

Research on the Current Situation of the Allocation of Public Health Human Resources in China

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Abstract

In order to understand the changes in the allocation of public health talents in China in the past 16 years, including the current situation and problems in terms of quantity, institutions and sub-disciplines, inter-regions, and personnel structure, provide suggestions for optimizing the allocation. This paper uses the 2003-2019 Health Statistics Yearbook to describe and analyze the composition of sub-disciplinary practicing (assistant) physicians, the composition of medical and health institutions, and the personnel of professional public health institutions. The results found that the proportion of talents in professional public health institutions is small and declining year by year, and the gap with the number of clinical talents has been widening. The proportion of talents in disease control and health supervision institutions has declined, and the proportion of talents in maternal and child health hospitals has increased sharply, exceeding 50%; The personnel of the Health Education Institute have long been in a position. In terms of regional distribution, the number of public health physicians per thousand population is the best in the east, followed by the west, and the lowest in the middle. The gap between the east and the central and western regions is large. The proportion of talents with more than 30 years of work experience in the CDC is large, and the proportion of highly educated talents is small, and high-end talents are lost. It is recommended to increase the staff of relevant departments for the prevention and control of infectious diseases, coordinate the health technical personnel between health institutions and regions, strengthen the training of public health personnel, and strengthen the quality of public health personnel.

Keywords

Public health, talent, resource allocation, emergency management.

1. Introduction

As early as in ancient times, sages put forward that "the saint does not cure the disease, cures the disease, cures the disorder, and cures the disorder." Public health is the science and art of organizing the community to work together to prevent diseases and prolong life. [1] In the past 70 years, China's public health undertakings have made great progress [2], but the healthy China strategy and the transition from "treatment" to "health" [3] have given my country a new mission of public health. At the same time, with the development of social economy, the large population flow, serious aging, frequent food and drug safety incidents, and rapid increase in the prevalence of chronic diseases, have brought severe challenges to public health prevention and control. [4]

Human resources are the most important basic resources in medical and health resources, and they play an irreplaceable role in preventing and controlling major public health emergencies. At present, China still has a shortcoming of insufficient public health emergency personnel reserves in the prevention and control of major epidemics and emergency response. Since the

reconstruction of the public health system after SARS in 2003, China has not paid enough attention to the construction of public health disciplines[5], the number of public health doctors has been insufficient for a long time[6], the reserve of public health professionals and technical personnel is insufficient[7], and the loss of personnel in the disease control system has been serious[8]. In order to deal with the shortcomings in the allocation of public health human resources in the context of major epidemics, this article is based on the 2003-2019 "China Health Statistics Yearbook", from the changes in the number of health personnel, the staffing of institutions, differences between regions, and the quality of public health talents. It analyzes the changes and existing problems in the allocation of health human resources in China from 2002 to 2018, and proposes strategies to optimize the allocation of talents.

2. Materials and Methods

2.1. Source

The relevant data comes from the 2003-2019 "China Health Statistics Yearbook". Chapter 2 of the yearbook introduces detailed information on health personnel. The definition of public health personnel in this article refers to the health technical personnel of medical institutions and public health institutions in a broad sense according to the institutional calculation method, but only includes personnel in public health institutions in a narrow sense. According to the personnel calculation method, only professional and technical personnel engaged in public health institutions or positions are included, and other auxiliary personnel such as administrative management are not included. The number of practicing (assistant) physicians in different departments is selected to measure the number of health personnel in public health-related departments; the composition of various health institutions and professional public health technicians is used as the basis for measuring the allocation of health human resources among institutions; the number of health personnel in 31 provinces, autonomous regions, and municipalities nationwide Health personnel and general practitioners per thousand population analyze the differences between regions; as well as basic population information related to gender, age, and education.

2.2. Statistical Analysis

Use Excel 2007 software to conduct a descriptive analysis of indicators such as the number of personnel in various medical and health institutions and professional public health institutions, and explore the changes in the number, structure, distribution, and quality of health personnel.

3. Result

3.1. Trends of Personnel Changes in Various Medical and Health Institutions

Medical institutions can be divided into four categories: hospitals, primary medical and health institutions, professional public health institutions, and other medical institutions. Among them, hospitals have the largest proportion of health technicians. As shown in Table 1, in terms of the number of people, except for other medical institutions, the absolute number of the other three types of institutions is increasing. Hospitals have the fastest growth rate, with an average annual growth rate of about 6%, followed by primary medical institutions. The growth rate is about 4%, and the growth rate of professional public health institutions is about 3.7%. In terms of proportions, the proportion of health technicians in hospitals ranks first among the four types of institutions, and the proportion of health technicians in primary medical institutions fluctuates. Data shows that from 2003 to 2007, the proportion of professional public health institutions fluctuated and increased, mainly due to the impact of SARS in 2003. The state increased public health investment and the construction of professional public health personnel. In 2005, professional public health The proportion of technical personnel in health

institutions was 9.1% (the highest proportion over the years), and then began to gradually decline. The decline was the fastest from 2008 to 2009, with a decrease of 0.5%. Although the H1N1 influenza occurred in 2009, H1N1 was mainly caused by overseas infections and Imported cases from abroad did not affect the country. The number of public health personnel continued to decline. In 2012, it only accounted for 7.92%, and then increased. From 2012 to 2013, it increased by 0.52%. The main reason was that the statistical caliber changed in 2013 (The number of health personnel was included in the number of family planning personnel), and then gradually declined, and its proportion continued to drop to 7.12% in 2018 (the lowest point in the past year). In general, the proportion of professional public health institutions and primary medical institutions has gradually decreased, while the proportion of hospitals has increased. The gap in the proportion of health technical personnel between public health institutions and hospitals has gradually widened, indicating that the number of public health personnel has been The development trend is a weakening process.

Table 1. Health technical personnel and their proportions in various medical institutions in China from 2002 to 2018 (person, %)

years	Hospital		Primary medical and health institutions		Professional public health institutions		Other medical and health institutions	
	person	%	person	%	person	%	person	%
2002	2399023	56.19	1440513	33.74	377027	8.83	53216	1.25
2003	2424232	56.29	1447346	33.61	387263	9	47630	1.11
2004	2488865	56.66	1465004	33.35	392481	8.93	46558	1.06
2005	2535854	56.86	1475087	33.07	405779	9.1	43467	0.97
2006	2660405	57.53	1511796	32.70	410090	8.87	34991	0.91
2007	2831683	59.15	1493463	31.19	428597	8.95	33867	0.71
2008	2985087	59.35	1562760	31.07	447283	8.89	34908	0.69
2009	3199904	57.81	1833445	33.12	464570	8.39	37205	0.67
2010	3438394	58.51	1913948	32.57	486801	8.28	37015	0.63
2011	3705541	59.74	1962497	31.64	498213	8.03	36607	0.59
2012	4057640	60.78	2051751	30.74	528825	7.92	37333	0.56
2013	4424925	61.37	2137623	29.65	608560	8.44	39470	0.55
2014	4741677	62.47	2176823	28.68	631558	8.32	39732	0.52
2015	5071151	64.33	2257701	28.19	639189	7.98	39496	0.49
2016	5415066	64.05	2354430	27.85	646425	7.65	38482	0.46
2017	5784712	64.36	2505174	27.87	661616	7.36	36728	0.41
2018	6129201	64.32	2682983	28.15	678258	7.12	38737	0.41

3.2. Trends of Personnel in Professional Public Health Institutions

Professional public health institutions can be divided into eight categories: disease prevention and control, specialized disease prevention and control hospitals (stations, stations), health education, maternal and child care hospitals, emergency centers, blood collection and supply institutions, health supervision institutions, and family planning technical service institutions. This article only selects Mainly 5 categories are analyzed. Exploring the trend of personnel changes between agencies, that is, the proportion of health technical personnel in five types of institutions to the total number of health technical personnel in public health institutions (Figure 1), to compare the staffing situation between agencies. The CDC and Maternal and Child Health Hospital staff tend to show a "scissors gap". Affected by SARS, the number of disease control technicians increased from 2003 to 2004, reaching a peak of 16,093 in 2004. After 2005, the absolute number began to decline and was lower than that of Maternal and Child Health.

hospital. The proportion of CDC health technicians in the total health technicians of public health institutions has been on a downward trend from 2002 to 2018, from 42.12% in 2002 to 20.71% in 2018, a significant decline. The number of health technicians in the Maternal and Child Health Hospital has continued to increase, from 38.18% in 2002 to 55.58% in 2018. In 2006, it surpassed the Center for Disease Control and became the institution with the largest proportion of professional public health institutions. In the other three types of institutions, the number of personnel in health inspection centers increased from 2002 to 2011, and began to decline after 2012, and continued to decline from 15.6% to 9.96% in 2018; the number of health education centers is the smallest and has been at a low level for a long time (0.2%-0.14 %). The change in the number of the entire public health institution shows that the market economy's impact on the medical system, due to the promotion of artificial reproduction and other technologies, has caused rapid growth in maternal and child workers in recent years. The role and status of the prevention and treatment institute has been gradually weakened, and the long-term shortage of health education personnel closely related to the health literacy of residents has affected the prevention and control of infectious diseases. For example, during the period of COVID-19, the low public health literacy has led to the spread of rumors to some extent, The lack of self-protection knowledge is not conducive to epidemic prevention and control.

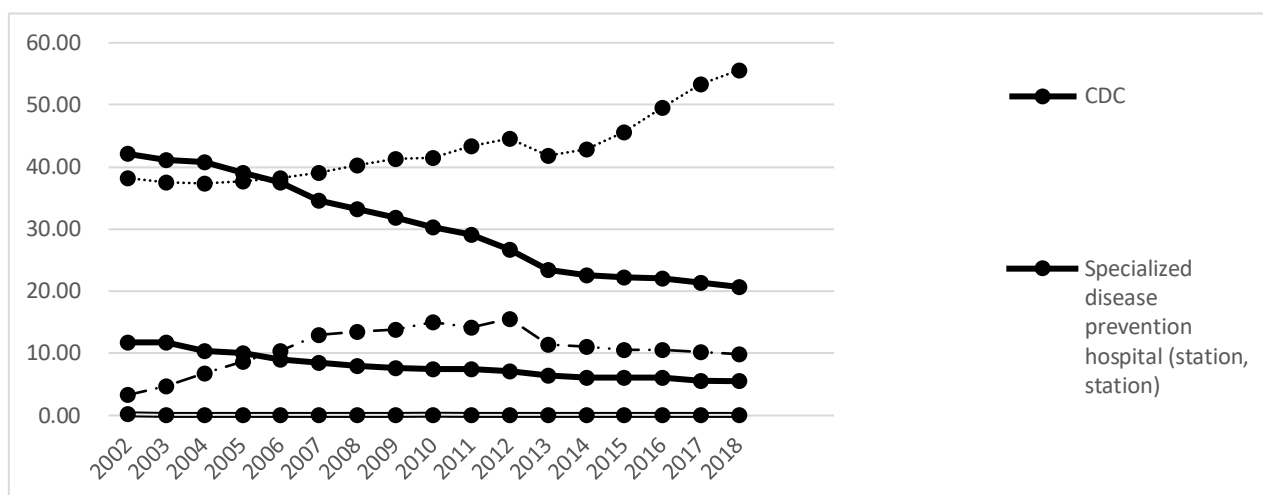


Fig 1. Trends of changes in the proportion of health technicians in five types of public health institutions (%)

3.3. Situation of Health Personnel in Eastern, Central and Western Regions

The eastern region includes 11 provinces and municipalities including Beijing, Tianjin, Hebei, Liaoning, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong, and Hainan; the central region includes Shanxi, Jilin, Heilongjiang, Anhui, Jiangxi, Henan, Hubei, Hunan 8 Provinces; the western region includes 12 provinces, autonomous regions, and municipalities in Inner Mongolia, Chongqing, Guangxi, Sichuan, Guizhou, Yunnan, Tibet, Shaanxi, Gansu, Qinghai, Ningxia, and Xinjiang. Practicing (assistant) physicians can be divided into four categories, namely clinical, traditional Chinese medicine, oral cavity and public health. General practitioners are practicing (assistant) physicians who are registered as general medicine or have obtained a training certificate. They usually work in community or township health centers. Their characteristic is to emphasize disease prevention, early detection and management. Therefore, general practitioners are the gatekeepers of disease prevention and effective treatment, and they play an important role in the prevention and treatment of infectious diseases. In order to avoid the influence of population on the number of doctors in the eastern, central and western regions, the number of public health practicing (assistant)

physicians per thousand population and the number of general practitioners per thousand population are selected for comparison [the number of public health practicing (assistant) physicians per thousand population in the nth year = No. Public health practitioner (assistant) physician/resident population for n years] (Figure 2). From 2012 to 2013, the number of public health physicians per 1,000 population in the eastern, central and western regions rose slightly. From 2013 to 2015, the number of public health physicians per thousand people declined rapidly in the west and the eastern and central regions declined slightly. From 2015 to 2018, fluctuations in the eastern region increased, while the central and western regions decreased year by year, especially in the western region. In 7 years, the number of public health practitioners (assistant) physicians per thousand population in the eastern region was greater than that in the central and western regions, and the central region was always ranked The last. In terms of the number of general practitioners, from 2012 to 2018, the eastern, central and western regions have been on the rise, with the eastern, rising fastest and higher than the central and western regions. The gap between the central and western regions is small. The western region was higher than the central region before 2015, and the central region surpassed the western region after 2015. The "Opinions on Reforming and Improving the Incentive Mechanism for Training and Using General Practitioners" clearly states that by 2020, there will be 2-3 general practitioners for every 10,000 residents in urban and rural areas. In 2018, the number of general practitioners across the country reached 222/10,000, completing the target ahead of schedule. However, it can be seen that there is a large gap between the eastern, central and western regions. In 2018, the number of general practitioners in the eastern region was 2.93 [general practitioners per thousand = general practitioners per 10,000 people/10], 1.73 in the central region, 1.66 in the western region, and 1.66 in the eastern region. Bigger than the average, general practitioners in the central and western regions have not reached 2/10,000.

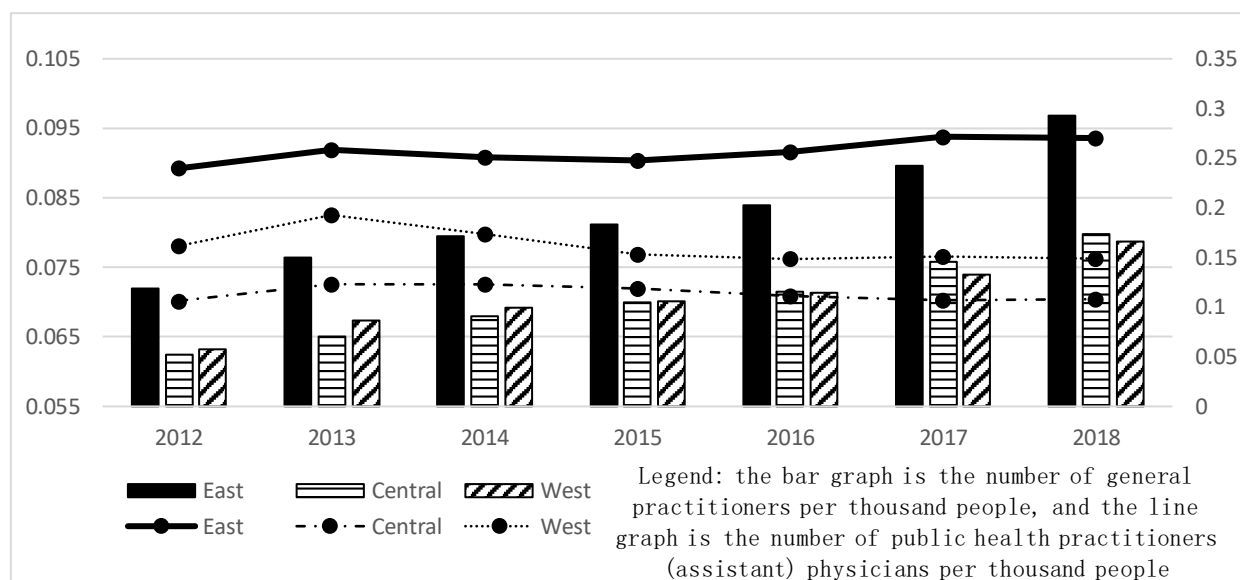


Fig 2. Number of public health practicing (assistant) physicians and general practitioners per thousand population

3.4. Changes in the basic situation of health technicians in hospitals and CDCs

It can be seen from Table 2 that in terms of gender, there are more women than men in hospitals and CDCs, and the proportion of women is increasing year by year. In terms of age, the health technicians in hospitals are mainly distributed between 25-34 years old, and the health technicians of the CDC are mainly distributed between 35-44 years old from 2014 to 2015. The proportion of 45-54 years old from 2016 has exceeded 35-44 years old, became the main force

of health technicians of the CDC. Taking 44 years as the demarcation point, it was found that the proportion of health technicians under the age of 44 in the Centers for Disease Control and Prevention dropped from 58.1% in 2014 to 51% in 2018. The proportion of health technicians under 44 in hospitals also showed a downward trend, but the proportion The rate of decline is large and slow, from 76.6% in 2014 to 74.7% in 2018. From the perspective of age structure, compared with hospitals, the CDC has obvious aging of talents, and there is a shortage of young talents. From the perspective of working years, the trends of CDC and hospitals are opposite. The proportion of disease control talents with 10-19 years of service has declined, and the proportion of people with more than 20 years of service has increased year by year, indicating the aging of talents and the "no successor" situation. In comparison, hospitals show a trend of two highs and one low, that is, the proportion of talents with a working experience of less than 10 years and more than 20 years is decreasing, while the proportion of young people with a working experience of 10-19 years fluctuates and rises. From the perspective of academic qualifications, currently, the proportion of health technicians in my country below undergraduate degrees is large, and there are few highly educated talents in the CDC. Further explore the internal personnel composition of disease control, that is, the proportion of health technical personnel in the total personnel of the institution (Figure 2). Since health technicians are the core personnel of the organization, it is believed that the larger their proportion of all personnel in the organization, the more high-end talents, and the more professional the organization. It was found that the proportion of health technicians in the Centers for Disease Control and Prevention in the total staff dropped sharply from 2002 to 2012 (76.78%-73.12%), and only started to rise after 2012. Among the health technicians, the number of practicing (assistant) physicians decreased, 2004 -In 2018, it decreased by about 10%, and the rate of decline exceeded that of health technicians, indicating that the decline of health technicians is that practicing (assistant) physicians play a major role. The above, on the one hand, the number of years of work reflects the serious "aging" phenomenon of the CDC; on the other hand, it also reflects the serious loss of technical staff with less working years in the CDC, especially the loss of high-end talents, and the overall quality of the CDC has declined. Retaining talent has become a problem.

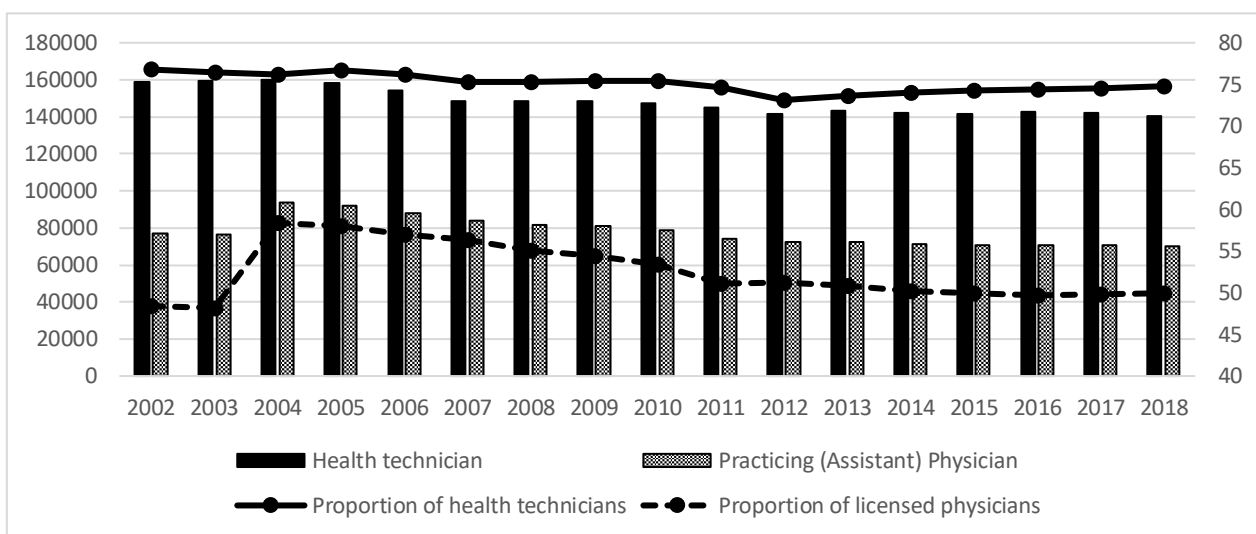


Fig 3. The number of health technicians and practicing physicians in the CDCs (persons, %)

Table 2. Changes in the basic situation of health technicians in hospitals and CDCs from 2014 to 2018 (%)

classification	CDC					hospital				
	2014	2015	2016	2017	2018	2014	2015	2016	2017	2018
gender										
male	46.1	45.5	44.3	43.7	42.9	27.6	27.2	26.7	26.4	25.9
Female	53.9	54.5	55.7	56.3	57.1	72.4	72.8	73.3	73.6	74.1
age										
<25	1.4	1.3	1.6	1.3	0.7	10.6	9.5	9.8	8.9	6.1
25-34	23.5	22.7	22.8	21.8	20.3	41	42.6	43.2	42.8	43.4
35-44	33.2	32.3	31.8	31.2	30	25	24.1	23.5	24.1	25.2
45-54	30.6	32.2	33.8	33.8	32	16.6	17.1	17.1	17	16.1
55-59	8.3	7.8	6.9	8.2	12.3	3.6	3.3	2.8	3.4	5
≥60	3.1	3.7	3.1	3.7	4.6	3.2	3.5	3.5	3.8	4.2
Working years										
<10	20.3	20.3	21.7	21.7	19.9	48	48.8	50.8	50.4	47.5
10-19	23.8	23	21.8	21	20.8	21.1	20.7	20.1	20.6	23.7
≥20	55.9	56.7	56.5	57.4	59.4	30.9	30.4	29	29	28.8
Education										
Postgraduate	4.9	5.2	5.7	6.2	6.8	6.3	6.7	7	7.4	7.7
Undergraduate	29.3	30.8	33.1	34.8	37.4	30.2	31.1	32.2	33.6	35.2
Undergraduatebelow	65.7	64	61.3	59	55.9	63.4	62.2	60.7	59	57

4. Conclusion

The results of this study show that: (1) In terms of personnel distribution, the proportion of health technical personnel in hospitals has increased year by year, with a rapid average growth rate, and the proportion of health technical personnel in professional public health institutions has decreased year by year, indirectly indicating that health technical personnel are more willing to go to the clinic. It is not a public health job; (2) In professional public health institutions, the number of women and children has increased significantly, while the number of CDCs, health inspection centers, and health education centers continues to decline, and there is a serious shortage of professionals in infectious disease prevention and control. (3) From the perspective of the regional distribution of health personnel, according to the degree of economic development, sufficient resources in the east are guaranteed. Due to central transfer payments and other reasons, the public health human resources in the west are better than those in the central region, and the central region has "collapsed" of talents [9], the level of public health development is in urgent need of improvement. (4) From the perspective of the demographic distribution of talents, the CDC has the phenomenon of aging population and insufficient new force; the current proportion of disease control talents in China with undergraduate and above is from 34.2%-44.2% in 2014-2018, There has been some progress, but the loss of high-level talents is serious, and high-level talents still need to be strengthened. Human resources are a key resource for emergency response to major epidemics and a core element for improving public health emergency response capabilities. my country's public health human resources have been weakened in the past 16 years. After the new crown pneumonia epidemic, it needs to be further improved. To solve the problem of insufficient public health talent pool and serious loss, it is necessary to promote the increase and adjust the stock.

In terms of improving the structure of existing public health technical personnel, attention should be paid to the development of infectious disease practitioners, the number and proportion of professional public health personnel, the construction of public health institutions, and geographical balance. One is to increase the number of personnel in infectious disease prevention and control departments and improve the construction of infectious disease departments. Second, pay attention to coordinating the proportion of health technical personnel in hospitals, primary medical institutions, professional public health institutions, and other health institutions, and increase the proportion of infectious disease prevention and control professionals such as the Center for Disease Control, Health Supervision, and Health Center. The third is to increase financial investment in the field of public health and guide the balanced allocation of personnel among institutions. Our country's understanding of "prevention first" is insufficient and insufficient attention, and the phenomenon of focusing on medical care over prevention is widespread [10]. The government has neglected health services and has seriously underinvested in it. Surveys have shown that public health expenditures in developed countries account for health Over 50% of business expenditures, China only accounts for 12% [11]. Fourth, it is necessary to give priority to strengthening the construction of public health talents in the central region, and to increase the proportion of public health (practicing) assistant physicians and general practitioners per 1,000 population.

In terms of the promotion of public talents, strengthen the training of public health talents and strengthen the quality of public health talents. Public health, preventive medicine and other majors are left out in the medical profession. Many students are transferred, and some students half-way transfer to more popular clinical majors [12]. Because of the lack of incentive policies, college graduates are not willing Employment in public health institutions has exacerbated the shortage of talents; the capped total performance salary and low quota have made public health institutions highly mobile [13], especially the drain of high-quality talents. Colleges and universities should be assisted to develop talents and improve their practical skills; establish a strict talent admission system, clarify the admission standards of professionals, such as academic qualifications, majors, and qualifications, and strictly control the entry of non-professionals into professional institutions; strengthen the training and response to major epidemics Drills to meet major epidemic prevention and control requirements.

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