

Analysis of COVID-19 epidemic data in Chinese mainland

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Abstract: COVID-19 is the most extensive global pandemic affecting mankind in the past century, and it is a serious crisis and a severe test for the whole world. Human life security and health are facing a major threat. The aim of this study was to analyze the epidemic situation in Chinese mainland in November 2022. Based on the data given on the official website of the National Health and Wellness Commission of China, the data on the outbreak of infected persons during the period from 0:00 a.m. on November 1, 2022, to 24:00 a.m. on November 30, 2022, were quantitatively analyzed by means of statistical analyses. The overall epidemic trend graph we plotted through EXCEL, and descriptive statistics were analyzed according to the data on the spread of the epidemic, deaths and cures. The results showed that the data for the whole month of November showed a slow and almost linear increase in the number of deaths, and the number of cures continued to increase at a higher rate than the number of deaths. The average mortality rate was 1.85%, with a minimum of 1.61% on November 30, while the cure rate had a maximum of 96.13% and a minimum of 86.84%. The stabilization of the cure rate and the low fluctuation of the mortality rate indicate that the Government's emergency response has been effective. China established a national emergency management system after the SARS outbreak in 2003, emphasizing hierarchical responsibility and territorial-based public health emergency management. In order to improve public health services, it is necessary to strengthen the planning of public health emergencies, improve the capacity of medical institutions and health administrative departments, increase resource investment and personnel training, and establish an incentive system for medical personnel. It is also crucial to strengthen the rule of law in public health, raise public health awareness, and enhance international exchanges and cooperation. These measures will help improve society's ability to respond to public health incidents and safeguard the health and safety of citizens.

1. Introduction

The global spread of COVID-19 has had an unprecedented impact, involving more than 200 countries and territories and resulting in more than 220 million confirmed cases and over 4.5 million deaths. This outbreak is caused by a new coronavirus called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which is alarmingly highly infectious. The World Health Organization declared COVID-19 a global pandemic on March 11, 2020, a decision that highlights

the serious threat the disease poses to global public health. As of August 6, 2021, there were reportedly more than 200 million confirmed cases and more than 4.25 million deaths worldwide. The pandemic has triggered a severe global crisis that has plunged the world economy into a state of collapse not seen since the 1918 influenza pandemic [1]. Learning lessons from the COVID-19 pandemic is critical. Therefore, we have not only provided an in-depth analysis of the data released in 2022, but also looked at the current weaknesses in the public health emergency response system and proposed measures to address them. These measures aim to strengthen the resilience and response of the public health system to better address similar challenges that may arise in the future.

In order to better understand the spread trend, scope and severity of the epidemic. By analyzing data, we can understand the changes in key indicators such as the number of infections, mortality, and recovery rates, and provide scientific basis and suggestions for the government, medical institutions, and the public to help them make timely and accurate decisions for possible future events. Be forewarned of difficulties encountered and be prepared.

The article is structured as follows Part I introduces the background and need, Part II provides a literature review, Part III briefly describes the sources of data sources and analyzes the methodology, Part IV shares the results of analyzing the trend of transmission and the trend of mortality and cure rates, Part V discusses and gives recommendations, and finally concludes.

2. Literature review

The COVID-19 outbreak in China has attracted a great deal of public attention, as evidenced by studies that analyzed the level of public concern about COVID-19-related events through social media platforms such as Sina Weibo [2,3].

These studies identified trends in public concern about the outbreak, which can be categorized into different stages. In addition, studies have been conducted to track the spatial and temporal distribution and trends of COVID-19 cases in specific regions of China to explore the patterns of disease transmission and the impact of control measures, and to illustrate the potential for drowning out even such a good situation if the outbreak continues to develop rapidly [4]. Having identified population size as a key variable in predicting the spread of COVID-19, the study utilized this information to assess the strength of public health interventions and to develop a dynamic model for predicting the spread of the virus [5].

The impact of the epidemic on mental health was also examined, focusing on depressive symptoms among university students in Wuhan, China, during the normalization phase of COVID-19 prevention and control. The study found that 15.8% of non-graduating undergraduates in Wuhan experienced moderate to severe depressive symptoms. Those students who experienced negative experiences during COVID-19, lacked support from family and friends, used electronic devices for longer periods of time each day, and faced back-to-school anxiety had a higher likelihood of developing depressive symptoms. The authors recommend developing targeted psychological interventions for college students and encouraging them to actively seek professional psychological help to improve their mental health [6].

In addition, the study also focused on the impact of public health events such as vaccine hesitancy on social media platforms to understand public perceptions and behaviors on COVID-19 related issues. The results showed that public attitudes were more positive when positive news about COVID-19 vaccines emerged, and vice versa. These research results emphasize the important role of public opinion in public health events in China [7]. Then the relationship between government information supply and public information demand in the early stages of the outbreak in China was studied, aiming to improve the government's communication effectiveness in public health crises [8].

Ensuring fair access to COVID-19 testing facilities is crucial for public health. This study examines the distribution of testing sites in urban and rural areas to safeguard residents' health rights and enhance social well-being. The authors suggest that future research should integrate more nuanced data into the model to yield precise outcomes, better capturing the accessibility of testing services[9]. Additionally, the functionality and quality of China-specific epidemic prevention and control applications were evaluated to understand their role in outbreak management during the pandemic. By reviewing existing apps on the Chinese app market and WeChat platform, it was found that apps with a larger number of users are being used for COVID-19 prevention and control efforts. However, the author recommends that relevant departments urge software developers to standardize the privacy protection policies of epidemic prevention and control software, strictly manage the large amounts of personal health data collected in the software, and standardize the traceability management of data use. [10].

In addition, the study by Xu and Yang focuses on analyzing China's public health emergency measures during the COVID-19 epidemic. Through quantitative and qualitative analysis, it was found that my country has effectively controlled the spread of the epidemic to a certain extent. For example, the number of deaths increased linearly, the number of recoveries increased exponentially, and the number of confirmed cases increased linearly, with the slope first increasing and then decreasing. However, there are still some weak links. To this end, it is recommended to strengthen and improve the emergency management system, public health services, legal system, citizen health education, and international exchanges and cooperation to enhance the ability to respond to public health crises[11]. Evaluated the impact of the COVID-19 epidemic on health-related quality of life in China and found that factors such as older age, chronic disease, and lower income were associated with increased risks of pain, discomfort, anxiety, and depression during illness.

Together, these research findings offer valuable perspectives on different facets of the COVID-19 epidemic in China, covering environmental effects, mortality rates, efficacy of containment strategies, and the application of AI models for prediction and management of the outbreak.

3. Method

3.1 Data source

The data were obtained from the distribution of COVID-19 outbreaks from 0:00 November 1, 2022 to 24:00 November 30, 2022 published on the official website of the National Health and Wellness Commission of China, with a time period of 30 days.

Since the real-time COVID-19 outbreak data in China will not be updated after December 28, 2022, the data for this study were from November 1 to 30, 2020 in the earlier period.

3.2 Analysis method

The paper selected Cumulative reported confirmed cases, New confirmed cases in Chinese mainland, Cumulative number of cured and discharged cases, Cumulative deaths and other indicators, used excel to plot the overall trend of COVID-19 in China, and analyzed the COVID-19 epidemic in November 2022, existing public health emergency management frameworks and capabilities are discussed and recommendations for discussion content are provided.

4. Results

4.1 Trends in total COVID-19 spread

Table 1 below shows real-time data released by the National Health Commission in November 2022, which shows the growth in the number of patients, the cumulative number of confirmed cases, the number of new infections per day, and the total number of people cured up to this point in time during the month. Cumulative reported confirmed cases in this paper refers to the total number of confirmed cases in the country from the beginning of the epidemic until November 2022. In Figure 1, the cumulative number of infected cases continues to increase at a faster and faster rate, and the cumulative number of infected cases in the country as of November 30th was 323,686 people.

Table 1: COVID-19 specific data for November 2022

	Cumulative reported confirmed cases	New confirmed cases in Chinese mainland	Cumulative number of cured and discharged cases	Cumulative deaths
11/1	260,971	465	250,891	5,226
11/2	261,552	581	251,162	5,226
11/3	262,309	757	251,486	5,226
11/4	262,966	657	251,737	5,226
11/5	263,554	588	252,004	5,226
11/6	264,123	569	252,280	5,226
11/7	265,013	890	252,543	5,226
11/8	266,359	1346	252,820	5,226
11/9	267,544	1,185	253,163	5,226
11/10	268,753	1,209	253,612	5,226
11/11	270,257	1,504	254,112	5,226
11/12	271,968	1,711	254,567	5,226
11/13	273,762	1,794	255,147	5,226
11/14	275,420	1,661	255,721	5,226
11/15	277,043	1,623	256,472	5,226
11/16	279,431	2,388	257,033	5,226
11/17	281,793	2,362	258,090	5,226
11/18	283,930	2,137	258,995	5,226
11/19	286,197	2,267	260,141	5,227
11/20	288,562	2,365	261,123	5,229
11/21	290,787	2,225	262,260	5,231
11/22	293,506	2,719	263,645	5,231
11/23	297,516	4,010	265,471	5,232
11/24	300,619	3,103	267,223	5,232
11/25	304,093	3,474	269,116	5,232
11/26	307,802	3,709	271,159	5,233
11/27	311,624	3,822	273,262	5,233
11/28	315,248	3,624	276,048	5,233
11/29	319,536	4,288	278,687	5,233
11/30	323,686	4,150	281,106	5,233

However, New confirmed cases in Chinese mainland is specifically expressed as the increase in

the total number of infections imported locally and from abroad for each day in November, as shown in Figure 2, the overall trend shows an increasing trend, the growth was slower from November 1 to 7, and the daily growth included both local infections and infections by people from abroad, with the daily increase not exceeding 1,000 new infected people, but from November 8 onwards, the number of new infected people increased to 1,000 per day. But from the 8th the number of new infected people began to increase, and the growth rate accelerated, in the 23rd, 29th and 30th the number of new people increased significantly have exceeded 4,000 people, the highest of 4,288 people. The fastest growth occurred on the 23rd, from 2,719 to 4,010, but then there was some decline, the number of infected people dropped briefly due to the tightening of control, but the overall trend remained the same.

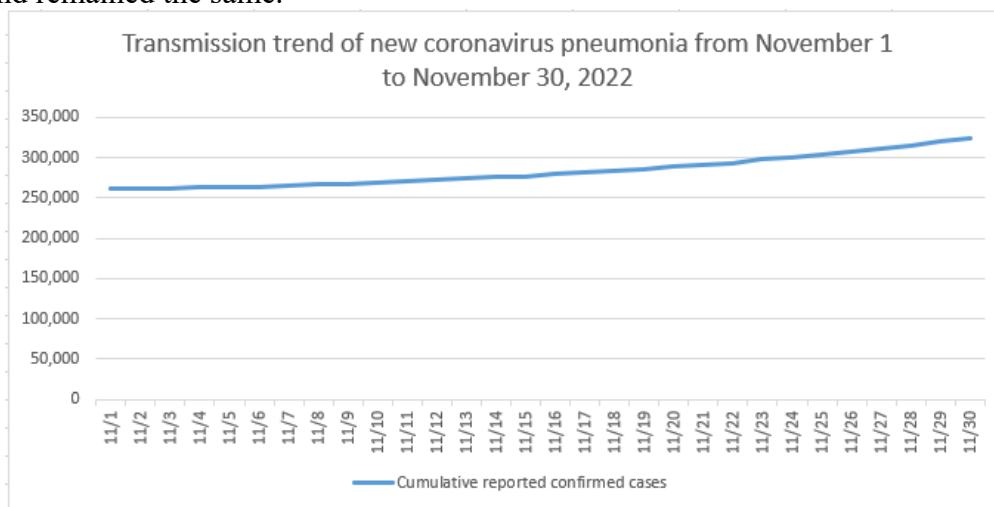


Figure 1: Transmission trend of new coronavirus pneumonia from November 1 to November 30, 2022



Figure 2: New confirmed cases in Chinese mainland

4.2 Trends in deaths and cures

The number of deaths increased very slowly, almost in a straight line, with the fastest increase

occurring on the 20th and 21st, when the number of deaths was 2 and locally infected. The number of cured people increased day by day, showing an exponential growth trend, as shown in Figure 3, the growth rate of the number of cured people is significantly higher than the growth rate of the number of deaths. The study used the number of deaths and cures divided by the cumulative number of diagnoses to obtain specific mortality and cure rates.

$$R_m = \frac{M}{N} * 100\% \tag{1}$$

$$R_c = \frac{C}{N} * 100\% \tag{2}$$

The final results show that in the whole month of November 30 days of data, the lowest mortality rate of 1.61% occurred on November 30, the highest mortality rate of 2% occurred on November 1, and the average mortality rate for the whole month was 1.85%. On the other hand, the highest cure rate in November was 96.13%, which occurred on November 1, and the lowest was 86.84%, which occurred on November 30, with an overall average cure rate of 92.01%.

While a consistently high cure rate indicates an abundance of medical resources and a gradual recovery of most of the healthcare sector that was hit hard at the beginning of the epidemic, the cure rate tends to decrease slightly over time, largely due to the fact that more patients than usual were diagnosed within a short period of time. The fact that the cure rate has maintained its value and the mortality rate has fluctuated little suggests that the government's emergency interventions have been effective and that the emergency management system has played an important role.

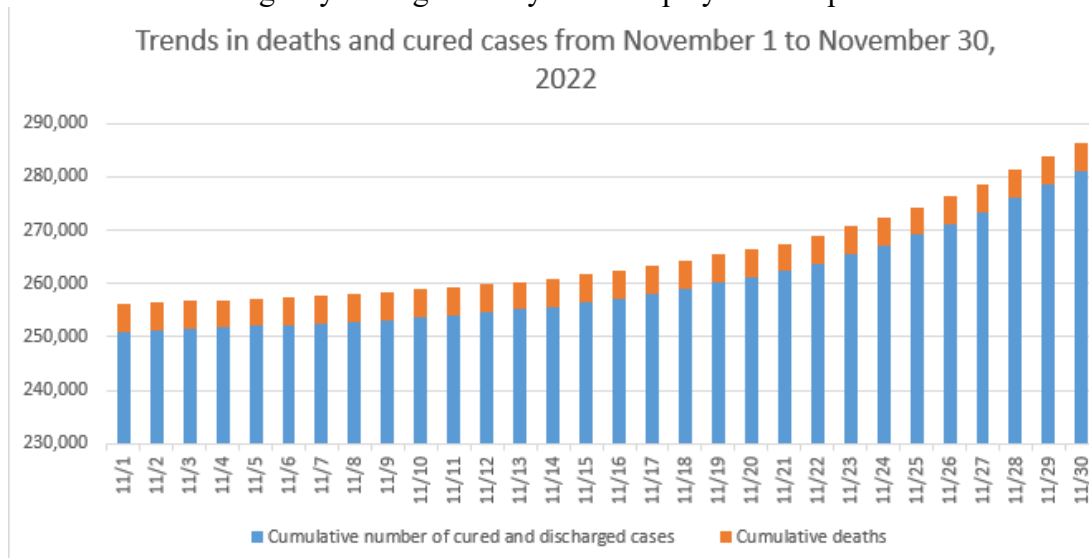


Figure 3: Trends in deaths and cured cases from November 1 to November 30, 2022

5. Discussion

As early as 2003, after the end of SARS, China established a national emergency management system at the macro level, consisting of an emergency response plan and an emergency management system, mechanism and legal system. On the basis of summarizing the prevention and control of sudden acute infectious diseases such as SARS, a public health emergency management system with hierarchical and territorial responsibility was established.

Although the public health emergency management mechanism was quickly launched, there are still weak links in the management system, emergency plans, support capabilities, social publicity

and health education during the epidemic response process. If these problems persist, once an emergency occurs again, people will be at a loss what to do and it will have a serious negative impact. So, here are some suggestions for known weaknesses:

5.1 Improve the public health service system

In order to improve the public health service system, we propose to strengthen the construction of an emergency response plan system for public health emergencies, categorize and formulate emergency response plans, and clarify and standardize the specific contents of the plans. Emphasis has been placed on improving the ability of medical institutions and health administrative departments at all levels to respond to and manage public health emergencies. We propose to increase the investment of medical and health resources in the public health service system, strengthen the training of public health teams and personnel, and improve the personnel structure. A system of incentives for medical personnel has been established, and the treatment of medical personnel has been improved.

5.2 Strengthen the rule of law in public health

Strengthening the rule of law in public health is an important measure to ensure public health security in society. This includes legislative improvement, the establishment of a sound regulatory and emergency response mechanism, the strengthening of intersectoral collaboration, the enhancement of public awareness and knowledge, and the strengthening of international cooperation. Through the comprehensive implementation of the above public health and legal measures, we can effectively enhance society's ability to prevent, control and respond to public health events, and protect the health and life safety of citizens.

5.3 Improve public health awareness

Improving public health awareness needs to be carried out through education and publicity, media communication, community services, role models, innovative technologies and other methods. Specific methods can be carried out to provide convenient science education to the masses by producing brochures, popular science books, etc. Or hold small publicity activities in the community, and often invite infectious disease doctors and experts to give free scientific lectures, so that most people who have not studied the basic knowledge and concepts of epidemic prevention in depth can master the basic skills to deal with sudden infectious diseases.

5.4 Promoting international exchanges and cooperation

International exchanges and cooperation require the establishment of an open and transparent information-sharing mechanism, the strengthening of cooperation and coordination among international organizations, and the promotion of the signing and implementation of multilateral and bilateral cooperation agreements.

It should learn from the World Health Organization and other advanced public health emergency management systems in the world, including emergency management organizational systems, operational models, early warning and monitoring, scientific research and experimentation, and civic education. China should actively participate in international academic exchanges on the prevention and control of epidemics and work closely with its counterparts around the world to share research results and jointly combat infectious diseases.

6. Conclusion

This study analyzed the COVID-19 epidemic in Chinese mainland in November 2022, and the data showed that the number of deaths increased slowly and the number of cures continued to increase, with an average mortality rate of 1.85% and an average cure rate of up to 96.13%. On this basis, China has established a national emergency management system, emphasizing public health emergency management, and proposing measures such as improving the plan, strengthening the capacity of medical institutions, strengthening the rule of law, and enhancing public awareness, in order to cope with the challenges of a global pandemic and safeguard citizens' health and safety.

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