PART I

Introduction

Analytic Framework, History, and Public Health

CHAPTER 1

China's Healthcare Industry
A System Perspective

LAWTON ROBERT BURNS AND GORDON G. LIU

Introduction

To western readers, analyzing a new healthcare system in the East might seem daunting. Indeed, it takes some of us decades to master an understanding of the healthcare system of our origin country. Nevertheless, there are several methods for approaching an analysis of another country's healthcare system. These include exposition of some (hopefully) invariant principles regarding healthcare that apply across contexts: analysis of what a system of health might look like; comparison with the US system (with which many are already familiar); comparison with other emerging systems such as India; application of existing frameworks for healthcare system analysis; and an appraisal of the major transitions under way in the country's socioeconomic, epidemiologic, and economic profile. This chapter analyzes China's healthcare system using each of these methods.

Some Invariant Principles of Healthcare Systems

The Iron Triangle

One way to analyze a healthcare system is in terms of a set of principles that are (or at least seem to be) invariant across cultural contexts. One principle is that every system aspires to achieve both efficiency and effectiveness. "Efficiency" encompasses three intermediate ends: ensuring access to healthcare, promoting the quality of healthcare, and controlling the cost of healthcare. "Effectiveness" encompasses three corresponding ultimate ends: public satisfaction, positive health outcomes, and financial protection.

A related principle is the "iron triangle" depicted in Figure 1.1. The logic of this triangle is that there are inevitable societal trade-offs in pursuing any of the goals (vertices) in the triangle.[1] If the triangle is an equilateral triangle, and thus each angle is 60 degrees, policy initiatives that expand one angle beyond 60 degrees force one or both of the other two angles to contract below 60 degrees. Thus, efforts to promote access to care (e.g., via insurance coverage) will lead to higher demand for care, rising utilization, and higher costs. Similarly, efforts to promote quality by virtue of enabling access to modern technologies (drugs, medical devices, and equipment) will also likely raise costs. Determining the right thrust and mix among the three angles constitutes the balancing act in resource allocation faced by most countries.

Perhaps no country allocates equal attention to all three goals in the manner of an equilateral triangle. Indeed, healthcare policy in the United States has alternated its focus and attention between these three angles since the late 1920s. In the 1960s, policy makers focused on expanding access to healthcare services via broader insurance coverage by enacting the Medicare and Medicaid programs (to cover the elderly and poor, respectively). In subsequent decades, the policy focus shifted to cost containment to deal with the rising utilization and cost of services that naturally followed from expanding access to insurance for population segments with greater need for healthcare services. During the past decade, policy makers have devoted more attention to quality via such initiatives as pay-for-performance (P4P), value-based purchasing (VBP), accountable care organizations (ACOs), and "never events" (reimbursement withheld for controllable adverse events in hospital episodes).

China faces challenges in pursuing each of these three goals. With regard to *cost*, national health expenditures in China have risen exponentially

since the start of the new millennium (see Figure 1.2). Indeed, China seems poised to emulate the trajectory of spending in other western countries. Moreover, a large percentage of all healthcare is financed out of pocket by the population. Until recently, there has been little health insurance or other forms of risk pooling. The new health insurance schemes enacted in the new millennium now cover most of the population for basic hospital benefits and have only recently begun to implement (or call for) supplemental insurance protection against catastrophic costs. There is also little accountability of providers and a predominance of fee-for-service payment, all of which are associated with high costs. Finally, there is questionable efficiency of the roughly 50–60 percent of the healthcare system financed directly or indirectly (via social insurance) by government sources, with little measurement of inpatient utilization and appropriateness of care.

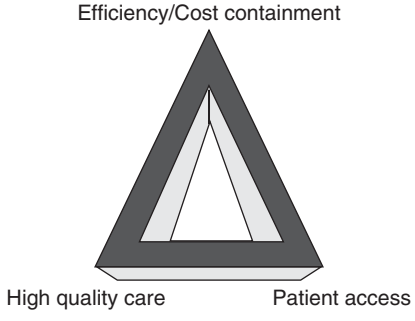

Figure 1.1 The iron triangle of healthcare: balancing act

With regard to *quality*, there is little effective regulation of providers, treatments, and medical products (often from spurious sources), considerable variation in the training and education of providers, and enforcement of laws and regulations at the national or provincial levels. There is considerable overuse of pharmaceuticals and IV solutions. There is also mixed evidence regarding the health of the Chinese population. On the one hand, China's rates of infant mortality, mortality of children under five years old, and life expectancy are all average compared to the region; on the other hand, China

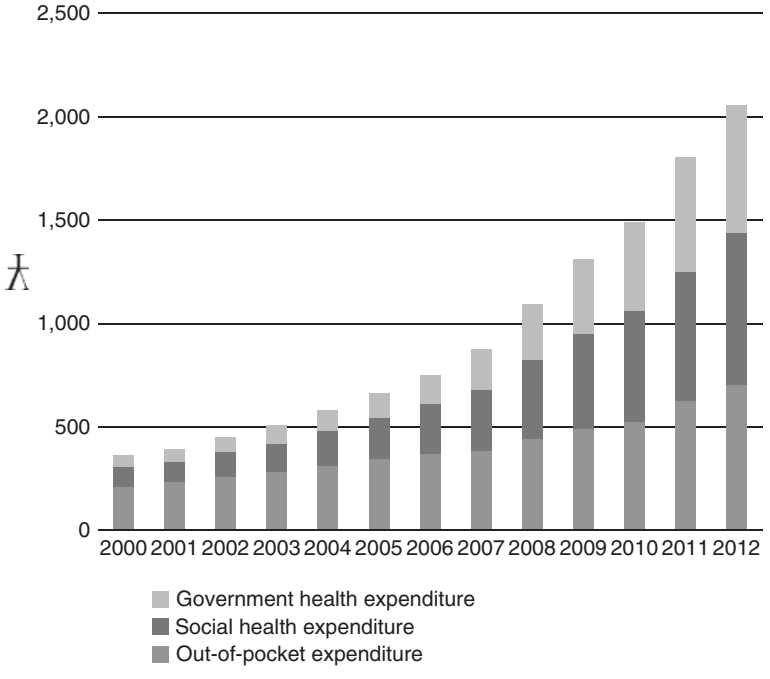

Figure 1.2 Per capita national health expenditures (NHE) in China

exhibits some of the highest declines in mortality rates and increases in life expectancy (covered below).

With regard to *access*, a substantial majority of the population still dwells outside of the cities where most (modern) healthcare facilities exist. Government spending on healthcare is disproportionately allocated to the urban areas rather than rural areas. Rural residents pay higher healthcare costs out of pocket as a percentage of household income. Access is also particularly problematic for the poor and migrant workers. Large variations also exist in the population's access to healthcare across China's provinces.

Countries like the United States and China face similar "iron triangle" trade-offs in sectors other than healthcare. For example, in the policy domain of energy, countries must balance their need for low-cost and efficient energy (cost angle) with low-emission and green energy (quality angle), and with rising demand and sustainable energy (access angle).

The balancing acts here seem formidable. Most economists believe it is impossible to achieve all three goals simultaneously and, thus, that trade-offs must be made.[2] After all, marketing executives believe that in order to position their product against the offerings of competitors, they must excel on one dimension (product cost, quality, or service) and seek parity on the other two. Optimization on all three is rarely considered (and is more rarely observed).[3] Nevertheless, there have been periodic efforts in the United States to pursue all three goals, usually in the context of national healthcare reform. The Health Security Plan (better known as the Clinton Health Plan) sought to do all three; more recently, the Patient Protection and Affordable Care Act (PPACA, better known as Obama Care) is likewise seeking to achieve all three. Underlying the new reform is "the triple aim": improved experience of care, reduced per capita cost, and improved health of the population (accomplished partly by enabling access to preventive services).[4] The jury is out regarding whether the triple aim is achievable, although there are organizations (e.g., Institute for Healthcare Improvement) actively involved in training providers on how to do so. Even its proponents recognize, however, that while the three goals are interdependent, sometimes they are negatively associated with one another (i.e., trade-offs are required).[5]

This discussion is pertinent to China's healthcare system and subsequent chapters in this volume because the country has historically undertaken a series of initiatives that seek to solve the iron triangle in the delivery of healthcare services. Nearly every healthcare reform undertaken by the Chinese government has espoused the goal to make healthcare more affordable, higher in quality, and more accessible to its population. The 2009 reform's goal is "to establish a basic, universal health system that can provide safe, effective, convenient, and low-cost health services to all of China's 1.38 billion citizens."[6]

Market Failure

Other principles observed in the US healthcare system also likely apply to China and elsewhere. These include the principle of market failure: i.e., non-competitive market conditions in the healthcare industry that inhibit the efficient operation of supply and demand. These features include lack of price information and pricing transparency; lack of data on product quality; the resulting inability to assess the comparative value (defined as quality divided by cost) of products and services; asymmetric information between providers and consumers; imperfect agency relationships between physicians and their patients; the heavy role of government as both a buyer and regulator; and moral hazard flowing from insurance coverage. Such features lead to distortions in market efficiency.

Principles Inherent in Healthcare Reform

Several principles emanating from healthcare reform efforts around the world may comprise an additional set of invariant principles. These include the reality of ever-rising healthcare costs (driven by population demographics and technological improvements, among other factors); rising public expectations from healthcare (driven by economic growth and rising national incomes, as well as increased global travel and immigration); the limited capacity of nations to afford the growing

demand of their populace for increasingly expensive healthcare; and increased skepticism regarding traditional methods of organizing and managing healthcare finance and delivery (e.g., the breakdown of centrally planned systems, as well as the recognition of market failures).[7]

Healthcare System Defined

A second way to study another country's healthcare system is through formal definitions. The phrase "health system" is widely used in discourse on global health (e.g., health systems strengthening) but enjoys no agreed-upon definition.[8] "Health system" actually combines two nebulous terms. The first is "health." According to the World Health Organization (WHO), "health" is "a state of complete physical, mental, and social well-being, and not merely the absence of disease and infirmity."[9] "Health" has also been defined as an important capability "that enables individuals to pursue things they might value."[10] There are as many indicators of health as there are definitions. These include life expectancy at birth, infant mortality rates, the percentage of children underweight, the percentage of women with body mass index (BMI) below 18.5, quality-adjusted life years (QALYs), and disability-adjusted life years (DALYs). Comparative historical data suggest that China has outpaced other developing countries on many of these indicators (see Table 1.1). Getting a comprehensive picture of a country across lots of indicators is impossible and probably futile. The United States, for example, is commonly lambasted for ranking relatively poorly among developed countries on infant mortality; on other indicators, however, such as cancer survival, the United States ranks quite highly.

The concept of a "system" is also rather elusive. Piecing together definitions from several dictionaries, we might define a system as a whole comprised of several interdependent parts that have differentiated roles, are interconnected by three processes (input, throughput, output), and thus are integrated in a holistic fashion. Such a comprehensive definition begs the question: does any country have a "system" of healthcare? The payer, provider, and producer components found in any country's healthcare industry are surely interdependent and interconnected (in the sense of serving one another as buyers and suppliers). But are they really integrated? And do they commonly focus on the provision of "health" as defined above?

The answer to both questions is likely "no." There are few collaborative partnerships between these sectors in the United States.[11] As noted earlier, there are huge disconnects between them in terms of their goals and incentives. Moreover, these sectors are commonly oriented to funding and delivering acute *care*, rather than promoting the *health* of the population. The latter would require greater emphasis and funding of prevention, healthcare promotion, and public health activities. Health, as defined in this section, is typically left to the public health system in most countries. What, then, does the United States have if not a system that delivers health? The reality more closely resembles a collection of public and private sector entities (e.g., firms, individuals, governmental bodies, professional associations) that pursue their individual interests, pursue one or more of the goals in the iron triangle, and may or may not interact with the patient.

Harvard University researchers define a healthcare system in a similar fashion as the collection of institutions and actors who provide healthcare (e.g., doctors, nurses, hospitals, pharmacies, and traditional healers); the organizations that supply specialized inputs to the providers (e.g., training schools, manufacturers of products); the financial intermediaries, planners, and regulators who control, fund, and influence the providers (e.g., insurers, government agencies, regulatory bodies); the organizations that offer preventive services; and the financial flows that finance the provision of healthcare.[12]

The World Health Organization defines a healthcare system more simply but more broadly as "all of the activities whose primary purpose is to promote, restore or maintain health."[13] In addition to the list of actors and institutions mentioned throughout this section, this definition of a healthcare system also includes health-enhancing interventions such as road improvements and environmental safety efforts. It also includes the efforts of informal healthcare givers in the home, behavioral change interventions conducted by employers or governments, and efforts

Table 1.1 China's health improvements relative to other countries

Age-standardized death rates, YLL rates, YLD rates, and life expectancy at birth and health-adjusted life expectancy at birth for 199														
Country	Age-standardized death rate (per 100,000)				Age-standardized YLL rate (per 100,000)				Age-standardized YLD rate (per 100,000)				Life expecta	
	1990		2010		1990		2010		1990		2010		1990	
	Rate	Rank	Rate	Rank	Rate	Rank	Rate	Rank	Rate	Rank	Rate	Rank	LE	Rank
Algeria	762	2	584	1	23,346	5	15,484	4	12,395	6	12,215	11	70.9	3
El Salvador	809	4	661	5	26,931	8	18,474	6	12,585	10	11,781	7	69.6	7
Albania	666	1	653	4	19,166	1	15,110	3	11,609	3	11,628	5	73.1	1
Ukraine	913	7	917	11	22,976	4	23,559	10	11,316	2	11,159	2	70	6
Marshall Islands	1,270	14	1,309	15	36,253	12	36,337	14	14,368	15	13,968	15	63.9	12
Tonga	914	8	882	10	22,822	3	22,195	9	12,546	9	11,940	9	70	5
Turkmenistan	1,144	12	919	12	39,780	14	24,522	12	11,911	5	11,933	8	62.8	13
China	**896**	**6**	**607**	**2**	**24,989**	**7**	**14,024**	**1**	**9,639**	**1**	**8,782**	**1**	**69.3**	**8**
Namibia	1,259	13	1,298	14	39,681	13	42,112	15	13,774	14	13,809	14	62.4	14
Samoa	1,088	11	863	9	28,245	9	21,441	7	12,397	7	11,587	3	67.2	9
Egypt	1,065	10	844	8	35,058	10	22,148	8	12,868	12	11,979	10	64.6	10
Guatemala	1,061	9	787	7	36,242	11	24,337	11	12,800	11	11,705	6	64.5	11
Armenia	809	5	674	6	24,125	6	17,197	5	11,778	4	11,588	4	70.3	4
Jordan	792	3	619	3	21,127	2	14,448	2	12,452	8	12,527	12	71.5	2
Vanuatu	1,507	15	1,291	13	41,590	15	34,595	13	13,346	13	12,657	13	61.6	15

Notes:
YLL = years of life lost to premature mortality
YLD = years lost to disability
HALE = health-adjusted life expectancy

to promote female education. The WHO explicitly acknowledges that their system definition does not imply any degree of integration among the activities and services performed.

United States versus China: Convergences and Divergences

A third method to approach another country's healthcare system is by way of comparisons and contrasts with one's own. There are a few commonalities worth noting at the national level. The United States is one of the world's oldest democracies, while China is one of the world's oldest countries. Both are distinguished by pluralistic systems of healthcare financing; both are currently seeking to simultaneously reform their financing and delivery systems and to reach nearly universal insurance coverage of their populations; and both need a concerted effort by their federal/central and state/provincial governments, along with considerable help from the private healthcare sector, in order to accomplish this reform. Both systems focus on the treatment of disease rather than the promotion of health. Finally, both offer a mix of allopathic and more traditional medicine (complementary and alternative medicine in the United States, traditional Chinese medicine in China) that formed the roots of their earlier healthcare delivery.

As noted in the Preface, healthcare systems in rapidly developing countries like China bear a number of remarkable similarities with the US context (see Table 1.2). Both countries (indeed, most countries around the world) worry about managing the iron triangle of healthcare: i.e., the difficulty in simultaneously pursuing the three goals of controlling healthcare costs while also expanding health insurance access to the population and improving the quality of care – for example, by ensuring access to new technologies and medicines. The affordability of healthcare is a common concern, especially with high and rising costs of hospitalization being a cause of impoverishment and personal bankruptcy in both countries.

There is also a common concern with geographic variations in healthcare spending, whereby more money is spent in some regions than in others (e.g., rich vs. poor states/provinces, urban vs. rural areas); there is the parallel concern with geographic disparities in health status (which may or may not result from spending variations). Another common concern is that the population's lifestyle and personal behaviors contribute to chronic illness and increase healthcare spending. There is a common concern with supplier-induced demand – i.e., that providers over-prescribe and over-treat as one means to increase their incomes – and the conflicts of interest that providers have with one another

Table 1.2 Convergence between China and the United States

- Concern with iron triangle
- Affordability of healthcare
- Seeking universal coverage via healthcare reform
- Concern with hospital costs as cause of impoverishment/bankruptcy
- Concern with high costs of technology as percentage of healthcare costs
- Hospital competition via technology wars
- Concern with chronic illness
- Concern with geographic variations in spending and health status
- Concern with conflicts of interest and supplier-induced demand
- Concern with lifestyle issues and behaviors
- Need to develop primary care delivery system
- Hospital waste and inefficiency
- Fee-for-service payment system
- Falling out-of-pocket spend as percent of health costs
- Mixture of financing mechanism: government, employer, individual
- Fragmentation between federal and state government funding
- Effort to balance market approach with regulatory approach
- Low consumer literacy and information
- Local government competing priorities: education, services, health
- Experimentation with new payment models
- Integrate allopathic with complementary and alternative medicine

Table 1.3 Divergences between China and the United States

System Dimension	China	United States
• Spend per capita on healthcare	Low	High
• Government spend as percent of NHE	Low	High
• Private health insurance	Low	High
• Depth and breadth of insurance coverage	Low	High
• Role of public sector hospitals	High	Low
• Preference for private providers	Low	High
• Centralized purchasers	Low	High
• Role of central government in healthcare	Low	High
• Governance mechanisms to monitor providers	Low	High
• Measures of utilization, appropriateness	Low	High
• System of outpatient care/primary care	Low	High
• Amount of money spent on pharmaceuticals	High	Low
• Integration of hospitals and pharmacies	High	Low
• Integration of physicians and hospitals	High	Low
• Role of hospitals in public health	High	Low
• Locus of conflict	Doctor–patient	Doctor–hospital
• Physician payment	Salary	FFS
• Standardized doctor training	Low	High
• Role of medical profession	Low	High
• Hospital length of stays	Long	Short
• Smoking viewed as major problem	No	Yes

(e.g., incentives and kickbacks for referrals) and with product manufacturers whose products they may be incented to (over) use.

There are numerous other similarities between the United States and China. Both operate a fee-for-service system combined with other payment approaches to reimburse providers. Both also include a mix of financing mechanisms that include payments from the federal/central government, state/provincial governments, employers, and individuals. As a result, both feature fragmentation between federal and provincial government efforts, and contend with the reality that provincial governments have many competing priorities for their limited budgets (e.g., education, social services, healthcare). Both desperately need to develop and invest in a broader capacity for primary care delivery (in terms of numbers and accessibility of providers), and both must confront a low degree of consumerism in getting their populations to take better care of themselves.

Despite the evident similarities, there are important differences in the details between the two countries (see Table 1.3).

The US spends roughly 18% of GDP on healthcare, with wide spending variations across geographic regions. Concerns over geographic variations in the US stem from parallel concerns with over-utilization and wasted resources. China spends only 5–6% of its GDP on healthcare. In China, geographic variations are framed as issues of societal inequities, especially between rural and urban populations, in resource allocation and access to healthcare.

In the US, the primary care movement argues for patient-centered medical homes (PCMH) that augment the solo physician's office with information technology (e.g., an electronic medical record) and physician extenders (e.g., nurse practitioners). In China, by contrast, the concern is with both rural and urban populations bypassing lower acuity providers to seek outpatient care services at tertiary hospitals. Another issue is the low level and

variable (and sometimes nonexistent) training of primary care practitioners outside of major cities.

In the US, consumerism is focused heavily on getting people to respond to financial incentives (e.g., through cost-sharing), to utilize information on provider costs and quality in their provider search and purchasing decisions, and to change their lifestyles. In China, by contrast, consumerism is much more basic: the government wants its population to be more active consumers of healthcare by increasing their domestic consumption and save less. The country also wants to address the lack of information among the population regarding the availability of healthcare services (as well as the effects of unhealthy behaviors like smoking).

The hospital and insurance sectors in the US have suffered stagnating growth for the past decade; in China, by contrast, these two sectors have been booming, due to heavy government investments as part of current healthcare reforms. China is witnessing an explosion in hospital capacity and insurance coverage, and is encouraging entry by the private sector into both.

Finally, hospitals and physicians in the US have been seeking to integrate over the past 20–25 years; in China, by contrast, most physicians are fully employed by public hospitals due to their common government ownership and sponsorship. In China, all hospitals also operate pharmacies for outpatient drug sales, drawing huge criticism as the central cause of the over-prescribing problems in China.

Beyond these differences in institutional details, there are several divergences dealing with financing, delivery, and regulation. In contrast to the United States: (a) China has spent relatively *little* per capita on healthcare; (b) its government accounts for a smaller share of national spending on healthcare, while out-of-pocket costs represent a greater proportion of total healthcare spending; (c) the government plays a strong role in healthcare provision (e.g., hospitals, physicians); (d) there are no powerful, centralized purchasers of healthcare services (outside of drugs) dealing with providers, such as large insurance companies; (e) there has been little private health insurance coverage; (f) there are only weakly developed governance mechanisms overseeing providers' behavior, with resulting concerns dealing with overutilization; (g) there are few mechanisms and incentives in the system to promote outpatient care in non-hospital clinics; and (h) the population favors treatment by public sector providers over the private sector.

China, India, and Other Emerging Countries

A fourth approach to understanding the healthcare system in China is by comparison with other emerging countries. In many of these countries, government lacks the infrastructure to levy taxes on workers in the large informal sector of the economy. This limits the tax base (which is relatively low compared to GDP) and thus the public funds available for healthcare investments. Cultural issues, divisions within government, the lack of political will, competing political jurisdictions, and competing investment needs all prevent efforts to redistribute what is collected. To the degree that public funds are invested in healthcare, they tend to go toward large public hospitals in urban areas rather than smaller primary care–oriented clinics in rural areas. The latter are poorly capitalized, poorly staffed and equipped, and offer poor access with long waiting times. Patients often bypass local facilities to seek care in large cities. Most patients pay for healthcare out of pocket, and often pay providers "informal payments" for better treatment and greater access.

We can draw these analyses more sharply by comparing China and its neighbor, India. Both countries have historically had large rural populations, while China has experienced rapid urbanization. Both countries also have rapidly growing economies, dramatic declines in poverty, and rising demand for healthcare services.[14] Until recently, both countries have lacked widespread insurance coverage: the Chinese central government has implemented broad coverage in the last two decades, while in India state governments and voluntary schemes have helped to increase insurance coverage to roughly one-quarter of the population. Both countries are concerned about access to affordable primary and specialty care, are increasingly concerned with the rising costs of healthcare, and are witnessing rising healthcare costs as a significant cause of impoverishment. Nevertheless, both countries spend a small percentage of their gross domestic product (GDP) on healthcare.

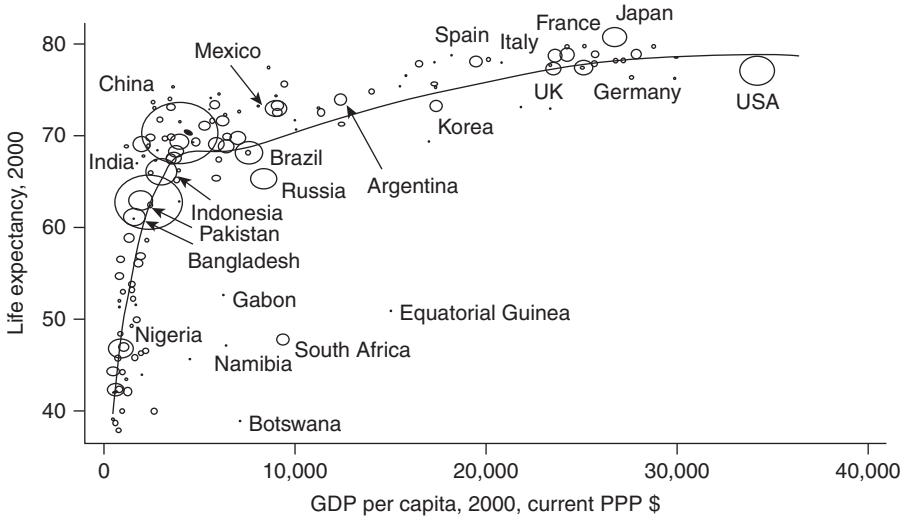

Figure 1.3 The Millennium Preston curve
Source: http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(06)69746-8/abstract.

In addition, both countries are located on the upward sloping portion of the Millennium Preston curve, which depicts the association between GDP per capita and life expectancy (see Figure 1.3). Both China and India can be expected to move up this curve as their GDP grows; the United States is an outlier. China's provinces can be arrayed along a similar curve: provinces with higher per capita incomes also exhibit higher life expectancy at birth.

The logic behind the association depicted in the curve is straightforward. Increased societal wealth can be channeled to greater investments in education, literacy, and public health, as well as purchases of health insurance and healthcare services that improve health status and longevity. The curve suggests that further improvements in health status (i.e., reduced mortality) may be achieved in these developing countries by greater societal spending on healthcare as a percentage of GDP. Not all economists agree, however, that the relationship in the curve is causal (i.e., that increasing income leads to longer life expectancy).[15] Indeed, improvements in health can come without any increase in societal wealth, and vice versa. In some developing countries like India and China, the dramatic improvements in health occurred prior to periods of great economic growth or during only small intervals of those growth periods. Moreover, it may be the case that to the degree there is any causality, it may be more that increasing health leads to increased societal wealth (an issue addressed empirically later on).

Why does the Millennium Preston curve quickly bend and begin to flatten out?

Not all spending is productive toward the end of greater longevity. Recent research suggests that greater spending on "home run" technologies and treatments – i.e., those that are cost-effective and useful for nearly all patients in the population, such as antibiotics for bacterial infections, aspirin and beta-blockers for heart attack patients, antiretroviral drugs for patients with HIV/AIDS, improved health behaviors – contributes the most to improved health outcomes and survival. Greater spending on potentially cost-effective technologies with heterogeneous benefits across patients (e.g., angioplasties with stents, imaging tests, antidepressants, Cesarean sections) can also improve productivity and health but with rapidly diminishing returns as more of the population uses these treatments. Finally, greater spending on technologies with modest or uncertain effectiveness (e.g., arthroscopic surgery for knee osteoarthritis, referrals to specialist physicians,