10 years of health-care reform in China: progress and gaps in Universal Health Coverage

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In 2009, China launched a major health-care reform and pledged to provide all citizens with equal access to basic health care with reasonable quality and financial risk protection. The government has since quadrupled its funding for health. The reform's first phase (2009–11) emphasised expanding social health insurance coverage for all and strengthening infrastructure. The second phase (2012 onwards) prioritised reforming its health-care delivery system through: (1) systemic reform of public hospitals by removing mark-up for drug sales, adjusting fee schedules, and reforming provider payment and governance structures; and (2) overhaul of its hospital-centric and treatment-based delivery system. In the past 10 years, China has made substantial progress in improving equal access to care and enhancing financial protection, especially for people of a lower socioeconomic status. However, gaps remain in quality of care, control of non-communicable diseases (NCDs), efficiency in delivery, control of health expenditures, and public satisfaction. To meet the needs of China's ageing population that is facing an increased NCD burden, we recommend leveraging strategic purchasing, information technology, and local pilots to build a primary health-care (PHC)-based integrated delivery system by aligning the incentives and governance of hospitals and PHC systems, improving the quality of PHC providers, and educating the public on the value of prevention and health maintenance.

Introduction

In April, 2009, China unveiled a huge and complex health reform plan[1] that pledged to provide all citizens with equal access to basic health care with reasonable quality and sufficient financial risk protection by 2020. By contrast, with the market-driven approach of the previous two decades—when an individual's ability to pay determined health-care access—the 2009 reform prioritised equity. Guided by this ideal, the government affirmed its role in the health sector, especially in the financing of basic health care,[2] and implicitly left a role for the private sector in the financing and provision of non-basic health care.

The reform was a response to widespread public discontent with health care's limited access and prohibitive costs, which often led to catastrophic health expenditures (commonly known as *kan-bing-nan, kan-bing-gui* in Chinese) and impoverishment. Frequently cited causes for the health system's failures were government underfunding and a dearth of health insurance coverage. Thus, the government injected massive funding into the health-care sector: from 2008 to 2017, government health expenditure (GHE) on health care quadrupled from ¥359 billion to ¥1·52 trillion (table 1; in July, 2019, US$1 was equivalent to ¥6·88). This translated to a rise of GHE as a share of total government expenditures from 5·7% in 2008, to 7·5% in 2017, and of overall gross domestic product (GDP) from 1·1% to 1·8% in the same timeframe.[4] Insurance coverage also reached over 95% of the Chinese population in 2013, and has been sustained since.[5] 10 years have passed since the reform's launch. Have the government's investments produced commensurate benefits for its people? Has the stated goal—equal access to quality health care with financial risk protection—been achieved? Why or why not? Our Review aims to answer these questions. We first describe and analyse China's health-care reform strategy and then evaluate evidence for whether the reform goals have been achieved. We conclude with policy recommendations and lessons learned.

Search strategy and selection criteria

We based our Review on reports (international and domestic), official documents, and published work. We searched PubMed, Google Scholar, EconLit, MEDLINE, the Social Science Research Network, JSTOR, Wiley Online Library, and China Knowledge Resource Integrated Database for articles and research published from 2009 onwards; we also included cross-references, landmark or highly regarded reports, and work suggested by peer reviewers. We restricted our search to works published in the English language or Chinese language and used the search terms "access", "equal access", "financial risk protection", "catastrophic health expenditure", "impoverishment", "efficiency", "equity", "quality", "public satisfaction", "patient satisfaction", "health expenditure", "public hospital", "health insurance", "primary health care", "primary health care integrated delivery", "essential medicine", "strategic purchasing", "provider payment", "zero mark up", "health reform", "health system", "Healthy China 2030", "health prevention", "yi lian ti", "yi gong ti", "China", and combinations of these terms". The date of the last search was Aug 5, 2019.

Towards a systemic approach to reform

Corresponding with the timing of official government reform plan announcements,[6,7] China's 10 years of health reform can be broadly classified into two phases: phase one was from 2009 to 2011 and phase two was from

2012 onward. The first phase emphasised financial investment, and the second phase prioritised the transformation of resources into effective services through systemic health-care delivery reform. To analyse China's reform, we adopted a health-care system framework in which national-level policy levers interact with health-care delivery system attributes to affect health system outcomes (figure 1).

The first phase: insurance expansion and infrastructure development

The first phase of the reform focused on increasing financial investment to expand insurance coverage and build infrastructure. Between 2008 and 2011, GHE more than doubled (table 1). Nearly half of the GHE funded premium subsidies to expand social health insurance (SHI) coverage. The remaining funds provided supply-side subsidies to primary health-care (PHC) facilities to deliver preventive public health services that are free for all, build infrastructure, construct health information systems, and train a new cadre of PHC providers. To reduce drug expenditures (which constituted 41% of total health expenditures in 2008[4] compared with an Organisation for Economic Co-operation and Development average of 16%),[10] mitigate irrational drug use, and improve access to safe and effective essential medications, the government also established an essential medicines programme (appendix 2 p 1).

Assessments of the first phase of the reform found increases in health-care utilisation but did not identify observable improvements in financial risk protection,[1,11–13] which was a primary motivator for reform. Much of this was due to inefficiencies in health-care delivery. The causes for inefficiencies were systemic. On the one hand, the delivery system was poorly governed and subject to bureaucratic rules and conflicting policies from multiple governing ministries.[1,14–17] On the other hand, the delivery system was motivated by profit; facilities needed to generate 70–90% of their revenue from service provision while being subject to a set of perverse incentives. Specifically, payment to facilities was fee-for-service according to a government-set fee schedule that reimbursed high-tech diagnostic tests above cost and allowed for a 15% mark-up on prescribed drugs. Physician compensation was tied to facilities' profits; with no incentive to coordinate care or invest in population health, providers focused on treating sickness, overprescribing expensive drugs and tests, and neglecting health prevention and promotion. The resulting hospital-centric and fragmented delivery system was costly and inefficient,[18–22] failing to serve the needs of an ageing population with an increasing burden of non-communicable diseases (NCDs).[20,23]

The second phase: health-care delivery reform

Recognising the inadequacies of the first phase, the Chinese Government moved to address the systemic causes of the inefficient health-care delivery system, including altering provider payment and pricing incentives, restructuring macro-governance, and reforming the health delivery system. Two central components constituted China's health-care delivery transformation: public hospital reform and a PHC-based integrated delivery system. Recognising the complexity of delivery reform, the central government issued general guidelines and, except for the Zero-Markup Drug Policy, encouraged local governments to innovate and experiment with models within their institutional context.

Reforming public hospitals

The government mandated the Zero-Markup Drug Policy for county-level hospitals in 2012, and for city-level hospitals in 2015 (the policy was introduced in PHC facilities in 2009).[24,25] This policy eliminated the 15% mark-up allowance on prescribed drugs. By design, the Zero-Markup Drug Policy was to be coupled with a fee-schedule adjustment—increasing fees for more labour-intensive services, such as physician visits and nursing, and reducing fees for diagnostic tests—to compensate hospitals for lost revenue from drugs and to reduce incentives for diagnostic tests. To compensate financial imbalances for hospitals in transition, local governments were expected to increase fiscal subsidies to hospitals, and hospitals were expected to handle part of the drug revenue loss through efficiency improvements. However, mostly because of fragmented governance, synchronising the suite of policies proved difficult (figure 2). Evaluation studies have found that the Zero-Markup Drug Policy and altered fee schedules reduced drug expenditures, but not total health expenditures;[26–30] hospitals recovered losses in drug revenue by increasing provision of diagnostic tests and basic medical services. Additionally, the effects of the policy

See Online for appendix 2

	GHE per capita (*real)	GHE (*real, in ¥100 million)	GHE (% of GGE)	GHE (% of THE)	GHE (% of GDP)	THE per capita (*real)	GDP per capita (*real)
2008	344·84	4579·66	5·74%	24·73%	1·12%	1407·74	30658·42
2009	460·50	6145·47	6·31%	27·46%	1·38%	1688·28	33377·45
2010	510·09	6839·83	6·38%	28·69%	1·39%	1792·02	36752·28
2011	611·20	8234·99	6·83%	30·66%	1·53%	2009·28	40066·02
2012	671·01	9085·68	6·69%	29·99%	1·56%	2255·29	43001·69
2013	739·48	10062·18	6·83%	30·14%	1·60%	2472·50	46111·14
2014	811·99	11106·57	6·98%	29·96%	1·64%	2720·11	49220·43
2015	952·13	13088·28	7·10%	30·45%	1·81%	3137·68	52356·35
2016	1044·09	14436·67	7·41%	30·01%	1·87%	3489·22	55547·78
2017	1093·88	15205·87	7·48%	28·91%	1·84%	3783·83	59043·65
Annual growth rates							
2008–12	18·1%	18·7%	..	..	..	12·5%	8·8%
2012–17	10·3%	10·8%	..	..	..	10·9%	6·5%

GHE=government health expenditure. GGE=government general expenditure. THE=total health expenditure. GDP=gross domestic product. *Numbers adjusted for inflation and measured in Chinese yuan in 2017 prices.

Table 1: **Government spending on health, and total health expenditure in China (2008–17)[3]**

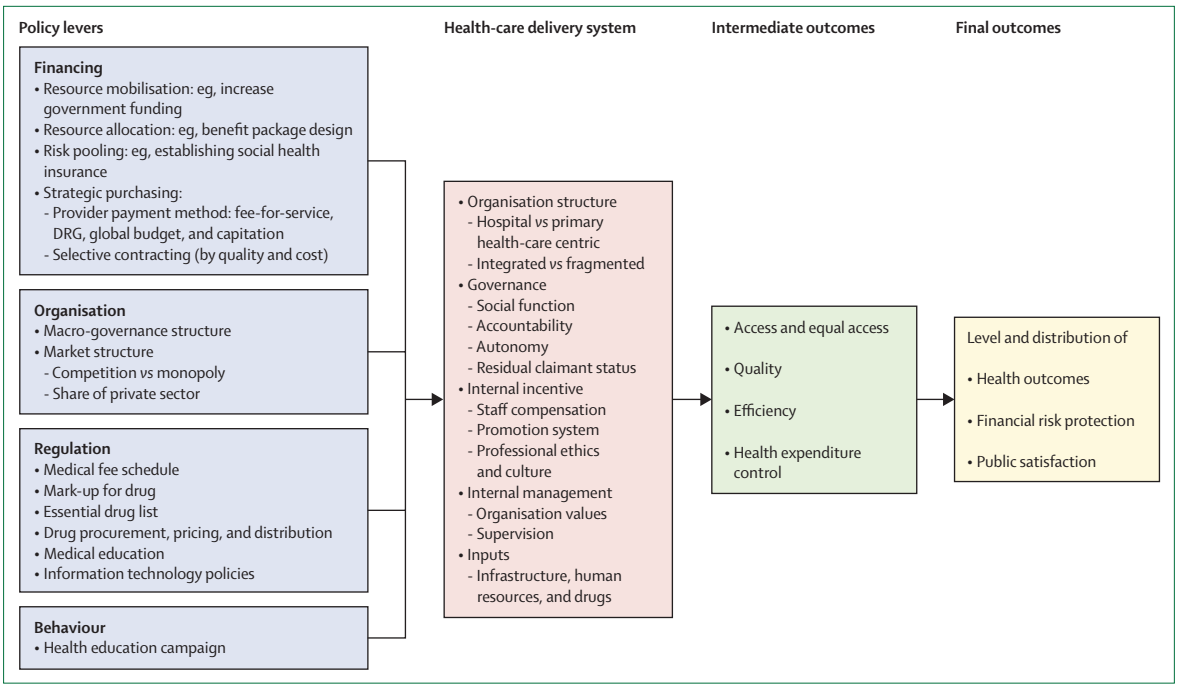

Figure 1: **A health system framework: policy levers, health-care delivery system, and outcomes**[8,9]
DRG=diagnosis-related group.

on mitigating the irrational use of drugs, especially antibiotic use, has been mixed.[31,32]

The central government issued guidelines for local governments to experiment with alternative payment methods (such as global budgets, diagnosis-related groups, case-based payments, and capitation) to replace the traditional fee-for-service scheme.[33] Preliminary evaluations of pilot initiatives found that these alternative payment methods are associated with decreases in total medical expenditures, out-of-pocket costs and length of stay,[29,34–38] but results on quality measures were insufficient and mixed.[29,36,38–41]

The central government published a set of national guidelines (appendix 2 p 3) for local governments to use when designing their own public hospital reform. By 2015, over ten models of public hospital reform emerged.[42] Of these, the Sanming model received the most national attention because it adopted a systemic approach (panel 1). Early evaluations showed that this model reduced medical expenditures without sacrificing service volume.[43] Following Sanming's success, China's State Council issued a policy encouraging replication of the Sanming model nationwide.[44]

Lessons learned from the Sanming model and others guided the central government's approach to public hospital reform. Under new policies, hospital directors would have more autonomy over day-to-day management;[45] rather than tying directors' income to hospital revenue, a proposed compensation system evaluates directors based on 55 indicators of service volume, expenditure control, hospital development, and patient satisfaction.[46] Similarly, Sanming's approach to restructuring physician compensation inspired the central government to launch comparable pilot reforms.[47]

Establishing a PHC-based integrated delivery system

In 2015, the State Council issued guidelines for building a tiered health-care delivery system to overhaul the existing hospital-centric approach.[48] Under the tiered model, health facilities at each level would deliver services according to their designated functions (appendix 2 p 3). Care across levels was to be coordinated and eventually integrated.

To operationalise tiered delivery, the government encouraged the development of medical alliances. Because of China's weak PHC system, hospitals led these alliances by providing support and training to build the competency of PHC facilities. Currently, there are two general types of alliances: loose networks in which a leading hospital trains lower-level facilities, offers so-called green channels (expedited tracks) for referrals, and serves as a centralised location for advanced diagnostic tests; and conglomerates that are functionally similar to loose networks, but importantly, all member facilities share responsibilities, resources, management, and economic interests. Preliminary evaluations show that pilots with the following three features are effective at reducing costs and delivering PHC functions: SHI schemes that pay the alliance by either global budgets or capitation, and the alliance can redistribute any savings accrued; alliances that link information techonology systems across levels; and

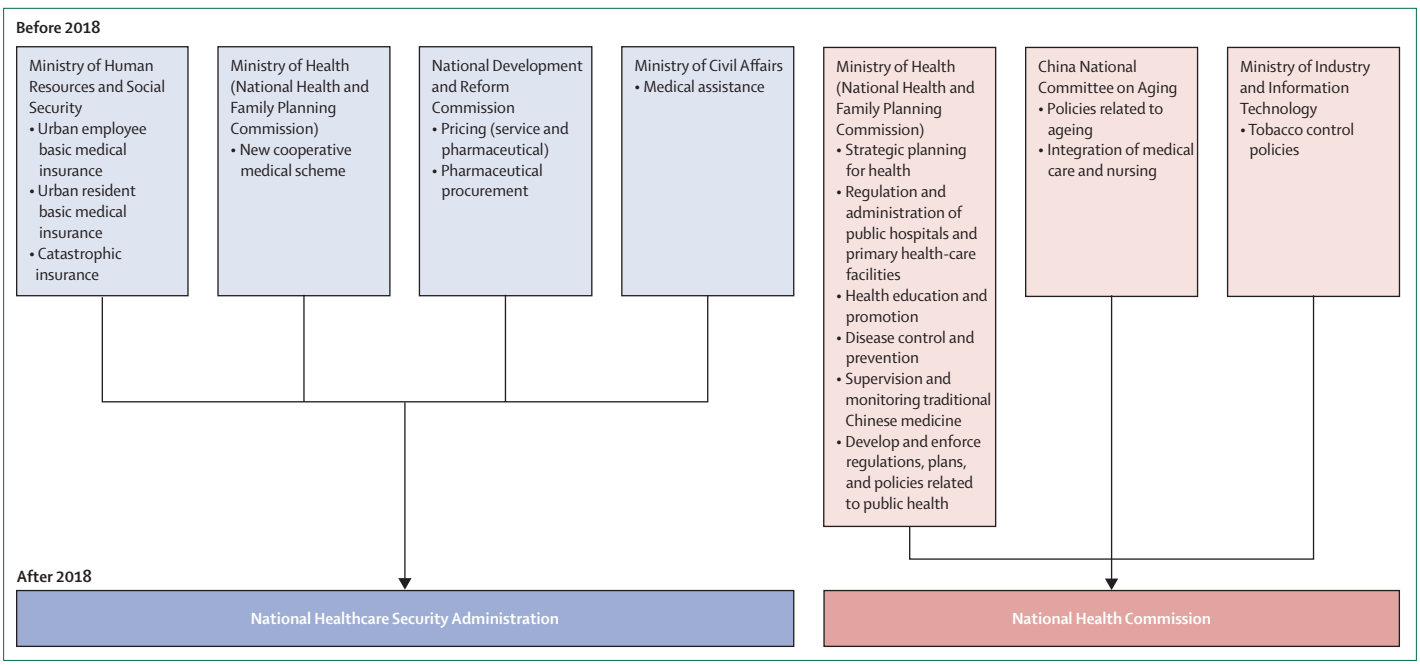

Figure 2: **Macro-governance structure for health care, before and after 2018**

Panel 1: Key elements of the Sanming model in China

Consolidation of power
The governing power of public hospitals, previously dispersed among many departments, was consolidated into one commission. This commission, chaired by Sanming's Deputy Mayor, set health policies and made governing decisions.

Performance-based managerial compensation
A new performance and reward system that held hospital directors accountable for their performance was introduced. Directors were rated in four areas: operational safety, clinical quality, facility development, and cost control (greatest weight). The annual compensation of a director was based solely on hospital performance relative to the targets and goals set by the commission in advance. After the reform, the income of hospital directors increased by about 70% on average.

Managerial autonomy
Hospital directors were given greater autonomy to run their hospitals, especially in managing human resources. Directors had the power to hire new staff, fire unqualified employees, and appoint vice-directors of hospitals.

Redesigned price schedule
Previously distorted price schedule was revised. Fees for skills-based physician services increased substantially, while negotiations between insurance plans and pharmaceutical companies helped reduce the prices of drugs substantially. On average, the prices for drugs decreased by more than 30%; some prices fell by over 80%. Removing the previously allowed 15% profit margin on drugs under the zero mark-up drug policy severed the link between drug sales and hospital profits.

Restructured physician compensation
Physician compensation was delinked from hospital profits and replaced by a basic salary with a bonus. The new bonus was tied to seniority, medical service volume, workload, quality of care based on indicators such as patient satisfaction, and the achievement of strategic targets (eg, controlling cost inflation). After the reform, physician income in Sanming increased by over 100%, with average annual income growing from approximately US$8000 in 2011, to more than $18 000 in 2014.

alliances that have an accountability system that evaluates performances at each level.[49–54] Two models of the medical alliance have been featured by the central government: a model for urban centres in Luohu, Shenzhen, China,[53] and a model for rural areas in Tianchang, Anhui, China.[55]

Beginning in 2016, Chinese residents could register with a family doctor team that was responsible for delivering preventive and basic health-care services and also served as a gatekeeper to the health-care system in return for a capitation payment. The government set a target of universal registration by 2020.[56]

Restructuring national health-care governance

2018 marked a major restructuring of China's national health governance with the establishment of the National

Healthcare Security Administration (NHSA).[57] The NHSA assumed the responsibility of administering the Urban Employee Basic Medical Insurance programme, the Urban-Rural Resident Basic Medical Insurance programme (which merged the original Urban Resident Basic Medical Insurance and the New Cooperative Medical Scheme), and Medical Assistance (which provides health security for low-income households), as well as deciding on pricing and overseeing drug procurement. The National Health Commission (originally called the Ministry of Health) continued to plan, administer, and regulate the health-care delivery system while taking on two new areas of responsibility: elderly care and tobacco control. Figure 2 details this organisational overhaul, which established a clear separation of the financing and provision of care.

	2010	2012	2014	2016	Difference between 2016 and 2010	p value
Hospital admission rate						
All	7·41%	8·33%	10·66%	13·52%	6·11%	<0·01
Urban	7·34%	8·18%	10·71%	14·94%	7·60%	<0·01
Rural	7·49%	8·47%	10·70%	11·20%	3·71%	<0·01
Group by household Income*						
First quartile (0–25%)	8·61%	8·95%	11·82%	13·94%	5·33%	<0·01
Second quartile (26–50%)	7·21%	8·89%	10·62%	13·07%	5·86%	<0·01
Third quartile (51–75%)	6·89%	7·70%	10·17%	12·84%	5·95%	<0·01
Fourth quartile (76–100%)	6·97%	7·89%	9·92%	14·92%	7·95%	<0·01
Rate of doctor visit in the last 15 days among respondents older than 15 years						
All	16·23%	18·18%	20·13%	22·66%	6·43%	<0·01
Urban	14·63%	15·99%	18·24%	22·57%	7·94%	<0·01
Rural	17·85%	20·72%	23·19%	22·87%	5·02%	<0·01
Group by household income						
First quartile (0–25%)	19·98%	20·52%	23·53%	26·42%	6·44%	<0·01
Second quartile (26–50%)	16·11%	18·92%	21·45%	24·01%	7·90%	<0·01
Third quartile (51–75%)	15·21%	17·08%	18·63%	20·73%	5·52%	<0·01
Fourth quartile (76–100%)	13·55%	16·82%	17·11%	19·70%	6·15%	<0·01
Reimbursement rate of inpatient care among respondents older than 15 years†						
All	29·41%	34·65%	39·65%	41·19%	11·78%	<0·01
Urban	34·87%	39·87%	43·33%	44·25%	9·38%	<0·01
Rural	24·34%	29·69%	34·72%	34·58%	10·24%	<0·01
Group by household Income						
First quartile (0–25%)	23·86%	31·13%	36·38%	38·01%	14·15%	<0·01
Second quartile (26–50%)	24·98%	32·75%	39·61%	35·67%	10·69%	<0·01
Third quartile (51–75%)	32·85%	35·89%	37·05%	41·80%	8·95%	<0·01
Fourth quartile (76–100%)	39·60%	39·86%	48·15%	50·28%	10·68%	<0·01
The proportion of households with catastrophic health expenditure‡						
All	14·35%	14·54%	11·04%	10·65%	–3·70%	<0·01
Urban	12·25%	12·31%	9·24%	8·89%	–3·36%	<0·01
Rural	16·36%	16·88%	13·16%	13·07%	–3·29%	<0·01
Group by household income						
First quartile (0–25%)	22·91%	20·91%	16·74%	16·75%	–6·16%	<0·01
Second quartile (26–50%)	13·72%	14·74%	10·95%	10·98%	–2·74%	<0·01
Third quartile (51–75%)	9·97%	11·88%	8·80%	8·59%	–1·38%	<0·05
Fourth quartile (76–100%)	9·95%	10·23%	7·55%	7·25%	–2·70%	<0·01

(Table 2 continues on next page)

Promoting the private sector

In 2012, the government announced a target of 20% private hospital market share by 2015. Greater private hospital participation was expected to improve public hospital performance via competition, enhance health provision by supplementing public sector shortages, and boost the economy.[58,59] Prices set by private hospitals were unregulated, but hospitals had to accept SHI payment rates if contracted by SHI programmes. To help private hospitals in the recruitment of reputable physicians, public hospital physicians could have dual practices with private hospitals. A faster approval process and tax exemptions encouraged not-for-profit hospital entry.[58,60]

By 2017, private hospitals accounted for 60·4% of total hospitals in China, but only 24·3% of total beds. Market share for outpatient services grew from 8% in 2009, to 14·2% in 2017. For inpatient services, the share increased from 8% to 17·6% in the same time period. Most private hospitals cannot compete with the scale of large public tertiary hospitals. In 2017, about 60% of hospitals were general and 29% were specialty.[3] Studies that compare public and private hospital cost and quality outcomes have produced inconclusive results.[61–63]

Refining first-phase initiatives

The government continuously improved upon SHI programmes by increasing its subsidies (appendix 2 p 1), reducing co-insurance rates, raising reimbursement ceiling, expanding service coverage beyond hospitalisation to also include outpatient services,[64] and introducing a catastrophic insurance scheme to provide additional financial risk protection.[64,65] Portability of benefits within and between provinces was enhanced,[66] and additional government subsidies helped to expand the preventive public health package.[67] Concurrent efforts aimed to improve drug procurement, distribution, pricing, and approval through centralised purchasing and reducing the number of steps between wholesale and retail.[68–70]

To increase and improve the PHC workforce, the State Council issued a plan in 2018[71] that targeted two to three general practitioners per 10 000 residents by 2020, and five general practitioners per 10 000 residents by 2030, through recruitment efforts and training for health professionals located in rural areas of China. Additionally, China aims to establish an integrated health information system in public hospitals and PHC facilities, as well as developing Internet+Health initiatives (use internet technology in the health sector) to improve efficiency and access (appendix 2 p 5).

Performance achievements and gaps

Drawing from existing literature and primary analyses, we evaluated whether China achieved its reform goal of

providing all citizens with equal access to basic health care with reasonable quality and sufficient financial risk protection. Because multiple policies were introduced simultaneously, the results presented should be interpreted as a reflection of the overarching reform effort, rather than of individual policies.

Achievements

Using data from the China Family Panel Studies[72]—a nationally representative survey done in 25 provinces in 2010, 2012, 2014, and 2016—we estimated that, from 2010 to 2016, the hospital admission rate increased from 7·4% to 13·5% and the probability of seeing a doctor in the last 15 days increased from 16·2% to 22·7%. For both measures, as of 2016, there were no statistically significant differences in utilisation between urban and rural populations. Among individuals in the four income quartiles, people with a high socioeconomic status had the fastest increase in hospital admission rates, and as of 2016, people with a low socioeconomic status had the highest outpatient visit rates. Hospital admissions were similar across all income groups (table 2). These results are consistent with existing empirical studies examining the effect of the SHI programmes on access and equal access to health care.[12,73,74] It should be noted that increases in utilisation are not synonymous with improvements in access, as overutilisation can be an indication of inefficiencies. However, because underutilisation was a concern before the reform, hospital admissions currently present as a reasonable indictor for access to health care.

Using China Family Panel Studies,[72] we evaluated several measures of catastrophic health expenditure and found that regardless of the measure used, the rate of catastrophic health expenditure declined, albeit modestly, with the greatest decrease among the households with the lowest socioeconomic status (table 2). For example, when considering catastrophic health expenditure as out-of-pocket payments greater than 40% of households' total consumption expenditure net of food, the incidence of catastrophic health expenditure for the 25% of households with the lowest socioeconomic status decreased from 22·9% to 16·8% (a 27% reduction), compared with reductions of 2·7%, 1·4%, and 2·7%, for the second, third, and fourth quartiles, respectively. Similar patterns are observed for other measures of catastrophic health expenditure (tables 2). The results in table 2 show an overall increase in the reimbursement rate for hospital admissions of 11·8%, with the lowest income group benefiting the most (14·2% *vs* 10·7% for the highest income group). Despite these improvements, substantial differences between the highest and lowest income groups' reimbursement rates and measures of catastrophic health expenditure remain. These differences might be attributable to large differences in insurance benefits; in 2018, the Urban Employee Basic Medical Insurance premium was approximately ¥4190 per person, compared with ¥780 per person for the Urban Resident Basic Medical Insurance and ¥660 per person for the New Cooperative Medical Scheme.[5,75]

	2010	2012	2014	2016	Difference between 2016 and 2010	p value
(Continued from previous page)						
The proportion of households with catastrophic health expenditure§						
All	13·58%	11·98%	11·43%	11·06%	–2·52%	<0·01
Urban	11·15%	10·61%	9·25%	8·94%	–2·21%	<0·01
Rural	15·90%	13·42%	13·99%	14·01%	–1·89%	<0·01
Group by household Income						
First quartile (0–25%)	22·17%	16·71%	17·32%	17·49%	–4·68%	<0·01
Second quartile (26–50%)	13·55%	12·29%	12·23%	11·69%	–1·86%	<0·01
Third quartile (51–75%)	9·78%	10·11%	8·73%	8·95%	–0·83%	0·339
Fourth quartile (76–100%)	9·06%	9·16%	7·34%	6·95%	–2·11%	<0·05
The proportion of households with catastrophic health expenditure¶						
All	31·45%	29·27%	27·99%	27·28%	–4·17%	<0·01
Urban	29·09%	27·01%	23·80%	24·89%	–4·20%	<0·01
Rural	33·71%	31·68%	32·99%	30·87%	–2·84%	<0·01
Group by household Income						
First quartile (0–25%)	41·58%	33·81%	36·55%	35·85%	–5·73%	<0·01
Second quartile (26–50%)	32·33%	31·03%	31·18%	29·43%	–2·90%	<0·05
Third quartile (51–75%)	27·04%	27·31%	24·76%	23·91%	–3·13%	<0·05
The richest quartile (76–100%)	25·03%	24·22%	19·01%	21·14%	–3·89%	<0·01

CFPS=China family panel studies. *In 2016, the household income per capita for the first quartile was ¥2216, second quartile was ¥7725, third quartile was ¥15756, and fourth quartile was ¥42909. †CFPS does not ask respondents to recall inpatient expenditure for every admission. Instead, CFPS asks respondents to recall total inpatient expenditures in the last year. ‡The percentage of households in which out-of-pocket payments for health care was 40% or more of households' total consumption expenditure net of food. §The percentage of households in which out-of-pocket payments for health care was 25% or more of households' total consumption expenditure net of food. ¶The percentage of households in which out-of-pocket payments for health care was 10% or more of households' total consumption expenditure net of food.

Table 2: **Trends in health-care utilisation and catastrophic health expenditure in China, 2010–16**

Gaps

Hypertension and diabetes are two major NCDs on the rise in China. In a 2017 national study of 1·7 million participants, nearly half of Chinese people aged 35–75 years had hypertension.[76] Of the patients with hypertension, fewer than a third were actively treated, and fewer than one in 12 were in control of their blood pressure. Prevalence of hypertension was similar in China (44·7%) and in the USA (45·5%), but the proportion of control was much lower in China (7·2%) than in the USA (43·5%).[76,77]

In 2013, a nationally representative survey of 170 287 Chinese participants identified a total diabetes prevalence of 10·9%, with more than 60% of cases undiagnosed.[78] Of those with diabetes, only 37% were aware of their diagnosis, and just 32% were receiving treatment. By contrast, the US diabetes prevalence was comparable with China at approximately 10·8% in 2011–14, but only about 1·2% of cases went undiagnosed.[79]

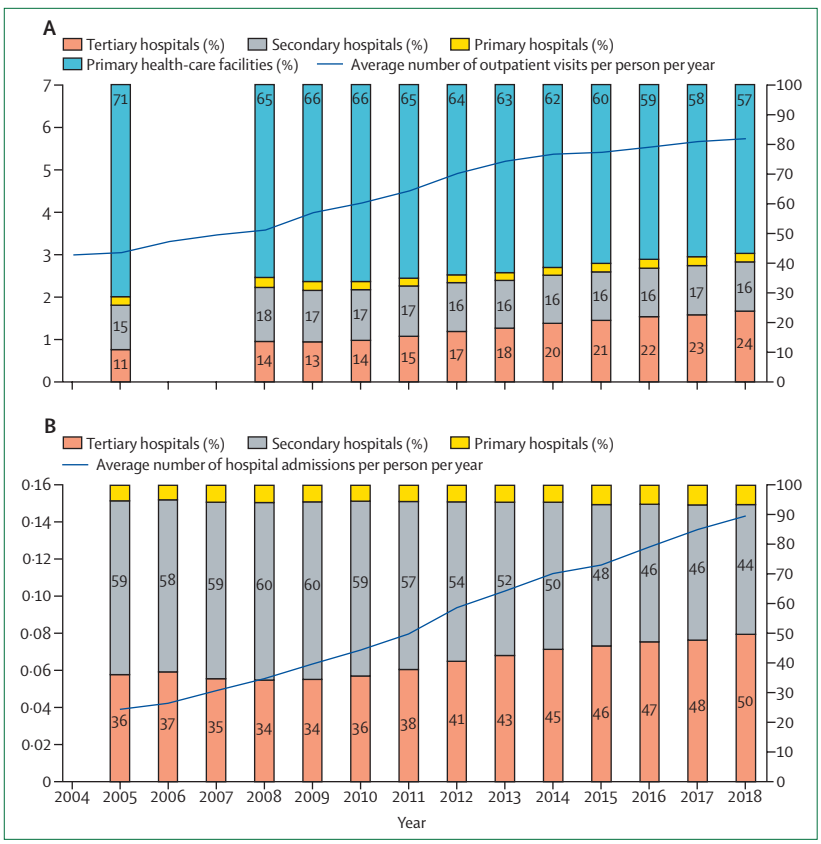

Figure 3: **Distribution of outpatient visits (A) and hospital admissions (B) by health facility level**[3]

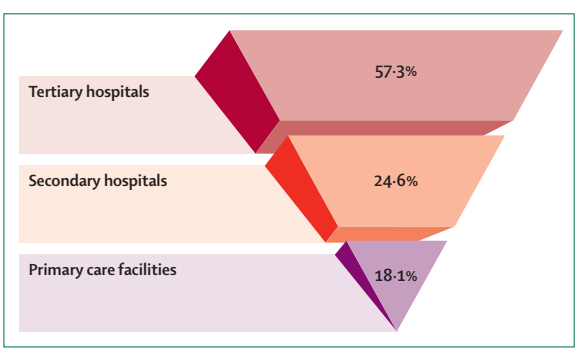

Figure 4: **Concentration of health resources at tertiary hospitals in 2017**[3]
Tertiary hospitals contain all public tertiary hospitals. Secondary hospitals contain all public secondary hospitals. Primary care facilities contain all primary care providers. Total revenue in each group is used for computing the ratios.

Progress has been made toward the detection and treatment of NCDs in China, but substantial opportunities for clinical improvement remain.

Because of the increasing burden of NCDs and disabilities associated with an ageing population, allocating more resources towards PHC in China would likely make for a more efficient health-care system. Indeed, government subsidies to PHC institutions have increased substantially: from 2009 to 2017, subsidies as a proportion of total PHC income increased from 12·3% to 32·5%.[3] However, despite the increase in funding, the share of outpatient visits at PHC centres has decreased relative to those treated at tertiary hospitals, and the share of hospitalisations at tertiary hospitals has increased (figure 3). In 2017, aprroximately 58% of resources were concentrated at tertiary hospitals, and only 18% at PHC facilities (figure 4). Such resource distribution is inefficient, costly, and does not meet the needs of the population.

Between 2008 and 2017, real total health expenditures increased at an average annual rate of 12·2%, outpacing the annual rate of real GDP growth (8·1%; table 1). We decomposed the health expenditure increase into (1) increase in visit volume and (2) increase in charge per admission or visit (charge accounted for both unit price and number of services per visit). We found that about 70% of the increase in health expenditures was due to an increase in volume, and about 30% could be attributed to increases in charges per admission or visit.[3,4] In the same period, hospital admissions increased 15% annually at tertiary hospitals and 9% annually at secondary hospitals. Charges per hospital admission increased 5·5% and drug expenditures increased 1·7% for tertiary hospitals; corresponding values for secondary hospitals were 6·5% and 2·7%. Outpatient visits increased 12·1% at tertiary hospitals, 3·4% at secondary level hospitals, and 4·4% annually at PHC facilities, and charges per outpatient visit increased at around 6·7–7·1% annually (figure 5). Without a price index specific to the health sector, we cannot conclude whether the growth in charge is due to increases in service intensity or price.

Reform efforts have resulted in mixed effects on quality. In PHC, subpar clinical quality and diagnostic inaccuracies persist. A 2017 study[80] in patients with incognito tuberculosis showed that providers at township health centres provided the correct treatment only 38% of the time and village clinics only 28% of the time. Another study[81] found that for a sample of incognito patients presenting with dysentery or unstable angina symptoms, village doctors did not ask the recommended questions 82% of the time and correctly diagnosed the patient's condition only 26% of the time. Additionally, rates of inappropriate antibiotic prescription and use remain high. Many patients remain dissatisfied with the care provided at PHC facilities, sometimes opting to bypass these facilites because they "do not trust primary health-care institutions"[82] or they are "not satisfied with the quality of care in primary health-care institutions"[82] (appendix 2 p 6).

Hospital performance, in terms of both outcomes and process measures, has improved moderately for some health conditions. However, overall evidence for hospital quality improvement is scarce and the scope of study is insufficient. For example, from 2013 to 2016, neurology inpatient hospital mortality rates decreased from 6·3% to 5·4%.[83] Meanwhile, a separate study of 33 reputable

tertiary hospitals in 25 Chinese provinces found that rates of aspirin given at arrival for acute myocardial infarction decreased from 80·7% in 2012, to 70·7% in 2018, and β blockers given at arrival remained constant (44·5% in 2012, and 44·0% in 2018).[84] Patient satisfaction with clinical services remains low, and safety measures compare unfavourably with those of other countries (appendix 2 p 7).

In a 2017 nationally representative survey on satisfaction with different aspects of livelihood, 28% of respondents reported that payment for health-care exerts the largest financial burden on their household expenses.[85] Additionally, 12% of respondents ranked health care as their least-satisfactory aspect of life, second only to income (28%). Within health care, 41% of people highlighted cost as the major problem, followed by the difficulty of accessing large hospitals (8·2%). Patients were particularly dissatisfied with the overcrowding and long waiting lines at tertiary hospitals.[86]

Discussion and policy recommendations

In the 10 years since launching health-care reform, China made steady progress towards achieving its reform goals. Access and equal access to health care substantially improved. Financial risk protection also improved, with people of a lower socioeconomic status benefiting the most, though much work remains. Such advancements were made possible by the government's momentous financial investments in China's health-care system, enabling nearly universal SHI coverage.

However, China still struggles to ensure quality care and access to effective services such as NCD prevention and management. Additionally, rapid health expenditure escalation could threaten the long-term financial sustainability of SHI programmes and limit the effectiveness of SHI in relieving households from catastrophic health expenditures. Although China's second phase of reform has begun to tackle the systemic causes of its health-care system's poor performance, results thus far are neither widespread nor obvious. The delivery system continues to be hospital-centric, fragmented, and treatment-focused for several reasons.

First, despite the government's policy encouraging a tiered delivery system anchored by PHC, actual implementation deviates substantially from the ideal model; without a functioning PHC system, medical alliances in China are predominantly led by hospitals, and except for a few notable pilots, most existing alliances are loose networks that do not have shared responsibilities, management, patient care, or economic interests across member facilities. In addition, hospitals paid by fee-for-service (as most still are) have no incentive to collaborate with PHC facilities, and the incomes of hospital directors and physicians are still tied to hospital profits, which diminishes their motivation to shift from treatment-based curative care to population-based

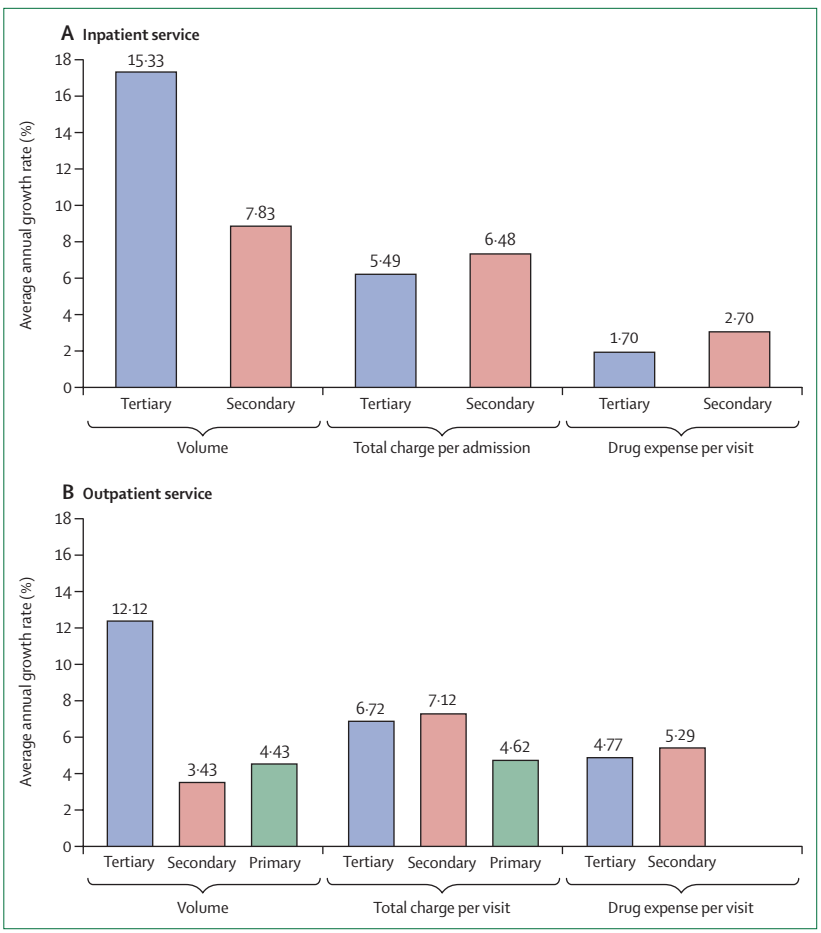

Figure 5: **Annual growth rate of volume and charges for inpatient and outpatient services (2008–17)**[4,56]

health prevention and management. This remains the case despite the government's promotion of Sanming's policies to reform governance and compensation. Furthermore, despite the government's policy to roll out a family registration system, few PHC providers in China are qualified to serve as gatekeepers or provide high-quality PHC services that patients trust. Finally, although the government invested heavily in information systems, system fragmentation has created barriers for integrated care; the National Health Commission hosts the electronic health records, the NHSA hosts insurance claims data, and each hospital owns a unique medical record system—none of which are interoperable.

Second, rising income levels and expansion of SHI spurred an increase in demand for higher care quality, but low-quality PHC care led patients to persistently overuse costly tertiary hospitals. However, at tertiary hospitals patients are dissatisfied with the high health-care costs and long wait times. Last, after years of profit-seeking behaviour, medical professional ethics have eroded.[87,88] Such entrenched behaviour may take years, or even generations, to change. Panel 2 highlights key

Panel 2: **Key findings and lessons learned from China's past 10 years of reform**

Key findings

- China's 10 years of health reform to date can be broadly classified into two phases: (1) 2009 to 2011 and (2) 2012 onward. The first phase emphasised financial investment, whereas the second phase prioritised the transformation of resources into effective services through systemic health-care delivery reform.
- By contrast with the market-driven approach of the previous two decades, the government affirmed its role in the health sector, especially in the financing of basic health care. Since 2009, the government has quadrupled its funding for health care; government health expenditures as a share of total government expenditures increased from 5·7% to 7·5%.
- Reform has made progress towards improved access and financial risk protection, especially for people of a low socioeconomic status.
- Despite the substantial investment in health care, the reform has not reached its full potential. Gaps remain in quality of care, control of non-communicable diseases (NCDs), efficiency in delivery, control of health expenditures, and public satisfaction. The real total health expenditures increased at an average annual rate of 12·2%, outpacing the annual rate of real gross domestic product growth (8·1%).
- As China faces an ageing population and an increased burden of NCDs, a hospital-centric, fragmented, and treatment-based health-care delivery system poses a risk to people's health and the health-care system's sustainability.
- An integrated delivery system based on primary health care would suit the health needs of the Chinese population better. It could be built by aligning the incentives and governance of hospitals and primary health-care systems, improving the quality of primary health-care providers, and educating the public on the value of services based on primary health care.

Lessons learned

- The government has to have a primary role in health-care financing to bring about equitable health care for China's population.
- Financing alone is insufficient for high-quality outcomes; financing reform must be coupled with delivery reform to transform resource investment into effective services.
- The sequence of reform matters; pouring money into the health-care system before reforming the delivery system can lead to more inefficiencies.
- Health reform should adopt a systemic approach that aligns multiple policy levers: financing, provider payment incentives, governance, and regulation; in China's case, expanding insurance without commensurate reform in the other policy levers limited the benefits realised.
- Local pilots can inform policy formulation and implementation. In large countries like China, a one-size-fits-all model rarely works. Instead, lessons learned about policies from local pilots can be refined and scaled for the national level in a systematic manner.

findings and lessons learned from the past 10 years of China's reform.

As China faces an ageing population and an increased burden of NCDs, a hospital-centric and weak PHC system poses a worrisome future. In the 13th Five Year Plan for Health,[89] the government reiterates health delivery reform priorities.[89] Considering these challenges and the changing needs of the population, we propose the following policy recommendations.

PHC-based integrated health-care delivery

Transforming the current fragmented and treatment-based delivery system into one that focuses on population health through high-quality, PHC-based integrated delivery poses a difficult task requiring deliberate changes to multiple pillars of the health-care system.

First, a provider payment overhaul would be necessary to reorient profit-driven hospitals towards maximising population health gains, financial risk protection, and public satisfaction. Currently, the government plans to implement diagnosis-related groups in all hospitals, but these payment mechanisms have previously failed to motivate coordination between hospitals and PHC facilities; every patient referred causes lost revenue. Instead, the NHSA should shift to paying PHC-based integrated delivery systems with a population-based capitation payment according to the number of people registered with the system's family doctor teams. The capitation payment would cover services spanning primary care, secondary, and eventually tertiary care. The integrated system would keep any savings accrued but also bear the risks of costs overrun. This population-based capitation payment should be supplemented with a pay-for-performance component; provider performance would be measured by health prevention efforts, control of NCDs, quality of care, appropriate use of antibiotics and diagnostics, and patient satisfaction.

Hospital governance requires restructuring to align with the updated payment incentives. Specifically, compensation of hospital directors and physicians must be divorced from hospital profits, with bonuses instead tied to quality and cost metrics. Furthermore, hospitals should be held accountable for not only their own performance, but also for the performance of lower-tier hospitals and PHC providers within their integrated delivery system. In this model, evaluations of tertiary hospital directors would encompass system-wide institutional performance and account for population-based health outcomes.

The dearth of human resources in China's PHC system needs to be addressed using new strategies. Training programmes have increased the number of general practitioners in China, but the number remains far below the nation's needs,[90] and those with formal training are often recruited by hospitals. Instead, China should consider building on the existing workforce in rural township health centres and village clinics, and utilising the skills of urban nurse practitioners. Both cadres could command a core set of skills to accurately diagnose, triage, and treat common health conditions, as well as promote preventative health and health education. Digital health technologies could provide a clinical decision support system powered by artificial intelligence algorithms and linked to secondary hospitals for training and advice,[91–93] and PHC providers could be connected to patients via mobile phones to monitor their conditions and remind them to adhere to NCD management protocol. Social recognition, adequate financial incentives, and a sense of belonging to the community they serve would also be essential for gaining patients' trust.[82]

To shift the demand for health care towards PHC, the government should launch large-scale health education campaigns to improve nationwide understanding of PHC's functions and its importance in the prevention and management of NCDs, and nudge people away from overcrowded and expensive hospitals for simple health problems. Health education campaigns should focus on changing behaviour such as diet, exercise, and adherence to disease management regimens for long-term health and NCD control. Finally, an information system to integrate the myriad electronic health, medical, and claim records across all provider levels is crucial. Since the government endorsed the use of internet-based approaches to improve the access, efficiency, and quality of care (appendix 2 p 5), millions of transactions have used these platforms, improving convenience and utilisation. However, the affect of these internet platforms in improving PHC service quality and effective care remains to be proven.

A four-tiered system with social care

In response to China's ageing population and the challenge it poses to the health-care system, the government has called for integrating medical and social care.[94] Such integration requires China to consider expanding its tiered delivery approach from three to four tiers. Tier one would combine simple medical and social care, consisting of home care aides and visiting nurses that provide health care and social support to elderly residents in their homes. Tiers two to four would roughly mirror the current three levels (family physicians at tier two, secondary hospitals at tier three, and tertiary hospitals at tier four).

Financing the four-tiered delivery system would need to incentivise coordination and integration between medical and social care. International experience has shown that not integrating financing creates barriers to care integration.[95] Payment for medical and social care should be integrated within the NHSA whereas governance of the service providers should be consolidated within the National Health Commission (at present, it is separated between the National Health Commission and the Ministry of Civil Affairs).

Strategic purchasing by the NHSA

As a strategic purchaser representing over 95% of the Chinese population, the NHSA has substantial purchasing power to leverage delivery system change. Importantly, in addition to reforming its way of paying providers, the NHSA should selectively contract providers on the basis of measures of quality and cost. This can be complemented by tying payments to quality. To do so, the NHSA would need to collaborate with the National Health Commission to institutionalise a system of data collection and quality reporting to accurately and objectively inform payments. Eventually, all PHC-based integrated systems' quality measures should be publicly available, which would aid patient decision making and create competition for superior quality.[15]

Private health insurance for non-basic health care

In the coming years, China's economic growth is forecast to slow to about 6%. Since the government's investment in health is a steady share of GDP, public investment in health is also expected to slow, creating a gap between health funding and total health expenditures. Estimates suggest that the gap between health expenditure growth and GDP growth will be approximately 4% in the next two decades.[96]

The option of using private insurance to fill the funding gap should be approached with caution. In 2009, the government's pledge to provide its citizens with equitable access to basic health care implicitly left non-basic care to the private sector. The definition of basic care should be clarified immediately. The government needs to decide on the nature of private insurance coverage; would it consist of supplementary policies only (exclusively for services and drugs not covered by SHI programmes), or also include duplicate policies (coverage for services and drugs already covered)? International experience suggests that duplicate private insurance leads to a two-tiered system in which private insurance holders have access to better care.[97,98] If the government wishes to prioritise equity for basic health care, then private insurance should be restricted to supplementary policies.

Implementation guidance for local governments

Although China's top-level policy directives are visionary and comprehensive, they are often vague, which result in weak local implementation; most provincial and city-level governments do not have the expertise to

successfully execute the specified health reform. Training health reform implementation officials, developing better operational instructions, establishing conditions that enable the policy, and setting more realistic timelines would improve implementation success. Rigorous external monitoring and evaluations could inform any necessary mid-course adjustments.

Conclusion

China's ongoing health-care reform is part of a broader effort for a healthy population: in 2016, President Xi Jinping announced Healthy China 2030, the country's long-term health sector strategy. The plan is grounded in the belief that a healthy population is essential for realizing China's long-term economic and social development goals. Similar to the Sustainable Development Goals, it encompasses strategies beyond health-care reform relating to health and wellness, including disease prevention, health maintenance, healthy ageing, healthy diets and exercise, environment, and comprehensive equity.[99] With the average life expectancy of 77 years, maternal mortality at 18·3 per 100 000 livebirths, and mortality of children aged less than 5 years at 6·1 per 1000 livebirths,[5] the Chinese population's health status is similar to that of other countries with advanced economies.[100,101] Now, NCDs present a pressing challenge. By moving toward PHC-based integrated health-care delivery, China's health-care reform has laid a foundation for Healthy China 2030. However, achieving the strategy goals depends on more than improved health care; it needs multi-sector collaboration to address health priorities such as tobacco control, environmental betterment, and urban planning.[102,103] Health-care reform is only the start of a nationwide effort to improve population health.

Contributors

WY led the overall design of the review by being involved in the conceptualisation, analysis, and interpretation of findings, and drawing policy recommendations and lessons. WY wrote the first draft of the manuscript. WC contributed to policy recommendations and overall interpretation of the findings. HF produced table 2, contributed to literature review and analysis of the paper. AC edited the manuscript and contributed to reviewing literature and analysis. TZ did the health expenditure analysis. All authors contributed to the literature review, data gathering and analyses, and comments on manuscripts.

Declaration of interests

We declare no competing interests.

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