Research Article

Research on Early Warning and Forecasting System of Public Health Emergencies Based on Complex Network

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It is an important research field related to the national economy and the people’s livelihood to establish and improve the crisis early warning management of public health emergencies and improve the timeliness and accuracy of prediction and early warning. The outbreak and spread of infectious diseases is a typical complex system composed of etiology, host, and environment. From the perspective of complex network, this paper combines infectious disease dynamics with biostatistics and simulation, analyze the transmission characteristics and process of infectious diseases on complex networks, and simulate the implementation effect of various prevention and control measures. It seeks the optimal strategy for its prevention and control, so as to provide decision-making basis for the study of infectious disease emergencies. And it simulates the evolution process of social contact network driven by people’s daily behavior. The results show that the transmission speed of infectious diseases in home networks is significantly lower than that in public networks. Through simulation analysis and effect evaluation, good results have been achieved, which can provide accurate and rapid decision-making for emergency managers. It proves the feasibility of the model. This study provides a new research perspective for infectious disease prevention and control.

1. Introduction

In recent years, emergencies in the field of health have emerged frequently and become the focus of attention all over the world under the background of globalization. Because they are sudden, latent, and destructive, we are required to be ready to meet them at all times. The early warning system for public health emergencies has become a hot spot in today’s academic circles [1]. Infectious illnesses have a significant influence on humans. When it is severe, it may put people’s lives in danger, and the spread of an epidemic can generate fear and unrest across society. It is of considerable theoretical value and practical importance to create realistic epidemic prevention and control strategies of infectious illnesses on the basis of explaining the occurrence mechanism and transmission law of infectious diseases [2]. This is a good time to nip the issue in the bud or at least mitigate the damage. China has developed a set of effective public health emergency management mechanisms after years of study. Preventive actions, on the other hand, are the greatest way to cope with public health crises. [3]. In the face of the major hazards that may be brought by public health emergencies, if the development trend can be accurately predicted before the outbreak, the damage will be reduced. The focus of traditional epidemiological research is to establish a mathematical model of infectious disease transmission by using differential equations. This method has achieved some success in explaining some transmission phenomena of infectious diseases, but it is aimed at evenly mixed people and cannot describe the transmission process of infectious diseases in real large-scale social networks with obvious heterogeneity [4].

With the development of personnel mobility and transportation technology, the transmission route and speed of infectious diseases are constantly changing, and various infectious diseases are spreading at an unprecedented speed all over the world. Moreover, governance is becoming more and more difficult, which brings increasingly serious
challenges to public health and population health [5]. Public health emergencies refer to major epidemics of infectious diseases, mass unexplained diseases, major food and occupational poisoning, and other events that seriously affect public health that occur suddenly and cause or may cause serious damage to public health [6]. Monitoring and early warning system is a timely monitoring and early warning activity for possible risks in the occurrence and development process of public health emergencies. It is not only the basis of the prevention and control system of public health emergencies but also the key to source control [7]. China’s emergency public health early warning system has progressed to some degree in recent years. In practice, however, there are still certain flaws, such as the early warning subject’s irrationality, the early warning standard’s latency, the monitoring subject’s inadequate scope, and so on. The social interaction network that humans build is a complicated one [8]. Previous research has assumed that the contact network is static, despite the fact that the structure of the real social contact network changes as individual information acquisition behaviors vary. The dynamic social interaction network is where infectious illnesses propagate. The monitoring and inspection of epidemic conditions involves the use of suitable monitoring and evaluation indicators, which needs the employment of a reliable and accurate crisis monitoring and evaluation system. Understanding infectious disease dynamics has become more popular by combining complicated network theory and epidemiology. As a consequence, from two theoretical and practical viewpoints, this study performs a preliminary examination into the evolutionary behavior, formation process, structural characteristics, and individual behavior pattern of social interaction networks on the transmission of infectious diseases.

Public health emergencies are characterized by uncertainty, complexity, unpredictability, rapid spread, wide coverage, and great harm [9]. It destroys the normal development of social and economic order and brings harm to the public’s personal and property safety. In this complicated situation, how to minimize the impact and losses caused by infectious disease emergencies has become an important topic worthy of study [10]. Public health emergencies will bring great social harm. If we can accurately predict its development trend before the outbreak, it will certainly reduce the damage caused by it. Therefore, it is imperative to improve the early warning system of public health emergencies. In the emergency management of public health emergencies, crisis early warning is the first line of defense to deal with public health emergencies, which is particularly important [11]. It is to locate, identify, and resolve the crisis at the latent and accumulation phases of the crisis’s onset, since this is the most advantageous time to minimize more damage and losses from the crisis. We may monitor, assess, and analyze the reasons creating the crisis via crisis early warning work and avert the causes of the disaster. The emphasis of this research is on the investigation of difficult network-based infectious disease emergency management. This paper uses mathematical analysis to determine the impact of network structure changes on the spread of infectious diseases using the infectious disease dynamics model and concludes that the impact of structural changes in social contact networks on the spread of infectious diseases can be equivalent to a change in disease spread probability. To abstractly describe the spatial organization of people, the infectious sickness model comprises a geographical multi-group network model as well as a quantitative statistical rule of people mobility. The simulation results show that reducing the average distance, stay length, or return probability reduces the possibility of infectious diseases spreading worldwide.

2. Related Work

Literature [12], combined with complex network and other related theories, simulated the whole process of online information dissemination and evolution of public health emergencies. Through model simulation, we find the life cycle phenomenon and group polarization phenomenon of sudden public crisis spreading in the network environment; furthermore, the evolution results of each subject attribute under different parameter values are analyzed and compared, and the effective methods of crisis information dissemination are explored. Literature [13] takes the scale-free network model in complex networks as the prototype, constructs a new online information dissemination model, and compares the conclusions drawn by simulation method with those drawn by random analysis method. [14] Based on the characteristics of online information dissemination of public health emergencies, the scale-free network model was improved, and a complex network model was established to reveal the evolution law of online information dissemination. Through the simulation study of the model, it can be seen that the improved new model can effectively reproduce the track and change trend of information dissemination and evolution and help to effectively deal with the occurrence and development of events. Literature [15] based on the analysis of the evolution law of crisis information dissemination of public health emergencies, it is concluded that it has certain periodic characteristics, and based on this, an emergency management strategy for dealing with public health emergencies by stages and time is established. Literature [16] summarizes the research on network public opinion early warning, early warning mechanism, early warning models, and methods of public health emergencies. Literature [17] holds that the spread of dynamic network crisis information is influenced by the psychological factors, personal values, and behaviors of people such as netizens. According to literature [18], the government’s publication of information is critical for online information about public health crises. To properly assist the public, the government should disseminate all types of information on the status of incident management in a timely manner, ensuring the validity and credibility of the information. Network public opinion is described in literature [19] via information sources, information performance, and information situation. The differential equation model is used to anticipate the unconventional public health crises, starting with the elements affecting the development trend of public health emergencies. The literature [20] examines the material
demand features of public health crises and lays forth the concepts of emergency forecast accuracy, effectiveness, simplicity, and economy. Based on the range of online information distribution issues, literature [21] proposes that online information dissemination and development is extremely interactive and follows a strong "circular pattern."

Based on previous studies, this paper puts forward the prevention and control strategies of emergency management of infectious diseases emergencies from the perspective of complex network and provides methods and ideas for emergency decision-making and policy formulation of infectious diseases emergencies. The research shows that the introduction of local structure makes the network have typical social network characteristics such as power law degree distribution with adjustable index, high clustering coefficient, and similar matching of node degree. At the beginning, the number of infectious diseases increases exponentially in the network, and the transmission speed obviously increases with the increase of local structure scale. Moreover, the spread of infectious diseases in dynamic networks can be equivalent to the spread in static networks, and the only difference is the change of the spread probability. This provides a new idea and method for studying the spread process of infectious diseases.

3. Methodology

3.1. Dissemination of Public Health Emergencies on Complex Networks. Complex network is an interdisciplinary research field full of vitality. On the one hand, in the research of complex network theory, new theoretical models and new analysis methods are constantly put forward. On the other hand, new structures and phenomena in real networks are constantly being discovered, and a large number of important application problems emerge [22]. From the establishment and development of quantum mechanics to the study of system structure complexity, we can all see the key role played by geometry. Generally speaking, the complexity of the system comes from three aspects. (1) Node complexity, (2) structural complexity, and (3) interaction of various complexity factors. The research of complex networks has strong interdisciplinary characteristics. At present, complex networks have been widely used in all levels and fields.

The concept of a complex network is a novel way of looking at complicated systems from a global viewpoint. It employs two fundamental components, nodes and edges, to explore complex network systems, regardless of how complicated the structure and size of the network is. A network [23] is made of nodes and edges. Nodes and edges are abstract representations of the system’s constituents and their relationships, respectively. A directed network may be defined if each edge has a direction. A weighted network may also be formed by defining the weights of the edges. Random networks, regular networks, and complicated networks may be classified based on the intricacy of the connections between network nodes. A complicated network is a system that incorporates both network and fundamental concepts. Graph theory sparked the study of complicated networks on a theoretical level. It is essentially a graph structure made up of a large number of nodes and their interaction connections, in which the system’s core parts or phenomena are abstracted as nodes, and the link between research items is specified by the connecting edges of nodes. Node degree is a basic metric for determining a node’s relevance in a network [24]. The degree of a node in a complex network refers to the number of nodes that are linked to it. The network’s statistical properties are reflected in the degree distribution function. According to the findings, the degree distribution in complex networks differs from Poisson distribution and is more akin to power law distribution, or scale-free distribution. Adjacent node pairs are two nodes in a network that are linked. The network is termed an associated network if the degrees of neighboring node pairs are correlated; otherwise, it is considered a random network. A basic way for determining the degree correlation of neighboring node pairs in a network is to compute the average neighbor node degree of node pairs. First and foremost, I.

\[
\langle k^m \rangle = \frac{1}{N_k} \sum_{k_{i,j} \in k} k_{i,j}^m.
\]

It represents the average value of the average neighbor node degree of all nodes with degree \( k \) in the network, where \( N_k \) is the number of nodes with moderate \( K \) in the network. For the immediate neighbors of nodes in the network, there is a great possibility that they are close to each other, and the aggregation coefficient is used to measure this degree.

The “publicity” of public health emergencies highlights its social nature and maintaining social stability is the value of social law. The occurrence and diffusion process of emergencies is a complex system. For the epidemic situation of major infectious diseases, besides the epidemic situation of infectious diseases itself, the driving force for the spread includes the social system and its interaction. It can be said that the characteristics of infectious diseases and the network structure of people determine the spreading behavior of diseases and the development of events. Scientific understanding of the characteristics of the aggregation and diffusion of infectious disease emergencies is the premise and basis for effective response.

Online information processing of public health emergencies is the core of emergency decision-making management of public health emergencies, and it is also the top priority of emergency management. In the process of occurrence and development of online information of public health emergencies, online information processing determines the occurrence and development of public health emergencies. The basis of scientific emergency decision-making is efficient, accurate, and timely processing of multisource heterogeneous and massive real-time online information of public health emergencies. Crisis early warning is an early warning mechanism based on the fact
that ordinary citizens have a strong sense of crisis and can quickly identify crises. There are four main ways of crisis early warning: ① direct warning, ② qualitative early warning, ③ quantitative early warning, and ④ long-term warning of these methods. Essentially, the whole process of crisis early warning involves monitoring, information collection, information evaluation and analysis, confirming the epidemic situation, issuing early warning information, taking emergency measures and other steps. The ultimate goal of crisis early warning is to reduce or even eliminate crisis events. According to the establishment process of crisis early warning management, it is divided into five aspects: information collection system, monitoring and evaluation system, early warning and prediction system, system guarantee system, and risk disposal system. In essence, crisis early warning management is a progressive control process. The framework system of crisis early warning management is shown in Figure 1.

Public health emergencies have the characteristics of poor predictability, great harm, and complex etiology and generally occur in a whole group of people in a region. If the patient does not seek medical treatment in time, it may endanger human health and survival. Outbreaks of public health emergencies often occur in a short period of time and are accompanied by serious hazards. The main purpose of infectious disease dynamics modeling is to study the epidemic law of diseases, predict epidemic trends and risks, and provide theoretical basis for the discovery, prevention, and control of disease epidemics. The spread of infectious diseases involves many factors, including not only the disease itself but also social, economic, geographical, and human factors. The characteristics of the infectious disease itself and the network structure of the population determine the spread of the disease and the development of the event. Therefore, a basic driving force for studying the spread of infectious diseases in complex networks is to understand the spread of infectious diseases from the microscopic mechanism, so as to effectively control infectious disease emergencies.

There are many types of public health emergencies according to their causes, and the causative factors of each type are also different. Society is in a causal environment, and different diseases and different types of diseases may show the same symptoms. A disease can also be the result of a variety of factors. The occurrence and prevalence of infectious diseases are affected by many factors. Pathogens, hosts, and environments in the “epidemiological triangle” are the basis for the occurrence and prevalence of infectious diseases. When the three are in a tripartite state, disease does not occur; but when change occurs and the equilibrium is disrupted, disease occurs and prevails. Therefore, anything that can affect these three basic elements may become an influencing factor for the occurrence and prevalence of infectious diseases. The relationship among infectious disease emergencies, pathogenic factors, and carriers is shown in Figure 2.

Each infectious disease has its own set of factors that determine its occurrence and prevalence. These variables are typically the result of the combined or sequential action of numerous factors, rather than a single cause. Changes in human behaviour, society, and the natural environment may all have varying degrees of effect on the prevalence and spread of infectious diseases across the globe. The network model is a broad category of models that has received a lot of attention in recent years.

3.2. Early Warning and Forecast System for Public Health Emergencies. The social system of the social transmission carrier of infectious diseases is complex, and the occurrence and development of infectious disease emergencies are irreversible and nonexperimental, making it impossible for people to conduct social experiments to observe the transmission process of infectious diseases. Computer simulation technology is used to solve problems in the fields of society and economy in a very effective means. Humans are social animals, which is reflected in the reality that society takes the family as its basic unit. The concept of family here is broad, not only referring to real families but also small groups that live together for a long time, such as work units and school dormitories. The formation and the evolution of social contact network originates from the social relations of family members in the whole society and their daily individual behaviors.

Although it is impossible to incorporate all features of complicated real-world systems in the computer simulation process, simulation, on the other hand, may be intuitively and successfully reproduced and examined as a tool for experimental study on actual systems, offering ideas and methods for assessing and addressing issues. Utilize contemporary network technology, computer technology, and other ways to mine and gather pertinent data from public health crises and health monitoring and reporting systems, as well as undertake preliminary screening, sorting, processing, and transmission. Provide reliable data sources for crisis early warning management, as well as the necessary circumstances for thoroughly detecting and evaluating crises. Within a complex system, new traits that are fundamentally distinct from lower levels might develop at each degree of complexity. In other words, there is no clear causal link between the complexity at the high level and the complexity at the lower level inside a complex system. The density function of the evolving process of original public health emergency information dissemination is

\[
f(x) = \frac{1}{\sqrt{2\pi}} e^{-(x-(T/2)^{1/2})^2}, \quad 0 \leq x \leq T, \quad T \to \infty. \quad (3)
\]

Among them, \(T\) is the evolution period. The distribution function of the evolution process of the original information dissemination of public health emergencies is

\[
F(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-(t-(T/2)^{1/2})^2} dt, \quad 0 \leq x \leq T, \quad T \to \infty.
\]

Among them, \(T\) is the evolution period. The construction of early warning system is a systematic project, involving policies and regulations, business processes, operating environment, information systems, and
many other aspects. Information collection is based on a large number of information sources and technical support. It is the first stage of establishing the object of crisis monitoring and early warning and the foundation of the whole crisis early warning management. Its information sources are mainly to collect relevant information and information about health problems related to diseases among people, events related to human beings and external events related to animal diseases, water, and environmental pollution, etc.

The real social network has the characteristics of small world, and the degree distribution is skewed, that is, it is closer to power law distribution or exponential distribution than Poisson distribution or uniform distribution. Building a model framework requires virtual mapping of the real environment in the model space. In addition, although the subnets inside the public network and the home network are isolated from each other, both networks are formed by the same group of people in different time periods, so there is still a certain probability of contact between individuals from different subnets.

To some extent, disease-related information spreads quickly, but people’s contact is not frequent, so we can set the limited condition that the acquisition of information leads to the adjustment of network structure much faster than the spread of disease. In this case, it can be considered that the time required by the network before the next infection has reached a steady state, which can be approximately considered as a steady state process. The change of edge can be obtained by the difference equation, which is expressed as

$$\Delta L_{pq} = c\left(L_{pq}^M - L_{pq}\right) - b_{pq}\cdot L_{pq}$$  \hspace{1cm} (5)

$c$ in formula (5) is the probability of establishing a new connection between individuals $p$ and $q$, $b_{pq}$ is the probability of disconnection between $p$, $q$ individuals. $L_{pq}$ is the edge between a node $p$ and any node $q(p,q \in \{S,I,R\})$, $L_{pq}^M$ is the largest edge between $p$, $q$. When the steady state is reached, $\Delta L = 0$, then:

$$L_{pq} = \frac{c}{c + b_{pq}}\cdot L_{pq}^M$$  \hspace{1cm} (6)

At this time, the increment of the number of infected individuals is

$$N_{it} = \frac{\langle k \rangle}{i} \cdot \frac{N - i - r}{N} \cdot \left(\frac{c}{c + b_{so}}\right) \cdot \left(\frac{c}{c + b_{so}}\right) \cdot \left(\frac{c}{c + b_{so}}\right) \cdot \left(\frac{c}{c + b_{so}}\right) \cdot \left(\frac{c}{c + b_{so}}\right) \cdot \lambda r.$$  \hspace{1cm} (7)
The third part of equation (7) is the probability of infected individuals around susceptible individuals, and equation (7) is rewritten as equation (8).

\[ N_{i+} = \langle k \rangle \cdot \frac{N - i - r}{N} \cdot \frac{i}{N - 1} (c/c + b_{ir}) \cdot (N - i - r - 1) + (c/c + b_{ir}) \cdot i + (c/c + b_{ir}) \cdot r \cdot \lambda. \] (8)

The spread of diseases in the dynamic network can be equivalent to the spread in the static network, but the difference is only the change of infection probability.

The following features should be included in the simulation system: (1) it can reflect the flow of people; (2) individuals in the system have the characteristics of infectious disease carriers; (3) it can reflect the spread of infectious diseases in real time; (4) it has the ability to predict the development trend of infectious diseases; and (5) it can reflect the impact of various prevention and control measures on the spread of infectious diseases. This network is known as a scale-free network because its degree distribution function is a power function. Because each subnet is formed individually, the degree distribution of the public network as a whole is identical to that of subnets, which can be proved using computer simulation. Create a disease early warning index system as well as a mathematical model for quantitative forecasting. A council of specialists in clinical medicine, preventive medicine, and management has been formed to examine the epidemic situation, and a framework for frequent consultation and analysis of the situation has been developed. Describe and evaluate the distribution, development, and influencing factors of infectious illnesses, as well as predict and warn the incidence and epidemic trend of corresponding infectious diseases, using suitable epidemiological and statistical methodologies.

4. Result Analysis and Discussion

Today’s world is in an era of rapid development, and society is changing rapidly. In the face of this rapidly developing society, the previously set standards may be out of date at any time. The cloud data obtained through the Internet repeatedly refresh previous crisis warning values and eliminate meaningless nonphysical warning coefficients. Computer network is the most basic environment to support early warning system. With the help of Chinese Internet, public telephone network, wireless communication network, and microwave communication, a computer integrated and emergency communication system supporting the whole early warning system will be established. Establish a good digital communication system for emergency monitoring and early warning to ensure the normal operation of the early warning system.

To improve China’s crisis early warning monitoring and evaluation system, we should first improve the monitoring technology and advanced scientific monitoring equipment, at the same time, reset specific indicators for each crisis, delete unnecessary programmed indicators, establish detailed and specific evaluation indicators and scoring methods for key crisis monitoring targets, set up an expert database, repeatedly scrutinize and approve the standards set by indicators, and finally establish a set of effective and operable monitoring and evaluation indicators. We compare

![Diagram](image_url)
the transmission speed of infectious diseases in home networks and public networks, as shown in Figure 3.

We can see that it takes less time steps to reach the peak of infection density in the home network. However, the peak time of infection density in public network is much longer than that in home network. Figure 4 shows the relationship between the infection density and time in the home network under different initial infection densities.

It can be seen from the figure that the time when the infection density in the home network reaches its peak is only related to the network structure parameters and infectious disease parameters, and has nothing to do with the initial infection number \( N_0 \). Therefore, compared with the public network, the home network actually plays a role in inhibiting the spread. Early warning system is a complex system engineering, which mainly includes the collection and integration of the above monitoring information, the establishment of early warning evaluation index system, early warning event evaluation and inference analysis, emergency alarm, acceptance and feedback of alarm events, etc. Simulation is an effective means to study the spread of infectious diseases, and the operation of simulation needs the support of the model. The model of infectious diseases shows the possible paths of the spread of infectious diseases and the distribution changes of infectious diseases. Establishing an infectious disease transmission model is the basis for understanding and studying the epidemic mechanism of infectious diseases, predicting the epidemic trend and making prevention and control decisions. Considering that in the process of online information dissemination of public health emergencies, with the continuous updating and superposition of derivative information, the evolution track of online information dissemination will change. Based on this, considering that the access of derivative information obeys different distribution functions, the evolution of online information dissemination of public health emergencies is studied. When the information is fully utilized, the recovery time is basically the same, which on the other hand shows that the information can inhibit the spread of the disease. Figure 5 shows the influence of different amounts of information in the model on recovery time when infectious diseases have recovery time.

Figure 6 shows the influence of the utilization degree of infectious disease information without recovery time on the inhibition of disease transmission. When infectious diseases are prevalent, the susceptible individuals who get more information try to restrain the infected individuals, thus greatly prolonging the time of all infections.

The results show that when the acquisition of individual information makes the change of network structure faster than the spread of disease, information has a great influence on the spread of disease. The more information available, the more obvious the inhibition of disease transmission. This conclusion has a guiding role for the government to intervene in diseases, and the speed of information release must be faster than the speed of disease transmission.

The sole criteria for determining truth is practise. Of course, this may be used to determine whether or not the early warning criteria for public health situations is scientific. It may be analyzed and put to the test to see how successful it is. Because everything in the world is in motion, the development of early warning standards should not be static. Early warning standards for public health crises should be developed in accordance with the evolution of the social economy, the natural environment in which humans live, and public health standards should be updated on a regular basis based on scientific investigations. If the pre-established early warning standard is ineffective in guiding emergency response, it is required to reconsider and change it. It is assumed that the derived information obeys continuous probability distributions such as uniform distribution, normal distribution, chi-square distribution, and exponential distribution, and the relevant calculation model of online information dissemination and evolution of unconventional emergencies is established and simulated, in combination with the development trend of the original information of emergencies. Figure 7 shows the outcomes.

According to the simulation results, it can be seen that the evolution curves of online information dissemination of unconventional emergencies shown by different distributions are not nearly the same, but some of them are similar, but all curves show bimodal distribution except uniform distribution.
In order to quantitatively study the propagation law of public health emergencies, a hypothesis is put forward: in the online information evolution cycle of public health emergencies, the propagation evolution of native information conforms to the life cycle theory, and follows the process of occurrence, development, climax, and decline, which is exactly the same as the standard normal distribution function. Based on this, we get the probability density function of the dissemination and evolution process of the original information of public health emergencies based on the characteristics of the standard normal distribution function of the original information.

At the initial stage of transmission, the number of susceptible persons is obviously higher than that of infected persons, and the infection rate is higher than the recovery rate, which makes the infection density rise continuously. However, with the spread, the number of susceptible people gradually decreased, so that the infection rate was less than the recovery rate, which made the infection density decrease continuously. However, in the alternating social network, the curve of infection density with time shows obvious multipeak characteristics. It shows that the influence of home network and public network on the spread of infectious diseases is different because if the spread speed of infectious diseases in home network and public network is the same, then changing the active time of network will not affect the spread process of infectious diseases.

In view of the above analysis results, we have carried out computer simulation verification. The simulation result is the arithmetic average of 200 independent simulations. In Figure 8, we give the computer simulation results of the change of infection density with the transmission probability and compare the results with those of BA model and KE model, respectively.

This result has certain guiding significance for the prevention and control of infectious diseases. That is, as long as we can identify the infected people and their close contacts in time and treat them in isolation, we can effectively reduce the risk of large-scale spread of infectious diseases to the population.

Through simulation calculation, the results show that when individual information acquisition makes the change of network structure faster than the spread of disease, information acquisition has a great influence on the spread of disease. The handling of public health emergencies emphasizes the principle of prevention and building a scientific, sensitive, and reliable monitoring, and early warning system is related to people's life safety. The optimization of public health emergency monitoring and early warning system should focus on newly emerging infectious diseases and unexplained diseases, encourage professional active monitoring and early warning subjects, improve the coordinated monitoring and early warning mechanism, and cultivate a monitoring and early warning culture in times of peace. In the process of dealing with emergencies, we should establish a timely, transparent, and credible information system, make full use of TV, newspapers and other tools, publish the latest information and facts at the first time, strive for the dominance of public opinion, publicly expose rumors, and ensure the credibility and authority of information.
5. Conclusions

Early warning is one of the purposes of monitoring. Only by scientifically and effectively warning public health emergencies, can we respond in time and effectively, control public health emergencies in the bud, or not cause a crisis, or minimize the harm of the crisis. The research on the propagation and evolution of online information and the mining of key online information focuses more on the early warning architecture, establishes the propagation and evolution model of online information by using the methods of model and simulation, seeks and mines key online information and key events, and lays the foundation for further establishing an effective early warning model. The development of public health emergency early warning system must keep pace with the times to play its role. The government must keep up with the development of science and technology to continuously improve the ability of public health emergency early warning and improve the public health emergency early warning system.

Dynamic model of infectious diseases based on complex network is a research hotspot in recent years. This paper studies the spread process of infectious diseases on complex networks. It also analyzes the influence of individual behavior change after obtaining information on the spread of disease. Through simulation calculation, the results show that when individual information acquisition makes the change of network structure faster than the spread of disease, information acquisition has a great influence on the spread of disease. The network model can simultaneously have many social network features such as small-world characteristics, skewed degree distribution, hierarchical structure, and dynamic evolution. This study provides a new idea and method for studying the spread process of infectious diseases. However, in view of the author’s limited research time, the complexity of infectious disease transmission, and emergency management, there are still some limitations in this study, which need to be explored and enriched in further research.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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