Primary health care system responses to non-communicable disease prevention and control: a scoping review of national policies in Mainland China since the 2009 health reform

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Summary

This study aims to review China's national policies related to non-communicable disease (NCD) prevention and control at the primary health care (PHC) level since China's 2009 health system reform. Policy documents from official websites of China's State Council and 20 affiliated ministries were screened, where 151 out of 1,799 were included. Thematic content analysis was performed, and fourteen 'major policy initiatives' were identified, including the basic health insurance schemes and essential public health services. Several areas showed to have strong policy support, including service delivery, health financing, and leadership/governance. Compared with WHO recommendations, several gaps remain, including lack of emphasis on multi-sectoral collaboration, underuse of non-health-professionals, and lack of quality-oriented PHC services evaluations. Over the past decade, China continues to demonstrate its policy commitment to strengthen the PHC system for NCD prevention and control. We recommend future policies to facilitate multi-sectoral collaboration, enhance community engagement, and improve performance evaluation mechanisms.

Keywords: China; Health reform; Non-communicable disease; Primary health care; Policy review

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Background

According to the Global Burden of Disease study, non-communicable diseases (NCDs), predominated by cardiovascular diseases (CVD), are causing growing disease-adjusted life years in China.[1,2] The prevalence of hypertension and diabetes in China, as key risk factors of CVD, also substantially increased over the past decade. Based on data from nationally representative surveys in China, the standardized prevalence of hypertension was estimated at 37.2% among Chinese adults aged 35–75 years,[3] and reportedly 12.4% for diabetes among those aged 18 or older.[4]

In 1978, the Alma-Ata declaration endorsed primary health care (PHC) as the "cornerstone" in health systems.[5] The 2018 Astana Global Conference on PHC further declared PHC system strengthening as the most inclusive, effective and efficient approach to achieve health for all.[6] PHC is acknowledged globally as the foundation of developing a robust health system response for NCD prevention and control.[7–9] Varghese et al. summarized that functioning PHC systems

Abbreviations: NCD, Non-communicable disease; CVD, Cardiovascular disease; PHC, Primary health care; WHO, World Health Organization; LMICs, Low-and middle-income countries

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strongly support NCD control by promoting healthy lifestyles to prevent NCD onsets, reducing premature NCD deaths, improving the quality of care and reducing NCD-related hospital admissions, and increasing cost-effectiveness, especially in low-and middle-income countries (LMICs).[7] Hague et al. added that PHC enhances community participation and engagement for NCD prevention and control, and that PHC promotes health equity by increasing access to NCD care for all people.[9]

Since 1949, the Chinese PHC system has evolved over three phases. The initial phase (1949–1978) was characterized by the well-known 'barefoot doctors' as the mainstay of its rural grassroots PHC workforce. This workforce policy influenced the establishment of similar basic health systems in several LMICs.[10,11] Spanning from 1978 to 2008 under the influence of China's economic 'Reform and Opening-Up', the second phase was characterized by progressive marketization and privatization of hospitals, particularly tertiary hospitals, with relatively less attention to investment in PHC strengthening. This, in part, led to decreased accessibility and affordability of essential health care.[10,11] The current healthcare reform cycle in China commenced in 2009, with PHC re-prioritized as a key reform area.[10–14] This was supported by the substantially increased government financial input to PHC institutions from 2·8 billion USD in 2008 to 33·7 billion USD in 2019.[15,16] China's PHC system at present consists of multiple types of grassroots level facilities. In urban areas, that mainly includes community health centres and stations, while in rural areas township hospitals and village clinics.[16]

Despite China's attempts to revitalize PHC, there remain many challenges driven by the rising disease and financial burden of NCDs.[12,17] A recent review identified several key policy documents in relation to China's strategies for NCD prevention and control, but there was lack of focus on the PHC system.[18] The primary goal of this study is to understand how China's current health reform phase has been supporting the nation-wide PHC system strengthening for NCD prevention and control. We have four specific objectives: First, to appraise the volume and variety of relevant policies and to explore major patterns in the policy making; Second, to identify key areas of China's PHC system strengthening for NCD prevention and control from the health system's perspective; Third, to identify the current underlying planning and implementation strategies in the policies related to PHC strengthening for NCD prevention and control; and Lastly, to identify the strengths and potential gaps in the planning and implementation strategies.

Methods

Study design

Guided by the PRISMA extension for Scoping Reviews (PRISMA-ScR, Appendix 1),[19] this study assessed China's national-level policy documents (with open-source access) in relation to NCD prevention and control with a PHC focus since 2009 (i.e. the latest phase of China's healthcare reform). This study was guided by two theoretical frameworks (Figure 1): World Health Organisation (WHO)'s health system six building blocks[20] and five strategies for integrated people-centred health services.[21] The study protocol is registered on the Open Science Framework platform (10.17605/OSF.IO/VK5CB).

Theoretical frameworks

The WHO six building blocks framework emphasizes the universal conceptualisation of six inter-related components of a health system (e.g., service delivery, health workforce, Figure 1),[20] and it maps out "what constitute" a health system. The five-strategy framework, on the other hand, recommends "five interwoven strategies to make health services people-centred and integrated, and to achieve universal health coverage",[21] and it addresses "how to strategically optimise" the health system. In this study, we employed both WHO frameworks in a complementary manner (Figure 1), where we used the six building blocks framework (left column in the figure) to examine how the Chinese central policy documents addressed the "hardware" (i.e. constitutions) of Chinese PHC system for NCDs, and we adjusted and operationalised the five-strategy framework (central column) from the perspective of China's PHC systems (right column), to examine how the policies addressed the "software" (i.e. strategies, actions) of Chinese PHC system for NCDs.

Data sources

An online search was conducted in June 2020 through the publicly accessible official websites of the Chinese State Council and its affiliated ministries (i.e. central government-level only).[22] The inclusion of affiliated ministries was guided by their functions designated by the State Council.[22,23] That includes ministries that were directly related with health (e.g., the National Health Commission), and those that could influence health-related issues (e.g., Ministry of Education).

Search strategy and selection criteria

The document search functions built in the national government official websites were limited. For example, there was no permission for Boolean operators, and keywords were limited to a maximum of three Chinese characters. A three-step alternative approach was applied to guide the search. First, we performed two keyword searches on each ministry's website, each time using one of the two Chinese-character keywords: *Man Xing Bing* (NCDs) and *Man Bing* (a common contraction for NCDs in Chinese). Second, the search records were

Figure 1. Combined theoretical framework.

merged, and duplicates were excluded, first from within the same ministry and then across different ministries. In the final step, an expanded snowballing search was conducted by reviewing references to other policies in the remaining records. To ensure the completeness of this search strategy, we conducted two additional searches on the same websites, each time using one of the two specific NCD conditions—*Gao Xue Ya* (hypertension) and *Tang Niao Bing* (diabetes)—as keyword, both of which are predominant NCD conditions in China.[24] We further consulted policy experts from Chinese Centre for Disease Control and Prevention and academic experts in the field of PHC and NCD to rule out major omissions.

Of note, as the multi-Chinese character term for "primary health care" (*Ji Ceng Wei Sheng Bao Jian/Ji Ceng Yi Liao*) exceeded three Chinese characters and could not be directly used during website search, and the inability to use "AND" as Boolean operators to limit the search to our PHC focus, we considered the PHC focus during the subsequent screening and data extraction process instead.

After the search, two researchers (SX and YM) conducted the screening process independently, and discrepancies and uncertainties were resolved through group discussions with other researchers (MT, PY, LM, XZ). Often without an abstract, the entire policy documents were screened by applying the following eligibility criteria. The inclusion criteria were (1) policy documents related to NCD prevention, treatment and management, with a PHC focus, and (2) issued by the designated ministries since the 2009 health reform. We used 7th March 2009 as the starting point, when the landmark policy document *"Recommendations by the Chinese Communist Party Central Committee and the State Council on Deepening the Health Care System Reform"* was officially released.[25] The end date of policy search was June 14, 2020.

The exclusion criteria included: (1) region-specific policy documents; (2) policy documents focusing on specific programs or campaigns, such as announcements or conclusions of specific, often one-off activities; (3) government follow-up responses or interpretations to previous policy regulations; and (4) specific clinical or pharmaceutical guidelines.

Given the multi-faceted nature of most policy documents, for policy documents whose major focus was not on PHC but secondary or tertiary hospitals, instead of excluding these documents, we identified their PHC-related contents, likely a few paragraphs or sentences, and included them for subsequent analyses.

Data extraction

For each policy document under analysis, the extracted information included title, ministry of release, time of release, and information about cross-referencing across the policy documents (Appendix 2). Based on the policy documents' releasing ministries, we classified them into 'singular releases' or 'joint releases' (i.e. released by one ministry or multiple ministries), and further determined each ministry's frequency of involvement in the jointly released policy documents, as a general indicator for the ministry's involvement in multi-sectorial collaboration in policy making. Regarding the time of release, each policy document was further grouped into three

periods: 2009-2010, 2011–2015 and 2016–2020, which aligns with the 11th, 12th, and 13th five-year plans of the Chinese central government, although the first group 2009-2010 only covered two years in the 11th five-year plan.[22] Regarding the information about cross-referencing across the policy documents, we scanned the background section of each document, where they would typically refer to other policy documents as leading document or supporting evidence.

Policy content analysis

After screening, three researchers (SX, CC, and YM) conducted thematic analysis to examine the contents of included policy documents, with a combination of deductive and inductive coding approach.

To identify key areas of China's PHC system strengthening for NCD prevention and control from the health system's perspective, we applied the deductive coding approach, guided by the WHO six building blocks and WHO five strategies for people-centred integrated care (Figure 1). The WHO six building blocks were systematically assigned to represent how each policy document addressed the essential hardware components of the PHC system, and the WHO five strategies to represent macro system-level strategies (i.e. software components) that were embodied in the policy documents.

To identify the underlying national policy planning and implementation strategies related to PHC strengthening for NCD prevention and control, we applied an inductive coding approach by two steps. First, we identified and extracted specific strategies or action items covered in the policy documents, and coded them as 'sub-themes' (e.g., to increase people's enrolment in the essential public health service package; to promote on-the-job training for PHC providers). Second, we synthesised these sub-themes, and generated higher-level major themes that covered multiple related sub-themes. For example, all sub-themes related to the essential public health service package were synthesised into one major theme, named 'essential public health service package'. We defined these 'major themes' as 'major policy initiatives', which represent the underlying planning and implementation strategies and actions for China's PHC strengthening for NCD prevention and control, each entailing various specific strategies (i.e. the sub-themes).

Finally, to identify strengths and potential gaps in the current policies, we conducted a brief bench-marking comparison between our identified strategies and WHO recommendations underpinned by the six building blocks and five strategies for people-centred integrated care.[20,21] All coding was performed using the NVivo 12 (QSR International) software for data management. The methodology of making the figures in the paper was described in Appendix 4.

Results

The initial search yielded 1799 records issued by the State Council and 20 central ministries (Figure 2). In the first round of screening, 1552 were removed based on the inclusion criteria, where most excluded records were deemed non-policy documents (e.g., news, reports, and patent notifications) or released before 7th March 2009. After duplicate removal (n = 27), a further 89 records were excluded on the basis of the exclusion criteria. Sixteen additional records were obtained through snowballing search and consulting with policy experts, and four records were added by the additional search with "hypertension" and "diabetes". A total of 151 policy documents were included in the analysis.

Volume, variety, and characteristics of included policies

About half of the eligible policy documents (n = 77) were released during the 13th five-year plans (i.e. year 2016–2020, Table 1). The Chinese State Council had issued the highest number in total and across each five-year plan (n = 90), followed by the Chinese National Health Commission (n = 48). Three-quarters of included policies (n = 114) were issued by a single ministry. Of note, more than half of the jointly released policy documents across ministries (n = 23) were released in the 13th five-year plan.

Multi-sectoral collaboration in policy making

Close to a quarter of the PHC policies were jointly released by at least two ministries (n = 37, 25%). As shown in Figure 3, the Chinese National Health Commission (formerly the Chinese Ministry of Health) was the leading agency of the multi-sectorial national policy making on our topic (n = 32), followed by the Ministry of Finance (n = 19) and the National Administration of Traditional Chinese Medicines (n = 18, numbers not mutually exclusive). Among the 32 jointly released policy documents led by the National Health Commission, the major participating ministries were the Ministry of Finance (n = 18) and the National Administration of Traditional Chinese Medicines (n = 17), and the Ministry of Civil Affairs, the National Medical Products Administration and the Ministry of Human Resources and Social Security (n = 8, for each) were also involved in the joint policy development. Other ministries had none to a few involvements in the joint releases of policy documents.

Key patterns of PHC policy making: policy generation structure and historical progression

The policy cross-referencing analysis shown in Figure 4 identified the leading two most referenced policy documents during each five-year planning period. These most referenced documents were all high-level strategic

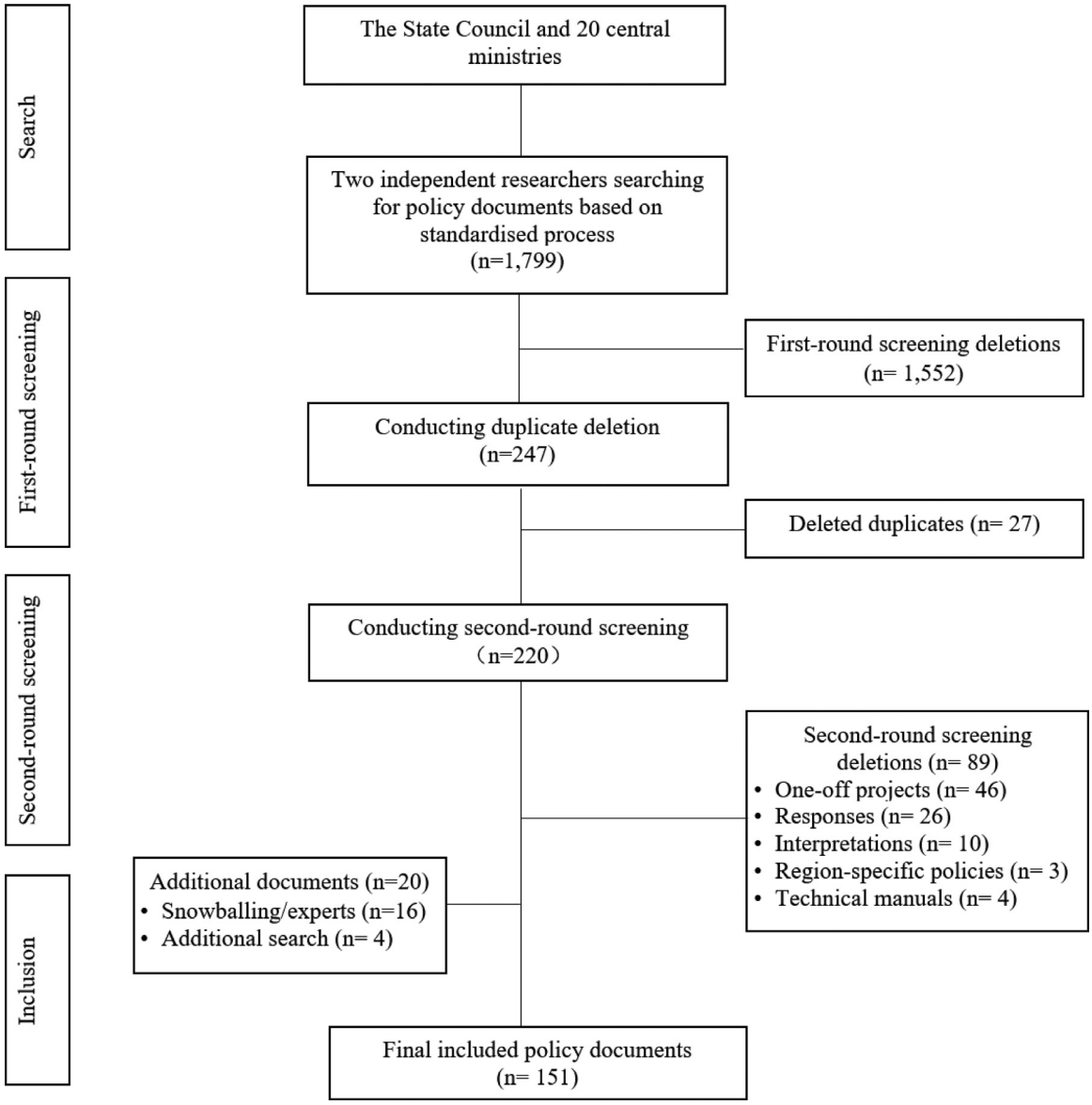

Figure 2. Study flow chart.

planning policy documents, some of which were health-focused (e.g., *Healthy China Action 2030*) and some were not (e.g., the five-year plans). Across the 11 years, the "*Recommendations by the Chinese Communist Party Central Committee and the State Council on Deepening the Health Care System Reform, 2009*" was unsurprisingly the most referenced PHC policy (21 times), which was closely followed by the "*Healthy China Action 2030, 2016*" (20 times), a nationwide strategic plan to achieve universal health coverage.

The vertical arrows in Figure 4 suggest a hierarchical national policy generation structure. The top-level policies, as high-level strategic planning policies, were most frequently referenced by other policy documents as leading document, and were eventually followed by bottom-level specific policy documents that provided technical guidance or requirements (e.g., *the Essential Public Health Service Package* documents). The horizontal arrows, on the other hand, illustrate a progressive policy retention and evolvement process, where some more recent policy documents were built upon and refined from historical ones. For example, the *essential public health service package* documents were present consistently across all time periods, with previous ones cross-referenced by the subsequent versions.

	11th Five-Year Plan (2009-2010)	12th Five-Year Plan (2011-2015)	13th Five-Year Plan (2016-2020)	All
Number of all documents	15	59	77	151
Releasing entities				
State of Council	9	36	45	90
National Health Commission [2]	3	18	27	48
MO Finance	1	8	11	20
National Admin of Traditional Chinese Medicine	1	7	10	18
MO human resources and social security	1	7	2	10
National Healthcare Security Admin [3]	0	0	9	9
MO Civil Affairs	0	5	3	8
National Development and Reform Commission	0	4	3	7
MO Science and Technology	0	2	5	7
Other departments combined [4]	1	7	8	16
Singular/Joint releases				
One department	14	46	54	114
Two departments	0	3	10	13
Three departments	1	4	6	11
Four or more combined	0	6	7	13

***Table 1*: Eligible policy documents by three time periods.[1]**

1: MO: Ministry Of; admin: Administration.

2: The Chinese National Health Commission changed its title from "Ministry of Health" to "National Commission on Health and Family Planning" (17th March, 2013) and then to the current "National Health Commission" (13th March, 2018). Policies issued by these three different names were counted as one.

3: The national healthcare security admin was established in 2018, therefore its number was 0 in the 11th and 12th five-year.

4: Other ministries (n = 12): National Medical Products Administration, Ministry of Ecology and Environment, Ministry of Housing and Urban-Rural Development, Ministry of Education, Ministry of Industry and Information Technology, Ministry of Agriculture and Rural Affairs, General Administration of Sport, National Government Offices Administration, Development Research Centre of the State Council, Chinese Academy of Science, Chinese Academy of Social Science, and National Bureau of Statistics.

Key areas of PHC strengthening for NCD control: mapping against WHO theoretical frameworks

There have been a growing number of the eligible policy documents that covered the health system building blocks (column) and integrated care strategies (row) (Figure 5). Regarding the six building blocks, 'service delivery' (covered in 126 policy documents, 93%) followed by 'health financing' (n=104, 69%) had been consistently covered the most among the 151 PHC-focused NCD control policies, whereas 'health information' (n=80, 53%) the least. For the five strategies, in general, while 'creating an enabling environment' received the most policy attention, and 'engaging and empowering people and communities' the least.

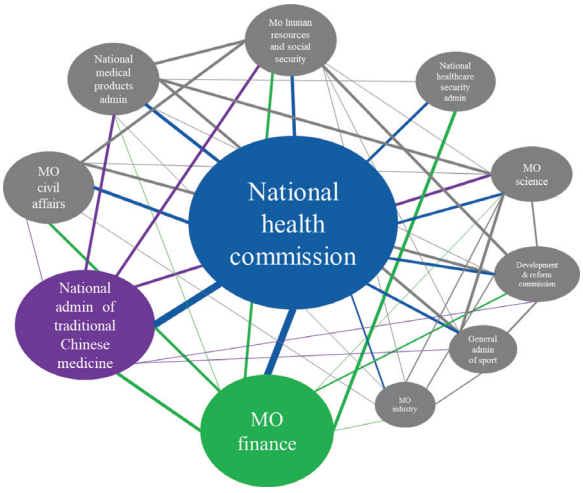

Figure 3. Multi-sectorial collaborative PHC policy making: network mapping*

* MO: Ministry Of; admin: Administration. The three coloured circles are the three ministries with the top-three highest numbers of jointly released policies. The size of each circle indicates the relative frequency of the ministry's involvement in jointly released policies. The width of each connecting line indicates the relative frequency of the two adjoining ministries in being involved in the same policies' releases.

Major policy initiatives for PHC-focused NCD control by WHO six building blocks

Through the inductive coding of the 151 policy documents, we identified 14 'major policy initiatives' (Figure 6, detailed by Appendix 3). Each of the 14 major policy initiatives, mentioned in multiple policy documents, covered multiple WHO health system building blocks and integrated care strategies. The leading three were "the basic health insurance schemes" (mentioned in 80 policy documents, 53%), "strengthening PHC personnel" (n = 74, 49%) and "the digitalization of health systems" (n = 70, 46%).

The 14 major policy initiatives entailed a total of 86 specific strategies that were identified through the inductive coding process. Exemplar strategies in line with the combined theoretical framework (Appendix 3) were listed in Tables 2.1–2.5, where potential policy gaps by comparing with WHO recommendations for the five strategies for people-centred integrated care were also identified.[20,21]

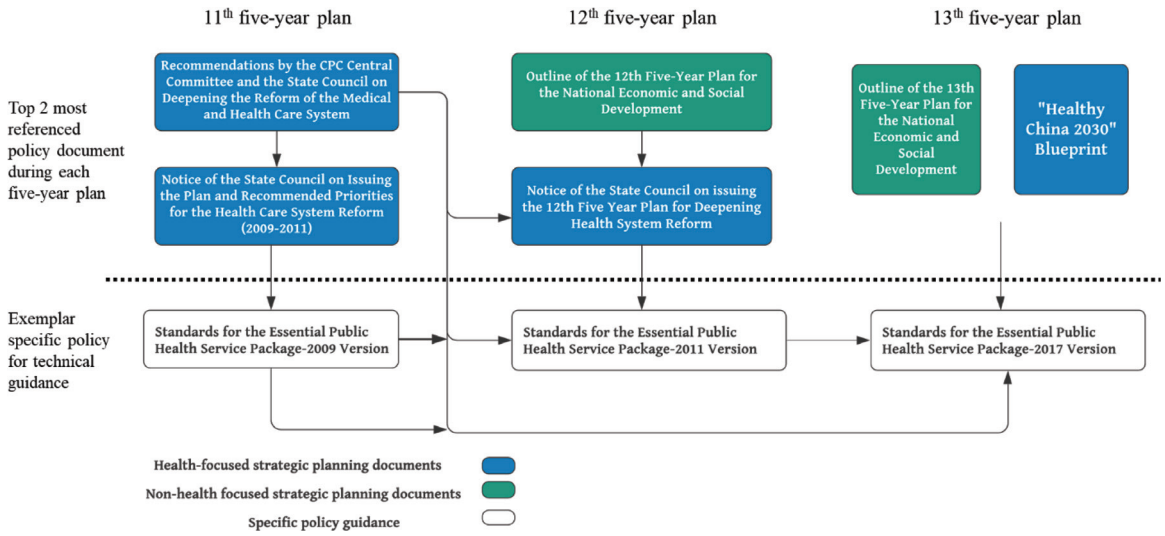

Figure 4. Leading PHC policies and policy cross-referencing*
* The direction of arrows in this figure represents the direction of referencing.

	Five-year plans	Service delivery	Health workforce	Health information	Medicines & technologies	Health financing	Leadership & governance
Engaging and empowering people & communities	11th	7	1	4	3	6	4
	12th	12	5	4	4	12	15
	13th	16	3	4	12	17	44
Strengthening governance & accountability	11th	9	12	6	9	6	10
	12th	30	27	9	20	12	17
	13th	37	28	8	14	27	8
Reorienting the model of care	11th	13	11	7	9	8	6
	12th	34	14	8	18	13	7
	13th	42	16	2	8	13	2
Coordinating services within & across sectors	11th	13	5	4	4	7	3
	12th	32	16	21	6	22	23
	13th	44	10	18	10	32	27
Creating an enabling environment	11th	11	6	8	8	12	12
	12th	27	21	20	29	29	16
	13th	26	18	22	37	36	11
Overall*	11th	14	13	10	13	12	13
	12th	49	32	35	37	39	40
	13th	63	35	35	47	53	54

Figure 5. Number of policy documents mapped against the combined theoretical framework.

Discussion

This review comprehensively examined national policies and key strategic plans, in relation to PHC-focused NCD prevention and control by the Chinese central government, from its monumental health reform in 2009. It demonstrated a strong political commitment to improving PHC-led, NCD prevention, treatment and management across all of the WHO's six health system building blocks and five strategies for integrated people-centred care. Fourteen major policy initiatives were identified, entailing a multitude of distinctive national strategies and action plans that suggested coherent and sustained leadership and resource support for policy planning, implementation and adjustment.

A growing number of Chinese national policy documents related to PHC-focused NCD prevention and control has emerged over the past eleven years, with about half within the latest five years. This is also corroborated by the substantially increased financial investment by the Chinese central government to the PHC-based facilities nationwide.[15,16] As an LMIC with the world's largest population, these are highly remarkable

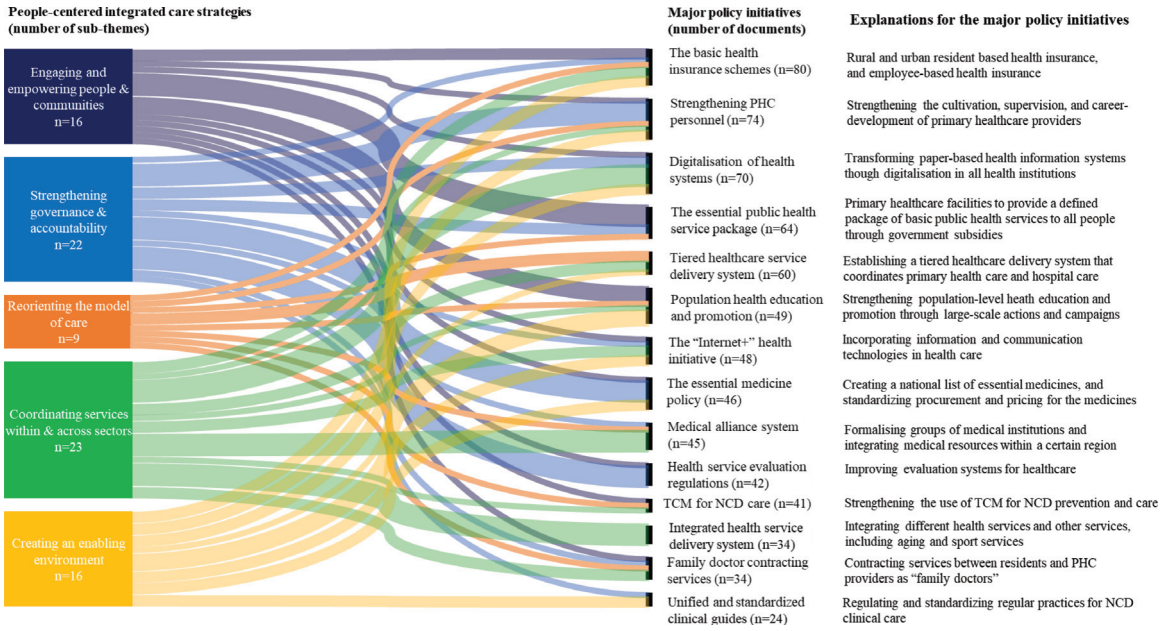

Figure 6. Major Policy Initiatives for PHC-focused NCD Control*

* PHC stands for primary health care, NCD stands for non-communicable diseases, and TCM stands for traditional Chinese medicine.

achievements for China, and placed China well ahead of many other LMICs.[26]

Three-quarters of the included policy documents were issued by one ministry, predominantly by the Chinese State Council or the National Health Commission (formerly the Ministry of Health). In a national policy review on healthy aging in China, more than half were jointly released.[22] Another recent review on China's NCD-related policies, on the other hand, found a promising trend of increasing emphasis for multi-sectorial collaboration, signalled by the joint-releases of a few recent policy documents among multiple government ministries,[18] and the promotion of concerted efforts from both health and non-health sectors in *Healthy China 2030*.[18,27] Multi-sectorial collaboration in joint policy-making and co-production can be further explored, particularly for PHC-focused NCD prevention and control, a highly complex mission requiring multi-stakeholder involvement.[21,28,29] For example, the digitalization of health system and the "Internet+"' health initiative face substantial challenges due to the lack of system interoperability and limitations in data transfer in China's current health system,[30] and as such, the speed, integrity and accuracy of the health information

WHO six building blocks	Identified strategies
Service delivery	Exemplar strategies included to increase people's participation in healthcare (e.g., encourage physical examination uptake, expand routine health check package coverage).
Health workforce	A major strategy was to attract and retain PHC workforce to empower people in less developed and marginalized regions.
Health information systems	Increasing people's access to health and service data was the main focus, in order to enhance their capacities for self-management for health.
Health financing	Major strategies aimed at increasing people's affordability of care (e.g., to increase and maintain people's registration rate of basic health insurance schemes; to increase per-capita health insurance subsidy).
Medicines and technologies	One of the key domains was to raise people's awareness about essential medicines, and to empower people in less developed and marginalized regions with better health infrastructures and supplies.
Leadership and governance	Major strategies associated with health governance were largely aimed at increasing population NCD health literacy (e.g., large-scale health promotion campaign launch, multi-media mobilization).
Comparison with WHO recommendations	Limited attention was paid to the engagement and mobilization of community-based non-health-professionals for NCD management.

***Table 2.1*: Identified specific strategies about engaging and empowering people & communities.**

WHO six building blocks	Identified strategies
Service delivery	Many policies advocated for the adoption of standardized 'clinical pathways'.
Health workforce	The policies included provision of technical guidance and support (e.g., continued medical education and on-the-job clinical training, training and contracting of general practitioners); enhanced clinical supervision and service performance evaluation.
Health information systems	Exemplar strategies included to utilize big data and information technologies to improve comprehensive NCD management, and to establish and improve the transparency and openness of health information.
Health financing	Many policies emphasized upgrading financial investment and funding management to PHC facilities (e.g., to connect financial investment with the quantity and quality of services, instead of giving per-capita payment).
Medicines and technologies	Exemplar policies include setting up a minimum prescription threshold for essential medicines used in PHC facilities.
Leadership and governance	Major strategies predominantly focused on the capacity building of PHC, and strengthening facility-level and individual-level performance evaluations.
Comparison with WHO recommendations	There was a current lack of guidance on the design and optimization of clinical performance monitoring and quality-oriented evaluation mechanisms that emphasize patient feedback.

***Table 2.2*: Identified specific strategies about strengthening governance & accountability.**

WHO six building blocks	Identified strategies
Service delivery	The primary focus was to shift or relocate care provision from the dominant tertiary hospital-led clinical care models to PHC-led, coordinated prevention, treatment and care models. A key strategy was for PHC systems to become multi-functional for NCD prevention and control (e.g., health education and promotion, population-wide disease screening, routinized clinical management, monitoring and rehabilitation, and service referral).
Health workforce	It was encouraged that health workforce should work at the PHC level. The roles of PHC providers as gate-keepers were underscored. Emphasis was also given to increase the responsibilities of contracted family doctors for various PHC duties.
Health information systems	The focus was given to the establishment and strengthening of the health information systems of PHC facilities, particularly for those that were non-digitalized.
Health financing	Economic stimulation mechanisms were deployed to promote service access and utilization to a range of PHC facilities (e.g., differentiated health insurance rebates, and extra financial incentives to use PHC services).
Medicines and technologies	Many policy documents promoted the relocation of medical resources to PHC facilities, including medicines, infrastructure, and technologies.
Leadership and governance	Policies mostly targeted at making resources available from tertiary hospital settings to downstream PHC facilities and expanding routine clinical practices for secondary NCD prevention.
Comparison with WHO recommendations	While many policies focused on financial support, there was lack of well-designed non-financial incentives for health workforces to work in PHC facilities where there is high need, such as rural and remote areas.

***Table 2.3*: Identified specific strategies about reorienting the model of care.**

are currently compromised.[31,32] Stronger and closer multi-sectorial collaborations, between health and industrial ministries, for example, to strengthen guidance and advocates through policy regulations, could be highly beneficial for this current situation.

Two unique policy making patterns were identified in this paper. First, it is characterized of a hierarchical policy generation structure, which stems from overarching strategic plans (mainly by the State Council), followed by high-level implementation plans (by State Council and/or ministries), and then more tangible policy initiatives (mainly by the National Health Commission and/or other ministries). This is consistent with the overall Chinese national policy making practice, where the State Council is the most influential in policy-making, followed by responsible ministries in charge. Similar findings were reported in a recently published healthy aging policy review. There found a clear and common "top-down" policy formulation pathway from the State Council to the ministries, while limited policies were observed in the "bottom-up" pathway (from ministries to the State Council), or "parallel" pathway (from one ministry to another).[22] The second pattern that we identified is characterized of a progressive policy retention and fine-tuning process, such as the three versions of the standards for essential public health service packages. The continuity and evolvement of the policies could help ensure the customization to the changes in people's health needs and health system status, so that long-term impact could be realized.

WHO six building blocks	Identified strategies
Service delivery	The unique medical alliance system was of particular interest. The proposed medical alliance partnership was characterized by a hierarchical healthcare provision mechanism where clear roles and responsibilities should be assigned to PHC facilities (e.g., screening, documenting, follow-ups, and health education), secondary hospitals (e.g., major clinical services and training for PHC providers), and tertiary hospitals (e.g., specialized care for severe and complicated clinical cases and training for PHC and secondary hospital providers), to enable a patient-centred, bi-directional referral pathway alongside the disease prevention, treatment and care continuum. In addition, health service delivery system integration between preventative, clinical and healthy aging systems was another policy focus.
Health workforce	The family doctor contracting services aimed at establishing properly trained multi-disciplinary PHC provider teams, including physicians, nurses, lab technicians, and pharmacists, who would provide major PHC and basic clinical services, and would bridge residents' PHC services with hospital care through referrals. Further, senior healthcare providers from higher level hospitals were encouraged to have multi-site clinical rotation across different health facilities, especially PHC facilities.
Health information systems	The prominent target was to establish integrated health information systems using electronic health records. It should be able to obtain basic health service data (e.g., service episodes, referrals) from a range of health care facilities (i.e., primary, secondary and tertiary, private and public) at various jurisdiction levels.
Health financing	It was largely emphasized the health insurance scheme coordination and integration as well as the nationwide health program budget allocation and cost-sharing between central and subsidiary government.
Medicines and technologies	Sharing medical resources across health facilities within the same regions, usually at the county or municipal level, was highly encouraged.
Leadership and governance	Many policy documents mentioned the essential coordination and multi-sectorial partnership building across different stakeholders, including government departments, industries, civil societies, and communities.
Comparison with WHO recommendations	Although some policy documents proposed to increase multi-sectorial collaborations in policy execution, such collaborations were not mandated and evaluated in the current policy documents.

***Table 2.4*: Identified specific strategies about coordinating collaborations within and across sectors.**

WHO six building blocks	Identified strategies
Service delivery	There were processes in place to standardize prevention, treatment and care guidelines for NCD management, and which includes simplifying admission, discharge, and referral processes.
Health workforce	An emphasis was to create a better working environment for PHC providers in career promotion and performance-based reward systems.
Health information systems	The main attention was paid to harmonize the use of digital health information systems (e.g., standardized data collection, enhanced data transferability, digital safety), and to establish nation-wide compatible digital health information systems.
Health financing	Major strategies were focused on the exploration, establishment and improvements of a comprehensive and diverse payment system for healthcare (e.g., diagnosis-related groups, DRGs).
Medicines and technologies	The key was to increase the affordability and accessibility of medicines (e.g., the removal of the price mark-up by public health institutions; improved procurement mechanisms for NCD medicines).
Leadership and governance	Efforts were mostly directed towards encouraging the adoption of healthier lifestyles through large scale and sustainable health education and promotion campaigns (e.g., for physical exercise, tobacco and alcohol control, healthy diet, mental health promotion), particularly in the latest 'Healthy China Action 2030' strategic plan.
Comparison with WHO recommendations	Limited attention was given to the engagement and involvement of civil societies and private organizations in co-creating a better environment for NCD care at the PHC level. Also, some of the much-needed policies, such as the adaptation of the DRG-based payment system and the upgrading into nation-wide compatible digital health information system in China, could be both resource-intensive and time-consuming.

***Table 2.5*: Identified specific strategies about creating enabling environment.**

Out of the fourteen major policy initiatives for PHC-focused NCD control and 86 associated specific planning and implementation strategies identified in this paper, health finance (e.g., the basic health insurance schemes), health workforce (e.g., the strengthening of PHC personnel), and service delivery (e.g., the essential public health service package) were the most common national policy priorities and strengths. Notably,

although the health information block was addressed in relatively the fewest policy documents across the eleven years, the digitalization of health systems was considered a national policy priority, especially in the most recent five-year planning period.[33] All of these are hinged upon an efficient national leadership and coordinated central governance mechanism.

Regarding national leadership in reorienting the model of care, task-shifting from tertiary hospital-dominated models to PHC-led and coordinated models was highlighted. This is also evident in the basic health insurance schemes, the essential medicine policy, and the essential public health service package, with the ultimate goal to improve accessibility, affordability and efficiency of PHC services.[34] This is further supported by the growing number of PHC providers and the steady increases of their government-paid salaries in China nationally.[15,16] However, despite these efforts, statistics show that the proportions of outpatient and inpatient visits to PHC facilities out of total healthcare visits had both decreased over time (outpatient: from 62% in 2009 to 54% in 2017; inpatient: from 28% in 2009 to 18% in 2017).[34] Researchers further found that the apparent limited capacities of PHC facilities to provide high-quality care often result in low service satisfaction among residents.[17]

To tackle these persistent challenges, two of the identified major policy initiatives, namely, the health service evaluation regulations and the strengthening of PHC personnel, offer a number of promising solutions by strengthening PHC workforce accountability. In current practice, however, PHC facilities often overly emphasize service volume and overlook service quality in their monitoring and evaluations.[35] Comprehensive yet feasible-to-implement quality performance evaluation systems, tailored for PHC facilities for NCD control, are warranted. Better performance evaluation mechanisms are expected to be equipped with appropriate incentives,[33] informed by quality data,[33] and oriented towards patient-centred care.[21,36,37]

The nationwide expansion of the essential public health service package, on the other hand, has brought additional challenges to the sustainability of the PHC workforce with increased workloads, mismatched rewards and incentives, and a widening gap of regional disparity.[17,33,38,39] Internationally, there are successful experiences of mobilizing community-based non-health-professional care workers to diverge public health responsibilities. The UK National Health Service endorses the role of "link workers", who are essentially community-based non-health-professionals, to facilitate health and social service access.[40] The female community health volunteer program in Nepal demonstrates in the developing world the effectiveness of community volunteers in supporting lifestyle changes and improving health outcomes for people with hypertension.[41] In China, similar and yet customized utilization of community-based non-health-professional care workers, if guided by proper training, supervision, and technical support, could potentially provide a viable alternative to addressing the current PHC workforce shortage.

Based on the authors' knowledge, this is the first study to comprehensively describe and synthesize China's national policies of PHC system responses to NCD prevention and control since the beginning of the current health reform phase. A notable strength of the study is the use of qualitative methodology, to guide the content analysis of the policy documents. Second, the use of the combined WHO frameworks might be adapted by other countries with similar political commitments. Several limitations in this study should also be acknowledged. First, we were only able to include open-sourced policy documents publicly displayed on the Chinese central government websites. Although we tried to reduce major policy document omissions through expert consultations, further research is needed to engage national and local policy makers to identify potential relevant policies that were not made public. Second, the policy document screening was restricted by the limitations of the search engines of these websites, including limitations in the length of Chinese characters and Boolean operators. We tried to mitigate these restrictions by simplifying the search strategies and increasing manual input in the screening process, as described in the Methods section. Lastly, the present study focused on the central government policies and did not consider their local uptake, adaptions, and possible innovations. Future research is therefore needed to explore how these central policies are translated into local contexts at different jurisdiction levels, and how local governments may have innovated in their policy making processes.

Recommendations and conclusion

China's strong political commitments to PHC strengthening for NCD control is inspiring. Based on the discussions above, we provide three recommendations for China's future policy development for NCD prevention and control with a PHC focus. First, we recommend further facilitating and supporting multi-sectorial collaborations in policy-making and execution processes among government ministries. Second, we recommend governments provide policy guidance to design and conduct quality-oriented performance evaluation, through robust health data and community feedback. Third, we recommend exploring feasible approaches to further engage communities in diverging PHC professionals' responsibilities for public health services, such as the mobilization of community-based non-health-professional care workers, to address the challenges of China's PHC workforce. In summary, future policy commitments to strengthen multi-sectorial collaborations, quality-oriented performance evaluation, and community

engagement and mobilization, could be considered in China's ongoing process of health reform, which may also potentially shed lights on other countries with related political agenda.

Authors' contributions

MT and SX led the conception of this study. LM, DP, HL, PY, and BL provided critical suggestions for the protocol of this study. SX and YM conducted the search of policy documents. SX and CC conducted data extraction and thematic analysis. SX completed the draft of this paper, and MT and LM made substantial edits to the draft. XZ, TW, TH, WJ, HS and all co-authors provided critical suggestions for the writing of this paper. All authors approved the submission of this paper.

Declaration of interests

The authors declare no conflict of interests for this study.

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Supplementary materials

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