

Analysis of CDC's Role in Public Health Emergencies

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Abstract: *Objective:* To explore the role of the Centers for Disease Control and Prevention (CDC) in public health emergencies. *Methods:* The details of 12 public health events that occurred between January 2021 to December 2022 were analyzed to explore the roles of the CDC. *Results:* There were 160 patients involved in 10 public health events in 2021 and 48 patients involved in 2 public health events in 2022. Besides, the proportion of school public health events in 2022 was 0%, which was lower than in 2021, which was 80% ($P < 0.05$). 99.38% of patients during public health events were sent to the hospital promptly in 2022, which was higher than that in 2021, which was 81.25% ($P < 0.05$). Furthermore, the average time taken for the CDC to control public health events in 2022 was 20.11 ± 1.62 hours, and the average time taken to send inspection reports was shorter than that in 2021. The public satisfaction score was also higher in 2022 compared to 2021 ($P < 0.05$). *Conclusion:* The role of the CDC is to control infectious diseases. Therefore, it is important to pinpoint the existing problems in the strategies implemented by the CDC so that more improvements can be made to better prevent infectious diseases.

Keywords: Public health events; Emergencies; Centers for Disease Control and Prevention; Infectious disease

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1. Introduction

Public health events are emergencies that can endanger public health, such as infectious diseases, food poisoning, occupational poisoning, and group deaths with unknown causes. The Centers for Disease Control and Prevention (CDC) is a national organization for preventing and controlling public health events^[1]. Due to the hazardous, unpredictable, and group nature of public emergencies, the China CDC faces a series of challenges when handling these situations^[2]. Therefore, the experiences in handling such events should be gathered to improve coping strategies and protect the lives of the people^[3]. This paper presents a retrospective analysis of the data from 12 social public events that occurred from January 2021 to December 2022 and discusses the importance of the CDC in responding to public health events.

2. Material and methods

2.1. General information

The data from 12 social public events from January 2021 to December 2022 were analyzed retrospectively. There was no difference between patients' general information in 2021 and 2022 ($P > 0.05$), as shown in **Table 1**.

Table 1. Data analysis table of patients in social public health emergencies

Year	No.	Gender		Age (years)	
		Male	Female	Range	Average
2021	160	82 (51.25)	78 (48.75)	16–72	28.41 ± 2.43
2022	48	25 (52.08)	23 (47.92)	16–73	28.39 ± 2.44
χ^2/t		0.0103		0.0500	
<i>P</i>		0.9193		0.9602	

2.2. Methods

The data of 12 social public health incidents were tabulated, including the occurrence, type of event, and number of patients, and the CDC's role in these events was analyzed. Subsequently, the shortcomings of the CDC were discussed and relevant countermeasures were proposed.

2.3. Observation indicators

(1) Number of public health events

The number of occurrences and the number of patients involved were recorded.

(2) Types of public health emergencies

Outbreak of infectious disease, school public health events, and social public health events.

(3) Timeliness of medical treatment

The timeliness of medical care is assessed through patient tracking and follow-up during public health emergencies. Patients with mild symptoms who received timely treatment and recovered well without any residual effects were rated as excellent. Patients with moderate to severe symptoms who received prompt treatment, experienced mild complications, and were not significantly impacted in their daily lives or studies were rated as good. If there was a lack of timely treatment, leading to severe complications and a significant impact on daily life and studies, the rating was poor. In cases where patients unfortunately passed away due to a lack of timely medical care, they were rated as not receiving timely medical attention^[4].

(4) Work quality

A self-made satisfaction scale was used to evaluate the patients' satisfaction with the CDC during a health event, which includes items like the time taken to control public health events and to send inspection reports.

2.4. Statistical analysis

The data was analyzed using SPSS 21.0. The count data was expressed in percentages and analyzed with a χ^2 -test. The measurement data was expressed in mean ± standard deviation and analyzed with a *t*-test. $P < 0.05$ indicates statistical significance.

3. Results

3.1. Number of emergencies

In 2021, 160 patients were involved in 10 public health events, while in 2022, there were 48 patients involved in 2 public health events. A statistically significant difference ($P < 0.05$) was observed between the two years, as presented in **Table 2**.

Table 2 Comparison of the number of social public health emergencies (*n* [%])

Year	Starting number (<i>n</i> = 12)	Number of patients (<i>n</i> = 208)
2021	10 (83.33)	160 (76.92)
2022	2 (16.67)	48 (23.08)
χ^2	10.6667	120.6154
<i>P</i>	0.0011	0.0000

3.2. Types of emergencies

In 2022, the incidence rate of school public health incidents was 0.00%, significantly lower than the 80.00% incidence rate observed in 2021 ($P < 0.05$), as shown in **Table 3**.

Table 3. Comparison of types of social public health emergencies (*n* [%])

Year	Outbreak of infectious disease	School health events	Public health events
2021 (<i>n</i> = 10)	1 (10.00)	8 (80.00)	1 (10.00)
2022 (<i>n</i> = 2)	1 (50.00)	0 (0.00)	1 (50.00)
χ^2	1.9200	4.8000	1.9200
<i>P</i>	0.1659	0.0285	0.1659

3.3. Timeliness of medical treatment

In 2022, 99.38% of patients involved in public health events were promptly transported to the hospital, which was significantly higher than the rate of 81.25% observed in 2021 ($P < 0.05$), as indicated in **Table 4**.

Table 4. Timeliness comparison of patients sent to hospital (*n* [%])

Year	Excellent	Good	Poor	Not timely	Rate of excellence
2021 (<i>n</i> = 160)	100 (62.50)	48 (30.00)	12 (7.50)	0 (0.00)	92.50
2022 (<i>n</i> = 48)	42 (87.50)	5 (10.42)	1 (2.08)	0 (0.00)	97.92
χ^2	-	-	-	-	37.4400
<i>P</i>	-	-	-	-	0.0000

3.4. CDC work quality

In 2022, the time taken by the CDC to manage public health events (20.11 ± 1.62 hours) and the time taken to send inspection reports (4.05 ± 0.96 days) were shorter than the corresponding durations in 2021. Additionally, the public satisfaction score (94.36 ± 3.15) was higher in 2022 compared to 2021 ($P < 0.05$), as indicated in **Table 5**.

Table 5. Comparison of work quality among CDC centers (mean \pm standard deviation)

Year	Time taken to control public health events (h)	Time taken to send inspection reports (d)	Public satisfaction score (points)
2021 (<i>n</i> = 160)	26.42 \pm 2.75	6.28 \pm 1.25	87.62 \pm 2.88
2022 (<i>n</i> = 48)	20.11 \pm 1.62	4.05 \pm 0.96	94.36 \pm 3.15
<i>t</i>	19.7971	13.1131	13.2521
<i>P</i>	0.0000	0.0000	0.0000

4. Discussion

4.1. Problems in the work of the CDC

(1) Insufficient monitoring capacity: Some Chinese CDCs lack adequate staff training, and the training content lacks standardization. Consequently, most frontline personnel lack the necessary skills to address public emergencies. Furthermore, CDC personnel often lack awareness of emergency protocols. Efficient reporting is crucial during a public health event. False reporting or delayed reporting due to incorrect judgment by inexperienced physicians can extend the time required for disease control ^[5]. (2) Problems with detection equipment: Some CDC instruments and equipment have limitations in detecting diseases, particularly in the context of pathogenic microorganism and bacteria detection. The accuracy of these detections may not meet the modern standards of disease prevention and control. Furthermore, with changing lifestyles and the growing complexity of disease causes, diagnoses, and treatment protocols, outdated equipment falls short of the requirements for modern public health event prevention and control. (3) Poor quality of staff: Public health emergencies are sudden and they come with many uncertainties. These characteristics lead to a lack of preparedness among the staff. Additionally, the disorganized on-site deployment further exacerbates the situation, resulting in the frequent occurrence of public health emergencies ^[6].

4.2. CDC's response strategy

Several countermeasures can be taken based in view of the existing problems. (1) Improving the management system of the CDC: The purpose of setting up the CDC is to prevent and control public health emergencies, so it is necessary to improve the management system of the CDC by establishing a standardized command system for all CDC. For example, in 2002, governments at all levels improved the unified command system when dealing with the SARS virus. Modern medical technology and professional knowledge were utilized to prevent and control the spread of infectious diseases. (2) Improving the capabilities of CDC staff: The staff training for CDC should be strengthened. For example, previous experiences in dealing with public health events can be shared to the staff members so that they can perform better during a public health event. (3) Preparing sufficient materials: Local government departments should increase their investment in local disease control centers and upgrade relevant equipment to improve on-site detection efficiency and accuracy. (4) Strengthening on-site management and control: when a public health event occurs, CDC personnel must rush to the scene immediately and formulate an emergency plan. Besides, they should identify and diagnose individuals with suspected infections and find and contain the source of infection as soon as possible. In addition, they should also adopt efficient plans to stop the transmission of diseases and viruses. For example, in cases of collective food poisoning, suspected food items should be retrieved to break the chain of virus transmission. The site where the breakout occurs should also be disinfected ^[7].

In summary, public health emergencies have the following characteristics. (1) Multiple causes: These emergencies are related to various factors, including natural disasters, accidents, animal epidemics, microbial infections, food poisoning, and occupational poisoning. (2) Variability in distribution: This includes differences in seasonal distribution, geographical distribution, and distribution among various population groups. (3) Extensive spread: If the infectious disease involves transmission routes, sources of infection, and susceptible populations, it can spread widely. (4) High risk: Major public health emergencies pose a significant risk to the lives and health of the general population and can have substantial impacts on local environments and economies. (5) Governance challenges: Addressing public health emergencies requires comprehensive management efforts. (6) Emergence of new events: Different types of viruses are associated with various public health events, and new viruses continue to emerge ^[8].

4.3. The role of the CDC

During the prevention and control of public health emergencies, the CDC assumes several vital roles: (1) Information dissemination: Local CDC should engage in continuous public awareness campaigns to educate the local population about infectious diseases. This can be achieved through the distribution of informational brochures, multimedia presentations, and other means. CDC should organize preventative measures, conducts drills, and updates emergency plans to align with local conditions. (2) Prevention and preparedness: Public health emergencies are inherently unpredictable in terms of duration, scope, and scale. Therefore, it is imperative to promptly collect and analyze various data, refine prevention and control measures based on this data, and generate early warning reports. These actions contribute to the development of more effective prevention strategies. (3) Collaboration: The CDC plays a pivotal role in fostering collaboration among various departments, facilitating coordination between multiple institutions and government bodies. This enhances the overall efficiency of disease prevention and control efforts, reduces public losses, restores social order, and ensures the safety of lives and property^[9].

Our analysis revealed that the CDC has some shortcomings in its response to public health emergencies. Therefore, several measures should be taken to improve the efficiency of the CDC. Firstly, there is a need for stronger prevention and control strategies that can efficiently contain the spread of diseases and protect public safety. Additionally, improving the quality of public health education and awareness campaigns is crucial. Ensuring that emergency supplies are up-to-date and well-maintained will help alleviate public panic during crises. Staff training, particularly related to emergency response plans, should be an ongoing priority with assessments to enhance workforce competence. Making CDC contact information readily available to the public is essential for rapid communication and response. Lastly, it is vital that CDC personnel report and respond swiftly to public health emergencies, especially in terms of timely patient care, which can significantly reduce mortalities^[10].

5. Conclusion

In conclusion, the CDC plays a pivotal role in preventing and controlling public health emergencies. They enhance public awareness, minimize disease transmission, and shorten the time for disease prevention and control, thereby playing a crucial role in protecting public safety and lives.

Disclosure statement

The author declares no conflict of interest.

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