

Analysis of the Current Situation and Problems of China's National Infectious Disease Network Direct Reporting System Under the COVID-19

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Abstract: Considering the highly transmissible feature of infectious diseases, each country establishes its surveillance system for infectious diseases to restrain the spread of infectious diseases quickly. This is the first step of humanity's "war against epidemics". This paper briefly reviews the development of China's national infectious disease network direct reporting model. From the early days of handwriting and mail delivery to the world's largest direct reporting system for infectious diseases, China's digital government has brought a huge breakthrough in preventing infectious diseases. However, the direct reporting system for infectious diseases, which was claimed to be able to reach the National Centre for Disease Control and Prevention in China within 2 hours, did not work as expected during the early outbreak of "COVID-19" in early 2020. Therefore, this paper explores the basic reasons for the "non-functioning" of the network direct reporting system and, hence, discusses the problems of digital government in infectious disease surveillance and the important role of advanced technology in infectious disease surveillance systems. Finally, suggestions are made for the direct reporting system of infectious disease networks in China.

1 INTRODUCTION

The Chinese Ministry of Health officially launched Decree No. 37 on January 1, 2004, on the implementation of the Measures for the Administration of Information Reporting on Surveillance of Public Health Emergencies and Infectious Diseases, followed by the opening of a direct network reporting system based on case reporting of infectious diseases throughout the country, which means that the information network is extended to townships (towns) and urban communities through national, provincial, municipal and county disease prevention and control agencies, thus forming a vertical and horizontal information reporting network (Li & Zhang, 2011). The innovative management model of reporting epidemics directly from the most grassroots medical and health institutions to the National Centre for Disease Prevention and Control (NCDC) has become a breakthrough in the information management model in China's public health sector, improving the

early detection of abnormal information through real-time monitoring of epidemics, especially plays an important role in the prevention, control, and disposal of infectious disease epidemics, the safeguarding of major rally events and the prevention of epidemics during natural disaster relief.

2 REVIEW OF THE EPIDEMIC OUTBREAK REPORTING METHODS IN CHINA

China's statutory epidemic reporting and feedback system was established in the 1950s when the Chinese State Council approved a bill to establish Health Protection Stations (HEPS) nationwide. Since 1952, the Ministry of Health issued a series of health statistics forms, including the Basic Health Information Form, the Infectious Disease Form, the Hospital Work Form, the Hospital Inpatient Disease Classification Form, and the Population Injury and

Death Statistics Form. Subsequently, the Chinese Academy of Medical Sciences (CAMS) was established in 1956 and the Chinese Academy of Preventive Medicine (CAPM) in 1986, both of which are responsible for the collection, management, analysis, and feedback of infectious disease surveillance data throughout China (Wang, 1996). Before 1985, infectious disease surveillance in China was conducted in the most primitive way, that is, clinicians filled out "infectious disease report cards" manually, and then reported and summarized statistics by mail through health prevention stations in villages, towns, counties, cities, provincial, and national levels (from county health bureau to city health bureau, to provincial health bureau, and finally to CAPM) (Xu & Chen, 2020). In other words, it often takes more than a month, or even longer, for information about the infectious disease to reach decision-makers. In the 1970s, China set up a single disease surveillance system for influenza, AIDS, and malaria, followed by a comprehensive disease surveillance system in the 1980s, with 145 disease surveillance sites nationwide, monitoring four areas:

birth, death, and infectious disease incidence, and planned immunization (Ma et al., 2006).

By the year 1986, there has been an initial electronic reporting system of infectious diseases in China, with more than 200 network nodes nationwide implementing monthly electronic reporting of national statutory infectious diseases, and some provinces even began using e-mail as a more efficient reporting method. In 2002, the Chinese Academy of Preventive Medicine (CAPM) was officially renamed the National Centre for Disease Control and Prevention (NCDC). According to the Law of the People's Republic of China on the Prevention and Control of Infectious Diseases (2004), CDCs at all levels are responsible for the surveillance, prediction, epidemiological investigation, and notification of epidemics and other prevention and control work of infectious diseases. Based on the official data from the NCDC, the epidemic dynamic results of 35 statutory infectious diseases analyzed by the national disease surveillance sites in 2000 is shown in figure 1.

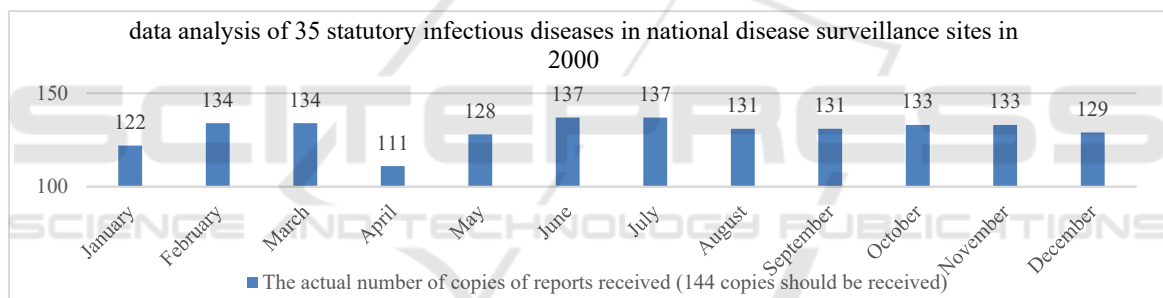


Figure 1: The epidemic situation of 35 statutory infectious diseases in national disease surveillance sites in 2000.

It can be seen that the lowest reporting rate of 35 statutory infectious diseases at the national disease surveillance sites from 2000 to 2002 was 77.08% in April 2000, and the highest reporting rate was 95.14% in June and July 2000. There were no months with a 100% reporting rate during this period. In 2003, after the SARS crisis, the NCDC established the National Network Direct Reporting System (NDRS) for infectious diseases and public health emergencies with the database of infectious diseases and public health emergencies as the core, according to the construction principle of "horizontal to the edge and vertical to the bottom" through the reorganization and transformation of the epidemic

reporting procedure (Huang et al., 2008). "Vertical to the end" means that all health institutions above the township level are included in the system and entitled to log in and fill in the information reported; "horizontal to the edge" means that all health institutions in the country are covered, including medical, supervision, disease prevention, and control institutions. According to the official data from the NCDC, the system has been used by all health institutions in China. According to the official data of the NCDC, the dynamic analysis of the epidemic situation of 37 statutory infectious diseases at the national disease surveillance sites in 2006 is shown in figure 2.

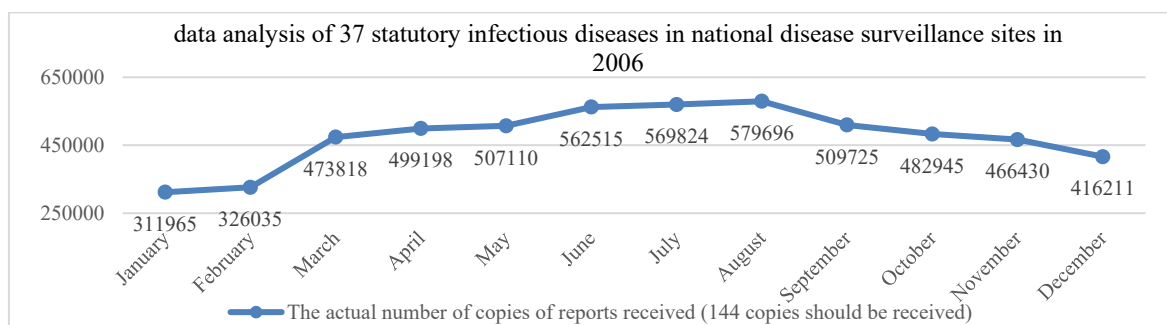


Figure 2: Epidemiological trends of 37 statutory infectious diseases in national disease surveillance sites in 2006.

Since the digital government model was initiated, the number of report cards has increased abruptly, with the lowest number of monthly report cards in 2006 being over 300,000 and the highest number of report cards close to 600,000. The increase in the number of infectious disease report cards means that China’s ability to monitor infectious diseases has improved, and reflects the positive effect that the digital government has brought to infectious disease surveillance. On September 29, 2017, the “Development of China’s Public Health as an Essential Element of Human Rights (2017)” stated that China has built the world’s largest online direct reporting system for notifiable epidemic diseases and public health emergencies. The epidemic disease

reporting system covers 71,000 medical institutions, with 160,000 users and nine million annual individual reports. Development of health and progress of human rights in China describes that the country has set up a laboratory network comprised of disease control and prevention institutions at the national, provincial, city, and county levels. Influenza, poliomyelitis, measles, and meningitis B labs of the NCDC have become WHO reference labs.

According to the above tables, we can briefly draw the network direct reporting process stipulated in the “Administrative Measures for Monitoring Information Reporting of Public Health Emergencies and Infectious Disease Epidemic Situations”, as shown in the following.

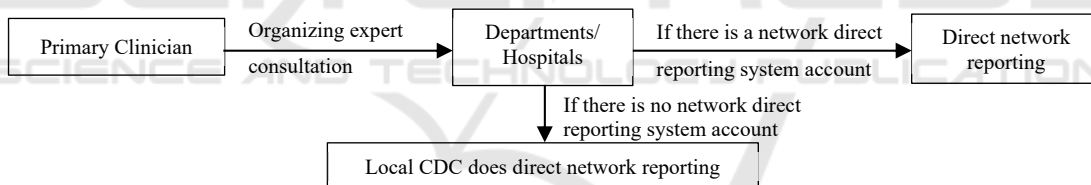


Figure 3: Direct network reporting process as stipulated in the Measures for the Management of Information Reporting on Surveillance of Public Health Emergencies and Infectious Diseases (image source: the author’s self-made).

It is clear that before 2020, the major reporters for China’s direct infectious disease network reporting system were either the hospitals to which the primary clinicians belonged or the local CDCs at the county level or above. However, the COVID-19 outbreak in early 2020 was not initially reported through the direct infectious disease network reporting system, and this issue will be addressed and analyzed in the following sections.

3 CASE STUDY

At the end of 2019, Hubei Provincial Hospital of Integrated Traditional Chinese and Western Medicine found several family-like cases of

pneumonia of unknown cause. On December 27, the hospital reported to the Wuhan Jiangnan District CDC. On December 29, the hospital conducted the first joint expert consultation, and then the hospital reported the situation to the provincial and municipal health commission yet did not report it through the network direct reporting system(2020). On December 30, the Wuhan Municipal Health Commission issued the internal departmental guidance documents “Emergency Notice on Reporting the Treatment of Unexplained Pneumonia” and “Emergency Notice on Doing a Good Job in the Treatment of Unexplained Pneumonia”. A comprehensive and retrospective investigation of seafood market-related pneumonia cases was launched. On the same day, Li Wenliang,

an ophthalmologist at the Central Hospital of Wuhan, forwarded text messages that 7 cases of SARS were diagnosed in the South China Fruit and Seafood Market in the WeChat group, with a photo of clinical pathogen screening results and a video of lung examination as a reminder for relatives and friends to take precautions. As news of the epidemic spread, Wuhan's work arrangements for the prevention and control of unexplained pneumonia, by-laws and regulations on the prevention and control of infectious diseases, public security management, and other laws and regulations, as well as the notification of the Municipal Health Commission, the public security administration of Wuhan started to investigate the information on infectious diseases on the Internet. Investigate the situation. On January 3, 2020, the Zhongnan Road Police Station of the Wuchang Branch of the Wuhan Public Security Bureau contacted Doctor Li Wenliang, and then he and his colleagues came to the police station for a conversation, and finally, Doctor Li Wenliang was given a letter of admonition(2020).

After learning about the pneumonia of unknown cause in Wuhan through other channels, National

Health Commission sent an expert team to Wuhan to discuss the “pneumonia of unknown cause” with the staff of the Wuhan Municipal Health Commission on December 31, 2019. On the same day, Wuhan Municipal Health Commission released news that 27 cases of pneumonia of unknown cause were found in Wuhan through its official media platform, and that “so far no obvious human-to-human transmission has been found in the investigation, and no medical staff infection has been found(*About the Current Situation of the City's COVID-19 Outbreak, 2019*)”. Among the 138 consecutive patients admitted to Zhongnan Hospital of Wuhan University from January 1st to 28, the proportion of medical staff was as high as 29%(Wang B X et al., 2020). The Wuhan Municipal Health and Family Planning Commission issued the “Manual for Medical Treatment of Unexplained Viral Pneumonia” on January 4, which stipulates that for suspected cases, the hospital should organize expert consultation within 12 hours, and the results of the diagnosis should be immediately reported online when there is suspected pneumonia of unknown cause. Two more adjustments were subsequently made, as shown in Table 1.

Table 1: Changes in the reporting process of the online direct reporting system.

Time	File name	The reporting process of the network direct reporting system
2006	Administrative Measures for Monitoring Information Reporting of Public Health Emergencies and Infectious Disease Epidemic Situations	The responsible reporting unit or person-make a direct online report immediately (within 2 hours).
2020.0 1.04	Wuhan Municipal Health Commission “Work Manual for Medical Treatment of Unexplained Viral Pneumonia”	Primary doctors discover suspected cases-relevant departments organize expert consultation-hospitals/medical institutions-report directly online (within 12 hours).
2020.0 1.05	Wuhan Municipal Health Commission “Work Manual for Medical Treatment of Unexplained Viral Pneumonia”	Primary doctors discover suspected cases-relevant departments organize expert consultation-hospitals/medical institutions-district health commissions organize expert consultation-report directly online.
2020.0 1.10	Wuhan hospitals received oral notices from relevant staff of municipal and provincial health commissions	Primary doctors discover suspected cases-relevant departments organize expert consultations-hospitals/medical institutions-district health Commission organizes expert consultation-Municipal Health Commission organizes expert consultation-Provincial Health Committee organizes expert consultation-report directly online.

In the 2006 revised version of the “Administrative Measures for Monitoring Information Reporting of Public Health Emergencies and Infectious Disease Epidemic Situations”, “direct reporting on the Internet” does not require other levels of review and consultation, although it also requires the

consultation of county, municipal and provincial levels. However, the purpose of the consultation is to “exclude the possibility of SARS”. The consultation is not a prerequisite for “direct online reporting”, but to facilitate the revision of the results of previous online direct reporting and issue early warnings and

take appropriate preventive and control measures on time. By contrast, it can be seen that in just a few days from January 4 to January 10, 2020, the original reporting method that the cases can be reported directly online once it is confirmed by the primary clinician has changed to the way by which direct online reporting is only possible after expert consultations organized by the district, city, and provincial health commissions at all levels, as well as the approval of the provincial health commission. Until January 24, when the unknown virus was officially named “new-coronavirus” (COVID-19) and the emergency system was debugged, the “dynamic monitoring function of pneumonia caused by new coronavirus infection” of the infectious disease network direct reporting system was finally launched.

4 CONCLUSION

Undoubtedly it is particularly important to have easy access to online reporting for infectious diseases, but at the beginning of the outbreak, due to the refrainment of reporting authority, the Hubei Provincial Health Commission kept claiming “no increase” until January 15, 2020, but the fact is that the spread of the virus never stopped during this time. In addition, even the top level of the NCDC has no executive power or decision-making authority, which means it is unable to make policy measures to prevent and control the outbreak. Therefore, although the NCDC reported the outbreak to the central government as soon as possible, before the central leadership approved the decision, members of the high-level expert group of the NCDC could do nothing but remind and urge people to reduce unnecessary outings and gatherings at the press conference, which also hindered the prevention work in the early stage of the epidemic.

First of all, the NCDC in China is a technical institution that provides technical services, and is responsible for reporting to higher administrative departments but is not entitled to release information to the public. Meanwhile, local CDCs are under the jurisdiction of the local health commissions and the local governments. The NCDC, which is supposed to be the “whistle-blower” for major public health events, is caught in a dilemma between local hospitals facing cases or suspected cases and the National Health Commission (NHC), owing to administrative decision-making authority. The reporting of infectious diseases through the direct network reporting system is still an administrative

act, which means that timely reporting is not the key, but approval by higher authorities is the key, while at the same time, the Health and Welfare Commission, which is not directly involved in technical guidance, holds the power to release information about the epidemic. Instead of institutionalization and professionalization, the legal obligation of direct reporting on the Internet has become administrative.

On the other hand, January 24, 2020, is the Chinese Lunar New Year. The “two sessions” and the “Spring Festival” drew the public attention, and the original professional direct reporting has become a political issue related to local economic development and social stability, and the direct online reporting system has turned into a political tool instead of technical service. When reporting cases of infectious diseases, the Health Commission or local governments had to take into consideration the factors such as the possible social instability caused by outbreaks and even the possible negative impact on personal promotions. Policymakers attempted to weaken and conceal the severity of the epidemic, resulting in opaque reporting of early cases of the epidemic, which did not attract sufficient attention from higher levels of government and thus failed to effectively control the outbreak as early as possible. Besides, a complex and accurate report of infectious diseases can be finished by a single physician under a normal situation. However, at the beginning of the outbreak, all the hospitals in Wuhan received at least 200 to 300 outpatients every day, and the number of patients with pneumonia of unknown cause increased rapidly. It was hard for doctors to report online, which exposed the loopholes of the current online reporting system.

All in all, the case study of the failure of China’s infectious disease network direct reporting system implies that scientific and technological means such as digital government cannot replace the government’s scientific management, power distribution, and balance. Infectious disease prevention and control work is a complex system arrangement instead of technical work only. At the same time, it is quite important to properly broaden the audience of the monitoring system, facilitate the operation and open the data. Therefore, it is recommended to explore the automatic reporting model of the hospital, which can reduce costs and the possibility of false reporting and concealment. At the national level, it is recommended that the NCDC be directly led by the State Council, or managed by the National Health Commission on behalf. If it extends downwards, it is possible to merge the local NCDC and the disease control department of the Health

Commission. At present, the two sectors overlap in some work at the grassroots level, which is not helpful for prevention and control in a state of crisis.

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