch programs) to the provision of information on low-cost healthy diets (for example, plant-based, whole-food diets). By focusing on the poor, this indicator allows countries to monitor the accessibility of a healthy diet for those people with high risk of poor health and often the least access to quality health care.

The measurement of this indicator was based on a standard method employed for gauging poverty: the cost of basic needs approach. In this approach, the cost of purchasing enough food to satisfy daily energy needs (usually 2,100 calories per person) is estimated. Then, a minimum-needs budget is estimated by multiplying this minimum food budget by a factor (the Orshansky coefficient) to reflect other needs. This factor is typically taken as 2, meaning the poverty line in a country is defined as twice the cost of meeting basic food needs. A household whose income falls below this line is deemed to be poor (Fisher 1997). Adjustments to this measure are made based on household composition to reflect both differences in energy needs of household members as well as presumed economies of scale in lower per-capita

costs of some items in larger households (for example, housing). In addition, adjustment can be made for variations in prices of food and other goods by region within a country.

In this widely used approach to poverty measurement, the cost of food is the central determinant of poverty levels. This cost is typically measured by establishing a "basic food basket." The basic food basket is based on a diet that meets energy and essential nutritional needs. A small sample of items is selected to be representative of the types of foods purchased by the near-poor (those in the income strata just above poverty). The average prices of these items are then estimated and monitored over time. Rather than estimate a single national average of prices, food prices are often estimated for local regions in order to reflect the geographic differences. A country will update its poverty measure each year based on changes in the prices of these foods. However, it is customary to keep the same items in the food basket. That is, new estimates of the types of food purchased by the near-poor are made infrequently.

Measuring affordability of a healthy-food diet is based on this same method, except that the "basic food basket" is replaced with a "healthy food basket." How should this "healthy food basket" be defined? One clear path is to use the government's own nutritional guidelines. In 2013, the MoH of Chile adopted a set of nutritional guidelines with 11 recommendations (Olivares y Zacarías 2013). Among them were:

- Having five daily portions of fruits and vegetables, in a variety of colors
- Consuming water as the principal beverage (six to eight glasses per day), and avoiding sugary drinks
- Having beans, lentils, or other legumes twice per week
- Eating fish (baked or steamed) twice per week
- Having three daily servings of low-fat dairy products
- Avoiding sugar, candy, and sugary drinks
- Avoiding fried foods and fatty foods such as mayonnaise and sausages
- Avoiding processed foods high in fat, sugar, or salt
- Reducing the use of salt

These guidelines could have been used as a basis to construct an alternative "healthy food basket." This would have required two intensive efforts. First, an overall list of products that meet the "healthy" nutritional requirements of the population would need to be constructed, as well as a sample of about 50 products from this list. Second, the prices for each of these 50 products would need to be calculated (perhaps for a variety of geographic locations).

Both steps were deemed to require a substantial effort. As a pragmatic alternative, rather than develop a new healthful diet from scratch, the "Healthy Food Basket" for our study was based on an adaptation of the food items already contained in the "Basic Food Basket." The quantities of these foods were adjusted to reflect the nine national nutritional recommendations cited above.

Table 5.3 shows the changes in quantities (grams or cubic centimeters per day) among the main food groups, comparing the new Healthy Food Basket with the Basic Food Basket. The largest percentage increase, of 167 percent, is in the category of dairy products and eggs. The consumption levels for drinks (via increased consumption of bottled water) and for fruits, vegetables, legumes, and tubers are doubled. Fish and seafood show a modest increase, of 17 percent. In contrast, the consumption of bread and cereals and of oils shows nearly no change. The Healthy Food Basket is also noteworthy for what it reduces substantially or even eliminates. The food group consisting of sugar, candy, coffee, tea, and condiments shows a large drop, of 44 percent. Meat consumption decreases by 54 percent. Expenses for meals outside the home (which mainly consisted of "fast foods") are completely eliminated in the Healthy Food Basket.

Table 5.4 summarizes the impact of the changes in the quantities of food items on the overall distribution of calories from various food groups. In the Healthy Food Basket, the single largest source of calories, 34 percent, are vegetables, fruits, legumes, and tubers. However, in the Basic Food Basket this food group accounts for 23 percent of calories. Another large shift is seen in the number of calories from dairy products and eggs, accounting for 17 percent of calories in the Healthy Food Basket, up from 6 percent of calories in the Basic Food Basket. These two large increases in calories are offset by sharp reductions in calories from meals consumed outside the home, which account for 12 percent of calories in the Basic Food Basket but fall to zero in the Healthy Food Basket. Meat consumption is also cut, declining from 8 percent of calories in the Basic Food Basket to 3 percent of calories in the Healthy Food Basket. Another important decrease is in calories from sugar, candies, cookies, tea, coffee, and condiments, which account for 8 percent of calories in the Basic Food Basket but drop to 5 percent of calories in the Healthy Food Basket. Finally, breads and cereals are an important source of calories in both the Healthy Food plan (29 percent) and in the Basic Food plan (30 percent).

Table 5.3 Change in Food Quantities: Healthy Food Basket versus Basic Food Basket

Food group	Quantity (grams or cubic centimeters per day)		
	Healthy Food Basket	Basic Food Basket	Change
Dairy products and eggs	310	116	167%
Drinks	129	63	105%
Vegetables, fruits, legumes, and tubers	805	440	83%
Fish and seafood	35	30	17%
Bread and cereals	223	219	2%
Oils	20	20	0%
Sugar, candy, coffee, tea, and condiments	36	64	−44%
Meat	35	76	−54%
Meals outside of home	0	18	−100%

Table 5.4 Caloric Distribution of Healthy Food Basket and Basic Food Basket

	Healthy Food Basket	Basic Food Basket	Difference
Vegetables, fruits, legumes, and tubers	34%	23%	11%
Bread and cereals	29%	30%	−2%
Dairy products and eggs	17%	6%	12%
Oils	9%	9%	0%
Sugar, candy, cookies, tea, coffee, and condiments	5%	8%	−3%
Meat	3%	8%	−5%
Fish and seafood	3%	3%	0%
Drinks	0%	1%	−1%
Meals outside of home	0%	12%	−12%

Table 5.5 Monthly Costs of Healthy Food Basket and Basic Food Basic per Person (Chilean Pesos, 2013)

Food groups	Healthy Food Basket	Basic Food Basket	Difference	Percent change
All food	43,872	32,239	11,635	36%
Dairy products and eggs	14,233	4,205	10,028	238%
Vegetables, fruits, legumes, and tubers	14,853	7,322	7,531	103%
Fish and seafood	1,827	1,737	89	5%
Oils	1,024	1,024	0	0%
Bread and cereals	6,146	6,206	−60	−1%
Drinks	1,207	1,361	−154	−11%
Sugar, candy, cookies, tea, coffee, and condiments	1,367	2,625	−1,257	−48%

Based on these changes in the quantities of food items, the monthly cost of the Healthy Food Basket is substantially higher than the cost of the Basic Food Basket. Whereas the Basic Food Basket costs 32,239 Chilean pesos (US$65.13 in 2013) per person per month, the Healthy Food Basket would cost 43,872 pesos (US$88.63 in 2013), or 36 percent more. Table 5.5 shows the contribution of food groups to the change in price (an increase of a little more than 11,600 pesos). The increase in consumption of dairy products and eggs is the main contributor to the cost increase, adding some 10,000 pesos to costs. The increase in consumption of vegetables, fruits, legumes, and tubers adds another 7,500 pesos. Offsetting these increases are

declines in costs from reduction in consumption of meat (saving 2,300 pesos), in consumption of meals outside the home (saving 2,200 pesos), and in consumption of sugar, candy, cookies, tea, coffee, and condiments (saving 1,300 pesos).

Essentially, the national nutritional recommendations substitute healthy and more expensive sources of calories for cheaper and less healthy sources of calories. However, it is important to stress that healthy diets do not necessarily cost more than unhealthy diets. The results of this pilot study indicate an increase in costs when following the specific set of nutritional recommendations adopted by the Chilean government. It is possible that

alternative healthy diets could be devised that would cost less than the Basic Food Basket, such as a healthy diet centered on plant-based whole foods. In some sense, a basic food basket is generally designed around the concept of providing the minimum of caloric needs at the lowest cost. From that perspective, healthy alternatives are likely to be more costly. This is an important topic for empirical investigation.

Finally, it is important to note that this indicator reflects the degree to which there are financial barriers to healthy diets. That is, the indicator uses the Healthy Food Basket to measure access in exactly the same way that traditional poverty measures use the basic food basket to measure poverty. The baskets measure access and affordability, not actual consumption. Financial barriers are just one obstacle to healthy eating. Governments are responsible for assuring access to healthy foods, but actually adopting a healthy diet and a healthy lifestyle is the choice of individuals. The concern with access is to guarantee that this choice is informed and freely made, and is not just a product of poverty.

How affordable is a healthy diet in Chile? We measure affordability for each household by calculating its monthly food costs relative to household income. The monthly household food costs are based on the hypothetical costs if the household purchased a Healthy Food Basket for each household member. As noted above, the Healthy Food Basket costs 36 percent more than the Basic Food Basket. Using the Casen survey 2013, a nationally representative survey of Chilean households (Gobierno de Chile, Ministerio de Desarrollo Social 2013), we estimate affordability of healthy diets for the entire population. To ensure comparability, we use the same methodology and the same data set employed by the Chilean government in calculating its poverty measure, but we just replace the

cost of the Basic Food Basket with that of the Healthy Food Basket.

The current poverty methodology used by the Chilean government multiplies the monthly cost of the basic food basket by an Orshansky coefficient factor of 2.68 to arrive at a poverty threshold. Households that fall below this threshold are deemed to be in poverty. The threshold varies by the size of household to reflect lower per-capita costs in larger households due to economies of scale (Gobierno de Chile, Ministerio de Desarrollo Social 2015a). We estimate that 27.1 percent of the Chilean population is unable to afford a healthy diet (table 5.6). This estimate of 27.1 percent of the population, or 4.7 million people, who lack access to healthy, affordable food is nearly double the official estimate of people in poverty, which is 2.5 million people, or 14.4 percent of the population (Gobierno de Chile, Ministerio de Desarrollo Social 2015b). Despite its favorable macroeconomic situation, Chile faces an enormous challenge in providing access to healthy foods. As we pointed out earlier in this article, lack of access to healthy food is a form of impoverishment.

It is also noteworthy that the large majority of those who cannot afford to eat healthy diets—3.7 million of the estimated 4.7 million people—reside in urban areas. However, the incidence of lack of access to healthy foods appears to be much greater in rural areas (an astounding 46 percent of the rural population) compared to urban areas (24 percent of the urban population). This is most likely an artifact of the way our indicator was constructed, using a single Healthy Food Basket for the entire population, that is, both rural and urban residents. It is possible that rural residents face substantially lower prices for healthy foods, considering that many of these foods are produced locally and indeed, in the case of farmers, are produced by the household. In future work, the method

Table 5.6 Population Unable to Afford Healthy Diet and Population that Is Poor, Chile 2013

Area	Unable to afford a healthy diet[a]		Official government estimates of poverty[b]	
	Proportion of population	Number of people	Proportion of population	Number of people
National	27.1%	4,677,000	14.4%	2,482,000
Urban areas	24.3%	3,657,000	12.4%	1,868,000
Rural areas	46.4%	1,019,000	27.9%	614,000

a. Estimates by authors based on application of Chile's method of calculating poverty (Gobierno de Chile, Ministerio de Desarrollo Social 2015a), with cost of the food basket based on our Healthy Food Basket.

b. National estimates of poverty are taken from the official government report on poverty in Chile (Gobierno de Chile, Ministerio de Desarrollo Social 2015b).

will be revised to account for lower costs of healthy foods in rural areas. For now, we note that the estimate for the rural population is biased upward and that the true rate is between 28 percent (using the Basic Food Basket) and 46 percent (using the Healthy Food Basket). In any event, since the vast majority of the population is concentrated in urban areas, this biased estimate for rural areas does not significantly affect our national estimates.

Households Experiencing Catastrophic Health Expenditures due to an NCD

The third indicator reflects growing concerns about the impoverishing effects of NCDs on the most vulnerable members of the population. One of the core objectives of health care systems is to protect persons from the financial risks associated with health care. Household medical expenditures can often be "catastrophic," that is, exceeding a sizable fraction of total household expenditures. Out-of-pocket payments for treatment of chronic NCDs are more likely to cause impoverishment or financial distress than is treatment for acute conditions. That is due to the nature of chronic NCD care, with its complexity, longevity, and technological demands.

The key estimation challenge for this indicator was the lack of a data source that contained both information on health spending on NCDs and information on household income. The main survey instrument used to measure catastrophic health costs incurred by households was the VII Chilean Household Budget Survey (2012) (Gobierno de Chile, Instituto Nacional de Estadísticas 2013). This instrument records information on household income and expenditures, including health expenditures. However, it does not distinguish among these health expenditures by causes, and so it is not possible to discern

which health spending is due to NCDs and which is due to other conditions. In addition, no information was collected on whether an individual had an NCD. The lack of data for these two important factors meant that this indicator on catastrophic health care costs due to NCDs had to be estimated using indirect methods. One important recommendation from this pilot study is the inclusion of questions in future rounds of the Household Budget Survey on NCD status of individuals and on health expenditures by cause.

Using data from the Household Budget Survey, we can apply a standard methodology employed by the World Health Organization (Xu 2003) and calculate the proportion of Chilean households facing catastrophic costs. Each surveyed Chilean household's capacity to pay is calculated based on the differences between their average monthly expenditures and a minimum threshold of subsidence expenditures (based on the poverty line). The household's average monthly out-of-pocket expenditures on health care are measured in the survey based on a daily diary (for health expenditures in the last two weeks), a recall diary of 3 months for doctor office visits, and a recall diary of 12 months for hospitalizations. If the average household monthly out-of-pocket expenditures on health care exceed 40 percent of the household's capacity to pay, the household is deemed to be facing catastrophic health costs.

Application of this method to Chilean data shows that 2.1 percent of households experienced catastrophic health care costs. As there is some debate in the literature over the 40-percent threshold, table 5.7 presents estimates of those facing catastrophic health costs (from any cause), using a variety of thresholds. About 9 percent of Chilean households faced average monthly health expenditures that exceeded 20 percent of their capacity to pay, and about

Table 5.7 Percentage of Households Facing Catastrophic Health Costs due to All Causes and due to NCDs

Average monthly health expenditures as percent of household income	Percent of households facing catastrophic costs from all causes	Percent of households facing catastrophic costs from NCDs
10%	20.9%	7.5%
20%	8.6%	3.1%
30%	4.1%	1.5%
40%	2.1%	0.8%
50%	0.9%	0.3%

4 percent faced average monthly health expenditures that exceeded 30 percent of their capacity to pay.

The low percentage of Chilean households facing catastrophic medical costs is striking. It may reflect effective health policies aimed at guaranteeing access to health care for certain health conditions (the AUGE/GES system). But it may also partly reflect the failure of health financing systems for non-AUGE/GES conditions, in which expensive treatment options (e.g., cancer drugs) are simply out of reach for impoverished families. In a sense, they are too poor to even begin to incur catastrophic expenditures for non-AUGE/GES conditions. Finally, it may simply reflect downward bias on estimates of catastrophic hospitalization costs. Since hospitalization is a relatively rare event, a 12-month recall questionnaire was used rather than a two-week daily diary. As a matter of simple statistics, taking an average over a 12-month period instead of a two-week period will lower the variance of the distribution of expenditures. Consider, for example, a household with only one hospitalization during the previous 12-month period. The average monthly health costs for that household are 1/12 the actual cost that the household experienced. Thus, this 12-month average is unlikely to represent the catastrophic impact of health expenditures among the poor. That is because the poor generally do not have access to savings, loans, or other financial tools to ease the burden of catastrophic expenses by spreading them out over the course of a year. For future work, an alternative estimation strategy would be to use the highest monthly cost observed over the 12-month recall period rather than the average amount over the 12-month period. A similar but less severe bias is also present in estimates of doctor consultations when using a 3-month recall.

While health costs due to NCDs could not be determined from the survey, an indicator variable was created based on reporting for health products or services that were deemed to be possibly related to NCDs. This indicator was broadly defined to include spending not only on obvious NCD treatments such as cardiac surgery but also on services not solely related to NCDs, such as blood tests and hospital examinations. Thus, the indicator of individuals with NCD expenditures is likely to include some individuals without NCDs, so it is best viewed as an upper limit. Using this method, we find that 59 percent of households reported an NCD expenditure. (And within these households, NCD expenditures account for 62 percent of total household health expenditures). A multivariate regression showed that the probability of having catastrophic health expenditures was three times greater among these households with NCD expenditures. By this measure, NCDs have a dramatic impact on the likelihood of experiencing catastrophic expenditures.

As was mentioned earlier, 2.1 percent of Chilean households experienced catastrophic health care costs, that is, with the average household monthly out-of-pocket expenditures on health care exceeding 40 percent of the household's capacity to pay. The distribution of medical expenditures of those households is presented in the first data column of table 5.8. Medicines accounted for 25.9 percent of the health expenditures in these households, hospitalizations for 19.6 percent, and all other types of spending for the remaining 55.5 percent.

Various sources of data were used to derive an estimate of the proportion of expenditures in each of those three categories (medicines, hospitalizations, and other) due to NCDs, which are reported in the second data column of table 5.8. Estimates of drug spending based on the general population taken from the National Health Survey of 2009–2010 indicate that about 18 percent of drug expenditures are on medications for NCDs (Gobierno de Chile, Ministerio de Salud 2011). Estimates of out-of-pocket hospitalization expenditures among the privately insured (ISAPRE) population (who have additional coverage for catastrophic illnesses ("CAEC")) indicate that about 51 percent of such expenditures insured under this catastrophic coverage plan are due to NCDs. Finally, estimates using the broad measure of possible NCD health expenditures (discussed above) using the Household Budget Survey indicate that, in general, 38 percent of expenditures among households with catastrophic expenditures are due to NCDs.

By taking a weighted average of expenditures on medicines, hospitalization, and all other expenses using the estimates for the proportion of spending in each health category due to NCDs, we can arrive at a crude estimate of the overall proportion of catastrophic health spending due to NCDs. Our estimate is that among households experiencing catastrophic costs, about 36 percent of their health costs are due to NCDs. We can then infer that since 36 percent of catastrophic costs are due to NCDs, then 36 percent of cases are due to NCDs. This is a strong inference (since it is only true if households exclusively had only NCD expenditures or only non-NCD expenditures), but it is the best approximation we can make under the circumstances. Assuming that 36 percent of the 2.1 percent of cases with catastrophic health expenditures are due to NCDs, we arrive at an estimate that 0.8 percent (less than one percent) of Chilean households face catastrophic costs due to NCDs (table 5.7). Table 5.7 also presents other estimates based on various thresholds. For example, if catastrophic spending is defined as health expenditures exceeding 30 percent of household income, then the percent of Chilean households facing catastrophic health expenditures due to NCDs increases from 0.8 percent to 1.5 percent.

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Table 5.8 Estimations of Proportion of Catastrophic Health Expenditures Attributable to NCDs

	Health spending by category for households with catastrophic health expenditures[a]	Health expenditures due to NCDs	Catastrophic health expenditures due to NCDs
Medicines	25.9%	18.3%[b]	4.7%
Hospitalization	19.6%	51.1%[c]	10.0%
Other	55.5%	38%[d]	21.1%
Total	100 %	n.a.	35.8%[e]

Note: n.a. = not applicable.

a. Authors' estimates based on the VII Household Budget Survey (Gobierno de Chile, Instituto Nacional de Estadísticas 2013).

b. Authors' estimates based on drug expenditures reported in the National Health Survey 2009–2010 (Gobierno de Chile, Ministerio de Salud 2011).

c. Authors' estimates based on hospitalization data from catastrophic health coverage of private insurers (ISAPRE) (Gobierno de Chile, Superintendencia de Salud 2012).

d. Authors' estimates based on the VII Household Budget Survey (Gobierno de Chile, Instituto Nacional de Estadísticas 2013).

e. Estimate of overall proportion of catastrophic expenditures due to NCDs based on weighted average of expenditures in three categories: medicines, hospitalization, and all other care.

LESSONS LEARNED AND FUTURE CHALLENGES

This pilot study in Chile derived baseline estimates of the values for three indicators of the socioeconomic and multisectoral aspects of NCDs. There were three major findings from the study. The first was that the Chilean central government devoted about 0.7 percent of its budget to NCD prevention and health promotion. The second was that about 27 percent of the Chilean population is unable to afford a healthy diet (meeting national nutritional recommendations). The third was that about 0.8 percent of Chilean households face catastrophic health expenditures due to NCDs. The study was important in demonstrating the feasibility of deriving estimates of all three indicators in a brief period (approximately four months). However, significant challenges were encountered that provide important lessons for future estimations of these indicators.

All three estimates were subject to serious data limitations. The central challenge in estimating the investments of the public sector in NCD prevention and health programs is to construct a systematic accounting system for monitoring these expenditures at a programmatic level across all ministries. This would require a significant and sustained commitment of resources. The absence of this systematic approach meant that indirect estimation methods needed to be used to derive estimates. Hence, considerable uncertainty surrounds our estimates for the indicators, and reasonable alternative hypotheses would have led us to quite different estimates. For example, calculation of the percent of government spending invested in NCD prevention and health promotion hinged on a reasonable guess that approximately 30 percent of man-hours in primary care clinics are directed toward these activities. But an alternative guess of 10 percent of time would have cut in half our overall estimate of the amount of government investment in NCD prevention and health promotion (118 billion pesos instead of our estimated value of 249 billion pesos). More precise estimates would have required substantial additional efforts that should be borne in mind in any future attempt to refine these values. In addition, this lack of precision is a reflection of the financing of local clinics on a per-capita basis rather than a fee-for-service basis, which makes it difficult to isolate the investment in NCD prevention and health promotion. In an underfinanced and overburdened primary health care environment, it is likely that resources devoted toward health promotion are redirected toward curative services since there is an express demand for curative services but less so for prevention.

This first attempt at estimating the socioeconomic aspects of NCDs has laid the foundation for better future estimates, by generating knowledge of the specific types of data that are missing and the steps needed to obtain these data. For example, to enable direct measurement of households experiencing catastrophic health costs due to NCDs, future versions of the Household Budget Survey

should include queries on the NCD status of household members and on which health expenditures are related to specific NCDs. In response to this lack of direct data, an important contribution of the pilot study in Chile was to develop an indirect methodology for identifying NCDs on the basis of classification of medical expenditures reported in the Household Budget Survey.

Other possibilities involve estimating the economic impact of NCDs not from household data but from individual data, as is done in cost-of-illness studies. This methodology is better developed and can be applied using data currently available. The weakness of this approach is that it fails to consider the household as a unit of analysis, which is most appropriate when considering the economic impact of the disease on the population.

A challenge in estimating government investments in NCDs was the low response rate from the other government ministries. One suggested answer was to develop a guide with a list of examples of types of government programs directed at health promotion or NCD prevention across a wide variety of ministries. The PAHO think tank report on NCDs and development (PAHO 2013) identified a list of 20 such activities across eight ministries. To this list, we can add those programs identified by the Chilean pilot study. A further expansion of items would be possible based on a literature review of studies analyzing public health spending devoted to NCDs. Such a guide would be useful when initiating discussions with other ministries about their role in health promotion and NCD prevention. Furthermore, data collection could use a specially designed survey based on these categories of activities. It is evident that cross-sectoral commitment to this measurement effort must be ensured so that representative results are obtained and can be monitored over time. Above all, we note that the low response rate from other government ministries is in itself an indicator of the need for an all-of-government approach to NCDs and health promotion.

In the context of measuring the affordability of healthy diets, there are several recommendations for moving forward with this indicator. The first is to attempt to reflect the lower costs of healthy food in rural areas relative to urban areas. The second is to explore the possibility of alternative healthy diets. The healthy diet based on Chile's national nutritional recommendations was determined to be more costly than a diet based on Chile's current basic food basket. However, as noted earlier, this is a result of the particular set of nutritional recommendations that substitute healthy, more costly food for less healthy, less expensive food. Exploring the costs of alternative "healthy" food diets is an important pending empirical investigation with significant policy implications. More fundamental is the question of what is meant by a "healthy" diet and especially the relationship between normative nutritional recommendations and empirical observation of the eating habits of a population. For effective monitoring of access to healthy foods, a consensus must be reached among stakeholders on these issues.

Despite all these problems, these estimates represent an important first look at the socioeconomic dimension of NCDs in Chile, and they lay the foundation for future work within the Americas. The estimates also mark an important advance in an evidence-based approach to NCDs. We look forward to estimating these indicators in other countries in the Americas and to further rounds of estimation in Chile in order to monitor trends and policy impacts

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Section 3

ECONOMIC IMPACT OF NCDs IN LATIN AMERICA AND THE CARIBBEAN

André Medici, Section Editor
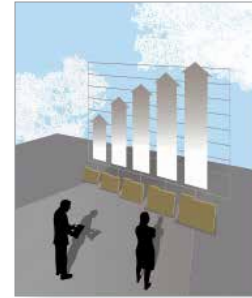
Macroeconomics and Risk Factors for NCDs: A Policy Agenda

David Mayer-Foulkes and Ilana Mayer-Hirshfeld

INTRODUCTION

The objective of this article is to examine the macro-economic dimensions of public, evidence-based health policies for reducing the prevalence of noncommunicable chronic diseases (NCDs) and their risk factors in Latin America and the Caribbean (LAC). The aim is to give a broad outline of the macroeconomics of NCDs, ranging from risk factor management and health costs to long-term economic growth and human development. This piece summarizes and follows on from ideas developed earlier (Mayer-Foulkes and Pescetto-Villouta 2012).

Main Characteristics of NCDs

NCDs and the multisectoral policies necessary to reduce their risk factors constitute a priority in the political and public health agendas. The reason is that NCDs are associated with high social, economic, and health costs due to the unnecessary loss of potentially healthy life. Moreover, the main risk factors for these diseases are well-known, negative, manmade effects of economic sectors producing unhealthy consumer goods or externalities. Thus while the challenge for the health sector is itself formidable, in fact, health promotion and prevention are indicated for NCDs. Following such a strategy requires the implementation of evidence-based policies to modify the behavior of consumers, producers, and urban planners, amongst others. The corresponding economic evaluations encompass the macroeconomic, long-term behavior of the concerned economies and their economic partners.

NCDs present a particular characteristic as compared to communicable diseases: a considerable portion of their risk factors are caused by human actions. NCDs are related to unwholesome lifestyles, specifically lifestyles characterized by unwholesome diets, use of alcohol and/or tobacco, and lack of physical activity. "Wholesome" means "helping to keep your body healthy" or "good for your health," according to the Merriam-Webster dictionary (http://www.merriam-webster.com/dictionary/wholesome). The word conveys the presence of a choice that is related to health outcomes, that occurs at both the individual and collective levels, and that is particularly relevant for the formulation of health policies. We use the term "unwholesome" to refer to the manmade component of NCD risk factors, that is, the unwholesome consumption of goods and exposure to externalities.

Unwholesome consumption and externalities tend to involve attractive, modern goods produced by large corporations for profit, as well as urban externalities, whose deleterious impact is often not readily apparent. The consumption of these goods brings up issues of knowledge, learning, and irrationality in consumer decisions, as well as responsibility in production, advertising, and social planning. The prevalence of these four main types of manmade NCD risk factors (poor diets, abuse of alcohol, use of tobacco, and lack of physical activity) is linked with the major forces driving social, economic, and cultural change, including globalization, urbanization, and the general policy environment (WHO 2002).

Figure 6.1 Positive Immediate Benefits and Negative Future Consequences Typically Associated with Unwholesome Goods, the Manmade Component of NCD Risk Factors
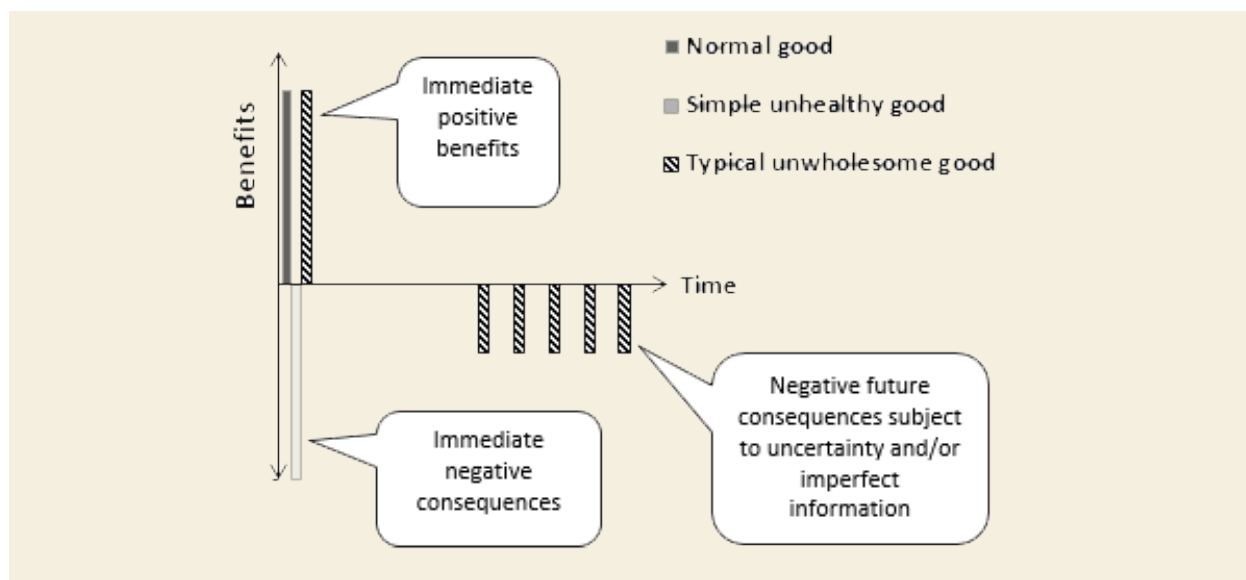
In extreme conditions it could be rational to consume unwholesome goods, for example when potable water is unavailable and soft drinks are used instead. However, such behavior can also express irrational ignorance, for example, when the perceived benefit of a soft drink habit is self-esteem and the unwitting consequence is long-term illness or death. To better understand the issues surrounding unwholesome goods, note that unwholesome goods tend to display a common feature: an immediate benefit combined with long-term, future negative consequences, about which the consumer and even the producer may be uninformed and uncertain (figure 6.1).

The Burden of NCDs

Since the 2002 Pan American Sanitary Conference, NCDs have been recognized as the greatest cause of premature death and morbidity in the LAC region. In 2007, 76 percent of LAC deaths were related to NCDs, 60 percent of them to the principal NCDs. The Pan American Health Organization (PAHO) also estimated that in 2007 some 250 million people were living with an NCD (Pescetto 2011). Among people between 30 and 60 years old, 50 percent of them had at least one NCD, and with the NCDs often impacting their ability to raise children and to be productive in the workforce, and also leading to premature death (Anderson and others 2009). In 2013, among children under 5 years of age in the LAC region, an estimated 4 million of them (roughly 7 percent) were overweight (WHO 2014).

The economic burden from NCDs is expected to rise substantially in the coming decades (Suhrcke and others 2006). A report by the World Economic Forum and the Harvard School of Public Health (Bloom and others 2011) estimates that NCDs will cost the world economy US$30 trillion (equivalent to 48% of global GDP) over the next 20 years. One macroeconomic analysis calculated that each 10-percent rise in NCDs is associated with a 0.5-percent lower rate of annual economic growth (Stuckler 2008.) The fiscal costs are expected to be higher than retirement costs (Adeyi, Smith, and Robles 2007).

Chronic diseases pose huge long-term costs in health care, whether financed by families or health systems. These diseases also affect poor and vulnerable populations disproportionately. NCDs present a huge organizational and technological challenge for health systems. Even individual disease categories, such as cardiovascular disease (Suhrcke and Urban 2010) and diabetes (Javitt and Chiang 1995), pose a growing threat to economic development. That is because of their direct health and health care impacts and because of the indirect costs in long-term human capital formation and low returns on those investments.

Economics of NCD Health Policies

A significant proportion of avoidable NCD risk factors are caused by human actions. (Genetic factors also exist, such as with diabetes and breast cancer.) These avoidable NCD risk factors result from individual and collective decisions that give rise to the unwholesome consumption and externalities mentioned above. Many NCDs should be prevented by individual and social behavioral changes rather than, for example, vaccinations and antibiotics. Therefore, NCD policy formulation requires: 1) an analysis of the decisions determining the prevalence of NCD risk factors and 2) an analysis of the economic effects of NCDs once they occur, whose reduction is the objective of policy. Both of these elements are necessary for a full macroeconomic understanding of NCDs. This is the essence of the two-pronged approach to NCDs of Maher and others (2009). The following materials will look first at the economic consequences of NCDs and then analyze the economics of the prevalence of NCD risk factors.

According to our definition above, wholesome human development refers to human development as it would proceed in the absence of risk factors caused by human action.

HUMAN DEVELOPMENT AND ECONOMIC GROWTH

NCDs are long-term health conditions whose impacts range over the life cycle. They affect human performance. Labor time is reduced and with it the application of the corresponding skills or human capital. These effects in turn decrease income and can also delay technological change, which is one of the drivers of economic growth. Labor time and available income must be redirected towards caring for the ill, and savings are reduced.

Taken together, these economic impacts of NCDs can be understood in terms of a model of human development that incorporates technological change and successive barriers to life-long human capital investment (Mayer-Foulkes 2008a). The model explains lagging human development and persistent poverty in an intergenerational context of economic growth that benefits and is benefitted by health. For example, human development lags spanned four generations in the stature transition in Bolivia, Brazil, Guatemala, and Peru, and in the cognitive transition in Mexico (Mayer-Foulkes 2008b; Mayer-Foulkes 2008c). Similarly, human development also interacts with the transition towards democracy

Figure 6.2 Human Development Trap Model, Showing Human Development in a Context of Technological Change, Differentiated by Socioeconomic Levels due to Intergenerational Market and Institutional Failures
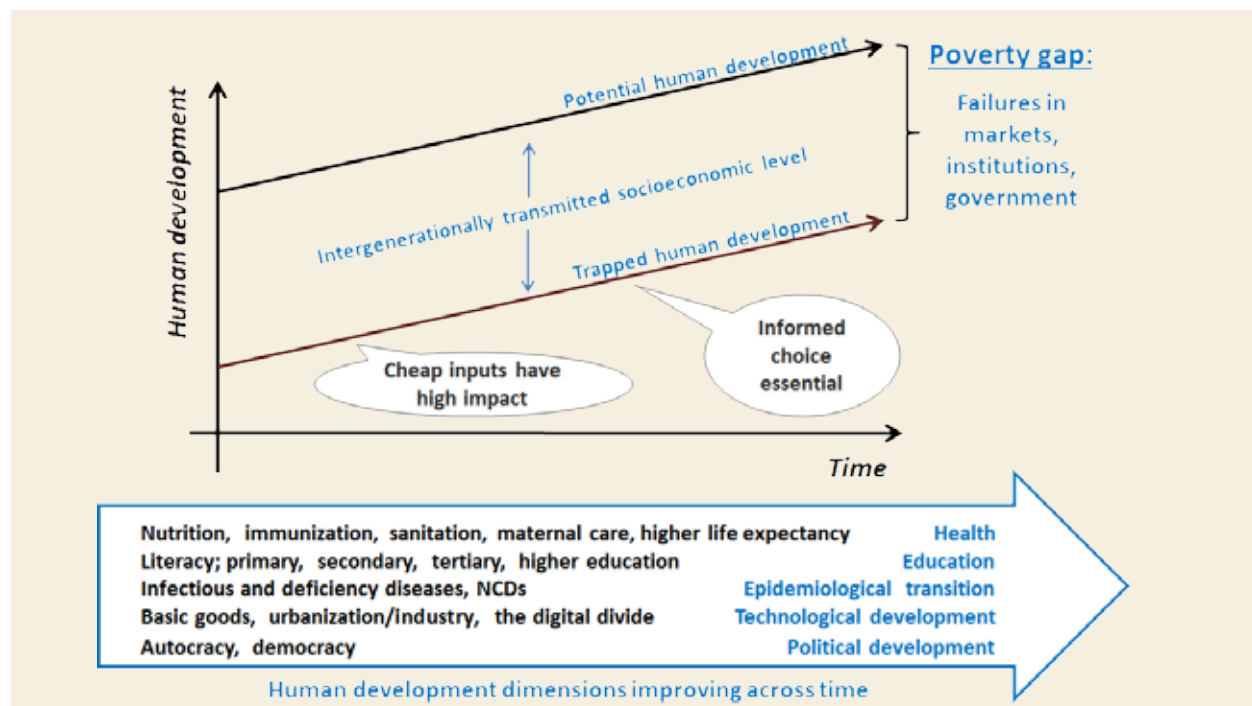
(Mayer-Foulkes 2013; Ranganathan and others 2015). This model of human development also underscores the important effect that early child development has on education, health, and income in adulthood (figure 6.2).

Figure 6.2 depicts the essential features of an epidemiological transition differentiated across socioeconomic levels, according to the human development trap model (Mayer-Foulkes 2008a). In this stylized representation, there are two socioeconomic levels, a high one and a low one. When "human development" refers to an entire society, it is referring to the conjunction of the human development of high and low socioeconomic strata. Differences between these socioeconomic levels may persist due to failures in markets, institutions, and government. Each socioeconomic level experiences an intergenerational increase in human development (for example, indicated by the human components of the Human Development Index of United Nations Development Programme, at an individual level). The increased level of human development follows a sequence of stages at which the critical health concerns evolve, in this case through nutrition, immunization, sanitation, maternal care, and higher life expectancy. At the same time, education evolves through literacy and through primary, secondary, tertiary, and higher education, with the lower socioeconomic levels lagging behind. At the initial stages of the human development transition shown, mortality is dominated by infectious and deficiency diseases, while at the later stages NCDs are dominant. At the same time, technological development is represented by a transition from basic goods to urbanization, industrialization, and socioeconomic status reflected by the digital divide. As discussed in Mayer-Foulkes (2013), the political transition towards democracy is also related to human development.

Note that at low levels of human development, cheap inputs have a high impact, since these are scarce for the poor, who are subject to market, institutional, and government failures. As human development proceeds and the epidemiological transition occurs, even for the poor, essential goods now represent a higher level of development. For example, higher levels of health services and informed choice may become essential to avoid NCDs. Moreover, technical requirements for the health sector itself may become much higher than for the population as a whole, presenting challenges in policy assessment, health surveillance, medical know-how, medical technology, and administration.

The first wave of studies on health and economic growth, in which PAHO played a very active role (Sachs 2001), was concerned with the lower stages of human development portrayed in figure 6.2. These studies were motivated by Nobel Prize–winning findings on the long-term impact of health on economic growth (Fogel 2002). These findings were synthesized in the concept of technophysio evolution, a rapid, culturally transmitted form of human evolution that is biological but not genetic and consists of a synergism between technological and physiological improvements.

Figure 6.3 Unwholesome Consumption and Externalities Reduce and Distort Human Development, with Impacts Differentiated by Socioeconomic Levels
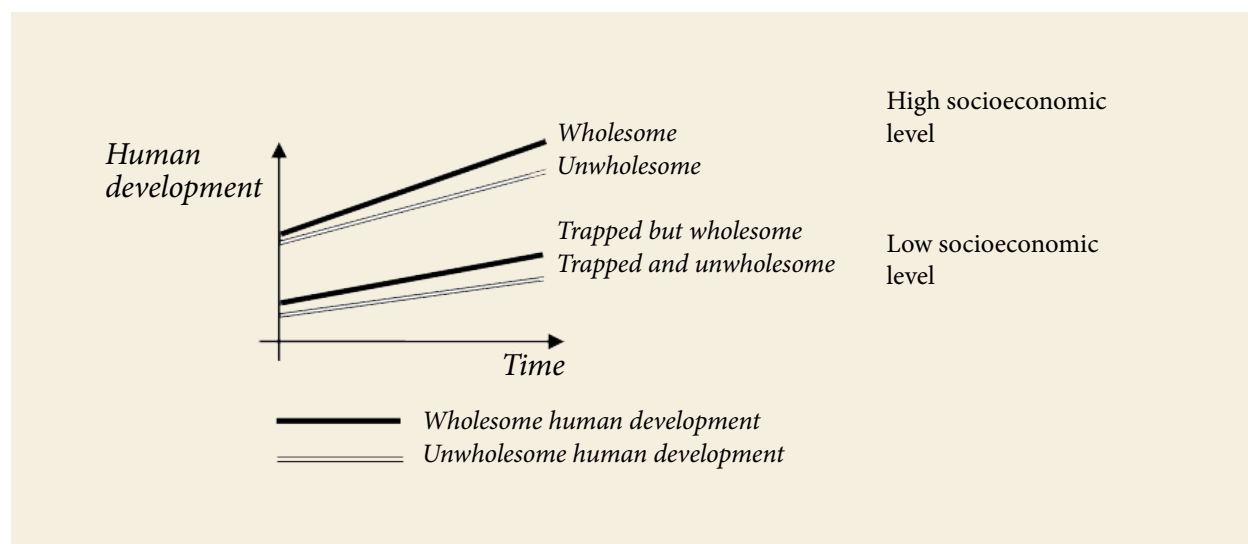
Figure 6.4 Impact of Unwholesome Consumption and Externalities on Lifelong Profiles of Health, Health Costs, Education, and Income
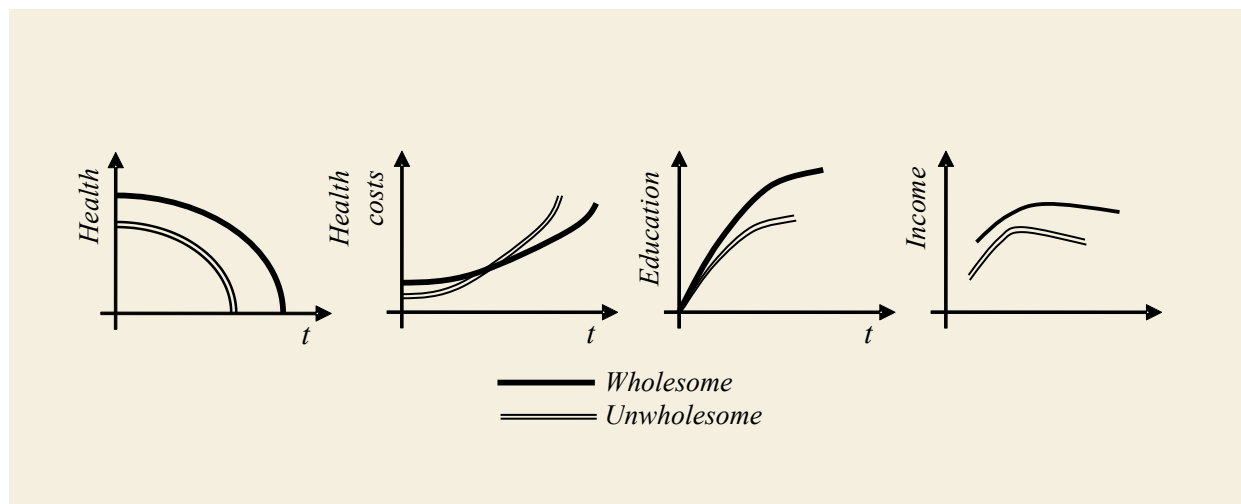
The shift in prevalence from infectious and deprivation diseases to NCDs can be considered a further stage of technophysio evolution, in both rich and developing nations. This additional stage occurs with the emergence from a poverty characterized by concerns with infant mortality, stature, and nutrition; infectious and deficiency diseases; maternal health; and life expectancy. The epidemiological transition towards NCDs was first defined as a concept by Omran in 1971 in conjunction with the demographic transition (Omran 2005). It is now clear that this transition is not as unidirectional as was first conceptualized. Several stages of the transition may overlap in the same country. It is quite possible to have epidemiological transitions differentiated across socioeconomic levels, as explained by the human development trap model (figure 6.2). It is also possible to have health and demographic transitions that are affected by the set of unwholesome consumption and externalities mentioned above (figure 6.1), that is, manmade NCD risk factors. These manmade risk factors can impact and distort the epidemiological transition, introducing in it what we have defined as an unwholesome component, in the shapes of population and life-cycle profiles of health, health costs, education, and income (figures 6.3 and 6.4).

Summarizing, the human development process is part of the economy and defines and interacts with labor supply, savings, investments, health and education costs, technological change, and so on. This process is also subject to the impacts of unwholesome consumption and externalities.

THE ECONOMICS OF NCD RISK FACTORS

The main NCD risk factors are unhealthy food and abuse of alcohol and/or use of tobacco, summarized as "unwholesome consumption," and physical inactivity, summarized as "unwholesome externalities." The demand for and the supply of these unwholesome risk factors are directly linked with the policies and politics of their regulation.

Demand, Supply, and Political Economy of Unwholesome Consumption

One major risk factor for NCDs is the nutrition transition. That transition has tended to replace a traditional diet rich in fruits and vegetables with an unwholesome diet that is heavy in calories derived from animal fats and that is lower in complex carbohydrates (Popkin 2002; WHO 2005; Yach and Beaglehole 2004). Among the underlying determinants of this and other risk factors are the major forces driving social, economic, and cultural change, including globalization, urbanization, and the general policy environment (WHO 2002).

The nutrition transition cannot be understood as a rational process of maximization of preferences conforming to the basic economic paradigm of rational individual and social choice. Instead, we see irrationality exploited for profit. An example is the existence of very simple, cost-effective measures to reduce the impact

of NCDs, such as decreasing the consumption of salt, sugar, alcohol, and tobacco. Another example is the impact of advertising on children and adolescent obesity. At the very least, cultivating rationality involves a very significant process of learning.

Some advances beyond the paradigm of rational maximization of preferences have emerged for economics. For example, Elster (2007) looks at self-interest and altruism, myopia and foresight, beliefs, emotions, collective belief formation, and action and decision making. Kahneman (2011) considers the interaction between fast, intuitive, and emotional thinking and slower, more deliberative, and more logical thinking. Akerlof and Kranton (2010) reflect on identity and social norms.

Exploiting irrationality for profit in the sale of unwholesome products involves adverse selection (the consumer cannot evaluate the product from its appearance). This allows such behaviors as irresponsible marketing and negligent production, where manufacturers knowingly produce and promote unwholesome products.

Unwholesome consumption tends to be led by a few large corporations whose advertising plays a leading role in the nutrition transition. In 2013, Nestle spent US$3.1 billion and Coca Cola US$2.9 billion for advertisements, and Mars, Inc., PepsiCo, and the McDonald's Corporation together expended another US$8.3 billion (Crain Communications Inc. 2014). Large diversified food companies, the second-largest ad spending category after cars, were expected to spend US$30.7 billion on ads in 2016, up slightly from US$30.4 billion in 2015, and advertising by the pharmaceutical industry is expected to be US$21 billion in 2016 (Maddox 2015). All these massive expenditures dwarf the funding available to WHO, whose organizationwide budget during 2014–2015 was US$1.99 billion per year (WHO 2013).

According to Pogge (2005a; 2005b), based on the United Nations Declaration of Human Rights, the systematic nature of the damages caused by advertising represents a massive violation of human rights.

Technological Change and Unwholesome Consumption

The market power of the large corporations producing unwholesome consumption goods partly originates from technological innovation. When the cheapest technology in a class of foods produces a healthy product, there is no problem. The difficulty comes when a cheap technology produces an unwholesome product. Thus there may be an inherent bias towards unwholesome products in the innovation process, since a lot of processed foods are less healthy than their fresh, organic counterparts. Most of the healthier products may be less amenable to large-scale

commercial production and consequently more expensive. Therefore, their production may on the one hand be less competitive and on the other hand less damaging to the environment. It is necessary to understand the precise supply-side economic determinants of the nutrition transition, which is altering agricultural land use and perhaps reducing sustainability.

Consequently, there is room for public policies promoting innovation for a wholesome diet, particularly in the fruit and vegetable agro-industry. Part of the problem may be that small-scale production, which wholesome food may require, needs more public support for innovation than does large-scale production. (See Mayer-Foulkes and Hafner (2015) for an analysis of the macroeconomic distortions caused by the market power of large-scale producers.)

The Allocation of Land and Unwholesome Consumption

In recent decades, the boom in processed foods, alcohol, and tobacco has led to large impacts on land allocation. The magnitude of the transformation is illustrated by the global transnational "land grab," which is occurring mainly in Sub-Saharan Africa but is also happening in Latin America (Borras Jr. and others 2012; GRAIN 2010; Lopez-Gamundi and Hanks 2011). The term "land grab" refers to the global wave of land purchases by transnational corporations (Cotula 2010). The term highlights the impact of political and market power, thus distinguishing it from the ideas of efficiency implied by "competitive markets."

Large corporations are purchasing land to produce healthy and/or unwholesome food for export, with profound implications for world agriculture, the livelihoods and food security of many, and the distribution of income, for decades to come (Cotula 2010). The repercussions of the land grab include increasing NCD risk factor prevalence due to the global impacts of unwholesome production.

Policies to channel the agricultural process towards the production of healthy food are especially important.

Unwholesome Externalities

The main NCD risk factor that works through externalities is lack of exercise, which to a great extent is a consequence of urban living and working conditions. A series of policies are required in this regard, for example with respect to transportation, urban design, availability of leisure areas, and better workplaces.

These and other externalities, such as urban and agricultural pollution, need to be taken into account as NCD risk factors.

The Static Impacts of the Unwholesome Economy

A substantial unwholesome sector has various expected static sectoral outcomes. When, for the reasons discussed above, unwholesome consumption becomes a larger sector of the economy than is optimal, it reduces the healthy food sector. Lifestyles and environmental externalities also reduce the resources dedicated to exercise and lead to unsafe streets, less green space, and fewer open spaces for walking. The resulting rise in the prevalence of NCDs increases both private and public health expenditures, as well as reduces productive labor and the aggregate product. A series of studies conducted with data for the late 1990s in the United States yielded some noteworthy findings. Chronic disease reduced working hours for men by 6.1 percent and for women by 3.9 percent (Suhrcke and others 2006). Healthy lifestyles in the working-age population reduced health care costs by 49 percent in adults aged 40 and above (Pronk and others 1999). Individual health care costs were increased 36 percent by obesity, 21 percent by smoking, and 10 percent by heavy drinking (Sturm 2002).

Globalization and NCD Risk Factor Policy and Policy Making

As the discussion has shown, NCD risk factors are associated with the global market. Globalization plays a critical role in global health (WHO 2002), health determinants such as the environment (McMichael 2002), health systems (Price and others 2001), and drug provision and tobacco consumption (Bettcher and others 2000; Shibuya and others 2003).

It follows that measures to regulate NCD risk factors may most efficiently be defined at the global level, consistent with the global market and legal framework. However, globalization has led to a weakening of public policy governance relative to the power of markets. Market power has increased to new heights around the world. Global governance development is only just beginning, at the same time that national governance has been weakened by globalization through processes such as tax competition (Mayer-Foulkes 2015). In addition, national policy making must be consistent with World Trade Organization (WTO) agreements, which include onerous requirement for evidence-based support. The priorities of multinational corporations were key sticking points in discussions over the recently signed UN political declaration on NCDs (Fink and Rabinowitz 2011). WHO itself is not immune to these problems, which influence policy formulation and research objectivity (Feig and Shah 2011; Shah 2011; Williams 2006).

The presence of market power in NCD risk factor production, made evident by the existence of lobbying, advertising, and profits, indicates the need for political action to put health policy in its right place. Producers of NCD risk factors as well as makers of health treatments are both deeply involved in government decision making on health policy. This entails, for example, heavy lobbying by the pharmaceutical sector. Chopra (2002) discusses the negative implications of corporate power for the promotion of healthy diets. The situation is so dire that Chopra and Darnton-Hill (2004) recommend a whole series of actions to take against the unwholesome food industry, similar to those taken against the tobacco industry. The UN declaration on the prevention and control of NCDs (UN 2011) is a step in this direction, following the WHO Framework Convention on Tobacco Control. Magnusson (2007; 2009) describes how to enhance and coordinate the global processes for health development. Horton and Lo (2014) consider protecting health to be a global challenge for capitalism.

The NCD prevention agenda has been moving forward slowly but surely. For example, Hospedales and others (2012) summarize country-driven efforts in the LAC region to address and prevent NCDs. Voon and others (2014) explore the issues involved in establishing regulations on NCD risk factors that are consistent with the WTO framework and so can thus withstand legal challenges from corporations. Bonilla-Chacin (2014) documents governance challenges in the design and implementation of populationwide, multisectoral interventions for preventing risk factors in several LAC nations, with case studies on Argentina's policies to reduce the consumption of trans fats and sodium; Bogotá's built environment to promote physical activity; Mexico's National Agreements on Food Health (the National Strategy to Fight Obesity); Uruguay's antitobacco policies; and Argentina's tobacco control policies.

The main policy recommendations for controlling NCD risk factors include taxes, labeling, legal dispositions and regulations on advertising and nutritional content, and information campaigns. Another proposal is for voluntary measures by industries to improve their products, such as with the salt content, without direct government intervention. Several authors have compared the effectiveness of various policy mixes for some of the countries of the Organisation for Economic Co-operation and Development (OECD) (Cecchini 2011; Lauer 2011; Sassi and Hurst 2008; Sassi, Cecchini, Lauer, and Chisholm 2009; Sassi, Devaux, Cecchini, and Rusticelli 2009; Sassi, Devaux, Church, Cecchini, and Borgonovi 2009).

CONCLUSION: NCD HEALTH POLICIES FOR LATIN AMERICA AND THE CARIBBEAN

NCDs are a costly, lifelong phenomenon. By and large, an important portion of that disease burden is a consequence of unwholesome consumption and externalities. Therefore, NCD policies have two key goals: (1) reducing the prevalence of risk factors and (2) providing treatment in a cost-effective way. Both of these are hard to achieve, and both require the development of evidence-based decision-making capabilities

Creating the databases and body of knowledge needed for policy evaluation is costly and poses a scientific challenge that could take as long to accomplish as would be required to put preventive policies into place.

Moreover, dealing with NCDs involves a learning process taking place at both the individual and societal levels. A considerable portion of NCD preventive policies can be thought of as implementing a learning process. It is therefore necessary to simultaneously implement health policy and construct the necessary evidence and experience base. This applies to implementing disease surveillance, reorienting health systems to respond to NCDs, and putting into place health promotion and disease prevention measures (PAHO 2007).

NCD risk factors are produced globally. Their regulation must be consistent with global economic agreements such as the WTO. International agreements may therefore be the most effective and efficient instruments for reducing those risk factors. However, the concentrated market structure of unwholesome production has large national and international political economy effects that not only distort national and global production and resource allocation, but also obstruct the development of these public health policies.

For the LAC countries, it is clear that a strategy of cooperation is called for that takes advantage of the commonalities among these nations. This would bring together the necessary resources for meeting the technical, health, and regulatory challenges of NCD policies.

Reducing the prevalence of NCD risk factors requires constructing global governance capabilities for establishing coordinated health policies. That kind of coordination could also help assemble the data and knowledge needed for reorienting health systems to respond to NCDs and for evaluating policy.

A series of designated, cost-effective measures for risk factor prevention and disease prevention has already been developed, and those measures provide a starting point for establishing NCD health policies (WHO 2014).

Multisectoral policies are needed to improve the food sector. Such policies must include promoting innovation for a wholesome fruit and vegetable agro-industry. Some elements for a healthy diet initiative for the Americas have been proposed by Mayer-Foulkes and Pescetto-Villouta (2012).

At present, even information on the direct and indirect costs of NCDs for the LAC countries is sparse. A concerted effort involving the collaboration of multiple institutions in those nations and elsewhere is essential, to make possible the cost-effective reduction of NCDs.

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The Equity Impact
of Noncommunicable Diseases
in Latin America

André Medici
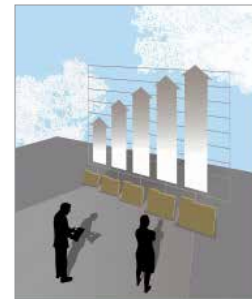
CONCEPTUAL ASPECTS

What is the difference between equity in health and equality in health? Among health economists, this debate has been going on since the 1980s, and it has revealed substantial differences in opinion. So far, most of the discussion has taken place in developed countries. Besides focusing on refining concepts and definitions, the argument has been about whether health care is a social good or a matter of distributive justice. This vigorous discussion has highlighted different visions about how to build or reform health systems (Daniels 1982). For some authors, inequality in health is the result of differences in genetic heritage, social and individual behaviors, experiences in life, exposure to health risk factors, and access to adequate health promotion, prevention, and treatment services. Because of the existence of so many determinants, inequality in health is the norm, given that no two persons have exactly the same health status. For Culyer and Wagstaff (1993), "Equality of health should be the dominant principle, and equity in health care should therefore entail distributing care in such a way as to get as close as is feasible to an equal distribution of health."

However, equality in health is associated with human functionality, given that better health improves one's capacity to be productive in society. Because of this, everyone should have the right to access health services. If not, society is denying equal, multidimensional

opportunities for all. For this reason, according to the Nobel Prize–winning economist Amartya Sen (2002), equity in health is a dominant principle and a matter of social justice: "Equality, as an abstract idea, does not have much cutting power, and the real work begins with the specification of what is to be equalized . . . This is where health becomes a critical concern, making health equity central to the understanding of social justice. It is, however, important to appreciate that health enters the arena of social justice in several distinct ways, and they do not all yield exactly the same reading of particular social arrangements. As a result, health equity is inescapably multidimensional as a concern."

The degree to which society provides access to health for everyone is a matter of equity. This equity is measured in terms of equal opportunities to have knowledge and to access health promotion, prevention, and treatment services according to each one's needs. Equity means that those with the same health care needs should receive equivalent services (horizontal equity), while those with different needs should receive different levels of care resources (vertical equity). The government should provide the public with enough knowledge about risk factors so that everyone can have the opportunity to avoid behavioral health risks. The government should also intervene in the social environments when they pose risks to the collective health.

Along these lines, besides carrying out educational campaigns and knowledge dissemination on health risk

factors, governments should be able to increase equality of opportunities in health by: (a) developing human environments free of pollution and contamination and safe from catastrophes and climate change; (b) making transportation systems, as much as possible, free from traffic accidents; (c) promoting affordable ways to perform physical activities (such as with public parks and sports courts and by regulating society so as to enable the population to have time available for these activities); (d) regulating and enforcing health and safety standards for food and other products for human consumption; and (e) regulating and monitoring occupational health standards and preventing work-related diseases.

On the other hand, having equitable health systems means that everyone can access and use health care services that meet their prevention, acute, and emergency needs and that treat noncommunicable diseases (NCDs). Everyone must also have access to rehabilitation facilities and long-term care. In other words, universal health coverage is directly associated with equal opportunities and equity in health.

The problem is how to start from this rights-based approach and then evaluate effective indicators and measures of health inequities. It is easy to say that social inequities in health exist because the society is unequal and that the only way to respond to health inequities is to resolve social inequalities. However, governments, including in Latin America, that have tried to solve social inequalities in health by implementing populist policies and measures, such as free health services for all, have not resolved the social inequalities nor achieved health equity. On the other hand, equal opportunities in jobs, education, and social/political participation play an effective role in improving health conditions for all and in reducing inequity in health. This has been shown in various developed countries.

A shared agenda that combines equal opportunities in health and in other social policies makes a real difference in increasing equitable access to services that can help deal with NCDs. In middle-income countries, NCDs have emerged as a major threat. Exposure to related risk factors and the lack of promotion, prevention, treatment, and rehabilitation services can increase both health inequity and the risk of impoverishment of large segments of the population. Figure 7.1 shows an analytical scheme that explains how this situation could occur.

Living with NCDs increases the demand for health services. If this additional care is not covered by public or private insurance, individuals can face drastically increased out-of-pocket expenses. This can be especially true for poor persons, who often do not have regular health insurance, thus increasing the portion of the household budget going for health services. This situation can increase ill health among family members, reduce opportunities for adults to work and for children to study, lead to earlier death among economically active household members, lower the household's income, and open the gates of poverty for the family. To avoid

Figure 7.1 How NCDs Could Increase Inequity and Lead to the Poverty Cycle
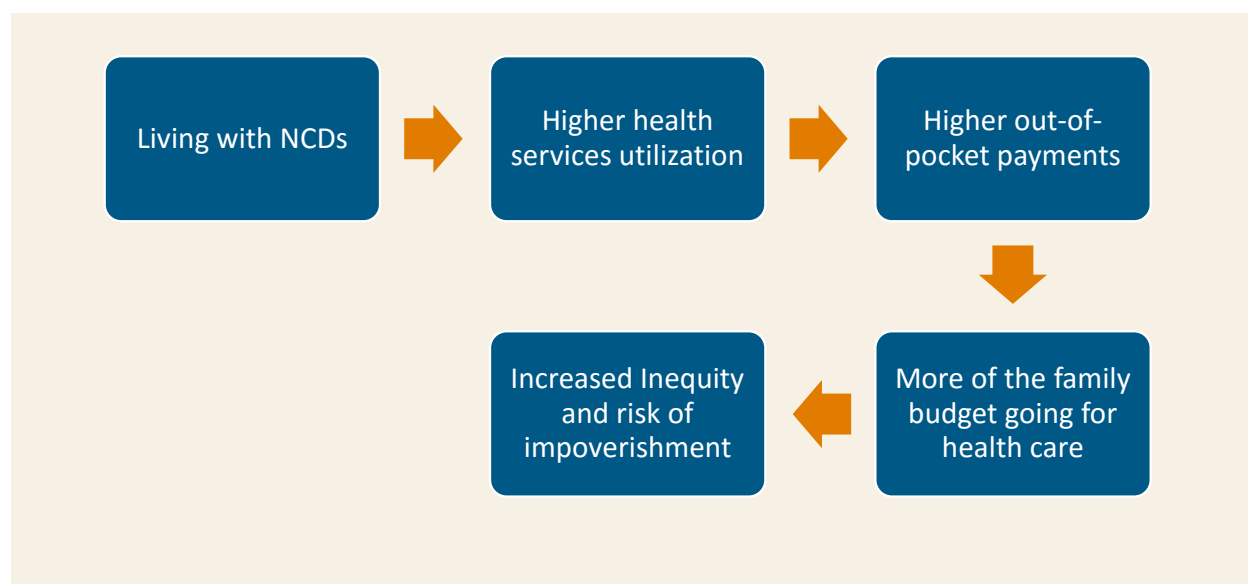
Source: WHO 2014a.

Note: AFR = African Region; AMR = Region of the Americas; SEAR = South East Asia Region; EUR = European Region; EMR = Eastern Mediterranean Region; WPR = Western Pacific Region.

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Table 7.1 Percentage of Obese Nonpregnant Women by Income Quintiles in 12 Latin American Countries

Country	Estimate year	Poorest quintile (%)	2nd quintile (%)	Middle quintile (%)	4th quintile (%)	Richest quintile (%)	Overall	Concentration index (CI)
Bolivia	2008	8.2	15.8	20.1	23.2	16,8	17,4	0.084
Brazil	2003	9,2	8,8	9,2	8,9	7,5	8,7	-0.028
Colombia	2010	14,0	16,0	14,7	13,9	11,9	14,2	-0.038
Domin. Republic	1996	7,5	13,0	13,7	13,9	14,7	12,9	0.086
Guatemala	1995	2,3	4,0	6,7	14,2	17,2	8,2	0.395
Guyana	2009	17,9	22,7	21,3	23,5	23,2	22,0	0.042
Haiti[a]	2005/6	0.6	1.8	3.1	7.1	13.0	6.2	0.437
Honduras[a]	2005/6	7.5	13.2	20.7	24.4	24.0	19.0	0.181
Mexico[a]	2002/3	14.1	16.3	18.9	17.2	14.8	16.2	0.027
Nicaragua	2001	7.6	13.5	19.3	23.1	21.9	18.2	0.151
Paraguay[a]	2002/3	9.2	8.9	9.8	16.6	10.7	11.4	0.064
Peru[a]	2004/8	5.0	12.2	17.0	17.8	15.0	14.2	0.111

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.

a. Average of the indicated two years

this vicious linkage between NCDs and deprivation, it is important to monitor how NCDs affect household income. Based on that, there must be actions to address income disparities and to increase access to health services among the population suffering from NCDs.

Despite advances in health coverage, most of the health systems in Latin America are not prepared to face the challenges of chronic diseases. The incidence of NCDs and their economic burdens in Latin America have both increased in recent years, with the poor suffering the most. Using data available from existing literature, this article will examine four aspects of the impact that NCDs have on equity in Latin American countries: (a) risk factors, (b) morbidity, (c) health services utilization, and (d) out-of-pocket spending.

EQUITY AND LIVING WITH NCDs: RISK FACTORS[i]

According to the World Health Organization (WHO) Global Health Observatory (http://www.who.int/gho/ncd/risk_factors/en/), NCD risk factors are common and preventable individual behaviors that underlie most NCDs. These actions include tobacco use, physical inactivity,

alcohol abuse, and having an unhealthy diet. These behaviors can lead to four key metabolic/physiological changes: raised blood pressure, overweight/obesity, elevated blood glucose, and higher cholesterol. These four changes are at the root of most NCD-associated morbidity, especially from cardiovascular diseases (such as angina), diabetes, and some cancers. These changes can also worsen individuals' perception of their own health status, thus contributing to low productivity, absenteeism, and other problems that block achievement of a happy life.

This section of the article will discuss how some risk factors associated with NCD morbidity are correlated with income levels. The data used are based on household surveys.[ii] Unfortunately, such surveys are not available for all countries or for all recent years.[iii] The data will be presented using income quintiles and the concentration index (CI) in order to address equity problems associated with these NCD risk factors. (The CI varies from -1 (minus one) to 1. When positive, the variable is concentrated in the richest part of the population. When negative, the variable is concentrated in the poorest part of the population.). The risk factors surveyed in these household surveys are: obesity among nonpregnant women, smoking, insufficient intake of fruits and vegetables, insufficient physical activity, and alcohol abuse.

Figure 7.2 Ratio between the Percentage of Obese Nonpregnant Women in the Richest and the Poorest Income Quintiles in 12 Countries of Latin America
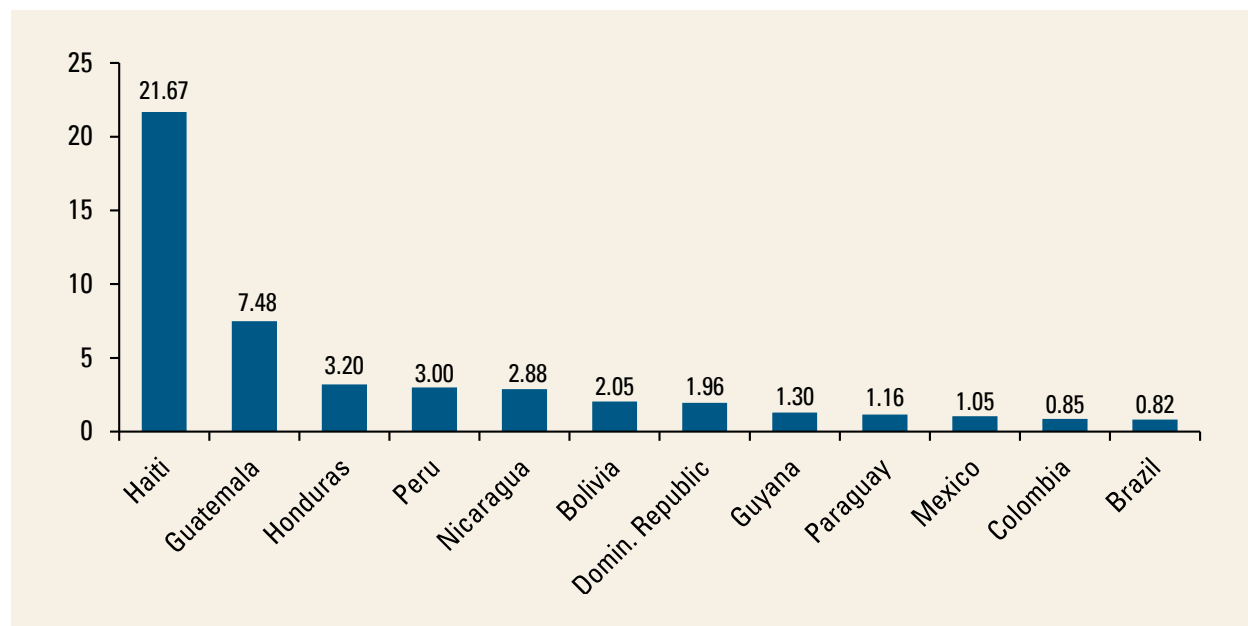
Obesity among Nonpregnant Women

Obesity is apparently not linked directly with income.[iv] Social and cultural characteristics, enhanced population knowledge, and such government efforts as health communication campaigns shape population obesity as a risk factor. However, studies developed by the Food Research and Action Center about the relationship among obesity, food insecurity, and poverty show that low-income women and children are more likely to have a risk of obesity than are men (FRAC 2015). For this reason, this subsection concentrates its analysis on women's obesity.

According to data from 12 countries in Latin America (table 7.1), obesity among nonpregnant women varies from 6.2 percent (Haiti) to 22.0 percent (Guyana). Table 7.1 also shows there are differences in the incidence of obesity among the income quintiles. In 9 of the 12 Latin American countries, there is a higher incidence of obesity among wealthier women than in poorer women. However, in the 3 countries with higher income levels—Brazil, Colombia, and Mexico—the concentration index (CI) in the distribution of the obesity among nonpregnant women by income quintiles is either negative or close to zero. In Brazil and Colombia, the incidence of obesity is higher among the poorest women than among the richest women.

When countries are very poor, women in higher-income groups tend to be more obese. However, economic growth and improvements in income distribution could lead to closing the obesity gap between rich and poor women. Besides these patterns, two other factors are often overlooked: The relationship between income and weight can vary by race-ethnicity and age, and disparities by income seem to be weakening over time.

In the United States between 1980 and 2000, the disparities in obesity rates among women decreased when considering such variables as income and ethnic group, even though the overall prevalence of obesity rose substantially (Zhang and Wang 2004). Rates of obesity also increased among both the poor and nonpoor between 1971 and 2000. However, at the end of the period, obesity was higher among the poor than among the nonpoor, similar to the pattern shown in table 7.1 for Colombia and Brazil.

Another way to see inequities in the distribution of a given variable is the relationship between the richest quintile and the poorest quintile (Q5/Q1 ratio). Figure 7.2, which is based on the table 7.1 data, presents the ratio between the percentage of obese women in the richest and the poorest income quintiles in the 12 countries. As can be seen, the countries with higher per-capita incomes, such as Mexico, Brazil, and Colombia, present the lowest ratios, while the highest ratios (higher than 2)

are in the countries with lower per-capita incomes: Haiti. Guatemala, Honduras, Peru, Nicaragua, and Bolivia.

Some public programs, such as massive media campaigns in Brazil and Colombia, have helped reduce obesity among the poor. These successful efforts could serve as a model for other countries of Latin America. Other programs might also help to reduce obesity among women, such as by creating subsidies for healthy foods for lower-income women and by regulating food advertising and school lunch programs. Without these kinds of activities, obesity and overweight rates in Latin America countries will continue to rise among vulnerable and low-income populations, including indigenous people.

Smoking

There is substantial evidence that in developed countries, smoking tends to be associated with lower-income groups. In these nations, reducing social inequalities in smoking and lessening smoking's health consequences is a public health issue and a political priority. This often leads to increased tobacco prices via taxation, with two key potential benefits. First, it may reduce smoking among lower-income groups, despite the fact that it depends on how price elasticity and tobacco demand are related. Second, more taxes on tobacco could help finance the rising costs of tobacco-related NCDs in public health facilities. Some of the strategies using tobacco taxation have helped reduce tobacco consumption in the lowest-income groups. According to the U.S. Centers for Disease Control (CDC 1998), cigarette prices and tax increases work more effectively to reduce smoking among males, Blacks, Hispanics, and lower-income smokers.

In Latin America and the Caribbean, according to Barreto and others (2012), smoking rates are declining, but remain a concern since many actions to prevent and control smoking have not yet been taken. Also according to these authors, recent data show that, overall, 17 percent of women in Latin America and the Caribbean smoke, but with large differences in the rates across the subregions. The Southern Cone has the highest percentage of women smokers (30 percent) and Central America the lowest (4 percent). The prevalence of smoking among men is higher overall, at 31 percent, with a low of 18 percent in the Latin Caribbean and a high of 44 percent in the Southern Cone.

Table 7.2 shows the percentage of women in nine Latin American countries in the first decade of this century who were smoking, by income quintiles. In five of these nations, smoking rates were higher among poorer women, as indicated by the negative concentration indices.

Table 7.2 Percentage of Women in Latin American Countries Who Smoked in Recent Years, by Income Quintiles

Country	Estimate year	Poorest quintile (%)	2nd quintile (%)	Middle quintile (%)	4th quintile (%)	Richest quintile (%)	Overall	Concentration index (CI)
Brazil	2003	27.4	21.6	14.2	16.8	16.7	19.5	–0.110
Domin. Republic	2002	13.3	11,0	8.2	6.9	5.6	8.6	–0.176
Guyana	2009	3.6	4.4	2.3	2.5	3.6	3.3	–0.046
Haiti[a]	2005/6	4.6	3.5	2.9	2.3	3.4	3.2	–0.066
Honduras[a]	2005/6	0.6	0.9	1.7	2.8	4.4	2.3	0.368
Mexico[a]	2002/3	8.8	12.0	15.9	17.8	26.3	16.1	0.216
Nicaragua	2001	2.2	3.0	4.2	5.5	9.5	5.3	0.293
Paraguay[a]	2002/3	14.3	12.6	8.0	8.5	13.7	11.3	–0.017
Peru[a]	2004/8	1.4	1.7	4.2	7.4	13.2	6.1	0.414

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.
a. Average of the indicated two years.

Table 7.3 Recent Changes in the Percentage of Women Smoking in Brazil and the Dominican Republic, by Income Quintiles

	Brazil			Dominican Republic		
			Change			Change
	2003	**2008**	**%**	**2002**	**2007**	**%**
% smoking Overall	19.5	8.6	−55.9	8.6	6.7	−22.1
% poorest quintile	27.4	6.2	−77.4	13.3	10.8	−18.8
% 2nd quintile	21.6	5.4	−75.0	11.0	8.4	−23.6
% middle quintile	14.2	6.7	−52.8	8.2	6.0	−26.8
% 4th quintile	16.8	8.1	−51.8	6.9	4.6	−33.3
% richest quintile	16.7	14.8	−11.4	5.6	4.8	−14.3
Concentration index	−0.110	0.226	—	−0.176	−0.183	—
Q5/Q1 ratio	0.86	1.72	100.0	0.58	0.72	24.1

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.

Note: The symbol "—" means data not available.

Available data show that in at least two countries—Brazil and the Dominican Republic—women's smoking rates declined in the first decade of this century (table 7.3). In Brazil, between 2003 and 2008, the percentage of women smoking fell from 19.5 percent to 8.6 percent, and in the Dominican Republic it dropped from 8.6 percent to 6.7 percent. However, table 7.3 also shows that in Brazil, the reductions among the poorer quintiles were noticeably higher than they were in the Dominican Republic.

Occurring over more than two decades, the large decrease in smoking in Brazil can be attributed to the country implementing effective tobacco control policies. Since 1996, the Brazilian federal, state, and local governments have put in place such policies as tobacco tax increases (1996, 2003, 2006), tobacco health warnings, advertising restrictions, and bans on smoking in indoor public places (Campaign for Tobacco-Free Kids 2013). These policies have impacted the lower- and middle-income quintiles of women more than the richest quintile, as can be seen in table 7.3.

In the Dominican Republic, despite the slight reduction in women's smoking as indicated in table 7.3, few public campaigns against smoking had been developed up through 2006, except vague messages printed on cigarette packages, billboards, posters, and placards (Dozier and others 2006). No radio or television messages and national awareness campaigns about the dangers of smoking had been presented. Although sales of cigarettes to teenagers and legal minors were forbidden, enforcement was inconsistent. For all these reasons, the reduction of smoking in the Dominican Republic did not have the strong effects among poor women as occurred in Brazil. Further, tobacco control efforts were still lagging in the country as of 2015 (WHO 2015).

Table 7.4 shows the percentage of adult men and women who smoked in six Latin American countries around 2002 and 2003, by income quintiles. Except in Mexico and Ecuador, the concentration indices are negative and the burden of smoking is largest for the poorest population. Uruguay has the highest overall share of smoking among the countries listed in the table (more than one-third of the adult population). Despite that fact, larger inequities can be found in other countries. For example, in the Dominican Republic, the CI is -0.219 and the adult population in the poorest-income quintile has a proportion of smokers almost three times as large as in the richest quintile.

Table 7.4 Percentage of Adult Population Who Smoked, by Income Quintile, in Six Latin American Countries, around 2002 and 2003

Country	Estimate year	Poorest quintile (%)	2nd quintile (%)	Middle quintile (%)	4th quintile (%)	Richest quintile (%)	Overall	Concentration index (CI)
Brazil	2003	30.4	25.6	19.8	17.8	17.6	22.2	−0.127
Domin. Republic	2003	26.4	18.0	14.8	10.4	9.4	15.1	−0.219
Ecuador	2003	13.8	15.6	15.1	17.3	17.8	16.4	0.038
Mexico[a]	2002/3	18.9	21.6	25.3	26.2	30.4	24.5	0.097
Paraguay[a]	2002/3	39.7	29.7	26.1	19.6	20.1	26.9	−0.150
Uruguay[a]	2002/3	36.6	34.8	35.0	30.7	30.7	33.5	−0.043

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.

a. Average of the indicated two years.

According to the World Health Organization (WHO), fruits and vegetables are indispensable for a healthy diet, and their reduced consumption leads to increased risk of NCDs, including cardiovascular diseases and certain types of cancer. There is also research-based evidence showing that fruits and vegetables may help prevent weight gain and also reduce the risk of obesity, given that they are rich sources of vitamins and minerals, fiber, and antioxidants and other beneficial nonnutrient substances.

Table 7.5 shows the percentage of the population with insufficient intake of fruits and vegetables in five Latin America countries around 2003, by income quintiles. As can be seen, the percentages are very high, ranging from 58 percent overall in Brazil to 87 percent overall in Ecuador. All the countries except Paraguay have negative concentration indices, indicating that the poor are more affected than the rich by the inadequate intake of fruits and vegetables.

Table 7.5 Percentage of Population with Insufficient Intake of Fruits and Vegetables in Five Latin American Countries, by Income Quintiles, around 2003

Country	Estimate year	Poorest quintile (%)	2nd quintile	Middle quintile (%)	4th quintile (%)	Richest quintile (%)	Overall	Concentration index (CI)
(%)	Middle quintile (%)	4th quintile (%)	Richest quintile (%)	Overall	Concentration index (CI)	17.6	22.2	−0.127
Brazil	2003	69.4	62.3	59.0	56.4	51.5	57.6	−0.054
Domin. Republic	2003	77.8	80.3	76.0	71.6	73.5	75.6	−0.020
Ecuador	2003	92.9	88.9	87.4	86.0	86.8	87.3	−0.006
Paraguay[a]	2002/3	60.5	64.3	67.0	69.0	72.1	66.7	0.033
Uruguay[a]	2002/3	75.4	73.2	71.6	71.7	66.7	71.7	−0.023

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.

a. Average of the indicated two years

Despite the high level of insufficient intake of fruits and vegetables in Latin American countries, there is little information on what governments are doing to boost consumption and to make these products more affordable to the poor. Increasing urbanization and higher production costs make fruits and vegetables more expensive. This especially disadvantages the poor and encourages more frequent consumption of unhealthy industrialized foods. There is a need for indicators to monitor the price and affordability of healthy foods in order to inform policy makers and to help them plan better strategies to tackle NCDs and their related inequalities in Latin American countries.

Insufficient Physical Activity

According to substantial scientific evidence, physical activity is fundamental in ensuring and enhancing health and well-being, with positive effects on the cardiovascular system, muscles, bones, immune system, and nervous system. Physical activity helps prevent NCDs (such as cardiovascular diseases, type 2 diabetes, and some kinds of cancers) by reducing blood pressure as well as cholesterol and sugar levels in the blood. According to a WHO estimate (http://www.who.int/dietphysicalactivity/pa/en/), physical inactivity is the fourth leading risk factor for global mortality, responsible for 6 percent of deaths worldwide. There are inequalities in the levels of physical activity that are related to age, gender, ethnicity, disability, income level, and living and working conditions. Generally, those who live in high-priced urban areas are more likely to meet their physical activity needs than are those living in the most deprived areas. Higher-income groups are better able to pay for gym fees and sports equipment and to participate in sport competitions than are lower-income groups.

In Latin America, many studies have been written about physical inactivity but few of them show inequalities in accessing physical activity according to sociodemographic characteristics of the population. An exception is Colombia, one of the countries in Latin America with the greatest socioeconomic inequality. In that country there is some evidence that adults with low socioeconomic status are less likely to do the recommended amount of leisure-time physical activity or to use a bicycle for transportation (Gonzales and others 2014). However, making comparisons between the physical inactivity levels in different countries could be difficult, given that differences in demographic structures and geography could also influence the levels of physical activity.

Table 7.6 shows the percentage of population with insufficient physical activity in six Latin America countries around 2003, by income quintiles. Uruguay and Mexico, two countries with a growing proportion of older residents, had the highest overall percentages of physical inactivity. In a majority of the countries, the differences among the quintiles were not too large, with

Table 7.6 Percentage of Population with Insufficient Physical Activity in Six Latin American Countries, by Income Quintiles, around 2003

Country	Estimate year	Poorest quintile (%)	2nd quintile	Middle quintile (%)	4th quintile (%)	Richest quintile (%)	Overall	Concentration index (CI)
Brazil	2003	24.5	23.1	23.9	20.6	24.5	23.3	−0.010
Domin. Republic	2003	15.4	15.9	16.0	18.0	19.8	17.0	0.058
Ecuador	2003	0.5	3.8	8.3	6.1	4.2	4.6	0.190
Mexico[a]	2002/3	39.0	36.3	31.8	30.5	29.5	33.4	−0.063
Paraguay[a]	2002/3	28.3	26.4	19.7	19.1	19.7	22.6	−0.089
Uruguay[a]	2002/3	49.3	48.8	44.5	42.6	41.8	45.4	−0.031

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.

a. Average of the indicated two years.

only a modest trend of insufficient physical activity being more common in the lower-income groups (with negative concentration indices).

Improving equity in access to opportunities for physical activity in the countries of Latin America requires policies that go beyond the health sector and also involve urban development, transportation, education, and labor. Governments have a critical role to play in helping the health sector to communicate the extent of the risk associated with sedentary behavior and to develop outdoor urban settings to promote physical activity (Bonilla-Chacin 2014). Adequate urban recreational equipment and facilities close to work and living spaces are essential to allow the poor to practice physical activity on a regular basis.

Alcohol Abuse

Alcohol abuse is another important risk factor for several NCDs. However, the social relevance of considering this a problem varies widely among different cultures, countries, and regions.

Parry and others (2011) have provided a useful summary of the relationships between different patterns of alcohol consumption and various NCDs: "Alcohol is causally linked (to varying degrees) to eight different cancers, with the risk increasing with the volume consumed. Similarly, alcohol use is related detrimentally for many cardiovascular outcomes, including hypertension, hemorrhagic stroke

and atrial fibrillation. For other cardiovascular outcomes the relationship is more complex. Alcohol is furthermore linked to various forms of liver disease (particularly with fatty liver, alcoholic hepatitis and cirrhosis) and pancreatitis. For diabetes the relationship is also complex. Conservatively, of the global NCD-related burden of deaths, net years of life lost (YLL) and net disability adjusted life years (DALYs), 3.4%, 5.0% and 2.4%, respectively, can be attributed to alcohol consumption, with the burden being particularly high for cancer and liver cirrhosis."

"Alcohol abuse" is a diagnosis in which alcoholic beverages are used in a recurring manner, creating dependence, despite negative consequences for health. It is an important risk factor for NCDs in Latin America. In some countries, it is especially prevalent among vulnerable groups, including the poor and indigenous populations. Table 7.7 shows that the highest proportion of alcohol abuse around 2003 was in Ecuador (33 percent), followed by Paraguay (14 percent) and Brazil (11 percent). However, only in Paraguay did the poor have alcohol abuse rates higher than those of the rich. Mexico and Uruguay had lower overall rates of alcohol abuse, but this risk factor was most prevalent in the richest-income quintile.

In general, alcohol abuse is more common in the richest quintiles, because alcohol is a commodity that requires available income to obtain. Given that, the lowest-income quintiles should be usually the least likely to drink. Higher

Table 7.7 Percentage of Population with Alcohol Abuse in Six Latin American Countries, by Income Quintiles, around 2003

Country	Estimate year	Poorest quintile (%)	2nd quintile	Middle quintile (%)	4th quintile (%)	Richest quintile (%)	Overall	Concentration index (CI)
Brazil	2003	7.5	10.6	11.7	11.9	13.3	11.0	0.092
Domin. Republic	2003	8.7	8.8	9.4	10.1	11.1	9.7	0.056
Ecuador	2003	30.4	29.5	29.9	36.9	35.3	33.0	0.046
Mexico[a]	2002/3	2.1	2.3	2.5	2.9	3.3	2.6	0.092
Paraguay[a]	2002/3	17.9	15.3	14.1	14.2	10.7	14.4	−0.092
Uruguay[a]	2002/3	2.8	4.8	2.8	3.8	5.6	4.0	0.132

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.

a. Average of the indicated two years.

prices of alcohol also help reduce consumption among the poorest quintiles, and alcohol taxation has been used many times in Latin American countries in this way. Banning of alcohol sales to minors is another important policy tool adopted by some Latin American countries to reduce alcohol abuse among the poor.

Summary of the Evidence on the Prevalence of NCD Risk Factors among Income Quintiles in Latin America

As shown by the data in this first section of the article, equity in the incidence of NCD risk factors in Latin America in the preceding 10 to 15 years has differed according to the socioeconomic, demographic, and epidemiologic trends related to each risk factor and to each country. Equity in the incidence of risk factors also varies in the different stages of epidemiological and demographic transition.

In the early stages of the demographic and epidemiological transition, NCD risk factors tend to have a higher incidence in the richest-income quintiles. Countries such as Bolivia, Haiti, and Guyana, which are in early stages of both transitions, contrast with such nations as Mexico, Brazil, and Uruguay, which are in more advanced stages of those transitions and have higher incidences of NCD risk factor in the poorer quintiles.

Table 7.8 summarizes the results expressed in the concentration indices in tables 7.1 to 7.7. A trend is considered "progressive" (the poor are apparently in a better situation) when the CI is positive. The trend is "regressive" (the poor are disproportionately affected)

Table 7.8 Summary of the Progressive or Regressive Trends in the Concentration Indices associated with NCD Risk Factors in 12 Latin American Countries in Recent Decades

Country	Risk factors progressive or regressive according to the concentration index					
	Obesity among nonpregnant women	Smoking among women	Smoking among men and women	Insufficient intake of fruits and vegetables	Insufficient physical activity	Alcohol abuse
Bolivia	Progressive	—	—	—	—	—
Brazil	Regressive	Regressive	Regressive	Regressive	Regressive	Progressive
Colombia	Regressive	—	—	—	—	—
Domin. Republic	Progressive	Regressive	Regressive	Regressive	Progressive	Progressive
Ecuador	—	—	Regressive	Regressive	Progressive	Progressive
Guatemala	Progressive	—	—	—	—	—
Guyana	Progressive	Regressive	—	—	—	—
Haiti	Progressive	Regressive	—	—	—	—
Honduras	Progressive	Progressive	—	—	—	—
Mexico	Progressive	Progressive	Progressive	—	Regressive	Progressive
Nicaragua	Progressive	Progressive	—	—	—	—
Paraguay	Progressive	Progressive	—	Progressive	Regressive	Regressive
Peru	Progressive	Regressive	Regressive	—	—	—
Uruguay	—	—	Regressive	Regressive	Regressive	Progressive

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.

Note: The symbol "—" means data not available.

when the CI is negative. In the majority of the 14 countries studied, among the regressive risk factors are smoking among men and women, insufficient intake of fruits and vegetables, and insufficient physical activity. However, alcohol abuse and female obesity are more common in the highest-income quintiles.

As table 7.8 makes clear, reporting only the average rates for risk factors for NCDs can hide the dimension of inequality in their incidence. Such information is essential for the design of health policies committed to universal health coverage and the pursuit of social justice with respect to NCDs in Latin American countries.

Some national risk factor surveys based on WHO methodology have been implemented since the beginning of this century. These surveys, developed and financed by each country, focus on obtaining core data on the established risk factors that determine the major disease burdens. This approach is flexible enough to allow each country to expand on the core variables and risk factors, and to incorporate optional modules related to local or regional interests (http://www.who.int/chp/steps/en/). Such research can offer great insight into the social patterning of chronic diseases in Latin America. The surveys can be linked to other data sources and can generate additional information on socioeconomic conditions that could be incorporated in multilevel analyses of equity and NCD risk factors. However, ongoing household surveys need to be done in order to produce up-to-date data and evidence on equity and NCD risk factors that can be a resource for designing better, equity-driven health policies.

EQUITY AND LIVING WITH NCDs: MORBIDITY DATA

Information about equity in relation to NCD morbidity is not easy to find and evaluate. Few recent household surveys in Latin American countries have presented information on NCD morbidity and income levels. In addition, there is likely a certain level of underregistration of NCD morbidity, especially among the poor, due to asymmetries in knowledge and in self-assessment of disease and health conditions. Generally, persons in the highest-income quintiles have more access to diagnosis and medical information about their diseases and morbidity conditions related to NCDs. While some NCDs are more evident and are easy to be self-detected in the poorest families, other diseases stay hidden for a long time, just appearing when the first acute symptoms require medical intervention or lead to death.

The Health Equity and Financial Protection reports of the World Bank (www.worldbank.org/povertyandhealth),

which are based on household surveys, have taken stock of this situation in countries around the world. For Latin America, data on income disparities and NCD morbidity are available for Brazil, the Dominican Republic, Ecuador, Mexico, Paraguay, and Uruguay. In these reports, the following specific conditions have been investigated for around the year 2003: angina, arthritis, asthma, depression, and diabetes. No data about income equity and cancer have been systematically analyzed for Latin American countries.

This section of the article will present morbidity data for these countries and these NCDs. The section also seeks to provide insight on some of the common misperceptions about NCDs, such as that chronic diseases mainly affect high-income countries, that low- and middle-income countries need to focus their attention on infectious diseases first and chronic diseases second, and that chronic diseases are diseases of affluence and mainly affect rich people (De Maio 2011).

Angina

Angina (as known as angina pectoris) is one of the main conditions of cardiovascular diseases. It is characterized by a chest pain caused by reduced blood flow to the heart muscle, and it is one of the main symptoms of coronary artery disease. Narrow arteries (atherosclerosis) can reduce the blood flow, and then such substances as fat, cholesterol, and calcium build up inside the artery walls, creating blood clots that block arteries and reduce the flow of oxygen-rich blood to the heart. The main factors for angina are overweight, history of heart disease, high cholesterol or high blood pressure, diabetes, smoking, and physical inactivity. In developed countries, angina's age-standardized prevalence tends to be elevated in women and also in persons with lower socioeconomic status, because of the lack of information about risk factors. These groups also receive fewer procedures during the episodes where medical care is needed, increasing their survival risks (Hetemaa 2006).

Risk factors associated with cardiovascular diseases and angina are increasing in Latin America. Smoking, insufficient intake of fruits and vegetables, and physical inactivity tend to affect the poor more, but alcohol abuse still affects the rich more. Table 7.9 shows the incidence of angina around 2003 in the six nations studied. The incidence appears to be higher among the poorer quintiles in Brazil, the Dominican Republic, and Ecuador, but somewhat higher among the richer quintiles in Mexico, Paraguay, and Uruguay.

Even with these different concentration indices, the risk of late detection of angina and other cardiovascular diseases is higher among the poorest-income quintiles,

Table 7.9 Percentage of Population with Angina in Six Latin American Countries around 2003, by Income Quintiles

Country	Estimate year	Poorest quintile (%)	2nd quintile	Middle quintile (%)	4th quintile (%)	Richest quintile (%)	Overall	Concentration index (CI)
Brazil	2003	6.7	7.2	8.5	6.4	5.3	6.8	−0.058
Domin. Republic	2003	3.2	5.7	5.4	3.7	2.3	4.0	−0.081
Ecuador	2003	5.9	6.0	3.1	3.8	4.5	4.4	−0.031
Mexico[a]	2002/3	1.8	2.0	1.9	3.0	2.8	2.3	0.105
Paraguay[a]	2002/3	5.1	6.3	6.0	6.6	5.2	5.8	0.005
Uruguay[a]	2002/3	4.2	5.6	5.6	6.2	4.9	5.3	0.016

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.

a. Average of the indicated two years.

due to poor access to health care and higher exposure to risk factors such as obesity, physical inactivity, and psychological stress. People living with coronary heart disease in the poorest-income quintiles are also more likely to be smokers and to be obese than are others. These risk factors have a high correlation with cardiovascular diseases in Paraguay (Chaves and others 2015). Other types of cardiovascular diseases that are brought on by infections, such as Chagas disease and rheumatic heart disease, are associated with extreme poverty due to poor housing, malnutrition, and overcrowding.

Arthritis

Arthritis is part of a family of musculoskeletal conditions. It can be divided into two main forms: (a) osteoarthritis, which is characterized by focal areas of loss of articular cartilage and is associated with hypertrophy of bone, and (b) rheumatoid arthritis, which is an inflammatory condition with widespread synovial joint involvement. The first has effects such as joint pain, tenderness, limitation of movement, crepitus, occasional effusion, and variable degrees of local inflammation. The second predominantly affects peripheral joints, creating a persistent synovitis and leading to joint destruction and long-term morbidity and increased mortality. Both arthritis conditions are related to the aging process and affect women more because they generally live longer than men do. Feller (2015) reported: "Researchers analyzed survey data on 4,000 Australian men and women over age 21 collected between 2007 and 2012. They found that woman with arthritis were 51

percent more likely to fall into poverty, while men were 22 percent more likely, when compared with people who do not have arthritis."

Table 7.10 shows that in Latin America, arthritis is related to equity in various ways. It affects the poor more in Brazil, Ecuador, and Uruguay, but the reverse is true in the Dominican Republic, Mexico, and Paraguay. However, problems in reporting arthritis can occur, especially among the poor, who may be uninsured or have limited health coverage. These persons often lack access to diagnostic tests for arthritis-associated symptoms, to medical visits, and to medicines to treat it properly. Distinctions in perceptions and knowledge among different income groups could also influence the equity analysis of the incidence of arthritis.

Asthma

Asthma affects approximately 300 million persons around the world, with prevalence rates in different countries ranging from 1 percent to 18 percent. Asthma in Latin America is a growing public health problem. Many studies have pointed out socioeconomic and demographic differences in asthma prevalence, morbidity, and mortality rates. These differences are mostly related to inequalities in income, variations in environmental and occupational exposures, and differential access to medical care (Greenwood and others 2011).

Table 7.11 shows that in all six Latin American countries with data available, the richest quintile has a higher prevalence of asthma than does the poorest quintile.

Nevertheless, according to some recent evidence, asthma in Latin America seems to be most prevalent and cause the most morbidity among poor urban populations, with causal factors strongly associated with poverty and inequality, such as urban pollution, poor hygiene, poor diet, and psychosocial distress (Cooper and others 2012). Despite that, household surveys in Latin America have not found this pattern, probably because of the limited access to diagnosis for this condition in poorer populations. However, Fattore and others (2015) present the hypothesis that the lowest socioeconomic groups suffer the greatest burden of asthma in Latin American countries, with the disease being associated with such risk factors as tobacco smoking, obesity, exposure to indoor allergens, low socioeconomic status, and psychological stress. Their study looked at adolescents in 48 Latin American urban centers and found that young persons with low socioeconomic status had more severe forms of asthma, greater exposure to chronic stress, and poor control over their illness. The study also found a strong correlation between the Gini index and the incidence of asthma in young persons.

Table 7.10 Percentage of Population with Arthritis in Six Latin American Countries around 2003, by Income Quintiles

Country	Estimate year	Poorest quintile (%)	2nd quintile	Middle quintile (%)	4th quintile (%)	Richest quintile (%)	Overall	Concentration index (CI)
Brazil	2003	11.9	10.3	10.0	11.4	9.7	10.7	−0.024
Domin. Republic	2003	12.0	11.4	11.2	12.6	15.1	12.5	0.062
Ecuador	2003	7.9	10.8	8.5	6.6	9.0	8.6	−0.043
Mexico[a]	2002/3	3.9	4.0	4.3	5.3	5.3	4.6	0.074
Paraguay[a]	2002/3	3.1	3.4	5.0	4.9	5.3	4.4	0.113
Uruguay[a]	2002/3	12.5	10.3	8.6	6.0	5.5	8.6	−0.171

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.
a. Average of the indicated two years.

Table 7.11 Percentage of Population with Asthma in Six Latin American Countries around 2003, by Income Quintiles

Country	Estimate year	Poorest quintile (%)	2nd quintile	Middle quintile (%)	4th quintile (%)	Richest quintile (%)	Overall	Concentration index (CI)
Brazil	2003	10.8	12.4	10.4	12.8	14.3	12.2	0.056
Domin. Republic	2003	7.9	9.7	11.6	9.2	11.6	10.1	0.057
Ecuador	2003	0.0	2.2	2.5	2.1	4.2	2.7	0.161
Mexico[a]	2002/3	2.1	2.5	2.9	3.4	3.2	2.8	0.100
Paraguay[a]	2002/3	3.1	5.2	6.9	5.7	8.3	5.9	0.161
Uruguay[a]	2002/3	7.0	8.2	7.9	8.3	10.0	8.3	0.064

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.
a. Average of the indicated two years.

Depression

According to studies based on burden of diseases data, depression is the most common mental illness (Hyman and others 2006). In its severe forms, depression can lead to suicide, but even when less severe, it can still affect daily life, work, and personal relationships. Despite the fact that the poor face more difficulties in life, there is no evidence that depression disproportionately affects them. However, people living in poverty have more limited access to adequate mental health care, thus increasing their probability of suffering from chronic depression.

Several international studies have shown a positive association between inequality and depression, especially for those living in urban areas. For example, in an econometric study that used data from Gallup polls in 93 countries, Melgar and Rossi (2010) demonstrated that the probability of being depressed increases when income inequality is greater.

According to the Pan American Health Organization (PAHO 2013), mental and neurological disorders represent almost one-quarter of the disease burden in Latin America. PAHO also estimates that 5 percent of the adult population in Latin America suffers from depression. However, the majority of sufferers do not access diagnostic services or receive treatment, which impairs their lives and their employability and also contributes to increased social and economic disparities. Given the absence of diagnosis and treatment services, the poorest population seems to lack the knowledge or perception that they are so affected by depression.

Table 7.12 shows that in all six Latin American countries with available data, depression appears to be generally higher in the richer income quintiles. This result may indicate that these higher-income groups have more information on depression or better access to diagnostic and treatment services. However, Brazil, where the concentration index is the third lowest among these six countries, is also the nation with highest levels of depression. In the case of Uruguay, where the concentration index is lower than in Brazil, the elevated incidence of depression could be associated with the high share of elderly in the population, given that aging is one of the factors associated with depression.

Table 7.12 Percentage of Population with Depression in Six Latin American Countries around 2003, by Income Quintiles

Country	Estimate year	Poorest quintile (%)	2nd quintile	Middle quintile (%)	4th quintile (%)	Richest quintile (%)	Overall	Concentration index (CI)
Brazil	2003	17.2	18.0	19.9	20.9	23.3	19.8	0.063
Domin. Republic	2003	4.7	9.2	9.8	11.0	10.9	9.4	0.124
Ecuador	2003	1.9	6.4	8.9	7.8	6.0	7.1	0.009
Mexico	2002/3	3.0	3.9	6.0	6.0	7.4	5.3	0.177
Paraguay	2002/3	3.0	5.1	7.1	8.2	10.4	6.8	0.202
Uruguay	2002/3	9.7	12.0	12.0	15.8	8.7	11.7	0.006

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.

Diabetes

According to Whitening and others (2010), from 3 to 4 percent of the world's population has diabetes, which is a chronic condition that leads to such health failures as blindness, renal chronic diseases, amputation, and cardiovascular diseases. Diabetes can reduce average life expectancy by 10 or more years. About 70 percent of the people with diabetes live in low- and middle-income countries. According to epidemiological studies, this proportion has increased steadily over the last two decades. Of the four etiological groups of diabetes (type 1, type 2, gestational, and others), type 2 is the most common, representing 80 to 95 percent of all cases.

Type 2 diabetes is partially a consequence of genetic ancestry, but it can be also associated with a lower level of physical activity and overweight and obesity. Even for persons with a predisposition to diabetes, controlling risk factors and having access to medicines is essential to preventing and controlling diabetes sequelae. Population aging naturally increases the prevalence of type 2 diabetes, as happens with other NCDs.

In lower-income countries where the demographic and epidemiological transition is still in the early stages, type 2 diabetes tends to be more frequent in the richest economic quintiles. However, with economic growth, increased urbanization, and more advanced stages of demographic and epidemiological transition, the poor start to be the most affected by diabetes. Without knowledge of and the ability to pay for treatment and medicines, lower-income groups frequently have the worse consequences and shortest life expectancy due to diabetes.

According to Arredondo and others (2014), the diabetes incidence in Latin America is increasing fast and will have a large economic impact in coming years. These authors emphasize that if no significant changes are made in the current health care model, health systems in Latin America "will face a constant and growing increase in the financial resources required to meet the demand for health services, particularly in countries like Brazil, Argentina and Mexico." If that happens, the high costs of treating type 2 diabetes could lead to catastrophic health expenditures for the poorest population segments.

Table 7.13 shows that in the six Latin American countries studied, only Uruguay has a regressive concentration index. The table also shows that all the countries have an overall diabetes incidence rate in the range of 2.0 percent (Ecuador) to 5.4 percent (Mexico), except for Brazil, where the rates are noticeably higher according the household surveys, despite it is not reflected in the diabetes incidence rates according international statistics, where Brazil has a rating behind countries like Mexico, for example (Martinez 2013).

In recent years, some health systems in Latin America have responded to the diabetes epidemic by improving diagnostic, promotion, and prevention services at the primary care level. This has been true, for example, with the family health program in Brazil (Pereira 2007) and with Mexico's Programa Oportunidades, which assists the population living in extreme poverty. These programs, if well managed, might reduce the risk of impoverishment associated with diabetes and other NCDs. However, further analysis and measurement is necessary to assess if these programs have been effective.

Table 7.13 Percentage of Population with Diabetes in Six Latin American Countries around 2003, by Income Quintiles

Country	Estimate year	Poorest quintile (%)	2nd quintile	Middle quintile (%)	4th quintile (%)	Richest quintile (%)	Overall	Concentration index (CI)
Brazil	2003	17.2	18.0	19.9	20.9	23.3	19.8	0.063
Domin. Republic	2003	2.8	2.1	5.6	7.2	4.0	4.5	0.132
Ecuador	2003	0.5	1.7	2.7	1.5	2.3	2.0	0.026
Mexico[a]	2002/3	3.4	5.3	6.3	7.0	5.4	5.4	0.100
Paraguay[a]	2002/3	2.3	4.2	5.6	5.4	6.8	4.9	0.165
Uruguay[a]	2002/3	4.6	7.0	3.6	6.4	3.7	5.1	−0.034

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.
a. Average of the indicated two years.

Summary of the Evidence on NCD Morbidity Data among Income Quintiles in Latin America

The above analyses of the morbidity data on the five NCDs in the six Latin American countries are summarized in table 7.14. From this information, it appears that inequities in NCD morbidity increase as there is greater economic development.

Table 7.14 Summary of the Trends in the Concentration Indices Associated with NCD Morbidity in Latin American Countries around 2003

Country	Risk factors progressive or regressive according to the concentration index				
	Angina	Arthritis	Asthma	Depression	Diabetes
Brazil	Regressive	Regressive	Progressive	Progressive	Progressive
Domin. Republic	Regressive	Progressive	Progressive	Progressive	Progressive
Ecuador	Regressive	Regressive	Progressive	Progressive	Progressive
Mexico	Progressive	Progressive	Progressive	Progressive	Progressive
Paraguay	Progressive	Progressive	Progressive	Progressive	Progressive
Uruguay	Progressive	Regressive	Progressive	Progressive	Regressive

Source: Data are from World Bank Health Equity and Financial Protection reports and datasheets, WB/DEC, 2013.

Three other inferences are possible from examining the concentration index trends presented in table 7.14. First, a majority of the studied countries in Latin America are in the early to intermediate stages of the demographic and epidemiologic transition. For this reason, NCDs tend to still affect more the richest-income quintiles than the poorest-income quintiles.

Second, the poorest groups may have difficulties in recognizing their NCDs or obtaining clinical information about their NCD health status, which increases the probability of underregistration of chronic diseases in household surveys.

Third, however, some chronic conditions, such as cardiovascular diseases or arthritis, are easily identified by individuals without clinical follow-up, because of their incapacitating effects. This reduces the probability of underregistration of these NCDs among the poorest-income quintiles. In these cases the household surveys could find more evidence of regressive concentration indices.

The NCD morbidity data indicate that the inequities are mainly explained by socioeconomic variables (such as income), rather than by health-related factors. Most Latin American countries need to advance in implementing preventive health strategies that improve the diagnosis and treatment of chronic conditions, while also increasing health coverage for the poorest groups.

EQUITY IN NCDs AND HEALTH SERVICES UTILIZATION

Health services utilization involves many aspects, such as gaining entry to and having guaranteed access to one or more locations in the health care system. These locations should be able to promote patients' communication with and trust in the system, to detect and treat health conditions, to promote health and prevent disease and death, and to prolong good-quality life. On the supply side, the most common barriers to health services utilization are a lack of available services, unaffordable costs, and an absence of public or private health insurance.

Persons living with NCDs use health services more often than do those not suffering from NCDs. Many international studies, such as by Lee and others (2015), show that multimorbidity associated with NCDs is increasing everywhere and that this is related with higher levels of health care utilization and greater financial burdens for individuals in middle-income nations. However, in most countries, despite the growing prevalence of multimorbidity, current clinical practice tends to emphasize a single-disease approach. This approach prolongs the problem without having a consistent way to resolve it.

Inequities in health services utilization are a function of several supply and demand factors. On the supply side, the relevant issues include access to services, especially primary care or structured health networks. On the demand side, the determinants of the level of utilization include social behavior, demographic profiles, knowledge, and exposure to health risk factors.

Many recent studies, such as one by Ozegowski and Sundmacher (2014), reveal the importance of differentiating among need, demand, and utilization of health services when trying to understand the root causes of health inequities. However, it is important to keep in mind the role of supply-side variables in shaping health services utilization. The lack of adequate primary care services to attend patient needs may hamper accessibility of care. In addition, given their often-limited health knowledge, lower-income groups do not have the best circumstances for making rational choices in health. Furthermore, when appropriate regulation is lacking, the excessive density of complex health structures such as high technology hospitals may result in unnecessary overprovision of services and unbalanced distribution of health funds.

What is the evidence on equity of health services utilization for Latin America? There are insufficient data to make estimates on all countries' covered services and quality of coverage. Nevertheless, there are data about equity related to health services coverage for some key interventions and services in some countries, including breast cancer screening and outpatient, hospitalization, preventive, curative, and specialized services (Dmytraczenko and Almeida 2015).

In addition, recent data from household surveys provide some comparative evidence for five countries of Latin America (Brazil, Chile, Colombia, Nicaragua, and Peru) concerning the equity impact of health services utilization around 2008 and 2009 (Murrugarra and Bonilla-Chacin 2014). Most of the information in this health services utilization section of this article is based on the data from those two authors.

Currently in Latin America, health services utilization varies widely among different countries and regions according to variables on both the supply and demand sides. However, only carefully designed surveys could explain which variables are behind such variation and what happens in each country. Comparing the data from household surveys in the five countries mentioned, health services utilization for the population without NCDs ranged from 8 percent (Chile, 2009) to 60 percent (Brazil, 2008). However, in general, NCDs prompt individuals to often use the health system over long periods of time. If a family lacks health insurance to cover such expenses, the NCD burden can greatly damage the family's economic welfare and increase the chances of impoverishment.

For individuals living with NCDs, health services utilization ranged from 24 percent (Colombia, 2008) to 83 percent (Brazil, 2008). Health services utilization differed according to socioeconomic and demographic conditions. For example, in all five countries, women with NCDs used more health services than did men with NCDs. This pattern did not necessarily hold for the elderly (60 years and older) and for persons younger than 15 years old. For example, the level of health services utilization by the elderly in Chile, Colombia, and Nicaragua was higher than for the population under 60 years old, but that was not the case in Brazil and Peru.

Health services utilization tends to be greater for individuals with higher incomes. While this was true overall for the five countries studied, it was not necessarily true for individuals living with NCDs (figure 7.3). In Chile, the rate of health services utilization for individuals living with NCDs around 2008 or 2009 in the poorest-income quintile was 33 percent, compared with 28 percent in the richest-income quintile. While the same happened in Colombia (23 percent compared with 22 percent), it was the reverse in Brazil, Nicaragua, and Peru.

Figure 7.3 Percentage of Households with Individuals Living with NCDs Who Utilized Health Services in the Preceding 12 Months, in 2008/2009, in Five Latin American Countries, according to Income Quintiles
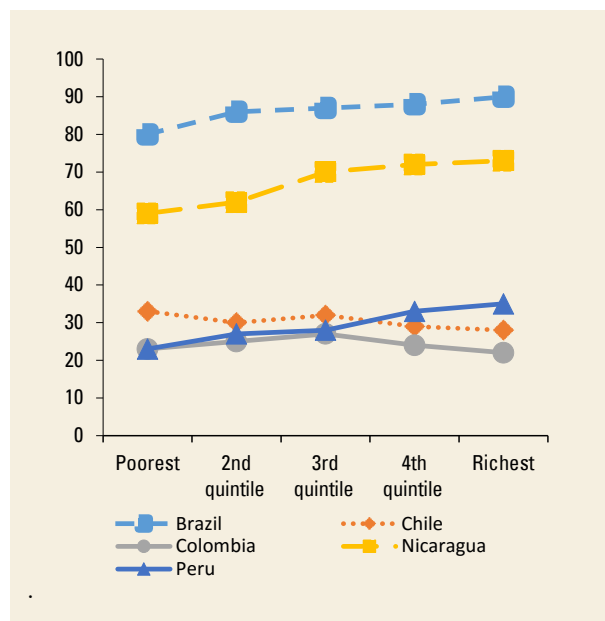

Figure 7.3 also shows that higher levels of utilization can be found in Brazil and Nicaragua than in Chile, Colombia, and Peru. However, according to Murrugarra and Bonilla-Chacin (2014), these data are not fully comparable across the countries. The data could be

influenced by the sample size differences (especially with Colombia) and by behavioral conditions, such as the information possessed by the interviewees concerning their NCD health status at the time of the interview.

The health care utilization differential for individuals living with NCDs is measured by the "ratio of NCD health services utilization," which is defined as the percentage of persons living with NCDs who utilize health services divided by the percentage of persons without NCDs who utilize health services, in a specific year. This indicator is sensitive to differences in how health services screen and provide health care options for population living with NCDs. Figure 7.4 shows the data related to this indicator, by income quintiles, for five countries of Latin America.

Figure 7.4 Ratio of NCD Health Services Utilization, by Income Quintiles, in Five Latin America Countries, around 2008/2009
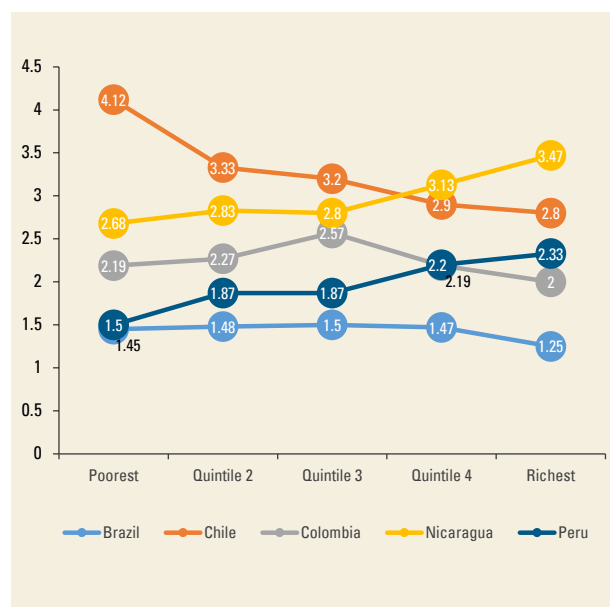
Note: The ratio of NCD health services utilization is the percentage of persons living with NCDs who utilize health services divided by the percentage of persons without NCDs who utilize health services, in a specific year.

The data show the realities of the use of health services by the population living with NCDs in different countries. In Chile, the use of health services for individuals living with NCDs in the poorest quintile is more than four times as large as that for persons without NCDs, but the ratio decreases progressively as income rises.

The level of health care utilization in Chile for persons living with NCDs is 33 percent in the poorest quintile and 28 percent in the richest.

In Brazil the ratio of NCD health services utilization is higher in the poorest quintiles than in the richer quintiles. The access to health services, such as those provided by the Family Health Program (PSF), allows free medical visits, exams, and medication for the population living with NCDs. In the poorest quintile, the persons living with NCDs use 45 percent more health services than do other individuals, while in the richest quintile the difference is only 25 percent. In addition, the access gap between the poorest and richest quintile is not so large.

About 80 percent of the poorest-quintile individuals living with NCDs in Brazil visit health services at least once a year, compared with 90 percent in the richest quintile.

Colombia has a ratio of NCD services utilization curve with a shape very similar to that of Brazil. But in contrast to Brazil, the percentage of people living with NCDs in Colombia who use health services in a specific year is the lowest among the five countries (ranging from 23 percent in the poorest quintile to 27 percent in the third quintile). Recent studies on health equity in Colombia, such as by Ruiz Gomez and others (2013), indicate there were equity improvements in the use of preventive and curative services between 2003 and 2008, but there were gaps in health service utilization among the different quintiles, especially between the poorest and the others.

In Peru and Nicaragua, NCD services utilization appears to be more regressive, with the richest having their health needs better met than is true for the poorest. In Peru, the ratios for the poorest through the richest quintiles increase steadily from 1.5 to 2.3, while in Nicaragua the ratios go from 2.7 to 3.5.

In Brazil and Chile, the access and utilization of the health services by individuals living with NCDs appears to be more equitable than in the three other countries. However, this does not necessarily hold true for possible inequities in the quality and effectiveness of the health services, given the lack of information by income groups in household surveys.

EQUITY IMPACT OF NCDs IN OUT-OF-POCKET HEALTH EXPENDITURES

Higher utilization of health services in households with persons living with NCDs could lead to higher out-of-pocket payments, especially where health services supplies and medicines are not free. In addition, the poorer health status of persons living with NCDs reduces their labor capacity and often leads to loss of household income. Together, these factors could increase the risk of poverty.

According to Anderson and others (2009), out-of-pocket spending represents almost 40 percent of total health expenditures in Latin America, and most of these

expenditures are related to NCDs. This has an impact on all sources of health financing, including household budgets. In Colombia (2008), Nicaragua (2009), and Peru (2009), the average out-of-pocket expenditures for all households represented 4.8 percent, 4.6 percent, and 3.7 percent of the household budgets, respectively. However, if at least one of the household members was living with an NCD, the out-of-pocket expenditures as a share of the household budget jumped to 7.1 percent, 6.5 percent, and 4.1 percent, in the same countries, respectively.

However, why are the poor who are living with NCDs spending more on health as a share of family budgets than the rich are? Data for these three countries provide some indications. Figures 7.5, 7.6, and 7.7, respectively, show out-of-pocket health expenditures by households, by income quintile, according to whether or not the household has a member living with an NCD, in Colombia (2008), Nicaragua (2009), and Peru (2009).

In Colombia, public authorities have developed policies, operational strategies, and action plans to fight against NCD risk factors, such as physical inactivity, unhealthy diets, and use of alcohol and tobacco. Despite those efforts, data from WHO (2014) show that 71 percent of all the deaths in Colombia are attributed to NCDs and that 12 percent of the deaths in the ages between 30 and 70 are related to NCDs.

From figure 7.5, it is clear that in Colombia the poorest households are spending more on health, as a share of their budget, than are the households in the richest quintile. Figure 7.5 also shows that spending on health is higher in all income quintiles for households that have at least one person living with an NCD. In the poorest, the fourth, and the richest-income quintiles, the share of household spending on health is double the share in households without a person living with an NCD. This demonstrates the uncovered financial burden that families (especially in the poorest quintiles) are suffering because of the lack of adequate protection for NCDs in the current health insurance mechanisms, as well as the high level of required copayments as compared to household income.

However, previous studies of equity in health spending in Colombia, such as by Ruiz Gomez and others (2013), contend that a major expansion in the social insurance coverage in the country between 2003 and 2008 increased equity. That expansion allowed public investments in a subsidized scheme to meet the needs of the poor, by increasing access and financial protection. Nevertheless, the authors also recognized that the Colombian health model still needs to implement preventive public health strategies, further increase the poor population's access to health services, and better integrate care for NCDs in the benefit plans.

Figure 7.5 Health Spending as a Percentage of the Household Budget, according to Presence or Not of a Household Member with an NCD, by Income Quintiles, Colombia, 2008
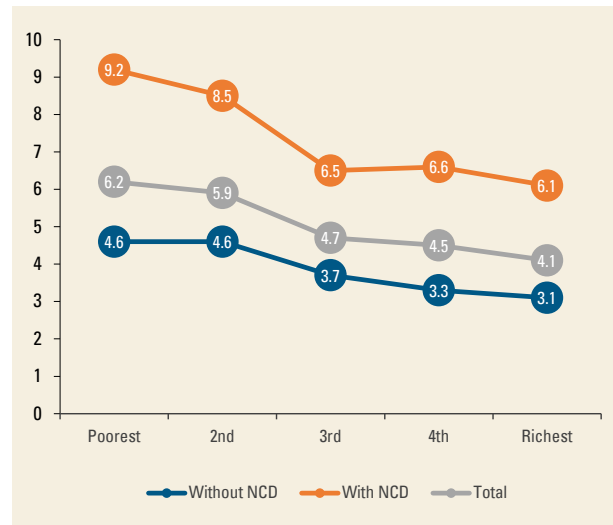
Health care reform that took place in Colombia in 2012 equalized the health insurance benefits plans and reduced the differences between the contributory and the subsidized schemes in terms of access to benefits. Equal benefits for both systems apparently created an inducement for some rich people to enroll in the subsidized system. In other words, the equalization of benefits related to NCDs revealed the limits in the supply side's ability to respond to an expanded demand for health services. As the WHO (2014) data indicated, Colombia still does not have evidence-based national guidelines, protocols, and standards for the management of major NCDs through a primary care approach; does not have an NCD surveillance and monitoring system in place to enable reporting against the nine global NCD targets; and has no national population-based cancer registry.

In Nicaragua, according to WHO (2014), NCDs in 2014 were responsible for an estimated 73 percent of all deaths and 19 percent of the deaths in the ages between 30 and 70 years old. The death rates from the main NCDs have increased steadily since the year 2000. The Ministry of Health has implemented few policies to fight against NCD-related health risks (except tobacco), but it has prepared evidence-based national guidelines, protocols, and standards for the management of major NCDs.

Figure 7.6 shows that, as has happened in other countries, Nicaraguan households with at least one person living with an NCD spend more on health as a share of the household budget than do households free from NCDs. Figure 7.6 also shows that, despite the fact

that household health spending is generally regressive, the NCD-related spending share is higher in the richest-income quintile than it is in the other quintiles. In the richest quintile, the proportion of spending on health for households with a person with an NCD is more than double that of households without NCDs. In the poorest quintile, that difference is only about 50 percent.

Figure 7.6 Health Spending as a Percentage of the Household Budget, according to the Presence or Not of a Household Member with an NCD, by Income Quintiles, Nicaragua, 2009
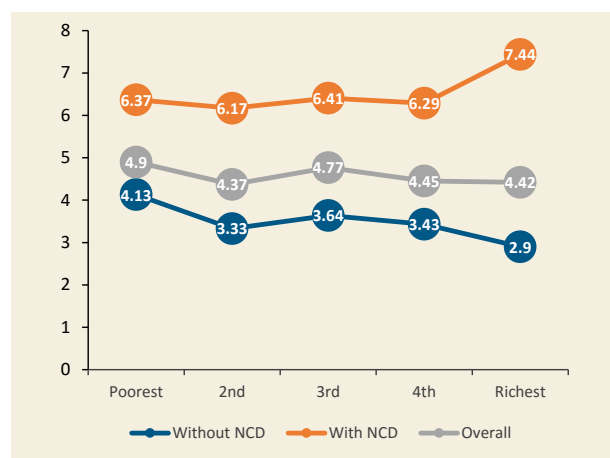
In Nicaragua, several key factors could limit the access of the poor to health services to prevent or treat NCDs. Income is likely the most relevant, but another limitation is the lack of facilities offering treatment or access to a diagnosis. According to Angel-Urdinola, Cortez, and Tanabe (2008), poor individuals living in rural areas, the indigenous population, and individuals living in households engaged in agriculture have little access to health care services and preventive care. In addition, access to health insurance is concentrated among the urban nonpoor living in the Managua and Pacific regions. In 2005, the coverage of health insurance in the highest-income quintile was just 25 percent, and less than 3 percent in the poorest quintile.

In Peru, according to WHO (2014), NCDs are estimated to account for 66 percent of all deaths and 11 percent of the deaths of the population aged between 30 and 70 years. The Ministry of Health has established a department to manage issues related to NCDs. However, the country has neither evidence-based national guidelines, protocols, and standards for the management of major NCDs through a primary care approach nor operational policies or guidelines to fight against NCD risk factors.

Figure 7.7 Health Spending as a Percentage of the Household Budget, according to the Presence or Not of a Household Member with an NCD, by Income Quintiles, Peru, 2009
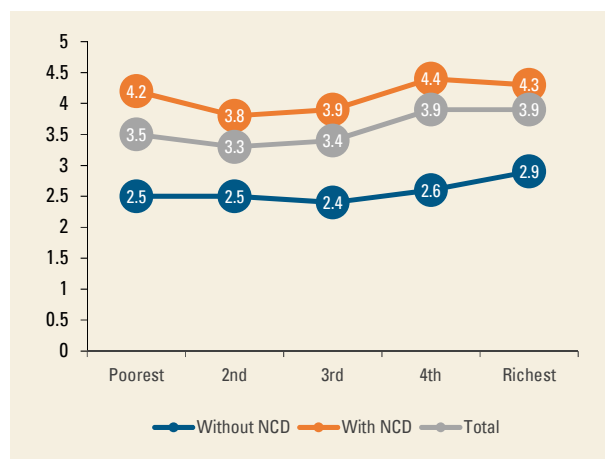

Overall, household spending on health as a percentage of the household budget is slightly progressive. There is a similar pattern for households with at least one individual with an NCD. Despite the appearance of similar NCD spending patterns across the income quintiles, some NCDs, such as cardiovascular disease, are strongly associated with both rapid urbanization and lower socioeconomic status in Peru.

CONCLUSIONS

Most of the health systems in Latin America are viewing coverage in terms of access to general health services. Therefore, governments are giving priority to inequality while postponing discussions of inequity. Inequity is more complex, given that it is associated with health care needs and quality of services. To appropriately tackle the NCD burden, countries in Latin America must focus on inequities. Attention to inequities in the quality of care is essential to assure that persons living with NCDs receive differentiated and specific care, from primary health units to specialized health facilities and hospitals. There must also be improved information on and better indicators of the health inequities that are associated with NCDs.

Health indicators obtained from household surveys are self-reported. In some circumstances, these indicators have been effective in capturing health differentials in specific populations. For example, self-assessed health reports have been useful for assessing mortality or psychological feelings and expectations about health. However, the level of information about health self-status

is asymmetric among socioeconomic and income groups. Most of the household surveys are based on self-reported data, generating different perceptions of health status in the households. Generally, the perception of health status is more accurate in the richer households than in the poorer ones.

In addition, the assessment of health services is differentiated among different income groups. The richest quintile has more access to diagnostic and health services, which contributes to a better understanding of the health status of this group. All these circumstances could generate problems in the accuracy and interpretation of the information collected by household surveys. These and other, minor shortcomings with household surveys make it hard to compare across population groups with different income levels. In developing countries, such those in Latin America (which has the greatest income inequality of any region in the world), lower-income persons tend to systematically overrate their true health, reporting that it is better than it actually is. Therefore, the self-reported measures may not reflect the full extent of health inequalities. In some household surveys, the rich report having worse health status than do the poor, thus creating some improbable health inequity data.

Even given these limitations with the self-reported information in household surveys, it is possible to reach three key conclusions from the data in this article.

First, the position of each country in the demographic and epidemiological transition process can affect the equity aspects of the incidence of NCD risk factors and morbidity. In the first decade of this century, countries in Latin America that are in the middle of the epidemiological transition, such as Brazil and Uruguay, have seen a higher burden of NCD risk factors and morbidity among the poor than among the rich. However, this has not happened in countries such as Mexico and Paraguay, which are in earlier stages of the epidemiological transition.

Second, health services utilization among people living with NCDs is naturally higher than it is for people not living with NCDs. In some countries, such as Brazil, Nicaragua, and Peru, the utilization ratio of those living NCDs is higher among the rich than it is among the poor, as can be seen in figure 7.3. However, this does not happen in countries such as Chile and Colombia, where the poor living with NCDs use more health services than do the rich.

Finally, in both Peru and Nicaragua, household spending on health, as a percentage of the household budget, is slightly progressive. This is true both among households with at least one individual with an NCD and among households with no persons with an NCD.

Equity in NCD health care provision is one of the biggest challenges that the countries of Latin America will face in the coming years. The existing evidence needs to be complemented with more detailed and frequent surveys and research. This effort will be crucial for better understanding the equity issues behind the access to promotion, prevention, and treatment of NCDs and for improving health policies in Latin America.

NOTES

[i]Most of the data used in this section are drawn from the World Bank Health Equity and Financial Protection reports and datasheets. That information can be found at www.worldbank.org/povertyandhealth.

[ii]These data are based on Demographic Health Surveys, World Health Surveys (WHO), Multiple Indicators Cluster Surveys, Living Standards and Measurement Surveys, and other available household-survey databases.

[iii]Since the beginning of this century, the World Health Organization has started to define a methodology to apply national risk factor surveys worldwide. In Latin America, some countries, such as Argentina, have started to apply these surveys.

[iv]Data show a regression coefficient (R2) near to zero for the association between obesity among nonpregnant women and gross national income (using parity power purchasing - PPP) for all 12 countries presented in table 7.1, thus indicating that the two variables are not correlated.

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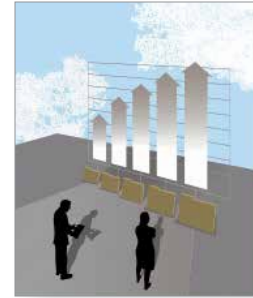
The Cost-Effectiveness of Interventions and Policies for Noncommunicable Diseases and Their Risk Factors in the Latin America and Caribbean Region: A Systematic Literature Review

David Watkins, Rosana Poggio, Federico Augustovski, Elizabeth Brouwer, Andres Pichon Riviere, Adolfo Rubinstein, and Rachel Nugent

INTRODUCTION

Noncommunicable diseases (NCDs) are the leading cause of death in the Americas, with cardiovascular disease (CVD) responsible for 45 percent of those deaths (Hospedales, Barcelo, Luciani, and others 2012). In the Latin America and Caribbean (LAC) region, it is estimated that from 1990 until 2020, death from CVD, including coronary heart disease (CHD), will increase by approximately 145 percent for both men and women. That compares with an increase of 28 percent for women and an increase of 50 percent for men in developed countries during the same period (Yusuf, Hawken, Ounpuu, and others 2004).

The countries and territories of LAC have pioneered a strong and multisectoral response to NCD prevention and control, spearheaded by the leadership of the Caribbean countries in the 2011 United Nations High-Level Meeting on NCDs, and continuing with the recent creation of the Healthy Latin America Coalition, which advocates for health promotion and NCD prevention. The Pan American Health Organization (PAHO) has promoted and facilitated member countries' activities in surveillance, policy development, and guidelines for NCD prevention. The PAHO Regional Strategy and Plan of Action for the Prevention and Control of Chronic Diseases was adopted in 2012, with explicit attention to the development and economic importance of NCDs, and to the need for multisectoral involvement (PAHO 2012).

In this environment, it is unsurprising that a large number of economic studies about NCDs have been produced in the LAC region. This article reviews the literature from LAC on the cost-effectiveness of interventions and policies to control and prevent NCDs. Many LAC countries use the World Health Organization (WHO) threshold to define an intervention as being cost-effective, that is, whether the cost of a disability-adjusted life year (DALY) or quality-adjusted life year (QALY) is less than one times the country's gross domestic product (GDP) per capita per life year. Most GDPs per capita in LAC range between U$S4,000 and US$12,000 (Sachs 2001).

The literature on this issue reflects several characteristics unique to the LAC region: the relatively robust availability of health condition and risk factor data; a strong political and advocacy environment for population policy implementation; and an active research network on economic and public health issues, particularly on cost-effectiveness methods. As a result, this review identified a large number of relevant articles, which enables interesting comparisons across time and geography.

SCOPE

This review examines cost-effectiveness literature in LAC on cardiovascular, metabolic, and respiratory diseases and primary risk factors, including unhealthy diet, physical inactivity, tobacco consumption, and excessive alcohol

consumption. We also reviewed cost-effectiveness studies of interventions for intermediate risk factors, such as high blood pressure and hypercholesterolemia. In addition, we reviewed cost-effectiveness studies on screening, prevention, and treatment of cancers. We excluded mental health disorders.

METHODS

Search Strategy

We searched the literature from the year 2000 onward for cost-effectiveness studies around specific diseases and risk factors that focused on countries within LAC. The search terms that we used largely matched those used for the economics reviews in the third edition of Disease Control Priorities (DCP3). The original DCP3 reviews queried the following databases for economic evaluations around cardiovascular and metabolic diseases: Medline, Embase, NHS Economic Evaluation Database (NHS EED), Health Economic Evaluations Database (HEED), and EconLit. In total, 3,809 titles were screened, but only 61 studies met the inclusion criteria, and 22 of these contained data relevant to the Americas. The DCP3 search was supplemented by a similar search of the LILACS, Medline, Cochrane Library, Embase, and SciELO databases for economic evaluations in the Americas that addressed either cardiovascular/ metabolic diseases or cancers. In total, 428 additional titles were identified and screened, but only 38 studies met the inclusion criteria. Hence we reviewed 60 studies in detail.

Data Extraction

For each of the full-text articles included in this review, one or more of this paper's authors did a detailed examination of it. We adapted a data extraction template from the DCP3 to capture: (1) "demographics" of included articles (study year, country, and journal); (2) information on the intervention(s) considered and the target population(s); (3) incremental cost-effectiveness ratios (ICERs), including costs (in local currency units) and outcomes (typically in DALYs or QALYs); (4) conclusions and major assumptions of each article; and (5) quality assessment, using the 10-point checklist developed by Drummond and colleagues (Drummond, Sculpher, Torrance, and others 2005).

Data Synthesis

To ensure all ICERs were comparable across studies, we deflated all costs to 2012 and converted them to U.S. dollars. Studies that did not specify the currency year

were assumed to report costs in currency units from the prior year. For example, a study reporting costs in Mexican pesos that did not report the currency year but that was published in 2011 was assumed to be reporting 2010 Mexican pesos, and this was deflated and converted to 2012 U.S. dollars. We used World Bank data on exchange rates, consumer price indices, and purchasing power parity dollars for our analysis (World Bank 2014).

CARDIOVASCULAR DISEASE: PREVENTION AND SCREENING

Our searches returned 52 interventions in 12 studies dealing with the cost-effectiveness of cardiovascular disease prevention. Broadly, the studies tended to focus on one of two approaches: (1) reducing the burden of CVD risk factors (e.g., diet, lifestyle, and smoking) at the population level or (2) screening and treating individuals with cardiovascular risk conditions (such as hypertension) or those at high risk of developing CVD, that is so-called "primary prevention." Table 8.1 summarizes the findings of these studies.

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Table 8.1 Summary of Findings in Cost-Effectiveness Studies of Cardiovascular Disease Prevention and Screening in the Latin American and Caribbean Region, 2000–2015

Author	Year	Condition	Country	Intervention	Comparator	ICER (US$)	Metric
Bautista	2013	Coronary heart disease	LAC region	Primary prevention "polypill" for women with >10% risk of CHD	Null	284	Per QALY
Bautista	2013	Coronary heart disease	LAC region	Primary prevention "polypill" for men aged 55+	Null	475.80	Per QALY
Bautista	2013	Coronary heart disease	LAC region	Primary prevention "polypill" for men with >10% risk of CHD	Null	1,103.14	Per QALY
Bautista	2013	Coronary heart disease	LAC region	Primary prevention "polypill" for women with abdominal obesity (WHO definition)	Null	2,935.34	Per QALY
Bautista	2013	Coronary heart disease	LAC region	Primary prevention "polypill" for men with abdominal obesity (LASO definition)	Null	3,743.88	Per QALY
Cecchini	2010	Obesity	Brazil and Mexico	Regulation of food advertising to children	Null	653.66 to 15,566.73	Per DALY
Cecchini	2010	Obesity	Brazil and Mexico	Mandatory food labeling	Null	83.47 to 11,711.79	Per DALY
Cecchini	2010	Obesity	Middle-income countries	Fiscal measures affecting the prices of fruit and vegetables and foods high in fat	Null	Cost saving	Per DALY
Ferrante	2012	Coronary heart disease	Argentina	Population-based salt reduction (5%)	Null	Cost saving	Per QALY
Ferrante	2012	Coronary heart disease	Argentina	Population-based salt reduction (25%)	Null	Cost saving	Per QALY
Gaziano	2006	Coronary heart disease	Brazil	Primary prevention "polypill" for individuals with >5% risk of CHD	Null	2,936.26	Per QALY
Lutz	2012	Tobacco use	Costa Rica, Dominican Republic, El Salvador, Nicaragua, and Panama	Varenicline	Bupropion or nicotine replacement or unaided cessation	Cost saving	Per QALY
Murray	2003	Coronary heart disease	AmrB region	Legislation to decrease salt content in processed foods, and appropriate labeling	Null	2.60	Per DALY
Murray	2003	Coronary heart disease	AmrB region	Legislation to decrease salt content in processed foods plus appropriate labeling plus mass media campaign on body mass index and cholesterol	Null	2.80	Per DALY
Murray	2003	Coronary heart disease	AmrB region	Mass media campaign on body mass index and cholesterol	Null	2.80	Per DALY

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Table 8.1 Summary of Findings in Cost-Effectiveness Studies of Cardiovascular Disease Prevention and Screening in the Latin American and Caribbean Region, 2000–2015 (continues)

Author	Year	Condition	Country	Intervention	Comparator	ICER (US$)	Metric
Murray	2003	Coronary heart disease	AmrB region	Voluntary reduction in salt content of processed foods plus appropriate labeling	Null	4.81	Per DALY
Murray	2003	Coronary heart disease	AmrB region	Primary prevention "polypill" for individuals with >25% risk of CHD	Null	7.41	Per DALY
Murray	2003	Coronary heart disease	AmrB region	Primary prevention "polypill" for individuals with >15% risk of CHD	Null	10.82	Per DALY
Murray	2003	Coronary heart disease	AmrB region	Individual treatment of blood pressure above a threshold of 160 mmHg	Null	16.23	Per DALY
Murray	2003	Coronary heart disease	AmrB region	Individual treatment of cholesterol above a threshold of 6.2 mmol/L	Null	17.43	Per DALY
Murray	2003	Coronary heart disease	AmrB region	Primary prevention "polypill" for individuals with >5% risk of CHD	Null	18.63	Per DALY
Murray	2003	Coronary heart disease	AmrB region	Individual treatment of cholesterol above a threshold of 5.7 mmol/L	Null	26.64	Per DALY
Murray	2003	Coronary heart disease	AmrB region	Individual treatment of blood pressure and cholesterol above thresholds of 140 mmHg and 6.2 mmol/L, respectively	Null	36.66	Per DALY
Murray	2003	Coronary heart disease	AmrB region	Individual treatment of blood pressure above a threshold of 140 mmHg	Null	37.26	Per DALY
Ribeiro	2015	Coronary heart disease	Brazil	Intermediate-dose statin (20% risk)	No statin	1,339.77	Per QALY
Ribeiro	2015	Coronary heart disease	Brazil	Intermediate-dose statin (15% risk)	No statin	1,814.91	Per QALY
Ribeiro	2015	Coronary heart disease	Brazil	Intermediate-dose statin (10% risk)	No statin	2,288.11	Per QALY
Ribeiro	2015	Coronary heart disease	Brazil	Intermediate-dose statin (5% risk)	No statin	6,208.92	Per QALY
Ribeiro	2015	Coronary heart disease	Brazil	High-dose statin (20% risk)	Intermediate-dose statin	17,168.53	Per QALY
Ribeiro	2015	Coronary heart disease	Brazil	High-dose statin (15% risk)	Intermediate-dose statin	21,731.22	Per QALY
Ribeiro	2015	Coronary heart disease	Brazil	High-dose statin (10% risk)	Intermediate-dose statin	30,664.75	Per QALY
Ribeiro	2015	Coronary heart disease	Brazil	High-dose statin (5% risk)	Intermediate-dose statin	61,350.10	Per QALY
Rubinstein	2009	Coronary heart disease	Argentina	Voluntary reduction in salt content in bread in Buenos Aires	Null	44.79	Per DALY
Rubinstein	2009	Coronary heart disease	Argentina	Mass media campaign around salt intake in Buenos Aires	Null	199.9	Per DALY

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Table 8.1 Summary of Findings in Cost-Effectiveness Studies of Cardiovascular Disease Prevention and Screening in the Latin American and Caribbean Region, 2000–2015 (continues)

Author	Year	Condition	Country	Intervention	Comparator	ICER (US$)	Metric
Rubinstein	2009	Coronary heart disease	Argentina	Primary prevention "polypill" for individuals with >20% risk of CHD in Buenos Aires	Null	1,069.55	Per DALY
Rubinstein	2009	Coronary heart disease	Argentina	Primary prevention "polypill" for individuals with >10% risk of CHD in Buenos Aires	Null	1,215.55	Per DALY
Rubinstein	2009	Coronary heart disease	Argentina	Primary prevention "polypill" for individuals with >5% risk of CHD in Buenos Aires	Null	1,339.91	Per DALY
Rubinstein	2009	Coronary heart disease	Argentina	Individual treatment of blood pressure above a threshold of 140 mmHg in Buenos Aires	Null	2,311.70	Per DALY
Rubinstein	2009	Coronary heart disease	Argentina	Individual treatment of cholesterol above a threshold of 6.2 mmol/L in Buenos Aires	Null	20,640.42	Per DALY
Rubinstein	2009	Tobacco use	Argentina	Individual treatment of tobacco dependence with bupropion in Buenos Aires	Null	#######	Per DALY
Rubinstein	2010	Coronary heart disease	Argentina	Population-based salt reduction in bread (1 gram per 100 grams bread)	Current practice	Cost saving	Per DALY
Rubinstein	2010	Coronary heart disease	Argentina	Primary prevention "polypill" for individuals with >20% risk of CHD	Null	Cost saving	Per DALY
Rubinstein	2010	Coronary heart disease	Argentina	Individual treatment of blood pressure (lifestyle change and medication)	Null	3,270.33	Per DALY
Rubinstein	2010	Coronary heart disease	Argentina	Mass media campaign around tobacco cessation	Null	3,582.71	Per DALY
Rubinstein	2010	Coronary heart disease	Argentina	Individual treatment of cholesterol (lifestyle change and medication)	Null	16,224.79	Per DALY
Rubinstein	2010	Coronary heart disease	Argentina	Individual treatment of tobacco dependence with bupropion	Null	66,818.49	Per DALY
Rubinstein	forthcoming	Coronary heart disease	Argentina	Policies to eliminate industrial trans fatty acids in foods	Current practice	Cost saving	Per DALY
Salomon	2012	Harmful alcohol use	Mexico	Aggressive alcohol taxation	Null	11.18	Per DALY
Salomon	2012	Harmful alcohol use	Mexico	Bans on advertising	Null	49.69	Per DALY
Salomon	2012	Tobacco use	Mexico	Increased tobacco taxation	Null	21.74	Per DALY
Salomon	2012	Tobacco use	Mexico	Bans on advertising	Null	434.78	Per DALY
Valencia	2014	Hypertension	Colombia	Renal denervation surgery (resistant cases only)	Best pharmacological care	3.61	Per QALY

Note: AmrB = Region B of the Americas (World Health Organization classification); WHO = World Health Organization; CER = incremental cost-effectiveness ratio; DALY = disability-adjusted life year; QALY = quality-adjusted life year; LASO = Latin American Consortium of Studies on Obesity.

Risk Factor Reduction in the General Population

The earliest and most widely recognized studies on the cost-effectiveness of CVD risk factor reduction were published as part of the WHO CHOosing Interventions that are Cost-Effective (WHO-CHOICE) project. Murray and colleagues, conducting their analysis at the regional level, found that legislation and mass media campaigns around salt intake, body mass index, and cholesterol were all very cost-effective (US$2.80 per DALY averted) (Murray, Lauer, Hutubessy, and others 2003). Similarly, Cecchini and colleagues, looking at a variety of interventions around obesity prevention in several middle-income countries (including Brazil and Mexico), found that fiscal measures to lower the price of healthy foods were cost saving and that mandatory labels on food products and regulation of food advertising to children were cost-effective (Cecchini, Sassi, Lauer, and others 2010). A WHO-CHOICE study specifically on NCDs in Mexico found that alcohol and tobacco taxation and advertising bans were very cost-effective, though bans on tobacco advertising would be less cost-effective than the other measures (Salomon, Carvalho, Gutierrez-Delgado, and others 2012).

Several of the cost-effectiveness studies looked specifically at Argentina, where the CVD burden as well as intervention costs and gross domestic product are higher than in most other Latin American nations. In this context, salt reduction strategies through legislation and mass media campaigns as well as elimination of trans fatty acids were cost saving (PAHO 2012 ; Ferrante, Konfino, Mejia, and others 2012; Rubinstein, Colantonio, Bardach, and others 2010; Rubinstein, Elorriaga, Garay, and others forthcoming). When assessing urban settings (e.g., Buenos Aires) specifically, salt reduction interventions were associated with incremental costs, though they were still very cost-effective (Rubinstein, Garcia Marti, Souto, and others 2009). Taken together, these studies illustrate that population-level efforts to reduce the CVD risk environment are either cost saving or very cost-effective. However, in the case of local interventions, the overall economic impact may vary by country income and urbanicity.

Individual-Level (Clinical) Prevention

Treatment of Individual CVD Risk Conditions. The same WHO-CHOICE studies that assessed population-level risk factor reduction also assessed treatment of hypertension and high cholesterol to prevent CVD. According to Murray and colleagues (2003), ICERs for treating blood pressure and cholesterol at different thresholds were all very attractive (less than US$37.26 per DALY averted), though higher thresholds were more

cost-effective due to selection of higher-risk individuals. By contrast, ICERs were much higher in the later studies by Rubinstein and colleagues looking at Buenos Aires specifically (Rubinstein, Garcia Marti, Souto, and others 2009) and Argentina generally (Rubinstein, Colantonio, Bardach, and others 2010). These differences are likely due to different data sources around the intervention costs as well as more modest assumptions around effectiveness. Blood pressure treatment ICERs ranged from US$2,311.70 to US$3,270.33 per DALY averted, while cholesterol treatment ICERs ranged from US$16,224.79 to US$20,640.42 per DALY averted. Similar results were seen in Brazil: Ribeiro and colleagues found that statin therapy for cholesterol treatment varied widely (US$1,339.77 to US$61,350.10 per QALY gained), depending on the dose of statin and the risk threshold (Ribeiro, Duncan, Ziegelmann, and others 2015).

Notably, only two studies assessed pharmacologic support for smoking cessation. Rubinstein and colleagues found that buproprion (compared to no medication) was not very cost-effective in Argentina on the whole (Rubinstein, Colantonio, Bardach, and others 2010), though it was cost-effective in Buenos Aires (US$66,818.49 vs. US$16,224.79 per DALY averted, respectively) (Rubinstein, Garcia Marti, Souto, and others 2009). Again, however, these differences were due to lower overall costs as well as higher effectiveness in the countrywide analysis. In contrast, an analysis by Lutz and colleagues demonstrated that varenicline (compared to bupropion, nicotine replacement, or unaided cessation) was cost saving in five different Latin American countries (Lutz, Lovato, and Cuesta 2012). This study should be interpreted with caution, however, since it was funded by the maker of varenicline.

On the whole, the studies discussed above suggest that treating individual CVD risk conditions can be cost-effective, provided that individuals are screened and targeted appropriately by clinicians according to absolute level of CVD risk. Pharmacologic approaches to smoking are less cost-effective than taxation and other population-based approaches, though more evidence is needed in this area.

Primary CVD Prevention Using Multiple Drugs: The "Polypill." Finally, several economic evaluations focused on combination drug therapy for primary prevention of CVD. The rationale for combining drugs such as blood pressure medications, aspirin, and statins is that each drug individually is effective at reducing the incidence of CVD (mediated by that drug's mechanism of action), so when combined, the risk reduction is much greater. The notion of a "polypill" containing a fixed-dose combination of these drugs has been around for about 15 years, but

the evidence for the effectiveness of a single combination pill is limited. Firstly, the TIPS trial, conducted in India (Indian Polycap, Yusuf, Pais, and others 2009), showed significant reductions in biochemical and intermediate clinical endpoints (e.g., blood pressure and cholesterol) compared to placebo. Secondly, the UMPIRE study, conducted in Europe and India (Thom, Poulter, Field, and others 2013), showed that such a single, fixed-dose pill significantly increased adherence as opposed to taking multiple pills. The only economic evaluation to include these primary data in a model for Latin American individuals was by Bautista and colleagues, who found that the pill was cost-effective in high-risk subpopulations, including older individuals and obese women (US$284 to US$3,743.88 per QALY gained) (Bautista, Vera-Cala, Ferrante, and others 2013).

Nevertheless, several other studies that preceded the TIPS trial assessed a theoretical polypill based on the effectiveness of the individual drugs and assuming good adherence (later demonstrated in the UMPIRE trial). Murray and colleagues (Murray, Lauer, Hutubessy, and others 2003) and Rubinstein and colleagues (Rubinstein, Colantonio, Bardach, and others 2010) found that a polypill targeting individuals at 15- to 25-percent 10-year risk of CVD was very cost-effective and, under some scenarios, cost saving. When applied specifically in Buenos Aires, the intervention was somewhat less cost-effective (US$1,069.55 to US$1,339.91 per DALY averted). Among these studies, the highest ICER (US$2,936.26 per QALY gained) was for Brazilian individuals treated at a five-percent 10-year CVD risk threshold (Gaziano, Opie, and Weinstein 2006).

As a group, then, these studies have similar conclusions to those around treating individual risk conditions. Hence, primary prevention of CVD on the whole can be cost-effective, though combined pharmacological therapy based on appropriate thresholds of absolute risk is probably more cost-effective than simply treating individual risk conditions themselves.

CARDIOVASCULAR, METABOLIC, AND RESPIRATORY DISEASES: TREATMENT

Our searches also returned 42 interventions in 22 articles on the cost-effectiveness of treatments for specific cardiovascular, metabolic, and respiratory conditions. A handful of studies focused on each of these diseases, though cardiovascular conditions were the most frequently studied.

Table 8.2 Summary of Findings in Cost-Effectiveness Studies of Cardiovascular, Metabolic, and Respiratory Disease Treatment in the Latin American and Caribbean Region, 2000–2015

Author	Year	Condition	Country	Intervention	Comparator	ICER (US$)	Metric
Alcaraz	2011	Heart failure and sudden death	Argentina	Primary prevention implantable cardioverter-defibrillator (population risk similar to MADIT-I trial), public sector	Usual care	8,353.32	Per QALY
Alcaraz	2011	Heart failure and sudden death	Argentina	Primary prevention implantable cardioverter-defibrillator (population risk similar to MADIT-I trial), private sector	Usual care	9,827.10	Per QALY
Alcaraz	2011	Heart failure and sudden death	Argentina	Primary prevention implantable cardioverter-defibrillator (population risk similar to MADIT-II trial), public sector	Usual care	17,116.08	Per QALY
Alcaraz	2011	Heart failure and sudden death	Argentina	Primary prevention implantable cardioverter-defibrillator (population risk similar to MADIT-II trial), private sector	Usual care	19,526.06	Per QALY
Alcaraz	2011	Heart failure and sudden death	Argentina	Secondary prevention implantable cardioverter-defibrillator, public sector	Usual care	20,752.99	Per QALY
Alcaraz	2011	Heart failure and sudden death	Argentina	Secondary prevention implantable cardioverter-defibrillator, private sector	Usual care	23,658.52	Per QALY
Alvis-Guzman	2008	Chronic obstructive pulmonary disease and acute lower respiratory infection	Colombia	Natural gas cooking fuel in homes	Current practice	128.01	Per DALY
Araujo	2008	Coronary heart disease	Brazil	Pre-hospital thrombolytic therapy for acute coronary syndrome	Usual care	Cost saving	Per life-year

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Table 8.2 Summary of Findings in Cost-Effectiveness Studies of Cardiovascular, Metabolic, and Respiratory Disease Treatment in the Latin American and Caribbean Region, 2000–2015 (Continues)

Author	Year	Condition	Country	Intervention	Comparator	ICER (US$)	Metric
Araujo	2010	Stroke	Brazil	Treatment of acute ischemic stroke in women with thrombolytics plus usual care	Usual care	24,546.05	Per QALY
Araujo	2010	Stroke	Brazil	Treatment of acute ischemic stroke in men with thrombolytics plus usual care	Usual care	27,158.09	Per QALY
Arias	2011	Stroke	Argentina	Percutaneous closure of patent foramen ovale plus aspirin (cryptogenic stroke only)	Aspirin alone	21,087.05	Per QALY
Ariza	2012	Chronic obstructive pulmonary disease	Colombia	Salmeterol/fluticasone	Indacaterol	Cost saving	Per QALY
Ariza	2012	Chronic obstructive pulmonary disease	Colombia	Formoterol/budesonide	Indacaterol	Cost saving	Per QALY
Ariza	2012	Chronic obstructive pulmonary disease	Colombia	Indacaterol	Tiotropium	1.53	Per QALY
Bertoldi	2011	Heart failure and sudden death	Brazil	Cardiac resynchronization therapy plus optimal medical therapy	Optimal medical therapy	11,460.76	Per QALY
Bertoldi	2011	Heart failure and sudden death	Brazil	Cardiac resynchronization therapy plus implantable cardioverter-defibrillator plus optimal medical therapy	Implantable cardioverter defibrillator plus optimal medial therapy	21,121.86	Per QALY
Bertoldi	2011	Heart failure and sudden death	Brazil	Implantable cardioverter-defibrillator plus optimal medial therapy	Optimal medical therapy	23,887.63	Per QALY
Bertoldi	2011	Heart failure and sudden death	Brazil	Cardiac resynchronization therapy plus implantable cardioverter-defibrillator plus optimal medial therapy	Cardiac resynchronization therapy plus optimal medical therapy	54,542.56	Per QALY
Chicaiza-Becerra	2010	Type 2 diabetes	Colombia	Magnetic resonance imaging plus plain radiographs for diagnosis of diabetic foot infection	Plain radiographs alone	1,101.97	Per DALY
Cruz-Cruz	2014	Stroke	Mexico	Treatment of acute ischemic stroke with dapsone plus usual care	Usual care	3,773.88	Per QALY
de Leon-Castañeda	2012	Type 2 diabetes	Mexico	Glibenclamide	Metformin	$132.13	Per QALY
de Leon-Castañeda	2012	Type 2 diabetes	Mexico	Glibenclamide	Acarbose	168.97	Per QALY
de Leon-Castañeda	2012	Type 2 diabetes	Mexico	Glibenclamide	No treatment	313.7	Per QALY
de Leon-Castañeda	2012	Type 2 diabetes	Mexico	Metformin	No treatment	341.14	Per QALY
de Leon-Castañeda	2012	Type 2 diabetes	Mexico	Acarbose	No treatment	471.60	Per QALY
Elgart	2012	Type 2 diabetes	Colombia		Sulfonylurea drug plus metformin	1.26	Per QALY

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Table 8.2 Summary of Findings in Cost-Effectiveness Studies of Cardiovascular, Metabolic, and Respiratory Disease Treatment in the Latin American and Caribbean Region, 2000–2015 (Continues)

Author	Year	Condition	Country	Intervention	Comparator	ICER (US$)	Metric
Gaziano	2006	Coronary heart disease	Brazil		Null	934.59	Per QALY
Home	2015	Type 2 diabetes	Mexico		Oral hypoglycemic drugs	Cost saving	Per QALY
Kuhr	2011	Heart failure and sudden death	Brazil		Usual care	24,954.59	Per QALY
Nita	2012	Type 2 diabetes	Brazil		Rosiglitazone or pioglitazone plus metformin	Cost saving	Per QALY
Obreli-Neto	2015	Type 2 diabetes	Brazil		Usual care	24.26	Per QALY
Poggio	2012	Heart failure and sudden death	Argentina		Usual care	118.93	Per QALY
Polanczyk	2007	Coronary heart disease	Brazil		Bare metal stent	#######	Per life-year
Reyes	2011	Chronic obstructive pulmonary disease	Chile		Usual care	Cost saving	Per QALY
Ribeiro	2010	Heart failure and sudden death	Brazil		Usual care	15,903.35	Per QALY
Ribeiro	2010	Heart failure and sudden death	Brazil		Usual care	45,767.93	Per QALY
Ribeiro	2015	Coronary heart disease	Brazil		No statin, secondary prevention	1,820.06	Per QALY
Ribeiro	2015	Coronary heart disease	Brazil		Low-dose statin, secondary prevention	2,270.08	Per QALY
Ribeiro	2015	Coronary heart disease	Brazil		Intermediate-dose statin, secondary prevention	26,021.58	Per QALY
Rodriguez-Martinez	2013	Asthma	Colombia		Beclomethasone	55,851.77	Per QALY
Vieira	2012	Coronary heart disease	Brazil		Null	4,895.38	"Event-free costs"
Vieira	2012	Coronary heart disease	Brazil		Null	9,856.06	"Event-free costs"
Vieira	2012	Coronary heart disease	Brazil		Null	10,775.66	"Event-free costs"

Note: MADIT = Multicenter Automatic Defibrillator Implantation Trial; ICER = incremental cost-effectiveness ratio; DALY = disability-adjusted life year; QALY = quality-adjusted life year.

Acute Care for Coronary Heart Disease and Stroke

Acute coronary syndromes ("heart attacks") and strokes are typically treated in hospitals and require advanced medical, diagnostic, and sometimes surgical capabilities. Unfortunately, there is limited evidence on the cost-effectiveness of various treatment approaches in Latin American countries. For acute coronary syndromes, Araujo and colleagues found that prehospital (paramedic) administration of thrombolytic medications in Brazil was cost saving (Araujo, Tura, Brasileiro, and others 2008). On the other hand, Polanczyk and colleagues found that using sirolimus-eluting stents as compared to bare metal stents was not cost-effective in Brazil, likely because of their greatly increased cost relative to their effectiveness (Polanczyk, Wainstein, and Ribeiro 2007). Another study by Araujo and colleagues found that thrombolytic medications for acute ischemic stroke were relatively cost-effective (US$24,546.05 per DALY averted in women and US$27,158.09 in men) (Araujo, Teich, Passos, and others 2010). Finally, a study by Cruz-Cruz and colleagues in Mexico concluded that dapsone as an adjunct treatment (neuroprotective agent) for acute ischemic stroke was cost-effective (Cruz-Cruz, Kravzov-Jinich, Martínez-Núñez, and others 2014); however, this medication should be considered experimental as it has not yet been included in stroke treatment guidelines.

Secondary Prevention and Chronic Care for Cardio-vascular Diseases

Evidence for the cost-effectiveness of secondary prevention and chronic care for CVD in Latin America is similarly limited. Secondary prevention refers to using drug therapy to treat individuals with existing CVD in order to reduce mortality and nonfatal events, such as repeat heart attacks and strokes. In Brazil, Gaziano and colleagues found that a "polypill" approach to secondary prevention was very cost-effective (US$934.59 per QALY gained) (Gaziano, Opie, and Weinstein 2006). Also in Brazil, Ribeiro and colleagues found that low-dose and intermediate-dose statins alone were cost-effective (US$1,820.06 and US$2,270.08 per QALY gained, respectively) (Ribeiro, Duncan, Ziegelmann, and others 2015). In addition, Ribeiro and colleagues found that high-dose statins as compared to intermediate-dose statins were less cost-effective (US$26,021.58 per QALY gained). For chronic CVD, a Brazilian study of medical therapy, coronary artery bypass graft surgery, and catheter-based angioplasty/stenting found that medical therapy costs until a subsequent CVD event were lower than surgical and catheter-based approaches (Vieira, Hueb, Hlatky, and others 2012). Unfortunately, this study did not assess the incremental costs of these approaches using utility-based measures, so application of their findings is limited.

Finally, Arias and colleagues in Argentina looked at catheter-based closure of patent foramen ovale following "cryptogenic strokes" (i.e., strokes without known cause, many of which are presumed due to this congenital defect). They found that closure was cost-effective relative to aspirin therapy alone; however, it should be noted that aspirin therapy is cost-effective in itself and is likely the higher priority treatment (Arias, Masson, Bluro, and others 2011).

Taken together, this limited evidence suggests that certain medication regimens and technologies can be cost-effective for secondary CVD prevention and chronic care.

Management of Heart Failure and Sudden Cardiac Death

Heart failure refers to a clinical syndrome that is predominately the end result of severe coronary heart disease. Viral infection, Chagas disease, rheumatic valve disease, and nutrition-related conditions are other important causes of nonischemic heart failure in developing countries. The standard medication regimen for heart failure employs several blood pressure medications, diuretics, and sometimes drugs to improve cardiac contractions; however, none of the studies in this review assessed the cost-effectiveness of such regimens. One study by Kuhr and colleagues found that cardiac rehabilitation (exercise therapy) for heart failure in Brazil was modestly cost-effective (US$24,954.59 per QALY gained) (Kuhr, Ribeiro, Rohde, and others 2011).

The natural history of heart failure also includes both poor cardiac function due to lack of synchronized heart beats between ventricles as well as lethal arrhythmias that lead to sudden death. Both these conditions can be treated by using intracardiac devices. These devices were the subject of three studies. Poggio and colleagues found that cardiac resynchronization pacing therapy (CRT) was very cost-effective in Argentina (US$118.93 per QALY gained) (Poggio, Augustovsky, Caporale, and others 2012). Alcaraz and colleagues, studying implantable cardioverter-defibrillators (ICDs) in Argentina, found that ICERs for "primary prevention" ICDs (i.e., for individuals who had not experienced sudden death) ranged from US$8,353.32 to US$19,526.06 per QALY gained, depending on the risk level of the individual and whether the payer was the public or private sector. Interestingly, they also found that "secondary prevention" ICDs (i.e., for individuals who had experienced sudden death but were then successfully revived) were slightly less cost-effective (US$20,752.99 to US$23,658.52 per QALY gained) (Alcaraz, González-Zuelgaray, and Augustovski 2011).

In Brazil, Ribeiro and colleagues found that the cost-effectiveness of ICDs depended quite a bit on the risk level of the individual, with higher- vs. lower-risk individuals having an ICER of US$15,903.35 vs. US$45,767.93 per

QALY gained, respectively (Ribeiro, Stella, Zimerman, and others 2010). Bertoldi and colleagues assessed combinations of CRT and ICD implantation as compared to optimal medical therapy. They found that the most economically attractive approach was to start with CRT (vs. medical therapy alone) or to add CRT for individuals who had already received an ICD (US$11,460.76 and US$21,121.86 per QALY gained, respectively). Either providing ICD therapy first or adding ICD capability for individuals who had already received CRT was less cost-effective (US$23,887.63 and US$54,542.56 per QALY gained, respectively) (Bertoldi, Rohde, Zimerman, and others 2013). The weight of evidence from all these studies suggests that, in some contexts, CRT and ICD devices are cost-effective, provided that the individual's risk is high enough. CRT is probably more cost-effective than an ICD as a single intervention, though the clinical indications for using these devices often overlap substantially, and they both require a similarly specialized cardiac electrophysiology and surgery platform.

Management of Type 2 Diabetes

A few studies assessed the cost-effectiveness of medical therapy for type 2 diabetes. In Mexico, de Leon-Castañeda and colleagues found that a variety of oral medications for diabetes were quite cost-effective (US$132.13 to US$471.60 per QALY gained) (Díaz de León-Castañeda, Altagracia-Martínez, Kravzov-Jinich, and others 2012). For Mexican individuals who have failed oral medications, the addition of long-acting insulin detemir appears to be cost saving (Home, Baik, Galvez, and others 2015). For individuals who have failed metformin alone, adding saxagliptin is a cost-effective alternative to sulfonylurea drugs in Colombia (Elgart, Caporale, Gonzalez, and others 2013), and it is a cost-saving alternative to rosiglitazone or pioglitazone in Brazil (Nita, Eliaschewitz, Ribeiro, and others 2012).

In addition to the studies of specific medications, two analyses focused on other aspects of diabetes care. A study by Obreli-Neto and colleagues in Brazil found that a pharmaceutical care support intervention—aiding in diabetes and hypertension medication dosing and adherence—was very cost-effective (US$24.26 per QALY gained) (Obreli-Neto, Marusic, Guidoni, and others 2015). Another important issue is the use of magnetic resonance imaging (MRI) to diagnose diabetic foot infection. MRI is superior to plain radiographs for this purpose, yet it is a very costly technology. Nevertheless, a study by Chicaiza-Becerra and colleagues found that in Colombia MRI is cost-effective relative to radiographs (US$1,101.97 per QALY gained) (Chicaiza-Becerra, Gamboa-Garay. and Garcia-Molina 2010).

In summary, although the number of studies is limited, the evidence suggests that using modern drugs and diagnostics for managing type 2 diabetes is quite cost-effective.

Management of Chronic Lung Disease

Lastly, a few studies have assessed strategies to deal with chronic lung diseases. Compared to beclomethasone, fluticasone was found not cost-effective in Colombia; however, other medications for asthma were not assessed in this study, and no other studies in this review assessed asthma treatments (Rodriguez-Martinez, Sossa-Briceno, and Castro-Rodriguez 2013). By contrast, Ariza and colleagues found that several different inhalers were all very cost-effective or cost saving for chronic obstructive pulmonary disease in Colombia (Ariza, Thuresson, Machnicki, and others 2012). Reyes and colleagues evaluated a pulmonary rehabilitation (exercise therapy) program for chronic obstructive pulmonary disease in Chile and found it to be cost saving when added to standard care (Reyes, Silva, and Saldias 2011). Finally, with regards to prevention, Alvis-Guzman and colleagues found that an intervention to replace biofuels with natural gas in Colombian homes reduced the burden of acute lower respiratory tract infections and chronic lung disease (US$128.01 per QALY gained) (Alvis-Guzman, Alvis-Estrada, and Orozco-Africano 2008). Hence, similar to the case of type 2 diabetes, strategies to address chronic lung diseases seem to be very cost-effective in general.

CANCER PREVENTION AND TREATMENT

Our search returned 35 interventions in 11 articles devoted solely to cervical cancer prevention and screening as well as 33 interventions in 11 articles devoted to other cancers, primarily breast cancer. The results are summarized in table 8.3 (cervical cancer) and table 8.4 (breast and other cancers).

Cervical Cancer

Nearly all of the studies on cervical cancer prevention focused on vaccination against human papillomavirus (HPV) as the primary method of prevention. Most studies focused on Brazil and Mexico. Generally, HPV vaccination was very cost-effective when added to "usual care," which in many settings includes cervical cancer screening with Papanicolaou smear every two or three years (Aponte-Gonzalez, Fajardo-Bernal, Diaz, and others 2013; Colantonio, Gomez, Demarteau, and others 2009; Fonseca, Ferreira, and Neto 2013; Novaes, de Soarez, Silva, and others 2015; Reynales-Shigematsu, Rodrigues, and Lazcano-Ponce 2009).

Table 8.3 Summary of Findings in Cost-Effectiveness Studies of Cervical Cancer Prevention and Treatment in the Latin American and Caribbean Region, 2000–2015

Author	Year	Country	Intervention	Comparator	ICER (US$)	Metric
Aponte-González	2013	Colombia	HPV vaccination (quadrivalent)	Usual care	14.39	Per DALY
Aponte-González	2013	Colombia	HPV vaccination (bivalent)	HPV vaccination (quadrivalent)	17.08	Per DALY
Colantonio	2009	Argentina	HPV vaccination plus usual care	Usual care	1,429.31	Per QALY
Colantonio	2009	Brazil	HPV vaccination plus usual care	Usual care	7,068.57	Per QALY
Colantonio	2009	Chile	HPV vaccination plus usual care	Usual care	50.75	Per QALY
Colantonio	2009	Mexico	HPV vaccination plus usual care	Usual care	993.04	Per QALY
Colantonio	2009	Peru	HPV vaccination plus usual care	Usual care	2,091.74	Per QALY
Fonseca	2013	Brazil	HPV vaccination and 3 Papanicolaou smear screenings (lifetime)	HPV vaccination	422.41	Per QALY
Fonseca	2013	Brazil	HPV vaccination and 10 Papanicolaou smear screenings (lifetime)	HPV vaccination	652.82	Per QALY
Gutiérrez-Delgado	2008	Mexico	Papanicolaou smear screening	No screening	1,634.30	Per DALY
Gutiérrez-Delgado	2008	Mexico	Hybrid capture screening	Papanicolaou smear screening	2,147.38	Per DALY
Gutiérrez-Delgado	2008	Mexico	HPV vaccination	Hybrid capture screening	8,335.25	Per DALY
Insinga	2007	Mexico	HPV vaccination (girls only) plus usual care	Usual care	3,036.79	Per QALY
Insinga	2007	Mexico	HPV vaccination (girls only) plus booster vaccination (girls only) plus usual care	HPV vaccination (girls only) plus usual care	3,404.90	Per QALY
Insinga	2007	Mexico	HPV vaccination (girls and boys) plus booster vaccination (girls only) plus usual care	HPV vaccination (girls only) plus booster vaccination (girls only) plus usual care	18,613.44	Per QALY
Insinga	2007	Mexico	HPV vaccination (girls and boys) plus booster vaccination (girls and boys) plus usual care	HPV vaccination (girls and boys) plus booster vaccination (girls only) plus usual care	18,656.09	Per QALY
Kawai	2012	Brazil	HPV vaccination	Usual care	188.89	Per QALY
Kawai	2012	Brazil	HPV vaccination plus booster vaccination	HPV vaccination	388.57	Per QALY
Kim	2007	Brazil	HPV vaccination (50% coverage)	Null	80.7	Per life-year
Kim	2007	Brazil	HPV vaccination (75% coverage)	Null	349.71	Per life-year
Kim	2007	Brazil	HPV vaccination (90% coverage)	Null	807.02	Per life-year
Novaes	2015	Brazil	HPV vaccination plus usual care	Usual care	4,627.08	Per DALY
Reynales-Shigematsu	2009	Mexico	HPV vaccination plus usual care	Usual care	7.18	Per life-year
Reynales-Shigematsu	2009	Mexico	HPV vaccination plus Papanicolaou smear screenings every 5 years plus usual care	HPV vaccination plus usual care	1,682.70	Per life-year

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Table 8.3 Summary of Findings in Cost-Effectiveness Studies of Cervical Cancer Prevention and Treatment in the Latin American and Caribbean Region, 2000–2015 (continues)

Author	Year	Country	Intervention	Comparator	ICER (US$)	Metric
Vanni	2012	Brazil	HPV vaccine US$5 per dose (90% coverage)	Usual care	12.68	Per QALY
Vanni	2012	Brazil	HPV vaccine US$12 per dose (50% coverage)	Usual care	71.64	Per QALY
Vanni	2012	Brazil	HPV vaccine US$12 per dose (70% coverage)	Usual care	161.68	Per QALY
Vanni	2012	Brazil	HPV vaccine US$12 per dose (90% coverage)	Usual care	224.44	Per QALY
Vanni	2012	Brazil	HPV vaccine US$27 per dose (50% coverage)	Usual care	367.73	Per QALY
Vanni	2012	Brazil	HPV vaccine US$27 per dose (70% coverage)	Usual care	604.85	Per QALY
Vanni	2012	Brazil	HPV vaccine US$27 per dose (90% coverage)	Usual care	720.25	Per QALY
Vanni	2012	Brazil	HPV vaccine US$120 per dose (50% coverage)	Usual care	2,189.90	Per QALY
Vanni	2012	Brazil	HPV vaccine US$120 per dose (70% coverage)	Usual care	3,333.68	Per QALY
Vanni	2012	Brazil	HPV vaccine US$120 per dose (90% coverage)	Usual care	3,772.42	Per QALY
Walwyn	2015	Belize	HPV vaccination plus usual care	Usual care	214.5	Per DALY

Note: HPV = human papillomavirus; ICER = incremental cost-effectiveness ratio; DALY = disability-adjusted life year; QALY = quality-adjusted life year.*t*

Only one study specifically investigated the tradeoffs between screening and treatment (Gutierrez-Delgado, Baez-Mendoza, Gonzalez-Pier, and others 2008). This study, conducted in Mexico, found that—compared to doing nothing—Papanicolaou smear was the most cost-effective intervention, followed by hybrid capture screening and then HPV vaccination (ICERs of US$1,634.30, US$2,147.38, and US$8,335.25 per DALY averted, respectively).

Most studies focused on the benefit of HPV vaccination added to current screening practices. For instances, a study by Vanni and colleagues in Brazil highlighted that the ICER for vaccination could range from US$12.68 per QALY gained to US$3,772.42 per QALY gained, depending on the price per dose and the coverage level (Vanni, Mendes Luz, Foss, and others 2012). A similar gradient across coverage was reported by Kim

and colleagues (Kim, Andres-Beck, and Goldie 2007). Another study demonstrated HPV vaccination was very cost-effective in Belize (Walwyn, Janusz, Clark, and others 2015). Finally, two studies looked at the cost-effectiveness of a repeat dose of the HPV vaccine ("booster" shot) in older adolescents. Kawai and colleagues found that a repeat dose would involve an additional US$200 per QALY gained (Kawai, de Araujo, Fonseca, and others 2012). An earlier study by Insinga and colleagues had similar results but also found that vaccinating both girls and boys was less cost-effective than just vaccinating girls (Insinga, Dasbach, Elbasha, and others 2007).

All things considered, the evidence suggests that HPV vaccination is a cost-effective addition to current practices, though coverage targets, vaccine prices, and the option of a booster shot all change the relative cost-effectiveness of vaccination.

Table 8.4 Summary of Findings in Cost-Effectiveness Studies of Prevention and Treatment of Breast and Other Noncervical Cancers in the Latin American and Caribbean Region, 2000–2015

Author	Year	Condition	Country	Intervention	Comparator	ICER (US$)	Metric
Buendía	2013	Breast cancer	Colombia	Trastuzumab plus usual care	Usual care	42.45	Per QALY
De Souza Bandeira	2015	Breast cancer	Brazil	Trastuzumab plus docetaxel	Docetaxel	709.80	Per QALY
De Souza Bandeira	2015	Breast cancer	Brazil	Trastuzumab plus paclitaxel	Trastuzumab plus docetaxel	5,700.93	Per QALY
Machado	2012	Breast cancer	Brazil	Lapatinib plus capecitabine as second-line treatment	Capecitabine alone as second-line treatment	163,935.66	Per QALY
Muciño Ortega	2012	Pancreatic neuroendocrine tumors (nonresectable)	Mexico	Sunitinib plus usual care	Usual care	2,356.47	Per QALY
Niens	2014	Breast cancer	Costa Rica	Current coverage (80%)	Null	10.91	Per DALY
Niens	2014	Breast cancer	Costa Rica	Biennial clinical breast examination screening (40–70 years) plus treatment of stage I to IV (95% coverage)	Biennial mammography screening (40–70 years) plus treatment of stage I to IV plus trastuzumab (95% coverage)	13.73	Per DALY
Niens	2014	Breast cancer	Costa Rica	Biennial mammography screening (40–70 years) plus treatment of stage I to IV (95% coverage)	Current coverage (80%)	30.92	Per DALY
Niens	2014	Breast cancer	Costa Rica	Biennial mammography screening (40–70 years) plus treatment of stage I to IV plus trastuzumab (95% coverage)	Biennial mammography screening (40–70 years) plus treatment of stage I to IV (95% coverage)	$69.90	Per DALY
Niens	2014	Breast cancer	Mexico	Basic awareness outreach program plus mass media awareness raising plus treatment of stage I to IV (95% coverage)	Biennial mammography screening (40–70 years) plus treatment of stage I to IV plus trastuzumab (95% coverage)	427.52	Per DALY
Niens	2014	Breast cancer	Mexico	Biennial mammography screening (50–70 years) plus treatment of stage I to IV (95% coverage)	Current coverage (70%)	1,082.90	Per DALY
Niens	2014	Breast cancer	Mexico	Biennial mammography screening (50–70 years) plus treatment of stage I to IV plus trastuzumab (95% coverage)	Biennial mammography screening (50–70 years) plus treatment of stage I to IV (95% coverage)	1,191.55	Per DALY
Niens	2014	Breast cancer	Mexico	Biennial mammography screening (40–70 years) plus treatment of stage I to IV plus trastuzumab (95% coverage)	Biennial mammography screening (50–70 years) plus treatment of stage I to IV plus trastuzumab (95% coverage)	1,457.29	Per DALY
Pichon Riviere	2015	Breast cancer	Argentina	Trastuzumab plus usual care	Usual care	17,024.05	Per QALY
Pichon Riviere	2015	Breast cancer	Bolivia	Trastuzumab plus usual care	Usual care	10,159.48	Per QALY
Pichon Riviere	2015	Breast cancer	Brazil	Trastuzumab plus usual care	Usual care	56,468.06	Per QALY

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Author	Year	Condition	Country	Intervention	Comparator	ICER (US$)	Metric
Pichon Riviere	2015	Breast cancer	Chile	Trastuzumab plus usual care	Usual care	114.97	Per QALY
Pichon Riviere	2015	Breast cancer	Colombia	Trastuzumab plus usual care	Usual care	43.93	Per QALY
Pichon Riviere	2015	Breast cancer	Peru	Trastuzumab plus usual care	Usual care	21,163.67	Per QALY
Pichon Riviere	2015	Breast cancer	Uruguay	Trastuzumab plus usual care	Usual care	2,073.01	Per QALY
Ribeiro	2013	Breast cancer	Brazil	Organized breast screening program implemented in Porto Alegre	Usual care	6,874.31	Per QALY
Sasse	2009	Breast cancer	Brazil	Adjuvant anastrozole (public sector)	Adjuvant tamoxifen (public sector)	20,544.14	Per QALY
Sasse	2009	Breast cancer	Brazil	Adjuvant anastrozole (private sector)	Adjuvant tamoxifen (private sector)	35,042.28	Per QALY
Souza	2013	Breast cancer	Brazil	Biennial screen-film mammography	Usual care	868.41	Per QALY
Souza	2013	Breast cancer	Brazil	Annual screen-film mammography	Biennial screen-film mammography	7,556.73	Per QALY
Souza	2013	Breast cancer	Brazil	Annual full-field digital mammography (<50 years) and annual screen-film mammography (50–69 years)	Annual screen-film mammography	17,563.88	Per QALY
Valencia	2012	Chronic myeloid leukemia	Colombia	Dasatinib as first-line treatment	Imatinib as first-line treatment	#######	Per QALY
Valencia	2012	Chronic myeloid leukemia	Venezuela	Dasatinib as first-line treatment	Imatinib as first-line treatment	#######	Per QALY
Zelle	2013	Breast cancer	Peru	Triennial fixed plus mobile mammography screening (45–69 years) plus stage I to IV treatment (95% coverage)	Null	1,563.93	Per DALY
Zelle	2013	Breast cancer	Peru	Triennial fixed plus mobile mammography screening (40–69 years) plus stage I to IV treatment (95% coverage)	Null	2,145.52	Per DALY
Zelle	2013	Breast cancer	Peru	Biennial fixed plus mobile mammography screening (40–69 years) plus stage I to IV treatment (95% coverage)	Null	10,417.48	Per DALY
Zelle	2013	Breast cancer	Peru	Annual fixed plus mobile mammography screening (40–69 years) plus stage I to IV treatment (95% coverage) plus extended palliative care plus adjuvant trastuzumab	Null	33,076.83	Per DALY

Note: ICER = incremental cost-effectiveness ratio; DALY = disability-adjusted life year; QALY = quality-adjusted life year.

Breast Cancer

Comprehensive Cancer Prevention and Control. A handful of studies focused solely on approaches to screening for breast cancer. In Brazil, standard mammography performed every other year is more cost-effective than yearly mammography and full-field digital mammography added to yearly mammography, with ICERs of US$868.41, US$7,556.73, and US$17,563.88 per QALY gained, respectively (Souza and Polanczyk 2013). An important aspect of implementing screening is stimulating demand; to this end, Ribeiro and colleagues assessed a program to increase breast cancer screening in Porto Alegre, Brazil, and found it to be cost-effective (US$6,874.31 per QALY gained) (Ribeiro, Caleffi, and Polanczyk 2013).

On the other hand, two studies that followed the WHO-CHOICE approach looked at the expansion pathway for screening and treatment of breast cancer. First, Zelle and colleagues assessed breast cancer prevention and control in Peru. They found that, assuming 95-percent access to breast cancer treatment at all stages, standard mammography is most cost-effective when performed every third year among women aged 45–69 years, as compared to screening every third year among women aged 40–69 years or screening every second year among women aged 40–69 years (ICERs of US$1,563.93, US$2,145.52, and US$10,417.48 per DALY averted, respectively). The least cost-effective strategy, and the one most closely resembling high-income country standards, was annual screening of women aged 40–69 plus addition of trastuzumab (see below) and extended palliative care for eligible individuals (ICER of US$33,076.83 per DALY averted) (Zelle, Vidaurre, Abugattas, and others 2013).

Second, Niens and colleagues assessed screening and treatment of breast cancer in Mexico and Costa Rica. They also assumed scale-up of breast cancer treatment to 95 percent in all but the base case scenario (current coverage 70 percent in Mexico and 80 percent in Costa Rica). In Mexico, all the strategies that were assessed were very cost-effective, with the most cost-effective being outreach and mass media campaigns around screening (US$427.52 per DALY averted) and the least cost-effective being standard mammography every second year plus trastuzumab for eligible women (US$1,457.29 per DALY averted). In Costa Rica, rankings of interventions were similar, though the ICERs were all lower (US$10.91 to US$69.90 per DALY averted) (Niens, Zelle, Gutierrez-Delgado, and others 2014). On the whole, these studies suggest that combining screening (and outreach) efforts with treatment provides the best value for the money, particularly at the population level.

Specific Chemotherapeutic Agents. Several studies evaluated novel chemotherapeutic agents from a health technology assessment perspective. The most frequent drug assessed was trastuzumab, which is used in an adjuvant setting for women with cancers that express the HER2/neu gene. In Latin America, it is estimated that 23.4 to 29.4 percent of cases of breast cancer are HER2/neu-positive and would thus be eligible for trastuzumab (Pichon-Riviere, Garay, Augustovski, and others 2015). Pichon-Riviere and colleagues evaluated the inclusion of trastuzumab to standard cancer care in seven Latin American countries and found ICERs ranging from US$43.93 per QALY gained in Colombia to US$56,468.06 per QALY gained in Brazil (Pichon-Riviere, Garay, Augustovski, and others 2015). Their ICER for Colombia was very similar to one reported in an earlier study (Buendía, Vallejos, and Pichón-Rivière 2013). Additionally, de Souza Bandeira and colleagues found that addition of trastuzumab to a taxane-based regimen was cost-effective (US$709.80 per QALY gained for docetaxel and US$5,700.93 per QALY gained for paclitaxel as compared to docetaxel) (de Souza Bandeira, Gonzalez Mozegui, de Mello Vianna, and others 2015). Another study found that, for second-line treatment, lapatinib (a biosimilar to trastuzumab) added to capecitabine in Brazil was $163,935.66 for each additional QALY, compared to capecitabine alone (Machado and Einarson 2012).

Finally, a study by Sasse and colleagues in Brazil assessed anastrozole, which is used in an adjuvant setting for women with cancers that express estrogen/progesterone receptors. The study by Sasse and colleagues found that, compared to tamoxifen (an older drug for hormone receptor-positive cancers), the ICER for anastrozole ranges from US$20,544.14 to US$35,042.28 per QALY gained, depending on public vs. private sector care (Sasse and Sasse 2009). Taken together, these studies provide suitable evidence that targeted agents for breast cancer can be cost-effective in a variety of Latin American settings, though some regimens are much less cost-effective than others.

Other Cancers

Only two studies looked at interventions for cancers other than breast and cervical cancer, and both focused on targeted chemotherapeutic agents. First, Valencia and Orozco compared two agents for chronic myeloid leukemia: dasatinib (a newer, more effective and expensive drug) and imatinib (an older generic drug). They found dasatinib not to be cost-effective in Venezuela

or Colombia (Valencia and Orozco 2012). Second, Muciño Ortega and colleagues compared sunitinib plus usual care to usual care only for nonresectable pancreatic neuroendocrine tumors and found this drug to be cost-effective (US$2,356.47 per QALY gained) (Muciño Ortega, Chi-Chan, Peniche-Otero, and others 2012). It should be noted that pancreatic neuroendocrine tumors are rare cancers, so this study's usefulness to policy makers is limited.

Despite the evidence presented above, there are massive gaps in knowledge around cancer prevention and control in Latin America. For instance, our search found no economic evaluations around lung, stomach, colorectal, or prostate cancer, which are the other most common neoplasms in the Americas besides breast and cervical cancer (Global Burden of Disease Cancer, Fitzmaurice, Dicker, and others 2015). Treatments for these cancers include a wide variety of nonspecific and targeted chemotherapy regimens as well as surgical and radiotherapy modalities. Therefore, most cancer prevention and treatment strategies lack any evidence for or against their cost-effectiveness.

CONCLUSIONS

Cardiovascular disease and cancers comprise a majority of the burden of disease in the Latin America and the Caribbean region, and given recent epidemiological changes, they will continue to grow in importance. Notably, most resources in LAC countries are still devoted to infectious diseases and maternal and child health programs. Despite these discrepancies in allocation of resources, the studies presented here provide an important evidence base for implementing cost-effective prevention and treatment programs around NCDs in LAC.

However, each cost-effectiveness study should be considered in the local context. Most Latin American and Caribbean countries have pluralistic health care systems, and decision making around interventions, programs, and policies can be fragmented due to the different actors. This is especially true when considering public vs. private sector programs. Hence, drastically different cost-effectiveness ratios—and decisions around interventions—may be seen across different payers. This was demonstrated explicitly in studies of the cost-effectiveness of cardiac stents (Polanczyk, Wainstein, and Ribeiro 2007) and defibrillators (Ribeiro, Stella, Zimerman, and others 2010) in Brazil, but similar nuances exist in other settings.

Hence, as the number and role of stakeholders—especially such private actors as pharmaceutical and device companies—grows in LAC, it will be increasingly important to conduct transparent and up-to-date analyses of new health technologies in each country. Until recently, there was very little use of economic evaluations to guide the decision-making process in the health care systems of most Latin American countries. Nevertheless, there was considerable awareness of the need to understand and apply these tools in order to improve the allocation of resources (Iglesias, Drummond, Rovira, and others 2005). In this regard, this last decade saw a large increase in the use of economic evaluations to inform coverage policies in different LAC countries (Augustovski, Alcaraz, Caporale, and others 2015).

Considering the growing burden and costs of NCDs in LAC, this systematic review highlights the evidence on cost-effectiveness of different interventions, programs, and policies that may be useful to inform resource-allocation decisions regarding NCDs in LAC.

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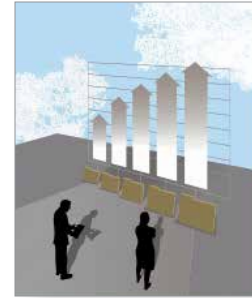
Section 4

MEETING THE CHALLENGE OF
NCDs: HOW TO ACHIEVE BEST
SOLUTIONS

Mauricio Hernández-Avila, *Section Editor*

Article **9**

Noncommunicable Diseases: Challenges and Opportunities for Health System Response

Camilo Cid, Cristóbal Cuadrado, and Ricardo Fábrega

INTRODUCTION

Health systems are facing an increasing burden of disease associated with noncommunicable diseases (NCDs). Around the world, such NCDs as cardiovascular diseases, cancers, chronic respiratory diseases, and diabetes currently represent 82 percent of premature deaths in the low- and middle-income countries (WHO 2015).

Four risk factors have been identified as the major contributors to the increase in NCDs: unhealthy diets, physical inactivity, harmful alcohol consumption, and tobacco use. Intermediate or metabolic risk factors such as high blood pressure, high cholesterol, and obesity are of high relevance as pathways between risk factors and NCDs. The countries of the Americas face particular problems in this regard. In recent decades, the Western Hemisphere has seen the fastest growth in the prevalence of overweight and obesity in the world. In 2030, Latin America and the Caribbean is projected to be one of the most affected regions of the world (Kelly and others 2008).

Concerns about the economic impact of NCDs are growing due to the high prevalence and chronic course of these conditions over the lifespan of the population. As an example, obesity cost for health systems are estimated to account for 2 to 8 percent of total health expenditures (Withrow and Alter 2011). In a context of growing health care costs, the rise in obesity prevalence in the United States of America between 1987 and 2001 accounted for over a quarter of the increase in total health expenditures during that period (Thorpe and others 2004). This can

be explained in terms of a 46-percent increase in direct health costs within obese populations as compared with normal weight groups (Finkelstein and others 2009).

Evidence from technical evaluations of the impact on macroeconomic productivity suggests that NCDs generate large consequences for countries all around the world (Chaker and others 2015), representing as much as 75 percent of global GDP in 2010, and with projections of US$47 trillion in losses over the next two decades (Bloom and others 2011). Such factors force health systems to spend more, affecting the possibilities of the countries to advance to effective universal health coverage (de-Graft Aikins and others 2014).

In this article we will take the WHO framework proposed by Murray and Frenk for the performance assessment of health systems (Murray and Frenk 2000) to discuss challenges and opportunities for the health system response to NCDs. Three main functions of the health systems of this framework will be used for the analysis: health provision, health financing, and stewardship.

The next section of this article presents recommendations on the health care models that best respond to the challenges of NCD health services delivery, and it also summarizes financing strategies that contribute to having integrated health care systems. The third section presents evidence on the policy interventions connected to the stewardship functions of health systems, using the example of regulatory policies to limit the impact of risk factors related to NCDs. The article concludes with some remarks on strategies that health system should apply in response to NCDs.

ENHANCING FINANCIAL MECHANISMS AND INTEGRATING CARE TO ADDRESS NCDs

NCDs and Universal Health

Noncommunicable diseases are already increasing health care costs in the countries of Latin American and the Caribbean (LAC). From what has been seen over recent decades in the countries of the Organisation for Economic Co-operation and Development (OECD), the costs will only continue rising.

The nations of the Americas are facing a rapid aging of the population and an escalating increase in chronic diseases. At the same time, the countries are advancing towards better access to health care and new technology. Fast growing demand and more costly health care is forcing countries to respond more quickly and with greater resources than observed in OECD countries. Resources will have to include not only health care services, but also funding for the promotion of health and the prevention of disease. At the same time, long-term care and community-based services are central concerns, in particular for the care of NCDs.

Increasing and improving financing with equity and efficiency is what the Pan American Health Organization (PAHO) has presented as a strategic line in relation to health care financing since 2014 (PAHO 2014). A core aspect of such a goal is to advance towards the elimination of direct out-of-pocket expenditures, one of the main barriers to access at the point of care. This has profound implications for the health care systems of the LAC countries.

First, governments will need to increase and optimize the financing from public funds to a target of 6 percent of GDP. LAC countries are at a considerable distance from this goal, so focused policies to find fiscal space for health care are necessary. Second, countries will have to replace the direct out-of-pocket expenditures with efficient and more equitable public expenditures. Third, the health systems have to align with the national health objectives. In this context, the organization of the health systems must be appropriate, and the payment mechanisms have to advance towards solidarity in the allocation of resources. As a whole, health care systems must strengthen their governance and stewardship.

NCDs and Resource Allocation

In most of the LAC countries, health care systems rely mainly on high out-of-pocket expenditures, with a lack of solidarity and poor efficiency. The general concepts of solidarity within risks and income, as well as the efficiency of payment mechanisms, may have a concrete representation in the case of NCDs. However, it is important to consider the potential problems associated with incentives when there are chronic diseases combined with the absence of pooled funds.

Problems associated with incentives appear on the supply side of providers, where it is possible to anticipate the health care costs associated with the chronically ill. In health economics, this is known as "selection." Selection results in efforts to exclude chronic patients, expel them from the health system, impose higher copayments or deductibles, and/or charge higher premiums. Other problems associated with incentives appear in the supply side of the production of services associated with the fragmentation in the organization of health systems and the lack of appropriate funding mechanisms. In this context, the system of incentives must take into account that health care services are provided at different levels within the health care system. The level where the services are performed should be the one with the greatest expected health gains.

The financial incentives associated with funding mechanisms have to be based on morbidity to achieve efficient ways of organizing care for NCDs, and to promote the integration of health care systems overall. The incentives have to be compatible with the mechanisms of coordination and planning, and with a resource allocation that incorporates costs in relation to morbidity. In general, the allocation mechanisms that best respond to these conditions are those that are risk-adjusted per capita ones. Allocation mechanisms rely on the aggregated data codified for the individual episodes of care, and utilize standard technologies for adjustment (Cid and others 2016).

In the integration of health care systems, health care "coordination" is defined as the delivery of all the health care interventions that are necessary for a patient, regardless of the provider, in order to reach a common goal. Health care coordination focuses on the interaction among providers. When that coordination reaches its highest level, it becomes "integrated" (Vásquez and others 2012). Coordination has to do with a network of institutions that delivers a set of services in a coordinated way, and assumes clinical and economic responsibility over the population it serves. However, the most relevant element of integration is that of the health care professionals. Coordination between the doctors and the clinical work, and the combined effort towards the objectives of the system, will ensure the required continuity of care (Shortell and others 1996).

Risk-adjusted per capita payment mechanisms promote coordination and decentralization within a network of providers in the health care system, with

an appropriate transferal of risk between individuals. Different payment mechanisms, such as global budget, fee for service, salaries, and per capita, coexist in most of the health care systems. Hence, integration within the systems is a central element for success (figure 1).

Risk-adjusted per capita financing is one of the most powerful regulatory tools for promoting integration across health care systems. Adjusted per capita payment considers risk adjustment as a "prospective" characteristic based on past morbidity. On the other hand, it incorporates "retrospective" cost structures or fixed costs that have been covered. The retrospective component is associated with the planned costs of the installed capacity, and the prospective component is associated with care interventions and risk (Cid and others 2016).

There are per capita systems in which the allocation of resources is based on areas, regions, or health authorities that are associated with populations. The characteristics of the individuals will define the amount of resources allocated to the population of the area as a whole. The goal is to provide the necessary resources based on the social determinants of health and the degrees of inequality in health within the population of the specific area or region.

Finally, segmented health care systems rely mainly on high out-of-pocket expenditures, with a lack of cohesion and poor efficiency, which works against the positive effects of resource pooling. The use of large pools of resources allows the individual risks to be absorbed into a single population risk. In turn, the shared risk reduces the uncertainty that characterizes the health-illness process and the demand for health care. On the other hand, at the aggregate level, risk pooling helps to predict the needs for health care services of a given population, allowing planning and organization of the allocation resources (Cid 2011).

STEWARDSHIP FOR NCD PREVENTION

The stewardship function of health systems relates to such areas as policy formulation, priority setting, and regulation (Murray and Frenk 2000), and countries with similar levels of income, education, and health expenditure differ in their ability to attain key health goals. This paper proposes a framework to advance the understanding of health system performance. A first step is to define the boundaries of the health system, based on the concept of health action. Health action is defined as any set of activities whose primary intent is to improve or maintain health. Within these boundaries, the concept of performance is centred around three fundamental goals: improving health, enhancing responsiveness to the expectations of the population, and assuring

Figure 9.1 Health Care Integration and Financing Systems to Respond to NCDs
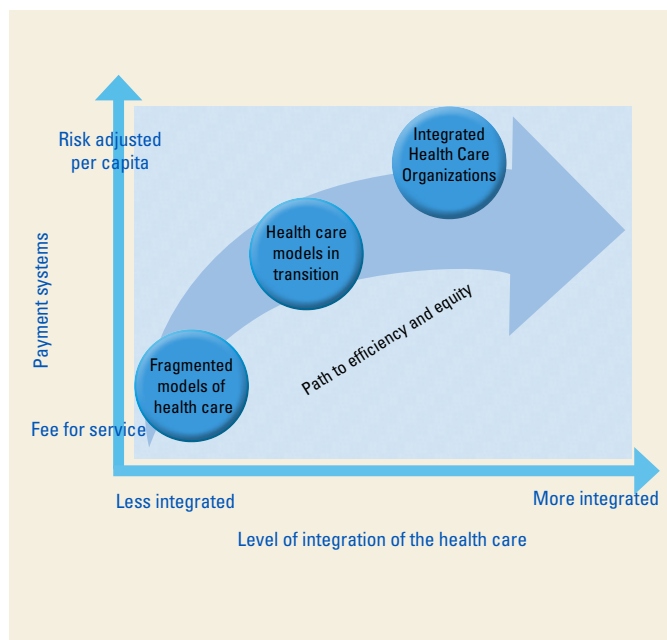
Source: Prepared by the authors.

fairness of financial contribution. Improving health means both increasing the average health status and reducing health inequalities. Responsiveness includes two major components: (a. Such activities rely directly on governments. The ministry of health and other health authorities cannot delegate these responsibilities to other stakeholders, such as the private health care sector.

There are many possible governmental interventions at the population level in the regulatory "tool kits" of the ministries of health, food and agriculture, or finance. These include such activities as food labeling, marketing regulation, bans, standards setting, product reformulation, taxes, and subsidies (Sisnowski and others 2015). Health systems need to utilize their capacity to make changes in the broad social environment in order to promote healthier living spaces for individuals. This has been strongly emphasized in the Health in All Policies approach (Leppo and others 2013).

Most of these policies involve actions that require collaboration with actors outside the health sector. Intersectoral efforts oblige health sector authorities to engage and commit with other sectors on relevant policy actions. Starting from this viewpoint, we will discuss some of the policy opportunities and regulatory actions that governments can apply to address NCDs, particularly from the perspective of prevention.

Economic Instruments

In this section, we denominate as "economic instruments" the policies that are intended to shape markets, discourage unhealthy diets, and promote healthier food choices. Such policies focus on price modifications or transferences aiming to increase the purchasing capacity for particular food categories. This definition of economic instruments considers both taxes and also interventions based on subsidies or price regulations (Shemilt and others 2013).

The potential relevance of economic instruments is self-evident when the impact of prices in consumption patterns within the food systems is analyzed. As an example, data for the United States from 1980 to 2010 show that the increase in the prevalence of obesity among both children and adults had a direct association with the relative price change of fruits and vegetables, and an inverse association with the price of carbonated beverages (Powell and others 2013). These findings suggest that obesity prevalence increases in contexts of rising prices for healthier foods and declining prices for unhealthy options.

Consistent with standard economic theory, food prices are able to affect population consumption patterns. Such findings are in line with the evidence of a recent study in Chile, which found that 27.1 percent of the population cannot access a quality food basket (Cuadrado and García 2015). The same study stressed that the cost of a food basket that meets national nutritional guidelines is 36.1 percent higher than that of a basic food basket used to define the poverty line. A systematic review considering different settings and food groups consistently showed similar results: healthier options cost more (Rao and others 2013). A paradoxical effect is evident: ultraprocessed and less healthy foods have lower costs and are more accessible. This highlights some elements of imperfect competition in the food system. Incomplete information regarding health consequences (particularly in the long term) and a high prevalence of differentiation of products encourages demand for unhealthy options. As a result, negative health consequences of consumption choices are treated as externalities not reflected in the price of products within the market.

Considering this evidence, the experience with nutrition is following long-standing policies on tobacco and alcohol taxation, where the effectiveness and cost-effectiveness of such interventions have been largely recognized as "best buys" for health systems (World Economic Forum and Harvard School of Public Health 2011). Recent experiences with using economic instruments to improve diets represent a promising area, with growing evidence (Niebylski and others 2015) and public policy potential. A basic requirement for the design and implementation of such policies is the presence of health sectors that are empowered and able to collaborate and engage with other relevant actors, such as finance or agriculture ministries.

Marketing Regulation, Labeling, and Bans

Evidence from the effects of advertising and marketing of tobacco (Paynter and Edwards 2009) and of alcohol (Smith and Foxcroft 2009) supports the decisions by governments in earlier decades to regulate such promotion, particularly to children and adolescents. Plain-packaging policies for tobacco, now being considered or implemented by some governments, represent a step forward. Tactics from the tobacco industry to oppose such regulations are well documented (Savell and others 2014; Savell and others 2016), and they represent important challenges to stewardship in health systems.

Labeling is another policy action aimed at better informing consumers, with the hope that that information will lead to better decisions. For example, nutritional labeling has shown consistent effects on promoting healthier diets, and is widely implemented around the world (Campos and others 2011). Nevertheless, gaps and inequalities exist in terms of implementation, and with different impacts on different subgroups (Cowburn and Stockley 2007).

Bans on unhealthy products have been proposed as another potentially relevant area within the policy space. The case of the trans fat ban in New York, with a 4.5-percent reduction in cardiovascular mortality rates, is evidence of the effectiveness of such interventions (Restrepo and Rieger 2016b). Similar to New York, a partial ban on trans fat products in Denmark showed a 4.3-percent reduction in annual cardiovascular mortality rates (Restrepo and Rieger 2016a). This evidence is strong, and similar actions have followed in California and other states of the United States. In addition, several other countries are considering such policies. Bans on smoking in public spaces and closing hours for liquor stores are other relevant interventions with widely demonstrated effectiveness.

CONCLUSIONS

From the evidence presented in this article, it is possible to draw a number of conclusions. The most important ones are summarized below.

First, noncommunicable diseases are already increasing health care costs in the LAC countries, and will continue to do so over the next few years. An aging population, increases in chronic diseases, and more costly health care services are leading to health care systems that are more complex and expensive.

Second, it is necessary to increase the financing from public funds, through the expansion of the fiscal space assigned to health care. In addition, it is necessary to move toward eliminating direct out-of-pocket spending and replacing it with efficient public expenditures and responsive resource allocation strategies.

Third, the organization of health care systems must align with national health objectives aimed at the integration of the health system within the providers and the levels of care. Health care systems based on primary health care and integrated levels of provision appear to be the fitting response to this new demographic and epidemiological profile. Within this context, the appropriate institutional arrangements for the care of NCDs must be taken into account in the financing schemes and the regulatory frames put in place.

Fourth, the integration of health care systems is a principal component for producing efficient, equitable, high-quality health care. The integration of the care is necessary for the health system as a whole and for NCDs in particular. To move in this direction, the incentives within the financing strategies have to be compatible with good coordination and planning of the care services. Incorporating morbidity in financing mechanisms is central to achieving efficiency, equity, and high quality within the health system. Usually, the allocation mechanisms that best respond to these conditions are based on risk-adjusted capitation.

Fifth, different resource allocation mechanisms present problems associated with the incentives that they promote. The planning of financing schemes must take these difficulties into consideration. Special attention must be focused on the problem of selection and NCDs.

Sixth, a risk-adjusted per capita payment system promotes coordination between different levels of care, as well as decentralization with appropriate risk transfer. The risk transfer will be appropriate to the extent that the per capita payment is available for the network of providers for all levels of care. Risk-adjusted per capita financing is one of the most powerful regulatory tools to promote integration across providers.

Seventh, comprehensive intersectoral policies must be put in place, and health care systems must be able to carry out changes that involve other sectors and overall social environments. Even within the strategy of finding new sources of fiscal space for financing, the policy can at the same time impose restrictions on some of the risk factors related to NCDs. Together with taxation and subsidies, there are many possible interventions at the population level, such as food labeling, marketing regulation, bans, standards setting, and product reformulation.

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Policy Framework to Develop and Improve Government Actions for Prevention and Control of NCDs

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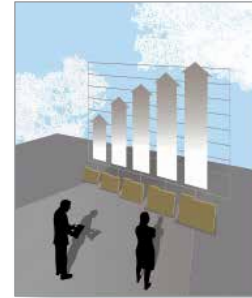
INTRODUCTION

Noncommunicable diseases (NCDs) are currently the leading cause of death, disability, and illness in Latin America and the Caribbean. Governmental response to NCDs has been fragmented, with limited interventions focused on addressing the need to provide personal health services. These services mainly guarantee primary and hospital-based care, supplies, or technologies. They are expensive and consume large amounts of resources, leaving other important components of collective health services out of the financing loop and policy priorities. These imbalances reduce the government's success in addressing structural factors using a proactive, preventive approach.

"Business as usual" is not an option. We need to move away from exhortations for greater individual responsibility for NCD management, and away from short-term, fragmented, reactive initiatives, to a more comprehensive approach. Governments must generate policies against NCDs by applying a Health in All Policies (HiAP) perspective. In that way, governments will systematically take into account the health implications of different policy decisions and also produce concurrent synergies that improve personal health services and population health, and that make healthy behaviors the natural choice (PAHO 2014).

In this paper we present a framework to address NCDs with actions within the government but also integrating other sectors, in a HiAP approach. We also delineate other forces outside government control that may influence, either negatively or positively, health policy decisions and, consequently, health outcomes.

We also include eight boxes that provide either additional details on some of the general topics discussed in the main text of this piece or case studies of NCD control efforts in specific Latin American countries. Because policies addressing NCDs are fairly new in the Americas, this information may help guide governments and health ministries in designing more effective and comprehensive NCD health policies.

BACKGROUND

Around the world, the growing prevalence of NCDs compromises development and economic growth and also increases health inequities and the number of people living in poverty (UNDP 2013). For low- and middle-income countries, the cost of NCDs will total an estimated US$21.3 trillion between 2011 and 2030 (Bloom and others 2011).

NCDs are currently the leading cause of death, disability, and illness in Latin America and the Caribbean (Glassman and others 2010). Disability-adjusted life years (DALYs) associated with depression, musculoskeletal disorders, type 2 diabetes (T2D), chronic kidney disease, and cirrhosis increased between 1990 and 2010. Chronic

kidney disease showed the greatest increase (230 percent), followed by musculoskeletal conditions (88 percent), and T2D (71 percent). Cancer incidence is also growing. In 2009, there were 2.8 million new cases, which cost US$153 billion in the first year after diagnosis (IHME 2013). This scenario is alarming because the number of cancer cases is expected to increase by 30 percent in the next decade. Furthermore, exposure to risk factors for NCDs is relatively high, as 145 million adults smoke in the Americas, with prevalence ranging from a low of 6 percent in Panama to a high of 40 percent in Chile (WHO 2014a). Overall, the countries of the Americas have the world's highest prevalence of overweight and obesity. Between 1980 and 2008, the average body mass index (BMI) increased by 1 kg/m² per decade, twice as fast as the average global increase. Obesity prevalence ranges from a low of 8 percent in Haiti to a high of 40 percent in St. Kitts and Nevis (PAHO 2012). Obesity is closely associated with the emerging T2D epidemic. In 2011, approximately 62.8 million people were living with T2D in the Americas, and this number is projected to increase to 91.1 million by 2030 (PAHO 2012).

NCDs create and exacerbate health inequities both between and within countries (Alleyne and others 2002) by increasing household expenditures, which keeps low-income households in chronic poverty cycles, debt, and illness. Furthermore, these families are also caught in a high-risk loop, as lower income is associated with poor-quality diets and low rates of physical activity, both of which increase the risk for NCDs (Drewnowski and Specter 2004; Taylor and others 2006). Inequities are also aggravated because people living in low- and middle-income countries, or in disadvantaged areas of high-income nations, are frequently subjected to badly designed or poorly enforced NCD policies or regulations (Barbeau and others 2005). These conditions generate inequities in accessing both effective health promotion and risk protection services and effective health care and medications.

THE STATE HAS A MAJOR ROLE IN THE PREVENTION AND CONTROL OF NCDs

A nation is responsible for promoting and protecting the health of its people, for preventing disease, and for reducing morbidity, disability, and mortality. This principle has been enshrined in the Constitution of the World Health Organization (WHO). The preamble of that document explicitly states, "Governments have a responsibility for the health of their peoples which can be fulfilled only by the provision of adequate health and social measures" (WHO 2006).

The global burden and threat of NCDs has heightened countries' awareness of the need to strengthen health systems and to broaden health-related actions to all government areas, so that health has become an issue of concern in every sector. Addressing the social determinants of health has been highlighted as a worldwide priority and a crucial opportunity to promote health policies that tackle the social roots of unfair and avoidable human suffering and thus reduce ill health and health inequalities (CSDH 2008). Countries in the Americas have rapidly implemented health reforms related to funding, purchasing, providing, and regulating health services (PAHO 2014). As part of an effort to achieve universal health coverage, governments throughout the Americas are also expanding public health programs and medical interventions to prevent and treat NCDs, with a commitment to achieve a 25-percent reduction in premature NCD mortality by 2025 (UNDP 2015). Additionally, many countries are implementing a "whole-of-government" approach to addressing NCD challenges. This method is recommended under the WHO's 2013-2020 Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases (WHO 2013). This approach engages multiple government ministries (including health, economy and finance, security, education, agriculture, transportation, and environment) in incorporating NCD prevention in all their policies.

Policy Framework to Address NCDs: A Comprehensive Approach

NCD challenges are systemic in nature, have a complex causality, and require integral, government-guided solutions (LIGTT 2014). In figure 10.1 we show a conceptual framework to guide interventions to address NCDs. This work draws on earlier efforts by Savigny and Taghreed (2009) and Murray and Evans (2003).

One of the strengths of this framework is that it incorporates and explicitly recognizes the need to develop concurrent actions against NCDs both within and outside of the health sector, different levels of intervention, and the various components of the government system. In addition, the framework displays the inputs, outputs, and outcomes that are needed to develop effective governmental actions for NCD prevention and control.

In the right block of the figure we represent the intergovernmental actors and activities involved in designing and implementing health policies. These actions are responsibilities of either the health sector or of other sectors within the government. The health sector plays a central role by providing effective access to personal and nonpersonal services. It also leads in setting

Figure 10.1 Policy Framework to Develop and Improve Government Actions for Prevention and Treatment of NCDs
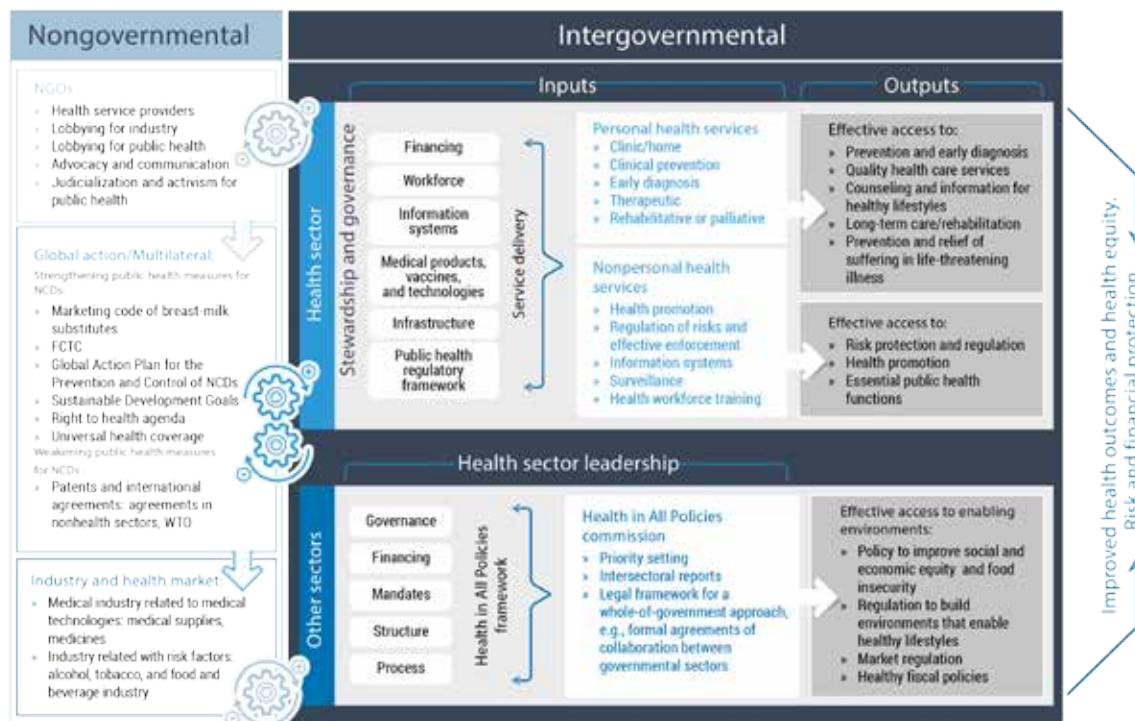
Source: Modified from Savigny and Taghreed (2009) and Murray and Evans (2003).

priorities and building alliances with other government sectors in order to address structural factors related to NCDs, within a HiAP perspective. Complex relationships between actors and stakeholders exist, both inside and outside of government, that influence government health decisions. At the same time, depending on their interests, these actors and stakeholders support or oppose particular positions. The direction of these differing positions is shown in the figure as gears with "+" or "-" signs.

In the left block of the figure we show other nongovernmental sectors and activities that influence government actions, including nongovernmental organizations (NGOs), global and multilateral actions and accords, and industry and the health market. Having a clear understanding of each sector's needs and of governmental organizational culture is a priority in order to define policies that reduce inequalities, improve health outcomes, and increase risk and financial protection, thus leading to higher productivity and economic growth.

Goverment Actions on Health

The state's role in maintaining population health has changed significantly in recent decades. Many governments are now playing a more important part in regulating the health market and in providing health services at the personal and community levels. The significant interdependence between health and development has made improving and maintaining health a central role for governments.

One reason for those changes is that a healthy population is key for economic progress, as populations live longer, are more productive, and create more wealth (Bloom and others 2004). This promotes economic growth and development, which results in higher incomes and more financial resources for health.

A second reason why governments are increasing their participation in health is the progress in human rights. Currently, many countries recognize health as a basic human need and a social right in their national

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constitutions, which is an important step forward in achieving universal coverage. A consequence of this change is an increase in the litigation on the right to health, which has intensified pressure on governments to improve access to essential health services (Iunes, Cubillos-Turriago, and Escobar 2012).

A third reason is the recognition that health care is different from other industries. Countries cannot solely depend on private markets to generate the public goods needed to provide health care, to solve health inequities, or to respond to societal demands related to health care. This has motivated governments to regulate health markets more broadly, to increase their role in health system governance, to provide services, and, in some cases, to lead insurance markets to provide access to basic and advanced care for vulnerable populations.

Broadening states' roles in mounting responses against NCDs, with adequate intersectoral work and good coordination with subnational health authorities and local governments, is key to ensuring a strong operational base for achieving specific NCD goals. Governments must also guide the health system reforms required to address emerging NCD challenges. Inevitably, most governments will have to increase the funding for population health services as well as personal health services aimed at preventing or treating NCDs and their complications.

Governments can reduce the prevalence of NCDs by enacting policies that positively change the conditions in which people are born and live, by reducing poverty and health inequities and by improving employment, housing, and the cultural environment. Through the health sector, governments also need to promote healthy choices and behaviors; limit the production, advertising, and consumption of tobacco, alcohol, and unhealthy foods and beverages; and improve the quality and efficiency of health services.

As we face the new challenges of the twenty-first century, it is once again important to evaluate the proper level of government intervention needed. It has been suggested that personal and societal benefits should be weighed against the potential erosion in personal freedoms (Nuffield Council on Bioethics 2007). In some cases, the elimination of choice may be very reasonable and little missed (as in banning lead paint, leaded gasoline, or trans fats). However, if applied too broadly, public indignation might reasonably ensue. Gostin (2014) notes that "the antipaternalism objection rests on a perverse assumption—namely that the status quo, with its rising NCD rates, is itself the product of individual choices, freely made."

THE HEALTH SECTOR'S RESPONSIBILITY

The overarching goals of health systems, as proposed by the WHO, are to: (1) improve the health of the populations they serve; (2) respond to people's needs, with services of the best possible quantity and quality, while minimizing costs; and (3) provide financial protection against the cost of ill health (WHO 2015a). To fulfill these objectives, governments must organize, finance, and regulate different health actions that translate into health services delivered by the health sector at the personal and collective levels. Also, under the leadership of the health sector, governments need to develop a whole-of-government approach in implementing health actions in all government sectors in order to modify the social determinants of health. This holistic approach, for example, can encompass actions developed by different sectors guided by government ministries: agriculture to decrease food insecurity and to increase access to healthy foods, transport to improve road and vehicle safety, economics to expand employment, or finance to develop fiscal policy to improve health.

Within the health sector, the quality and effectiveness of services provided depends importantly on addressing the core components outlined by the WHO as building blocks for health system strengthening. These include having adequate governance and necessary funding; maintaining a sufficient, skilled, and motivated health workforce; having reliable information systems; providing adequate access to medications and technologies; enhancing service performance and increasing public confidence; and instilling an effective public health regulatory framework to safeguard health service users and the public (WHO 2010c). In the proposed framework, two additional elements are included: the health regulatory framework and the health infrastructure, both as important elements required to provide adequate health service delivery and nonpersonal services.

Currently, personal health services represent the most visible and valuable outputs of the health system for users and society. As such, these services consume, by far, the largest share of the health budget, over 90 percent (OECD 2015b). These services include vaccination, screening and early diagnosis, and therapeutic, rehabilitative, and palliative actions (Murray and Frenk 2000). Collective (nonpersonal) health services are those provided at the community level, frequently offered as public goods by governments. They include effective stewardship and governance as well as such other essential public

health services as health promotion and risk protection, surveillance and health information systems, workforce training, and environmental sanitation. Other nonpersonal health services focus on vector control, clean water, food safety, and air pollution control.

Effective stewardship and governance are key to good performance for any health system. Those traits are needed to provide effective services, while also controlling costs and addressing patients' needs. Adequate governance relies on the coordinated operation of the core components previously mentioned. Governance is based on strategic policy frameworks, effective regulation and oversight, sound financial management, and accountability and transparency (WHO 2007). It requires that governments have defined priorities, goals, and plans for NCD treatment and control that are formulated with the participation of relevant stakeholders. These priorities, goals, and plans must be implemented through accountable health policies and programs that are

adequately financed and that consider actions needed in each of the core components.

Adequate financing is critical for health systems to deliver effective services. In recent years, many countries have proposed national NCD strategies, but often without the needed funding to implement and operate those endeavors (WHO 2010b). In the short run, the growing NCD burden will increase needs, making current funds even more inadequate, especially among low- and middle-income countries. NCD control will require the reengineering of current financial policies, along with clear stewardship to find appropriate evidence-based "best buy" interventions that are country relevant and that match the existing resources.

To control NCDs, governments will need to develop public policies that guarantee there is an appropriate health workforce. A sufficient, well distributed, adequately trained, organized, and motivated health workforce is essential to effectively respond to NCDs. A salient

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Box 10.1
Training and Developing Human Resources to Address NCDs

The health system's workforce has historically been trained to address acute and episodic communicable diseases, which were the leading causes of morbidity and mortality during the last century. Health professionals are currently not prepared to address the challenge of a demographical and epidemiological transition where care for long-term chronically ill patients is needed. An urgent transformation of health systems and of health workers is required to meet the new threats of this transition.

Addressing other NCDs also requires a multidisciplinary team of physicians, nurses, nutritionists, and psychologists. These professionals need a wide range of knowledge, skills, and attitudes. These include promoting self-care; providing and coordinating evidence-based preventive and curative care; involving the family and the community in the care process; and participating in continuing education. These NCD care providers also need transdisciplinary, teamwork, and problem solving skills in order to respond to the population needs in a timely manner. According to Pruitt and Epping (2005), WHO has categorized the new core competencies for caring for NCDs into the following groupings:

- Patient-centered care
- Partnering
- Quality improvement
- Information and communication technology
- Public health perspective

It is necessary, then, to systematically train health-related human resources in a joint effort between medical and

nursing schools and health services. It is also urgent to increase worldwide health education spending, which is estimated at US$100 billion per year, and which represents less than 2 percent of global health expenditures (Frenk and others 2010).

This scenario suggests the need for at least three immediate actions to address the new challenges with NCDs: (1) transform medical school curricula to have better prepared human resources; (2) help current care providers to develop a new set of skills; and (3) certify and recertify health professionals who acquire new NCD core competencies.

Given the complexity of the NCD challenge, online health workforce training has the potential to reach large audiences, build learning communities in a sustainable and scalable way, and foster interdisciplinary debate. Such online training could include virtual technologies with synchronous and asynchronous communications, massive open online courses (MOOCs), and repositories of learning objects.

Finally, the process of education and training should not focus just on the health sector. There is a need to envision health in the curricula of all university courses in order to achieve a Health in All Policies perspective. People must also be able to acquire health promoting skills that will decrease the prevalence of NCDs. Self-management support can systematically provide education as well as reinforce interventions and thus increase patients' skills and confidence in managing their own health and well-being.

aspect of NCD care is the continuous and long-term need for multidisciplinary clinical staff, such as nurses, nutritionists, social workers, and physicians. According to the WHO, there is a shortage of skilled health professionals to confront the growing burden of NCDs (Campbell and others 2013). Thus, continuous training will be needed for the active health workforce to attain the new skills needed to address NCDs. This education can be delivered by modifying and updating medical school curricula as well as by applying new instructional tools such as massive open online courses (MOOCs). Box 10.1 outlines the components and actions required in the training of health professionals to address NCDs.

Effectively evaluating progress against NCDs will require new information systems. Inevitably, governments will need to enact new policies for NCD reporting and surveillance and to invest in new information systems.

Improved information technology could reduce costs by increasing the health sector's productivity and the ability of the health sector to monitor NCDs and to evaluate new NCD interventions, technologies, and regulations. Any such health information system will need to produce, analyze, and disseminate reliable and timely information on the determinants and frequency of NCDs, the performance of the health system, and the health status of the population. Box 10.2 explains the need for adequate health information systems and outlines how to develop them.

Governments use legal frameworks that include laws, decrees, regulations, rules, and other mechanisms to implement public policies and to set requirements for citizens, institutions, and markets. High-quality regulatory policy is key for providing efficient and effective NCD health care services, while also maintaining quality, limiting spending, correcting market imperfections, and improving

Box 10.2
The Role of Health Information Systems in the Prevention and Control of NCDs

According to WHO, a well-functioning health information system is one that produces, analyzes, and disseminates reliable and timely information on the determinants of health, the performance of the health system, and the health status of the population (WHO 2007). This information should be presented in accessible formats and media so it can be used for decision making at all levels of the health system (Savigny and others 2009).

The information needed to monitor and evaluate NCD prevention and control policies and programs includes indicators from a wide range of domains, both inside and outside the health sector. Population-based data can come from such sources as censuses, vital events registries, and population-based surveys. Other sources of data could include health-system-based information on the availability and geographic distribution of health infrastructure (e.g., facilities, equipment, human resources) and on the health services provided (personal and nonpersonal). Additional sources include medical records and health expenditures (HMN and WHO 2008). Population-based surveys and health surveys can provide information about the prevalence and incidence of NCDs, as well as the prevalence of their determinants and risk factors. Surveys are also useful to evaluate the impact of intersectoral policies and programs in modifying lifestyles and environments and in preventing NCDs.

Together, the censuses, vital events registries, and population-based surveys provide a complete view of the population demographics and health status. Mortality,

which is the most definitive end point in the evaluation of the health of a population, has been used since the eighteenth century. Recently, premature mortality (preventable and treatable conditions) has been used as an indicator of the health system's overall performance.

To monitor health care processes, the quality of health care, and the performance of the health system, the data produced by a routine health information system should be used (Lippeveld, Sauerborn, and Bodart 2000). Hospital discharges and emergency admissions data may be used to monitor the performance of primary health care. This can be achieved by using avoidable hospitalization indicators, which are based on conditions susceptible to the quality of primary health care. Also, the use of data contained in electronic health records promises an avenue for the development of indicators to monitor quality of care in the control and treatment of NCDs. Statistical analysis with electronic health record data, such as path analysis (Munro 2004), may be a way to review and enhance health care protocols but, most importantly, to monitor the quality of care both in primary health care and hospitalization.

Efforts to strengthen the health information system should focus on enhancing the quality of routine health data by developing a professionalized health information workforce and by standardizing indicators. In addition, methodology to calibrate routine health data, population-based surveys, and vital registration data with each other should be developed in order to provide feedback and to strengthen each of these data sources.

environmental conditions. Regulatory changes can also enhance health sector workforce training, information systems, and NCD care models (PAHO 2015b).

The WHO has identified 10 "very cost-effective" population-based interventions that involve the effective use of law or regulation (Campbell and others 2013). It has been estimated that these interventions could be provided in low- and middle-income countries at a cost of US$0.20 per capita per year and in upper-middle-income countries for US$0.50 per capita per year (WHO

Box 10.3

Progress in the Americas on the WHO Framework Convention on Tobacco Control

The WHO Framework Convention on Tobacco Control (WHO FCTC) came into force on February 27th, 2005, after approval by 40 member states (UN 2011). This framework represents a milestone in the global public health agenda. For the first time, an international legal instrument supports the guidelines and best practices to prevent tobacco consumption and secondhand smoke exposure. The FCTC constitutes the global instrument that will allow member states to attain a relative reduction of 30 percent in tobacco prevalence by the year 2025. Mexico was the first country in the Americas to sign and ratify the convention. Currently, 30 countries of the Americas have done so. Member states that have signed the convention are committed to strive in good faith to ratify, accept or approve, and adopt a political commitment not to undermine the objectives set therein.

Governments must safeguard the achievements reached through the control measures that have already been implemented, and must not give in to pressures from the tobacco industry. Governments must also accelerate the complete and comprehensive implementation of all the measures to reduce the demand and supply of tobacco products by developing intersectoral policies to implement the Global Action Plan for the Prevention and Control of NCDs 2013 – 2020 (WHO 2013).

That plan recommends the full implementation of the WHO FCTC, including those interventions that have proven to be the most cost-effective ("best buys") for tobacco control. Such interventions are based on three fundamental pillars: (1) measures to reduce the demand for tobacco, (2) steps to decrease the supply of tobacco and tobacco products, and (3) coordination mechanisms across different ministries and sectors.

Evidence has identified four highly cost-effective interventions to reduce tobacco consumption at the national level: (1) tobacco tax and price increases; (2) enforcing smoke-free environments; (3) completely prohibiting tobacco advertising, promotions, and sponsorships; and (4) product packaging with health warning labels and pictures. These measures have a greater impact if they are implemented in a comprehensive, simultaneous, and synergistic way, and if they also incorporate well-designed health promotion campaigns and cessation strategies to help smokers quit. Additionally, there are other measures that cannot be overlooked by the governments to reduce the tobacco-related disease burden. First is the implementation of measures to counter the interference of the tobacco industry, and second is the establishment of mechanisms that enable coordination across different ministries and sectors to implement the WHO FCTC in each country (WHO 2013).

Two indicators can be used to evaluate the impact of these policies: (1) the prevalence of tobacco consumption among adolescents and (2) the standardized actual prevalence of tobacco consumption among those over 18 years old.

Governments in the Americas have demonstrated a strong commitment and political will in rapidly advancing in the implementation of the WHO FCTC: 17 have passed laws banning smoking in indoor workplaces and public places; 17 require tobacco packaging to display large graphic health warnings showing the harmful health effects of tobacco and covering more than 50 percent of the surface of the pack; 11 have increased taxes on tobacco; 6 have banned tobacco advertising, promotion, and sponsorship; 6 have smoking cessation policies; and 5 recently signed a protocol on illicit trade in tobacco products (PAHO 2015c).

Countries in Latin America that have implemented the WHO FCTC with the highest standard of rigor include Brazil, Costa Rica, Panama, and Uruguay. In the last decade, these countries have reduced the prevalence of tobacco consumption among both adults and youth. This evidence shows that it is possible to diminish the tobacco epidemic.

Latin American and Caribbean countries need to strengthen efforts to position tobacco control as a priority in the public health agenda. The morbidity and mortality resulting from current tobacco use will be seen in 15 to 20 years, so nations must be vigilant now in implementing pending control actions. Maintaining political will and the public's involvement will be essential for those who are working on tobacco control in the Americas.

2011). These regulatory interventions address tobacco, alcohol, processed foods, sugary beverages, salt, and trans fats, and they involve such areas as retail prices, warning labels, pricing policies, and marketing restrictions and prohibitions. However, many of these interventions will be opposed by industry and industry-related stakeholders. For governments to improve their regulatory capacity, a HiAP approach will be needed, such as has recently been tried with nutritional guidelines to address obesity in Mexico (Charvel, Cobo, and Hernández-Ávila 2015).

Given the rapid increase in risk factors that drive NCDs, regulation is paramount. Regulation acts as a primary prevention mechanism by shifting risk at the population level. For example, improved food labeling can enhance individuals' health and nutritional literacy and lead to more demand for healthful choices. Similarly, prohibiting the marketing of low-nutrient, high-calorie foods to children can help prevent unhealthy food preferences, obesity, and habituation towards sweet/salty taste preferences at a young age (Sassi and Hurst 2008).

Regulation can take different forms, depending on the types of risk factors and the level of exposure. Transparency and legitimacy in the regulatory process are essential. This can involve the procedures for obtaining technical consultation, for opening up social participation, and for adequately supporting communication. Transparency

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Box 10.4
The Type 2 Diabetes Problem in Mexico

In spite of various policies and programs developed by the government of Mexico to address the growing burden posed by type 2 diabetes (T2D), there is still much room for improvement, given that the disease has become a public health emergency.

In Mexico, the growing burden of T2D is mainly associated with the increasing trends of obesity (Barquera and others 2013). It is posited that complex interactions of environmental and genetic factors are driving the disproportionate burden of T2D in Mexico. Specifically, it appears that the population carries a haplotype that increases the risk of T2D by 20 percent when compared to noncarrier populations (The SIGMA Type 2 Diabetes Consortium 2014). Well-established risk factors for T2D are also on the rise. In less than 20 years, Mexico has seen important changes in dietary and physical inactivity patterns, which have driven up the prevalence of obesity by 2 percent per year, the largest increase seen in the world (Barquera and others 2013). The T2D epidemic has grown rapidly. The number of people aged 20–79 years old who report being diagnosed by a physician with T2D has doubled in 12 years. The expansion in the epidemic is likely even larger than that, due to underestimation of T2D cases. According to the 2012 Mexican National Health and Nutrition Survey, the prevalence rate of previously diagnosed T2D was 9.1 percent, representing 6.4 million persons living with this condition (Flores-Hernández and others 2015). Projected rates from age-period-cohort models suggests diabetes prevalence among adults (ages 20+) may reach 13.7 to 22.5 percent by 2050, affecting 15 to 25 million individuals, with a lifetime risk of 1 in 2 to 1 in 3 (Meza and others 2015).

Mexico has the highest prevalence rates of T2D and of hospitalizations attributed to T2D complications among the countries of the Organisation for Economic Co-operation and Development (OECD). While adequate and comprehensive T2D care in Mexico has improved over the last decade, according to international standards, the current situation remains suboptimal. For example, in 2012 only 29.7 percent of persons living with T2D had a glycemic level that met the individualized HbA1c target. Poor glycemic control has important social and economic consequences since it is related to such complications as cerebrovascular events, blindness, nontraumatic amputations, and chronic renal failure (OECD 2015a).

The impact of T2D is high in Mexico, with close to 85,000 premature deaths per year. The associated health costs amount to some US$3.4 billion annually, or about 0.7 percent of the gross domestic product (Barquera and others 2013).

T2D also puts enormous pressure on the health system and on patients. In Mexico City alone, more than 41.5 percent of the visits for NCDs (13 million visits) are related to T2D. Even though inequities in the financial protections for NCD prevention and treatment have been reduced, a study showed that patients pay more than 50 percent of the total health care costs for their T2D-related treatment (OECD 2015a).

As a response to the T2D crisis and to the fragmentation of the health sector, Mexico has launched a specific action program for the prevention and treatment of overweight, obesity, and T2D. The major challenges to strengthening this program will include harmonizing actions, coordinating different sectors and indicators, improving health care quality and information systems, and carrying out health promotion and risk protection activities.

in all interactions is key, such as with clear rules for consultation, receipt of information, public comment, public hearings, and other societal input (PAHO 2015b).

The WHO Framework Convention on Tobacco Control (WHO FCTC) represents a milestone in public health regulation. The WHO FCTC is the first legal instrument to be adopted by the global health community that establishes guidelines and best practices to prevent tobacco use and exposure. It sets up measures to reduce demand for tobacco, such as through taxation, labeling and health warnings, banning tobacco sponsorships and advertising, and supporting smoking cessation. It also regulates tobacco supply by prohibiting sales to minors and sales of individual cigarettes, and by promoting viable alternatives for tobacco growers. Additionally, the WHO FCTC promotes protection from tobacco smoke in public places and educational and health care facilities, as well as global surveillance systems to monitor progress

in smoking cessation (WHO 2003). Governments in the Americas have shown a strong commitment and political will to implement the WHO FCTC (PAHO 2015c). Box 10.3 describes the implementation of the WHO FCTC in the Americas.

Evaluation is an essential element when addressing NCDs. National surveillance systems should be in place to monitor the prevalence and incidence of risk factors and disease outcomes, which will continuously inform the creation and modification of policies. An evaluation scheme that includes sociodemographic and economic correlates of health outcomes is recommended so that inequities can be recognized and addressed. Evaluation plans for new policies should be created and financed at the time of the policy formulation.

Various evaluation indicators for NCDs have been proposed. The new Sustainable Development Goals (SDGs), which were adopted in September 2015 and

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Box 10.5
Changes in Paradigms and Resources for Treating Type 2 Diabetes

The remarkable growth of the economic burden caused by type 2 diabetes (T2D) has stimulated the search for innovative approaches to improve the effectiveness of diabetes care (Córdova-Villalobos and others 2008). Over the last few decades, there have been many advances in treating diabetes. Current clinical guidelines have evolved from intensive glycemic control to a patient-centered approach (Gæde and others 2008), where glycemic control goals (based on HbA1c levels) are targeted differently according to patient characteristics, ranging from <6.5 percent (in recently diagnosed subjects, free of chronic complications) to <8 percent (for patients with complications and a diminished life expectancy). In addition, treatment has been reinforced with interventions aimed at preventing complications (e.g., control of plasma lipids and blood pressure levels; proper use of antiplatelet agents; smoking cessation; vaccination; and screening for retinopathy, nephropathy, and foot/dental abnormalities) (Hernández-Jiménez and others 2011). Furthermore, diabetes medications moved from only three (metformin, sulfonylureas, and insulin) to more than eight groups; additionally, two or more options exist within the majority of these drug groups. As a result, the selection of drug therapy has become more complex. Furthermore, self-monitoring glucose devices are not accessible, and many patients still do not achieve proper use.

For decades, physicians took the leadership role on

diabetes management, and patients assumed a passive role. Recently it has been recognized that T2D patients need multidisciplinary teams composed of different clinical specialists as well as nurses, dietitians, and psychologists to address their illness in a comprehensive way. These teams empower patients and their families to make healthy decisions and lifestyle changes. In most countries, access to specialists is limited to one or two evaluations per year. Online- or cellphone-based support tools help patients to monitor their treatment (WHO 2013). Quality assurance programs have been a great success in some countries (Aguilar-Salinas and others 2015). The proportion of patients who were achieving treatment goals doubled in the past decade, with the percentage of cases with HbA1c <7 percent growing from 25 percent to 50 percent. Preventive actions such as an annual eye exam were done with more than 70 percent of patients.

Despite that progress, the effectiveness of treatment varies greatly among health systems. Therefore, providers should implement their own quality assurance program based on their resources and the characteristics of the target population. Structured national programs are needed to change the burden of the disease. Not surprisingly, the majority of health systems experience difficulties in keeping their workforce trained and up to date, and the adequate implementation of clinical guidelines in primary care units remains as a challenge.

built on the Millennium Development Goals, can serve as overarching goals for specific policy and program goals to be put into place. Goal 3 is to "ensure healthy lives and promote well-being at all ages" (UNDP 2015). From this, more specific targets stem, some of which pertain to NCDs. These targets can be key in evaluating and monitoring national and local NCD health programs and plans.

Persistent inequalities in NCDs call for policies that consider the social gradient of health. NCD prevalence is higher among disadvantaged and vulnerable people than among those of higher socioeconomic status. Additionally, the risk factors that underlie these conditions, such as smoking and high blood pressure, are more likely to affect low-income groups. Access to care is also influenced by social inequalities, as communities with low social status face greater barriers to timely diagnosis and treatment than do communities with higher status. These social inequalities require that NCD policy makers consider removing geographic and financial barriers to care as well as creating specific health programs to target and engage people from marginalized communities (Di Cesare and others 2013).

The importance and comprehensiveness of the previously outlined components that must guide the health sector's actions can be illustrated with the T2D epidemic. Box 10.4 illustrates the great challenges that T2D imposes in Mexico.

It has become clear that having new medical technologies to treat diabetes may not be effective if we do not have a properly trained workforce or the necessary information systems to guide impact evaluations and evidence-based decision making. At the same time, it is important to implement effective regulations so that people at risk of developing T2D can select foods and beverages that decrease such risk. In addition, the ministry of health must be engaged in primary prevention that shifts population risk factors, as well as in timely secondary and tertiary prevention to diagnose, treat, and prevent late complications associated with diabetes and other NCDs. Box 10.5 outlines needed changes in paradigms and resources to treat T2D.

HEALTH IN ALL POLICIES: OTHER SECTORS' RESPONSIBILITIES

A shared goal towards population health and well-being is to shape the most important social and economic determinants of health. For this, it is necessary both to deliver adequate health care and to enact policies that affect household and community living, working, and cultural conditions. In this way, all people can have an equal opportunity to live a healthy life (Freiler 2013).

Health sector policies and programs to prevent and treat NCDs need to build synergies with polices implemented in other government sectors, to create a comprehensive HiAP approach (CSDH 2008). However, even though HiAP is a feasible, attractive idea, actually implementing it remains a challenge.

Among the key elements for this kind of intersectoral policy to succeed are a clear national mandate at the highest executive levels, effective health leadership and a jointly operative government, and establishment of bridging capacities between sectors. An intersectoral approach means coordination of the government as a whole (PHAC 2013), from the planning stage through the implementation and evaluation of policies' impact (Narendra and others 2014; WHO 2010a). Priority setting and evidence-based policy decisions should be the responsibility of the ministry of health, which should provide adequate stewardship and advocacy in order to engage and coordinate with other partners within the government.

Understanding each sector's needs and organizational culture should be a priority. This will enhance stakeholders' acceptance of activities in their programs and in their mandates that are aligned with the health sector's priorities and that ultimately improve health outcomes (Freiler 2013). Examples of health-centered efforts carried out in other sectors include improving public spaces so they encourage physical activity, creating school programs that build nutrition literacy, and engaging school children in pursuits that promote health and reduce violence. There can also be well-designed nutritional programs for hunger relief that increase caloric intake as well as focus on long-term nutritional needs and the growing challenge of overweight and obesity associated with food insecurity.

The HiAP design should be sustained in a strong legal framework to facilitate the coordination of actors, accomplish objectives and aims, and achieve adequate enforcement. Law helps organize society by providing a framework for government structure and giving legitimacy to government actions. The frameworks include the statutes, ordinances, regulations, and court rulings that are supported by the government. In this way, the legal framework, developed within a HiAP perspective, should incorporate different regulatory strategies and tools, depending on the challenges imposed by the health problem needing to be solved. As a result, a legal framework can have a mixture of regulatory mechanisms, such as command and control, risk regulation, economic and social regulation, and performance-based regulation.

The legal framework should consider the three different impacts that law has in public health (Parmet 2007). The first impact is pragmatic, since law is the main tool for public health practitioners and the input that regulators work with, change, interpret, and enforce in order to

equitably protect and promote the health of populations. The law also provides them the authority and means to address urgent public health problems. The second impact is elemental, because law provides the social structures, norms, and mechanisms to cover public health needs to fulfill its objectives. The third impact is judicialization (Daniels and others 2015), which relies on the importance of human rights in modern constitutions, by recognizing health as a human right, where public health actions are part of that right. This process is becoming an important mechanism in Latin America and other regions that can influence HiAP positively or negatively, depending on the role that either the courts or the litigating organizations or individuals have in this kind of process.

The scope of HiAP has differed from country to country. Some nations have used legislation to clearly identify synergies and priorities, allocate resources, and set cross-sectoral goals. Others are starting with local intersectoral initiatives that, after having been proven effective, have been scaled up for higher government levels. Consequently, there is no one-size-fits-all HiAP, and the implementation process will most likely depend on the risk factors for NCDs identified within each country (WHO 2014b).

Box 10.6
Open-Streets Initiatives Boost Physical Activity

Physical inactivity has important effects on many aspects of human health. Recently ranked as the fourth leading cause of death worldwide (Kohl and others 2012), physical inactivity is one of the main behavioral risk factors for NCDs globally (WHO 2010b). Worldwide, 31.1 percent of adults overall are physically inactive, with the highest proportion (43 percent) seen in the Americas and in the eastern Mediterranean (Hallal and others 2012). Physical inactivity is a risk factor for breast and colon cancer, diabetes, and ischemic heart disease (WHO 2009). It has been estimated that a 10-percent reduction in the prevalence of physical inactivity could decrease direct health care expenditures in Canada by US$124 million in a year (WEF 2010). The WHO has set a voluntary global target of a 10-percent relative reduction in the prevalence of insufficient physical activity by 2020 (WHO 2013). However, accomplishing that will be difficult, since advocacy, engagement, and coordination by many players is needed (Kohl and others 2012; Pollack and others 2014). Making this change in low- and middle-income countries is particularly challenging.

One possible answer is a ciclovía recreativa program, under which roadways are temporarily closed to allow sports and other leisure pursuits. Launched in 1974 in Bogota, Colombia, this community-based effort now makes 121 kilometers of Bogota's main avenues available on Sundays and holidays for biking and other recreational activities. The program has democratized public spaces, opening them up to Bogota's residents and visitors for free and without limits on social class or age. The program started through an advocacy movement of bike riders, who convinced the mayor of Bogota to make some of the city's arterial roads available for a bike rally that lasted three hours. The program now involves the active participation of more than nine government sectors (PAHO and others 2009).

The successful experience in Bogota has served as an example for similar programs in cities and countries throughout the Americas (Sarmiento and others 2010). The benefits go far beyond just physical activity, as participants report a higher quality of life, more neighborhood social capital, and increased engagement in healthier lifestyles.

Bogota´s Ciclovía Recreativa has proven to be cost-beneficial (Montes and others 2012), and the model was incorporated into Colombia's National Public Health Plan in 2007 as one of the actions to increase physical activity by walking or bicycling as a means of transportation or recreation. As way to assure its continuity, the program became part of the national obesity law in 2009.

Operational and maintenance costs of ciclovía program in the Americas range from US$45,000 to US$2,072,896 per year. Most of these programs are financed with municipal resources, although additional revenues can come from advertising or sponsorships. Some countries, such as Chile, have funded the program using private resources. Other nations have partially funded their ciclovía activities through local communities using Kickstarter fundraising campaigns.

Planning, implementing, and maintaining a ciclovía program requires active community participation and strong political commitment to assure financial support and continuity of operations. The ciclovía approach has been successful in changing the "business as usual" paradigm in addressing health risk factors and in moving towards a Health in All Policies framework, where mutual benefits for different sectors can be achieved.

Various attempts to develop intersectoral whole-of-government plans and programs have been made in the Americas, including in Brazil, Colombia, Guyana, Mexico, Peru, and the United States. One example, launched in 1974, is the Ciclovia Recreativa ["Open Streets"] program in the city of Bogota, Colombia. Started as a local initiative driven by activists' interests in biking, the project grew in scale, substantially increased people's physical activity, and was incorporated into Colombia's National Public Health Plan in 2007. Box 10.6 outlines the development of the Ciclovia Recreativa program. Colombia's current 10-year public health plan is built within a HiAP framework, with the participation of more

than a dozen ministries. Box 10.7 describes the process of embracing that perspective.

NGO lobbying of governments has played a significant role in improving NCD prevention and control policies. Recently, in Latin America these organizations have promoted litigation in the courts to resolve disputes over the right to health, access to high-quality health care services and health coverage, and the goods and services that the state must legally provide to citizens (Iunes, Cubillos-Turriago, and Escobar 2012). This judicialization phenomenon has raised citizens' awareness of legal mechanisms to ensure their right to health. In Argentina, for example, citizens have begun to file more lawsuits relating to the failure of the state to provide adequate levels of risk protection against tobacco. In one case, two NGOs filed a suit calling on the government of the city of Buenos Aires to adequately enforce its prohibition on tobacco consumption in enclosed spaces, such as workplaces and bars. The plaintiffs have lost at both the District Court and Court of Appeals levels (FIC Argentina 2013). However, in another case, Argentina's Supreme Court ruled against a subsidiary of British American Tobacco that had asked to have the antitobacco law of the province of Santa Fe declared unconstitutional (FIC Argentina 2015).

Even though right-to-health litigation has held governments accountable for their constitutional duties, equity issues have been raised, as access to justice is not equitably distributed, and lack of collective actions may generate horizontal inequities. Judicialization has also raised questions about courts possibly interfering in the prioritization of health resources. The limited technical capacity of the courts might lead to suboptimal decisions for society as a whole, given the opportunity cost of not delivering other services (Daniels and others 2015; Iunes, Cubillos-Turriago, and Escobar 2012). To address these issues, Daniels and others (2015) have proposed a middle ground that "requires the health system to develop a fair, deliberative process for determining how to achieve the progressive realization of the same right to health or health care and that also requires the courts to develop the capacity to assess whether the deliberative process in the health system is fair."

Examples of opposition to efforts to improve health have also emerged, with some NGOs even aligning themselves with the agendas of private sector groups. Therefore, mapping the interests and strategic activities of these organizations is important, as they often carry critical weight in setting government policy. In 2010, Mexico launched a national strategy to control obesity and overweight as a response to surging rates of overweight and obesity (Pratt and others 2014). Although this policy was a successful example of the effect that a multisectoral

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Box 10.7

Incorporating a Health in All Policies Perspective in Colombia's National Public Health Plan

According to WHO, the Health in All Policies (HiAP) approach focuses on legitimacy, accountability, transparency, information access, participation, sustainability, and multisectoral collaboration (WHO 2014b). This approach systematically takes into account the health implications of decisions, seeks synergies, and prevents harmful health externalities in other governmental policies.

Because many factors that shape the NCD epidemic lie outside the reach and direct responsibility of the health sector, Colombia has strongly committed itself to implementing a HiAP approach in its national 10-Year Public Health Plan 201–2021 (PDSP) (Ministerio de Salud y Protección Social de Colombia 2012). Operating through intergovernmental structures, the health sector has a central role in promoting this approach. Objectives and strategies are defined through the Intersectoral Public Health Commission, with the participation of more than 12 ministries. A technical secretariat defines instruments and indicators to follow up on PDSP implementation. Colombia's experience with the ciclovía recreativa program (see box 10.6) has influenced how the different sectors coordinate with each other to address the social determinants of health. Effective health leadership at all levels of government is achieved by: (a) addressing the social determinants of health; (b) strengthening health information systems; (c) bolstering regional capacities; (d) harmonizing powers at all governmental levels; (e) providing technical assistance to all levels of government in order to ensure capacity development; and (f) developing and strengthening a national management system that includes the evaluation of health outcomes.

response can have in creating healthier environments, it also faced considerable opposition from the private sector, which limited the strategy's impact. Box 10.8 contains a more detailed description of this effort and how it was influenced by the private sector.

Multilateral health organizations have played a major role in overcoming political obstacles and achieving policy coherence between trade objectives and health objectives (Weishaar and others 2012). The WHO FCTC is one example of how global health diplomacy can advocate for health interests in the face of such other concerns as economics, foreign policy, trade, and development (WHO 2015b). The WHO FCTC has been key in advancing tobacco control at the national level in many countries.

Dealing with the trade-related aspects of intellectual property rights is one of the major concerns for a successful health-oriented policy. A solid government commitment, along with NGO support, is needed to address these challenges. For example, the Framework Convention Alliance embodies the interests of approximately 500 NGOs from 100 countries that advocate for governments to implement the WHO FCTC and that monitor compliance with the treaty in the countries that have ratified it. This organization's interest is also to include the WHO FCTC and global tobacco control in the international health and development framework, including the SDGs (UNDP 2015).

Health-related consumption taxes and fiscal measures have been effective in influencing consumer behavior and in generating resources to address social determinants of health. However, many Latin American countries trying to implement these instruments face opposition from such government ministries as finance, trade, and industry (Ministry of Social Affairs and Health of Finland 2013).

Finally, we stress the different roles that the private sector can play in controlling NCDs. On the one hand,

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Box 10.8
A National Strategy to Control Overweight and Obesity in Mexico

In 2010, in response to the rise in the prevalence of obesity and such NCDs as hypertension and type 2 diabetes (T2D), Mexico launched a national strategy against overweight and obesity (known as ANSA, for its acronym in Spanish for the Acuerdo Nacional para la Salud Alimentaria: Estrategia contra el Sobrepeso y la Obesidad) (Pratt and others 2014). Approximately one-third of Mexican children (34.4 percent) and adults (32.4 percent) are overweight or obese (Barquera and others 2013). It was through the creation of ANSA in 2010 that overweight and obesity first gained broad recognition as public health problems in Mexico that warranted a whole-of-government policy. ANSA was conceived as a multisectoral public health policy designed by the federal government but that included participation from nongovernmental, industry, and academic organizations. The policy focused on providing clean drinking water, encouraging the drinking of water rather than sugary beverages, promoting breastfeeding, boosting health and nutritional literacy, improving food labeling, increasing the availability of healthful food choices, and enhancing public parks and recreational spaces in order to encourage physical activity.

A salient aspect of ANSA was creating specific guidelines that established what foods could be sold in schools, which was done as a joint effort between the Ministry of Health and the Ministry of Education. Additionally, textbooks were supplemented with material on nutrition and physical activity, and free government-provided school breakfasts were modified in order to offer a more balanced and nutritious meal (Pratt and others 2014).

ANSA represented a milestone in addressing NCDs by placing the problems of overweight and obesity on the national agenda and implementing the first policies to reduce the prevalence of these conditions. ANSA had limitations and faced challenges, as it was not a legally binding agreement, which reduced its power to enforce the program recommendations. Also, it faced considerable opposition from food and beverage industry associations. The efforts of these interest groups were especially strong in regard to the guidelines on the food environment in schools. The industry associations managed to change ANSA's initial proposal to a more lenient, although still very significant, policy. In addition, some food associations and related interest groups framed ANSA's actions as those of a "nanny state" interfering with individual freedom. This type of argument can make it harder to address NCD issues, as it reshapes the issue of overweight and obesity as an individual's problem and responsibility, and it blocks the discussion of wider societal, environmental, and structural drivers of these conditions.

Unfortunately, while ANSA has been transformed into a strategy with a more narrow scope, it still faces many of the same challenges as earlier. Likewise, since ANSA is not a legally binding document, it has a limited capacity to address the social determinants of overweight, obesity, and diabetes.

the private sector promotes health actions by providing innovative technologies for the diagnosis, prevention, treatment, and long-term care of these diseases. It also delivers knowledge and human resources to strengthen health infrastructures, improve supply chains, support capacity building, facilitate emerging research, and catalyze partnerships. Even though its influence in improving health is clear, the affordability of these technologies and resources remains an issue in relation to increasing health equity gaps.

On the other hand, private sector industries related to NCD risks such as alcohol, tobacco, and food and beverages can oppose health policy due to economic interests that fall beyond population wellness (Brownell 2010; Charvel, Cobo, and Hernández-Ávila 2015; Nestle 2006). These industries have strong leverage over legislative bodies through well-articulated lobby efforts. These "unhealthy commodities" industries protect their profits aggressively even when evidence shows deleterious effects on the population's health. Additionally, ministries of economics and trade, along with international trade agreements, often provide market entry for tobacco, alcohol, and ultraprocessed food and drink corporations through takeovers of domestic companies. Therefore, public regulation and market intervention are the only evidence-based mechanisms to prevent harm caused by the unhealthy commodity industries (Moodie and others 2013).

CONCLUSIONS

NCDs are a growing global challenge to health, development, and well-being. Low- and middle-income countries are particularly vulnerable, since this epidemic is occurring in the context of an accelerated transition, limited investment in NCD control, low regulatory capacity, and weak legal frameworks for health promotion and risk protection. Health systems are largely unprepared to address the increasing demand for personal health services that NCD growth will produce.

In the Americas, NCDs now account for two-thirds of all deaths, and they are also the leading causes of disability and premature mortality. Increasing costs attributed to these diseases limit the response capacity of health budgets. Between 2006 and 2015, the cumulative total loss to the gross domestic product due to heart disease, stroke, and diabetes in just the four countries of Argentina, Brazil, Colombia, and Mexico was estimated at US$13.54 billion. This situation urgently calls for an increased focus on health promotion and disease prevention; strengthened quality of personal health services, with simultaneous actions embracing all the core components; and a HiAP

approach that assigns health actions beyond the health sector, especially to address social determinants of health.

Various measures are essential for the appropriate treatment and control of NCDs. These include: (a) health education and patient empowerment; (b) compliance with international guidelines to support obesity and T2D management; (c) adoption of integrated care models with multidisciplinary teams; (d) continuous development of knowledge and technologies through health-workforce capacitation and training; (e) movement towards a model that delivers health services closer to patients' homes through the use of technology; (f) benchmarks for monitoring progress and informing policies; (g) a strong regulatory framework; and (h) a HiAP approach to effectively address determinants of health.

There is no question that individuals are in some ways responsible for the good or bad health decisions they make. Nevertheless, the striking growth of NCDs sheds light on societal and structural factors that are beyond an individual's control and that play a role in the development of these diseases. This situation underscores the state's responsibility to provide a legal framework that expands healthier choices as the standard, leading to healthier behaviors.

The complex causal framework of NCDs shows that involvement not only of the whole of government, but also of every sector of society, will be needed to address risk factors as well as social determinants. The health sector should exhibit strong and effective leadership in prioritizing evidence-based actions on NCDs and in defining strategies to generate synergies with other government sectors that improve the population's health and well-being. It is within a HiAP framework that synergistic efforts can make the population's health a priority across government actions.

In many countries, the establishment of a HiAP governance structure, such as a commission supported by a legal framework, has been successful in defining intersectoral priorities and responsibilities. Law impacts public health by providing pragmatic and elemental elements, and if needed, by allowing litigation mechanisms to ensure citizens access to the right to health. Strategic HiAP planning should involve keen insight into other sectors' resources, capabilities, and responsibilities. This planning should also clearly define coordination, evaluation, and control mechanisms for assessing impact and identifying needed areas of improvement at the national and subnational levels.

The implementation of the WHO FCTC and its ongoing evaluation has provided important insight into the challenges of applying a HiAP approach. That convention represents a milestone as a legally binding treaty for public

health purposes that connects to relevant UN conventions that protect human rights, particularly the right to health. Some of the lessons learned in successfully implementing the WHO FCTC could be applied to NCD prevention and control. These include making control of preventable risk factors a priority within national health plans and having that control championed by the ministry of health; establishing strong commitments and leadership from other ministries (e.g., finance, trade, agriculture) that are relevant to risk factor control; linking control to economic growth and poverty reduction; and including health in international agreements such as those developed within the framework.

Planning, implementing, and maintaining a ciclovía program requires active community participation and strong pby: (a) addressing the social determinants of health; (b) strengthening health information systems; (c) bolstering regional capacities; (d) harmonizing powers at all governmental levels; (e) providing technical assistance to all levels of government in order to ensure capacity development; and (f) developing and strengthening a national management system that includes the evaluation of health outcomes.

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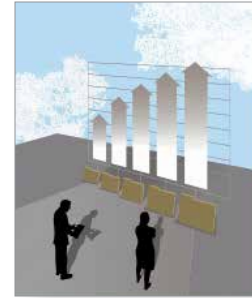——. 2015a. *Diabetes Shows Upward Trend in the Americas*. Washington, DC: PAHO. http://www.paho.org/hq/index.

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Article **11**

Responding to NCDs under Severe Economic Constraints: The Links with Universal Health Care in the Caribbean

Karl Theodore, Stanley Lalta, Althea La Foucade,
Anton Cumberbatch, and Christine Laptiste

INTRODUCTION

It is now widely acknowledged that the high incidence and consequent economic burden of chronic noncommunicable diseases (NCDs) are no longer entrenched problems of just "rich countries," but have become major front-burner concerns of all developing countries (Institute for Health Metrics and Evaluation 2013; Suhrcke and others 2006; World Bank 2011; WHO 2005). Among these developing countries are the "small [island] developing states" in the Caribbean, which have certain unique structural, economic, epidemiological, and health policy characteristics. For the Caribbean nations and territories, these characteristics make the challenges of responding to NCDs equally urgent but also requiring more circumspection, given their "fragile capacities," which could derail or deter well-designed plans.

Aiming to address the causes and growing burden of NCDs, Caribbean countries have articulated well-intentioned response policies, including universal health care and several national/regional action plans. This article probes why, despite these plans, Caribbean nations continue to be "bold in statements but hesitant in actions" in containing the NCD epidemic.

The article begins by reviewing the need to confront the heavy burden of NCDs, the persistence of some infectious diseases, and the rise of other, new infectious illnesses. Additionally, the piece examines the urgent need to address the increase in trauma-related cases due to violence and accidents. This is followed by an analysis of the constrained economic and fiscal space that governs resource availability and NCD policy options. In the final section, the article outlines possible pathways to give greater impetus to learning from international best practices and intensifying local initiatives within the universal health coverage framework, in order to provide countries more measurable, sustainable results in their NCD control programs.

NCDs AND THE TRIPLE BURDEN OF HEALTH PRIORITIES IN THE CARIBBEAN

Over the last few decades, NCDs have become the dominant causes of morbidity, premature mortality, and disability in the Caribbean. In fact, from 2000 to 2012 they accounted for close to 70 percent of deaths in the member states of the Caribbean Public Health Agency (CARPHA). NCDs have been described as major threats to hard-won health gains, overall socioeconomic welfare, quality of life, and development in the region (CARICOM 2007; Healthy Caribbean Coalition 2014; Nikolic and others 2011; PAHO and CARICOM 2011).

NCDs are the leading causes of ambulatory visits, prescriptions for medications, diagnostic procedures, hospitalizations, surgeries, and social care. This is true, for example, for hypertension and cardiovascular problems (about 1 in 4 persons); diabetes and its comorbidities (1 in 10 persons); obesity; musculoskeletal conditions; cerebrovascular conditions; cancers; respiratory conditions; and mental health conditions (PAHO 2012). The data on NCD prevalence also suggest that levels of hypertension, diabetes, and prostate cancer in the Caribbean are among the highest in the Western Hemisphere (Bloom and others 2011).

Economic Burden and Cost of NCDs

The burden of NCDs affects all social groups regardless of income, sex, occupation, area of residence, or, increasingly, age. In fact, particularly worrying for Caribbean countries is the incidence of diabetes, hypertension, and depression, along with obesity in children (CARPHA 2014). The major risk factors are rooted in social determinants and lifestyle-related behaviors such as unhealthy eating habits (salt, sugars, trans fats), abuse of alcohol and tobacco products, and inadequate levels of physical activity (CARICOM 2007; Hospedales 2014; PAHO and CARICOM 2011; WHO 2005).

These concerns about the generalized incidence of the NCD epidemic in various population groups are heightened by the fact that many persons present with multiple conditions—in some cases, as many as six NCDs (PAHO and CARICOM 2006; PAHO and CARICOM 2011; Tropical Metabolism Research Institute 2008). Further, there is a segment of the population that is unaware that they have an NCD. Of those who are aware, some seek conventional or mainstream treatment, some use indigenous treatment alternatives, and some do not seek treatment. Finally, of those who do seek mainstream care, between 30 percent and 50 percent are managing their conditions by adhering to prescribed directives (Hennis 2002; Hospedales and others 2011; PAHO and CARICOM 2006; Sealey 2014; Tropical Metabolism Research Institute 2008).

Available data on the economic burden of NCDs highlight the major conditions, including hypertension, diabetes, and cancers. Barcelo and others (2003) reported that in The Bahamas, Barbados, Guyana, Jamaica, and Trinidad and Tobago, the direct treatment costs (medications, consultations, hospitalization) and the indirect costs (foregone earnings due to years of productive life lost due to premature mortality and disability) for diabetes were approximately US$1 billion per annum, or about 3 percent of GDP. Using a cost-of-illness approach, this estimate is based on a prevalence rate of about 16 percent; the indirect costs and direct costs account, respectively, for 84 percent and 16 percent of the estimate.

CARICOM (2007) and Abdulkadri, Cunningham-Myrie, and Forrester (2008) estimated the combined direct and indirect costs of diabetes and hypertension as a percentage of GDP for selected countries in 2001. These results were: The Bahamas (1.36 percent); Barbados (5.34 percent); Jamaica (5.9 percent); and Trinidad and Tobago (8.0 percent). On the other hand, Chao (2013) calculated the total direct costs of diabetes and hypertension in 2005 and found figures ranging from US$1.6 million in Anguilla to US$289 million in Jamaica. Expressed as a proportion of total public health expenditures, these direct costs ranged from 17.6 percent in The Bahamas to 211.3 percent in Guyana.

Barcelo (2009) estimated that among persons 40 years and older in 10 Caribbean countries (Antigua, Barbados, The Bahamas, Belize, Dominica, Jamaica, St. Kitts, St. Lucia, St. Vincent, and Trinidad and Tobago), there were 21,206 potential years of life lost due to diabetes in 2003, with foregone future earnings of US$145 million.

In terms of the cost of cancers, the Economist Intelligence Unit (2009) estimated the incidence of the top five types of cancer in The Bahamas, Barbados, Belize, Guyana, Haiti, Jamaica, Surinam, and Trinidad and Tobago as ranging from 426 in Belize to 12,574 persons in Haiti. Total direct and indirect costs of these cases ranged from US$1.4 million in Guyana to US$17.6 million in Trinidad and Tobago, while the cost per case ranged from US$599 in Haiti to US$23,059 in The Bahamas.

Context of the NCD Response

NCDs are not the only health priorities for Caribbean countries. In fact, also demanding immediate attention and resources are the presence, persistence, and emergence of such infectious and communicable diseases as HIV/AIDS, dengue fever, malaria (in some countries), and other vector-borne, food-borne, and water-borne illnesses (CARPHA website (http://carpha.org/); PAHO 2012; PAHO and CARICOM 2006). Structurally, Caribbean nations are dependent on international travel and trade. Coupled with the countries' largely unprotected coastlines, in recent years these factors have led to surges in activities to control SARS, bird flu, swine flu, MERS, cholera, and chikungunya. Also, in 2014 and into 2015, countries had to prepare for the threat of Ebola (CARPHA website (http://carpha.org/); PAHO 2012).

Further, the increasing incidence of trauma-related conditions ("external causes"), particularly interpersonal violence (homicides and assault) and motor vehicle accidents, has produced even more worries for Caribbean health systems and policy makers. Data from PAHO and CARICOM (2006) and the UN Office on Drugs and Crime and the Latin America and the Caribbean Region of the World Bank (2007) suggest that homicide rates in some Caribbean countries (approximately 30 per 100,000 in 2007) are among the highest in the Western Hemisphere and also among the highest for countries not directly involved in armed conflicts or domestic insurgencies. There is competition for state attention, financing, and prioritization in health policy making, resource allocation, and meeting international obligations. This means that communicable and trauma-related conditions are necessarily placed high on the agenda. This is not

surprising when one considers the negative impact these conditions can have on international trade and travel, domestic investment, business activity, and confidence. All of these factors are critical to the economic survival of Caribbean countries, given their openness and dependence on tourism, imports, exports, and remittances. In this environment, therefore, even though NCDs are the dominant causes of ill health, they tend to be regarded as more long-term concerns and less of an "emergency" that requires immediate action.

NCDs AND THE IMPLICATIONS OF STRUCTURAL AND MACROECONOMIC CONSTRAINTS

In most Caribbean countries, the public sector dominates in the financing and provision of health services. Data from the World Bank DataBank (http://databank. worldbank.org/data/home.aspx) and from WHO (2014)

indicate that, on average, approximately 60 percent of total funds for health are derived from public sources. The rest comes largely from private sources (out-of-pocket payments, insurance, gifts and grants, NGOs), with relatively small amounts of external aid.

In addition, the data indicate that on average, Caribbean countries are spending around 6 percent of their GDP on health, or approximately US$200 to US$2,000 per capita per annum. Given this distribution, future funding for NCDs will depend substantially on macroeconomic and fiscal developments. These developments affect both public sector resources and also private and household funds (through business gains, employment and poverty levels, and availability of community grant funds).

Table 11.1 highlights some critical features of the economies of 15 countries in the Caribbean, projected for 2012. These characteristics have direct implications for policy making and resource flows for health in general

Table 11.1 Selected Economic Indicators, Projections for 2012, for Eastern Caribbean Currency Union (ECCU) Nations, Larger Caribbean Nations, and the Caribbean as a Group

	Population (millions)	GDP per capita (US$)	Real GDP growth (%)[a]	Gross public debt (% of GDP)	Trade openness (X+M) % of GDP[b]	Sovereign credit rating[c]
ECCU countries						
Anguilla	0.0	17,307	0.5	21.2	875.7	—
Antigua and Barbuda	0.1	13,401	1.0	97.8	107.1	—
Dominica	0.1	7,022	0.4	72.3	92.4	—
Grenada	0.1	8,133	0.5	105.4	71.0	B-
Montserrat	0.0	12,825	2.0	4.3	269.4	—
St. Kitts and Nevis	0.1	12,869	0.0	144.9	75.5	—
St. Lucia	0.2	7,509	0.7	78.7	112.0	—
St. Vincent	0.1	6,537	1.2	68.3	82.5	B+
ECCU as a group (8 countries)	0.7	10,700	0.8	74.1	210.7	—
Larger Caribbean countries						
Bahamas, The	0.4	23,417	2.5	52.6	102.3	BBB+
Barbados	0.3	16,307	0.7	70.4	96.8	BBB-
Belize	0.3	4,386	2.3	81.0	136.3	C
Guyana	0.8	3,596	3.7	60.4	142.7	—
Jamaica	2.8	5,526	0.9	143.3	80.8	B-
Suriname	0.5	9,339	4.0	18.6	118.2	BB-
Trinidad and Tobago	1.3	17,935	0.7	35.7	98.9	A-
All Caribbean countries as a group (15 countries)	7.1	11,074	1.4	70.3	164.1	—

Source: Adapted from IMF 2013; IMF International Financial Statistics dataset (http://data.imf.org/?sk=5DABAFF2-C5AD-4D27-A175-1253419C02D1).

Note: For the table rows labeled "ECCU as a group" and "All Caribbean countries as a group," the population value is the sum of the individual countries. Except for the sovereign credit rating, all the other values in those two rows are the simple average, for the 8 ECCU countries as a group and for the 15 Caribbean countries as a group.

a. Real GDP growth rate is end-of-period, 12-month percentage change.
b. For trade openness, X+M = exports + imports.
c. Sovereign credit ratings are median ratings published by Moody's, S&P, and Fitch; the "—" symbol indicates no published data available.

and for NCDs in particular. Among the most noteworthy attributes are:

- Relatively small population size (from fewer than 10,000 persons in Anguilla and Montserrat to 2.8 million in Jamaica)

- General middle-income status (average GDP of US$11,074 per capita)

- Low economic growth rates (an average of 1.4 percent, with 8 countries having real GDP growth rates of less than 1 percent)

- Very high debt burden (an average of 70.3 percent of GDP, with 10 countries above the manageable threshold of 60 percent)

- High degree of trade openness (an average of 164.1 percent, with 8 countries above 100 percent)

- Sovereign credit rating largely in the B range for the countries with published data

Based on the data shown in Table 11.1 as well as other macroeconomic data, the International Monetary Fund (IMF 2013) indicated that Caribbean countries face major challenges in managing and restructuring their economies for sustained development. This is due mainly to their vulnerability to disasters and external shocks, low or stagnant growth, high debt levels, weak trade/international competitiveness, and high levels of dependence on remittances. One of the IMF's recommendations was "fiscal consolidation," with an emphasis on "restraining" public expenditure and enhancing tax collection. Since a large percentage of these countries' revenues is necessarily allocated to debt repayments (as high as 40 percent in some countries), the prognosis for increased health allocations is gloomy.

The Caribbean Development Bank (CDB 2014) also recognized the constraints some of its member countries face, in terms of low growth rates and high debt levels. The CDB argues that these limitations are compounded by the fact that the Caribbean is one of the most disaster-prone and tourism-dependent regions in the world. Further, the region is increasingly faced with the negative effects of global climate change. The CDB's short-term outlook for Caribbean nations was cautiously optimistic: slow to modest growth of 2 percent to 3 percent. This will depend on the speed of the economic upturn in the global economy (which will affect trade, travel, remittances, and debt servicing/new credits) as well as the absence of any intervening natural disasters (hurricanes, floods, or droughts). The CDB recommended more fiscal control and greater private sector investment in the economies.

Lalta and Barnett (2012) examined the data on overall macroeconomic and fiscal space in the Caribbean in relation to such indicators as GDP growth rates (low); income tax

levels (0 percent to 50 percent); consumption and value added taxes (10 percent to 50 percent); customs tariffs (0 percent to 30 percent); debt servicing requirements (10 percent to 55 percent of current revenue); and the extent of social security deductions (5 percent to 20 percent). The authors also considered the above indicators in the context of constrained fiscal space, along with the general "graduation" of Caribbean countries in terms of lessened eligibility for external concessionary and grant funds. They concluded that it was unlikely that health systems would receive any substantial increases in public funds in the near future.

There are some key lessons that may be drawn from this review of structural, macroeconomic, and fiscal factors that may continue to foster "fragile capacities" in Caribbean countries as they address NCDs. Firstly, their small population sizes have human resource implications in terms of the volume and range of skills that may be pooled to address the multidimensional aspects of NCDs. Small population size also has implications for relatively high unit costs for programs, medications, diagnostic services, and hospitalization.

Secondly, total health spending of around 6 percent of GDP, or between US$200 and US$2,000 per capita per annum, is significantly below levels observed in most developed countries. This means that Caribbean countries should be very cautious in accepting "developed country" approaches in managing their NCD burden. The high degree of openness to and dependence on external forces (natural as well as economic) suggests that priority should go to core population-based programs for controlling NCDs, along with specialized treatments as resources permit.

Thirdly, ongoing and projected macroeconomic and fiscal constraints, along with the competition for public funds, imply that NCD plans should emphasize cost-effectiveness and intersectoral coordination in order to maximize scarce resources.

Lastly, with access to external concessionary funds diminishing, there will be a need for more domestic and regional resource generation, particularly drawing on the private sector, social security organizations, and civil society.

UNIVERSAL HEALTH COVERAGE PRINCIPLES AND PATHWAYS FOR SUSTAINABLE ACTION ON NCDs

Reviews of the relevant documentation indicate that Caribbean countries have explicit policies and programmatic responses in relation to controlling NCDs, with emphasis on the basic principles of universal health

coverage (UHC). This is evident in their adoption of the Port-of-Spain Declaration "Uniting to Stop the Epidemic of Chronic NCDs" (CARICOM 2007); the Caribbean Cooperation in Health Initiative (CARICOM 2010); the PAHO and CARICOM Strategic Plan on NCDs (2011); and UN Resolution 66/2 on prevention and control of NCDs (WHO 2012). Actions on these major agreements are reflected in national strategic plans for the control of NCDs at the national levels in most Caribbean nations.

In Caribbean countries, NCD control programs and treatment services are financed through a mix of public funds, private funds, community and civil society spending, and regional support (HEU and PAHO 2015). The public funds consist of budgetary allocations to ministries of health, as well as defined prescription drug plans for chronic diseases in countries that include The Bahamas, Barbados, Jamaica, and Trinidad and Tobago. Private funds are comprised of out-of-pocket spending by households, private health insurance payments, and investment in workplace wellness activities by businesses. Community and civil society funds come from NGOs and from community events sponsored by business and other charitable entities. Regional technical and financial support activities are carried out by CARICOM and CARPHA.

Several major actions on NCD control have already been initiated at the regional, national, community, and civil society levels. Our review suggests that such actions could be bolstered and enhanced by employing specific UHC approaches to address gaps in access to care by reaching out to uncovered population groups (i.e., those not seeking care) and those who are not managing their conditions in line with care guidelines. Further, gaps should also be minimized in the availability, quality, and delivery of requisite services as well as in financial protections (given the high levels of out-of-pocket spending on NCD services).

Intersectoral collaboration, particularly in relation to the social determinants, should be encouraged. This includes a Health in All Policies (HiAP) approach to strengthening the prevention response, especially in relation to social determinants and lifestyle-related causes of NCDs. Linked to this is the need for research to drive and/or support fiscal regimes to promote a healthy food supply (less salt, sugar, trans fats, and obesogenic foods) as well as to deter abuse of alcohol and tobacco products.

Additionally, a more diverse financing system is needed, where social security organizations are more fully involved in resource generation and where costs are shared, monitored, and controlled in cooperation with private and civil society partners. Also highly recommended are results-based financing approaches, which seek to make more efficient use of scarce resources

through linking expenditure to achieving defined targets in terms of processes, outputs, and outcomes of NCD programs. Further, making use of cost-effective purchasing of medications, technologies, and supplies, perhaps through the PAHO Revolving Fund or other joint purchasing agreements, is also a key component of cost control.

CONCLUSIONS

Although the Caribbean is facing a virtual epidemic of NCDs, the region has certainly benefited and will continue to benefit from the experience of other regions and countries. However, the reality of small size and an extended period of economic difficulties suggest that the Caribbean response to NCDs must emphasize prevention if the health situation in the region is not to become intractable. More research is needed to update estimates of the economic burden of NCDs and to explore fiscal and financing options. Nevertheless, we know enough about the economic impact of such diseases as diabetes and hypertension and about the debt burden of the region to begin putting in place the type of response that will both protect the health of the population and keep the cost of safeguarding the population's health within affordable limits.

The recommendations suggested include the introduction of various new measures. One is an HiAP approach that dovetails with the drive to UHC. Another is bringing on board new players, including social security organizations, relevant intersectoral agencies, and a strengthened set of civil society organizations, mainly to assist with the prevention and adherence challenges of NCDs. Clearly there will be a need to upgrade the implementation of the Port-of-Spain Declaration. Also required will be more intensive national involvement with other regional responses, including the newest phase of the Caribbean Cooperation in Health Initiative, as well as the PAHO and CARICOM Strategic Plan on NCDs and the PAHO strategy for UHC. What may also be needed is the adoption, and adaptation as required, of the "crusading" and organizing principles that seemed to work well for such other public health concerns as immunization and HIV/AIDS.

What is clear is that it cannot be business as usual for the Caribbean. To say that the region faces the threat of being overwhelmed by NCDs is not an exaggeration. The sooner there is a policy response that acknowledges this, the greater the chance of the region continuing along its human development growth path by being able to effectively respond to the challenges that arise.

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Section 5

CONCLUSIONS

George Alleyne

Article 12

Economic Dimensions of Noncommunicable Diseases in Latin America and the Caribbean: Policy Agenda Considerations

George Alleyne
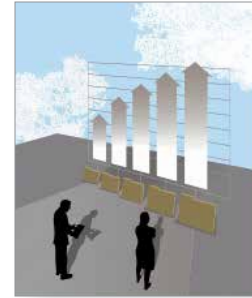
INTRODUCTION

One of the purposes of this book on the economic dimensions of noncommunicable diseases (NCDs) in Latin America and the Caribbean is to provide policy guidance that is based on taking stock of the situation, assessing what is working, and weighing new empirical work. The previous articles have outlined the magnitude of the epidemic, in terms of both the epidemiology and the macroeconomic consequences. Those articles make it clear that preventing and controlling NCDs is indispensable for good health, which must be seen as a stock of capital individually and as an aggregate that promotes well-being. NCD prevention and control also contributes to productivity and extends life expectancy, both of which are instrumental to human development (Alleyne 2009; Alleyne and Cohen 2002). In the preceding articles, some policy frameworks with various models and examples are presented, along with descriptions of how they should be developed. However, too much emphasis cannot be placed on the nature of the policies required, the various places where they need to be developed, and the mechanisms for formulating them. This is needed to give some context and relevance to the macroeconomics of establishing such policies or their economic influence and consequences (Mendis 2010).

This article builds on the preceding ones. It outlines a policy agenda that focuses more on the overall national framework for addressing NCDs within the broader concerns of health than on the policies that are relevant

for the individual drivers of NCDs. Many of the NCD drivers have been set out in detail by the Pan American Health Organization (PAHO) in a menu of global and regional actions targets and tools (PAHO 2012a).

THE WORLD AFTER 2015

The adoption of the 17 Sustainable Development Goals (SDGs) in 2015 has significantly changed the approach that must be taken with regard to possible overall national policy frameworks (UN 2015). Goal 3 of the SDGs has a broad scope: "to ensure healthy lives and promote well-being for all at all ages." It encompasses nine primary targets and three additional ones that may be seen as describing the means of implementation. One of the targets that is not a relic of the Millennium Development Goals (MDGs) is 3.4: to reduce mortality from NCDs and promote mental health. The inclusion of a specific target on NCDs has been welcomed by the NCD community, but there is some strong skepticism on the value of overstating exceptionalism for any aspect of health and, indeed, for any aspect of human development.

The acceptance of the SDGs has not made irrelevant the thesis that human development can be sustained by the intertwining, conceptually in the form of a triple helix, of the three essential strands or domains of activity: the social, the economic, and the environmental (Alleyne and others 2013; Steiner 2011). It is perfectly possible to group the 17 goals under the three domains (table

1), and to propose that, as components of the three domains, the goals are also intertwined and interlinked. It is crucial to restate and emphasize that, in the words of the UN Resolution titled "Transforming our World. The 2030 Agenda for Sustainable Development," the goals are "integrated and indivisible, and balance the three dimensions of sustainable development: the economic, social and environmental" (UN 2015). Therefore, no single one can be achieved without interaction with the others.

NCDs AND THE HEALTH GOAL

In a similar fashion, the nine primary targets or components of the health goal must be seen to be intertwined with consequences for the policies to address them. There is no longer justification for considering the macroeconomics of the decrease in mortality from NCDs in complete isolation from the macroeconomics of the prevention of communicable disease or the establishment of universal health coverage. The implementation may indeed call for separate tools and sets of activities, but there must be much greater effort to establish the policies that link them. It is unproductive for a country to consider the cost of an information system needed for universal health coverage as separate from that needed for the reduction of NCDs.

At the national level, within the health goal itself and within its specific components, attention must be paid to policies of integration. Perhaps one of the more striking and pressing examples would be the relationship between NCDs and HIV/AIDS (Narayan and others 2014). The SDG health goal both seeks a one-third reduction in premature mortality from NCDs by 2030 and also targets the end of the AIDS epidemic. The relation between HIV/AIDS and NCDs has become increasingly clear, given that persons with HIV/AIDS now live longer and are thus more prone to developing NCDs. For example, HIV/AIDS drug treatment leads to increased longevity, but also consequent hyperlipidemia and a predisposition to NCDs (Kotler 2008).

There have been valid arguments for building on the AIDS response in order to address the NCD epidemic, especially in low- and middle-income countries. In these nations, the AIDS programs present established platforms that could be used for NCDs. Further, there is good epidemiological, clinical, and management evidence speaking to the rationale for utilizing these platforms (Crabtree-Ramirez and others 2014; Lamptey and Dirks 2012). These platforms, which include primary care and community settings, represent an efficient way to address the comorbidities from the two conditions (Atun and others 2013).

Another attraction is the level of funding available for HIV/AIDS and NCDs. It is estimated that development

Table 12.1 The 17 Sustainable Development Goals Allocated to the Three Human Development Domains

Economic	Social	Environmental
1. End poverty	2. End hunger and promote sustainable agriculture	6. Ensure sustainable water and sanitation
8. Promote sustainable economic growth, productive employment, and decent work	3. Ensure healthy lives and well-being	7. Ensure affordable, reliable, sustainable, modern energy
9. Build resilient infrastructure and sustainable industrialization	4. Ensure quality education and lifelong learning opportunities	11. Make cities and human settlements inclusive, safe, resilient, and sustainable
12. Ensure sustainable consumption and production patterns	5. Achieve gender equality and empower all women and girls	13. Combat climate change and its impacts
17. Implement and revitalize the global partnership for sustainable development	10. Reduce inequality within and among countries	14. Sustainably use the oceans, seas, and marine resources
	16. Promote peaceful and inclusive societies for sustainable development; provide justice for all; build effective, accountable, and inclusive institutions	15. Sustainably use terrestrial ecosystems and forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss

assistance for health in Latin America and the Caribbean was US$10.9 billion in 2014, while US$611 million was directed towards NCDs (IMHE 2015). This disparity is not a new phenomenon. Over the past 25 years, funding for NCDs as a percentage of development assistance for health in Latin America and the Caribbean has never risen above 1.5 percent. The comparison among the allocations for NCDs, HIV, and child health is shown in table 2 (Dieleman and others 2015). While a significant part of the HIV/AIDS funding is disease-specific, it must be possible to leverage some portion of it to address some of the problems common to both HIV/AIDS and NCDs.

Table 12.2 The Allocation of Development Assistance for Health in Latin America from 1990 to 2014 among NCDs, Child Health, and HIV

Year	NCDs	Child health	HIV
1990–1994	0.73%	9.17%	2.94%
1995–1999	0.10%	7.72%	4.30%
2000–2004	0.16%	8.86%	7.15%
2005–2009	0.94%	12.73%	23.16%
2010–2014	1.48%	12.13%	17.61%

Source: Data are from Dieleman and others (2015).

The breakdown of the traditional silos between NCDs and HIV/AIDS and other communicable diseases represents one of the mechanisms by which adequate financing for NCDs could be made available at the national level. Identical arguments can be made with respect to the achievement of universal health coverage, of which NCDs must represent a critical component. Similarly, it can be argued that the health of women, children, and adolescents needs universal health coverage; that integrated delivery platforms are important; and that it is therefore time to bring together the movements for effective management of these two priority areas (NCD Alliance 2015).

SECTORAL COOPERATION POLICIES

One obvious mechanism for addressing this situation at the national level is through the often-cited need for sectoral cooperation, which should be interpreted as whole-of-government as well as whole-of-society cooperation. The

outcome document of the 2014 review of NCDs (United Nations General Assembly 2014) reiterates what was made explicit in the political declaration of the UN General Assembly's high-level meeting on NCDs in September 2011. That 2014 document noted that "effective non-communicable disease prevention and control requires leadership and multisectoral approaches to health at the governmental level, including as appropriate, health-in-all policies and whole-of-government approaches across sectors beyond health." The influence of sectors other than health is not peculiar to NCDs and affects all the targets of the SDG health goal. Cooperation at the level of the government has been cited frequently in the preceding articles in this book, and some attention is also given to the macroeconomics of such cooperation. Cooperation among the various sectors of government or Health in All Policies (Leppo and others 2013) can indeed take place, with the understanding that the nature of the assignment of responsibility for one or another aspect of societal welfare is essentially a political decision.

The first consideration is the attention paid to the health sector per se. In recent years, sectoral spending in health in Latin America and the Caribbean as a percentage of GDP has fluctuated. This has perhaps substantiated the argument that if health is an essential good, then expenditure in health should not suffer the same fate as expenditures in other sections of government when there are pressures on the national budget. It is argued that expenditures on essential goods should be countercyclical, thus not be unduly compromised in periods of national budgetary stringency (Musgrove 1997). Between 2004–2005 to 2008, when economic growth in Latin America and the Caribbean was robust, national health expenditure as a percentage of GDP actually fell from 6.8 percent to 6.4 percent. However, during the economic crisis from 2008 to 2010, it rose to 7.0 percent (Suarez-Berenguela and Vigil-Oliver 2012). It would have been ideal to have data for the expenditure on NCDs during the period to determine if it moved in tandem with the total national expenditure on health.

THE COST OF NCDs AND FISCAL POLICIES

In spite of the skepticism mentioned before, there must be a rationale for prioritizing the various problems that affect health. The thrust of much of this book is that NCDs must be high on the priority list because of the burden of disease they cause and the macroeconomic consequences. The level of resources allocated to NCDs globally in relation to the burden of disease is disproportionately low (Nugent and Feigl 2010). It is legitimate to ask whether it is realistic to expect that, even in spite of the

irrefutable data on the burden of disease, there will be increased spending on NCDs. It seems obvious that the growing burden of NCDs will lead to increased public expenditure predominantly for secondary prevention and treatment. This increased burden on the public budget will come about as a result of population aging and the growth of the age-specific expenditures, which are likely to arise in part because of the increased demand for the technologies needed to deal with the NCDs in all countries. In all likelihood, it is the increase in the age-specific component of the expenditure growth that will be most problematic for countries (Adeyi, Smith, and Robles 2007). To the extent that the public purse will bear a significant part of these costs, the question will surface as to whether governments can create and implement policies to create the fiscal space needed to deal with these expenses (Heller 2006).

Although the primary purpose of taxation on tobacco, alcohol, and food is to reduce consumption, it is attractive to suggest that the taxes on them can provide some of the additional revenue needed to address the NCD problem. Taxes on tobacco have been well studied (Chaloupka, Yurekli, and Fong 2012), and the World Health Organization (WHO) has developed a specific manual on tobacco taxation. Article 6 of the Framework Convention on Tobacco Control refers to price and tax measures to reduce the demand for tobacco. Raising tobacco taxes so they account for 70 percent of the retail price is recommended. That would lead to significant price increases, thereby inducing smokers to quit and deterring youth from beginning to smoke. Data from PAHO show that in most countries of the Americas between 2008 and 2012, taxes as a percentage of the price of the most-sold brands of cigarettes increased. In 2012, that percentage ranged from a high of 81.24 percent in Chile to a low of 6.60 percent in Antigua and Barbuda (PAHO 2013).

There is robust evidence of the price elasticity of alcohol, so taxation and pricing are effective tools for reducing consumption. The real price needs to grow faster than the inflation rate in order to reduce consumption. However, the general opinion is that the absence of good regulatory measures may limit the impact of taxation (Elder and others 2010).

Taxation of food and beverages has been under discussion, especially in relation to preventing obesity and the attendant development of NCDs (WHO 2014). A great deal of attention has been paid to taxing sugar-sweetened beverages, which are associated with the increased risk of obesity, particularly in children (World Cancer Research Fund International 2016). In fact, an increasing number of countries, including Barbados, Chile, Dominica, and Mexico, have attached taxes to these drinks. Although taxation of these products will raise revenue, there is normally extreme reluctance to accept earmarking of those taxes. However, there are examples of taxes from tobacco being used to fund the drugs and technologies needed to treat NCDs, such as in Jamaica, according to the Jamaica National Health Fund (http://www.nhf.org.jm).

The prospect of substantially increased funding dedicated exclusively to NCDs from some version of the Global Fund is remote. It is likely that increased allocation of funding for the prevention and control of NCDs will come from already established budgets assigned to other sectors. For example, attention to the dietary aspects of NCDs may be within the remit of the agricultural sector and a call on its budget. In other words, shifting the already assigned budget for agriculture will produce funding to address the nutritional aspects of NCDs (Nugent 2011).

The thesis is often advanced that given the world's economic situation—and even in better times—the great part of the resources needed for health in general and NCDs in particular must come from domestic resources. This is inherently logical if there is to be sustainability of resources, given the historic need for country ownership and control of their own programs. However attractive this may be for the majority of countries in the Americas, there are some few, notably Haiti and Guyana, that would be faced with tremendous difficulty in adhering to this policy and practice. The argument used by Sachs with regard to universal coverage is used to demonstrate this difficulty (Sachs 2012). The GDP per capita of Haiti and of Guyana in 2014 were $500 and $1,500, respectively. Public revenues amount to around 20 percent of national income, or US$100 and US$300 per person per year, respectively. It has been recommended internationally that least 15 percent of the total budget be assigned to health, which would represent US$15 and US$45 in the case of these two countries. It is also estimated that the minimum package for primary health care services was US$50-US$60 per person in 2012 (Sachs 2010). If the total budget for health was as above in those two nations, then it is clear that these two countries simply would not have the fiscal space needed to achieve the majority of the targets in the SDG health goal. Given that reality, no national policy for the prevention and control of NCDs is likely to succeed without significant external assistance. There have been various initiatives for making the local expenditure of external funding more effective, for example, cash on delivery (Center for Global Development 2016). However, our experience is that the policy of supporting local interagency committees, as was done in the program to eliminate poliomyelitis in the Americas, provides a successful platform for effective, coordinated program delivery and for ensuring financial probity (Hull and others 1998).

EXPENDITURE ON NCDs

Another article in this book, the piece by Cuadrado, Palacios, Miller, and Legetic, looks at indicators for monitoring the socioeconomic dimension of NCDs, by means of a pilot study in Chile. The article seeks to analyze the expenditure in the traditionally nonhealth sectors that impacts on the prevention and control of NCDs. (It should be noted that the focus is on expenditure rather than budgetary allocation.) Even with the limited data available in a single country, it is possible to determine that significant expenditure that affects NCDs will be found in sectors other than health. One major difficulty in this approach is developing a taxonomy of areas in other sectors that contribute to the prevention and control of NCDs. This is similar conceptually to the exercise to determine expenditure rather than budget that impacts on climate change coming from traditional nonenvironmental sectors (Bird and others 2012).

WHOLE-OF-GOVERNMENT COOPERATION

Even though the macroeconomic imperative of devoting resources from nonhealth sectors is clear, the political mechanism for coordinating such expenditures to achieve maximum results is difficult to establish. The politics of financing NCDs within the competing priorities in the health sector is nothing compared with the problem of coordinating expenditures among the various sectors of government. The assumption of the practicality of the whole-of-government approach mentioned so frequently is belied by the political difficulties that are inherent in the Health in All Policies approach. While the health sector has a uniquely parochial interest in achieving health outcomes, other sectors have at best what might be described as liberal interest. For example, there is no political utility for the education sector to direct resources to the activities needed for the prevention and control of NCDs (Alleyne and Nishtar 2013). The proposals to ensure the coordination of expenditures include the formation of interministerial committees within government. However, for these committees to be effective, there must be clear presidential or prime ministerial direction or imprimatur, as well as arguments—preferably economic ones—to promote this cooperation. Collaboration that involves the whole of government to address a health issue may also take place when the public involvement and outcry make it a matter critical for political survival of the government as a whole. Rarely do the problems of the NCDs create this level of public outrage.

WHOLE-OF-SOCIETY COOPERATION

There is much debate on the policy implications of involving the private sector and possible conflict of interest. However, the whole-of-society approach, which involves interaction among the government, the private sector, and civil society, is critical for preventing and controlling NCDs. Encouraging the irrational choice of unwholesome foods is a policy that has been well developed by the private sector, and the growth of behavioral economics is likely to produce even better tools for that than those that are now available (List and Samek 2015). Currently, the public policies available to counteract such tendencies are perhaps mainly limited to its fiscal instrument, which may be inadequate, given the advertising and marketing power of the large business enterprises that are involved.

There would be general agreement that the private sector should not be involved in the formulation of national NCD policy, but rather in its implementation. This private sector participation could take three different forms (Institute for Strategy and Competitiveness 2016). First, there is corporate philanthropy. There is increased private sector interest in directly funding health programs, with the Bill and Melinda Gates Foundation being the most prominent actor. However, except for work in tobacco control, this organization has been spectacularly absent from development assistance for NCDs. Second is corporate social responsibility, which has focused predominantly on workplace health and corporate citizenship in efforts to prevent and control NCDs. There are several examples of workplace wellness programs that incidentally generate savings (Baicker, Cutler, and Song 2010). "Shared value" is the third and most recent concept to emerge in terms of corporate interest in health, essentially utilizing commercial business methods to profitably address social problems (Porter and Kramer 2011). In this mode of participation, focusing on the health or NCD problem is accompanied by an economic value proposition. In the future, the development and massive distribution of simplified technologies for managing NCDs could fall into this category.

Civil society is the third of the major components of the state to be involved. Even though the organizations that fall under this rubric of civil society are diverse, it is possible to identify those that are dedicated exclusively or almost exclusively to the issue of NCDs. The voice of civil society in this area has become stronger with the formation in 2010 of the NCD Alliance (http://www.ncdalliance. org/), which initially represented an alliance among the four largest NCD organizations: the World Heart Federation, the International Diabetes Federation, the

International Union against Cancer, and the International Union against Tuberculosis and Lung Disease. The alliance subsequently added other major health-related not-for-profit organizations. It has spearheaded the formation of national and regional alliances, such as the Healthy Latin American Coalition and the Healthy Caribbean Coalition, whose major roles are advocacy and accountability. Accountability is of critical importance in determining whether the commitments made by governments in the international fora for the prevention and control of NCDs are translated into both national policies and subsequent implementation of activities. This watchdog function of civil society is not limited to governments but should expand to ensure that the private sector also fulfills the commitments it makes publicly to the prevention and control of NCDs. If well organized, civil society can promote accountability frameworks to influence the policies of government as well as those of the private sector (Swinburn and others 2015).

In 2011, PAHO created the Pan American Forum for Action on NCDs (http://www.paho.org/panamericanforum/). The intention was to provide a platform where all stakeholders might discuss differences and agreements, with a view toward arriving at concrete proposals and programs to support the implementation of the PAHO Strategy for the Prevention and Control of Noncommunicable Diseases (PAHO 2012b). The very laudable thesis behind its creation was that the whole-of-society cooperation promulgated by the UN General Assembly's high-level meeting on NCDs in September 2011 would be facilitated if the collective voices of society helped raise awareness, promoted new initiatives, and shared best practices for the prevention and control of NCDs. The forum has languished somewhat recently as a result of the intense debate at the global level on the role of nonstate actors in health.

CONCLUSION

The policy agenda for the prevention and control of NCDs must embrace new arrangements that have to be considered with the adoption of the SDGs, given that the SDGs represent indivisible and integrated approaches to promoting and sustaining human development. Just as the goals of the SDGs must be integrated, the policy option for health must include the integration of the targets within the health goal. To the extent possible, the silo approaches that dominated the MDGs must be removed. The example of the synergy between NCDs and HIV/AIDS is revealing. The growth in NCDs will lead to an increased call on the public purse, and it is unclear how governments can find the fiscal space that is needed.

Taxes on tobacco, alcohol, and unwholesome foods can reduce consumption and may provide some revenue. However, those new funds are generally not dedicated exclusively to health or to the prevention and control of NCDs. The international policy of advising governments to look to domestic resources to address this fiscal space cannot be relevant in the very poor countries. The need for sectoral cooperation is obvious, in terms of both the whole-of-government approach and the whole-of-society approach. Effective whole-of-government policies depend primarily on high-level political support. In terms of the whole-of-society process, emphasis is placed on the three forms of corporate action and on the dual roles of civil society in advocacy and accountability.

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