



HUMAN DEVELOPMENT UNIT

East Asia and Pacific Region

Toward a Healthy and Harmonious Life in China:

Stemming the Rising Tide of Non-Communicable Diseases



THE WORLD BANK

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ON THE COVER “Tai chi under the morning sun in Beijing.” Tai chi is a Chinese martial art practiced for defense training and health benefits. *Photo taken by Mr. Chunsheng Bai, Beijing, China, June 2, 2011.*

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Contents

<i>Foreword</i>	vii
<i>Acknowledgements</i>	ix
1 Introduction	1
2 Why This Report?	1
3 China's Rising NCD Epidemic: 2010–2030	2
3.1 <i>Explosive Increase in the Number of People with at Least One NCD</i>	2
3.2 <i>Morbidity Makes Up the Bulk of the Burden Attributable to NCDs and about 50 Percent of That Burden Occurs in People under 65</i>	3
3.3 <i>NCD Mortality Is Higher in China Than in Other Leading G-20 Countries</i>	3
4 Socioeconomic Determinants and Health Risk Factors for NCDs and Consequences In China	4
4.1 <i>Growing Urbanization and Changes in Behavioral and Biological Factors</i>	4
4.2 <i>Over 50 Percent of the Increased NCD Burden Is Preventable by Modifying Behavioral Risks</i>	4
4.3 <i>Rapid Population Aging May Increase China's NCD Burden by at Least 40 Percent by 2030 If the NCD Epidemic Is Not Controlled</i>	5
4.4 <i>NCDs Contribute to Inequalities in Health</i>	6
4.5 <i>Economic Impact of the NCD Burden</i>	7
5 Role for Government on NCDs Prevention and Control	8
5.1 <i>Economic Rationale Justifying Government Actions on NCDs</i>	8
5.2 <i>Confronting NCDs Effectively: A Litmus Test of China's Health Sector Reform</i>	8
6 Launching a Multisectoral Strategy for NCD Prevention and Control	10
6.1 <i>Suggestions for Comprehensive and Effective NCD Strategies in China</i>	10
6.2 <i>What Actions to Take? From Governmental Policy to Program Implementation</i>	11
6.3 <i>Addressing Information Gaps</i>	25
7 The Way Forward	26
References	27
Map IBRD 33387	33

FIGURES

Figure 1: Distribution of Disease Burden in China	1
Figure 2: Projected Number of NCD Cases (People Aged 40 Years or Over)	2
Figure 3: Total Years Lost due to NCD Morbidity per 1000 Population	3
Figure 4: Total Years of Life Lost from Death per 1000 Population.	3
Figure 5: Mortality (per 100,000) from Major NCDs in China and Selected Countries	3
Figure 6: Number of Adults above 40 Years Old with at Least One Risk Factor, 2010.	5
Figure 7: Population Growth and Share of Population Aged 65+ and 80+ in China, 2010–2050	5
Figure 8: The Effect of Aging on the Future Number of People with at Least One NCD by Gender	6
Figure 9: Three Scenarios of the CVD Working-age Mortality Rate, 2010–2040	7
Figure 10: Simulated per Capita GDP Path.	7
Figure 11: Diabetes Acute Complications Admission Rates, 2007.	9
Figure 12: Coverage of NCD Programs at County Level in China	9
Figure 13: Preventing and Controlling the NCD Tide.	11
Figure 14: Proposed Expansion Path for an NCD Prevention Package	16
Figure 15: Effective Approaches to Reducing Mortality from Coronary Heart Disease	17
Figure 16: Health Expenditure by Type of Health Care Service, 2007	18
Figure 17: Expenditures on CVD Treatment by Treatment Type, Tianjin, 2008	19
Figure 18: “Pyramid of Care” Model	19
Figure 19: “Chronic Care” Model.	19

TABLES

Table 1: NCDs and Care-seeking Behavior among Low-income Groups, 2008.	7
Table 2: Impact of a Change in Self-assessed Health on Hours Worked and Income in China.	8
Table 3: Characteristics of NCDs	9
Table 4: Examples of Inter-Institutional Coordination Mechanisms for Health-Related Activities in China	12
Table 5: Priority Interventions for NCDs	13
Table 6: Tobacco Prices and Taxation in BRICS Countries, 2009	13
Table 7: HiAP for NCD Prevention and Control	14
Table 8: Life Course Approach for NCD Prevention and Control.	21
Table 9: Examples of Financial Incentives for NCD Services	22

BOXES

Box 1: Projected Impact of Priority NCD Prevention Interventions in China	15
Box 2: Quality and Outcome Framework in the United Kingdom	23

Abbreviations

BMI	Body mass index	MI	Myocardial infarction
BP	Blood pressure	MOF	Ministry of Finance
BRICS	Brazil, Russia, India, China and South Africa	MOH	Ministry of Health
CDC	China Center for Disease Prevention and Control	NCD	Non-communicable disease
COPD	Chronic obstructive pulmonary disease	NICE	National Institute of Health and Clinical Excellence
CHD	Coronary heart disease	NPFPC	National Population and Family Planning Commission
CVD	Cardiovascular diseases	OECD	Organization for Economic Cooperation and Development
DALY	Disability-adjusted life year	OOP	Out of pocket expenditures
DM	Diabetes mellitus	P4P	Pay for performance
DMP	Disease management program	PPP	Purchasing power parity
DRG	Diagnostic-related groups	PHC	Primary health care
EHR	Electronic health records	QOF	Quality and outcome framework
EU	European Union	RF	Risk factor
FCTC	Framework Convention on Tobacco Control	UNDP	United Nations Development Program
GDP	Gross domestic product	VSL	Value of a statistical life
GP	General practitioner	WHO	World Health Organization
HALE	Healthy life expectancy	WTP	Willingness-to-pay
HIP	Health Impact Assessment		
HT	Hypertension		

Foreword

The scientific concept of development means putting people first and aiming at comprehensive, coordinated and sustainable development. To put people first, we should take people's interests as the starting point and foothold of all of our works, make continuous efforts to meet various needs of the people, and promote an overall development of the people.

17th National Congress of the Communist Party of China, 2007

In the late 1980s, China's Ministry of Health started to focus on the transition in the country's demographic and disease pattern. The Disease Prevention Project, launched in 1997, formalized the collaboration between the Government of China and the World Bank in fighting the rising tide of non-communicable diseases (NCDs). The project introduced for the first time innovative behavior risk factor surveillance surveys and health promotion for NCD disease prevention and control in China. Despite having achieved encouraging results in reducing the prevalence of smoking among the local population and improved institutional capacity in seven project cities and one province, these early successes could not be sustained, mainly because the health system was geared to combat only acute and infectious diseases and insufficiently prepared to tackle chronic diseases, including NCDs.

The new round of health sector reform in China presents an opportunity for a revitalized focus on NCDs that have become the most prominent threat to people's health in the country. Mutual benefits will likely derive from addressing NCDs and implementing health sector reform.

The Ministry of Health and the World Bank have jointly adopted a three-step approach with the aim of placing NCDs at the top of the Government's agenda. Step one is to raise awareness about NCDs among policy makers, particularly those outside the health sector, through a number of high-level conferences, seminars, and workshops. Step two is to implement further analytical studies to address key questions the Government has raised, particularly: (a) what should the Government do in response to the escalating NCD burden;

that is, what interventions should be included in NCD prevention and control programs, taking into account cost-effectiveness, equity, local relevance, and political and other predefined criteria? and (b) how can the proposed NCD prevention and control interventions be implemented? Step three is to put the proposals from Steps one and two into practice by developing and implementing a National Program for NCD Prevention and Control in China.

The present report is part of Step two. The evidence presented in the report strongly suggests that the coming 10 years are a critical time for China to prevent and control the threat posed to the country's prosperity by the growing NCD burden. The challenge ahead is significant, but with political commitment and support at the highest levels of government, both at the central and provincial levels, an effective multisectoral response could be developed, including the adoption of critical changes in the current health system building on ongoing health care organization, financing, and service delivery reforms in China. And, as noted in this report, a combination of population-based interventions and treatment targeted at NCD-related, high-risk groups, would reduce the NCD burden by 50 percent when implemented at full-scale. It is our sincere hope that this report will provide a useful reference to policy makers for moving forward a multisectoral agenda for NCD prevention and control over the short and medium term.

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1 INTRODUCTION

China's 12th Five-year Plan (2011–2015) aims to promote inclusive, equitable growth and development by placing an increased emphasis on human development (1).

Good health is an important component of human development, not only because it makes people's lives better, but also because having a healthy and long life enhances their ability to learn, acquire skills, and contribute to society (2). Indeed, good health is a fundamental right of every human being (3). Good health among a population can also enhance economic performance by improving labor productivity and reducing economic losses that arise from illnesses (4,5,6,7).

While China has had an enviable economic growth and development performance for more than 30 years, its human development has lagged behind the most advanced economies. China ranked 89th in the 2010 human development index prepared by the United Nations Development Program (UNDP) (8). The Chinese population's healthy life expectancy (HALE) at birth is about 10 years shorter than in some of the leading G-20 countries (9). China could narrow these gaps in human development vis-à-vis these countries by identifying the priority health issues affecting its population, mustering political support to overcome them, and implementing appropriate interventions, as described below.

China has made impressive gains in recent decades to control communicable diseases, ushering in an opportunity to confront non-communicable diseases (NCDs), its leading

cause of ill health, premature mortality, and disability. Taking advantage of this opportunity would enhance the health and welfare of China's population. Challenges abound, but with a carefully laid-out approach, China can lead the way globally in tackling NCDs and advance its social and economic development in the decades ahead.

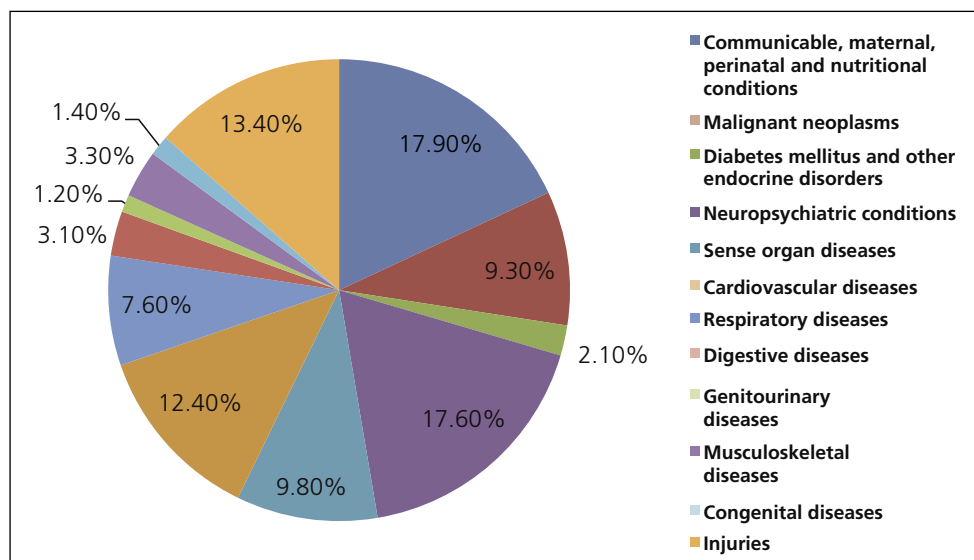
2 WHY THIS REPORT?

NCDs¹ are China's number one health threat. They account for over 80 percent of its 10.3 million annual deaths (10) and Figure 1 shows that they contribute to 68.6 percent of the total disease burden (11). The main NCDs in China are cardiovascular diseases (CVDs), diabetes mellitus (DM), chronic obstructive pulmonary diseases (COPDs), and lung cancer. These conditions account for a significant share of the total NCD burden in China and share common, amendable behavioral and biological risk factors.

In 2010 and again in 2011, the World Economic Forum singled out NCDs as a leading risk to the global economy (12) due to their high likelihood of occurrence and their huge potential to cause severe economic loss. The Forum recommended that governments mount a serious policy and programmatic response to this economic and social development risk.

1 NCDs are a set of chronic diseases, including cardiovascular disease, cancers, chronic respiratory diseases, and diabetes, characterized by a long latency period, prolonged clinical course and debilitating manifestations.

Figure 1: Distribution of Disease Burden in China



Source: WHO, Burden of Disease Study, 2009.

As is discussed herein, there is a substantial *avoidable* economic burden associated with NCDs. For example, estimates for China done for this report indicate that the economic benefit of reducing CVD mortality by 1 percent per year over a 30-year period (2010–2040) could generate an economic value equivalent to 68 percent of China’s real gross domestic product (GDP) in 2010, more than US\$ 10.7 trillion (valued in purchasing power parity terms-PPP). However, if an effective response is not mounted in China to deal with NCDs, the disease burden posed by these conditions will aggravate the economic and social impact of the expected population explosion of older citizens and smaller workforce in China. And, a reduced ratio of healthy workers to sicker, older dependents, will certainly increase the odds of a future *economic slowdown and pose a significant social challenge in China*.

This report, prepared on the basis of assessments conducted by the World Bank in 2008–2010, outlines *why* the Government of China should pay priority attention to NCDs, articulates *what* would constitute an effective NCD response, and proposes *how* to operationalize the response over the medium

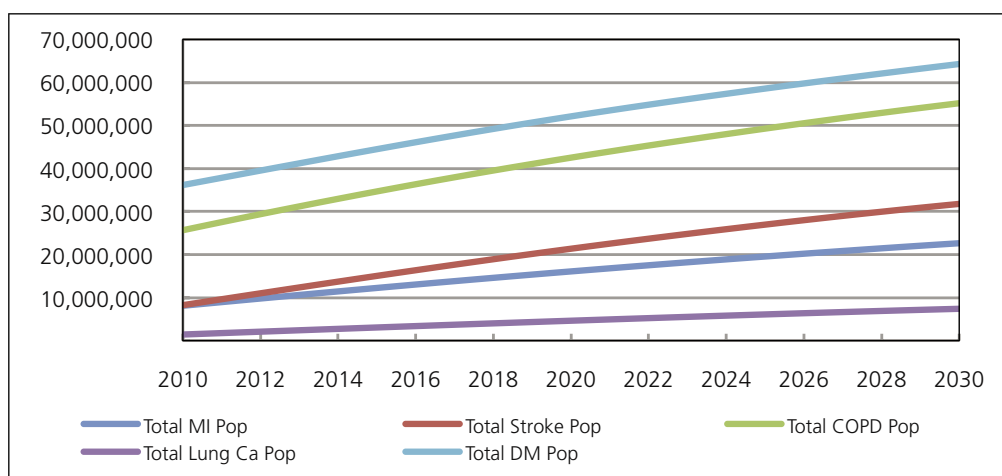
and longer terms. The findings and recommendations can inform and promote a broad dialogue toward the development of a multisectoral response to effectively address the growing burden of NCDs, including a better alignment of the health system with the population’s health needs. The report also advocates implementing “Health in All” policies and actions for a multisectoral response to NCDs in China to help achieve the ultimate goal of “harmonious” development and growth.

3 CHINA’S RISING NCD EPIDEMIC: 2010–2030

3.1 Explosive Increase in the Number of People with at Least One NCD

The number of NCD cases (CVDs [myocardial infarction and stroke], COPDs, DM, and lung cancer) among Chinese people over 40 will double or even triple over the next two decades, most of it during the next 10 years (Figure 2). Diabetes cases will be the most prevalent disease, while lung cancer cases will increase fivefold.

Figure 2: Projected Number of NCD Cases (People Aged 40 Years or Over)



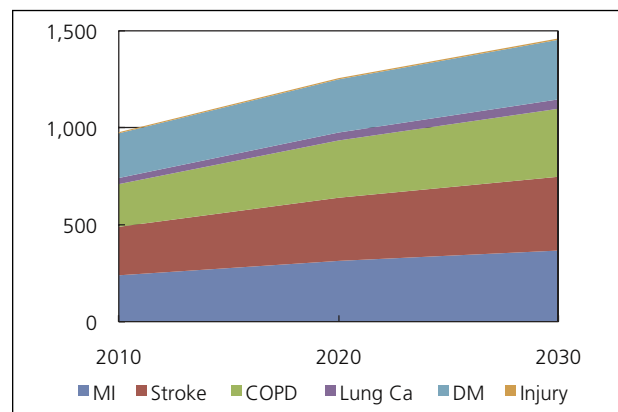
Estimated Number of Cases	2010	2020	2030
Myocardial infarction	8,101,001	16,081,550	22,630,244
Stroke	8,235,812	21,356,978	31,773,456
COPDs	25,658,483	42,527,240	55,174,104
Lung cancer	1,412,492	4,621,900	7,391,326
Diabetes mellitus	36,156,177	52,118,810	64,288,828
Total	79,563,965	136,706,478	181,257,958

Source: China Nutrition and Health Survey, 2002, China National NCD Risk Factor Surveillance, 2007

3.2 Morbidity Makes Up the Bulk of the Burden Attributable to NCDs and about 50 Percent of That Burden Occurs in People under 65

The burden of the four leading causes of ill health—MI, stroke, diabetes, and COPD—is expected to increase over 2010–2030 by almost 50 percent. More than 50 percent of the disease burden will be caused by CVDs (MI and stroke)

Figure 3: Total Years Lost due to NCD Morbidity per 1000 Population



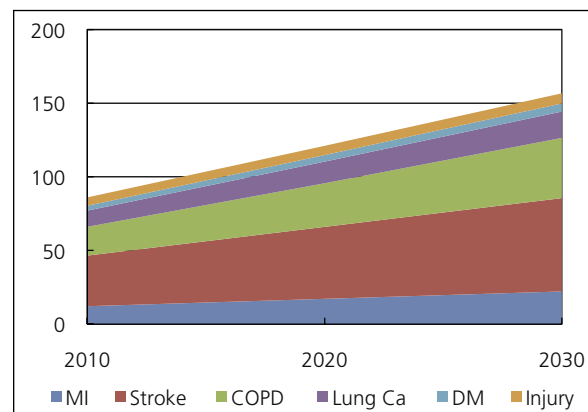
Source: Death Cause Surveillance from China Disease Surveillance Points, 2005, and China Nutrition and Health Survey, 2002, and China National NCD Risk Factor Surveillance, 2007.

3.3 NCD Mortality Is Higher in China Than in Other Leading G-20 Countries

China has very high mortality rates due to the major NCDs (Figure 5). Its mortality rate for stroke is four to six times

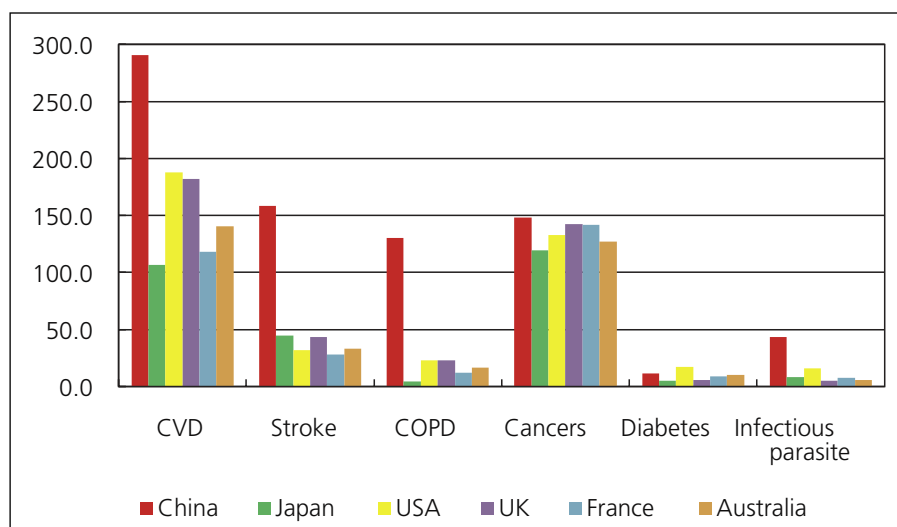
(Figure 3); stroke has the largest health and well-being impact on an individual. The burden due to deaths from these NCDs will increase by more than 80 percent (Figure 4). NCD-related morbidity accounts for more than 90 percent of the total NCD burden. About half of China's disease burden from NCDs occurs in people under 65. The growing NCD burden is ominous for the country as disability will likely be substantial in the years to come, including a significant and growing burden to the health system.

Figure 4: Total Years of Life Lost from Death per 1000 Population



higher than that in Japan, the United States, and France; for COPD it is about 30 times as high as in Japan; and its rates for cancers are also slightly higher than comparators. China's mortality rate for diabetes is lower than that in the United States, but higher than in Japan and the United Kingdom.

Figure 5: Mortality (per 100,000) from Major NCDs in China and Selected Countries



Source: Data and Statistics, World Health Organization (2004).

Note: Standardized according to world's population age structure in 2000.

4 SOCIOECONOMIC DETERMINANTS AND HEALTH RISK FACTORS FOR NCDs AND CONSEQUENCES IN CHINA

China's shifting disease profile is deeply rooted in the social, economic, and environmental changes the country has experienced in recent decades, particularly changes in exposure to and the magnitude of different health risk factors and, as will be discussed in the later sections of this report, limitations in the access to, use of, and effectiveness of public health and medical care services.

4.1 Growing Urbanization and Changes in Behavioral and Biological Factors

Internal migration, particularly to big cities, is altering the spatial distribution of China's population. The UNDP estimates that there will be more than 900 million people—60 percent of the total population—living in cities by 2030 (13). More than 250 million of the increased 350 million will be migrants. At least six out of the eight megacities—the country's "economic engines," Shanghai, Beijing, Tianjin, Shenzhen, Wuhan, Chongqing, Chengdu, and Guangzhou—are each projected to have a population well above 10 million.

While rising incomes, an improved food supply, and a variety of food products contributed to the significant reduction in malnutrition and improved health status in China over the past 20 years, changes in dietary patterns, unhealthy behaviors, and pollution associated with urbanization are now involved in the rapid increase of NCD-related risk factors, particularly among low-income groups and migrants (14,15).

Excessive salt intake, by far the most prevalent modifiable risk factor for NCDs in China, is greater than 12 g per day per person, twice the maximum intake recommended by WHO. China's high level of consumption has not changed for a decade.

At 54 percent, the prevalence of tobacco smoking among men aged 15–69 is among the highest in the world. Among daily smokers aged 20–34 years, 52.7 percent started smoking daily before age 20. Although the overall smoking level among females is relatively low at 2.1 percent, it has been increasing among young females. The highest rates of smoking are among males with lower education levels (63.2 percent for those with a secondary education versus 44 percent for those with college or above

education); among rural males (56.1 percent versus 49.2 percent among urban males); and among males in the western regions (60.1 percent versus 50.1 percent among males in the east region) (16).

The prevalence of hypertension, high blood glucose, overweight/obesity, and high blood cholesterol, which are related to dietary intake (e.g., high intake of saturated fat and salt and low intake of vegetables, fruits, and vegetable and fish oils) is lower than those in Organization of Economic Co-operation and Development (OECD) countries but has been increasing rapidly. The estimated prevalence of hypertension among adults over 18 increased from 7.5 percent in 1979 to 18.1 percent in 2004 (17). The prevalence of diabetes has increased alarmingly: from 0.67 percent in the 1980s, 2.5 percent in 1994, 5.5 percent in 2001, to 9.7 percent in 2007/08 (18).

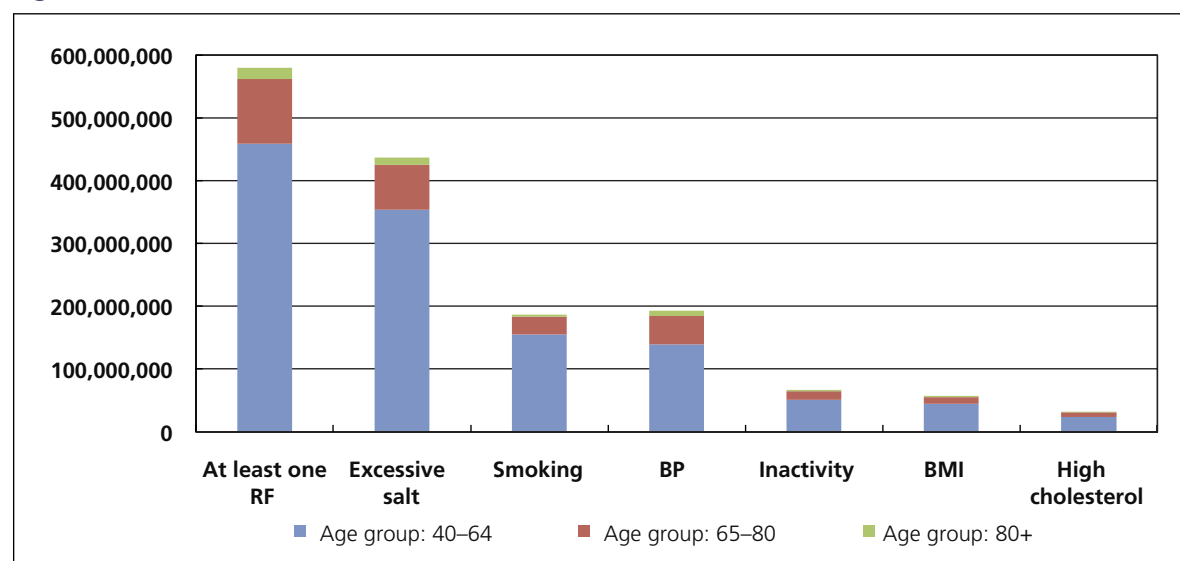
The overall prevalence of overweight and obesity increased from 1992 to 2002, by 38 percent and 81 percent, respectively, and reached 22.8 percent and 7.1 percent, respectively, in 2002 (19). It is estimated that about 200 million people in China are overweight or obese. Also, obesity and overweight have been increasing at an alarming rate among adolescents. The prevalence of overweight plus obesity in children/ adolescents aged 7 to 18 years old from urban centers reached 32.5 percent for boys and 17.6 percent for girls in the northern coastal cities: this rate is the same or even higher than that for the same groups in developed countries (20,21).

The fundamental drivers of the obesity epidemic in China have been reduced daily energy expenditure due to increased physical inactivity in cities and fat intake, particularly from growing consumption of fast foods and sugar-rich soft drinks, both of which have a high energy density. While traditional Chinese diets had only 15 percent fat and negligible sugar, between 1982 and 2002 average fat consumption in urban areas rose from 25 percent to 35 percent and from 14.3 percent to 27.7 percent in rural areas (22).

4.2 Over 50 Percent of the Increased NCD Burden Is Preventable by Modifying Behavioral Risks

At least 580 million Chinese were estimated to have at least one modifiable NCD-related risk factor in 2010 (Figure 6). Between 70 and 85 percent of these people were under age 65. By 2030, those risk factors—behavioral and nutritional—could contribute to a 50 percent increase in China's NCD burden if not controlled.

Figure 6: Number of Adults above 40 Years Old with at Least One Risk Factor, 2010



Source: China Nutrition and Health Survey, 2002, and China National NCD Risk Factor Surveillance, 2007.

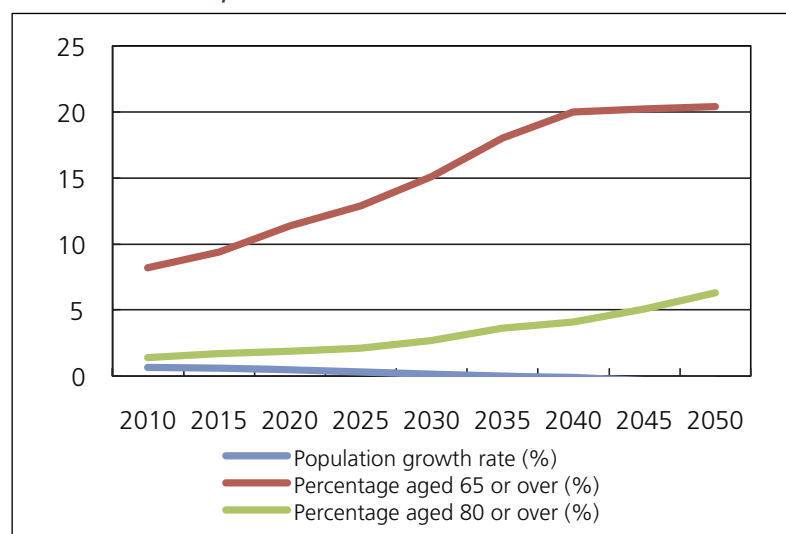
Note: "RF" means risk factor.

4.3 Rapid Population Aging May Increase China's NCD Burden by at Least 40 Percent by 2030 If the NCD Epidemic Is Not Controlled

The aging of a population—where the absolute number of adults and elderly grows—inevitably leads to a shift in the burden of disease from younger to older age groups and toward NCDs. The changes in the age structure of China's population have the following important features that suggest the potential geographic foci for mounting an effective response to NCDs in China:

1. The low fertility rate in the past several decades is the demographic driver shaping China's future population profile (23). By 2040, it is anticipated that China will have fewer people under the age of 50 and many more elderly in their 60s to 80s (24) (Figure 7). The cohort of the oldest-old (aged 80 plus) is forecast to increase from 12 million in 2000 to over 40 million in 2030. This population explosion of older citizens will result in about 240 million people 65 or older by 2030, up from 115 million today.

Figure 7: Population Growth and Share of Population Aged 65+ and 80+ in China, 2010–2050



Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, World Population Prospects: The 2008 Revision, <http://esa.un.org/unpp>.

2. China's rural areas are aging more rapidly than its cities, largely due to rural-to-urban migration. In 2008, the aged proportion (60 years old and above) was 9.4 percent in rural areas and 6.9 percent in urban areas, a gap of 2.4 percentage points. By 2030, the aged proportions in rural and urban areas will be 21.8 percent and 14.8 percent, respectively, a gap of 7.09 percentage points (25).
3. Chongqing, Sichuan, Anhui, Hunan, and Hubei have a relatively higher level of population aging in relation to their level of economic development (26).
4. Most of China's mega-cities (Shanghai, Beijing, Tianjin, Shenzhen, Wuhan, Chongqing, Chengdu, and Guangzhou) already have people 65 and older exceeding more than 10 percent of their populations, while the national average for this age group is 8.5 percent (27).

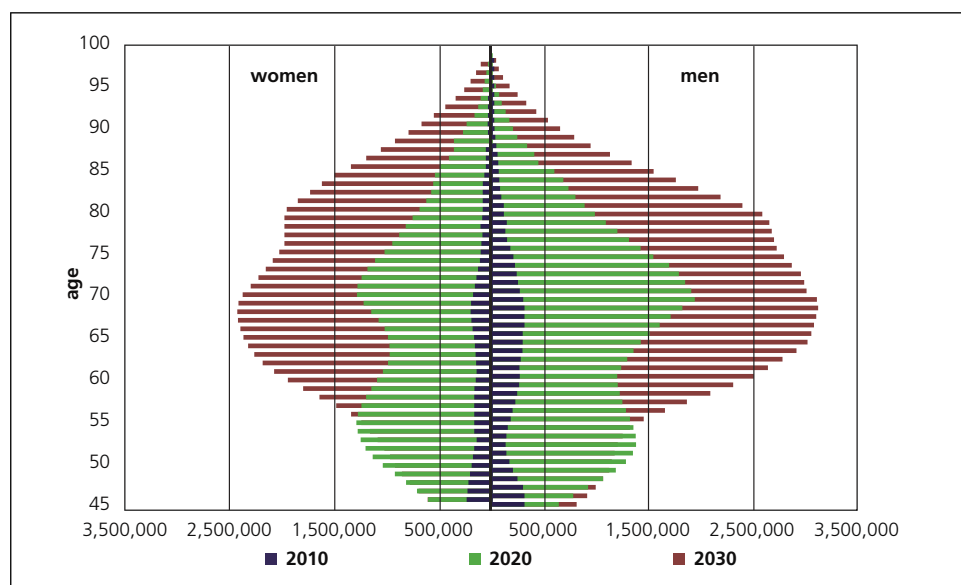
China's rapid population aging is estimated to increase the NCD burden by at least 40 percent by 2030 (Figure 8). The expected population explosion of older citizens and reduced size of the labor force (people aged 15–64 years) will place severe economic and social pressures as the country strives to meet the needs of the elderly, particularly of a growing cohort of people with chronic ailments that last years or even a lifetime (28). Furthermore, a reduced ratio of healthy workers to sicker dependents will certainly increase the odds of a future economic slowdown and pose a significant social challenge

in China. While aging is not avoidable, premature death can be prevented, disability due to NCDs can be postponed, and healthy aging can be achieved as demonstrated in leading G-20 and European Union (EU) countries (29, 30, 31).

4.4 NCDs Contribute to Inequalities in Health

The socioeconomically and otherwise disadvantaged populations in China are often hit harder by NCDs than the affluent members of society since (a) chronic diseases and at least some of the risk factors leading to NCDs, e.g., hypertension, tend to be more prevalent among the poor; (b) the poor are often lacking in or have limited access to quality health care when they develop an NCD; and (c) the adverse impact of chronic diseases on income and overall family welfare is proportionally larger for the poor. NCDs also contribute to high out-of-pocket (OOP) payments for health services and drugs and exacerbate inequity in both health status and access to health care. While low-income groups in China experience a similar or even higher prevalence of NCDs than the rest of the population, their lower hospitalization rates suggest that they are less likely to seek health care (Table 1). The incidence of catastrophic health spending tends to be higher among low-income groups as well (32). Even in cities, 37.6 percent of low-income patients reported not being hospitalized, despite advice to do so, because a majority of them (89.1%) faced financial constraints. A recent study also showed that because of high health care expenditure, rural patients with chronic conditions were more than twice as likely to drop out of treatment for financial reasons, as were patients in urban areas (33).

Figure 8: The Effect of Aging on the Future Number of People with at Least One NCD by Gender



Source: Authors.

Table 1: NCDs and Care-seeking Behavior among Low-income Groups, 2008

Accessibility to Inpatient Care	National Average		Low-Income Group	
	Urban	Rural	Urban	Rural
NCD prevalence	28.3%	17.1%	27.2%	23.1%
Annual hospitalization rate	7.1%	6.8%	5.8%	5.9%
% not being hospitalized against medical advice	26.0%	24.7%	37.6%	34.6%
% who cited economic hardship as the main reason for not being hospitalized	67.5%	71.4%	89.1%	81.5%
Prevalence of catastrophic health expenditure	—	—	5.9%	10.2%

Source: Ministry of Health (MOH), National Health Services Survey in China, 2008.

4.5 Economic Impact of the NCD Burden

Recent estimates indicate that China's overall economic burden from NCDs could be very high. In the absence of a scaled-up Government response, CVDs, stroke, and diabetes alone are expected to result in a loss of US\$ 550 billion in China between 2005 and 2015 (34). An analysis by the World Bank calls attention to the following potential gains stemming from effective NCD policies:

- At the micro-economic level: A change in adult health status can result in a 16 percent gain in hours worked and a 20 percent increase in individual income.² Tackling NCDs, on top of being a valuable health investment, may thus be seen as an

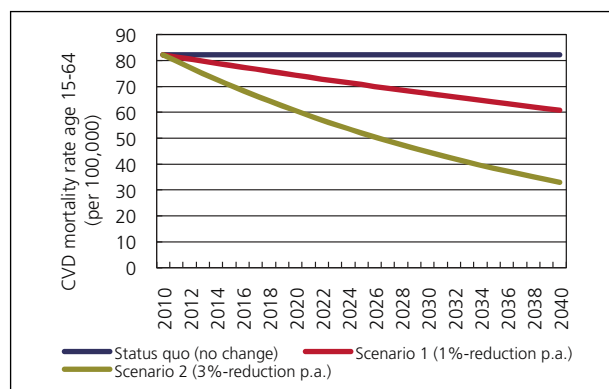
2 Surveys typically ask respondents to assess their health on a five-point scale ranging from "very poor" to "excellent." The "change" means a one-step improvement along the range, such as from "poor" to "fair."

investment into people's productivity and hence their earnings potential (Table 2).

- At the macro-economic level: reducing CVD mortality by 1 percent per year over a 30-year period (2010–2040) could generate an economic value equivalent to 68 percent of China's real GDP in 2010, more than PPP US\$ 10.7 trillion (Figures 10 and 11).
- The society wide "economic costs" of NCDs are even larger if the value people attribute to health is captured.³ Reducing CVD mortality by 1 percent per year produces—if the intrinsic value that is

3 One way to make the value attributed to health explicit is by measuring the extent to which a person is willing to trade health for specific market goods for which a price exists. Willingness-to-pay (WTP) studies undertake this measurement. A large number of WTP studies make it possible to calculate a "value of a statistical life" (VSL), which can be used to value changes in mortality. WTP can also be inferred from risk premiums in the job market: Jobs that entail health risks, such as mining, pay more in the form of a risk premium.

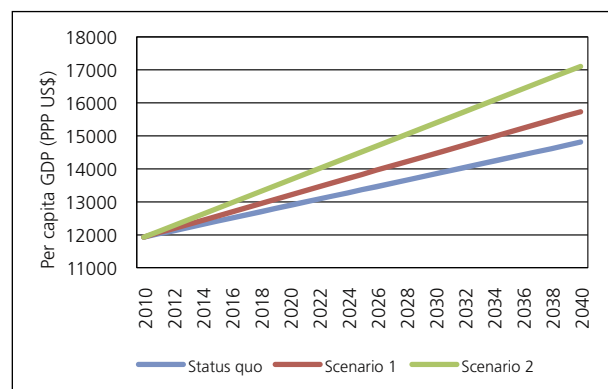
Figure 9: Three Scenarios of the CVD Working-age Mortality Rate, 2010–2040



Source: Authors, 2010.

Note: Assuming 2005 CVD mortality rate according to Abegunde et al. (36).

Figure 10: Simulated per Capita GDP Path



attributed to life is measured—an annual benefit of about 15 percent of China’s 2010 GDP (PPP US\$ 2.34 trillion), while a 3 percent reduction would amount to an annual benefit of 34 percent (PPP US\$ 5.40 trillion).

The combination of exceptionally fast population aging in China and a low fertility rate will strain China’s labor force participation rate by 3–4 percentage points by 2030 (35). The increase in NCDs, if not addressed effectively as a top governmental priority in the years to come, would not only exacerbate the expected labor force shortages, but also compromise the quality of human capital because more than 50 percent of the NCD burden currently falls on the economically active population (aged 15–64).

Table 2: Impact of a Change in Self-assessed Health on Hours Worked and Income in China

	Hours Worked	Income
Overall	16.0%	20%
Urban	21.0%	5.2%
Rural	12.0%	14.6%

Source: Authors.

To optimize labor productivity as the population ages, interventions to improve the quality and skill mix of the existing labor force and extend the retirement age could only provide a short-term solution. The success of these interventions in the medium and longer terms would depend on the working-age population’s staying healthy. Indeed, the rise of the “epidemic” of NCDs, if not addressed, will dilute and hinder the expected positive effects of these policy measures.

Inertia in response to NCDs and the resulting aggravation of health inequalities and economic growth slowdown have the potential to exacerbate social tensions in China.

5 ROLE FOR GOVERNMENT ON NCDs PREVENTION AND CONTROL

5.1 Economic Rationale Justifying Government Actions on NCDs

From an economic perspective, government intervention is justified as a means to achieve a net improvement in social welfare. That is, it is justified when private markets fail to function efficiently or when the social objectives of equity in access to health services are otherwise unlikely to be

attained. Global evidence suggests at least three sources of market failure that could justify government intervention for tackling the risk factors that give rise to NCDs:

- *Externalities:* There are substantial external costs resulting from second-hand smoke and alcohol-induced road traffic injuries and fatalities. NCDs also impose costs on health care and the social insurance system and hence on “third parties.”
- *Imperfect information:* People are not always fully aware of the health (and other) consequences of unhealthy lifestyle choices such as smoking, alcohol abuse, physical inactivity, and poor diet. They may also be misled by deliberately distorted information promoted by the food, alcohol, and tobacco industries. Government intervention in the form of the provision (and production) of NCD-related health information (such as the health consequences of smoking) provides a public good that generally is undersupplied compared to the social optimum. This also includes the role for a government to engage in research about the health consequences of unhealthy behavior.
- *Non-rational behavior:* Children and adolescents (and even adults) tend not to take into account the future consequences of their current choices, irrespective of whether they are informed about them. Their current choices may well conflict with their long-term best interests. This provides, in principle, a justification for government to support interventions to prevent people from harming themselves when they do not fully appreciate the consequences of behaviors that pose health risks.

5.2 Confronting NCDs Effectively: A Litmus Test of China’s Health Sector Reform

The chronic nature of NCDs, their “chronicity,” poses a major challenge to health systems worldwide because with the onset of NCDs people often spend substantial parts of their lives in less than perfect health and in need of medical care (37). Well designed and sustained prevention and treatment interventions, which are mutually reinforcing, are required to reduce the burden of NCDs and control their potentially enormous pressure on the health system.

The Government of China, therefore, will need to tackle the main risk factors of NCDs following a multisectoral approach

Table 3: Characteristics of NCDs

Characteristics of NCDs	Needs of NCD Care
Etiology, behavior risk factors, pollutants, viruses	Behavioral interventions
Duration: long-term and repetitive, acute episodes	Continuous, long-term care, particularly at the primary care level Care planned in advance and pro actively Patients trained in goal setting, problem solving, self-management and actively involved in decision making and treatment planning, since the composition of services will change if the condition deteriorates or personal priorities change Regular interaction between health professionals and patients
Frequent co-morbidities	Multi-disciplinary teams Coordination between different service providers
Frequent disability	Involvement of patients themselves and their family members Other forms of social services

Source: Adopted from E. Nolte and M. McKee. *Caring for People with Chronic Conditions: A Health System Perspective*. 2008.

to prevent their onset in the first place, while at the same time redesigning and improving the performance of the health system to deal with NCDs that do occur in spite of prevention efforts (e.g., heart attacks, strokes) (Table 3).

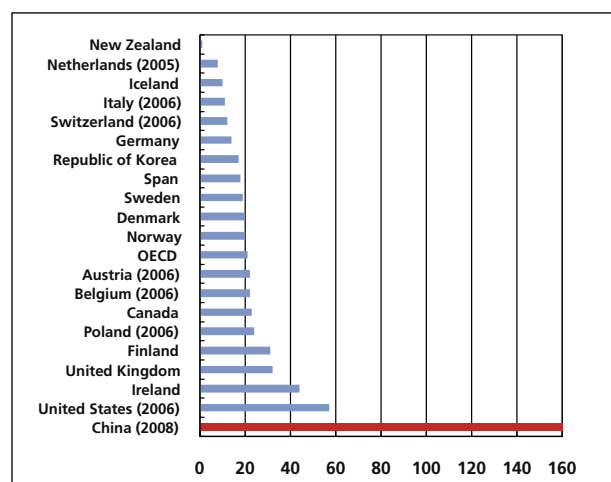
China's health system is not currently responding effectively to the needs and demands of its population. The higher mortality rates for major NCDs (such as CVDs, COPD, and cancers) and the higher hospital admission rates for acute

complications of diabetes in China relative to the rates in OECD comparators⁴ provide strong evidence of the poor performance of the Chinese health system (Figures 5 and 11).

Additional evidence of the organizational and operational deficiencies in the Chinese health system is provided by the findings of a recent survey on institutional capacity for NCD prevention and control in the country. The survey findings revealed that more than 55 percent of counties had no specialized

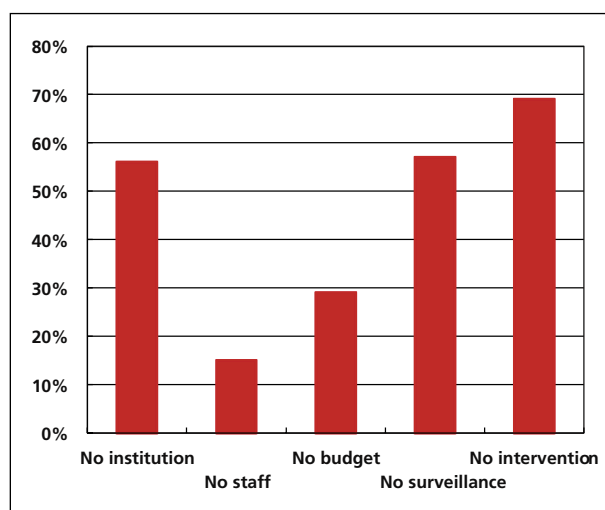
Figure 11: Diabetes Acute Complications Admission Rates, 2007

Age-sex Standardized Rates per 100,000
Aged 15 and Over



Source: Health at a Glance 2009. China's datapoint is an estimate based on the 2008 national household health surveys.

Figure 12: Coverage of NCD Programs at County Level in China



Source: China CDC, *Capacity for NCD Prevention and Control of the Center for Disease Control System in China*, 2009.

⁴ The variations in hospital admission rates across countries can only be partially explained by the differences in prevalence rates ($R^2=0.17$). To a great extent, this variation reflects effectiveness and efficiency of each country's health system in addressing NCDs.

institutions for NCDs, and around 15 percent had no staff working on NCDs at the local level (38). In terms of work performed, less than 45 percent of county-level Centers for Disease Control (CDCs) carried out any form of NCD-related surveillance activities, and only about 30 percent of them implemented any NCD-related interventions in the year before the survey (Figure 12).

The surging NCD epidemic, if not checked, may pose a severe challenge for containing the escalation of health expenditures in China. Globally, effective containment of health care costs and expenditures has proven very difficult. For instance, in the past 10 years, health expenditures in OECD countries have increased by 50 percent in real terms (39). In China, health expenditures tripled between 2000 and 2009, with the most rapid increase in 2008 and 2009, reaching, respectively, more than 16 percent and 20 percent of total health expenditures. *It is estimated that total health expenditure might further grow by almost 50 percent in the next five years* (40). Such a skyrocketing increase would not only constrain government budgets, but also those of the Chinese population, particularly the rural poor, since OOP payments for health represent 37 percent of total health expenditures (41). This situation would significantly undermine China's effort to expand health insurance coverage in the face of growing health care costs; it could also increase the odds of impoverishment among vulnerable populations due to catastrophic health events that would require high OOP expenditures to cover the cost of needed drugs and medical care services.

6 LAUNCHING A MULTISECTORAL STRATEGY FOR NCD PREVENTION AND CONTROL

While NCDs cannot be totally eliminated, preventing them and managing those cases that remain through a continuum of care can make a substantial difference in minimizing premature mortality, ill health, and disability, as confirmed by the experience in developed countries, such as Finland, England, Canada, France, and Germany. Many preventive NCD interventions can be highly cost-effective (42), such as the interventions recommended under the Framework Convention on Tobacco Control (FCTC, 43) and multidrug therapy administered to individuals at high risk of developing CVDs (44). And, improvements occur in a shorter time frame than people commonly believe—indeed, recent evidence from England indicates that reducing direct and second-hand exposure to tobacco smoke has immediate health and economic benefits, as the burden of CVD is reduced along with related health care expenditures within one year. Finland's long-documented experience also shows that health improvements

occur within two–seven years after the elimination of the exposure to risk factors, and they are beneficial even for people in older age groups (45, 46, 47).

6.1 Suggestions for Comprehensive and Effective NCD Strategies in China

At the international level there is agreement on what constitutes an effective set of policy options and interventions for tackling NCDs effectively (48,49). As this consensus is based on accumulated evidence from different countries, the Government of China may consider adopting the following policy options for the short and medium terms:

- **Health in All Policies (HiAP)⁵:** HiAP seeks to improve health and contribute to the well-being and wealth of nations through structures, mechanisms, and actions planned and managed mainly by sectors other than health, because improved health status of the population has, in turn, important effects on the realization of social and economic objectives.
- **Fiscal and regulatory measures:** These measures include pricing policies; marketing of healthy products such as fruits and vegetables; and increasing the social and economic costs of unhealthy products (e.g., cigarettes, alcohol, and fast food for children).
- **Health sector actions:** The health sector needs to be restructured to adopt novel care organization and financial models with a strong primary health care (PHC) system that is structured for delivery of well-defined, integrated NCD care and that creates an enabling environment for individuals to assume greater responsibility for their own health by making informed, healthier choices.
- **Community actions:** In OECD countries, fitness programs are subsidized by employers, who can also provide tobacco-free workplaces. Health promotion activities are implemented by communities. Indeed, companies, as employers, can have a strong influence on the behavior of their staff and

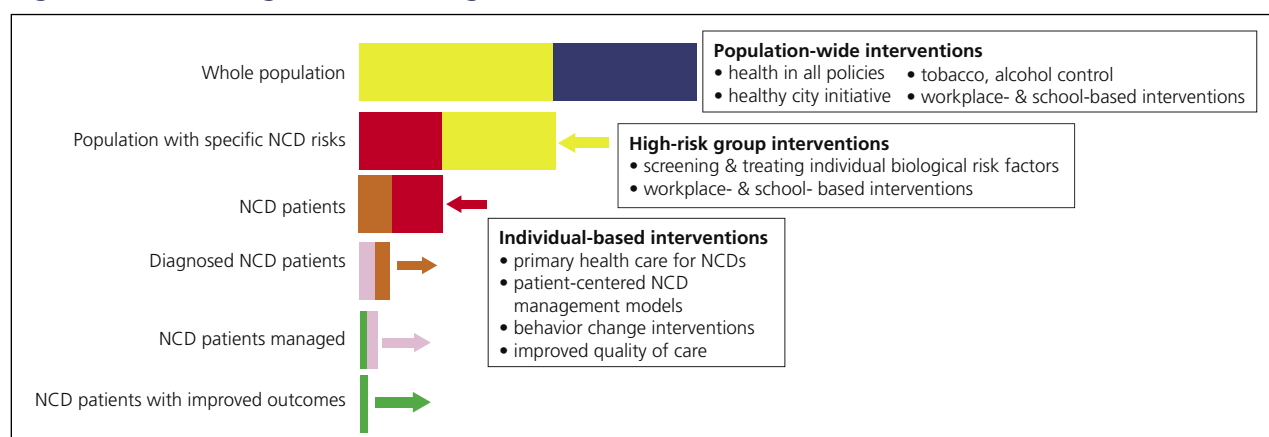
⁵ The two most important instruments to practice HiAP are the health impact assessment (HIA) and health lens projects. HIA is defined as “a combination of procedures, methods and tools by which a policy, program, or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population.” Designed and implemented by non-health sectors, health lens projects mainly aim to accomplish a sectoral development agenda but also include some activities or components to mitigate the negative impacts or enhance the positive impacts on a population's health.

can make them aware of health risks in ways not open to a government. As shown by the experience in the United States, these types of programs have very good “returns”: a recent study documented that medical costs fell by about US\$ 3.27 for every dollar spent on wellness programs with similar “returns” achieved from reduced absenteeism (50). China’s experience in Daqing and Beijing demonstrated that community-based NCD interventions were not only effective but also had long-lasting impacts on health improvement (51,52).

Figure 13 illustrates the linkage between the above-proposed policy options (including the intervention packages) and the expected outcomes. The population in China can be divided into two groups: the population without any known NCD-related risk factor (the blue bar) and the population with at least one NCD-related risk factor (the yellow bar).

Implementing population-wide interventions, such as HiAP and other measures, including fiscal and regulatory measures, community actions, and a health sector response—such as screening and treating individuals for/with NCD-related biological risk factor(s)—will result in a reduction in the share of the population with at least one NCD risk factor (compared to the no-intervention scenario). These results are also observed among NCD patients: some of them have been diagnosed and identified (the brown bar), but concurrently a significant number of them are not; among those who have been diagnosed, again, only some are under medical care (the pink bar). Lastly, among those under medical care, only some achieve improved health outcomes (the green bar). An effective health system response would ensure that more NCD patients are being diagnosed as early as possible and managed properly; over time, a greater share of NCD patients will have improved outcomes.

Figure 13: Preventing and Controlling the NCD Tide



Source: Authors.

6.2 What Actions to Take? From Governmental Policy to Program Implementation

6.2.1 Improving the Government’s Commitment and Response to NCDs

Improving the population’s health should be among the priority social objectives to be pursued under the programs, activities, and investments required to implement China’s 12th Development Plan over 2011–2015. As argued before, this would require improved Government commitment to tackle NCDs effectively in the medium term.

To that end, the Chinese Government may consider supporting the following actions in the short term:

- A mid- and long-term multisectoral national plan for NCDs should be prepared with clear, time-bound objectives and targets and a fully costed action plan to guide related budgetary and investment decisions. Such plan could serve as a framework for developing required laws, regulations, and enforcement mechanisms, as well as policies and programs, assigning intersectoral responsibilities and accountability for the results at the central, provincial, and local levels, and coordinating international cooperation.
- Epidemiological surveillance systems and other data collection mechanisms should be strengthened to monitor regularly the achievement of time-bound targets, and well-structured strategic communication

activities should be supported to communicate the results achieved to policy makers, program managers and the population as a whole.

- Large-scale (province-wide) demonstrational NCD prevention and control pilots in collaboration with international organizations should be designed and implemented. Such projects would: (a) mobilize international technical assistance to support project preparation and implementation, based on global best practices, and (b) generate evidence about new approaches before scaling up to the rest of the country.

6.2.2 Putting in Place an Effective Multisectoral Coordination Mechanism

The Government could consolidate, streamline, and strengthen the coordination of health actions and investments for health-related activities, including those for tackling NCDs, by establishing an overarching multisectoral National Health Committee (Table 4). This committee should be chaired by at least a Vice Prime Minister-level official to raise the political importance of the NCD effort and involve representatives from different sectoral ministries and other stakeholders.

Table 4: Examples of Inter-Institutional Coordination Mechanisms for Health-Related Activities in China

Name	Institutional Characteristics
National Food Safety Committee	A Vice Premier is the leader of this long-term institution.
The State Council Leading Group for Strengthening Health System Reform	A Vice Premier is the leader of this temporary institution, with equivalent structures at the local level.
National Population and Family Planning Commission (NPFPC)	Minister of NPFPC, a long-term institution having local branches.
Inter-ministerial Coordination Mechanism for Framework Convention on Tobacco Control (FCTC) implementation in China	Minister of Industry and Information is the leader, holding irregular meetings.
Inter-ministerial Meeting Mechanism for Mental Health	The Vice Minister of Health is the leader, holding irregular meetings.

Source: Prepared by authors on the basis of available Government information.

To strengthen coordination and a multisectoral response to NCDs, China can introduce different financial mechanisms, such as establishing a “start-up grants” mechanism to support the development of the new approaches, as done in such countries as Australia, Denmark, England, France, Germany, and Canada.

6.2.3 An Initial Focus on Four Major NCDs before Expanding to Cover All NCDs

An effective NCD response in China can begin with averting and delaying as much as possible the onset of four major NCDs: namely, CVDs (heart attacks and stroke), diabetes mellitus, COPDs, and lung cancer, along with alcohol-related injuries. A sustained effort is required to reduce the prevalence of four major behavioral risk factors: smoking, unhealthy diet, physical inactivity, and alcohol abuse. This in turn would contribute to the reduction of the four major related biological risk factors at the population level: hypertension, high cholesterol, high blood sugar, and overweight/obesity.

This proposed initial focus is justified by the following considerations: (a) a significant share of total NCD burden

stems from the onset and prevalence of these diseases and conditions; (b) these diseases share common risk factors and, hence, common interventions; and (c) equity and feasibility criteria for China support a focus on these diseases.

6.2.4 The Priority for Immediate Action: Adopting Population-Wide Prevention and Targeted Treatment to High-Risk Individuals

Accumulated evidence at the international level indicates that population-wide prevention, which aims to change disease-related risk behaviors, environmental factors, and their social and economic determinants for NCDs in an entire population, are the most effective for NCD prevention and control, along with those that target treatment to people at high risk of NCDs (Table 5). It should be clear however that international experiences cannot be simply transplanted into China. Turning this evidence into actionable policies and practices in China will require careful assessment and adaptation that takes into account particular cultural, socioeconomic, and institutional factors that influence policy decisions and program development.

Table 5: Priority Interventions for NCDs

Risk Factor	Intervention
Tobacco use	Accelerate implementation of the Framework Convention on Tobacco Control: • Raise taxes on tobacco • Enforce bans on tobacco advertising, promotion, and sponsorship • Ban smoking in public places and protect people from tobacco smoke • Offer help to quit tobacco use and warn about the dangers of tobacco use
Excessive dietary salt intake	• Regulate salt concentration limits in processed and semi-processed foods • Reduce dietary salt levels through voluntary action by food industry • Promote low-sodium salt substitutes • Implement information and education campaigns to warn about the harm from excessive salt intake
Harmful alcohol use	• Increase taxes • Ban advertising • Restrict access
Unhealthy diets, physical inactivity, obesity	• Introduce taxes for unhealthy food • Provide subsidies for healthy food • Promote labeling • Administer marketing restrictions
Cardiovascular risk	• Facilitate access to and promote combinations of drugs for individuals at high risk of NCDs

Source: Adapted from Beaglehole and others, "Priority actions for the non-communicable disease crisis," 2011 (53).

Initial assessments prepared for this report indicate that most of the interventions under this group could be implemented in the near term, and their incremental cost would be relatively low, except for some HiAP measures, for which the costs need to be evaluated.

It is highly recommended that the interventions proposed for each risk factor be implemented as a package in order to maximize the health outcomes. However, building upon existing political and social acceptance and support, as well as available funding, a gradual and incremental approach could be adopted in China, concentrating at the beginning on the reduction of excessive dietary salt intake, harmful alcohol consumption, and

smoking in public places. Development of a national salt reduction strategy could be supported to achieve a "quick" public health gain. Some of the proposed interventions for preventing harmful alcohol use could be adopted as well, including enforced legislation to reduce drunk-driving. China has also ratified the FCTC, and a ban on smoking in public places became effective on May 1, 2011, building on the successes of the bans on tobacco advertisement and smoking in public places during the 2008 Olympic Games held in Beijing, the 2010 Shanghai World Expo, and the 2010 Guangzhou Asian Games. It would be important, therefore, to support the enforcement of the smoking ban in public places, particularly in health facilities, and to monitor its effectiveness.

Table 6: Tobacco Prices and Taxation in BRICS Countries, 2009

	China	Brazil	India	The Russian Federation	South Africa
Price*	US\$ 0.73	US\$ 1.03	US\$ 1.65	US\$ 0.51	US\$ 2.04
Tax**	36%	58.39%	55%	37%	44.72%

Source: WHO Report on the Global Tobacco Epidemic, 2009, available at <http://who.int/tobacco>.

Note:

* The price of a pack of 20 cigarettes for most brands (official exchange rate);

** the percentage of the retail price for most brands.

More challenging but more cost-effective actions such as excise tax increases and the resulting higher retail prices for cigarettes merit consideration on the basis of the assessment and policy deliberation by the Government of China and taking into account international experience in countries such as Australia, Canada and the United States that show that higher excises induce some smokers to quit; reduce consumption by continuing smokers, prevent others from starting, and reduce the number of ex-smokers who resume (54). The adoption of this fiscal measure would be consistent with the Government's commitment to the FCTC (55). Compared to the progress made in other BRICS (Brazil, Russia, India, China and South Africa) countries, China has been lagging behind mostly in raising the tobacco taxes (Table 6).

International best practices in using tax policy to reduce tobacco consumption suggest that (a) there is a trend toward adoption of specific taxes, particularly if the main goal is to discourage the consumption of cigarettes (Australia, India, Japan, the Republic of Korea, Maldives, New Zealand, the Philippines, and Taiwan, China, have adopted specific excises on cigarettes); (b) for countries with specific taxes, there is a trend away from weight-based specific levies to unit-based levies—that is, specific excises based on the number of cigarettes; and (c) specific taxes can and would keep pace with inflation if they were automatically adjusted for changes in the consumer price index, as is done in Australia and New Zealand.

Table 7: HiAP for NCD Prevention and Control

Sector	Opportunities
Finance	• Subsidy for healthy food production • Increasing prices for tobacco, alcohol, edible oils • Removal of subsidy for products harmful to health, such as tobacco leaf and tobacco products
Agriculture, food industry	• Production and marketing of healthy food • Salt reduction in (semi)-processed food; reduction of trans fat in food • Maintaining adequate land for agriculture and food systems; crop substitution for tobacco leaves
Environment	• Globally, a quarter of all preventable illnesses (e.g., cancer, COPDs) are the result of poor environmental conditions where people live. Stricter environment standards and enforcement should be practiced. • Real estate developers can be encouraged or mandated to include physical exercise facilities in their projects.
Infrastructure, transportation	• Optimal planning for road, transport, and housing to reduce environmentally costly emissions and traffic injuries and to improve accessibility to health services • Better transport, including cycling and walking opportunities, building safer and more livable communities, and accessible facilities for physical activities
Education	• Physical activity program among school children • School food and nutrition program • Production of an adequate number of health professionals with needed skills for NCD prevention and care
Social protection	• Improved coverage of NCD-related preventive, curative services at the PHC level • Exemption of NCD patients from copayment for selected preventive and curative services • Funding the cost for care planning, documentation, and coordination activities for integrated care • Adjustment of health financing by disease morbidity/burden • Moving toward a single payer system
Legislation and law enforcement	• Development and enforcement of pro-health policies and regulations on drunk driving, home violence, and a smoke-free environment • Enforcement of anti-air pollution legislation
Media	• Promotion of change in social norms concerning smoking, being sedentary, and alcohol abuse and advocating healthy lifestyles
Private sectors	• Occupational health and work safety • Workplace wellness programs

Source: Adopted from *Adelaide Statement on Health in All Policies*, WHO, Government of South Australia, Adelaide, 2010.

In 2009, China adjusted its tobacco tax with the ad valorem tax structured at the producer price level but has not passed the adjustment to the retail price level. Had China passed its 2009 tobacco tax adjustment from the producer price level to the retail price level, the retail price would have increased 3.4 percent, resulting in 700,000 quitters avoiding smoking-related illnesses and premature death (56). Alternatively, if China increases the specific tax of 1 yuan per pack (from the current level of about 40 percent to about 50 percent of the average retail price), with a price elasticity of -0.50, 3.8 million lives would be saved, reducing medical costs by 2.28 billion yuan and generating a productivity gain of 10.27 billion yuan for the Chinese economy (57).

Other opportunities for HiAP could be considered for NCD prevention and control (Table 7). It is advisable to set up a cross-sectoral taskforce to identify possible areas and interventions for dealing with NCDs. A practical first step would be for this task force to prepare a priority list of activities and investments to implement multisectoral actions in health. Eventually, the Government could consider adopting HiAP as a national policy, as done by the European Union in 2006 (58).

The involvement of public and private production and commercial enterprises could be of particular importance in

China. The concept of employers' playing a larger role in improving employee fitness and health is not new. The U.S. Government, for example, is encouraging employers to invest in workplace health promotion, and about 95 percent of its large employers and a third of its smaller ones offer wellness programs (59). A growing awareness of the substantial costs to employers of ill health and disability linked to NCDs-related risk factors provides the grounds for advocating workplace-based health promotion initiatives by the Government.

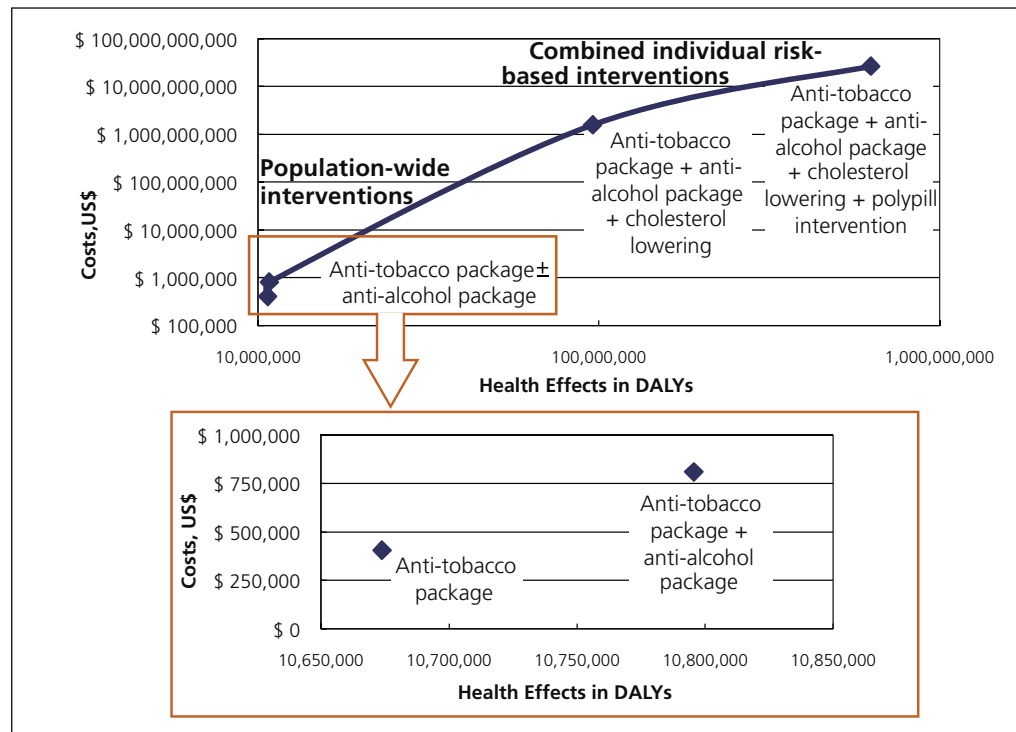
Estimated Costs and Effects of NCD Prevention Interventions: Halving the NCD Burden

As described in Box 1 and shown in Figure 14, four sets of population-wide and high-risk, group-based preventive interventions are estimated to deliver the greatest value for investments needed at different levels of available resources in China. These preventive intervention sets can be implemented separately; however, combinations of different *sets of interventions* lead to economies of scale and more value for money. With full implementation of the combined set of interventions, one could expect 600–800 million DALYs or lost years averted annually over a period of ten years with an expenditure of about \$220 per capita per year. This is about 45–60 percent of the estimated total NCD burden of about 1.4 billion in 2010.

Box 1: Projected Impact of Priority NCD Prevention Interventions in China

- Implementation of tobacco control measures—including higher taxation and prices for cigarettes, and banning smoking in public places and advertisement of tobacco products—would prevent 10 million DALYs lost annually at only a few cents (US) or less than 0.04 yuan per capita per year.
- At a doubling of resources, a few additional cents (US) or around 0.07 yuan per capita, a combination of anti-tobacco measures with interventions for controlling alcohol abuse, e.g., increasing tax and banning advertising, would help avert an additional 40 million DALYs lost annually.
- At about US\$ 13 or 90 yuan per high-risk individual, the combined implementation of anti-smoking and alcohol abuse measures, along with preventive interventions—e.g., screening of and treatment for individuals with elevated blood cholesterol levels—would help prevent about 85 million DALYs lost per year.
- US\$ 220 or 1500 yuan per high-risk individual annually is required to add a next set of cost-effective interventions, i.e., in high-risk groups, cardiovascular risk assessment and management and preventive treatment with multidrug regimes (statin, aspirin and two or three blood pressure-lowering drugs). The total cost would be over US\$ 26.5 billion or 180 billion yuan annually (less than 10 percent of the total health expenditure in 2010), and the total annual DALYs lost averted would be around an additional 500 million.
- The first two groups of interventions could be financed through the priority public health programs for NCDs and implemented at the national level. The third and fourth groups can be financed through health insurance schemes.

Figure 14: Proposed Expansion Path for an NCD Prevention Package



Source: Authors.

Note: Both axes in large figure are in log scale.

Interventions for reducing dietary salt intake—which would lead to lower blood pressure, one of the main risk factors for CVDs—could also be highly cost-effective in China, as demonstrated by the experience in the United Kingdom, Finland, and Japan. This can be done using a multi-pronged approach, including legislation and regulation, working with the food industry, general health promotion campaigns, and the promotion of low-sodium salt substitutes, since in China most salt is added during cooking. The U.K. salt reduction program spent just £15 million (about US\$ 24 million) but led to 6000 fewer CVD deaths per year, saving the U.K. economy about £1.5 billion (about US\$ 2.43 billion) per annum (60).

6.2.4 Over the Medium Term: Strengthening the Health System to Address NCDs

The explicit priority attached to NCD prevention and control in China over the medium term should drive improvements in the health system. This is required for early detection and treatment of risk factors, and early identification and treatment of conditions such as heart attacks and strokes and the recurrence of these conditions. These interventions occur at the patient level in a health care setting. Building upon ongoing health system reform efforts included under its five health reform pillars, the Government of China may consider adopting additional policy, institutional, and service provision

measures to strengthen the capacity of the health system to better respond to the NCD challenge as outlined below.

Improving financial protection in health

The Government of China recently committed to support the reduction of OOP payments for health care from the current level of 37 percent of total health expenditure to 30 percent by 2015 (61). This target is highly relevant to NCD patients since NCDs are the biggest contributor to escalating individual and household expenditures on health care. Between 1985 and 2005, health expenditures associated with CVD alone increased by 17.3 percent annually, while the total health expenditure increased by 11.8 percent per year. The Government has already adopted some measures—such as reducing the prices of pharmaceuticals, integrating different health insurance schemes, and increasing government spending on health—in order to reach the target. Further actions would be needed to reduce the OOP burden incurred by NCD patients and their families.

Creating new fiscal space for financing NCDs

Levying a “sin tax” on tobacco, alcohol, and sugar soft drinks needs to be considered (e.g., on tobacco, as the

current price of cigarettes in China is very low compared to other G-20 countries). This would not only help reduce their demand and consumption but also has the added benefit of raising Government revenue (54). Some countries, such as Australia and the United States, are using revenue from these taxes to help fund health promotion programs and insurance schemes. A good example is the decision in February 2009 by the U.S. Government authorizing the renewal and extension of the Children's Health Insurance Program for poor children by using a 62-cent per-pack increase in the federal taxes of cigarettes to fully fund the program (62). In addition, tapping resources from other sectors through implementation of HiAP could be further considered to mobilize funding for cross-sectoral health-related interventions.

Improving central Government financial allocations for health by taking into account the population's health conditions

The central Government in China could consider using disease morbidity as a factor in the formulae used to calculate allocations (per capita) to new rural collective medical schemes, urban resident basic health insurance schemes, as well as its NCD-related allocations to the provinces. Such an approach is used in such countries as the Netherlands, Belgium, and Germany (63). Similar arrangements have already been adopted in China for funding HIV/AIDS and TB prevention and control programs.

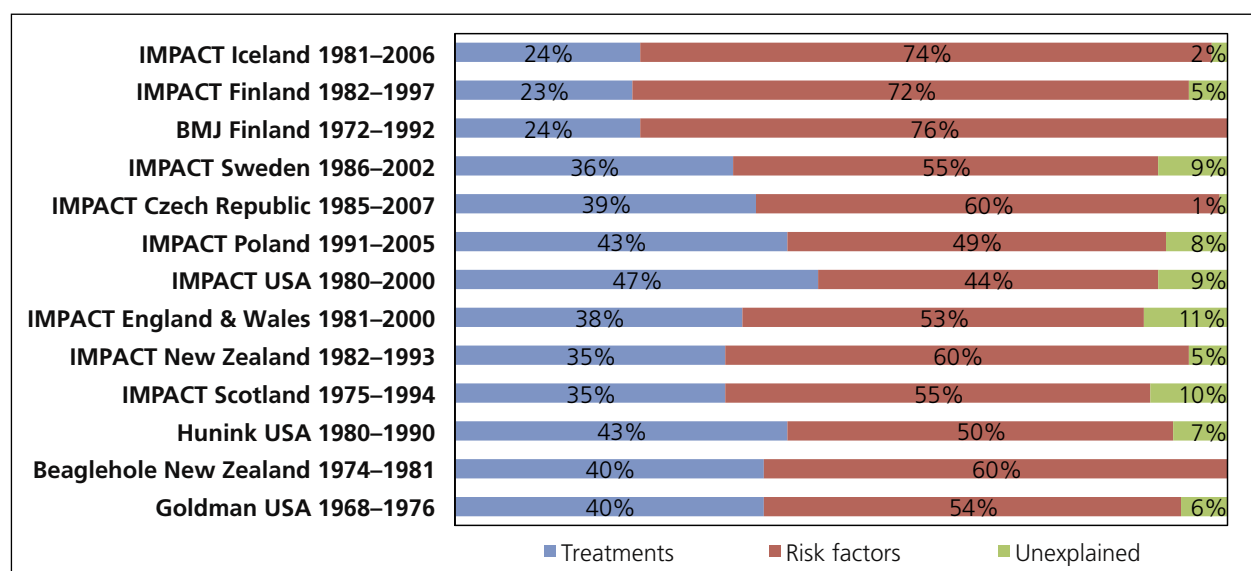
Moving to a single payer for health services

Development of a universal basic health insurance scheme in China could be accelerated through integration of various health insurance schemes as is being done in early stages in Chongqing, Zhejiang and Guagnxi to adopt mechanisms to fund the NCD prevention and control. Continued coverage by a SINGLE insurer at the provincial level could pool risks, create improved benefit packages, allow more equitable allocations across populations and improve purchaser's leverage in addressing NCDs more proactively and efficiently, because the benefits of avoiding severe complications are often only realized after eight to ten years (64). Such an approach would reduce the administrative costs associated with the operation of thousands of existing insurance schemes, facilitate coordinated care, increase the capacity of the scheme to cushion the financial risks due to NCDs, and better position the payers in active purchasing of services from different providers.

The financing of NCD-related activities would need to prioritize prevention

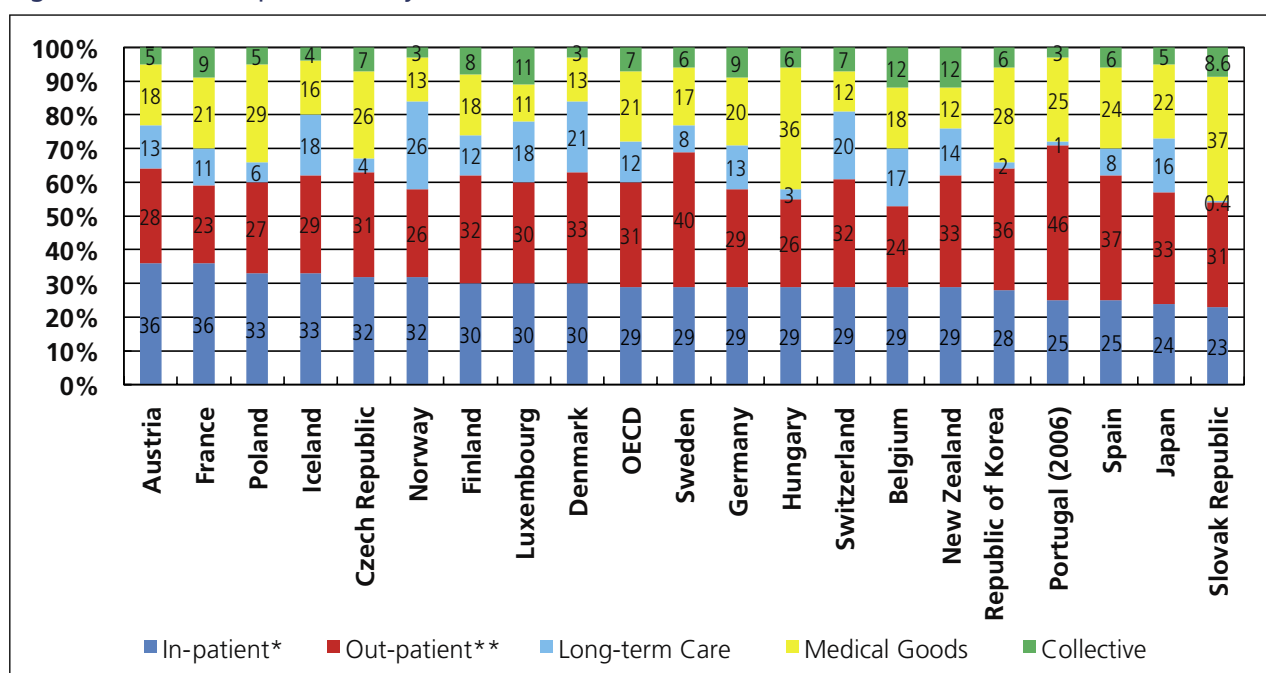
Cost-effective, population-wide interventions and those targeting high-risk groups recommended in the previous section need to be given the highest priority and be fully financed in order to achieve the best return for investment. A review of the approaches for reducing coronary heart disease (CHD) in most of developed countries demonstrated that reducing total cholesterol level, blood pressure, and tobacco smoking account for a significant share of the reductions in CHD

Figure 15: Effective Approaches to Reducing Mortality from Coronary Heart Disease



Source: Ford et al., 2007, *Explaining the decrease in U.S. deaths from coronary disease, 1980–2000*, *New England Journal of Medicine*, 356: 2388–98, updated by Capewell & Andersen, 2011.

Figure 16: Health Expenditure by Function of Health Care, 2007



Source: *Health at a Glance 2009: OECD indicators*.

Note: * Curative-rehabilitative care in inpatient and day-care settings; ** home care and ancillary services.

mortality (Figure 15) (65). Also, a screening and control program for early diabetes and hypertension in Mexico demonstrated that for each U.S. dollar invested in prevention, US\$ 85–323 would be saved over a 20-year period (66).

A shift to primary health care is needed to tackle NCDs effectively

Different countries have been shifting emphasis in expenditure toward primary health care to deal with NCDs. OECD countries on average allocate 31 percent of their total health expenditure to outpatient care and less than 40 percent to inpatient care (Figure 16). The benefits of this approach are well documented. A recent study in Brazil, for example, demonstrated that its strengthened PHC helped prevent unnecessary hospitalization (67).

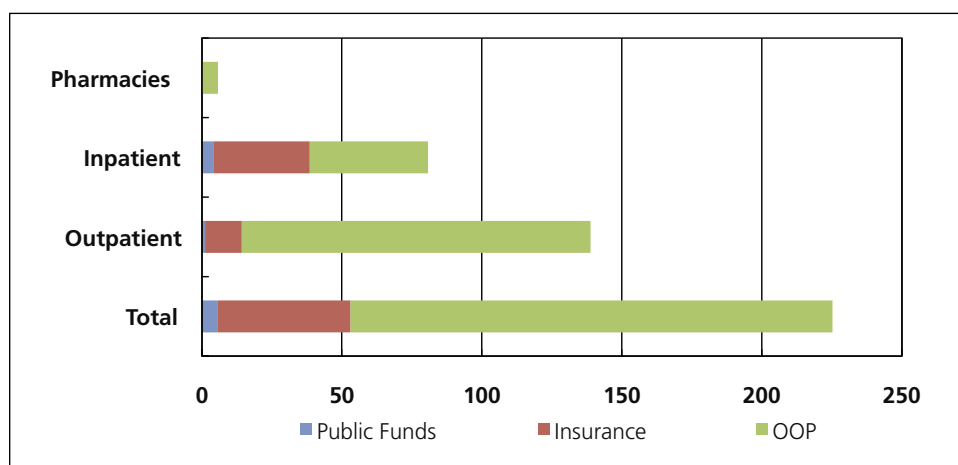
Data from China suggest the opposite: the allocation of total health expenditure on outpatient care fell from 37.8 percent in 2005 to 32.5 percent in 2009 (34). Further evidence indicates health spending by the Government and insurance schemes has been skewed toward inpatient care. The recent National Health Service survey showed that in 2008, OOP as a share of medical bills, remain significantly higher for outpatient care compared to inpatient care and reached 84 percent of monthly per capita income among patients in the poorest quintile (compared to about 11 percent in the richest quintile) for an average outpatient visit (68). In Tianjin Municipality,

about 82 percent of the Government's and insurance schemes' spending on CVDs was on inpatient care, and only 18 percent was on outpatient care in 2008 (Figure 17) (69).

To increase the relative importance of PHC services in the health system, health insurance schemes in OECD countries have adopted several measures that may be relevant for China:

- Improved coverage of NCD-related preventive and curative services at the PHC level and at home and provision of outpatient drugs (70, 71);
- Exempting NCD patients from copayments for selected preventive care and curative services that are necessary for patients who need long-term chronic care (United States and France, 72);
- Funding the cost for care planning, documentation, and coordination activities to incentivize providers to deliver coordinated and integrated care for NCD patients, for example, the “year of care” approach adopted in the U.K. National Health Services for diabetes control. The amount of funding for expected care is calculated using a risk-adjusted capitation formula based on the likely annual consumption of a range of necessary health services. Service providers are paid through an integrated capitation method (73). Such practices are found in Australia, the United States, and parts of

Figure 17: Expenditures on CVD Treatment by Treatment Type, Tianjin, 2008
In million yuan



Source: Yang et al., *Case Study of NCD Expenditure Analysis in One District of City of Tianjin, 2010*.

Thailand. Often, GPs act as fund holders, using capitation payment funds to purchase inpatient services and/or specialist services for registered patients.

Adopting new health care organization models

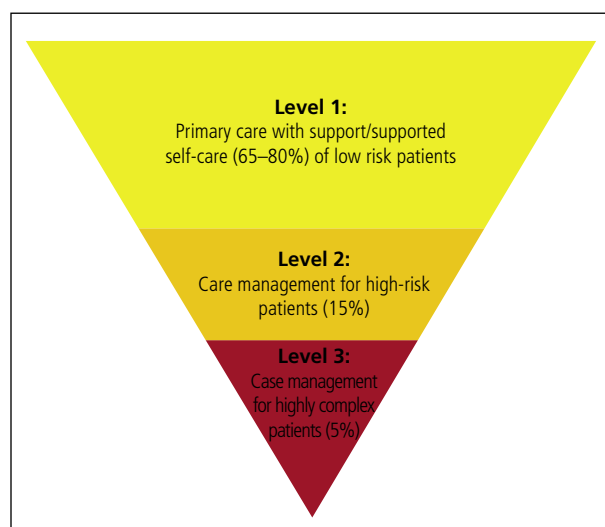
China's health system will not be able to handle effectively the growing NCD burden alongside the lingering burden of communicable diseases without striving to integrate different levels of care to guarantee the continuity of care.

As currently done in other countries (e.g., the United States, England), the adoption of new health care organization and service delivery approaches may be considered as an option to better manage NCDs in China, particularly for delivering

more efficient care to patients who are affected by two or more chronic conditions. In adopting new approaches, the goal is to improve access to and the quality of services and to control health care costs. Before introducing any new model widely in China, however, it is advisable to pilot it at a small scale to assess its feasibility, adapting it to local conditions, and to evaluate the results.

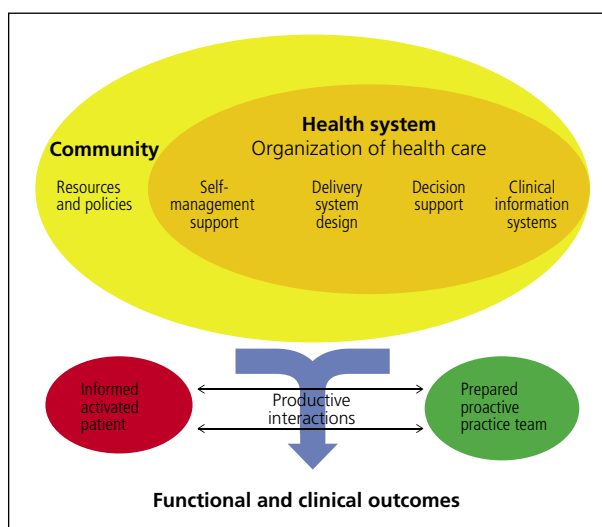
NCD patients can be categorized according to the intensity and sophistication of care needs (74, 75) and provided with the needed services accordingly. A majority of NCD patients need a low level of care since their conditions are reasonably under control with self-management. Only about 5 percent of NCD patients would require complex case management delivered by specialized personnel or through hospital-based

Figure 18: "Pyramid of Care" Model



Source: Adapted from E. Nolte, M. McKee. *Caring for people with chronic conditions: A health system perspective, 2008*.

Figure 19: "Chronic Care" Model



Source: Adapted from E. Nolte, M. McKee. *Caring for people with chronic conditions: A health system perspective, 2008*.

care. In between these two groups are the so-called high-risk patients who need structured care management from specialists because their condition is not stable or is deteriorating (Figure 18).

The “Chronic Care” model, which has been adopted in several countries, offers some useful applications for redesigning health care organization and service delivery in China to improve the quality of care for NCD patients (76; Figure 19). The model’s main components are: (a) self-management support (counseling, education, and information giving); (b) delivery system design (multidisciplinary teams); (c) decision support (evidence-based guidelines and training of health workers); and (d) clinical information systems (patients’ records, clinical audit, and feedback). At the core of this model are the productive interactions between service providers and patients in assessment, self-management support, optimization of therapy, and follow-up.

Disease management program (DMP), another model that may be relevant for organizing the provision of NCD-related health care services in China, is now widely used in the United States, Germany, and other OECD countries (77). The decision to include any NCDs as part of DMPs is guided by selection criteria, such as a high number of patients, high expenditure, potential for quality improvement, existence of evidence-based guidelines, need for coordinated care at different levels of the system and potential for improvement through patients’ initiatives (78). NCD patients and service providers can be encouraged to join the appropriate DMP with appropriate incentives, such as risk structure compensation and a reduced or even waived copayment by enrolled patients. A recent review confirmed that after four years of follow-up, overall mortality and drug and hospital costs were all significantly lower for patients who participated in the program compared to other insured patients with similar health profiles who did not participate (79).

Telemedicine (e-health, m-health) is also being increasingly used for NCD care and has been proven effective for the treatment of diabetes, heart disease, and COPD, as well as for promoting smoking cessation and physical activity, with good results as measured in terms of improved service utilization and treatment compliance, reduced hospital admission, increased patient satisfaction, and improved health outcomes (80,81,82,83,84,85).

Effective NCD health care models point to three important lessons that may be relevant to China:

- **Emphasis on PHC:** The PHC system plays a

pivotal role in the provision of both preventive and curative care for almost all high-risk groups and most NCD patients (86,87). For NCD care, the PHC system should (a) enable first-contact access for patient needs; (b) provide long-term, patient-centered care; and (c) ensure comprehensive care for most health needs and coordinate care, both horizontally and vertically. Experiences in urban areas in Shanghai and Beijing, as well as in rural areas in Shandong Province, show that township health care centers and village clinics in rural China and community health care centers in urban China have been able to fulfill such tasks when they are well equipped and staffed with trained and motivated personnel. Currently, however, the health system in China is still hospital-centered, which is less cost-effective for the Government and provides less financial protection for patients and their families.

- **Self-management of NCDs:** Patients and their families are informed and motivated for self-management by either PHC providers or peer patients to adhere to treatment regimes, monitor their conditions, and adopt and maintain healthy behaviors.
- **Effective coordination between PHC, hospitals, and other service providers:** Coordination is needed to ensure continuity of care for NCD patients at different levels of the system, enabled by well defined referral procedures and contractual arrangements, and information systems and technology.

Developing synergies between NCD programs and other health programs

Given co-morbidities among NCD patients (88), taking a disease-inclusive approach at the service delivery level is critical. As part of health care organization reforms, there is opportunity to develop synergies among different health programs to show benefits for their own work and for tackling NCD so that different health programs (a) share existing facilities, resources, information systems and (b) target a “common” population, as follows:

- **Maternal and child health and NCDs:** Lifestyle modification and behavioral interventions—such as tobacco and alcohol control and adequate and appropriate nutrition during pregnancy—could lead to healthier mothers and babies and lower infant mortality. Tackling medical conditions arising during pregnancy (hypertension, gestational diabetes)

Table 8: Life Course Approach for NCD Prevention and Control

Stages of Life	Opportunities
Fetal development and maternal environment	• Maternal diet/nutrition • Regular check-ups for intra-uterine growth and control of hypertension and high blood sugar
Infancy and early childhood	• Subsidy for healthy food or targeted nutritional intervention for children from families with low socio-economic status • Promotion of breast feeding
Adolescence	• School-healthy lunch/dinner program • Regulating food advertising to children • Reducing time for television viewing and fostering sports and hobbies • Banning tobacco sales to minors
Adulthood	• Risk factor modifications, such as prevention of tobacco smoking, smoking cessation, prevention of alcohol drinking • Development of parental and food preparation/cooking skills • Wellness programs at workplaces • Early detection and treatment for elevated blood pressure, serum cholesterol level, and hyper-insulinemia
Aging and older people	• Risk factor modifications: prevention of tobacco smoking and excessive alcohol drinking, smoking cessation • Establishment of expert patient groups or patient self-support groups
All stages	• Five servings of fruits and vegetables per day • 30 minutes of physical activity per day • Preventing tobacco smoking and the harm of second-hand smoke • Effective and equitable primary health care • Changing social norms to make healthy choices easier • Promoting community safety

Source: Hill, D., Nishida, C., James, W. P. T. 2004. A life course approach to diet, nutrition and the prevention of chronic diseases. *Public Health Nutrition* 7 (1A): 101–121.

could reduce maternal mortality and impact on the longer term health of mothers. Maternal and child health programs could also be used to raise awareness of and detect early signs and symptoms of cervical and breast cancer (89).

- **Communicable diseases and NCDs:** A TB control program provides an opportunity for NCD prevention and control since TB patients may also have diabetes and/or COPD and may smoke (90). TB control programs could be also leveraged to promote smoking cessation. Cervical cancer is vaccine preventable, so prevention of this cancer could be built into existing immunization programs. Screening for hypertension and elevated blood sugar levels can be administered among people diagnosed with HIV infection.
- **Environmental health and NCDs:** Smoke-free environments or air pollution control and enforcement

of occupational health legislation could help to reduce the prevalence of COPD and cancers.

Life course approach for NCD prevention and control

Major biological risk factors may emerge and begin having effects in early life and continue to have a negative impact throughout life and even into the next generation. Lifestyle modification at all stages of life can reduce the risk of progression to NCDs. A life course approach is recommended for adaptation in China to seize opportunities at different stages in life for NCD prevention and control (Table 8) (91). Government policy has an essential role in facilitating a conducive economic and legal environment to reduce risk factors at the population level and to facilitate making health changes easier, more effective, and sustainable.

Establishing new institutions and adopting new roles

New institutional bodies would need to be set up to strengthen the capacity of the health system to deal with NCDs. For example, China's MOH, with the support of the U.K. National Institute of Health and Clinical Excellence (NICE), has established a new agency in charge of conducting routine technology assessments and screening new drugs to guide resource allocation decisions and improve the cost-effectiveness of services provision. The capacity of this institution needs to be developed and strengthened to fulfill its critical role.

Some existing institutions may require further strengthening to take on new roles or perform their current duties and responsibilities more effectively. For instance, local CDCs may function as technical hubs to support a strengthened NCD prevention and control effort, bringing together and coordinating different initiatives and actions. At the service delivery level, new organizational arrangements may be developed as well. PHC providers have a role to play as gatekeepers to prevent unnecessary hospital admissions. In turn, hospitals may rely on technical advisory teams comprised of specialists in different disciplines for handling complicated cases and providing technical assistance to PHC providers. Indeed, there is now an opportunity to reorient the entire health system towards health promotion and disease prevention. A good

example is the U.K. Every Contact Counts initiative, which aims to have every provider-patient contact include health promotion and disease prevention interventions (e.g., counselling, screening, smoking cessation advice).

Developing new roles and searching for more flexibility in using existing staff require an assessment of the existing environment (policy and legal, structural and procedural, and financial mechanisms) that influence institutions' or health care workers' proposed new roles. To support these arrangements, additional changes may be needed so that (a) adequate incentives for various health care professions and stakeholders are provided for the delivery of required care to patients, and (b) collaboration and teamwork are enhanced.

Developing a capable and motivated workforce

The rising NCD epidemic necessitates a comprehensive human resources development plan. To this end, the following considerations should be taken into account in China:

- **Skill mix for NCDs:** Expertise in some areas—such as how to define a health insurance benefit package based on cost-effectiveness analysis; how to regulate price, volume, availability, and payment of new market entry pharmaceuticals related to NCD and other diseases; how to plan, organize, and provide patient-centered care; partnership development; information and communication technology; and

Table 9: Examples of Financial Incentives for NCD Services

Focus	Financial Incentives (Country of Practice)
Structure	Demand side • Reduce health insurance premiums if enrollees meet health improvement targets (e.g., quit smoking or reduce weight) (United States) • Reduce/waive copayment by enrollees for joining DMPs (Germany) • Cover additional services for patients in DMPs Supply side • Implement DMPs and enroll patients in DMPs (Germany, United States) • Put in place a "package of care" that crosses institutional/ sectoral boundaries (Australia); • Risk structure compensation (Germany)
Process	Demand side • Keep patients in DMPs for a set period (Germany) Supply side • Pay for performance: Ensure the care protocols specified in DMPs are followed; reach pre-defined targets on process measures (Germany, United Kingdom, Australia); offer quality improvement grants (Australia)
Outcome	Supply side • Pay for performance: Reach predefined targets, health outcomes, and patient satisfaction or reward the top X% of providers on an indicator(s) (United Kingdom)

Source: Adopted from E. Nolte and M. McKee. *Caring for People with Chronic Conditions: A Health System Perspective*. 2008.

behavior sciences and public health—should be developed. Global experiences suggest GPs are key to facilitating integrated care for NCD patients if they are trained to meet patients' multiple and complex needs. By the end of 2010, there were only 60,000 GPs in China, 3.5 percent of all licensed physicians, far lower than the 30–60 percent observed in OECD countries.

- **Staff mix for NCDs:** China may assess the need to train more nurses and to enlarge their roles in NCD management. In addition, enlisting

community resources—such as patient-self support groups; retired health workers; and NGOs, such as associations for hypertension and diabetes prevention and control—could be explored as NCD service extenders, as has been practiced for HIV/AIDS and TB care in China. Trained and equipped with adequate skills and knowledge, they can take on functions traditionally assigned to staff in medical facilities.

- **Quantity and distribution:** The number of health worker per 1000 population in China is lower than

Box 2: Quality and Outcome Framework in the United Kingdom

Providers must fulfill a range of quality requirements in order to be contracted with the National Health Service (e.g., having a practice information leaflet for patients and a system to enable quality assurance). The contract includes a system of financial incentives for clinical and organizational quality. The Quality and Outcomes Framework (QOF) rewards practices for the provision of 'quality care' and helps to standardize improvements in the delivery of clinical care. Quality rewards are a substantial part of the funding (typically 25% of a GP's income) in addition to capitation and infrastructure payments.

To link payments to the achievement of quality standards, a system of points was developed, with an original maximum of 1000. The maximum number of points achievable for each indicator is related to its associated workload: 87 clinical indicators account for 66% of the total number of points achievable by a practice. The most points are available for diabetes (92 points), hypertension (79 points), and coronary heart disease (76 points) and smoking cessation (60 points).

Points for clinical indicators are awarded on a simple linear basis between a minimum and maximum. For example, for controlling blood pressure, a maximum of 57 points can be earned. No points are earned until 40% of patients have achieved a targeted blood pressure level; the maximum practically achievable has been set at 70%. If a practice achieves the blood pressure target in 70% of covered population, it will receive 57 points for this indicator. If the target is achieved in only 60% of the targeted population, the practice will earn for this indicator only 38 points $[=57 \times (50\% - 40\%) / (70\% - 40\%)]$.

Domain	Sample Indicator
Clinical management	% of patients with hypertension whose last blood pressure measurement is 150/90 or less % of patients with diabetes whose the last blood pressure measurement is 140/80 or less
Organization	The practice has up to date clinical summaries in at least 60% of patient records
Quality & productivity	The practice engages with the development of and follows 3 agreed care pathways in the management and treatment of patients to avoid emergency admission and produces a report of the action taken.
Patient experience	The length of routine booked appointments with the doctor is not less than 10 minutes
Additional services	% of female patients whose notes record that a cervical screening test has been performed in the proceeding 5 years

Source: Adapted from British Medical Association. *Quality and Outcomes Framework Guidance for GMS Contract 2011/12*. 2011.

that in OECD countries (92,93) and concentrated in the economically developed eastern region. Less than 36 percent of physicians are working at the PHC level, such as at village clinics, township health centers, and urban community health centers. Alternative options could be assessed to reverse this situation and improve the distribution of human resources in the health system.

Improving health service delivery

Different approaches that may be relevant for China exist to improve health services delivery for NCD patients, with larger effect when measures are combined.

Financial incentives

Financial incentives can be applied at different levels and to different stakeholders to encourage behavior modification among the patients and improve the delivery of NCD services (Table 9).

Pay for performance (P4P): Payment to health care providers could be conditioned on the achievement of specific programmatic targets measured in terms of volume, price, type of service delivered, and quality. P4P could be particularly useful for the prevention and control of certain NCDs, such as diabetes and hypertension, because (a) the quality and outcome of these NCDs are easy to measure, for example, blood glucose test for diabetes patients and blood pressure measurements for hypertensive patients (94), and (b) they have clearly defined treatment protocols that can be used to define care norms based on evidence. In addition, international experiences suggest that it is important that the design of a P4P mechanism (a) not penalize providers who serve populations with high morbidity or that are hard to reach and (b) minimize distorting aspects of P4P in relation to other services not included in the scheme (95).

General practitioners (GPs) in the United Kingdom, for instance, are rewarded for delivering care (processes) exhibiting particular features assumed to be associated with clinical and organizational quality and health outcomes of the registered patients (96). The Quality and Outcome Framework in that country structures and facilitates contractual arrangements and conditions for providers (Box 2). Some models of P4P have been introduced in China; e.g., in Shanghai and Henan Province. The accumulated experiences in these provinces should be evaluated before replication in other provinces.

Different ways to implement P4P could be assessed for adaptation in China: (a) global experience suggests that 5–25

percent of reimbursement payments can be withheld for a quality reward. They can be allocated to service providers in the full amount or partially on the basis of compliance with agreed service delivery targets; (b) a bonus of 5–20 percent of total reimbursement can be paid to top-rated providers; (c) quality grants can be set up for specific quality improvement activities to providers who meet quality improvement targets; and (d) to get started, health insurance authorities can link at least 10 percent of compensation to performance to promote change in practices and improvement in service quality. The percentage should be then increased gradually.

To discourage practices that discriminate against older and sicker patients and facilitate the provision of services to NCD patients along a care continuum, physicians could be contracted on a risk-adjusted capitation basis (taking into account age, gender, health status, and quality indicators). A combination of different payment methods is recommended to be used to pay hospitals. While a diagnostic-related groups (DRGs) reimbursement method, coupled with good quality assurance systems such as pre-admission certification, can help improve technical efficiency, the allocation of global budgets can discourage unnecessary hospital admissions and promote service delivery at the primary and specialized outpatient levels of care. In addition, incentives for patients can be introduced: NCD patients can be encouraged to join NCD management programs through reductions in and/or exemptions from co-payments and by lowering the health insurance premiums of patients who enroll in such programs and achieve individual health targets (e.g., smoking cessation, weight reduction).

Regulatory tools

To contribute to the improvement of quality of care in China, the adaptation of some additional regulatory tools and service delivery arrangements could be explored, as follows:

Licensing and accreditation: These mechanisms could be used to prequalify potential service providers under the DMP approach for NCDs. Structural and equipment requirements, use of standardized clinical guidelines and protocols to guide the process of care, as well as data collection and reporting requirements can be established for service providers and facilities that want to be licensed/ accredited.

Selective contracting: Contracting with pre-selected providers is done, for example, in the United States, Austria, and the Netherlands. Selective contracting allows health insurers to channel their members to providers who offer favorable terms, fostering competition among providers on the basis of price, quality, scope of services and

amenities. Selective contracting does not necessarily restrict access to any provider. Seeing a noncontract provider could just require lower reimbursement rates for providers by the insurance companies and higher copayments for patients (97,98).

Gatekeeping: GPs and their assistants have been used as the first contact for managing health problems in Australia and the United Kingdom (99,100). Specialists can be seen only upon referral from a GP or GP's assistant. PHC providers willing to be a gatekeeper have to fulfill certain criteria, such as: (a) follow evidence-based clinical guidelines, (b) attend mandatory training on patient-oriented communication and basic diagnosis and treatment of common NCDs, and (c) run an in-house quality management program in their practice.

Development and enforcement of evidence-based guidelines: Practice guidelines for chronic disease management need to be updated on the basis of reviews of available clinical evidence and technological developments and adapted at the different levels of the health system in accordance with the institutional and financial reality of China's provinces. Standard operating procedures or criteria need to be developed on NCD patient referral between health providers at different levels.

Building a continuous quality assurance culture

In China, the adoption of processes and tools for continuous monitoring and assessment of the performance of service providers could be explored so that the results can be used to identify areas for improvement. Patient satisfaction surveys can also be used to identify areas for health care improvement, to induce physicians and other care givers to modify service delivery practices in accordance with feedback provided by patients. In order to build a continuous quality assurance culture in the health system, the National Center for Cancer Research, National Center for CVD Research of the Chinese Academy of Medicine, China CDC, and the China National Health Development Research Center would need to work together to develop clinical guidance and standards of care for the management of NCDs at the service delivery level, as well as processes and tools to monitor and assess their uptake by providers and the impact of these measures on the quality of care delivered and health outcomes.

6.3 Addressing Information Gaps

In developing new policy and implementing institutional reforms in China's health system, proper attention would need to be placed on (a) establishing robust monitoring

and evaluation arrangements that underpin and accompany policy development, target setting, and program implementation. The systematic collection and assessment of data and information are necessary to better understand the changing nature and characteristics of the population's health conditions and to measure and document the impact of policy decisions and interventions that are implemented to address NCDs at different levels of the system. Many of the recommended options and actions in China have been either not implemented or not properly evaluated.

China would also need to be cautious when extracting lessons from other countries' experiences, because its health delivery system is organized differently and operates in a different socio-economic context than those in other countries. Similarly, the Chinese people have different sets of cultural values and expectations that influence demand and utilization of health services.

Scaling up and strengthening the epidemiological surveillance systems for NCDs and related risk factors and creating a strong empirical research capacity in the health sector are critical to generate valid, reliable, and timely data and assessments on what works for NCD prevention and control in the country. While full-fledged NCD surveillance surveys should be implemented every five years, risk behavior surveillance surveys are recommended every two years. Besides, province representative data on NCDs and related risk behaviors need to be developed and used to assess local NCD response.

At the service delivery level, the development of electronic health record (EHR) systems has the potential to improve NCD care by (a) facilitating coordinated and integrated care: health providers at different levels and different location could have all the necessary information on any given patient in a timely manner; (b) tracking and monitoring patients' status and sending out health maintenance alerts (101); (c) documenting the performance of different service providers (102); and (d) reducing laboratory and medication errors.

Many countries are investing heavily in EHR systems (103). China's MOH has started an initiative to health sector "informatization," and different EHR systems have been developed at the provincial level. It is of utmost importance, therefore, to ensure the standardization of demographic, health and service data across the health system through the use of a common patient identifier (e.g., civil registry number), as well as internationally accepted diagnosis and procedures coding systems, and recording and reporting forms, including health insurance claim forms. These

measures would facilitate the coordinated flow of information among service providers, and between service providers, health insurance schemes and public health authorities. The development of EHR at the provincial level in China should be closely monitored and evaluated to draw lessons about design, cost, implementation requirements, and results achieved to inform scale up to other provinces.

7 THE WAY FORWARD

China's NCD epidemic will continue to explode over the next 20 years if not addressed effectively. This has the potential to undermine the Government's agenda for harmonious and human-centered development, particularly by aggravating health inequities. It may also raise the odds of a future slowdown in economic growth due to a reduced ratio of healthy workers to a growing number of sicker dependents. Too low a ratio may pose a significant social challenge that could undermine China's economic prosperity.

Much of China's NCD burden can be avoided and the remainder managed with the adoption and adaptation to local conditions of good practices that have been proven effective internationally. Indeed, as outlined in this report, cost-effective policy options exist for a comprehensive multisectoral response to the NCD epidemic. With improved political commitment at the highest levels of Government, many of the key challenges for implementing these options can be overcome so that (a) policies and investments in other sectors contribute to the control of the social determinants and risk factors associated with the onset of NCDs and (b) health care organization, financing and service delivery systems are redesigned to generate better health outcomes.

As the “platform for action” for effectively addressing NCDs in China is a medium-term effort, its implementation could build on and be accelerated by the full and immediate implementation of the FCTC that the Chinese Government has ratified, including adoption and enforcement of smoke-free public spaces and workplaces to reduce the risks of second-hand smoking, tobacco advertising, and increases in excise taxes on tobacco products, enhanced regulation of the salt, fat, and sugar content of processed foods; and the scaling up of health care organization and financial reforms to facilitate access to essential treatments for the most common NCDs. At the same time, making the achievement of good health outcomes a key social objective under China's 12th Five-year Plan (2011–2015) would help to raise the political commitment to promote health improvement contributions by other sectors, such as education, employment, transport, and urban and rural development.

With reduced unhealthy behaviors, improved socioeconomic environments conducive to health, and expanded access to quality health services, not only do people live longer, but their quality of life is also improved by the reduction of sickness and disability at the end of life. Data from successful efforts in developed countries reveal that health improvements occurs in a shorter time frame than people commonly believe—within a year or a few years rather than decades—after the elimination of the exposure to risk factors (104,105). These advancements not only benefit individuals and families but also society as a whole and the national economy.

An effective response by China to address its NCD challenge in the years to come could be a powerful example that would significantly influence the rest of the world.

REFERENCES

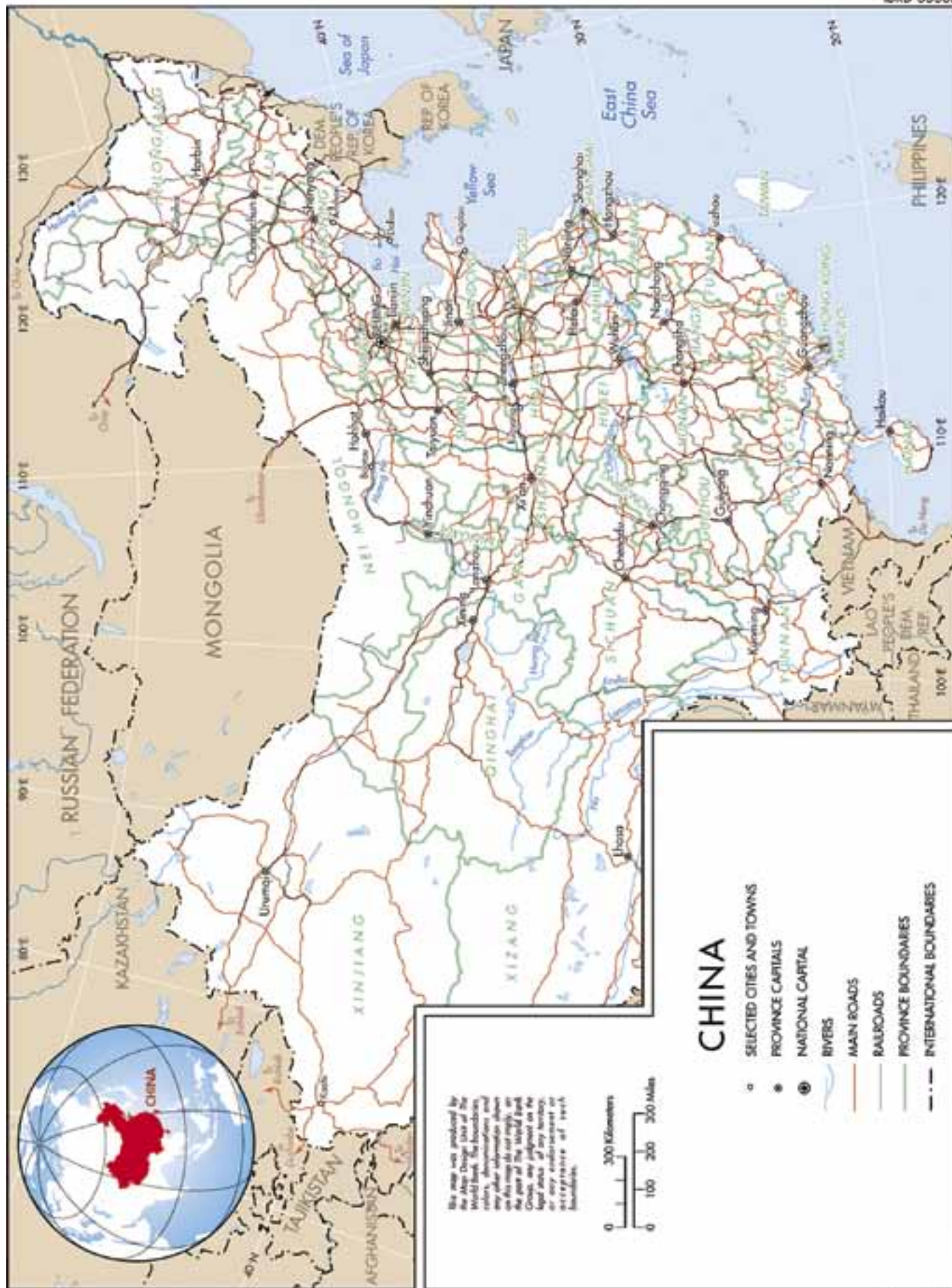
- 1 China, Center Committee of Chinese Communist Party. 2011. *Suggestions on the Development of the 12th Five Year Plan for the Nation's Economic and Social Development*. Accessed on December 24, 2010, at http://news.china.com/zh_cn/focus/2010zgqh/11087561/20101028/16211890.html.
- 2 Sen, A. 1999. *Development as Freedom*. New York: Alfred A. Knopf.
- 3 WHO. 1946. Constitution. Accessed on January 4, 2011, at <http://apps.who.int/gb/bd/PDF/bd47/EN/constitution-en.pdf>.
- 4 Sen, A. 2011. "Health: The Perspective of Knowledge." Accessed February 21, 2011, at <http://www.institut.veolia.org/en/cahiers/sustainable-development-knowledge/ideas-broadening/sen.aspx>.
- 5 Smith, J. P. 1999. Health bodies and thick wallets: The dual relation between health and economic status. *Journal of Economic Perspectives* 13 (2): 145–66.
- 6 Case, A., Fertig, A., and Paxson, C. 2005. The lasting impact of childhood health and circumstance. *Journal of Health Economics* 24 (2): 365–89.
- 7 Bloom, D. E., Canning, D., and Sevilla J. P. 2004. The effect of health on economic growth: A productive function approach. *World Development* 32 (1): 1–13.
- 8 UNDP. 2010. "The Real Wealth of Nations: Pathways to Human Development." Accessed December 23, 2010, at <http://hdr.undp.org>.
- 9 WHO. 2010. *World Health Statistics*. Accessed January 4, 2011, at http://www.who.int/whosis/whostat/EN_WHS10_Full.pdf.
- 10 Wang, L., Kong L., Wu F., Bai Y., and Burton R. 2005. Preventing Chronic Diseases. *Lancet* 366: 1821–24.
- 11 WHO. 2009. *Global Health Risks*. Comparative Risk Assessment Project. Geneva: WHO.
- 12 World Economic Forum. 2010. "Global Risks 2010." A Global Risk Network Report, Geneva.
- 13 UNDP. 2009. "Overcoming Barriers: Human Mobility and Development." Human Development Report 2009. New York: UNDP.
- 14 Hu, D., Reardon, T., Rozelle, S., Timmer, P. W. H. 2004. The emergency of supermarkets with Chinese characteristics: Challenges and opportunities for China's agriculture development. *Development Policy Review* 22: 557–86.
- 15 James, W. P. T. 2008. The fundamental drivers of the obesity epidemic. *Obesity Reviews* 9 (Suppl. 1): 6–13.
- 16 China, Ministry of Health/Center for Disease Control. 2011. *Global Adult Tobacco Survey (GATS) China 2010*. Draft Report.
- 17 He J., Gu D., Chen J., Wu X., Kelly T. N., Huang J. F., Chen J. C., Chen C. S., Bazzano L. A., Reynolds K. et al. 2009. Premature deaths attributable to blood pressure in China: a prospective cohort study. *Lancet*, vol.374(9703): pp. 1765–1772.
- 18 Yang, W., Lu, J., Weng, J., Jia, W., Ji, L., Xiao, J., Shan, Z., Liu, J., Tian, H., Ji, Q. et al. 2010. Prevalence of diabetes among men and women in China. *New England Journal of Medicine*, 362 (12): 1090–1101.
- 19 Chen, C. M. 2008. Overview of obesity in Mainland China. *Obesity Reviews* 9 (Suppl. 1): 14–21.
- 20 Ji, C. Y., and Cheng, T. O. 2008. Prevalence and geographic distribution of childhood obesity in China in 2005. *International Journal of Cardiology* 131 (1): pp. 1–8.
- 21 International Obesity Task Force. 2003. "Waiting for a Green Light for Health? Europe at the Cross Road for Diet and Disease." IOTF Position Paper. Retrieved November 8, 2010, at <http://www.ionf.org/popout.asp?linkto=http://www.ionf.org/media/euobesity2.pdf>.
- 22 Chen, C. M., Zhao, W., Yang, Z., Zhai, Y., Wu, Y. and Kong, L. 2008. The role of dietary factors in chronic disease control in China. *Obesity Reviews* 9 (Suppl. 1): 100–103.
- 23 Eberstadt, N. 2010. The demographic future: What population growth—and decline—means for the global economy. *Foreign Affairs* 89 (6): 54–64.
- 24 UN Population Division. 2008. "World Population Prospects: The 2008 Revision." Retrieved October 31, 2010, at <http://esa.un.org/unpp/p2k0data.asp>.

- 25 Cai, F. and Wang, D. 2005. "Demographic Transition: Implications for Growth," in *The China Boom and Its Discontents*, eds. Ross Garnaut and Ligang Song. Asia Pacific Press at the Australian National University.
- 26 China, National Bureau of Statistics, 2010. *China Statistical Yearbook*. China Statistics Press.
- 27 McKinsey & Company. 2009. "Preparing for China's Urban Billion." Retrieved October 31, 2010, at http://www.mckinsey.com/mgi/reports/pdfs/china_urban_billion/China_urban_billion_full_report.pdf.
- 28 Eichengreen, B., Park, D., and Shin, K. 2011. "When Fast Growing Economies Slow Down: International Evidence and Implications for China." NBER working paper #16919.
- 29 Fries, J. F. 1980. Aging, natural death, and the compression of morbidity. *New England Journal of Medicine* 303: 130–135.
- 30 Annemien H. N., Lisette C.P.G.M. De Groot, Wija A., Van Stavern. 2003. Dietary quality, lifestyle factors and healthy ageing in Europe: the SENECA study. *Age and Ageing* 32: 427–434.
- 31 Allaire, S. H., LaValley, M.P., Evans S. R., O'Connor, G. T., Kelly-Hayes, M., Meenan, R.F., et al. 1999. Evidence for decline in disability and improved health among persons aged 55 to 70 years: the Framingham Heart Study. *American Journal of Public Health* 89: 1678–83.
- 32 China, Ministry of Health. 2009. *An Analysis Report of the National Health Services Survey in China, 2008*. Peking Union Medical University Publishing House.
- 33 Jian, W., Chan, K. Y., Reidpath, D. D., and Xu, L. 2010. China's rural-urban care gap shrank for chronic disease patients, but inequalities persist. *Health Affairs* 29 (12): 2189–96.
- 34 WHO. 2005. "Preventing Chronic Diseases: A Vital Investment." Accessed December 25, 2010, at http://www.who.int/chp/chronic_disease_report/en/.
- 35 Peng, X. J., 2006. Demographic shift, population ageing and economic growth in China: A computable general equilibrium analysis. *Pacific Economic Review* 13 (5): 680–97.
- 36 Abegunde, D. O., Mathers, C. D., Adam, T., Ortegón, M., and Strong, K. 2007. The burden and costs of chronic diseases in low-income and middle-income countries. *Lancet* 370 (9668): 1929–38.
- 37 Frenk, J. 2011. "Framing the Diagonal Approach." Presentation delivered at the Conference "The Long Tail of Global Health Equity: Tackling the Endemic Non-Communicable Diseases of the Bottom Billion." The Joseph B. Martin Conference Center, Harvard Medical School, Boston, March 2, 2011.
- 38 China, Center for Disease Control. 2009. *Capacity for NCD Prevention and Control of the Center for Disease Control System in China*. Beijing.
- 39 Gurriá, A. 2010. "Health: Improving Healthcare Is Vital for Long-term Growth." Retrieved February 22, 2010, at http://www.oecd.org/document/54/0,3746,en_21571361_44315115_46155446_1_1_1_1,00.html.
- 40 China, Health Economics Institute. 2009. *China Total Expenditure on Health Report*.
- 41 China, National Center for Health Development and Research. 2010. *Report on China Total Health Expenditure*. National Center for Health Development and Research, Beijing.
- 42 Jamison, D. T., Breman, J. G., Measham, A. R., Alleyne, G., Claeson, M., Evans, D. B., Jha, P., Mills, A., and Musgrove, P. 2006. *Disease Control Priorities in Developing Countries*. New York: Oxford University Press and Washington, DC: World Bank.
- 43 Asaria, P., Chisholm, D., Mathers, C., Ezzati, M., and Beaglehole, R. 2007. Chronic disease prevention: Health effects and financial costs of strategies to reduce salt intake and control tobacco use. *Lancet* 370 (9604): 2044–53.
- 44 Lim, S. S., Gaziano, T. A., Gakidou, E., Reddy, K. S., Farzadfar, F., Lozano, R., and Rodgers, A. 2007. Prevention of cardiovascular disease in high-risk individuals in low-income and middle-income countries: Health effects and costs. *Lancet* 370: 2054–62.
- 45 Sims, M., Maxwell, R., Bauld, L., and Gilmore, A. 2010. Short terms impact of smoke-free legislation in England: retrospective analysis of hospital admissions for myocardial infarction. *British Medical Journal* 340: c2161.
- 46 Puska, P. 2003. "Curbing the Global Epidemic of Non-communicable Diseases." Touch Briefings. Retrieved September 7, 2010, from <http://www.touchbriefings.com/cdps/cditem.cfm?NID=28>.

- 47 Li, G., Zhang, P., Wang, J., Gregg, E. W., Yang, W., Gong, Q., Li, H., Jiang, Y., An, Y., Shuai Y., Zhang, B., Zhang, J., Thompson, T. J., Gerzoff, R. B., Roglic, G., Hu, Y., and Bennett, P. H. 2008. The long-term effect of lifestyle interventions to prevent diabetes in the China Da Qing Diabetes Prevention Study: A 20-year follow-up study. *Lancet* 371: 1783–89.
- 48 WHO. 2008. “Closing the Gap in a Generation: Health Equity through Action on the Social Determinants of Health.” Commission on Social Determinants of Health Final Report, Geneva.
- 49 Puska, P., Vartiainen, E., Laatikainen, T., Jousilahti, P., and Paavola, M. 2009. *The North Karelia Project: From North Karelia to National Action*. Helsinki: Helsinki University Printing House.
- 50 Baiker, K., Cutler, D. and Song, Z. 2010. Workplace wellness program can generate savings. Health Affairs, Accessed December 27, 2010, at <http://content.healthaffairs.org/content/29/2/304.full.html>.
- 51 Wu X. G., Gu D. F., Wu Y. F., Yu X. H., Wang S. Y., Wang N., Gao J. M., Duan X. F., Zhou B. F., Liu L. S. 2003. An evaluation on effectiveness of worksite-based intervention for cardiovascular disease during 1974–1998 in Capital Iron and Steel Company of Beijing. *Journal of China Preventive Medicine* 37 (2): 93.
- 52 Guangwei, L., Zhang, P., Wang J., Gregg, E.W., Yang, W., Gong Q., Li, H., Li, H., Jiang, Y., An, Y , Shuai, Y., Zhang, et al. 2008. The long-term effect of lifestyle interventions to prevent diabetes in the China Da Qing Diabetes Prevention Study: A 20-year Follow-up Study. *Lancet* 371: 1783–89.
- 53 Beaglehole, R., Bonita, R., Horton, R., and others. 2011. Priority actions for the non-communicable disease crisis. The Lancet online April 6, 2011 DOI:10.16/S0140-6736(11)60393-0.
- 54 Sunley, E. M. 2009. “Taxation of Cigarettes in the Bloomberg Initiative Countries: Overview of Policy Issues and Proposals for Reform.” Paper prepared for the Bloomberg Initiative to Reduce Tobacco Use, available at www.tobaccofreeunion.org and accessed May 21, 2011.
- 55 Shafey, O., Ericksen, M., Ross, H, et al. 2009. *The Tobacco Atlas*, 3rd ed. Atlanta, GA: American Cancer Society.
- 56 Hu, T., Mao, Z., and Shi, J. 2010. Recent tobacco tax rate adjustment and its potential impact on tobacco control in China. *Tobacco Control* 19: 80–82.
- 57 Hu, T., Mao, Z., Shi, J., and Chen, W. 2010. The role of taxation in tobacco control and its potential economic impact in China. *Tobacco Control* 19:58–64.
- 58 Koivusalo, M. 2010. The state of health in all policies (HiAP) in the European Union: potential and pitfalls. *Journal of Epidemiology Community Health* 64: 500–503.
- 59 Zeidner, R. 2004. “Fitness On the Job.” Special to *Washington (DC) Post*, August 17.
- 60 He, F. J., Jenner, K. H., and Macgregor, G. A. 2010. WASH-World Action on Salt and Health. *Kidney International* 78: 745–53.
- 61 Zhang, M. 2011. “Reducing Out of Pocket Payment for Health Below 30 Percent in the Next Five Years.” Accessed February 22, 2011, at http://www.china.com.cn/news/2010-12/24/content_21610520.htm.
- 62 Pear, R. 2009. “Obama Signs Children’s Health Insurance Bill.” *New York Times*, February 4, 2009. Accessed May 20, 2011, at <http://www.nytimes.com/2009/02/05/us/politics/05health.html>.
- 63 Van de Van, W., Beck, K., van de Voorde, C., Wasem, J. and Zmora, I. 2007. Risk adjustment and risk selection in Europe: 6 years later. *Health Policy* 83: 162–79.
- 64 Eastman, R. C., Javitt, J. C., Herman, W. H., Dasbach, E. J., Copley-Merriman, C., Maier, W., Dong, F., Manninen, D., Zbrozek, A. S., Kotsanos, J., Garfield, S. A. and Harris, M. 1997. Model of complications of NIDDM. II—Analysis of the health benefits and cost-effectiveness of treating NIDDM with the goal of normoglycemia. *Diabetes Care* 20 (5): 735–44.
- 65 Ford, E. S., Umed, A. A, Janet, B. C., Julia, A. C., Darwin, R. L., Thomas, E. K., Wayne, H. G., Simon, C. 2007. Explaining the decrease in U.S. deaths from coronary disease, 1980–2000. *New England Journal of Medicine* 356 (23): 2388–98.
- 66 Castro-Rios, A., Doubova, S. V, Martinez-Valverde, S., Coria-Soto, I., and Peres-Cuevas R. 2010. Potential savings in Mexico from screening and prevention for early diabetes and hypertension. *Health Affairs*, accessed December 27, 2010, at <http://content.healthaffairs.org/content/29/12/2171.full.html>.

- 67 Macinko, J., Dourado, I. Aquino R., de Fatima Bonolo P., Fernanda Lima-Costa, M. Guadalupe Medina, M. Mota E., Berenice de Oliveira, V., and Aparecida Turci, V. 2010. Major expansion of primary care in Brazil linked to decline in unnecessary hospitalization. *Health Affairs* 29 (12): 2149–60.
- 68 Brixi, H. 2009. “China: Urban Services and Governance.” Washington, DC. World Bank. Policy Research Working Paper No. 5030.
- 69 Yang, H. W., Zhang, Y. H. 2010. Case Study of NCD Expenditure in one District in City of Tianjin. *Health Soft Science* 24 (3): 11–14.
- 70 Gibis, B., Koch-Wulkan, P.W., and Bultman, J. 2004. “Shifting Criteria for Benefit Decisions in Social Health Insurance Systems.” In *Social Health Insurance Systems in Western Europe*, eds. R.B. Saltman, R. Busse, and J. Figueras. Copenhagen: WHO Regional Office for Europe.
- 71 Zon, R., Towle, E., Ndoping, M., Levinson, J., Colbert, A., and Williams C. 2006. Reimbursement of preventive counseling services. *Journal of Oncology Practice* 2 (5): 214–18.
- 72 Durand-Zaleski, I., and Obrecht, O. 2008. “France.” In *Managing Chronic Conditions—Experience in Eight Countries*, eds. E. Nolte, C. Knai, and M. McKee. Copenhagen: WHO Regional Office for Europe.
- 73 Walter, S. 2006. “Year of Care: The National Perspective.” Accessed December 28, 2010, at http://www.researchoption.co.uk/YOC_docs/pres3.pdf.
- 74 Boenheimer, T., Wagner, E., and Grumbach, K. 2002. Improving primary care for patients with chronic illness. *Journal of the American Medical Association* 288: 1775–79.
- 75 Boaden, R., Dusheiko, M., Gravelle, H., Parker, S., Pickard, S., Roland, M., et al. 2006. Evercare Evaluation Final Report. National Primary Care Research and Development Centre, University of Manchester.
- 76 Wagner, E. H. 1998. Chronic disease management: What will it take to improve care for chronic illness? *Effective Clinical Practice* 1: 2–4.
- 77 Todd, W. and Nash, D. 1997. *Disease Management: A Systems Approach to Improving Patient Outcomes*. Chicago: American Hospital Publishing, Inc.
- 78 Busse, R. 2004. Disease management programs in Germany’s statutory health insurance system. *Health Affairs* 23 (3): 56–67.
- 79 Stock, S., Drabik, A., Büscher, G., Graf, C., Ullrich, W., Gerber, A., Lauterbach, W.A., and Lungen, M. 2010. German diabetes management programs improve quality of care and curb costs. *Health Affairs* 29 (12): 2197–05.
- 80 Canadian Agency for Drugs and Technologies in Health. 2008. Home Telehealth for Chronic Disease Management, by K. Tran, J. Polisena, and D. Coyle.
- 81 Van den Berg, M. H., Schoones, J.W., and Vliet Vlieland, T.P. 2007. Internet-based physical activity interventions: A systematic review of literature. *Journal of Medical Internet Research* 9(3): 26.
- 82 Rojas, S. V., and Gagnon, M. P. 2008. A systematic review of the key indicators for assessing telehomecare cost-effectiveness. *Telemedicine and e-Health* 14 (9): 896–904.
- 83 Akesson, K. M., Saveman, B. I., and Nilsson, G. 2007. Health care consumers’ experience of information communication technology: A summary of literature. *International Journal of Medical Informatics* 9: 633–45.
- 84 Goldzweig, C. L., Towfigh, A., Maglione, M., and Shekelle, P. G. 2009. Costs and benefits of health information technology: New trends from the literature. *Health Affairs* 28 (2): w282–93.
- 85 Garg, A. X., Adhikari, N. K. J., McDonald, H., Rosas-Arellano, M. P., Devereaux, P.J., Beyene, J., et al. 2005. Effects of computerized clinical decision support systems on practitioner performance and patient outcomes: a systematic review. *Journal of American Medical Association* 293: 1223–38.
- 86 Schmittdiel, J., Shortell, S., Rundall, T., Bhdenheimer, T., and Selby, J. 2006. Effect of primary health care orientation on chronic care management. *Annals of Family Medicine* 4: 117–23.
- 87 Kizer, K., Demakis, J., and Feussner, J. 2000. Reinventing VA health care: Systematizing quality improvement and quality innovation. *Medical Care* 38 (Suppl I): 7–16.
- 88 Caughey et al. 2008. Prevalence of comorbidity of chronic diseases in Australia. *BMC Public Health* 8: 221.

- 89 Gillman, M. W. 2005. Developmental Origins of Health and Disease. *New England Journal of Medicine* 353 (17): 1802–1809.
- 90 Creswell J., Raviglione, M., Ottmani, S., Migliori, G.B., Uplekar, M., Blanc, L., Sotgiu, G., and Lonnroth, K. 2010. Tuberculosis and non-communicable diseases: neglected links, missed opportunities. *European Respiratory Society Journal*, retrieved May 10, 2010 at <http://erj.ersjournals.com.ezproxy.massey.ac.nz/content/early/2010/10/14/09031936.00084310.full.pdf>.
- 91 Hill, D., Nishida, C., James, W. P. T. 2004. A life course approach to diet, nutrition and the prevention of chronic diseases. *Public Health Nutrition* 7 (1A): 101–121.
- 92 WHO. 2006. “World Health Report: Working Together for Health.” Accessed February 22, 2011, at <http://www.who.int/whr/2006/en/index.html>.
- 93 China, Ministry of Health. 2009. *China Health Statistics Year Book—2009*. Beijing.
- 94 Glasgow, N., Zwar, N., Harris, M., Hasan, I. and Jowsey, T. 2008. “Australia.” in *Managing Chronic Conditions: Experience in Eight Countries*, eds. E. Nolte, C. Knai, and M. McKee. Copenhagen: European Observatory on Health Systems and Policies.
- 95 Roland, M. 2007. The quality and outcomes framework: Too early for a final verdict. *British Journal of General Practice* 57: 525–27.
- 96 Smith, P. C., York, N. 2004. Quality incentive: The case of U.K. general practitioners. *Health Affairs* 23 (4): 282.
- 97 Hofmarcher, M. M., and Durand-Zaleski, I. 2004. “Contracting and Paying Providers in Social Health Insurance Systems.” In *Social Health Insurance Systems in Western Europe*, eds. R. B. Saltman, R. Busse, and J. Figueras. Maidenhead: Open University Press.
- 98 Durand-Zaleski, I., and Obrecht, O. 2008. “France.” in *Managing Chronic Conditions: Experience in Eight Countries*, eds. Nolte, E., Knai, C. and McKee, M. Copenhagen: European Observatory on Health Systems and Policies.
- 99 Dennis, S. M., Zwar, N., Griffiths, R., Roland, M., Hasan, I., Powell Davies, G., Harris, M. 2008. “Chronic Disease Management in Primary Care: From Evidence to Policy.” Viewed on September 10, 2010, at https://www.mja.com.au/public/issues/188_08_210408/den11106_fm.pdf.
- 100 Taylor, S. J. C., Candy, B., Bryar, R. M., Ramsay, J., Vrijhoef, H. J. M., Esmond, G., Wedzicha, J.A., Griffiths, C. J. 2005. Effectiveness of innovations in nurse led chronic disease management for patients with chronic obstructive pulmonary disease: systematic review of evidence. *British Journal of Medicine* 331: 485.
- 101 Blaya, J. A., Fraser, H.S.F., and Holt, B. 2010. E-health technologies show promise in developing countries. *Health Affairs* 29 (2): 244–51.
- 102 Valerie, W., Bloom, F., Pierdon, S., Wood, C. 2007. Employing the electronic health record to improve diabetes care: A multifaceted intervention in an integrated delivery system. *Journal of General Internal Medicine* 23 (4): 379–82.
- 103 Hammond, W. E., Bailey, C., Boucher, P., Spohr, M., and Whitaker, P. 2010. Connecting information to improve health. *Health Affairs*, 29 (2): 284–88.
- 104 Puska, P. 2002. Successful prevention of NCDs: 25 year experience with North Karelia Project in Finland.” *Public Health Medicine*, 4 (1): 5–7.
- 105 Marquez, P. et al. 2005. “Dying Too Young: Addressing Premature Mortality and Ill Health due to Non-communicable Diseases and Injuries in the Russian Federation.” Washington, DC: The World Bank. <http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/ECAEXT/0,,contentMDK:20661159~pagePK:146736~piPK:146830~theSitePK:258599,00.html>.



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Toward a Healthy and Harmonious Life in China: Stemming the Rising Tide of Non-Communicable Diseases discusses *why* priority attention to non-communicable diseases (NCDs) is now required in China, articulates *what* would constitute an effective NCD response, and proposes *how* to operationalize the response over the medium and longer terms.

It is expected that the findings and recommendations of this report can inform and promote a broad dialogue toward the development of a *multisectoral response* to effectively address the growing burden of NCDs in China, including a better alignment of the health system with the population's health needs.

An effective response by China to address the NCD challenge in the years to come could be a powerful example that would significantly influence the rest of the world.

Toward a Healthy and Harmonious Life in China: Stemming the Rising Tide of Non-Communicable Diseases will be of interest to political and business leaders, policy makers and managers who focus on economic and social development challenges and options to address them. Within the health sector, this report will be of particular interest to ministry of health and health insurance officials, university researchers, health services providers, and others working to improve health conditions in China and in other countries around the world.

A healthier and more productive population is a critical factor for ensuring sustainable economic growth and harmonious social development over the medium and longer term.
