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## Foreword

## Population-Based Behavioral Risk Factors Prevention and Control: the Fundamental Strategy for Fighting NCDs

Wenhua Zhao<sup>1,2,#</sup>

Noncommunicable diseases (NCDs) and related risk factors are one of the major global challenges of the 21st century and are responsible for 71% of all deaths worldwide (1). More than 36 million people die annually as a result of NCDs, including 15 million people who die at a young age, between 30 and 70 years old (2). The burden continues to rise and has been one of the major public health challenges for all countries, including China. Behavioral risk factors interventions are considered the cornerstone of the prevention and control of chronic diseases. Substantial reduction of NCD mortality requires policies that considerably reduce tobacco and alcohol use and blood pressure, and provide equitable access to efficacious and high-quality preventive and curative care for acute and chronic NCDs (3).

In order to maintain people's health and build a healthy China in a well-rounded way, China made a lot of efforts and issued several policies, plans, and national actions for the prevention and control of NCDs. China's top legislature approved the country's 14th Five-Year Plan (FYP), and called for "fully implementing the Healthy China Actions", "strengthening prevention, early screening and comprehensive intervention of chronic diseases", etc. Therefore, it is necessary to systematically review and summarize successful experiences, challenges, and strategies of China's NCDs prevention and control, especially strategies for the prevention and control of behavioral risk factors for NCDs.

With the support of the Chinese Preventive Medicine Association (CPMA) and World Health Organization (WHO) China Representative Office, a study titled Research on National Action Strategies for Promoting Population-Based Prevention and Control of Behavioral Risk Factors for NCDs was implemented from August to December 2021. The objectives of this study were to systematically review the development and implementation of NCD prevention and control policies and strategies in China over the past 30 years, to summarize China's practices and successful experiences in preventing and controlling behavioral risk factors for NCDs, and to analyze and compare them with the "Best buys" interventions recommended by WHO, and to put forward action strategies on future NCDs prevention and control. The study team consists of dozens of experts and scholars in related fields. According to but not bound to the research plan, they applied new methods and explored new ideas, systematically reviewed and analyzed a large amount of literature and research information, and organized several discussions and expert consultations to continuously improve the research.

This issue of *China CDC Weekly* contributes important evidence and promotes discussion on national action strategies for promoting population-based prevention and control of behavioral risk factors for NCDs. The first paper describes a systematic review and evaluation of policies for the prevention and control of NCDs and behavioral risk factors in China (4). The second paper is about the evaluation of the implementation of strategies for population-based prevention and control of behavioral risk factors for NCDs (5). The third paper discusses the evaluation of the implementation of strategies for the individual-based intervention of behavioral risk factors for NCDs (6). Together, these three studies present empirical evidence to evaluate national action strategies and actions for the prevention and control of behavioral risk factors for NCDs in the Chinese population. Based on the findings, we made recommendations and future direction for national actions and strategies for population-based prevention and control of behavioral risk factors for NCDs (7).

We sincerely thank all the organizations and individuals who have provided consultation and support for the implementation of this study and the preparation of the report. We want to thank the CPMA for providing all-around support for the implementation of the project. We also want to thank the WHO China Representative Office for the financial support. However, in view of the tight research schedule, the limited capacity of the research team and the impact of the COVID-19 pandemic, there must be room for improvement in this research report. Therefore, it is far from enough to evaluate national action strategies and actions for the prevention and control of

behavioral risk factors for NCDs in the Chinese population based solely on this report.

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## Preplanned Studies

## Quantitative Analysis on NCDs Prevention and Control Policies Based on the Perspective of Policy Instruments — China, 1990–2020

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### Summary

#### What is already known about this topic?

Noncommunicable diseases (NCDs) are a major public health problem in the world. NCDs are the leading cause of premature deaths and disabilities among Chinese residents, resulting in heavy economic and health burdens.

#### What is added by this report?

This study conducted a quantitative analysis of the policy texts on NCDs prevention and control in China from 1990 to 2020, based on the perspective of policy instruments. It was discovered that China's NCDs prevention and control policies developed rapidly from the ground up over the 30 years from 1990 to 2020 and that the majority of China's NCDs prevention and control policies were environment-oriented, while supply-oriented and demand-oriented policies were insufficient.

#### What are the implications for public health practice?

The findings of this study suggested that increasing supply-oriented and demand-oriented strategies should be prioritized in the future formulation and revision of NCDs prevention and control policies.

Noncommunicable diseases (NCDs) are responsible for almost 71% of all deaths globally (1). The number of deaths due to NCDs in China accounted for 86.6% of total deaths in 2012 (2). However, the unhealthy lifestyle of Chinese residents is still prevalent, such as excessive intake of salt and edible oil, sugary beverage consumption among children and adolescents, smoking, alcohol consumption, and lack of physical activity (2). In order to maintain the people's health, China has issued a number of policies, plans, and national actions for the prevention and control of NCDs. In particular, the Medium- and Long-Term Plan for the Prevention and Treatment of NCDs (2017–2025), the Outline of the Plan for “Healthy

China 2030”, and the Healthy China Action (2019–2030) promulgated by the Chinese State Council put forward a series of indicators for NCDs control. It is necessary to systematically review the strategies for NCDs prevention and control in China so as to achieve the goal of healthy China. Based on the theory of policy instruments, we conducted a textual content analysis and a quantitative analysis of the policies on NCDs and their behavioral risk factors that were issued by the State Council and relevant national ministries and commissions from 1990 to 2020. It was found that China's NCDs prevention and control policies experienced rapid development during the 30 years from 1990 to 2020 and that the majority of China's NCDs prevention and control policies were environment-oriented, while supply-oriented and demand-oriented policies were insufficient. These findings suggested that attention should be paid to increasing supply-oriented and demand-oriented strategies during the formulation and revision of NCDs prevention and control policies in the future.

The methods of policy document system retrieval and policy text research were conducted in this study. The national health-related policy documents were searched in the portals of the Central Government and national ministries and commissions with the keywords of NCDs and their behavioral risk factors. The inclusion criteria of the policy documents included the following: 1) the release date should be between 1990 and 2020; 2) the departments releasing policy documents were the State Council and relevant national ministries and commissions; 3) the forms of policy documents included laws and regulations, planning, circulars, opinions, measures, announcements, health industry standards and guidelines (issued or guided and supported by health administrative departments), programs (policies); 4) the public form of the policy documents was published online on the official website; and 5) the content of policy documents was closely related to the

prevention and control of NCDs or 4 behavioral risk factors (unhealthy diet, use of tobacco, harmful use of alcohol, and physical inactivity). The exclusion criteria included the following: 1) news reports, conference speeches, work reports and interpretation of policy documents related to the prevention and control of NCDs or their behavioral risk factors; 2) only keywords of NCDs or their behavioral risk factors, no substantive content; and 3) documents included in the policy text pool.

The main information elements of the policy document texts were extracted to form an analysis database, including the name of the policy document, the release unit, the release time, the document number, the file type, and the text items. The material was classified using the policy instrument theory, which divided policy instruments into three categories: supply-oriented, environment-oriented, and demand-oriented (3). Figure 1 shows the categories and mechanisms of policy instruments for NCDs prevention and control. Based on the perspective of policy instruments, a textual content analysis and a quantitative analysis were conducted with policy documents on NCDs and related behavioral risk factors in China that were issued between 1990 and 2020. Both analyses were carried out using SPSS software (version 16.0, SPSS Inc., USA).

This study retrieved 645 documents publicly available on national-level networks, excluded 233

according to the inclusion and exclusion criteria, and finally included 412 policy documents in the analysis. Among the 412 policy documents, 39 policy documents on NCDs prevention and control were released from 1990 to 2005, accounting for 9.5% of the total number of documents, 149 were released from 2006 to 2015, accounting for 36.2% of the total, and 224 were released from 2016 to 2020, accounting for 54.4% of the total (Figure 2).

Among the NCDs policies released in 1990–2020, on a type basis, 59 policy documents were supply-oriented, accounting for 14.3% of the total number of documents; 340 were environment-oriented, accounting for 82.5% of the total; and 13 were demand-oriented, accounting for 3.2% of the total. Supply-oriented, environment-oriented, and demand-oriented policies all showed an increasing trend, and environment-oriented policies were significantly higher than supply-oriented and demand-oriented policies. After 2011, supply-oriented and demand-oriented policies gradually increased, but their proportions were still low (Figure 3).

Among the 4,455 pieces of policy instruments for NCDs prevention and control, on a content basis, 78.2% were environment-oriented, and 18.0% and 3.9% were supply-oriented and demand-oriented, respectively. In all the policy instruments, strategy-based measures accounted for 46.1% of the total policy instruments, followed by goals and planning, which

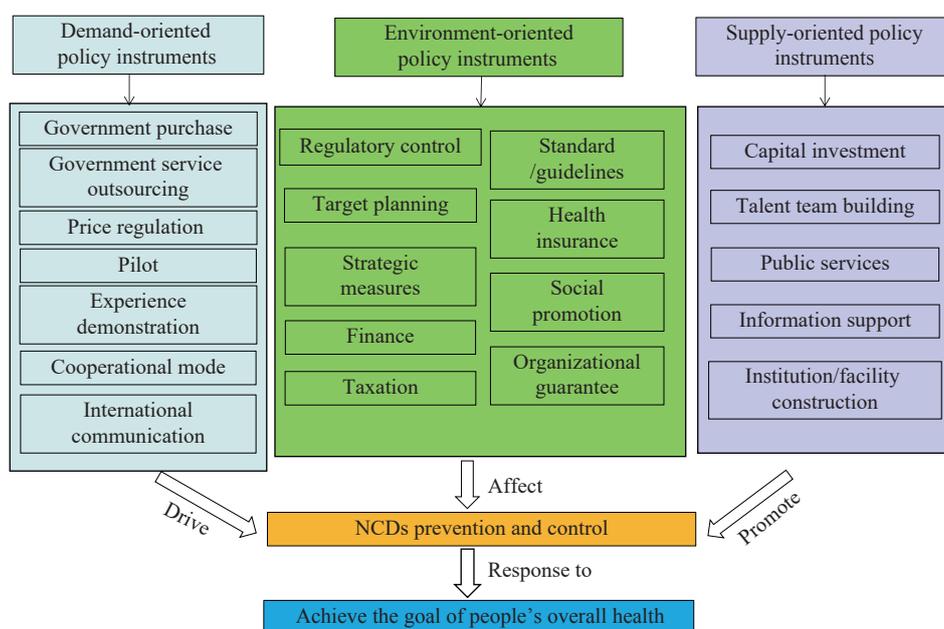


FIGURE 1. Categories and mechanisms of policy instruments for noncommunicable diseases (NCDs) prevention and control.

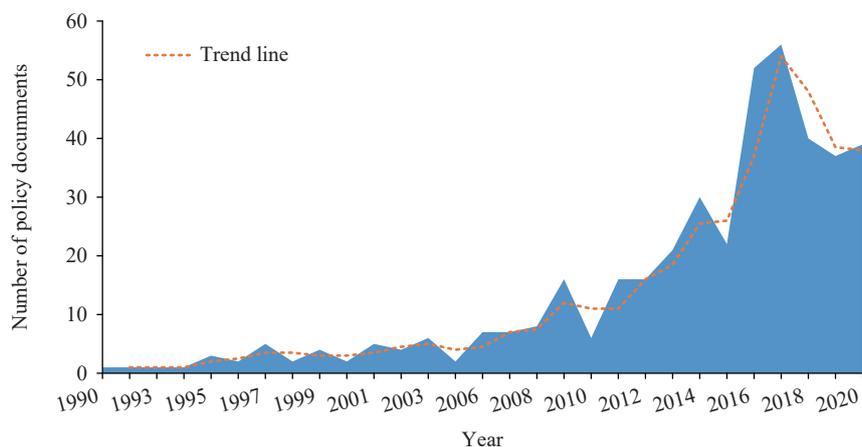


FIGURE 2. The Distribution of the release time of policy documents on noncommunicable diseases prevention and control in China in 1990–2020.

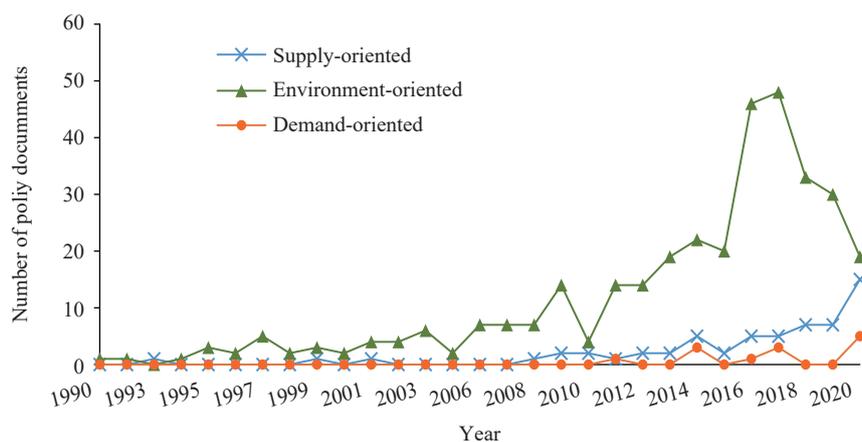


FIGURE 3. The Distribution of the types of policies on noncommunicable diseases prevention and control in China in 1990–2020.

accounted for 14.5%; capital investment, talents building, and information support accounted for 1.5%, 3.0%, and 3.8% of the total policy instruments, respectively; finance, taxation, and laws and regulations accounted for 0.1%, 0.2%, and 1.8% of the total policy instruments, respectively. In the supply-oriented policy instruments, public service investment accounted for 31.6%, information support 21.0%, and talent building and capital investment, respectively, 16.5% and 8.3%. In the environment-oriented policy instruments, strategic measures accounted for 59.0%, and laws and regulations, taxation, and financial instruments accounted for 2.3%, 0.3%, and 0.2%, respectively. In the demand-oriented policy instruments, cooperation models accounted for 30.1%, and government service procurement and government service outsourcing accounted for 2.9% and 1.7%, respectively (Table 1).

## DISCUSSION

China's NCDs prevention and control policies have grown rapidly out of nothing over the 30 years from 1990 to 2020, especially after 2016, when such policy documents reached a peak. This is mainly related to factors such as rapid social and economic development, the shift of residents' disease and death spectra to NCDs, the increasing importance attached by the Party and the government to NCDs prevention and control, and the fulfillment of international commitments in China (4–6). In 2016, China made clear the guiding principle of integrating health into all policies, and issued programmatic policy documents such as the Outline of the Plan for “Healthy China 2030”, the Medium-and Long-Term Plan for the Prevention and treatment of NCDs (2017–2025), and the Healthy China Action (2019–2030). A series of

TABLE 1. The Distribution of various policy instruments for noncommunicable diseases prevention and control.

Type of policy instrument	Sub-item	Number	Type-based proportion (%)	Total-based proportion (%)
Supply-oriented	Capital investment	66	8.3	1.5
	Talent building	132	16.5	3.0
	Public service investment	253	31.6	5.7
	Information support	168	21.0	3.8
	Institution/facility construction	181	22.6	4.1
	Subtotal	800	100.0	18.0
Environment-oriented	Goals and planning	648	18.6	14.5
	Strategic measures	2,054	59.0	46.1
	Finance	6	0.2	0.1
	Taxation policy	11	0.3	0.2
	Medicare support	113	3.2	2.5
	Standards and guidelines	215	6.2	4.8
	Laws and regulations	80	2.3	1.8
	Social promotion	275	7.9	6.2
	Organizational safeguard	80	2.3	1.8
	Subtotal	3,482	100.0	78.2
Demand-oriented	Government procurement	5	2.9	0.1
	Pilot projects	36	20.8	0.8
	Government service outsourcing	3	1.7	0.1
	Price regulation	21	12.1	0.5
	Experience demonstrations	47	27.2	1.1
	International communication	9	5.2	0.2
	Cooperation models	52	30.1	1.2
	Subtotal	173	100.0	3.9
<b>Total</b>		<b>4,455</b>	<b>100.0</b>	<b>100.0</b>

supporting policy documents for the implementation of these programmatic documents was also introduced by the involved ministries, resulting in a large increase in the number of documents released. “Healthy China” was elevated to a national policy, highly placed on the development agenda, with NCDs prevention and control policies gradually changing from “disease-centered” to “health-centered.”

Policy instruments are the means and measures to achieve policy goals. Different types of policy instruments have different roles and mechanisms. This study showed that national NCDs prevention and control policies used a combination of three types of policy instruments, namely supply-oriented, environment-oriented, and demand-oriented policy instruments, with the amount to which they were used varying substantially. Environment-oriented policy instruments accounted for 78.2%, while supply-oriented and demand-oriented instruments occupied

18.0% and 3.9%, respectively. Giving full play to the complementarity of different policy instruments was the key to the rational allocation of policy instruments (7). In this sense, environment-oriented policy instruments were overrepresented in China’s NCDs prevention and control policies, while supply- and demand-oriented instruments were underused, which was consistent with the results of similar studies in the fields of pension services, healthy city construction, and so on (8–9). On the one hand, it reflected that decisionmakers were expected to support NCDs prevention and control by creating a favorable policy environment. On the other hand, it also suggested that decisionmakers should consider the rational distribution of various policy instruments as NCDs prevention and control was a complex and systematic project, so as to give full play to the “impetus”, “pull” and “influence” of supply-, environment-, and demand-oriented instruments (9).

The study implied an unbalanced internal composition of each type of policy instruments. In supply-oriented policy instruments, public service investment accounted for one-third, while talent building and capital investment were inadequately designed. At present, the situation of NCDs prevention and control is severe, while understaffing and insufficient capacity and funding are common problems facing NCDs prevention and control nationwide. In the national disease control system, full-time personnel for NCDs prevention and control accounted for only 3.2% of in-service staff, with a wide gap in western regions, especially in primary medical institutions (10–11). China's NCDs prevention and control is mainly financed by central and local governments, but the funding is inadequately guaranteed in some underdeveloped regions, so local governments need to explore a variety of sound funding models and sustainable funding guarantee mechanisms (12). The environment-oriented policy instruments were dominated by strategic measures and goals and planning, with laws and regulations, taxation and finance accounting for a small proportion (less than 3%), suggesting that decisionmakers tended to create a favorable policy and social environment and facilitate consensus on enhanced NCDs prevention and control through moderate instruments such as formulating strategies, planning and goals. However, as NCDs prevention and control involves economic, cultural, environmental, and other factors, the most cost-effective method is mandatory control through laws and regulations, as well as economic regulation through taxation and finance (13). The Basic Health Care and Health Promotion Law, released on December 28, 2019, is China's first basic and comprehensive law on health, which would drive the rule-of-law process of NCDs prevention and control (14). In the demand-oriented policy instruments, government procurement and government service outsourcing accounted for less than 3%. These instruments can motivate and attract stakeholders such as social organizations and enterprises to be actively engaged in NCDs prevention and control, thus effectively reducing government investment in talent building, capital and technology, and forming an effective pull for NCDs prevention and control (15). To meet people's health needs, it is critical to strengthen the development of demand-oriented policies, promote government procurement, pilot projects for NCDs prevention and control, experience summary, demonstration, and promotion (16), and

provide a variety of multi-level, effective, and convenient NCDs prevention and control services.

This study is subject to certain limitations, which might cause some biases in the results. First, as policy texts were obtained through an online search, policy documents that had not been made public could not be included. Second, given the rich connotations of policy instruments themselves, different types of instruments may have intersected attributes and blurred boundaries, and the coding of instrument categories may be somewhat subjective.

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## Preplanned Studies

## Evaluation of China Healthy Lifestyle for All Interventions Based on RE-AIM Framework — China, 2007–2020

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### Summary

#### What is already known about this topic?

Since the launch of China Healthy Lifestyle for All (CHLA), each action area has been evaluated at the local level and effective results have been achieved in most areas.

#### What is added by this report?

Based on the Reach, Effectiveness, Adoption, Implementation, and Maintenance (RE-AIM) model, the study found that there is an imbalance in the development of CHLA, and some of the action goals and indicators are not satisfactory.

#### What are the implications for public health practices?

A national action evaluation index system should be built to ensure the sustainability and scientific nature of this strategy. In addition, the government needs to attach great importance to CHLA to effectively help residents take health actions.

Overall, 7 of the top 10 fatal diseases in the world are chronic noncommunicable diseases (NCDs) (1). Approximately 89% of deaths in China were attributed to NCDs in 2018 (2). In order to mitigate the effects of NCDs in China, it is necessary to establish a system for comprehensive NCDs control, carry out comprehensive health education and promotion, and advocate the adoption of a healthy lifestyle by the public (3). Therefore, multiple national departments launched the China Healthy Lifestyle for All (CHLA) campaign to promote and disseminate information on a healthy lifestyle, promote technical measures and support tools, and carry out various national activities in 2007. To evaluate the implementation and intervention of CHLA, we applied the RE-AIM model (4). Overall, the CHLA has shown an upward growth trend and actions taken under the CHLA in multiple domains have shown great progress. To further promote the CHLA, measures were tailored to local conditions.

This study contains a literature review, systematic

review, and meta-analysis and applied the RE-AIM model to evaluate the process and results of the CHLA project. The relevant literature was retrieved from both Chinese and English databases as well as other publicly available platforms, including the VIP Chinese Journal Service Platform, the China National Knowledge Infrastructure (CNKI), and the United States National Library of Medicine (PubMed) with the key words of CHLA and its related activities. A mixed research approach combining qualitative and quantitative methods was used to collect and analyze the data. Annual progress data for CHLA comes from the work information management system of CHLA, which includes CHLA activities' data from 31 provincial-level administrative divisions (PLADs) and Xinjiang Production and Construction Corps (XPCC) in the mainland of China. The evaluation dimensions are described in Table 1.

In the “Reach” dimension, the coverage and mass participation in the CHLA actions were shown in Table 2. In our study, up to December 31, 2015, a total of 2,507 counties (districts) across the country had launched the CHLA, a launch rate of 80.90%. Up to December 31, 2020, a total of 2,817 counties (districts) across the country had launched the CHLA action, a launch rate of 95.20%. The rates in the eastern, central, and western regions were 97.36%, 97.73%, and 91.36%, respectively. The launch rate of each region has increased in the two phases with the fastest expansion in the western region. In general, the launch rate of the western region, as compared with the eastern and central regions, was still at a low level.

In the “Efficacy” dimension, the CHLA action had achieved a remarkable intervention effect. In 2012, the National Action Office carried out a nationwide assessment of the CHLA, which mainly assessed its five aspects, including “awareness of the CHLA action,” “awareness of healthy lifestyles,” “awareness of health knowledge,” “use of health support tools,” and “changes in lifestyle and behavior.” It has been documented that specific knowledge on a healthy lifestyle, such as the recommended level of physical activity, recommended intake of oil and salt, and

TABLE 1. RE-AIM evaluation dimensions.

Dimension	Definition	Index
Reach	Obtain service propagation or effective coverage	Coverage and mass participation
Efficacy	Behavioral consequences of intervention	Awareness rate, utilization rate of health tools, changes in life behavior; mass satisfaction
Adoption	Organizational support and participation in policy implementation	Departments involved in the action
Implementation	Whether the implementation is carried out as planned, the content and depth of implementation; the compliance of the participants	The construction of propaganda and education activities, training activities and health support environment
Maintenance	The extent to which the action is maintained or institutionalized (policy, legislation)	Measures to ensure the sustainability of the action

Abbreviation: RE-AIM=reach, efficacy-adoption, implementation, maintenance.

TABLE 2. Launch of CHLA in the eastern, central, and western regions.

Region	Phase 1			Phase 2		
	Number of counties (districts) under their jurisdiction	Number of counties (districts) launching CHLA	Proportion (%)	Number of counties (districts) under their jurisdiction	Number of counties (districts) launching CHLA	Proportion (%)
Eastern region	912	849	93.09	909	885	97.36
Central region	922	888	96.31	927	906	97.73
Western region	1,265	770	60.87	1,123	1,026	91.36
Total	3,099	2,507	80.90	2,959	2,817	95.20

Note: For phase 1: Data was updated on December 31, 2015; for phase 2: Data was updated on December 31, 2020.

Abbreviation: CHLA=China Healthy Lifestyle for All.

parameters for a healthy Body Mass Index were higher in the action groups than in the non-action groups, and higher in urban than rural populations (5). In addition, the proportion of conscious control of oil and salt intake in urban and rural action groups was higher than that in non-action groups (5). In this study, according to the inclusion and exclusion criteria, 42 pieces of literature (47 studies) were included in the meta-analysis. The results showed that the CHLA was effective. See Table 3 for the results on lifestyle and behavior changes in the CHLA action group and the control group. In addition, it was notable that the CHLA was well accepted across the country. For example, in 2014, Shanghai carried out an evaluation of the effect of the yearly distribution of health gift packages to the city's residents as part of the CHLA action, showing 82.1% satisfaction.

In the "Adoption" dimension, many departments were involved in the action. The first phase of the CHLA was jointly initiated by three departments and the second phase was jointly managed by five ministries and commissions. In light of local conditions and the advantages of multi-department collaboration, a working mechanism for the CHLA has been gradually formed under the leadership of the government and with the participation of various departments. For example, the Chongqing Municipal Education Commission, market regulatory departments, sports departments, municipal

governments, propaganda unions, and other relevant departments actively issued policy documents conducive to the control of risk factors related to chronic NCDs.

In the "Implementation" dimension, the corresponding results were shown in Table 4. Increasing trends were seen in the number of trainees, on-site activities, health lectures, and so on since the launch of the CHLA actions in the eastern, central, and western regions. In the first phase of CHLA implementation, the eastern region made progress in all areas, while the western region lagged behind. In the second phase, progress was made in all regions.

In the "Maintenance" dimension, central and local governments took many measures to ensure the sustainability of the CHLA actions. For example, Shandong Province brought salt reduction interventions under the provincial basic public health service projects and grassroot medical and health service institutions carried out salt reduction interventions and follow-up for residents in areas under their jurisdiction. In addition, since the launch of the CHLA, many technical programs have been released, such as the Overall Program of Action on Healthy Lifestyles for All (2007–2015), the Implementation Program for Healthy Lifestyle Instructors, the Action Program on Healthy Lifestyles for All (2014–2025), and so on. These actions have also been incorporated into policy documents such as the Performance

TABLE 3. Meta-analysis of the behavior changes in the CHLA action group and the control group.

Item	Region	Quantity of study	RR (95% CI)
Conscious control of salt intake	Eastern region	12	1.43 (1.22, 1.68)
	Central region	2	1.83 (0.85, 3.94)
	Western region	5	1.17 (1.13, 1.23)
	Total	19	1.39 (1.25, 1.54)
Conscious control of edible oil intake	Eastern region	12	1.59 (1.30, 1.94)
	Central region	2	1.89 (0.86, 4.13)
	Western region	5	1.24 (1.13, 1.36)
	Total	19	1.50 (1.32, 1.70)
Conscious control of body weight	Eastern region	11	1.51 (1.23, 1.86)
	Central region	2	1.36 (0.57, 3.23)
	Western region	5	1.23 (1.16, 1.30)
	Total	18	1.40 (1.23, 1.59)
Daily intake of fresh fruits	Eastern region	3	1.27 (0.89, 1.81)
	Central region	1	1.52 (1.43, 1.61)
	Western region	5	1.36 (1.08, 1.70)
	Total	9	1.35 (1.16, 1.57)
Daily intake of fresh vegetables	Eastern region	3	1.16 (1.06, 1.27)
	Central region	1	1.59 (1.52, 1.67)
	Western region	5	1.34 (1.15, 1.57)
	Total	9	1.31 (1.16, 1.49)

Abbreviations: CHLA=China Healthy Lifestyle for All; RR=relative risk; CI=confidence interval.

TABLE 4. CHLA Progress in the eastern, central, and western regions.

Item	Phase 1				Phase 2			
	Eastern region	Central region	Western region	Total	Eastern region	Central region	Western region	Total
Number of trainees	330,685	290,642	205,563	826,890	531,459	518,130	1,128,370	2,177,959
Number of on-site activities and health lectures	42,668	23,968	20,653	87,289	98,224	57,424	60,661	216,309
Frequency of media coverage	11,728	9,943	5,453	27,124	26,426	22,869	15,676	64,971
Supportive environment*	24,171	10,305	6,480	40,956	42,463	22,001	14,532	78,996
Smoke-free environment	17,690	7,942	6,544	32,176	21,420	12,643	11,047	45,110
Ten minutes of physical exercise at schools	1,063	843	383	2,289	1,388	1,058	621	3,067
Healthy lifestyle instructors	126,339	74,025	44,040	244,404	362,726	222,042	214,209	798,977

Abbreviation: CHLA=China Healthy Lifestyle for All.

\* There are nine main environments for health-oriented interventions: communities, public institutions, schools, canteens, restaurants (hotels), footpaths, cabins (gas stations), streets, and theme parks.

Evaluation Standard for Disease Prevention and Control (2012), the Outline of the “Healthy China 2030” Plan, and China’s Mid-and Long-term Plan for the Prevention and Treatment of Chronic Diseases (2017–2025) and so on.

## DISCUSSION

China’s top legislature approved the country’s 14th

Five-Year Plan, the blueprint for high-level development for the next five years, and pointed out the need to “fully implement the healthy China Action.” Therefore, we applied the RE-AIM model to evaluate the actions to provide scientific advice for the formulation of population-based risk reduction strategies for chronic NCDs for the 14th Five-Year Plan.

In this study, the launch rate of the CHLA showed

an upward trend in adoption at the county level. However, due to the vast differences in the level of economic growth among different regions, the development of CHLA was not balanced. Compared with the eastern and central regions, the start-up rate in the western region was the lowest. As for the progress on the actions themselves, the eastern region was generally in a leading position, while the western region was relatively slow. This suggests that the actions can be carried out by level management in the future (6). The Health Literacy Monitoring Report of Chinese Residents 2012-2020 showed that among the 3 aspects of health literacy levels, healthy lifestyle and behavioral literacy had the fastest average growth rate. Among the literacy levels of six types of health problems, NCDs prevention and control literacy had the fastest average growth rate. These metrics indicate the success of the CHLA. However, some of the CHLA's goals and indicators have not been satisfactory. For example, the rate of obesity among urban and rural residents of all ages in China has been rising, with more than half of the adult residents being either overweight or obese (7). It is worth noting that the rate of being overweight or obese among 6- to 17-year-old children and adolescents is 19% (7). These problems indicate that the development of a healthy lifestyle requires continuous efforts and attention to all stages of the life cycle (8). Overall, it is important for the government to formulate strategies and measures with sustainable plans for their ensured and continued implementation.

Since the CHLA was launched in 2007, only one effective evaluation had been carried out nationwide in 2012. There had also been some evaluations in some PLADs, but the evaluation methods and content design varied. Since the initiation of the CHLA action, no scientific, comprehensive, and systematic evaluation has been conducted on the application of health-supported environments nor on the settings and work of healthy lifestyle instructors. In order to ensure the sustainability and scientific nature of this strategy, it is recommended that an action evaluation index system is developed, standardized, and adopted for the evaluation of content and implementation of the CHLA actions as soon as possible for regular evaluations.

This study was subject to several limitations. First of all, this study used publicly available data. Therefore, no unreleased or non-published data was included. Second, CHLA is a population-based intervention for NCDs in China. Therefore, it is unable to be used to develop scientific recommendations and strategies for individual-based intervention.

In the future, with improved strategies and more

attention from the government, national healthy lifestyle actions can be effectively promoted, helping residents demonstrate the concept of “taking the first responsibilities for their own health.”

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## Commentary

## Recommendations and Future Direction for Population-Based Prevention and Control of Behavioral Risk Factors for NCDs

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Based on the major findings of our studies, we found that in the past two or three decades, China's noncommunicable diseases (NCDs) prevention and control policies experienced rapid development. The service mode of NCDs management was transformed, the service capabilities at primary medical facilities were comprehensively improved, and the health literacy and action capability of residents were improved. Remarkable achievements have been made in the prevention and control of NCDs, and a lot of experience has been accumulated. However, unhealthy lifestyles among Chinese residents are still common, and the control of NCDs and related behavioral risk factors faces great challenges. Therefore, in order to implement the Healthy China strategy, early prevention and strengthening of the health management of NCDs in high-risk groups are essential.

### EXPERIENCES AND ACHIEVEMENTS

China's NCD prevention and control policies developed steadily over the last 30 years, and the "Healthy China" strategy was elevated to become a national strategy. From 1990 to 2020, China's NCDs prevention and control policies experienced a rapid development. The number of policies issued at the highest levels such as the Communist Party of China (CPC) Central Committee, the State Council, and the National People's Congress gradually increased, accounting for one-third of the total number of policies on NCDs. The issuing department changed from single ministry or commission in the early stage to multiple ministries and commissions jointly issuing documents. Regarding the types of policies, most were environment-oriented, but supply-oriented and demand-oriented policies were also increasing.

The policy focus shifted from addressing NCDs to comprehensive prevention and control of their risk factors, creating a favorable policy environment for

NCDs prevention and control. In particular, in 2016, the CPC Central Committee and the State Council incorporated the implementation of a comprehensive NCD prevention and control strategy into the *Outline of the Plan for Healthy China 2030* (1–2). In the 15 special actions under the *Healthy China Action (2019–2030)* (3), 4 actions were targeted at NCDs prevention and treatment and another 6 actions such as reasonable diet, national fitness, and tobacco control were aimed at interventions on health-influencing factors for the prevention of NCDs. "Healthy China" was upgraded as a priority national strategy, NCDs prevention was placed at a more prominent position, and policies shifted from being "disease-centered" to "health-centered."

Fairness in health was promoted and holistic NCD prevention and control was achieved. The China Healthy Lifestyle for All (CHLA) and the National Basic Public Health Services Projects (NBPHSP) are two national strategies and actions covering all Chinese people (4–5). They are important measures to improve the health of residents and truly demonstrate that the Chinese government has taken concrete actions to fulfill its responsibilities in the field of public health so as to safeguard people's health in an all-round and life course way. With relatively small investments, the country protected the health and safety of about one-sixth of the world's population. Government investment was increasing year by year to ensure equality in funding standards. Central government funds were allocated in priority to poverty-stricken areas in the western and central regions to ensure fairness and accessibility of healthcare.

The service mode of NCD management was transformed. The pattern of waiting for the call for services at primary medical institutions was transformed. They became more active in providing services and promoted family doctor contract services. Relying on the team of general practitioners, they signed agreements with NCDs patients so as to provide them with continuous, personalized, and comprehensive services. Medical communities were set

up and a hierarchical diagnosis and treatment system was advanced, which resulted in the gradual formation of a treatment pattern characterized by initial diagnosis by primary medical facilities, hierarchical diagnosis and treatment, and two-way referral. For example, patients with minor illness seek medical service from community health facilities, those with major illness seek help from higher-level hospitals, and those in recovery can go back to the primary health facilities so that every household has a “family doctor” and everyone has access to basic medical services (6).

Information technology had been applied to help realize the whole-process management of NCD. IT opportunities and technology have developed rapidly in recent years and have also been fully used for NCDs prevention and control. For example, the mainstream media and new media (Weibo, WeChat official account, short videos, etc.) were used to carry out various forms of publicity and education on NCDs prevention and treatment. The Internet was integrated with the health industry to try out new modes of health management services for NCDs. Information technology was used to achieve whole-process NCDs management from information collection to evaluation of intervention effects, which made medical and health services convenient, efficient, and sustainable (7).

The health literacy and action capability of residents was much improved so that they could take the first responsibilities for their health. China made extensive efforts to publicize and advance the implementation of the CHLA and the NBPHSP, and developed and promoted applicable health technologies and support tools, which helped people to foster healthy behaviors and lifestyles. It built a health management model characterized by centering on the individual self, interpersonal mutual assistance, social support, and government guidance, which greatly enhanced people’s capabilities to maintain and promote their own health, and implanted the concept of “taking the first responsibilities for one’s own health” into people’s mind so that everyone can gradually become conscious and capable of protecting their own health (8–9).

## CHALLENGES

The implementation and development of integrated prevention and control strategies for NCDs are unbalanced and insufficient. Although the nationwide NCDs prevention and control work has achieved full coverage, there is still a big gap in the implementation of NCDs prevention and control strategies between the

east and the west, and between urban and rural areas. The allocation of medical resources is still quite uneven. The health literacy of urban and rural residents in China has been greatly improved, but there are still big differences between urban and rural areas and among regions (1).

Manpower at primary medical facilities is insufficient to fully meet the needs of NCD prevention and control. On the one hand, manpower at primary medical institutions is insufficient to meet the needs of the huge number of NCDs patients and high-risk groups for health services; on the other hand, although the capabilities of the primary-level staff have been greatly improved in recent years, they cannot meet the needs of NCDs prevention and control and people’s increasing demands regarding NCDs management, especially in terms of risk factor intervention and lifestyle management skills.

Early prevention is implemented among high-risk groups, which generates both demands and challenges. The implementation of a strategy targeting NCDs high-risk groups will help identify high-risk groups of NCDs in the early stage so that health management and enhanced lifestyle interventions can be carried out to reduce the risk level of NCDs occurrence in individuals, and prevent and delay such occurrences. It is the most cost-effective method. However, there is a clear shortage of policies in China that are aimed at service users, individuals, and improvement of institutional capacity building for the prevention and control of the behavioral risk factors of NCDs.

There is no systematic evaluation of the national strategies and actions for NCD prevention and control. There is still a lack of regular, scientific, and systematic evaluation of national strategies and actions for prevention and control of NCDs, such as the CHLA and the NBPHSP, and of strategies and actions for prevention and control of behavioral risk factors such as smoking and physical inactivity.

## RECOMMENDATIONS AND FUTURE DIRECTION

Implementing the Healthy China strategy will effectively promote the implementation of measures and strengthen evaluation. China’s prevention and control policies for behavioral risk factors of NCDs should be further strengthened and supplemented to serve the demand side (service users); the existing strategies and actions with strong pertinence, wide

coverage, direct function, and obvious effect shall be further advanced to ensure the realization of the goals of the “Healthy China” strategy. All the relevant departments and regions shall establish supervision and evaluation mechanisms, and include the implementation of plans as an important item subject to government supervision so as to drive the implementation and fulfillment of various plans, goals, and measures. The state should also regularly organize evaluations on the implementation progress and effects of the plans.

NCDs prevention and control actions targeting the different stages of the full-life cycle should be advanced. Outside of genetic factors, NCD risk factors show a gradual accumulation process. Highly targeted strategies, measures, technologies, methods, and humanistic and psychological care will be required throughout the life cycle, from the maternal nutrition and birth weight in early life, to the cultivation of healthy lifestyles in childhood and adolescence, the promotion of healthy behaviors in occupational groups, and to the all-round care for the elderly and patients with NCDs. China has elevated the life course health to the status of a national strategy. The country shall continue to actively explore and advance the establishment of a comprehensive health implementation system covering the full life cycle, which not only reflects the top-level design, but also ensures integrity and continuity.

The strategy of early prevention and health management should be implemented among NCDs high-risk population. China should implement early identification of high-risk groups of NCDs and carry out early intervention, further refine the intervention goals and paths for the behavioral risk factors of hypertension and diabetes at the primary level, and establish effective safeguard measures in terms of policy, financing mechanism, and work process. The high-risk groups are mostly the labor force population, so workplace-based intervention shall be carried out as a key strategy. It is recommended to apply the new intelligent management technology to actively test service models for the health management of high-risk groups of NCDs in the occupational population.

The allocation of resources and training personnel in rural areas should be strengthened, especially in central and western regions. China should increase the investment in rural health and step up the allocation of health resources to rural areas. Funds must be actually in place and allocated in priority to the primary level and remote areas. Because general practitioners are the

main force of the family doctor team for NCDs prevention and control at the primary level, and in view of the existing regional imbalances in the manpower and capabilities for NCDs prevention and control at the primary level, the country should strengthen the construction of professional teams and personnel training in this regard in the western region and the rural areas, and step-up incentive mechanisms for innovation talents.

Comprehensive intervention strategies for behavioral risk factors need to be carried out in key populations. The “best buys” refer to effective interventions with cost effectiveness analysis  $\leq$  I\$ 100 per disability-adjusted life years averted in low- and lower-middle income countries, which proposed by WHO are the most cost-effective intervention measures (10–11). In the future, China could focus on the two key groups of hypertensive and diabetic patients and NCDs high-risk population, and carry out pilot programs and research on comprehensive intervention strategies that reduce the use of tobacco, harmful use of alcohol, unhealthy diets, physical inactivity, and other behavioral risk factors.

Further discussions should be held on the obstacles causing some of the intervention strategies in national action plans to be hard to implement, in a bid to advance the full implementation of the best intervention strategies.

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## Recollection

## Evaluating Behavioral Risk Factor Interventions for Hypertensive and Diabetic Patient Management in the National Basic Public Health Service Programs from 2009

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### BACKGROUND

In recent decades, China has faced a double burden of infectious diseases and noncommunicable diseases (NCDs). The number of deaths due to NCDs accounts for 88.5% of total deaths in China in 2019. To address these public health issues and improve the accessibility and affordability of primary health care, a National Basic Public Health Service Program (NBPHSP) was introduced as part of China's healthcare reform initiated in 2009. Subsidized by national and local government budgets, NBPHSP is mainly implemented by community and township health service centers, as well as health stations in urban areas and village clinics in rural areas (1). Health management of patients with hypertension and diabetes is an integral and pivotal part of the NBPHSP. The National Health Commission successively promulgated the National Standards for Basic Public Health Services (2009, 2011, and 2017 editions) to guide the management of patients with hypertension and diabetes. As required, all primary health care institutions should provide services for detection, comprehensive treatment, and follow-up for the local hypertensive and diabetic residents above 35 years old (2). Lifestyle and behavior risk factor interventions are cost-effective to tackle NCDs and are fundamental components of hypertension and diabetes management in the NBPHSP. Yet, limited literature has evaluated its implementation in China. Therefore, this study used pragmatic approaches to recollect published data and evaluate the implementation of the behavioral risk factor intervention in NCD patients in this nationwide public health action.

### METHODS

We integrated the "Reach, Efficacy-Adoption, Implementation, Maintenance (RE-AIM)" framework

to develop the protocol (3). We tailed the maintenance dimension to the policy development process, as NBPHSP is a national-wide policy and funded by the government. We further extended 3 dimensions of cost, successful experiences and challenges, and made the evaluation to 8 final dimensions (Table 1).

Environment scanning was applied to search, identify, extract, and compile implementation data on hypertension and diabetes management in the NBPHSP from January 1, 2009, to November 31, 2021 (4). First, policy notes from the websites of the National Health Commission were reviewed. National medical reform reports, related national health service surveys, statistical bulletins, normative documents, work reports, and data compilation on the NBPHSP hypertension and diabetes management were collected. Subsequently, searches were made in SinoMed, CNKI, WanFang Database, and PubMed with "national basic public health services," "primary care centers," "hypertension management," "diabetes management," "lifestyle intervention," and "behavior risk factor intervention" as keywords. The data collection process was conducted under the study protocol by 2 researchers independently. A total of 128 policy notes, 15 normative documents/guidelines, 17 reports/statistical bulletins and 38 papers/dissertations were reviewed. We classified the above documents into 8 dimensions as predefined in Table 1. When multiple documents were available for a specific indicator, we used data with good representativeness (nationwide), most recently published and officially released by national government institutions. We use data mainly from 3 national reports and 11 papers/dissertations according to representativeness and relevance in this recollection study (Table 2).

### MAIN OUTCOMES

#### Policy Development

The guides for lifestyle interventions for

TABLE 1. Dimensions of RE-AIM framework for implementation of behavioral interventions for hypertension and diabetes management in NBPHSP.

Dimension	Definition	Indicators
Policy	Development of policies for NBPHSP hypertension and diabetes management	Policies, legislative and guideline
Adoption	Institutional and personnel participation	Composition of participating medical staff
Implementation	Content, depth and mode of intervention implementation	Modes of service Application of technical standards Application of information technology Guidance on lifestyle
Cost	Time investment and cost	Service time Cost estimation
Reach	Coverage of target population	Number of people with hypertension managed Number of people with diabetes managed
Efficacy	Intervention effect including work effect and health effect	Awareness rate Satisfaction rate Acceptance Blood pressure control rate Blood sugar control rate
Successful experience	Achievements and benefits	Achievements and benefits
Challenges	Major problem or obstacle	Major problem or obstacle

Abbreviations: RE-AIM=reach, efficacy-adoption, implementation, maintenance; NBPHSP=national basic public health service program.

hypertensive and diabetes patients in the National Standards for Basic Public Health Services were basic between 2009 and 2017 (2). Since 2017, the National Health Commission has recommended contract-based family doctor services and concentration on treatment-and-prevention integration in hypertension and diabetes management (5). National technical guidance on hypertension and diabetes prevention and management at primary medical facilities was developed (2017 and 2020 editions for hypertension, 2018 for diabetes) (5). Primary health workers were trained to strengthen their capacity for patient management. Interventions on risk behavior factors were scaled up, focusing on “salt reduction, weight loss, exercise, quitting smoking and drinking, and keeping a peaceful mind.” Chinese citizens’ privilege of receiving safe and effective services to prevent and control health-related risk factors and diseases is legally guaranteed by the Law of Promotion of Basic Medical and Health Care, promulgated in 2019.

### Adoption

Treatment of hypertension and diabetes in NBPHSP has achieved universal coverage in the Chinese primary care system. Village doctors and part of outpatient doctors were providers for hypertension and diabetes in the early stage of NBPHSP. The personnel assigned to the NBPHSP shifted to family doctor teams, mainly composed of general practitioners, specialist physicians, nurses, and public health physicians, with general practitioners taking the

lead role since 2017.

### Implementation

**SERVICE mode:** Outpatient visits were mostly applied for hypertension and diabetes management in the early stage, adopted by 93.8% of primary care centers in a sampled survey in 8 provincial-level administrative divisions (PLADs) in 2015 (6). Multidisciplinary and refined services have been gradually increased since the introduction of contracted family doctor team services in 2017. By the end of 2018, the nationwide coverage of contracted family doctor team services in 10 key groups (including patients with hypertension and diabetes) was 71.3% (7).

**FIELD application of technical guidelines:** The field application rate of national standards for NBPHSP was 87.5% in hypertension management and 91.7% in diabetes management in 8 selected PLADs in 2015 (6). Although versions of the guidelines for primary care centers were issued in 2017, data to evaluate their application are still pending.

**GUIDANCE:** Risk behavior factors assessment and guidance to change unhealthy diet, physical inactivity, smoking, and drinking are routine in follow-up visits. Patient self-management is promoted as an appropriate tool for behavior risk factors intervention by National Center for Chronic and Noncommunicable Disease Control and Prevention (NCNCD), China CDC, in 2010. It became one of the tasks for establishing national demonstration areas for comprehensive

TABLE 2. The included national reports and papers/dissertations.

Type/Title	Applied dimension
National reports	
Development Report on Health Reform in China (2020) (7)	Implementation
Statistical Bulletin on Medical and Health Development in China (2020) (11)	Reach
The Sixth National Health Services Survey Special Report Two (2021) (14)	
Papers/ Dissertations	
Progress in basic public health service projects (2017) (1)	Adoption
Assessments of chronic disease management of national basic public health service programs in primary health care institutions (2017) (6)	Implementation
On national demonstration areas: a cluster analysis (2017) (8)	
The role of the basic public health service program in the control of hypertension in China: results from a cross-sectional health service interview survey (2021) (9)	Cost
Research on the current situation of national essential public health services and manpower cost estimation in Jiangsu Province (2017) (10)	
Awareness rate and satisfaction of basic public health services among key population in Henan Province in 2016 (12)	Efficacy
Evaluation on programs regarding the community-based management of hypertension and type 2 diabetes mellitus patients in eight PLADs, China (2014) (13)	
Research on equalization mechanism of essential public health service from the perspective of citizen participation-results from chronic disease management (2020) (15)	
A study of the effect of basic public health services (2018) (16)	
Utilization and Management Effect of National Essential Public Health Services in Chinese Type 2 Diabetic Patients (2021) (17)	
Prevalence and control of hypertension in adults in China, 2018 (18)	

Abbreviation: PLAD=provincial-level administrative division.

prevention and control of NCDs, which covered 17.1% of all counties and districts in China by 2020 (8).

**APPLICATION of information technology:** Information systems are widely established in primary care centers to promote NBPHSP services. The vast majority have items to support hypertension and diabetes management related to the establishment and exchange of electronic health records, follow up on medication, dietary and physical activity, etc. A cross-sectional health service interview survey in 17 provincial-level administrative divisions (PLADs) in eastern, central, and western parts of China in 2014 showed a 30% higher effect on hypertension management in districts/counties with established information systems (9).

### Cost

**SERVICE time:** A survey in Jiangsu Province in 2017 found that time spent on “hypertension and diabetes management” accounted for over 37% of the total NBPHSP package, making it the most time-consuming item. On average, medical staff in primary health facilities spent 130 minutes treating one case of hypertension or diabetes management per year, in which 22 minutes were spent on risk behavior factors intervention (10).

**COST estimate:** According to staff expenditures and number of personnel for NBPHSP, the average annual cost of “hypertension and diabetes management” provided by primary medical staff in Jiangsu was 150 CNY/case in 2017 (10).

### Reach

The total number of people with hypertension and diabetes under NBPHSP management showed steady increases in China. By the end of 2020, 109.12 million hypertensive patients and 35.73 million patients with type 2 diabetes were covered by standardized management in China (11).

### Efficacy

**AWARENESS and satisfaction rate:** Residents’ awareness and satisfaction rates with the NBPHSP was an important indicator for the NBPHSP performance evaluation. A provincial-wide sample survey in 2016 indicated the awareness rate of lifestyle intervention among urban and rural diabetic patients under NBPHSP management was 86.29% and 85.58%, respectively, which was lower than other services (regular blood sugar measurement and physical examination) (12). Sample surveys conducted in various locations across China showed that

hypertensive and diabetic patients were generally satisfied with NBPHSP services, and the range of satisfaction rates was around 83%–95.87% (12–13).

**LIFESTYLE management received and acceptance:** The Sixth National Health Service Statistical Survey (2018) indicated 91.5% of self-reported hypertensive patients and 86.2% of self-reported diabetic patients had been followed up by primary healthcare centers or facilities. At their most recent follow-up, 89.9% and 92.9% of self-reported hypertensive and diabetic patients, respectively, had received lifestyle guidance, which was the lowest among all service items (Table 3) (14).

However, the acceptance of the lifestyle intervention was not optimistic. The results of the China Health and Retirement Longitudinal Study (CHARLS) (2011–2015) showed an acceptance rate of 70%–83% for smoking cessation, a rate of 66%–70% for alcohol quitting, and a rate of 28%–39% for body weight control in hypertensive and diabetic patients aged above 45 years old (15).

**CONTROL rate:** A systematic review found that reported blood pressure control rate was 50%–65% in hypertensive patients and blood glucose control rate was 50%–70% in diabetic patients from studies published between January 1, 2009, and May 3, 2016. Better control of blood pressure and blood glucose was observed after NBPHSP management compared with the baseline at recruitment (16).

**CONTRIBUTION of NBPHSP services for hypertension and diabetes control in China:** NBPHSP data from pilot areas of primary health care reform in 17 PLADs in China in 2014 indicated a significantly better control rate for hypertension in patients  $\geq 35$  years under NBPHSP management compared to those not under management (control rate: 76.9% vs. 68.2%) (9). An evaluation study conducted in 5

PLADs showed a positive association between NBPHSP and diabetes control in China during the 10-year implementation (2009–2019) (17). Blood glucose control was improved by utilizing pre-determined diabetes management services, including personal health record review, traditional medication treatment, follow-up, and blood glucose tests, while guidance on lifestyle risk factors was not included.

Data from national behavior risk factor surveillance in 2018 showed that the awareness, treatment, and treatment control rates of hypertensive patients above 18 years old in China were 41.0%, 34.9%, and 31.5%, respectively, lower than those reported from the NBPHSP. However, compared with the National Nutrition Survey in 2002, these rates showed a significant upward trend in 2013 and 2018 in China (Table 4). The monitoring results of these nationally representative large populations may indirectly reflect the effects of the NBPHSP hypertension and diabetes management initiated in 2009 (18).

## Successful Experience

According to the NBPHSP, up to over 100 (109.12 million) million hypertensive patients and 30 million (35.73 million) type 2 diabetics were under daily management by primary medical and health care centers in the past 10 years. Based on the estimation of 270 million hypertensive patients and 120 million diabetics in China, the NBPHSP policy has reached around one-third of hypertensive and diabetic patients nationwide. Large numbers of NCDs patients in China were diagnosed early, followed up with, and medicated and treated. Universal health benefits and fairness were demonstrated through the policy guarantee, showing that the Chinese government has taken concrete actions to fulfill its public health responsibilities. The government paid attention to this initiative and

TABLE 3. Lifestyle management during follow-up in self-reported hypertensive and diabetic patients  $\geq 15$  years.

Indicator (%)	Self-reported hypertensive			Self-reported diabetic		
	Total	Urban	Rural	Total	Urban	Rural
Followed-up $\geq 4$ times/year	55.3	45.9	67.0	51.4	44.4	65.0
Followed by primary care centers	91.5	88.3	94.7	86.2	84.2	89.4
Guidance received in the follow-up						
Measurement*	97.2	95.3	99.1	93.7	91.2	97.4
Medication	92.8	92.6	93.0	94.2	94.1	94.4
Consult on disease	91.0	90.6	91.3	92.7	92.4	93.3
Lifestyle guide	89.9	88.7	91.0	92.9	91.5	94.9

\* refer to blood pressure measurement or fasting glucose measurement.  
Data source: the Sixth National Health Service Statistical Survey (2018).

TABLE 4. Awareness rate, treatment rate and control rate of hypertension among people over 18 years old in China from 2002 to 2018.

Indicator (%)	2002	2013	2018
Awareness rate of hypertension	30.2	40.9	41.0
Treatment rate of hypertension	24.7	32.5	34.9
Hypertension treatment control rate	25.0	29.8	31.5

Notes: Awareness rate of hypertension: The proportion of respondents diagnosed with hypertension who has noted being hypertensive before measuring their blood pressure in this survey. Treatment rate of hypertension: The proportion of respondents diagnosed with hypertension who have taken antihypertensive drugs in the last two weeks. Hypertension treatment control rate: The proportion of hypertensive patients with blood pressure below 140/90 mmHg who have taken antihypertensive medication in the last two weeks.

increased investment year by year. The budget subsidy of NBPHSP gradually increased from 15 yuan per capita in 2009 to 79 yuan in 2021.

## Challenges

Actions are being taken to promote an integrated strategy for the prevention and treatment of hypertension and diabetes management of NBPHSP. Gaps still exist between guidance on modifiable risk factors and field implementation in the primary health care settings. Due to the lack of targeted, quantifiable, and operational technical specifications and appropriate technical tools, risk behavior factor interventions have not been sufficiently implemented, and their basic therapeutic role in NCDs management has not been fully exerted. Furthermore, patients' acceptance of risk factor interventions remains difficult. Particularly in recent years in China, personalized health demands are rising, and demands for the service capacity of family doctor teams are increasing. Continuous capacity building for the family doctor teams with medical and preventive integration is needed.

## Strengths and Limitation

This study evaluates the implementation of the milestone public health action of NBPHSP by robust evaluation framework and has some preliminary findings. However, due to insufficient data on NBPHSP, particularly on the implementation of risk behavior factor intervention in hypertensive and diabetic patients' management, the content of this study was relatively limited. Parts of the evaluation were based on regional and small-scale studies. The findings and suggestions of the study need to be updated and improved by further studies.

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