



How to deal with rural children's epidemic prevention in the transmission of major infectious diseases: Reflect on cases of Chinese 2019 novel coronavirus pneumonia

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ABSTRACT

The novel coronavirus can be transmitted to humans through intermediate animal hosts, causing deadly lung infections and has a human-to-human transmitting nature. The epidemic has spread from urban centers to townships and even rural areas in China. This article has chosen the hot articles on rural children's epidemic prevention and protection from Chinese new media and uses NLPPIR analysis system to do the text analysis. It is found that the current focus issues of children's health-oriented issues are mainly the source of the virus, the pathogenesis, the distribution of patients, disease prevention, and how the nation acts.

1. Introduction

The epidemics spreads rapidly and may have a great impact on society, which has a greater impact on the physical and mental health of the public, especially children. Since December 2019, an increasing number of infectious pneumonias caused by novel coronavirus (NCIP) cases have been discovered in Wuhan, a large city of 14 million people in central China. The Chinese government, medical staff and all walks of life have all joined in the battle. A retrospective inference study of epidemiological cases in China (Li, Guan, Wu, Wang, Zhou, Tong, et al., 2020) collected demographic characteristics, history of exposure, and time of disease of 425 laboratory-confirmed NCIP cases. In the study, prior to January 22, there were no cases of children under the age of 15. The early development of the epidemic can be divided into three stages: firstly, the incubation period, which may last from 7days to 14days;

secondly, the hovering and analysis stage. On January 9, Xu Jianguo, the leader of the preliminary assessment of pathogen detection results, said in an interview with Xinhua News Agency that the pathogen of this unexplained viral pneumonia case was initially identified as a new kind of coronavirus. On January 11, in the fourth bulletin of Wuhan Municipal Health Commission, it was mentioned for the first time that the daily notification was started after the pathogen of "pneumonia caused by unknown virus" was initially identified as a novel coronavirus (2019-nCoV). Thirdly, the confirmation and processing stages. On January 20, in response to the prevention and control situation, Zhong Nanshan, the leader of the senior expert group of Chinese National Health and Health Commission, accepted an interview and formally confirmed the succession. Since then all sectors of China have been actively fighting against the epidemic.

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2. Literature Review

Health education is very important for children’s development, especially when they face sudden infectious diseases. Present research mainly focuses on the popularization of health education and disease prevention, which can be divided into physical and mental health education. Relevant research in Australia and Africa focuses on educational projects’ implementation in and out of schools. A study found that the quality and frequency of services for hearing-impaired children living in Australia rural and remote areas is poorer than urban, and researchers recommend that remote access can also be used to provide assistance for rural children (Barr, Duncan, and Kerry Dally, 2018). Future research on the differences between rural and urban youth should focus on high-quality assessments of physical health, while appropriate and consistent definitions of rural also need more attention (McCormack, and Meendering, 2015). As for the rural areas in Africa, most countries suffer a crisis of human resources for health and lack of labour to provide basic health care. Another research showed that there was little information on medical training and deployment policies in rural Africa, with only 37 articles meeting the inclusion criteria. Some established policies also demonstrated multiple positive strategies to improve rural MNCH (Maternal, Newborn and Child Health) outcomes by deploying and training doctors, nurses, and midwives (Murphy, Goma, MacKenzie, Bradish, Price, Nzala, et al, 2014).

A data search was performed on PubMed, OVID, ERIC, Web of Knowledge, CNKI, and Wanfang database in a comprehensive Meta-analysis, and SMD and random effects models were used to analyze. The study found that there are 11 concerning studies, which provide the scores of mental health tests of 4,621 migrant children and 5,076 urban children and seven test criteria for eight tests. The migrant children have worse mental health than urban children, and the future research should focus on how to improve the mental health of them (Zhang, Yan, & Yuan, 2019). Due to the lack of psychologists and other behavioral health professionals, especially those with expertise in treating youth, it is difficult for children and adolescents in rural areas to receive psychological services, but tele-therapy can help bridge this gap. Researchers have expanded the evidence of conducting adult tele-psychological assessment and treatment to rural children practice, and future technologies and applications are also been concerned (Duncan, Velasquez, and Eve-Lynn Nelson, 2015).

Existing literature mainly discuss the status, measures and future prospects of children’s health education in rural areas, but most of them are preventions and investigations of health education or reflections after the illness. Internationally, there is little systematic experience in rural children’s rescue mechanisms and coping strategies for serious outbreaks. This study attempts to use WeChat, a new social media and also a public health

communication method commonly used by the Chinese, to conduct text analysis. At the same time, combining with previous health education research, starting from the child-oriented epidemic problems that are currently challenging China, the research may effectively provide a Chinese case and global discussions on future establishment of rural children’s public health governance and ecosystem mechanisms.

3. Methodology

This study proposes three research questions: firstly, what are the characteristics of NCIP reports on children’s health and anti-epidemic contents in China’s new media? Secondly, in response to the extreme cases of rural children with special needs, reproduction of media reports may allow the public to reflect on what effective assistance can be taken. Lastly, what lessons can China’s efforts in such an outbreak provide for future global rural children prevention mechanisms and responsibility systems?

In the prevention and control of infectious diseases, online advocacy from schools, home education and public health safety institutions is critical. In particular, the booming development of the internet has made information transfer more rapid, and education community can learn the latest news and share the opinions with the public. In recent years, social media represented by the WeChat public accounts have become a popular online medium for the public because of its huge audience and the timely information, and its monthly active users exceeded 1.1 billion on average in 2019. In order to study the orientations of media towards children in facing epidemics, the research is conducted on WeChat platform with the keywords of “2019-nCoV + students / children”. The top 26 hot articles have been selected and analyzed by Natural Language Processing & Information Retrieval Sharing Platform (NLPIR) (Zhang, 2019). Based on features such as word frequency, word length, part of speech, location, and high-frequency words on the internet, computer automatically weights the importance of the text and calculates the keywords. The research has sorted the selected words in descending order based on the feature weights (Chen, xia and chen, 2019), and filtered out the top 30 keywords for analysis.

This study also uses case analysis method to reproduce the case of “Hubei 17-year-old Cerebral Palsy Died Alone at home 6 Days Later” which were reported on the WeChat. Firstly, the case facts were stated, and then the predicaments of children in rural areas in fighting with NCIP and the following subsequent accountability treatments were also reproduced. Finally, global discussions for international strategies on rural children’s are also discussed.

3.1 New media reports’ orientations on children’s epidemic prevention during NCIP.

Table 1 Top 30 keywords of text based on weight sorting

rank	key words	word class	word weight	frequency	rank	key words	word class	word weight	frequency
1	coronavirus	n_new	77.89	194	16	possible	n	32.54	55
2	virus	n	73.21	357	17	prevention	v	32.36	69
3	mask	n	52.83	162	18	confirmed case	n_new	30.35	24
4	wuhan	ns	49.16	105	19	winter and spring season	n_new	30.05	10
5	NHC	n_new	41.49	13	20	discover	v	30.04	42
6	Novel coronavirus	n_new	40.87	134	21	spread	vn	29.8	64
7	WHO	n_new	40.16	15	22	wear mask	n_new	28.88	18
8	case	n	38.85	104	23	need	v	28.57	48
9	infection	v	38.47	142	24	Academician Zhong Nanshan	n_new	27.66	10
10	prevention	n_new	37.15	23	25	research	vn	27.34	52
11	n95mask	n_new	35.46	11	26	patients	n	26.51	54
12	epidemic situation	n	35.13	82	27	animal	n	26.51	44
13	emergence	v	32.72	56	28	Symptom	n	26.22	59
14	conduct	v	32.64	43	29	Droplet	n_new	25.84	15
15	surgical mask	n_new	32.59	14	30	treatment	vn	25.5	48

There are a total of 36 306 words (Chinese characters) in the selected top 26 hot articles. Through detailed reading and preliminary text analysis of WeChat's hot articles, children's anti-epidemic orientation in China's media are the following: what is 2019-nCoV, what is the virus source, the pathogenesis, and the development of the epidemic, how patients are distributed throughout the country, how to prevent, and how the country responds. The top 30 keywords in weight ranking are shown in Table 1, with which the central concerns of children's health education and anti-epidemic work could be found. The weight of coronavirus became the top priority of the entire incident, with viruses, masks, Wuhan, and National Health Commission ranked at 2, 3, 4, and 5, which represent the source of the epidemic, precautionary measures, and national responses. The five important orientations are explained in detail below (table 1).

First, the source of virus. In the hot articles, an important issue for children's health education is where the virus comes from. After the outbreak, the virus was presumed to have originated from one or more unidentified animals and transmitted to humans at a large animal and seafood market in Wuhan. Gene sequencing revealed that the new viruses appearing in Wuhan are related to coronaviruses transmitted by bats. These viruses include SARS virus and viruses that are closely related to SARS virus. However, other mammals can also transmit these viruses-SARS virus is most likely transmitted to humans by civets.

Second, the pathogenesis and transmission. Under natural conditions, all coronavirus infections use the respiratory or intestinal tracts as the primary sites of replication. The pathophysiological changes that cause clinical symptoms are mainly acute cell killing of target cells, so the local immune response causes antibodies secretion, which can limit the infections. Possible routes of transmission include droplet transmission, fecal-oral transmission, and contact transmission. The infection does not occur immediately, there is an incubation. The early symptoms are similar to those of a cold, which will be aggravated if they are not treated properly.

Third, the distribution of patients and the development of the epidemic. Hubei Province has the largest population of infection, and Wuhan has the largest population of confirmed cases. By February 1, 2020, 11,823 cases have been diagnosed in China. As shown in Figure 1, the cumulative number of confirmed cases has been on the rise since January 14 and has grown rapidly.

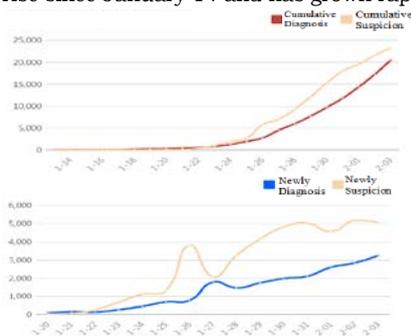


Fig 1 Cumulative (newly) diagnosis and suspicion trend of NCIP in China

The development trends of death cases and cured cases in China are shown in Figure 2. January 24 can see a dividing point, there were more cured cases than death cases before the 24th, and the situation has been reversed after that day. But unfortunately, till now, there is no effective medicine to treat the epidemic. At the rapid outbreak of the disease, Chinese government has responded with all her efforts. WHO Director-General Tan Desai said highly on Chinese government and relevant departments' efforts in controlling the epidemic situation, patient treatment, and communications with WHO after the outbreak at the press conference. For the moment, as the epidemic has a latent period of one to two weeks, with the

Chinese Spring Festival homecoming tide and the post-holiday reworking tide, the general situation is still on the rise.



Fig 2 Cumulative Rehabilitation(Death) and outbreak trend of 2019-nCoV in China

Figure 3 shows the cumulative and newly diagnosed cases in mainland China by 18:00 on February 4. It is obviously that Wuhan, Hubei Province, is the core area of the epidemic, radiating to its surrounding provinces and provinces with large floating populations, such as Zhejiang, Guangdong, Hunan, Henan, Anhui, etc., and there are also many rural areas in these provinces. The rural children in these provinces need strict prevention and control work.

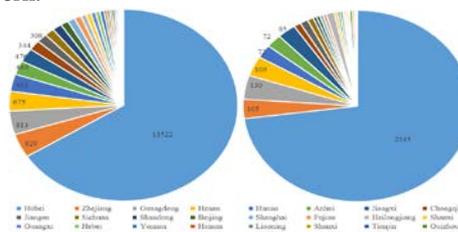


Fig 3 Cumulative and newly Diagnosis cases of NCIP in China

Fourth, disease prevention. The education community are also concerned about disease prevention, especially how to prevent rural children from infectious diseases. According to the International Health Regulations of 2005, the World Health Organization has proposed a temporary "Infection prevention and control during health care when novel coronavirus (nCoV) infection is suspected" for 2019-nCoV: (1) Early Identification and Control the source of infection: for suspected patients, they should be quarantined from other patients, and preventive measures for respiratory tract should be taken immediately. (2) Adopt standard preventive control measures for all patients: including hand hygiene and respiratory protection, wearing personal protective equipment according to risk, avoiding needle sticks or punctures, the management and disposal of contaminated waste, the equipment used by patients and bed sheets cleaning and disinfection. (3) Use control measures to prevent droplet exposure or airborne transmission for suspected patients; (4) Environmental controls, including basic health care facilities infrastructure, are necessary to ensure proper environmental ventilation and cleanliness of all areas within the medical institution.

Fifth, the state is concerned. After the outbreak, the education community became panicked and needed protection. The words "National Health Commission", "World Health Organization", and "Academician Zhong Nanshan" are relatively high in the rankings, which indicates that the country, relevant agencies, key personnel, and the netizens have all paid close attention to the epidemic. When the nation is fighting the 2019-nCoV, on January 24, construction of the Wuhan version of "Little Tangshan" Hospital started, and it could accommodate 1,000 beds. On January 26, Wuhan Epidemic Prevention Headquarters held a dispatch meeting and decided to build Leishenshan Hospital which can accommodate 1,300 beds. By now, Huoshenshan Hospital has been delivered as a whole on February 2 and Leishenshan Hospital on February 5.

3.2 How Rural Children Cope with NCIP: Case Reproduction and Countermeasures

3.2.1 Reproduction of media cases of a rural child

On January 29, an article in the Guangming Daily titled "Family Suspected of NCIP was quarantined. A 17-year-old child with cerebral palsy in Hubei died alone after 6 days at home", which sparked thinkings in the education community. Yan Xiaowen, from the Yanjia Village, Huajiahe Town, Hubei Province, worked in the canteen of a middle school in Wuhan. After returning home for the Spring Festival, both his second son and he had a fever so they went to the nearest hospital for medical treatment. He was quarantined for suspected of NCIP, and left his 17-year-old eldest son who was with cerebral palsy alone at home. His eldest son, Yan Cheng was alone at home for 6 days and died on January 29. After being quarantined, the child's father had repeatedly asked for help online, and reported the incident to the Disabled Persons Federation of Hubei Province through a public welfare organization. Later, the local disabled federation asked the village to send a meal to Yan Cheng every day. The village arranged specific meal delivery and care. The child with cerebral palsy also had speech impairment and difficulty in moving and could only stay in bed. This sad result is even more disturbing-not only because the unfortunate encounters of the weak are more sympathetic, but also because it reflects a "secondary injury" in the epidemic prevention campaign which may be overlooked due to the ignorance and backwardness of special groups in remote areas.

Governor of Chang'an Street (WeChat ID: Capital news) sorted out the time line of the incident: On January 17, Yan Cheng was brought back to his village by his father Yan Xiaowen from Wuhan, and lived in a resettlement house built by the government; January 22, Yan Xiaowen went to the town health center for treatment, and was asked to take a medical observation. On January 29, Yan Xiaowen was diagnosed as infected and was sent to Xinghua Township Health Center for quarantine and treatment. At 11:00 on January 29, as for being a close contact, Yan Cheng was transferred to the town's centralized observation site for isolation and treatment; at 12:30 on January 29, Yan Cheng died in the quarantine room. In the afternoon of the same day, Hong'an set up a joint investigation team led by the County Public Security Bureau to conduct a comprehensive investigation into the death of Yan Cheng. Earlier, it was reported that for more than 6 days after his father had been quarantined and observed, Yan Cheng was at home alone. In response, the investigation team stated that the local village office had entrusted their relatives, village clerks and doctors to take care of him. Although they took care of Yan Cheng daily, the relevant clerks did not do their best and performed their duties proper.

In the evening of January 31, local news released that according to the investigation team's feedback, during work, there was slackness in Huajiahe Town local government. In the afternoon of February 2nd, the Hubei Provincial Commission for Discipline Inspection and Supervision reported 6 typical problems and poor performance of duties in the incident. According to the report, the party committee and government of Huajiahe Town performed purely. Town Party Committee Secretary Wang Baoquan and Mayor Peng Zhihong were removed from their office. Others who failed to take their responsibilities will all be punished accordingly.

The outbreak of NCIP was unexpected, and it develops and spreads rapidly in large scale. Till now, there are few confirmed cases in rural areas. But it has great concealment and children in rural China are easily ignored in this epidemic. At present, for the sudden outbreak of NCIP, the prevention and diagnosis of children in remote rural areas required attention. Villages and

village health centers and volunteer teams should report immediately. And by means of the internet, anti-epidemic publicity and assistance in first time through online information such as mobile phone WeChat and Weibo should be carried out. In this case, the Chinese local government made a proactive response and imposed legal sanctions on issues such as the lack of enforcement power of the personnel involved, strictly investigated and dealt with unhealthy clerks in the prevention and control of the epidemic.

3.2.2 Public health education for rural children in developed countries

The Chinese government has made great efforts in education equity in recent years, the quality of education for rural children has improved significantly. However, there is still a need to further strengthen systemic projects and to do more longitudinal research on continuous child health education in rural schools. In terms of school health education, the U.S. National Centers for Disease Control and Prevention (CDC.gov)'s Healthy School Program uses the WSCC (Whole School, Whole Community, Whole Child) model as a framework to promote school health education. And this is also a framework to manage, improve, and evaluate students' health and promote the training of relevant professionals. The framework contains ten elements: physical education and activities, nutritional environment and services, health education, social and emotional atmosphere, physical environment, health services, psychological counseling and social support services, employee's health, community participation, and family participation.

Detailed standards have been formulated to help teachers and parents evaluate their own health behaviors and habits, as well as their ability to care and manage their own health (Rooney, video, and birch, 2015). Some Australian researchers proposed that the main reason for the lack of health education in rural areas is the shortage of doctors, and a "short-term accommodation" program can be adopted to provide health professionals with a rural background (Kruger and Tennant, 2000). A other study of the use of video conferences to provide psychological services to rural children has been conducted by researchers who believe that children in rural areas are suffering from a lack of psychologists and other behavioral health professionals, especially those with expertise in treating youth.(Duncan, Velasquez, and Nelson, 2015).

A detailed and comprehensive plan in school education in response to an outbreak is a key part of the epidemic prevention and control. The Outbreak Management Manual developed by the Ministry of Health and Human Services of Newfoundland Labrador Province, Canada in 2015 aims to provide provincial policy and procedure making basis for epidemic prevention and control, which certainly allows necessary flexibility. Dr. Xie Ailei believes that the characteristics of this provincial-level guidance document are: first, emphasizing the importance of information communication between relevant parties; second, adhering to the information transparency and disclosure; third, establishing professional standards, such as how to form an epidemic management team, how to set up standard epidemic control procedures, how to define and determine the epidemic, how to carry out pre-, mid-and post-epidemic summaries, all of the above have been offered with detailed explanations; fourth, an action framework may offer people more behavioral authority; fifth, taking a long-term perspective, a post epidemic evaluation and suggestions for improvement are required and the appendix is of great reference value for formulating policies. It is particularly worth mentioning that one of the three main purposes of the manual is to ensure the protection of vulnerable groups immediately.

Health education for rural children in China can learn from the experience of developed countries. In daily rural school health education, medical graduates can provide with professional health education in rural areas through internships. At the same time, internet, telematics and other technological means can provide health education and basic medical services for children in rural areas. In addition, regional epidemic management strategies in developed countries is a good example, which could formulate epidemic management documents and implementation manuals to be used as practical courses K-12 schools, especially in rural schools. Although the epidemic has not completely dispersed, China has set a good example for the world, especially for developing countries.

Recently, the Chinese government is actively responding to the outbreak of infectious diseases. It is urgent to resolutely quarantine all suspected patients in accordance with the "Four Concentrations" requirements: firstly, to compress the process of screening and diagnosis. It is necessary to resolutely control the source of infection; simplify the procedures for diagnosing, and avoid delays for mild patients and home-based quarantine observers to become serious. Secondly, all suspected cases should be intensively isolated. All suspected cases should be quarantined, tested, diagnosed and treated to prevent cross-infection. All localities should speed up the setting up of designated hospitals and establish isolation wards by requisitioning hotels, guest houses, idle factory buildings, etc.; Third, to do everything possible to improve the ability to receive and treat patients. It is necessary to continue to coordinate the deployment of medical resources to vacate as many beds as possible, speed up the progress of new and reconstructed hospitals, accelerate the transformation of general wards for patient treatment; accelerate the speed of bed turnover, and treat more and more urgently needed patients. Fourth, to strengthen the epidemic search work. All streets must establish special classes for community epidemic search, carpet-type search for suspected cases, strictly implement the medical observation system, build files, make records, and report abnormalities immediately. In particular, article 4 has adopted a positive response to remote rural areas. Facing the outbreak of crisis, the international academic community should consider how to take action to study the specific operation of the response strategy. At the same time, international scholars also need to learn from China's active response and conduct extensive research and follow-up reflections.

4 Conclusion and Discussion

This article clarified the reports on children's prevention of NCIP in the public new media. Based on a case study, the situation of rural children in the epidemic was analyzed, and the experience of rural public health education in developed countries was used as examples to provide references for the developing countries. By February 2, 2020, the confirmed cases had reached 10,000 or more in China. The epidemic is spreading widely and rapidly. With its large population, the Chinese government has made great efforts to make such an active response. Moreover, there are few international precedents to learn. With a population of 14 million in Wuhan, the government try to integrate the whole society's human and material resources to support the epidemic-stricken areas in such a short period. Combining it with the development of the epidemic in China and the current children's anti-epidemic education in rural areas, this article proposed that as a vulnerable group, the state, schools and the society should give full attention and provide assistance for rural children.

Firstly, relevant policies and regulations on health in rural areas should be established and improved, and more importantly, a practical and smooth implementation mechanism also need to be established. Article 17 of the "Law of the P.R.C on Prevention

and Control of Infectious Diseases" stipulates that an infectious disease surveillance system, the health administration department of the State Council formulates national infectious disease surveillance plans and programs have been established, and the health administration departments of the local governments should formulate local plans and programs directly under the guide of the Central Government. Although the existing infectious disease control laws already have examples, there are no specific programs for rural areas. In addition, the establishment of a public health security system is critical. Recalling the SARS period, on April 4, 2003, the US President Bush specifically signed an executive order that gave public health agencies the right to isolate and quarantine patients with SARS and related diseases. In order to do a good job in communication and ensure information transparency, their websites were frequently updated and they were notified daily to the media (Huang, 2003). Some scholars have called for the Chinese government to take this as an opportunity to speed up the establishment of China's modern and emerging high-risk virus defense mechanism and to promote the development of the biotechnology industry (Hu, 2003). Other developing countries should learn to establish a public safety and health system and corresponding accountability mechanisms, and pay special attention to the group of vulnerable children in rural areas. This study finds that the nation is more concerned about the establishment of public health policies, laws and regulations targeting at vulnerable areas and child groups. When the Africa national policy was promulgated in the research on rural maternal and child health in Africa, little practical strategy was mentioned (Murphy, Goma, Mackenzie, et al, 2014). China's major sudden epidemic fully reveals that while national policies, laws and regulations have been designated, more attention should be paid to its practical and smooth implementation paths and mechanisms.

Second, during the holidays, the school can carry out physical and mental health education for students through the internet, telephone, text message, WeChat, etc., and publicize the requirements for epidemic prevention and control to students and parents in rural areas, and guide rational understanding and scientific prevention and control of the epidemic. Health education can be integrated into the study of various subjects in school, and can also be carried out through various activities. People often focus on children's physical harms by illnesses, and ignore the mental heal to help students understand the true status of the epidemic and establish scientific concepts, to guide the students taking the medical workers as models and learn their self-dedication in the fighting, to guide students to optimistically face problems in the epidemic and know how to effectively seek psychological and other assistance. Finally, schools should carry out education for epidemiological prevention and treatment, so that students can clarify the basic principles of disease control and actively carry out various forms of public health education for their peers. As international studies have focused on children's physical health (McCormack and Meendering, 2015), China has also paid special attention to children's mental health in the fight against the epidemic.

Third, in response to this epidemic, the Ministry of Education of China has taken active measures. On January 27, the Ministry of Education took the lead in proposing that the spring semester of 2020 be postponed. It is required that schools of all kinds at all levels should strengthen the guidance for students' study and life during the winter vacation. Online tutoring can provide a series of free courses for rural areas, and introduce online libraries, museums, etc. into rural education system, which avoids personnel contacts without delaying students' learning. At the same time, online psychological counseling is introduced to rural areas to help children better understand the

epidemic and relieve their fear. For example, the Department of Psychology of Beijing Normal University and the Beijing Normal University Psychological Counseling and Service Center urgently prepared the opening of a psychological support hotline counseling service. Public health education in rural areas in Australia mentioned that the state should arrange for experts to conduct health education (Barr, Duncan and Dally, 2018). There are free online consultations in China, especially for rural areas.

With today's highly developed information technology, researchers have an easier access to public opinions in a timely manner. The timeliness of integrating information in the era of big data has overcome the limitations of the past. This article only conducts text analysis and case analysis of hot discussed articles on the WeChat platform. It has not reached a large user group and the high reading volumes. Though the research results reflect the current focus and attitude of educators on NCIP to a large extent, the selected sample size is small, it is necessary to further expand the sample size and conduct in-depth research in combination with questionnaires and interviews to explore how rural schools and communities can more effectively improve their performance. We call on that local non-official organizations and people of all walks join in the prevention and treatment of infectious diseases, since they can guarantee more rural children to receive both physical treatment and spiritual comfort in facing with public health problems.

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