

APPENDIX 1

The Basis for Public Intervention in the Control of Noncommunicable Diseases

This appendix contains additional background, mostly of a technical nature, on topics covered in chapters 1 and 2.

Accelerated Mortality Reduction Scenario for Noncommunicable Diseases

The World Health Organization's (WHO's) 2002–30 burden of disease projections are based on historical trends that may or may not persist in the future. As noted in chapter 1, if a wide range of noncommunicable disease (NCD) interventions is successfully adopted in the years ahead, more rapid progress in addressing NCD-related morbidity and mortality may be achieved. What would be a feasible target for NCD mortality reduction? This section provides some additional background to the scenario presented in the main text.

Figure 1.4 showed the implications of doubling historical rates of NCD mortality reduction worldwide during 2005–15. That is, it doubled historical annual decreases in age- and gender-specific NCD mortality rates. The only exception was for males aged 70 and older, for which the baseline projection is a 0.5 percent annual increase in mortality because

of strong aging trends. As doubling this positive value would imply a deteriorating trend, the scenario instead incorporates a 0.5 percent annual decrease in mortality for this group, which is close to the doubled rate for females aged 70 and older. Figure A1.1 shows the annual decreases in age- and gender-specific NCD mortality rates in the baseline (that is, historical trends) and doubling scenarios. For information, the figure also includes the additional 2 percent scenario contained in Strong and others (2005) and advocated by WHO (2005a). That scenario subtracted an additional two percentage points from the historical trends.

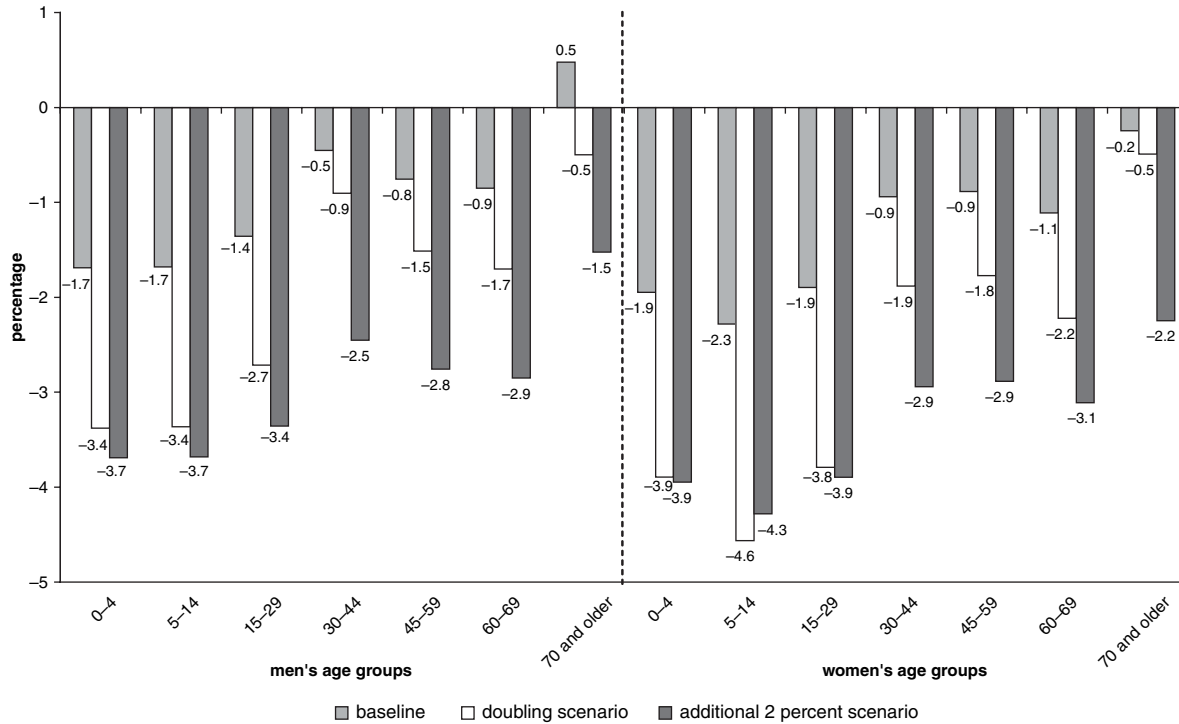
As noted in the main text, the best-case scenario achieved historically over sustained periods of time has been the 3 percent annual reductions achieved in cardiovascular disease mortality rates in several high-income countries. The doubling scenario was identified as a plausible compromise that significantly improves upon historical rates, but acknowledges that the experiences of high-income countries with excellent medical care are likely to be beyond the reach of most low- and middle-income countries in the immediate future. The doubling scenario would mean that roughly 13 million deaths could be averted for all age groups cumulatively over 2005–15. The corresponding number for the additional 2 percent scenario is 36 million.

As in Strong and others (2005), the estimates here use deaths instead of disability-adjusted life years as the unit of measurement. The calculation of disability-adjusted life year reductions associated with the scenario presented here was beyond the scope of this report, although this is not intended to diminish the potential gains in morbidity reduction that can be achieved through improved NCD outcomes.

Evidence on the Economic Burden of NCDs

The section on “Economic Rationale: Efficiency, Equity, and Budget Implications” in chapter 2 briefly described various findings in the literature on the economic burden of NCDs, particularly in the form of cost of illness studies, and the broader household impact of chronic disease and risk factors. Tables A1.1–A1.4 provide additional information. Note that the literature contains large gaps with regard to explicitly addressing NCDs and their economic burden. More commonly, the literature discusses health in general and leaves readers to infer the possible impact of NCDs in particular (see, for example, Gertler, Levine, and Ames 2004; Russell 2005). Closing this gap should be a priority for future research.

Figure A1.1. Annual Change in Age- and Gender-Specific NCD Death Rates, 2005–15, Alternative Scenarios



Source: Lopez and others 2006; Strong and others 2005; authors' calculations.

Table A1.1. Cost of Illness Studies for Noncommunicable Diseases and Risk Factors

<i>Economy or group of economies</i>	<i>Condition</i>	<i>Year of estimate</i>	<i>Total costs as a percentage of gross domestic product</i>	<i>Percentage of costs that are indirect</i>	<i>Source</i>
Australia	Tobacco use	1992	3.4	48.7	Collins and Lapsley 1996
Canada	Tobacco use	1991, 1992	1.4–2.2	—	Kaiserman 1997; Xie and others 1996
Canada	Obesity	2001	0.7	69.8	Katzmarzyk and Janssen 2004
China	Tobacco use	1989	1.5	74.4	Hu and Mao 2002
China	Obesity	1995	2.1	23.8	Popkin and others 2001
European Union–25	Cardiovascular disease	2003	1.9	42.8	British Heart Foundation (unweighted averages) ^a
European Union–25	Stroke	2003	0.5	61.4	British Heart Foundation (unweighted averages) ^a
Finland	Tobacco use	1995	0.8	—	Pekurinen 1999
France	Alcohol use	1997	1.4	56.5	Fenoglio, Parel, and Kopp 2003
France	Tobacco use	1997	1.1	49.9	Fenoglio, Parel, and Kopp 2003
Germany	Alcohol use	1995	1.1	—	Horch and Bergemann 2003
Germany	Obesity	1998	0.2	48.2	Sander and Bergemann 2003
Hungary	Tobacco use	1998, 2002	3.2–4.0	—	GKI Economic Research Institute 2004; Szilagyi 2004
India	Tobacco use	1990–91	0.02	—	Rath and Chaudry 1995
India	Obesity	1995	1.1	67.3	Popkin and others 2001
Korea, Rep. of	Tobacco use	1993–98	0.6–1.2	—	Kang and others 2003
Latin America (24-country average)	Diabetes	2000	3.5	72.4	Barcelo and others 2003
Mexico	Diabetes	1995	0.8	—	Villarreal-Rios and others 2002

Mexico	Hypertension	1999	0.7	—	Villarreal-Rios and others 2002
Myanmar	Tobacco use	1999	0.1	—	Kyaing 2003
Peru	Tobacco use	1997	0.77	—	Chaloupka and Jha 2000
Switzerland	Alcohol use	2001	0.1	—	Frei 2001
Switzerland	Obesity	2002	0.6	—	Schmid and others 2005
Taiwan, China	Tobacco use	2001	0.5	77.8	Yang and others 2005
Tanzania	Diabetes	1992	0.5	—	Chale and others 1992
United Kingdom	Cardiovascular disease	1999	1.0	75.5	Liu and others 2002
United States	Tobacco use	1997–2001	1.7	55.1	Centers for Disease Control and Prevention 2005
United States	Obesity	2000	1.2	47.9	Department of Health and Human Services 2001
United States	Depression	2000	0.8	68.6	Greenberg and others 2003
United States	Diabetes	2002	1.3	30.7	American Diabetes Association ^b 2006
United States	Cardiovascular disease	2006	3.5	36.1	American Heart Association 2006
United States	Hypertension	2006	0.6	25.2	American Heart Association 2006
United States	Stroke	2006	0.5	35.6	American Heart Association 2006
Venezuela, R. B. de	Tobacco use	1997	0.3	—	Pan American Sanitary Bureau 1998

Source: Suhrcke and others 2005.

Note: — = not available.

a. British Heart Foundation. "British Heart Foundation Statistics." British Heart Foundation. <http://www.heartstats.org/eucosts>. Date consulted: August 15, 2005.

b. American Diabetes Association. "Direct and Indirect Costs of Diabetes in the United States." American Diabetes Association. <http://www.diabetes.org/diabetes-statistics/costs-of-diabetes-in-us.jsp>. Date consulted: November 15, 2006.

Table A1.2. Estimates of the Annual Per Capita Burden of Cardiovascular Disease, Selected Countries, 2000*(U.S. dollars)*

<i>Country</i>	<i>Low estimate</i>	<i>High estimate</i>
Brazil	15.79	21.32
China	5.64	7.62
India	4.78	6.45
Portugal	57.64	77.82
Russia	69.34	93.61
South Africa	22.88	30.88
United States	205.91	277.98

Source: Leeder and others 2004.

Note: Estimates are in potentially productive years of life lost converted to per capita figures based on gross domestic product and population estimates from the World Bank. High estimates are based on alternative studies that used different measures of mortality to produce about a 30 percent increase in potentially productive years of life lost. See Zhou and others 2003.

Table A1.3. Estimated Prevalence of Diabetes among Those Aged 20–79 and Direct Medical Costs Attributable to Diabetes by Region, Selected Years

<i>Region</i>	<i>Prevalence (%)</i>		<i>Direct medical costs, 2003 (US\$ billions)</i>	
	<i>2003</i>	<i>2025</i>	<i>Low</i>	<i>High</i>
			<i>estimate</i>	<i>estimate</i>
Developing countries	4.5	5.9	12.3	23.1
East Asia and the Pacific	2.6	3.9	1.4	2.7
Europe and Central Asia	7.6	9.0	2.9	5.3
Latin America and the Caribbean	6.0	7.8	4.6	8.7
Middle East and North Africa	6.4	7.9	2.3	4.3
South Asia	5.9	7.7	0.8	1.6
Sub-Saharan Africa	2.4	2.8	0.3	0.5
Developed countries	7.8	9.2	116.4	217.8
World	5.1	6.3	128.7	240.9

Source: International Diabetes Federation 2003. Narayan and others 2006.

Extent to Which NCDs Matter to the Poor

Chapter 2 provided a brief overview of findings on the extent to which NCDs matter to the poor. This appendix includes graphical representations of the results described earlier (results are drawn primarily from Smith 2006b).

The earlier discussion pointed out that if the burden of disease is measured as total deaths, NCDs appear to be highly important to the world's poor (figure A1.2). NCDs account for about 75 percent or more of the disease burden in all country income groups except the poorest. Even in

Table A1.4. Household Impacts of Chronic Diseases and Risk Factors

<i>Country</i>	<i>Study</i>	<i>Year(s) of study</i>	<i>Condition</i>	<i>Adverse impact</i>
Bangladesh	Kibriya and others 1999	—	Diabetes	6–12 months wages; or US\$160 per year.
Bangladesh	Efroymson and others 2001	1991–96	Tobacco use	Male smokers spent 18 times more money on cigarettes than on health and 20 times more than on education, or twice as much as health, education, clothing, and housing combined. This is equivalent to 500 more calories for children's diet: If money were spent on food instead of tobacco, 10.5 million malnourished individuals could have an adequate diet, saving 350 children each day.
China	Hu and others 2005	2002	Tobacco use	The urban poor spend 6.6 percent of their household income on cigarettes.
Egypt	Nassar 2003	1995–2000	Tobacco use	5–6 percent of household income.
India	Shobhana and others 2000	—	Diabetes	15–25 percent of household income for treatment.
India	Bonu and others 2005	1995–96	Tobacco use	OR = 1.35 of borrowing and for distress selling during hospitalization for individuals who use tobacco. OR = 1.38 for nonusers who lived in household with smoking. OR = 1.51 for nonusers in households with both tobacco and alcohol use. Population-attributable risk for borrowing due to tobacco use = 16 percent.
India	Bonu and others 2004	1998–99	Tobacco use	Children are less likely to be immunized and more likely to have acute respiratory infection, to be malnourished, and to die before age one. OR = 1.21 less likely from smoking. OR = 1.15 more likely respiratory illness. OR = 1.21 more likely underweight. 7 percent of infant mortality is attributed to tobacco.
Indonesia	Adioetomo, Djutaharta, and Hendratno 2005	1999	Tobacco use	6.2 percent of household income.
Morocco	Aloui 2003	1998–99	Tobacco use	2.4 percent of household expenditure.

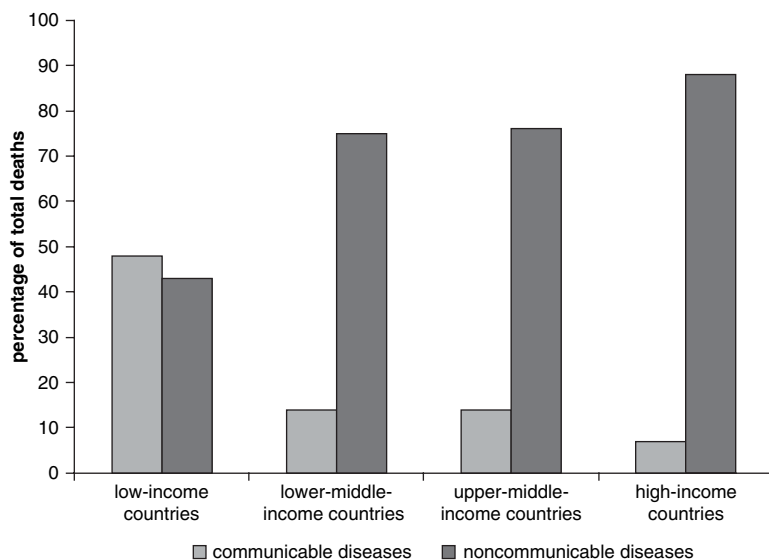
(continued)

Table A1.4. Household Impacts of Chronic Diseases and Risk Factors *(continued)*

<i>Country</i>	<i>Study</i>	<i>Year(s) of study</i>	<i>Condition</i>	<i>Adverse impact</i>
Myanmar	Kyaing 2003	1999	Tobacco use	2.7 percent of household expenditure; 4.4 percent for the lowest quintile.
Nepal	Karki, Pant, and Pande 2003	2001	Tobacco use	9.6 percent of lower household expenditure.
Russia	Suhrcke and others 2005	2002	Chronic disease	5.6 percent of lower median per capita income.
Tanzania	Neuhann and others 2001	1996–98	Diabetes	25 percent of minimum wage; costs exceed per capita health expenditure by a factor of 20.

Source: Suhrcke and others 2005.

Note: — = not available; OR = odds ratio.

Figure A1.2. Causes of Death by World Bank Income Group, 2005

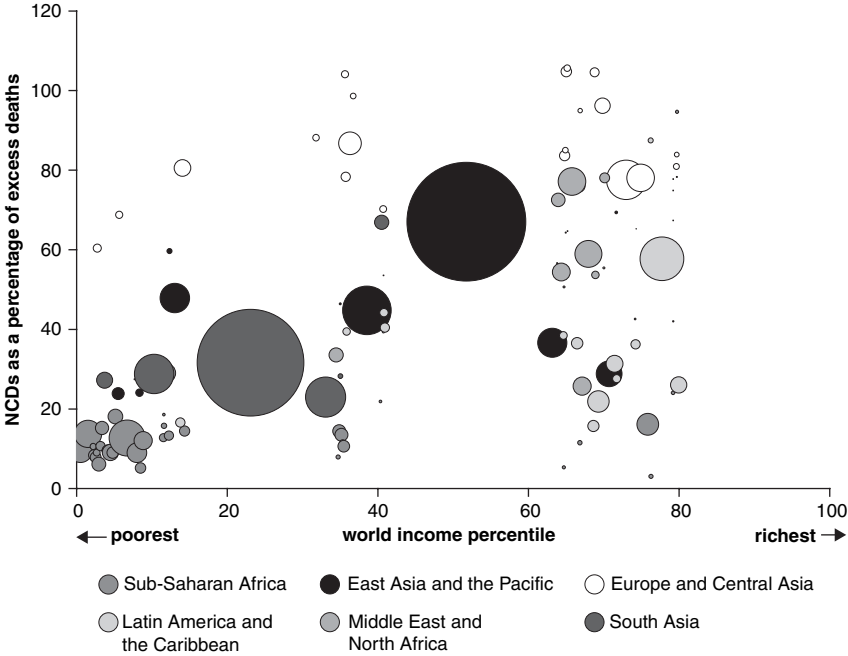
Source: Lopez and others 2006.

low-income countries, NCDs are projected to be the most important cause of death by 2015.

When total deaths are shown, the implicit counterfactual is that all deaths can be averted; however, as shown in figure A1.3, an alternative metric whereby NCDs appear less important is excess deaths. This yardstick addresses the gap between mortality in the world's richest countries and the rest of the world, and thus the implicit counterfactual is the mortality profile that prevails in the world's richest countries. Specifically, excess deaths are calculated by subtracting current deaths due to NCDs and other causes among the world's poorest 80 percent from the number of deaths that would occur if their current population structures had the same age- and gender-specific death rates that now prevail in the world's richest 20 percent (see Gwatkin and Guillot 2000; Smith 2006b).

As the figure indicates, in the world's two poorest quintiles—primarily countries in Africa and South Asia—NCDs account for less than a third of excess deaths. This is in contrast to total deaths, for which India, for example, has an almost equal balance between total deaths due to NCDs as opposed to other causes. The difference between total and excess deaths attributable to NCDs is particularly stark in several large

Figure A1.3. World Income Percentiles and NCDs as a Percentage of Excess Deaths by World Bank Region, 2005

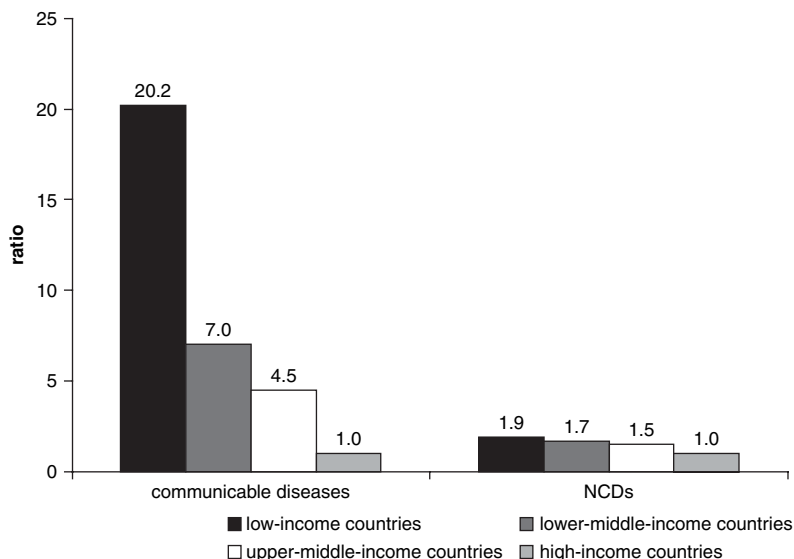


Source: Smith 2006b.

middle-income countries in the fourth quintile. The gap is 25 to 40 percentage points in Algeria, Colombia, Peru, Thailand, and the República Bolivariana de Venezuela. Many of the poor countries where NCDs are important when looking at excess deaths are in the Europe and Central Asia region. In China, NCDs account for about 77 percent of total deaths and 67 percent of excess deaths.

The reason for the gap between the NCD share of total deaths and of excess deaths is the relative size of the difference between underlying mortality rates of the rich and poor for NCDs compared with communicable diseases. As figure A1.4 shows, while the rich-poor gradient is significant for NCDs, it is far smaller than the equivalent gradient for communicable diseases. For NCDs the mortality rate is twice as high for the poor than for the rich; for communicable diseases the ratio is 20 to 1. Whether the data are presented for NCDs in isolation or together with communicable diseases can affect the interpretation of the importance of NCDs.

Figure A1.4. Ratio of Age-Standardized Death Rates in Low- and Middle-Income Countries to Those in High-Income Countries, 2005



Source: Authors' calculations based on Lopez and others 2006; Mathers and Loncar 2005.

Despite interest in the gradient between rich and poor *within* a country, fewer data are available on this issue. Some evidence suggests that for obesity, the income gradient “twists” as countries grow richer (Monteiro and others 2004). That is, in poorer countries, obesity is a greater problem for the rich, whereas in richer countries it is more relevant to the poor. This inflection typically appears to take place in the lower-middle-income bracket. This view is supported by evidence from the Europe and Central Asia region that suggests that within countries the poor have both a higher prevalence of NCDs and higher risk factors than the rich (Suhrcke and others forthcoming), but the relationship between risk factors and socioeconomic status appears to vary widely across different world regions (Blakely and others 2005).

Finally, in relation to the distribution of NCD risk factors across income groups, figure A1.5 shows how the presence of four risk factors—adult smoking prevalence, systolic blood pressure, cholesterol, and body mass index—varies across countries. Raw data are presented as standard deviations below (better than) or above (worse than) international averages. The figure indicates that in general, risk factors tend to

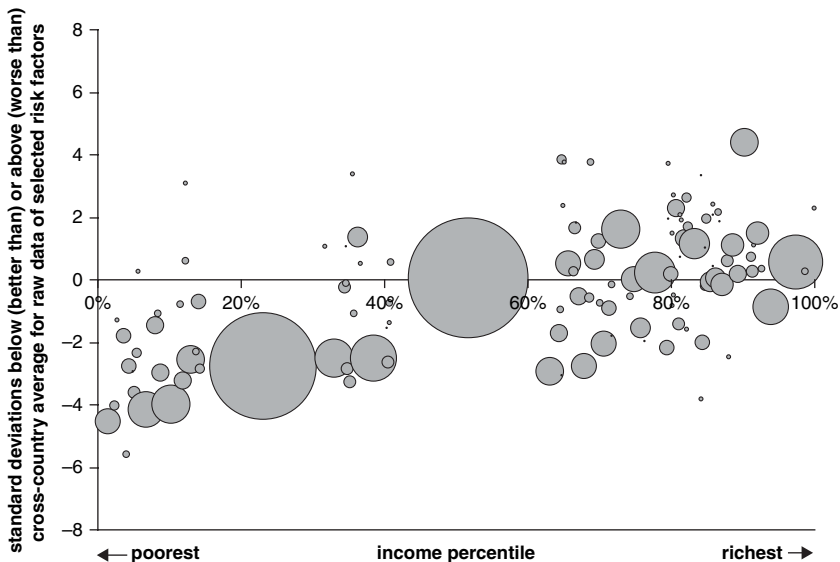
become worse as countries develop, reflecting the effects of urbanization, dietary changes, and other lifestyle issues. As these are raw data, and all four risk factors are weighted equally, the figure should not be interpreted as a measure of absolute or relative risk in the medical sense.¹

NCDs and Health Financing

A section in chapter 2 discussed the potential relationship between a larger NCD burden and health expenditures and highlighted upstream and downstream linkages with aging, technology adoption, insurance coverage, and economic growth. The key message was that the aging channel was likely to be a considerably less important determinant of health spending increases than the pressures on age-specific expenditures caused by the other factors. The section emphasized that greater demand for expensive technologies and insurance coverage, both of which could be expected to accompany a growing NCD burden, were key channels that merit policy attention.

Historical experience in a wide range of middle- and high-income countries suggests that age-specific expenditures often increase at a rate

Figure A1.5. Income Percentile and NCD Risk Factors

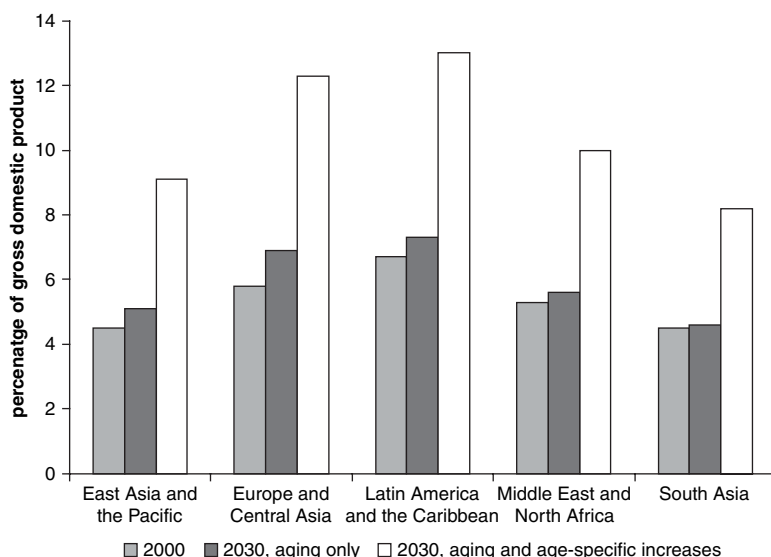


Source: Authors' calculations using data from Lopez and others 2006; WHO. "WHO Global InfoBase Online." WHO. <http://www.who.int/ncdsurveillance/infobase/web/InfoBaseCommon/>. Date consulted: November 14, 2006.

one to two percentage points faster than gross domestic product growth. Figure A1.6 illustrates that if age-specific expenditures rise at a rate 2 percentage points faster than gross domestic product because of the potential pressures identified earlier, the resulting increase in health spending would be much larger than the impact of aging alone. If the difference was 1 percentage point, the key message would remain. These estimates are approximate and are not intended as formal projections of the growth of health spending in the future (note that projections in World Bank 2006a are considered to be demographic shifts only). Nevertheless, they serve to emphasize the potential impact of NCDs on health spending through age-specific expenditure growth.

The positive message emerging from these estimates is that age-specific expenditures can be substantially influenced by policy, whereas aging cannot. Perhaps the most important policy instrument in this respect is the definition of nascent benefits packages, that is, whether these are provided in the form of social insurance schemes or tax-financed public provision. Decisions must be made about when, for example, anticholesterol drugs, CT scans, mammography, and so on become widely prescribed and applied within publicly funded financial protection mechanisms.

Figure A1.6. Potential Changes in Total Health Spending as a Percentage of Gross Domestic Product, Regional Averages



Source: Smith 2006a.

An important consideration will be how soon they can be afforded given the revenue stream. As the discussion of technology and insurance highlighted, these are the issues that are likely to play a central role in determining the impact of NCDs on health budgets. Specific approaches could include health technology assessments and the familiar reforms to patient cost sharing, provider payment mechanisms, possible insurance competition, and so on.

An additional policy issue relates to sustainability and the funding of future obligations. Many health financing mechanisms, including tax-financed systems and many social insurance schemes, are financed in a pay-as-you-go manner, in which current contributions fund current beneficiaries. However, in aging societies, revenues will fall while outlays increase, which can lead to insolvency. This highlights the importance of ensuring that health financing systems—whatever form they take—are sustainable over the long-term in the face of a rising burden of NCDs. Despite insufficient evidence to draw clear policy conclusions, medical savings accounts are another option that may be considered.²

Notes

- 1 The report team is engaged in ongoing work to develop a more accurate risk factor index.
- 2 These are personal savings accounts that are restricted to spending on medical care (see World Bank 2006a for a brief overview).