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Literature research of the Nutrition Improvement Programme for Rural Compulsory Education Students in China

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Abstract

Objective: To describe the Nutrition Improvement Programme for Rural Compulsory Education Students (NIPRCES) in China and to share the experiences of developing and implementing nationwide school meal programmes with other countries.
Design: The article is based on a literature review of technical documents and reports of NIPRCES and relevant national legislation, technical reports and studies on school nutrition, minutes of meetings and national conferences, and official documents of the National Office of Student Nutrition and the Chinese Center for Disease Control and Prevention.
Setting: People's Republic of China.
Subjects: Published papers, national policies, legislation and unpublished official documents.
Results: A total of 23 million rural compulsory education students were covered by NIPRCES. In the development and implementation process of NIPRCES, fifteen ministries and national committees were involved and an efficient collaborative mechanism was established. All NIPRCES-covered schools were required to serve meals on a daily basis. By the end of June 2012, the proportions of students choosing 'school feeding', 'food package' and 'family feeding' modes were respectively 64·0 %, 32·0 % and 4·0 %. The central government subsidized school meals annually by more than $US 2·5 billion and invested $US 4·8 billion on school kitchens to support this programme.
Conclusions: The NIPRCES is a significant movement of governmental nutritional intervention in China. Food safety, financial security, decentralization and other potential concerns should be considered and lessons can be learned from other countries. Further relevant research and a nationwide monitoring and evaluation programme are needed.

Keywords
School meal
School nutrition
Development
Implementation

Poverty and purchasing power are generally recognized as central to the malnutrition problem[1]. Since the 1980s, with the Open Up policy, living conditions and annual incomes have improved dramatically in both urban and rural households in China. According to the 2012 Statistic Bulletin of the National Economic and Social Development of the People's Republic of China, the per capita net income for rural households was 7917 CNY† (≈$US 1257) in 2012[2]. The Engel coefficient, referring to the proportion of expenditures on food relative to the total consumption expenditures of households, decreased from 45·5 % for rural households in 2005 to 39·3 % in 2012[3]. Lower Engel coefficients and development of social economic status were direct factors contributing to child growth[4]. The results of the 2002 China National Nutrition and Health Survey showed the tendency for increased intakes of energy, protein, fat, carbohydrate and micronutrients that correlated with the increasing incomes in both urban and rural households[5].

Despite the notable improvement, the prospect of nutritional status of students living in rural China remains grim when compared with their urban counterparts. In 2005, the height, weight and chest circumference differences between 14-year-old rural and urban boys were 4·3 cm, 5·8 kg and 1·8 cm, respectively. Moreover, in the same age group of 14-year-old students, rural boys and girls had a higher rate of low Hb levels than their

† The monetary unit for Chinese currency in the present article is 'CNY' (Chinese Yuan); the exchange rate was 6·3 CNY = $US 1 in 2012.

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respective urban counterparts (25·7 % *v.* 17·6 % for boys and 13·5 % *v.* 12·1 % for girls)[6]. In addition to the poor nutritional status of rural students, shortage of dining facilities and lack of nutrition education are common in rural schools of China. An investigation conducted in 122 poor rural primary schools in north-west China indicated that only 8·2 % of the investigated schools had cafeterias, between 50 % and 70 % of students had two meals per day throughout the whole year (the percentages differed by season), and the principals, teachers and parents generally lacked nutrition and health knowledge[7].

Malnutrition during childhood has long-term implications for individuals and the population as a whole. A systematic review noted that childhood malnutrition was a risk factor for mental illness, adulthood high blood glucose concentrations, high blood pressure and harmful lipid profiles; and it was strongly associated with shorter adult height, less schooling, reduced economic productivity and lower human capital[8]. That article concluded that childhood malnutrition leads to permanent impairment and might also affect future generations. In the past 20 years, Chinese researchers have noted the implications of childhood malnutrition and suggested that childhood malnutrition improvement policies be developed on a national basis. More practical comprehensive intervention actions should be implemented in schools, especially in rural schools, such as providing students with well-designed school meals, promoting health education and building more school cafeterias[9,10].

Meanwhile, the Chinese government has been aware of the necessity and urgency of modelling an integrated nutrition improvement policy approach for children, with the targeted populations being rural compulsory education students, who are mainly 6 to 15 years old at grades 1 to 9. In 2001, the central government launched the Two Exemptions and One Subsidy and it has been continuously implemented for 12 years. The Two Exemptions refers to the exemptions of textbooks and miscellaneous charges for rural compulsory education students. The One Subsidy refers to the daily food allowance for rural poverty boarding students[11]. A quarter of all rural compulsory boarding students, totalling 6·79 million, were covered by this policy in 2006[12]. The new food allowance standard of the Two Exemptions and One Subsidy increased to 1000 CHY (≈$US 158·7) per school year per primary-school student (4 CHY per day × 250 schooling days) and 1250 CHY (≈$US 198·4) per school year per secondary-school student (5 CHY per day × 250 schooling days) beginning in the autumn semester of 2011[13].

On 23 November 2011, the Nutrition Improvement Programme for Rural Compulsory Education Students (NIPRCES) was launched by the General Office of the State Council. The aim of the NIPRCES was to improve the nutritional status of rural students and to decrease the gap between urban and rural populations. According to the new policy, every NIPRCES-covered student is subsidized by 600 CHY (≈$US 95·2) per annum (3 CHY per day × 200 schooling days) for school meals from the autumn semester of 2011[14]. NIPRCES was reckoned as the milestone and commencement of the new nutrition policy in China. Although NIPRCES has been established for more than one year in China, published information is very limited. Our work was based on a literature review of NIPRCES in China and the school meal programmes in other countries. The present article first introduces the development and implementation details of NIPRCES and then discusses the potential problems that need to be addressed in the next stage of implementation in rural China and the implications of our research for further research, practice and society.

Methodology

The search strategy was designed to be inclusive and focused on three key elements: school meal, school nutrition improvement and NIPRCES. The retrieval of academically published relevant research or studies was based on the major Chinese and English electronic databases: Chinese National Knowledge Infrastructure (CNKI), Chinese Science Citation Database (CSCD), CBMdisc and PubMed, published before 20 June 2013. The retrieval of published relevant news reports and national legislations was based on the Chinese online search engine Baidu or the homepage websites of the issuing ministries. To identify the relevant studies, the reviewers reviewed all titles, abstracts and full texts generated from the searches. A total of 141 published English and Chinese papers or articles and eighteen legislations or acts were identified from 1082 search results. Thirty-three of them were cited in our article.

However, NIPRCES is a recently launched policy and there were limited publications on this specific topic. The data source of our article was based mainly on a review of unpublished official documents provided by the National Office of Student Nutrition and the Chinese Center for Disease Control and Prevention from 2011 to 2013, such as technical documents, government agencies' reports or briefings, and the minutes of internal meetings or national conferences. The specific key word 'NIPRCES' was focused upon during searching relevant unpublished official documents. A total of two technical documents, eight reports or briefings, and five minutes were identified by the reviewers.

The data regarding coverage of NIPRCES as presented in Table 2 were collected from one unpublished briefing provided by the Office of National Leading Group for NIPRCES in October 2012. Since NIPRCES is a policy targeting specific areas and populations in China, the coverage rates were calculated by using the eligible objects instead of the whole population. The calculation of coverage rates of counties, schools or students was done using the formula: NIPRCES coverage rate (%) = [number of NIPRCES-covered

counties (or schools or students)/number of eligible counties (or schools or students)] × 100 %.

Results

Ministries and their roles in NIPRCES

The first legislation the Notion of the General Office of the State Council on NIPRCES Implementation was issued on 23 November 2011, and it initially stated the roles of government agencies involved[14]. An efficient collaborative mechanism was established to ensure the smooth implementation of the programme. To provide unified guidance and administration, the National Leading Group for NIPRCES had been set up before the programme was launched, and fifteen ministries and national committees were united as members of this administrative group. The Office of National Leading Group for NIPRCES, known as the National Office of Student Nutrition (NOSN), is located in the Ministry of Education and it is responsible for running routine assignments during implementation. On 23 May 2012, the fifteen members of the National Leading Group for NIPRCES collaboratively launched the Detailed Plan for the Implementation of NIPRCES, which listed names of ministries and national committees involved in NIPRCES and described their particular roles in detail for the first time[15]. Table 1 summarizes the roles and responsibilities of each ministry within this collaborative mechanism.

In China, each administrative ministry or national-level government agency has its vertical management system nationwide. As an example, Fig. 1 illustrates the network of the public health system in China and its role in NIPRCES.

Subsidy policy and financial support of NIPRCES

In 2012, the national education cost was approximately 2·2 trillion CNY (≈$US 349·1 billion) and it accounted for 4 % of the national gross domestic product[16], which included 16 billion CNY (≈$US 2·5 billion) of school meal funding that the Chinese central government annually subsidized for NIPRCES from the national budget. Each NIPRCES-covered student was subsidized by 600 CNY (≈$US 95·2) per annum and that doubles the average cost of school feeding programmes in low-income countries[17]. In rural China, the subsidy of 3 CNY (≈$US 0·5) per day covered one meal

Table 1 Roles and responsibilities of ministries within the Nutrition Improvement Programme for Rural Compulsory Education Students (NIPRCES) collaborative mechanism

Ministry	Roles and responsibilities
(1) Ministry of Education	Policy maker and leading party in NIPRCES: **1.** To legislate the regulations and acts **2.** To lead the organization and implementation **3.** To cooperate with other departments on programme planning and improvement
(2) Ministry of Finance, and (3) National Audit Office	Funding provider and manager: **1.** To provide funding **2.** To inspect and manage the budget utilization
(4) Ministry of Health*	Technical supporter, dietary guideline provider, nutrition and health monitor: **1.** To conduct nutrition surveillance **2.** To provide dietary guideline and technical supports **3.** To organize and conduct nutrition education and staff training
(5) Propaganda Department of the Central Committee of the Communist Party of China	Mobilization and media supervision: **1.** To organize the community mobilization **2.** To report the overall progress objectively **3.** To create friendly public opinion and atmosphere
(6) Ministry of Supervision	Programme inspection and supervision: **1.** To inspect and supervise the government's performance during implementation **2.** To investigate, discipline and punish the activities violating the law
(7) Ministry of Agriculture	Technical support on food products: **1.** To provide the technical support and quality control on food/agricultural products production
(8) State Administration for Industry and Commerce	Administrative management of catering companies: **1.** To be responsible for the registration and administrative management of all catering companies **2.** To inspect and manage the food circulation process
(9) State Food and Drug Administration, and (10) General Administration of Quality Supervision, Inspection and Quarantine, and (11) Office of Food Safety Committee of the State Council	Food security inspection and supervision: **1.** To inspect and manage the food service process **2.** To deal with food safety events or emergencies

Note: Other involved ministries and national committees were the (12) National Development and Reform Commission, (13) National Supply and Marketing Cooperative General Agency, (14) Central Committee of the Communist Youth League, and (15) China Women's Federation. Their overall responsibility is to provide full administrative support, and human and financial resources for this collaborative programme.
*The Ministry of Health was renamed as the National Health and Family Planning Commission of the People's Republic of China in March 2013.

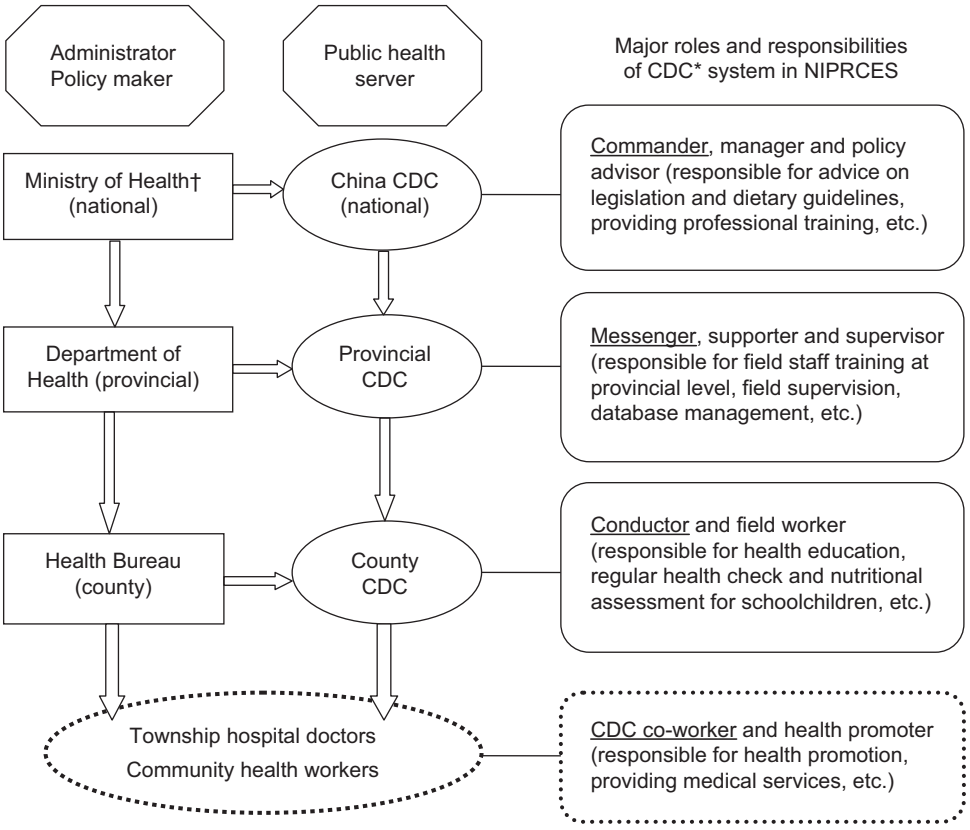


Fig. 1 Network of the public health system in China and individual members' roles in the Nutrition Improvement Programme for Rural Compulsory Education Students (NIPRCES). *CDC, Center for Disease Control and Prevention; †The Ministry of Health was renamed as the National Health and Family Planning Commission of the People's Republic of China in March 2013

in school. For the boarding students in rural areas, who were simultaneously covered by the Two Exemptions and One Subsidy and NIPRCES, the total amount of daily food subsidy was 7 CNY (≈$US 1·1) for primary-school students or 8 CNY (≈$US 1·3) for secondary-school students, and it could cover three meals per day in rural schools and meet the basic dietary requirement for schoolchildren.

As the shortage of school kitchens hampers the implementation of NIPRCES, on 23 May 2012, the National Leading Group for NIPRCES launched a series of five auxiliary regulations to legislatively guide the construction or refurbishment of school kitchens and dining facilities. To support the implementation of school kitchen policies, the Chinese central government has invested a total of 30 billion CNY (≈$US 4·8 billion) as special funds for school kitchen construction in rural areas. The funds were distributed annually and paid centrally by the national treasury to the provincial revenues from 2011 to 2013. Provincial- and county-level governments were accountable for raising more funds locally to cover the shortage. All rural schools involved in the NIPRCES were required to equip qualified kitchens by the end of 2013.

Other supporting policies of NIPRCES

Most of the NIPRCES-covered provinces were located in poor, remote and multi-ethnic areas, with underdeveloped social economy and management ability. The public concerns focused on food safety and financial security during implementation. Therefore, a series of documents was developed and released by the NOSN, including the Detailed Plan for the Implementation of NIPRCES, the Interim Procedures for Food Safety Management of NIPRCES, the Interim Procedures for Special Funds Management of NIPRCES, and the Tentative Manual for Nutrition and Health Monitoring and Evaluation of NIPRCES.

Coverage of NIPRCES

The Notion of the General Office of the State Council on NIPRCES Implementation stated: 'the NIPRCES intervention should start from pilot counties and then be expanded to a wider range nationwide. The pilot counties are selected from the middle or western destitute areas in mainland China. The destitute areas are defined by the National Program of Poverty Alleviation in Rural China Year 2011–2020 and other relative official documents'[14]. Eventually, twenty-two different provinces and a range of three to eighty-five pilot counties from each province were determined by the State Council. All rural compulsory education students living in pilot counties were eligible to be subsidized by NIPRCES. In total, NIPRCES covers more than 23 million rural compulsory education students from 699 pilot counties nationwide. Numbers of counties, schools and

Table 2 Distribution of Nutrition Improvement Programme for Rural Compulsory Education Students (NIPRCES) coverage in provinces

	Name of Province	Number of covered counties	Number of covered schools	Number of covered students (in thousands)
1.	Yunnan	85	13 527	3530·1
2.	Tibet	74	1291	240·2
3.	Guizhou	65	12 824	3443·1
4.	Sichuan	60	7030	1541·1
5.	Gansu	58	10 442	2316·0
6.	Shaanxi	43	4204	894·0
7.	Xinjiang	43	2139	835·5
8.	Qinghai	40	1641	370·4
9.	Hunan	37	6841	1512·1
10.	Guangxi	29	5866	858·4
11.	Henan	26	9480	2526·0
12.	Hubei	26	3336	860·2
13.	Hebei	22	2131	503·4
14.	Shanxi	21	1948	320·3
15.	Jiangxi	17	3783	928·5
16.	Chongqing	12	2592	745·5
17.	Anhui	12	4371	988·3
18.	Heilongjiang	11	903	169·0
19.	Inner Mongolia	8	182	50·9
20.	Ningxia	7	1378	210·8
21.	Jilin	3	256	43·6
	Total	699	96 165	22 887·4

students covered by NIPRCES in different provinces are listed in Table 2. According to the data obtained from the NOSN, by the end of October 2012, 100 % of listed pilot counties and approximately 100 % of listed eligible students were covered by NIPRCES.

In addition to the national school meal programme NIPRCES, there were fifteen provinces promoting local school meal programmes in 485 non-pilot counties. A total of 239 million CNY (≈$US 37·9 million) school meal subsidies were distributed to 8·5 million rural students in 2012.

According to the 2011 National Statistic Bulletin of the Educational Development, the population of rural and urban compulsory education students was approximately 150 million nationwide and 22 % (≈32·8 million) of them were boarding students[18]. The NIPRCES and local school meal programmes covered over 31 million rural compulsory education students in total at the initial stage.

The catering modes in NIPRCES

The Detailed Plan for the Implementation of NIPRCES requires that school meals should be served on a daily basis choosing one of three recommended catering modes: (i) school feeding; (ii) food package; and (iii) family feeding. The school feeding mode is used for schools equipped with qualified chefs and high-standard kitchen and dining facilities. School meals, most commonly the lunch, are served at school cafeterias. The food package mode is used for schools without qualified chefs or kitchens. The package is supplied by qualified food companies. The package is similar to a lunch box, but there are two major differences between a food package used for NIPRCES and a lunch box used in other countries. First, food packages are most commonly served between meals. Second, milk, egg, sausage or other processed foods and fruits are commonly served in packages but the portion size and variety rarely meet the requirement of a lunch served for schoolchildren. The family feeding mode is also used for schools without qualified chefs or kitchens. Where the school is located in a remote rural area without convenient transportation or the number of students is very small, and consequently the delivery cost of food packages is high and exceeds the budget, the local family with qualified chef and kitchen is permitted to provide meals for students in that case. Table 3 compares the advantages and disadvantages of each mode. Different catering modes are applied to the practical conditions of each school, and the schools or local governments will make the proper decision. The Detailed Plan for the Implementation of NIPRCES suggests the food package and family feeding should be gradually replaced by school feeding when the school meets all requirements[15].

According to the data provided by the NOSN, by the end of June 2012, 53·0 % of NIPRCES-covered schools, while 64·0 % of NIPRCES-covered students used the school feeding; 35·0 % of schools and 32·0 % of students used the food package; and 12·0 % of schools and 4·0 % of students used family feeding. The major reason for not choosing the school feeding mode was the shortage of qualified chefs or dining facilities.

Discussion

Positive roles of school meal programmes

Generally speaking, school meal programmes play positive roles in the nutritional adequacy of children's diets[19] as well as in society. The dietary intakes of school meal programme participants and non-participants differ significantly

Table 3 Comparison of the three catering modes in Nutrition Improvement Programme for Rural Compulsory Education Students (NIPRCES)-covered schools

	School feeding	Food package	Family feeding
Where are the meals produced?	School kitchen	Food company	Local family nearby
What foods are served?	Local traditional dishes and staple foods	Standardized food packages	Local traditional dishes and staple foods
When are the meals served?	Breakfast/lunch/dinner	Recess snack or lunch	Lunch
Are the qualified dining facilities and chefs required in the school?	Yes	No	No
Can the school inspect and manage the food production?	Yes	No	No
Are the meals profitable?	No	Yes	Yes

in terms of both the kinds of foods eaten and underlying characteristics[20,21]. Cognitive function or academic achievement is also improved in undernourished children when they receive school meals[22,23]. Moreover, the positive social impact of school meal programmes has been observed in terms of awareness and interest in diet among students, teachers and guardians, the proportion of children skipping breakfast has decreased, and quality of life has been improved[24]. At a special period of rapid economic growth with the existence of relatively high childhood malnutrition rate in rural areas, to promote NIPRCES and to give priority to the most remote and poor areas were wise and strategic decisions made by the Chinese government.

Implication of major results and further studies

In our research, we found that the Chinese central government annually subsidizes more than $US 2·5 billion for NIPRCES from the national budget and a total of 23 million rural students benefit from this national school meal programme. Regardless of the amount of subsidy or the number of schoolchildren, it is unprecedented in Chinese history. Our research reviewed substantive first-hand data and explained the development and implementation process of NHIPRCES in detail to the world. The experience can be shared and exchanged with other countries, especially those countries under similar circumstances as China. However, NIPRCES is still at the preliminary and trial stage, the short-term or long-term nutritional outcomes of NIPRCES are yet unknown and the social or economic impacts are also unidentified. Therefore, further studies are urgently needed to evaluate the nutrition and economic benefits.

The coverage and sustainability of school meal programmes are directly affected by the income level of a country. The World Food Programme's report, *State of School Feeding Worldwide 2013*, revealed that the income level of a country is associated with the scale and extent that school meal programmes can be consolidated into national policy frameworks[25]. It is indicated that countries with higher income level tend to establish more consolidated regulatory frameworks and have stronger institutionalization. On the contrary, school meal programmes in poorer countries rely more on aid from non-governmental organizations and other sectors. The annual per capita incomes of rural and urban households in China were respectively $US 1257 and $US 3900 in 2012[26]. Following the World Bank definition of income groups, the per capita income of China was between $US 1036 and $US 4085 and so China is classified as a lower middle income country[27]. It is rarely seen that a lower middle income country consolidates a long-term school meal programme into the regulatory framework and the government invests more than $US 2·5 billion annually and an additional $US 4·8 billion in special school kitchen funds to implement a school meal programme covering 23 million rural students. Strong determination and effective governance are essential at the initial stage of development and implementation.

Another characteristic of NIPRCES is the collaborative working mechanism. In other countries, the Ministry of Education or the Department of Agriculture is the most common major government agency responsible for the governmental school meal programmes[28,29]. However, we found that fifteen ministries and national committees engaged in NIPRCES, and the high coverage rate and high efficiency in our national nutrition intervention programme were closely associated with this collaborative working mechanism. Under the structure of the united National Leading Group for NIPRCES, each ministry or committee has its clear role and responsibilities as a team member (described in Table 1) and there is a legislated commitment to ensure their active involvement[15]. In the next stage, process evaluation is strongly suggested to assess the performance of each member and to observe the efficiency of this collaborative working mechanism.

Our research results showed that school feeding is the dominant catering mode (53·0 %) in NIPRCES-covered schools. Whichever catering mode the school chooses, the ideal mode for students is the one that provides an adequate and balanced diet by serving them safe and diverse foods. Compared with the food package or family feeding, the school feeding mode shows more advantages in terms of food diversity and safety (see Table 3) but it requires standardized school kitchens, qualified chefs and more funding. To offer a substantial foundation for the universal application of the school feeding mode, the central

government invested $US 4·8 billion in school kitchen funds. Nevertheless, strong evidence of a comparative study is still needed to prove the hypothesis of the superiority of the school feeding mode.

Potential concerns and suggestions

During the implementation of NIPRCES, there are certain public concerns that should be noticed. On one hand, the increasing problems in food preparation and safety control bring great concerns to parents and the public, especially when the public media recently revealed several food security cases in rural schools[30–32]. The experience from the Brazilian school feeding programme indicates that strong government leadership, intersectoral decision-making processes and political pressure by civil society organizations were key factors in the food security process[28]. On the other hand, large amounts of funds are invested annually via the revenue system, such as the school meal subsidies and school kitchen funds. Financial security and the prevention of corruption is another public concern.

Decision makers should also notice other potential challenges and rethink them, for example: the shortage of chefs and cafeteria staff in the short-term future; and the geographic, climate, ethnic, culture, religious and social economic disparities among schools when developing a nationwide nutrition intervention programme. An American study indicated that conclusions drawn at the national level might be unsuitable for policy making and intervention at state and local levels, due to the geographically specific disparity[33]. Decision makers need to take more factors into account to balance the equality and feasibility.

Conclusions

The national school meal programme of NIPRCES is a significant governmental nutritional intervention in China. The Chinese government has committed to continuously invest enormous human and financial resources to implement this programme. Food safety, financial security, decentralization and other potential concerns should be considered and rethought by our policy makers. There is not an existing successful operational model of school meals in China to borrow from, but we should learn from other countries and develop our own mechanism. Further research on the process evaluation, monitoring and assessment of nutritional outcomes, cost-effective analysis and other more studies of NIPRCES are urgently needed in the future.

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