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Non-communicable Chronic Diseases in the  
Americas: An Economic Perspective on Health  
Policies

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## Abstract

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*Non-communicable chronic diseases (NCDs) are amongst the principal burdens of disease in both developed and underdeveloped countries. The main causes of these illnesses are well known. They are tobacco use, unhealthy diet, physical inactivity and the harmful use of alcohol. The prevalence of these risk factors is directly related to the activities of transnational corporations. To begin with, just the budgets dedicated to advertising for risky consumption is larger than the budget of the World Health Organization.*

*NCDs have many complex links with the economy whose study is almost completely absent for the Americas. They have important economic microeconomic and macroeconomic impacts and affect economic performance in the long-term. Yet the detailed evaluation of their economic impact, which is essential for establishing the importance of alternative policies, has only just begun in some regions of the world and is almost completely absent for the Americas.*

*The sheer burden on the working and aged population implies that strong impacts on labor, saving and investment, as well as an increased human capital depreciation can be expected. These will all impact long-term economic growth. It is a research priority to quantify these impacts. However, in the context of globalization many changes are occurring at a very fast pace, often faster than their rigorous analysis.*

*It is urgent to develop a global institutional framework capable of promoting the control of NCD risk factors, as well as health and economic growth in general. For example, developing legal mechanisms to slow the negative impact of the deficient nutrition transition could be a step in that direction. In the context of globalization, an international institutional framework is urgently needed to balance markets with governance, to hold TNCs responsible for their impact, and to tax them so they carry their fair share of social weight.*

## Resumen

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*Las enfermedades crónicas no transmisibles se encuentran entre las principales cargas de enfermedad en los países desarrollados y subdesarrollados. Sus principales causas son bien conocidas: el tabaquismo, dietas deficientes, inactividad física y el uso nocivo del alcohol. La prevalencia de estos factores de riesgo se relaciona directamente con las actividades de las empresas transnacionales. Para empezar, los presupuestos que varias transnacionales dedican a la publicidad de*

*consumos riesgosos es mayor que el de la Organización Mundial de la Salud.*

*Las enfermedades crónicas no transmisibles tienen vínculos complejos con la economía, cuyo estudio es casi inexistente en las Américas. Éstas tienen importantes repercusiones microeconómicas y macroeconómicas que afectan el desempeño económico de largo plazo. Sin embargo, la evaluación detallada de su impacto económico, que es esencial para establecer la importancia de políticas alternativas, apenas comienza en algunas regiones del mundo.*

*Simplemente el peso de la enfermedad sobre la población activa y los ancianos implica que pueden esperarse fuertes impactos sobre fuerza de trabajo, ahorro e inversión, así como una mayor depreciación del capital humano. Todas éstas tendrán un impacto sobre el crecimiento económico a largo plazo. Es una prioridad de investigación cuantificar estos impactos. Sin embargo, en el contexto de la globalización muchos cambios están ocurriendo a un ritmo muy rápido, a menudo más rápido que su análisis riguroso.*

*Es urgente desarrollar un marco institucional global capaz de controlar los factores de riesgo de las enfermedades crónicas no transmisibles, así como la salud y el crecimiento económico en general. El desarrollo de mecanismos legales para frenar el impacto negativo de la transición hacia la nutrición deficiente podría ser un paso en esa dirección. En el contexto de la globalización, es urgente un marco institucional internacional que equilibre el mercado con la gobernanza, que responsabilice a las empresas transnacionales por su impacto, y que las sujete a la tasación de impuestos, de modo que cumplan con su porción justa del peso social.*

## *Introduction*

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Non-communicable chronic diseases (NCDs) are amongst the principal burdens of disease in both developed and underdeveloped countries. They have important economic microeconomic and macroeconomic impacts and affect country-wide economic performance in the long-term. While the main causes and treatments for these illnesses are relatively well known, their prevalence across countries and social groups has only recently become apparent. Yet the detailed evaluation of their economic impact, which is essential for establishing the importance of alternative policies, has only just begun in some regions of the world and is almost completely absent for the Americas.

The aim of this article is to review the literature on the impact of NCDs on macroeconomic aggregates and on long term economic growth and development in countries of the Americas. This includes published articles and working papers focused on analytical frameworks and empirical studies applied to Canada, United States, Latin America and the Caribbean. However, although there is a significant amount of research published on NCDs from a global, world-wide point of view, we found that not much research has focused on the impact of NCDs in the Americas.

Instead, research up to now has focused on disease prevalence, burden of disease, and on initial examination of the possible complex causal channels that may link NCDs with macroeconomic performance and long-term growth. We thus report on the overall perspective that the literature provides on NCDs and their economic impact, including as many results as possible on the Americas.

We also report on the general perspectives of the analysis of the relation between health and economic growth, and make suggestions as to possible lines of research that are relevant for the Americas.

### *Chronic Diseases – Definition and Prevalence*

Chronic diseases are defined as those that have been, or are likely to be, present for at least 3-6 months, and can only be controlled, not cured (O'Halloran *et al.*, 2004).

The World Health Organization (WHO) often limits the term chronic disease to four major chronic conditions: cardiovascular disease (CVD), cancer, chronic respiratory disease and diabetes. Although there are many other chronic conditions, such as mental disorders, vision and hearing impairment, oral diseases, bone and joint disorders and genetic disorders, for the purposes of economic analysis, research is centered on these four main chronic conditions (Suhrcke *et al.*, 2006).

Non-communicable chronic diseases (NCD) represent the single largest global cause of mortality in people of working age. Over half of the deaths in the world are due just to these four chronic conditions –cardiovascular disease (30% of total global mortality), cancers (13%), chronic respiratory disease (7%) and diabetes (2%) (Unwin and Alberti, 2006). These diseases (NCD) –primarily heart and stroke disease, cancer, chronic obstructive pulmonary disease and diabetes– caused an estimated 35 million deaths in 2005, 80% of which occurred in low and middle income countries (LAMICs), which had 84% of the world population.<sup>1</sup> These conditions were responsible for 50% of the disease burden in 2005 (Alwan and MacLean, 2009).

Death rates from NCDs are considerably higher in LAMICs than in high-income countries: estimated to be 56% higher in men and 86% higher in women in 2005. NCDs are responsible for significant premature mortality and morbidity throughout the world. In LAMICs the disease develops at an earlier age than in high-income countries (Unwin and Alberti, 2006).

The rapidly increasing burden of these diseases is affecting poor and disadvantaged populations. As a consequence, health gaps between and within countries are widening disproportionately (Meetoo, 2008).

NCD has major impacts on men and women and their elderly dependents, and result in income and investment opportunity losses, and overall lower levels of economic development (Unwin and Alberti, 2006). The burden of NCDs thus poses serious implications for social and economic development worldwide but particularly for low and middle income countries.

While international agencies have dedicated their budgets to controlling infectious diseases, evidence of non-communicable diseases reveals an alarming global pandemic and associated fatalities (Strong *et al.*, 2005). For example, it was estimated that globally, approximately 58 million people died in 2005 from chronic diseases such as cardiovascular disease (Figure 1), and this figure has been predicted to rise to 64 million in 2015 (Strong *et al.*, 2005). Chronic diseases are slow to develop but lead to devastating complications, resulting in premature death and poor quality of life. This shift in the pattern of disease is occurring at a faster rate in countries undergoing economical development than it did in the Western world half a century ago (Popkin, 2002). This accelerated rate of change with the increasing burden of the disease is causing a major public health threat, which necessitates immediate and effective action (Meetoo, 2008).

NCDs are largely preventable. The number of premature deaths can be greatly reduced (Strong *et al.*, 2005). The four most prominent NCDs (cancer, cardiovascular disease, chronic obstructive pulmonary disease (COPD) and

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<sup>1</sup> The World Bank classifies countries into low income, lower-middle income, upper-middle income and high income countries, according to per-capita gross national income. In 2003 the definitions were as follows: high income,  $\geq$  US\$9,206; upper-middle income, US\$2,976-\$9,205; lower-middle income, US\$746-\$2,975; low income,  $\leq$  US\$745 (World Bank, 2003).



diabetes) share modifiable and preventable risk factors related to lifestyles. These factors are predominantly tobacco use, unhealthy diet, physical inactivity and the harmful use of alcohol. Pollution and stress also contribute. Eliminating these risk factors through changes in lifestyles could lead to a significant drop in the incidence of NCDs.

### ***Causes of chronic diseases***

The causes of the main chronic disease epidemics are well established and well known. Population aging is an important underlying causal determinant because of the strong association between disease incidence and age (Yach and Beaglehole, 2004). Other underlying determinants reflect the major forces driving social, economic and cultural change, including globalization, urbanization and the general policy environment (WHO, 2002a). Further, global forces such as those in trade and marketing are increasing the causal entrenchment of chronic diseases in all of the regions. For example, one of the health-related effects of globalization is the trend known as 'nutrition transition', which according to Popkin (2002) is the replacement of a traditional diet rich in fruit and vegetables by a diet rich in calories derived from animal fats, and lower in complex carbohydrates. Except for countries with a less developed infrastructure, this transition is well underway in almost every corner of the globe (Yach and Beaglehole, 2004). Such a diet, when combined with a low level of physical activity, regular tobacco use and alcohol consumption, sets the scene for a population-wide atherosclerosis and global distribution of chronic diseases (WHO, 2005).

A major objective of any strategy to prevent and control NCD is to reduce the level of exposure of individuals and populations to the common risk factors and their determinants. Tobacco is a risk factor for six of the eight leading causes of death (Torelli, 2004). It kills up to half the people who use it and currently kills more than 5 million people worldwide each year [Unwin and Alberti, 2006].<sup>2</sup>

Inappropriate diet and physical inactivity, both separately and in concert, are contributing to the rise in obesity prevalence. Around 40% of people worldwide are not participating in sufficient physical activity to benefit their health. The resultant death toll in 2002 from this physical inactivity is estimated at 1.9 million deaths. In 2000, at least 2.6 million people died of causes attributable to obesity (Popkin, 2001).

Harmful use of alcohol is ranked as the fifth leading risk factor for premature death and disability worldwide and is estimated to cause about 2.3 million premature deaths (WHO, 2008b).

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<sup>2</sup> Square brackets are used to cite a reference from which several sentences are quoted verbatim or almost verbatim.

Estimates have been made of mortality (% of total deaths<sup>3</sup>) attributable to common NCD risk factors. For example, elevated blood pressure has been estimated to cause 12.8% of total global deaths; smoking and oral tobacco use cause 8.8%; high blood cholesterol causes 7.9%; low fruit and vegetable intake causes 4.9%; physical inactivity causes 3.4%; excessive alcohol intake causes 3.2%; indoor smoke from solid fuels causes 2.9%; and urban air pollution causes 1.4% (WHO, 2002a).

## ***Burden of major NCDs***

### *Cardiovascular disease*

Despite declining mortality in some developed countries, such as the USA and Canada, heart disease remains the dominant public health problem in these societies. In 2004 it was estimated that cardiovascular diseases caused approximately 17 million deaths worldwide (29% of all deaths), and of these about 80% (14 million) occurred in LAMICs (WHO, 2008a).

In 2004 there were over five times as many deaths from stroke in LAMICs (5 million) than in high-income countries (0.75 million) and the number of deaths due to heart attacks was almost 6 million in LAMICs compared with 1.3 million in high-income countries (WHO, 2008a). Pregnancy-associated hypertension is an important health problem in LAMICs, where it is the major cause of premature birth and perinatal death and causes approximately 16% of maternal mortality, rising to 26% in Latin America and the Caribbean (Khan KS *et al.*, 2006).

### *Cancer*

WHO reports that there were an estimated 14.5 million new cancer cases in 2004, with approximately 66% occurring in LAMICs (WHO, 2008a).

Over three-quarters of lung cancer cases are related to smoking. Trends are predicted by past cigarette consumption patterns in the population and are expected to continue to increase globally, particularly in LAMICs, due to the heavy marketing and uptake of tobacco products in these countries (*ibid*).

In 2002 a quarter of a million women died from cervical cancer, with 98% attributable to human papilloma virus. Falling incidence rates in high income countries are generally attributed to screening. Vaccines now exist to prevent most of these deaths (WHO, 2005).

In 2002, it was estimated that chronic hepatitis B infection (HBV) was killing 340 000 people per year from liver cancer and cirrhosis with 82% in LAMICs. It is largely preventable, as about 80% of cases are related to infection with hepatitis viruses, principally HBV, with geographical patterns mirroring infection (WHO, 2008a).

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<sup>3</sup> Global deaths were about 155 million a year in 2007.

### *Diabetes*

WHO estimates that in 2005 there were 1.1 million deaths from diabetes globally (3.3% of the total), with 80% occurring in LAMICs (WHO, 2008a). The number of deaths is projected to rise to 2.2 million in 2030 (ibid.). Routine sources of mortality statistics underestimate the impact of diabetes on mortality. Using more refined methods, about 3 million deaths globally can be attributed to diabetes every year. Eighty per cent of people with diabetes live in developing countries, and of the top 10 countries with highest prevalence, practically all are LAMICs. There is evidence to suggest that the prevalence of diabetes in LAMICs is increasing faster than in high-income countries (Mohan *et al.*, 2006).

### *Chronic obstructive pulmonary disease (COPD)*

COPD is caused primarily by tobacco smoking, with some due to environmental air pollution and occupational hazards, and incidence trends rise with age (Mannino, Buist, 2007). In 2004 COPD was estimated to have caused 3 million deaths worldwide (5.1% of the total) with over 90% of these deaths occurring in LAMICs (WHO, 2008a). Mortality rates of COPD are expected to continue to rise in these countries due to the rise in cigarette smoking. Prevalence is tied strongly to cigarette smoking at the population level, and over 15% of middle-aged smokers have abnormal lung function. There is a general underreporting of this condition. (Ibid.)

COPD has a significant economic and social cost to society, in the form of health-care costs and loss of productivity caused by the illness. Hospital costs are high, particularly those associated with treating chronic respiratory failure. Moreover, COPD is one of the leading causes of lost days of work (Mannino, Buist, 2007).

### *The age distribution of chronic disease*

The relationship between disease and age is crucial from an economic and public-policy standpoint. Frequently, economists and others focus on the working population –commonly understood to be people between the ages of 15 and 65– to determine whether disease is occurring prematurely and to determine the economic impacts of disease [Suhrcke *et al.*, 2006].

A considerable share of death due to chronic disease occurs prior to age 60, even in high-income countries where the average age of death is older than elsewhere. Approximately one-third of deaths due to chronic disease occur before age 60 in middle-income countries and 44% occur before age 60 in low-income countries. (Ibid.)

## *Macro and long-term economic impacts of health – a summary*

Interest in the interrelation between health and economic growth was sparked by Nobel Prize winning historical studies by Fogel and Wimmer (1992) and Fogel (1994). They found that a third or even one half of the economic growth in England over the last 200 years is due to improvements in nutrition and health. Arora (2001) finds comparable results for seven advanced countries using 100- to 125- year time series of diverse health indicators. This line of research has concluded that the synergism between technological and physiological improvements has produced a rapid, culturally transmitted form of human evolution that is biological but not genetic, which continues in both rich and developing nations, and is called technophysio evolution by Fogel (2002). The prevalence shift from infectious to non-communicable chronic diseases can be considered to be part of this evolution.

The general viewpoint that has emerged on the interrelation between health and economic growth is summarized by Bloom and Canning (2008). According to this point of view, while health is a direct source of human welfare and also an instrument for raising income levels, a number of mechanisms exist through which health can affect income. The main ones are the impact of health on worker productivity, children's education, savings and investment, and on the demographic structure, which itself has impacts on productivity, investment and consumption. As well as the impact of current illness, health may have large effects on prospective lifespans and life cycle behavior. Studies suggest there may be a large effect of health and nutrition in utero, and in the first few years of life, on physical and cognitive development and economic success as an adult. Macroeconomic evidence for an effect on growth is mixed, with evidence of a large effect in some studies. However, there is a possibility that gains from health may be outweighed by the effect of increased survival on population growth, until a fertility transition occurs. The low cost of some health interventions that have large-scale effects on population health makes health investments a promising policy tool for growth in developing countries. In addition, higher priority could be given to tackling widespread "neglected" diseases—that is, diseases with low mortality burdens that are not priorities from a pure health perspective, but that do have substantial effects on productivity [ibid].

On the other hand, Jack and Lewis (2009) review the links between health and economic growth with a special pragmatic focus on the role of government. They note that health progress in the past two centuries has been fueled mainly by technological impacts from outside the health sector, such as increased food quantity, knowledge of disease transmission, and some specific, effective public health interventions controlling communicable diseases such as malaria, yellow fever, and hookworm. They also highlight investments in very young children that pay off in healthier and more

productive adults. However, they consider that whether public investments in medical care affect health hinges on the unfortunately low quality of health institutions in much of the developing world. Thus they find institutional issues to be central in efforts to enhance public health investments. [Ibid.]

Related to the role of institutions, to be discussed below, is the observation that relatively inexpensive public health interventions and policies have had remarkable impacts on population health, even in very poor countries (Bloom and Canning, 2008). In practice, a consensus is emerging that the major force behind health improvements has been improvements in health technologies and their adoption. Kenny and Casabonne (2007) argue this point systematically using cross country data sets. Cutler, Deaton, and Lleras-Muney (2006) also argue that the major force behind health improvements has been improvements in health technologies and public health measures that prevent the spread of infectious disease, and not higher incomes.

A multitude of examples exist showing that important health improvements can be obtained through the application of very cheap methodologies. For example, an estimated 30 million infants are born each year in developing countries with impaired growth due to poor nutrition during fetal life (UN, 2000). Cretinism, which can be avoided if iodized salt is provided to the mother, is the most common preventable cause of mental retardation worldwide (Cao *et al.*, 1994: 1739).<sup>4</sup>

In fact, a major point in health deficiencies in poor populations, both in lagging countries and in the developed world, is that the treatment is available and inexpensive, yet does not occur. Table 1 shows the large prevalence figures for such preventable neglected parasitic worm diseases. Bloom and Canning (2008) give a series of other examples and references related to malaria, lymphatic filariasis, iron deficiency anemia.

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<sup>4</sup> Moreover, malnourished children are less likely to enroll in school; or to do so at a later age (UN, 2004).

**TABLE 1. PREVENTABLE NEGLECTED DISEASES PREVALENCE (PERCENTAGE)**

REGION	TRICHURIASIS	ASCARIASIS	HOOKWORM	SCHISTOSOMIASIS
Latin America and Caribbean	19	16	10	4
Sub Saharan Africa	24	25	29	29
Middle East and North Africa	2	7	3	7
South Asia	20	27	16	
India	7	14	7	
East Asia and the Pacific	28	36	26	
China	17	39	16	0.1

Source: De Silva *et al.* (2003).

### *Economic consequences of NCD and related risk factors*

The analysis of the economic impact of NCD builds upon the initial wave of analysis of the macro and long-term economic impacts of health by examining the different mechanisms mentioned above. There are several large scale studies on the impact of chronic diseases which we now summarize.

#### *A Solow model calibration*

According to Abegunde and Stanciole (2006), diseases in general, and chronic diseases in particular, deprive individuals of their health and productive potential. The burden of chronic diseases challenges individual or household income and savings, and competes with investment activities. From a country's perspective, chronic diseases reduce life expectancy and ultimately economic productivity, thus depleting the quality and quantity of countries' labor force [and human capital]. This can lower national output in national income (GDP and GNI). Diseases also reduce intergenerational skills and wealth transfer, affecting schooling. The economic impact of chronic diseases can be estimated and projected by analyzing specific channels through which chronic disease influences economies. Income earnings (e.g. GDP) provide the ultimate link to the socioeconomic effects of chronic disease.

**TABLE 2. PROJECTED CHRONIC DISEASE-ATTRIBUTABLE INCOME LOSS  
AS PERCENTAGE OF GDP**

	BRAZIL	CANADA	CHINA	INDIA	NIGERIA	PAKISTAN	RUSSIA	UK	TANZANIA
2005	0.92	0.38	1.08	1.27	1.11	0.84	2.73	1.11	1.57
2015	3.21	0.64	3.94	5.04	3.07	3.08	12.35	5.18	4.19

Source: Abegunde and Stanciole, Table 3 (2006).

Abegunde and Stanciole (2006) construct a Solow model for the impact of chronic diseases which they estimate and calibrate on data from nine countries: Brazil, Canada, China, India, Nigeria, Pakistan, Russian Federation, the United Kingdom and the United Republic of Tanzania. Their projected loses are shown in Table 2. They conclude: "Two major factors account for these grim forecasts on the economic impact of chronic diseases: the labor units lost on account of deaths from chronic disease and; expenditure to treat chronic disease (in direct medical costs). Evidence from the United States, Japan and other countries that have appreciably controlled the burden of chronic disease indicate that these expenditures continue to increase annually. As indicated in this model, medical expenses are initially covered by current earnings, then by savings and eventually from accumulated capital assets. This, in addition to lost labor units, may constrain growth and development given business as usual scenario. Further analysis will indicate that the results from this model are primarily sensitive to the share of physical capital in real output and secondarily, the proportion of healthcare funded from savings underscoring the importance of medical expenditure on chronic disease to economic growth."

#### *Cardiovascular disease and economic growth*

Suhrcke and Urban (2006) assess the impact of cardiovascular disease (CVD) mortality on economic growth, using a dynamic panel growth regression framework taking into account potential endogeneity problems. They start from a worldwide sample of countries for which data was available and detect a non-linearity in the influence of working age CVD mortality rates on growth across the per capita income scale. They then split the sample (according to the resulting income threshold) into low- and middle-income countries on one hand, and high-income countries on the other hand. In the latter sample they find a robust negative contribution of increasing CVD mortality rates on subsequent five-year growth rates. Not too surprisingly, they find no significant impact in the low- and middle-income country sample.

*The Oxford Health Alliance Report<sup>5</sup>*

This paper assesses and evaluates the current state of knowledge on the economic impact of chronic diseases, with a primary focus on low- and middle-income countries, and a secondary focus on high-income countries (where information on the former is lacking).

Its conclusions can be summarized as follows:

1. Chronic diseases cannot be characterized any longer as 'diseases of affluence', nor as problems of the elderly retired population (see Table 3 obtained from the report).
2. Overall, a fair amount of evidence exists to conclude that there are important economic consequences of chronic disease –both for the individual and his/her family and for the economy at large. Yet, there are severe gaps in the evidence that call for more research, in particular for developing countries.
3. Intervention to prevent chronic disease may be justified from an efficiency perspective: people act non-rationally and against their own desires for their future selves, they are frequently imperfectly informed about the health risks of their choices, and their actions may have significant negative consequences for others or for society at large. When such market failures exist, interventions are called for to move people closer to a social optimum in an efficient manner.
4. As a result of the breadth of possible actions countries could take, and the simultaneous lack of experience in taking action against chronic diseases, it is not feasible to single out specific interventions as the most cost-effective in developing countries. Over time, a consensus will point toward specific approaches that can be studied and perhaps even standardized in some ways. Until then, most of the data that can be drawn upon to select chronic disease interventions is partial, imperfect or merely suggestive.

The report is a wide examination of many issues related to the economic impact of NCD, in a manner that is representative of the incipient literature on this subject. In the following sections we summarize some of these issues to show the breadth and complexity of the economic impact of NCD.

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<sup>5</sup> This subsection quotes extensively from the report (Suhrcke et al., 2006).



**TABLE 3. OUT OF ALL DEATHS BEFORE 60,  
HOW MANY ARE ACCOUNTED FOR BY EACH DISEASE CATEGORY?**

	LOW INCOME	LOWER- MIDDLE INCOME	UPPER- MIDDLE INCOME	HIGH INCOME
I. Communicable, maternal, perinatal and nutritional conditions	69%	32%	46%	26%
II. Chronic or non-communicable conditions	20%	53%	8%	72%
III. Injuries	11%	23%	21%	21%

Source Mathers *et al.* (2003).

### *Costs of NCD*

Based on the selective literature review undertaken for the present study, the cost of chronic diseases and their risk factors –as measured by cost-of-illness studies– is significant and sizeable, ranging from 0.02 to 6.77% of a country's GDP.

In most developed countries for which results are available, the total costs of cardiovascular disease (CVD) varies between 1 and 3% of GDP (Tables A 7 and A 8 present the total –direct and indirect– costs of selected chronic diseases and their risk factors as a percentage of GDP). In interpreting the figures it is important to note that the numerical results from COI studies are typically not directly comparable across countries, disease categories and time. Relatively few results are available for developing countries, although there are some exceptions. Barcelo *et al.* (2003) find the share of total costs due to diabetes to be strikingly high in many developing countries, varying between 1.8% for Venezuela and 5.9% for Barbados.

Pronk *et al.* (1999) found that a 'healthier' lifestyle (defined as the simultaneous occurrence of physical activity three times per week, moderate BMI and non-smoking status) reduces healthcare costs by 49% compared to an 'unhealthy' lifestyle for adults 40 years and older.

Similarly, Sturm (2002) assessed the additional per-person annual healthcare costs associated with obesity, overweight, smoking and heavy drinking among the working-age US population (age 18 to 65). Obesity increased costs by \$395 (36%), smoking (currently or ever) increased costs by \$230 (21%) and heavy drinking increased costs by \$150 (10%). The higher cost increases for obesity may be partly explained by the especially detrimental impact of obesity on chronic conditions (which in turn are the primary drivers of healthcare costs).

Using an advanced econometric approach, Finkelstein *et al.* (2003) examined the costs of obesity for a representative sample of the US adult population (including people over age 65), based on survey data from 1996 to 1998. The average increase in per-person annual medical spending associated with obesity in the sample was \$732 (37.4%). When these figures are extrapolated, the expenditures for overweight and obesity together amount to 9.1% of total annual US medical expenditures in 1998.

The findings of these studies point to the fact that healthcare costs associated with obesity are considerable and have reached, if not exceeded, the costs of smoking and heavy drinking. Informed speculation can be made about the lifetime net costs associated with risk factors when COI data is combined with recent epidemiological evidence. One hypothesis, defended by Finkelstein *et al.* (2003), is that the lifetime costs imposed by overweight and obesity will be higher than those for smokers, because smokers are more likely to die prematurely than the obese or overweight (Stevens *et al.*, 1998). This is in line with earlier research, which suggested that lifetime external costs for physical inactivity, a risk factor for obesity, were almost double those for smoking (Manning *et al.*, 1991).

Although cost-of-illness studies are a popular instrument for highlighting the economic importance of chronic disease (and risk factors) in the developed world, and as an input into economic evaluations of interventions, it is not always possible to perform them in developing countries. Proper COI methodology requires a comparatively sophisticated breakdown of cost information by diseases and services, which may be beyond the reach of the poorest countries at present.

The report states that assessing the microeconomic consequences at the individual and household level is a particularly promising alternative to COI studies, especially for developing countries, in that it requires ‘merely’ the presence of appropriate household survey data and allows—at least in principle—causality to be established between the health proxy and economic outcomes. The available studies have shown that chronic disease and related risk factors affect consumption and saving decisions, labor-market performance and human-capital accumulation. Nevertheless, evidence gaps and barriers to more research exist. Demonstrating the microeconomic costs is important because individuals, in particular adolescents, may not always be aware of the costs incurred by behavior, since the costs will not have to be confronted until later in life.

### *Costly subsistence decisions*

The report makes interesting comments on consumption smoothing (Suhrcke *et al.*, 2006).

Minimum levels of consumption are an imperative necessity that might result in costly decisions, referred sometimes to as “consumption smoothing”.

This in developing economies it is questionable whether consumption fluctuations in response to shocks actually give an accurate measure of the welfare costs of risk. The criticism rests on the idea that while current consumption can be held steady during shocks, maintaining smooth consumption can be very costly over medium- and long-term periods for households in developing countries (Morduch, 1995). The insights of this debate may be of relevance to any future assessment of the true costs of chronic illness in developing countries.

The long-term costs of successful consumption smoothing are perhaps most obvious in the case of households living close to subsistence levels and without access to sufficient means of formal insurance. Those households will be very reluctant to cut consumption when their income is falling due to some external shock. In response, they will use whatever means they can to avoid reducing consumption to below subsistence levels (which is consistent with Wagstaff's (2005) results, showing that the poor achieved better consumption-smoothing results than the rich). This may involve, for example, taking children out of school or selling important assets, with considerable long-term effects for the household. In such instances —when high risk aversion is coupled with a lack of formal insurance— a public intervention in the form of social insurance could yield important welfare gains. The reduction of costly consumption-smoothing mechanisms could lead to welfare improvements such as greater education attainment levels by children (Chetty and Looney, 2006). A number of studies —focused on unexpected events other than chronic disease— have shown that households resort to particularly costly consumption-smoothing strategies (Chetty and Looney, 2006; Dercon, 2002, Frankenberg *et al.*, 1999) and that the consequences of doing so may particularly affect children's health and education (Behrman, 1988; Foster, 1995; Jacoby and Skoufias, 1997; Rose, 1999). While it is not hard to imagine similar effects in the case of chronic disease, direct empirical research is only just emerging.

Although there is no specific evidence showing that an individual or household has fallen into poverty because of chronic disease, there is a fair amount of evidence highlighting very feasible mechanisms by which this could happen. Expenditures for chronic disease treatment as well as for the consumption of addictive goods leading to chronic disease are likely to impose a substantial (and possibly impoverishing) economic burden on the individuals or households concerned. Unexpected 'health shocks' due to chronic disease may impair a household's ability to maintain its overall consumption levels - a type of insurance deficit that typically justifies government intervention. More research, however, is needed to quantitatively and qualitatively assess the long-term implications of household coping strategies.

### *Effects on labor supply and labor productivity*

Chronic diseases and related risk factors may affect labor productivity and labor supply, which have important consequences for individuals and households. The theoretical underpinning of these effects stems from the concept that healthier individuals can produce more output per hour worked (i.e. increased labor productivity) because healthy people have better physical and mental capacities. In addition, more physically and mentally active individuals can make better and more efficient use of technology, machinery and equipment. Counter-intuitively, however, economic theory predicts a more ambiguous effect of health on labor supply. The ambiguity results from two effects working to offset each other. If the consequence of poor health is to reduce wages through lower productivity, this would lead to more leisure and therefore lower labor supply as the economic return from work diminishes (a substitution effect). On the other hand, to avoid a reduction in lifetime earnings from lower productivity, the individual seeks to compensate by increasing labor supply (an income effect). The income effect is likely to gain importance if the social-benefit system fails to cushion the effect of reduced productivity on lifetime earnings. The net impact of the substitution and income effects thereby ultimately becomes an empirical question (Currie and Madrian, 1999).

The effects of illness on labor-market outcomes have been widely assessed in high-income countries, showing that chronic diseases affect wages, earnings, workforce participation, hours worked, retirement, job turnover and disability (see Suhrcke *et al.*, 2005b and Currie and Madrian, 1999 for a review of the evidence more specifically related to high-income countries). Although a fair and increasing amount of evidence exists from low- and middle-income countries, the high-income country evidence is not without relevance for poorer countries. If a negative labor-market effect can be detected in wealthy nations that are commonly equipped with functioning social insurance systems, it is reasonable to expect that in poorer countries (where formal insurance systems are underdeveloped and informal insurance may not be a perfect substitute) there will be an even more important effect of ill health (Strauss, Thomas, 1998).

People with chronic diseases and risk factors are more likely to face barriers to employment arising from productivity limitations, costs of disability and, in some cases, stigma (R and KD Brownell, 2001) (see Tables A 9 and A 10 for a summary of the studies reviewed in the report). Few studies exist assessing the labor-market impact of chronic illness in a comprehensive set of low- and middle-income countries. Two exceptions are Savedoff and Schultz (2000) for Latin America and Suhrcke *et al.* (2007) for Eastern Europe and Central Asia.

The volume by Savedoff and Schultz (2000) shows that, in several Latin American countries, the effects of adult illness on productivity are generally

statistically significant. The magnitude of the effect suggests that earnings may be quite sensitive to small but consistent improvements (or declines) in health. For example, in Colombia, when the number of missed days of work increased by 1% for men, wages decreased by 0.7% (see Table 5, *ibid*). The various studies measured health status using widely different criteria, yet all of them corrected for endogeneity. Overall, there is a fair amount of evidence on the impact of chronic disease on both labor supply and labor productivity, and since the labor market is a key vehicle for economic development at large, the weight of this evidence should not be underestimated. At the same time, there remains scope for more work of this kind, which at present is limited by the lack of survey data that combines both relevant chronic disease proxies and the usual socioeconomic and demographic data.

#### *Effect on education and human-capital accumulation*

Evidence indicating the possibility that household expenditures for either chronic disease treatment or for addictive goods (tobacco and alcohol) may crowd out expenditures that could otherwise be invested in children's education (e.g. Efroymsen *et al.*, 2001; Bonu *et al.*, 2004). Since education is a powerful determinant of future earnings (and future health), a full assessment of the costs of chronic disease must take the impact on education into account. Parents engaging in unhealthy behaviors related to chronic disease may affect a child's ability to perform academically. Several studies have, for instance, documented an association between smoking while pregnant and impaired cognitive and behavioral development (Ernst *et al.*, 2001). Consequently, nicotine exposure in utero may be related to lowered human capital formation and productivity in adult life. Hay (1991) estimates that the cost of reduced lifetime productivity of nicotine-exposed children is about \$4 per pack. Despite the plausibility of the hypothesis, proving causality remains a challenge in many of the existing studies (Torelli, 2004).

Obviously, the death of a parent from chronic disease will have many negative consequences for children. A comprehensive study by Gertler *et al.*, (2004) has examined how the loss of a parent affects children's school enrolment in Indonesia. Carefully handling the econometric challenges involved, the researchers found that a child whose parent has recently died is on average two times more likely to drop out of school than children with living parents. This effect is highest for youth at the transitions between primary and junior secondary and between junior secondary and senior secondary levels. Contrary to expectations, the authors found little differential treatment based on the gender of either the child or of the deceased parent. Although causes of death were not specified, the results are potentially relevant to the assessment of the economic impact of chronic diseases. Indonesia has experienced a marked increase in the prevalence of chronic disease over the past decades (see Ng, 2006), so that one can

probably assume that many of the observed deaths were indeed caused by chronic disease. Moreover, the impact of parental death may be considered a 'lower bound' of the combined impact of death and ill-health, in cases where death is preceded by long periods of illness. Alcohol abuse by adolescents is correlated with various indicators of inferior academic performance in a considerable number of studies in developed countries, where binge drinking is rather widespread among teenagers. Most studies do not, however, specifically address causality, and studies that correct for endogeneity are needed to clarify the causal relationship between alcohol use and school achievement. Clinical studies have shown that heavy drinking impairs brain functioning (Deas *et al.*, 2000). Heavy drinking may also take time away from studying and class attendance, diminish academic reputation among teachers and peers, and lower motivation and attachment to school (DeSimone and Wolaver, 2005).

The impact of overweight or obesity on educational outcomes has not been fully studied, but has potentially important effects. Overweight or obese children may be more likely to miss school or suffer from lower self-esteem, greater shame and perceived teasing compared with their peers, as a consequence of stigmatization (Hayden-Wade *et al.*, 2005). Any of these issues around self-esteem could decrease the incentives for children to invest in additional schooling

Overall, the existing evidence on the influence of chronic disease and related risk factors on educational performance and attainment points to different channels—the death of parents can reduce school enrolment, maternal smoking can impair cognitive development, alcohol abuse is related to inferior performance, and obesity may reduce the incentive to invest in education. Given the importance of education in determining psychosocial development and future earnings potential, it is likely that effective programs to prevent chronic disease will have broad positive effects beyond the (no doubt worthwhile) improvement of health. More research that seeks to ascertain causality in the relationship between risk factors and educational outcomes is, however, needed to guide policy intervention [Suhrcke *et al.*, 2006].

### *Macroeconomic consequences of chronic disease*

Health in general—measured as life expectancy or adult mortality—is a robust and strong predictor of economic growth. Since chronic disease constitutes a major part of the global health burden and accounts for a major part of reduced life expectancy and adult mortality, it would be expected to have a negative impact upon economic growth. Quantifying this impact is a difficult task, however, and is fraught with methodological challenges (Pritchett L., 2006).

One study estimated that a five-year increase in life expectancy will give a country a 0.3-0.5% higher annual GDP growth rate in subsequent years (Barro, 1996), a result that could in principle be used to infer a relationship between chronic disease mortality and growth.

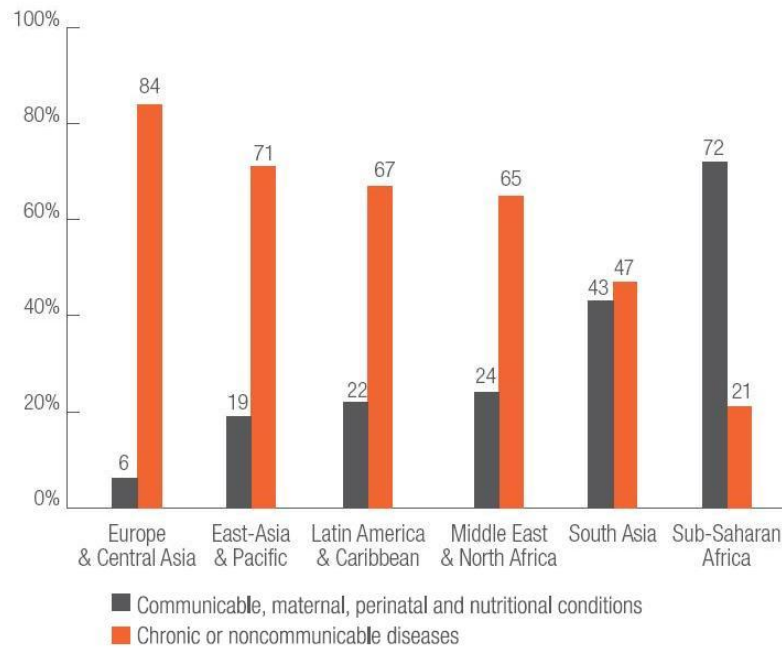
Suhrcke and Urban (2006) used a worldwide sample of countries for which data was available and noted that the influence of working-age CVD mortality rates on growth was dependent on the level of initial per-person GDP. They therefore split the sample into (broadly) low- and middle-income countries on the one hand, and high-income countries on the other. In one estimate, a 1% increase in the mortality rate was found to decrease the growth rate of per-person income in the subsequent five years by about 0.1% in the high-income country sample. The result is based on a panel of five-year intervals between 1960 and 2000, and includes a set of standard controls (including initial income, openness, secondary schooling, etc.). The authors used a dynamic panel growth regression framework, taking into account potential endogeneity problems from reverse causality or omitted variables, which might determine both CVD mortality and growth simultaneously. While 0.1% is a small amount in growth terms, it is much larger in absolute money terms when summed up over many years. The authors did not find a significant influence of CVD mortality on growth in the low- and middle-income country sample. Overall, a fair amount of evidence exists to conclude that there are important economic consequences of chronic disease –important for the individual and his/her family but also potentially important for the economy at large. At the same time, there are severe gaps in the evidence that call for more research into the economic consequences of chronic disease, in particular for developing countries. It is obvious that the economic consequences of chronic disease in developing countries have not figured prominently on the research agenda, especially when compared with the existing research on communicable diseases (especially HIV/AIDS) (see Behrman *et al.*, 2006).

While it is highly plausible to assume that chronic diseases might affect economic growth, given that health in general affects growth and that chronic diseases account for a major part of the global health burden, the question has hardly been addressed by the research community. One study indicates that reductions in cardiovascular disease mortality at working age might well have been a significant contributor to economic growth over the past decades in high-income countries (Suhrcke and Urban, 2006). If this result points to the current or future role of chronic diseases in developing countries, this evidence could spur policymakers to stem the fast-growing burden of chronic disease in order to promote future economic growth.

The increased burden of chronic diseases in countries that also have a high infectious disease burden is putting a strain on health services (see Figure 1). In all countries, it is also leading to growing economic costs, best documented with respect to tobacco-related diseases (Jha and Chaloupka, 1999), with

increasing evidence emerging for cardiovascular disease (Leeder *et al.*, 2004), diabetes (International Diabetes Federation [IDF], 2003) and obesity (Thompson and Wolf, 2001). Many developed nations have focused considerable efforts on addressing the burden of chronic diseases. In contrast, the rising burden of chronic diseases in countries with low financial status has received inadequate attention (Beaglehole and Yach, 2003). In the absence of policy actions, economic development leads to increased tobacco use and obesity which later results in chronic diseases (Popkin and Doak, 1998). Unlike infectious diseases, which generally decline with economic growth, chronic disease risks do not begin to fall until high levels of wealth and literacy are reached (McKeown, 1988) when governments are more likely to respond to public health concerns and use a broad range of policy instruments to influence consumption trends. Thus far, however, declines in chronic disease risks have only been achieved by the Organization for Economic Cooperation and Development countries (Leeder *et al.*, 2004). Therefore, the challenge for policy makers is how to implement policies that support continued economic development while simultaneously reducing the rates of increase in chronic diseases [Meetoo D., 2008].

**FIGURE 1. WORLDWIDE SHARE OF DEATHS BY CAUSE AND WORLD BANK REGION (EXCLUDING HIGH-INCOME COUNTRIES, 2002)**



Source: Mathers *et al.* (2003).



### *Public capacity to deal with NCD*

There are major gaps in the capacity of countries to tackle NCD. For example, a substantial proportion of countries have no adequate NCD control policies, only about half have concrete plans for cancer control or tobacco control and most countries have no data on NCD risk factors in their annual health reports or regular health reporting systems. There were major gaps in the availability and skills of health professionals, and a considerable proportion of countries reported similar gaps in the availability and affordability of essential medicines, particularly in primary health care. NCD prevention is increasingly recognized by health policymakers as a major health priority, but in most cases this is not translated into serious policies or plans.

There is evidence that cost-effective interventions exist that can prevent chronic diseases for a reasonable cost in developing countries. Some of this evidence has come from studies carried out in developing countries, some is from modeling based on available data, and some is from experience in developed countries that suggests a likelihood of cost-effectiveness in developing countries.

Cost-effective interventions include tobacco-cessation programs, tobacco taxes, contextually appropriate mass-media education campaigns to improve diet, community-based physical activity programs, and secondary prevention through pharmacological interventions. However, much more investment in carefully designed and conducted interventions trials in developing countries is needed. Many of the interventions that are generally thought to be effective or even cost-effective have not been evaluated in a developing-country context. Because there is little economic incentive for the private sector to conduct such research, it would likely be an excellent investment for the public sector as the burden of chronic diseases grows with ageing populations and the factors contributing to many chronic diseases spread around the world.

Determining the macroeconomic impact of chronic diseases in developing countries (and even in developed ones) remains a challenge, given the notorious difficulty of disentangling the factors driving economic growth. Worthwhile alternatives to the growth regression approach include the attempt to more explicitly model and then calibrate the effects of chronic disease for a given country, or more qualitative approaches that discuss the sources of economic growth in a given country and the role that chronic disease may (or may not) have played in this context.

The most common household surveys used by researchers do not routinely include a set of chronic disease or risk factor proxies (e.g. Demographic and Health Surveys (DHS), Living Standard Measurement Surveys (LSMS), Multiple Indicator Cluster Surveys (MICS)).<sup>6</sup> This has been a significant impediment to

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<sup>6</sup> For DHS, see [www.measuredhs.com](http://www.measuredhs.com); for LSMS, see [www.worldbank.org/lsmis](http://www.worldbank.org/lsmis); for MICS see [www.childinfo.org](http://www.childinfo.org).

further in-depth research on many of the issues covered in this report. As chronic diseases already represent a sizeable health challenge in low- and middle-income countries (with important economic consequences –as indicated by much of the evidence presented here), there is ever less justification for these omissions in surveys undertaken to assess living conditions in those countries. The inclusion of such components into already well-established surveys would be a highly cost-effective way of filling in current research gaps.

Better assessment and explanation of the within-country distribution of chronic disease risk factors by socioeconomic status is needed, particularly in low- and middle-income countries

Given the evidence that the burden of chronic disease is shifting toward the poor in developing countries, interventions need to be evaluated for how well they succeed in actually reaching the poor. This remains a formidable challenge of health interventions more broadly (Gwatkin *et al.*, 2005).

### ***Globalization and health***

According to WHO (2002b), the growing concentration and power of large corporations, the ease of the movement of capital, cheaper transport and communication and increasing integration of markets and regions, processes usually subsumed under the term globalization, have a critical role to play in the present and future generation of global health. Influential studies are beginning to draw attention to the impact of these processes on important influences on health such as the environment (McMichael, 2002), health systems (Price *et al.*, 2001), drug provision and tobacco consumption (Bettcher *et al.*, 2000). The findings of Chaloupka and Laixuthai (Bettcher *et al.*, 2000), showing an almost ten per cent increase in cigarette consumption in countries that were forced to open their markets to American cigarettes, is a pertinent example. More recently, Bettcher *et al.* (2003) demonstrate a positive relationship between trade liberalization and tobacco consumption, with the greatest correlation in low-income countries. [Ibid.]

**TABLE 4. TOP TEN TRANSNATIONAL CORPORATIONS IN FOOD MANUFACTURING AND PROCESSING BY TOTAL SALES IN 1998 (US\$ BILLIONS)**

	SALES	PROFITS	CHIEF PRODUCTS	EMPLOYEES
Philip Morris	56.11	6.31	Tobacco, cereals, beverages	152,000
Cargill	51.00	4.68	Cereals, seeds, oils, beverages	80,600
Unilever	50.06	7.94	Oils, dairy, beverages, meals	287,000
Nestlé	49.96	4.11	Beverages, cereals, infant food	225,808
Pepsico	20.92	1.49	Beverages, snacks	142,000
Sara Lee	20.01	-0.53	Meat and bakery	139,000
Coca-Cola	18.87	4.13	Beverages, foods	29,500
McDonalds	11.41	1.64	Restaurants	267,000

Source: Chopra (2002).

In the context of food systems globalization is nothing new. Trade in food has been documented since settled agriculture became the norm. This does not mean that the current phase is not qualitatively different. The sheer pace and scale of change is unprecedented. The global value of trading in food grew from US\$ 224 billion in 1972 to \$438 billion in 1998; food now constitutes 11% of global trade, a percentage higher than fuel (Pinstrup-Andersen & Babinard 2001). This increase has been accompanied the consolidation of agricultural and food companies into large transnational corporations (TNCs), see Table 4 [Chopra, 2002].

Drewnowski and Popkin (1997) suggest that the globalization of the human diet is very much a combined outcome of cultural sensory preferences coupled with the greater availability of cheap fats in the global economy and rapid social changes in the lower income world.

Thus the impact of the multinational company advertising on cultural change is a very important part of the dietary transition. Nestle and Coca Cola each spent over \$2.1 billion in advertisement in 2007 (Crain Communications Inc. and The Ad Age Group, 2008). This equals the full budget of the World Health Organization, which for the two years 2008-2009, was US\$4.2 billion organization-wide.<sup>7</sup>

In the context of globalization, Bornstein *et al.* (2008) therefore considers the current worldwide epidemic in obesity as a communicable rather than non-communicable process. Obesity may be defined as “socially-contagious”.<sup>8</sup> Recall further that companies have numerous techniques to target children and teens, suggesting that they are aiming to change soft drink and fast food consumption over the long term (Corinna Hawkes, 2002).

<sup>7</sup> Information read at <http://www.un.org/np/agencyprofile/profile.php?AgencyID=12> on 11/20/2009.

<sup>8</sup> Furthermore, real infectious agents are being identified that may cause obesity by central mechanisms or by modulating adipocyte function or at least by contributing to the chronic inflammatory milieu of the metabolic syndrome. Globalization may form a critical platform for these pathogens.

In linking the policies and processes of globalization with the nutrition transition, obesity and diet-related chronic diseases, Hawkes (2006) stresses the role of three major processes of market integration: (I) production and trade of agricultural goods; (II) foreign direct investment in food processing and retailing; and (III) global food advertising and promotion. She shows how specific policies implemented to advance the globalization agenda account in part for some recent trends in the global diet. Agricultural production and trade policies have enabled more vegetable oil consumption; policies on foreign direct investment have facilitated higher consumption of highly-processed foods, as has global food marketing. These dietary outcomes also reflect the socioeconomic and cultural context in which these policies are operating.

Global spending in advertising by the top 100 advertisers, in measured media bought in 2007, was US\$11.006 billion in food, US\$3.762 billion in restaurants (such as McDonalds), US\$3.730 billion in soft drinks, and US\$1.598 billion in beer, wine and liquor. All of these are areas known to directly impact NCD. Their advertising budget of US\$20,096 billion is ten times that of the WHO. Advertising for the drug industry ran at US\$9.428 billion, also way beyond WHO's capacity to regulate. Advertising in personal care (US\$23.414 billion) and cleaners (US\$3.333 billion) could also impact health.<sup>9</sup>

In so far as combating NCD is a matter of people acquiring healthy living styles by acting according to accurate and truthful information, health organizations are at a clear disadvantage with respect to multinational corporations. For this reason Chopra and Darnton-Hill (2004) compare the smoking and obesity epidemics. Some of their policy suggestions for the obesity epidemic, that follow the experience of tobacco, are shown in Table 5.

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<sup>9</sup> See Crain Communications Inc. and The Ad Age Group (2008), page 7, for a table with the data.

**TABLE 5. STRATEGIES USED AGAINST THE TOBACCO INDUSTRY AND POSSIBLE SIMILAR RESPONSES AGAINST FOOD INDUSTRY (CHOPRA AND DARTON-HILL, 2004)**

<b>TOBACCO STRATEGY</b>	<b>POSSIBLE ANALOGOUS RESPONSE TO PROMOTE HEALTHIER DIETS</b>
Accumulate and publicize evidence of health effects	Reports and advice to government from national expert groups (such as medical associations); multilateral organizations such as WHO take lead on identifying avoidable health risks of continuing overconsumption of unhealthy diets and lack of physical activity
Exposure of industry advertising tactics	Release and dissemination of marketing strategies used to target young children; alternative sources of funds to support sports and similar events
Litigation	Parents could sue schools providing unhealthy diets; litigation against companies aggressively targeting young children
Labeling of cigarette packets	Health warnings on high fat foods and high sugar soft drinks
Taxing of cigarettes	Taxes on high sugar soft drinks and perhaps targeted high fat foods
Publicize the social, economic, and environmental impact of tobacco production	Campaigns by national, international, and non-governmental consumer groups; use of freedom of information disclosure; multilateral organizations such as WHO take lead on identifying, and naming, the effect of obesogenic environments
Increase awareness of role of industry in supporting researchers	Vigilance by peer reviewed journals, and other media, on noting industry links and possible conflicts of interest when publishing articles; increase publication of articles addressing the issue
Expose foreign governments that are enforcing the introduction and marketing of new brands of cigarettes into a country	Exposure of the practice; pressure by consumer associations; use of World Trade Organization rules that are in place to protect public health

Source: Chopra and Darnton-Hill (2004).

According to Hawkes (2006), policies addressing poor diets, obesity and diet-related chronic diseases must take into account the influence of the policies and processes of global market integration on long-term dietary change, looking beyond the health sector as narrowly defined, and entering into debates and policy arenas dealt with by other sectors and disciplines. They must also address, in some way, the behavior of Transnational Food Corporations (TFCs), preferably by creating incentives to improve “healthy” market functioning. Finally, they need to focus on the promotion of healthy diets over the long-term among groups of low SES. Policies that focus on diet quality are important for addressing problems across the whole nutritional spectrum.

Globalization has thus introduced a new economic dimension to the analysis of the mutual impact between health and growth that goes beyond the first generation of analysis represented by Bloom and Canning's (2008) summary referred to above.

### *Perspectives in health and economic growth*

The previous sections have summarized the causes, prevalence and costs of NCD, the macro and long-term economic impacts of health in general, several studies on the macro and long-term economic consequences of NCD, and the impact of globalization on the nutrition transition and NCD.

Amongst the most striking results of the literature reviewed above, towards which consensus is gravitating, is that much of the long-term health improvement was due to inexpensive health inputs resulting from innovations, many of these outside of the health sector, and their adoption. This process did not, however, occur simultaneously in all countries, but lagged behind in less developed countries. The question arises, why are there so many examples of health deficiencies in poor populations, both in lagging countries and in the developed world, for which treatment is available and inexpensive, yet does not occur?

This is a very relevant question for NCD. The reason is that the causes for these diseases are known and prevention relatively inexpensive. It is clear that NCD produce large disease and cost burdens, whose elimination will contribute to well-being and economic growth. What needs to be done for preventive measures to be applied? More generally, given the complexity of health issues in general and NCD in particular, what can make health systems responsive to population needs?

Perhaps these are the crucial questions that must be examined to deal with the heavy burden of NCD. They also refer to the health expenditures that have the highest macroeconomic and long-term impact, since they are the most cost effective.

To examine these questions we first examine the role of institutions and of dynamic poverty traps in the relation between health and economic growth.

#### *Institutions*

Institutions have been proposed as one of the main ultimate causes of economic growth (Acemoglu, Johnson and Robinson, 2005). Economic institutions determine the incentives of and the constraints on economic actors, and shape economic outcomes. As such, they are social decisions, chosen for their consequences. Because different groups and individuals typically benefit from different economic institutions, there is generally a conflict over these social choices, ultimately resolved in favor of groups with greater political power. The distribution of political power in society is in turn

determined by political institutions and the distribution of resources. Political institutions allocate de jure political power, while groups with greater economic might typically possess greater de facto political power. [Ibid.]

Property rights, control of corruption and executive privilege and the state of law all form part of what is referred to here as institutions. These are often emphasized for their impact on generating a vibrant and efficient market economy.<sup>10</sup> Now, what the market economy produces are *private* goods. The theory shows that when it is perfectly competitive and under a series of assumptions such as perfect information the production of private goods is Pareto efficient.

What about the production of public goods, and what about distribution? Here what we need is another kind of institutions. By and large, the method that has worked in developed Western societies has been to have a democratic government that levies taxes and decides on how to spend them in a series of government programs dedicated in principle to producing public goods and to redistributing income.

In particular, health is strongly involved with the dimension of public goods. We have seen how Jack and Lewis (2009) find health institution quality to be central to the effectiveness of efforts to enhance public health investments in medical care.

An essential query here is therefore, what is the institutional kernel that can simultaneously produce the appropriate institutional context for the production of both public and private goods? The property rights and laws that simultaneously defend private property and democracy in countries such as the US and Britain do not necessarily transplant easily to underdeveloped countries, for example when property rights work in favor of the politically powerful, and no further measures are taken.

One can ask further, is an institutional kernel promoting both public and private goods a common “third” cause of both health and wealth improvements across countries? If such an institutional kernel matters to promote both health improvements and economic growth, this could partly explain Acemoglu and Johnson’s (2007) finding that while the wave of international health innovations and improvements that began in the 1940s significantly increased life expectancy and population (for a sample of 59 countries, from Western Europe, Oceania, the Americas, and Asia), life expectancy increases themselves had a small effect on GDP growth.

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<sup>10</sup> Acemoglu, Robinson and Johnson (2002) argue that Europeans introduced institutions both at home and in some of their colonies that encouraged investment and led to economic growth. On a closer examination of their regressions, Richter, Kelleher and Timmons (2008) note that their instrumented institutional variable had a persistent but relatively low growth rate impact of 0.18% per year. Finite lived leaders may have preferred the private benefits of expropriation to modest short-run increases in their country's growth rate, despite the clear long-run benefits of improving institutional quality.

### *Dynamic poverty traps*

The existence of dynamic poverty traps provides an alternative explanation to the persistence of income and human development differences between countries.

A dynamic poverty trap is one in which different sets of countries evolve along distinct trajectories of economic growth, at perhaps different growth rates, or different subsets of a country's population evolve along distinct or stratified intergenerational trajectories of wellbeing, including income, health, education and consumption. These traps are dynamic in that they admit rates of growth and divergence. Countries or subpopulations in lower trajectories may remain several generations behind those in higher trajectories.

Examples of such dynamic poverty traps for countries are given by models including long-term economic forces of technological change and admitting multiple steady states that arise due to innovation externalities that generate a *disadvantage* of backwardness under the conditions of globalization, both under British hegemony in the period 1820-1914 and in the current wave of globalization (Mayer-Foulkes, 2008a, 2008b). These models represent development, semi-development, and stagnation at the country level as distinct dynamical attractors generated since the Great Divergence, that the current model of globalization tends to stabilize in their current state.<sup>11</sup> Only a few countries manage to cross the boundaries between these attractors (Mayer-Foulkes, 2010). When they do so they experience miracle growth, at least 5% a year for two decades, and emerge from underdevelopment to development, as was the case for Denmark, Sweden, Italy, Japan, South Korea, Taiwan, Hong Kong, Singapore, Ireland, Germany in the 19th century, Western Germany after the War, Cyprus, Iceland, Spain, Malta, Portugal and Israel.

Country membership in these attractors depends on initial conditions, country size, institutional quality, geography, openness and so on. A model and empirical corroboration of such stratified and divergent economic growth and human development that includes the impact of economic geography and endogenously improving institutions is constructed by Mayer-Foulkes (2009a).

Human development can also be subject to a dynamic poverty trap in which whole segments of the population lag behind. This is shown empirically for Mexico (Mayer-Foulkes, 2008c), and shown to be possible under globalization in Mayer-Foulkes (2010).

Trapped populations have fewer resources and knowledge and fail to access even inexpensive health inputs. They also have less political voice, so health systems tend to be less responsive to them. They are particularly vulnerable to the risk factors of NCD.

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<sup>11</sup> Mayer-Foulkes and Nunnenkamp (2009) show that, on average, FDI contributes to convergence in developed countries and divergence in underdeveloped countries.



These models of development and underdevelopment can also explain the long-term fundamentals of the 2008 economic crisis (Mayer-Foulkes, 2009b). The argument is that cheap-factor-seeking foreign direct investment generated high profits (in 2007, of the same magnitude as the US trade deficit) that generated a global savings glut (Bernanke, 2005) that led to a long-term decline in interest rates. In the context of deregulation this led to a housing bubble and a financial meltdown.

### *Global institutions*

Our discussion in a sense includes the existence of dynamic poverty traps as an ultimate cause of differences in health and income between countries, in addition to institutions, geography and trade.

These dynamic poverty traps are caused by externalities, market incompleteness, and so on, and country membership in high and low steady states is influenced by institutions, geography, trade and initial levels.

What this implies is that there is an even stronger need for institutions and government than a single steady state theory would warrant, because effective policy is needed for countries to change from a low to a high steady state. Since low steady state membership already involves a selection towards lower institutional quality, and because institutions also develop endogenously, it is even harder for underdeveloped countries to escape their lower steady state than it would be if things were equal. The policies that are needed must meet a high standard: to be able to counteract the market failures and externalities that lead to the existence of poverty traps in the first place.

Globalization has added a new element to the panorama. Our discussion of the nutrition transition has revealed the intimate link between the actions of TNCs, the nutrition transition, tobacco and alcohol consumption, and NCD. Taking preventive action at the source implies regulating the actions of transnational corporations. Since this is beyond the power of most individual countries, what it requires is an international institutional framework.

Thus the first corollary is that *the required institutional framework is now international*.

The same conclusion is reached in an analysis of the long term fundamentals of the current economic crisis (Mayer-Foulkes, 2009b). What is taking place is that there is an imbalance between markets and governance. The savings glut was in effect an investment shortfall. This investment shortfall is due at least in part to an insufficient provision of the publicly provided complements to private investment, such as institutions, infrastructure, education, health and science.

It is not hard to understand that, by and large, private and public goods<sup>12</sup> must be produced in proportion to each other. With this purpose, private production is taxed, and governments produce public goods.<sup>13</sup> Of course, this must include transnational corporations, which produce an ever higher proportion of income. Foreign affiliates of transnational corporations now produce a sizable proportion of the world product, at least 11%.<sup>14</sup> However, foreign affiliates evade taxes by benefiting from the lawless no man's land that exists in between nations. Mayer-Foulkes (2009b) discusses this tax loophole and proposes a harmonization of corporate taxes that is a strategic proposal in that it addresses a wide set of problems simultaneously.

First, it directly addresses the challenge of establishing global governance. The reason is that governance is based on taxation. Harmonizing taxes for TNCs represents an opportunity for all governments to pursue a common interest to increase public funding and at the same time to raise the global levels of cooperation, order and law. This funding can be used for education, health, infrastructure, institutions, science and innovation.

Second, it removes a subsidy for international at the expense of local production, therefore raising the efficiency of the global economy and reducing the competition that labor in advanced countries faces from abroad. At the same time it transfers income from corporate profits to the poor, rewarding cheap labor with the resources needed for economic development.

Third, it can establish the groundwork in cooperation and the funding for producing global public goods such as global coordination for the transition towards green energy and global climate control. This global cooperation can also serve to regulate TNCs that produce negative externalities such as a deficient nutrition transition.

The motivation for regulating TNCs also arises from health imperatives such as preventing the huge burden of NCD that the deficient nutrition transition is bringing about.

This imperative is not limited to the underdeveloped countries. The power of TNCs that are free to operate globally is in fact threatening the institutional framework of countries like the US, which have been held up as institutionally exemplar. The huge burden of NCD is equally present in the US, and has been equally caused by fast foods, tobacco, alcohol, and low exercise. These fast foods have been equally pushed by corporate advertizing.

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<sup>12</sup> For simplicity let us include equity, which may require transfers, as a public good.

<sup>13</sup> In fact, imperatives such as global climate stability and environmental sustainability may require the production of an even higher proportion of public goods than in previous historical times.

<sup>14</sup> See Table I.4 and page 4 of UNCTAD (2008) for these figures. However, the statistics mentioned in the report are inconsistent. For 2007, Figure I.2 shows a profit level of about \$900 billion, a profitability of about 7%, and defines profitability as the ratio of net income (profits before interest and taxes) to sales. The text mentions profits of \$1,100 billion on the same page, and total sales of \$31,197 in Table I.4, which would yield a profitability of 3.53%. Table I.18 shows that the average returns on sales is 10.8%. This would yield aggregate gross profits of US\$3,369 billion.

Just food advertising in the US is between US\$2<sup>15</sup> and US\$10 billion a year (Brownell and Ludwig, 2002), while the cost of NCD was approximately 6.8%<sup>16</sup> of GDP, or US\$939 billion.

To get a clearer picture of the political aspects, note that in the current campaign for health reform in the US, pharmaceutical companies seeking to hold their market power and avoid government competition are spending 41% more than last year,<sup>17</sup> when they spent about US\$230 million.<sup>18</sup> In 2007 their lobbying was worth US\$225 million, compared to advertising worth maybe US\$6.5 billion.<sup>19</sup> This means that the drug industry spent on obtaining the favor of its regulator, the US congress, approximately 3.5% of what it spent on advertizing: not much! The food and beverage industry lobbied even less, \$26 million in 2009 (the highest ever for them).

The provision of public goods by the US democracy has weakened as a result of liberalization and globalization. The distortion of democracy that the figures shown above represent occurs in all walks of life. Deceptive scientific research funded by corporations has clouded the implications of global warming for years (Gelbspan, 1997, 2005). The same occurred in the debate over the dangers of smoking. Currently oil and coal lobbying systematically oppose green energy. Note also the drug industry might lobby against the prevention of chronic disease, since this would reduce the consumption of pharmaceuticals.<sup>20</sup>

In analyzing the present regulation crisis, Acemoglu (2009) mentions the financial and informational power of Wall Street, drawing a parallel to crony capitalism in Asia. Building global institutions is as urgent to the US as it is to the rest of the world.

### *Local institutions*

In the previous subsection we showed that a global institutional framework is essential to put preventive measures in place for NCD. Local efforts will always tend to fall short. However, this does not mean that local institutions are not crucial for health and economic growth as well.

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<sup>15</sup> Of the US\$11 billion spent worldwide, I estimate 20% is spent in the US, the weighted average proportion of what Unilever, Nestle and Coca Cola spend in the US.

<sup>16</sup> This proportion of GDP is taken from Suhrcke *et al.*, 2006, Table A 7, web annex, and corresponds to 2000-2004.

<sup>17</sup> Read at <http://industry.bnet.com/pharma/10002798/pharma-lobbying-money-whos-spending-what-fighting-healthcare-reform/> on 11/20/2009.

<sup>18</sup> Read at <http://www.opensecrets.org/news/2009/06/drug-makers-cash-in-on-lobbyin.html> on 11/20/2009.

<sup>19</sup> Of the US\$9.4 billion spent worldwide, I estimate 69.9% is spent in the US, the weighted average proportion of what Pfizer, Bayer and Novartis spend in the US.

<sup>20</sup> The top lobbying industries in 2007 were Pharmaceuticals/Health Products, Insurance, Computers/Internet, Electric Utilities, Hospitals/Nursing Homes, Education, Securities & Investment, Misc Manufacturing & Distributing, Business Associations, Oil & Gas, Real Estate, TV/Movies/Music, Civil Servants/Public Officials, Air Transport, Automotive, Health Professionals, Telecom Services & Equipment, Misc Issues, Health Services/HMOs, Human Rights, see <http://www.opensecrets.org/lobby/top.php?showYear=2007&indexType=i>, read 11/21/2009.

But our discussion has hopefully clarified that institutions are needed that strengthen the provision of both public and private goods. Strengthening market institutions will strengthen the provision of private goods. However, the power of the population to obtain public goods must also be strengthened. These two pursuits are both necessary for generating welfare.

It can be expected that in a better institutional framework for producing both public and private goods, when inexpensive preventive health measures are known, they will be applied, and health systems will be more responsive to population needs.

### *Research needed*

While the burden of NCD is, already heavy, it is predictable that it will continue at the same levels or worse. Because of the heavy health and economic burdens that these epidemics represent, policies to be applied can be planned to include their econometric and epidemiological analysis. This analysis will in turn benefit from the earliest possible presence of databases designed to evaluate them.

These databases can be designed to carry out joint analyses of intervention cost-effectiveness, microeconomic impacts, and macroeconomic aspects of NCD risk factors, prevalence and treatment.

Suhrcke *et al.* (2006) list a series of criteria that these efforts can meet, to which we have added institutional factors, economic geographic factors, responsibility and regulation.

1. Databases must include chronic disease risk factors, prevalence, access and treatment indicators in microeconomic household surveys including institutional and economic geography factors, to be able to:
  - a. Assess and explain the within-country distribution of NCD risk factors by socioeconomic status, particularly in low- and middle-income countries.
  - b. Assess the microeconomic impact of NCD, in particular if longitudinal datasets become increasingly available.
  - c. Assess responsibility in the supply of consumer goods and in labor and transportation conditions in relation to NCD risk factors and prevalence.
2. Design cost-effectiveness analysis databases for interventions to prevent NCD, including institutional factors associated with health facilities, localities and regions, to be able to:
  - d. Assess access to treatment for the full range of socioeconomic status.

3. Design data bases for a policy, macroeconomic and long-term analysis, including as far as possible the factors driving economic growth, as well as fiscal and government policy factors, to be able to:
  - e. Evaluate macroeconomic losses incurred by NCD with broader measures than per-capita income that explicitly recognize that the 'true' purpose of economic activity is to maximize social welfare, capacities and so on.
  - f. Carry out a thorough examination of potential market and government failures so as to evaluate policy interventions.
  - g. Evaluate the impact of regulation and policy on risk factors of NCD.

This research effort would benefit from a continent-wide coordination rendering cross country analysis and comparison feasible.

### ***Action needed***

As noted above, WHO researchers on the nutrition transition list a whole series of negative externalities due to the actions of large TNCs that form part of the nutrition transition. Chopra and Darnton-Hill (2004) suggest legal responses against food industry (Table 5), based on the experience against the tobacco industry.

With respect to NCD risk factors, why wait for the damage to be done?

There is already an international treaty against tobacco. The WHO Framework Convention on Tobacco Control (WHO FCTC) is the first treaty negotiated under the auspices of the World Health Organization. It was adopted by the World Health Assembly on 21 May 2003 and entered into force on 27 February 2005. It has since become one of the most widely embraced treaties in UN history and, as of today, has already 167 Parties.<sup>21</sup>

A similar stance is necessary with respect to NCD risk factors. One possibility could be to put transnational food corporations on notice for negligence and for unfair and deceptive advertising. Another possibility would be to include a health insurance premium in the price of unhealthy food sold. Taxes could also be levied to fund the necessary information campaigns, for example on what a good diet is, and for research on already existing issues.

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<sup>21</sup> Cited from <http://www.who.int/fctc/en/index.html>. See also <http://www.globalissues.org/article/533/tobacco>, both read 22/11/2009.

## Conclusions

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Non-communicable chronic diseases (NCDs) are amongst the principal burdens of disease in both developed and underdeveloped countries. The main causes and treatments for these illnesses are relatively well known, and they are well known to have many complex links with the economy. Their detailed study has only just begun in some regions of the world but is almost completely absent for the Americas. Nevertheless, it can be expected that the micro and macroeconomic interlinkages of NCD are complex and hard to disentangle econometrically. The sheer burden on the working and aged population implies of itself that strong impacts on labor, saving and investment, as well as an increased human capital depreciation can be expected, and that the damage and losses suffered by the young will imply cognitive and human capital accumulation losses. These will all impact long-term economic growth.

It is clearly a research priority to quantify these impacts so as to identify the most crucial aspects of the impact of NCD for the countries of the Americas.

An integrated database initiative involving data on cost-effectiveness, microeconomic, macroeconomic and long-term aspects, applied in coordination with policy and across countries, and ensuring continuity with previous data efforts could be the most effective.

However, the current world economy moves very quickly, and in the context of globalization many changes are occurring at a very fast pace. These include changes in economic life including migration, occupation and technology, and changes in lifestyle including the nutrition transition, environmental issues and so on. These changes often occur faster than their rigorous analysis. An example is the literature on economic growth in general and on the interaction of health and economic growth in particular. Neither has reached a full consensus on the main issues. Thus there is room for suggesting policies with flexible strategies.

One such strategic set of issues is implementing policies to develop a global institutional framework based on international cooperation that can in turn help develop country specific institutional frameworks to promote the control of NCD risk factors as well as health and economic growth in general. Indeed, strong institutions supporting the supply of both public and private goods are a common factor of both health and economic growth—a theme that itself requires further research.

In particular, developing legal mechanisms to slow the negative impact of the deficient nutrition transition could be a step in that direction.

In the context of globalization, an international institutional framework is urgently needed to balance markets with governance, to hold TNCs

responsible for their impact, and to tax them so they carry their fair share of social weight.

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