

# The Role of New Media Technologies in Epidemics -- Taking the 2014 Ebola outbreak as an example

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**Abstract.** The Ebola outbreak in 2014 had a significant impact on the global public health system. However, New Media also played a crucial role. Before the outbreak of the epidemic, the role of New Media in the pandemic had already begun to receive attention from some scholars. The most unique aspect of the 2014 Ebola epidemic was the large-scale integration of new media and epidemic control. This paper analyzes the use of New Media during the epidemic to explore its impact on public opinion, information dissemination, and public health communication. The findings provide insights into the potential of New Media in future epidemic response and management. In this paper, the performance of New Media in the Ebola epidemic is analyzed, and it is concluded that New Media can facilitate cooperation among various parties, alleviate the pressure of the epidemic, promote the development of epidemic research, simplify epidemic control planning, and strengthen disease control. This paper also suggests the transmission of misinformation and the problems of epidemic anxiety and "Vaccine Hesitancy" brought about by new media technologies and their solutions, in order to prepare for future epidemics that may occur.

**Keywords:** Ebola; Epidemic; New Media; Misinformation; Vaccine Hesitancy; Epidemic Anxiety.

## 1. Introduction

The Ebola pandemic that broke out in 2014 is the most serious one in the epidemic of Ebola so far. The significant impact caused by the initial stage of the epidemic led to its declaration as a "Public Health Emergency of International Concern" by the World Health Organization (WHO) on August 8, 2014 [1]. Over the course of two years, it resulted in more than 28,000 cases and 11,000 deaths [2], causing a significant and undeniable impact on countries in West Africa. Additionally, it also posed a major challenge to the global public health security system.

As the pathogen of the pandemic, the Ebola virus belongs to the family of Filoviridae, a negative-sense RNA virus [3]. It can be transmitted through various means, such as body fluids and droplets. The average incubation period for individuals exposed to the virus is 8 to 10 days [4], and the fatality rate can range from 50% to 90% [5]. Although the epidemic was gradually resolved in 2016, the collective efforts made by all parties cannot be ignored. One particular aspect that distinguishes it from previous epidemics is the involvement of the media, especially New Media.

New media technologies refer to novel media technologies, including social media, video platforms, artificial intelligence, and big data analysis. These technologies have made rapid progress since the beginning of the 21st century and have occupied an important position in our lives. In fact, before this epidemic, some scholars had already noticed the role of New Media in the field of public health and began to focus on studying its role in epidemics. For example, in 2011, Tirkkonen [6] et al. researched the online authority communication of the 2009 swine flu in Finland. Liu [7] et al. also attempted to construct a framework for the 2009 H1N1 influenza by social media and traditional media.

This paper chooses the 2014 Ebola virus outbreak as an example because it was a significant time point and a great attempt for the integration of New Media and epidemic control. In the future, whether it is the Zika virus outbreak in 2016 or the COVID-19 pandemic in 2020, the role of New Media in epidemic prevention and control has only increased. This paper analyzes the work of New Media (such as social media, satellites, academic platforms, etc.) during the Ebola epidemic to determine its significant role in controlling the epidemic, and at the same time, the problems brought about by the

new media technologies in the process of development and their corresponding solutions are suggested. I hope this may be helpful to further the application of new media technologies in future outbreaks of infectious diseases.

## **2. The role of New Media in epidemic prevention and control**

### **2.1. New media technologies coordinate cooperation among various parties**

Scholars such as Wu [5] believe that the key factor in controlling the development of this epidemic and reducing the mortality rate lies in international assistance. However, in the early stages of the outbreak, the World Health Organization had to publicly admit that its early work was a failure [8]. The main reason for this was that international assistance in the early stages was focused on controlling the epidemic through unilateral aid, which resulted in a clash between the scientific methods such as "isolation" and "cremation" perceived by international workers and the knowledge and culture of the indigenous in Africa, which even triggered a series of conflict events. On the other hand, it is also due to the single command and control mode adopted by the local government, which lacks feedback channels from the community. The government issued orders to the community, but the problems encountered by the community cannot be solved solely by themselves.

However, with the promotion and open communication of the Centers for Disease Control and Prevention (CDC), the World Health Organization (WHO), and Medecines Sans Frontiers (MSF) on Instagram and Twitter [9], as well as the proposal of the Western Area Surge (WAS) action plan [10] put forward by Sierra Leone, the pandemic situation has gradually improved. The WAS plan, by optimizing the "117" emergency call center and encouraging the public to actively dial "117" to provide feedback on issues, has successfully bridged the gap between international workers, local governments, local communities, and the general public. This has enabled international aid, local governments and communities to successfully cooperate and jointly fight against the epidemic. It can be seen that New Media, working as a channel for information exchange, can promote bidirectional dialogue between the government and the public, as well as facilitate cooperation between international workers and indigenous populations, therefore, the workers can effectively control the spread of infectious diseases and the treatment of affected individuals.

### **2.2. The use of social media to ease the pressure of the epidemic**

The direction of public opinion also had a huge impact on the control of the outbreak. Positive public opinion can make it easier to control the epidemic, while negative public opinion is more likely to cause obstacles. This is where social media comes in.

In terms of reality, the outbreak of the Ebola epidemic has led to a shortage of medical supplies in the affected areas, resulting in numerous humanitarian crises. Through the promotion on social media platforms such as Twitter and Instagram, the attention of global citizens has been successfully drawn to the situation of the epidemic. As a result, the affected areas have received a significant amount of supplies and technical assistance from organizations and countries around the world, which greatly alleviating the local shortage of supplies and technological deficiencies.

Psychologically, due to the high fatality rate and contagiousness of the Ebola virus, it has caused significant psychological impacts on the general public. In this situation, the public is highly susceptible to rumors and fear, and it can even lead to various incidents of unrest [11]. And for healthcare workers, the severe illness conditions and round-the-clock work also bring a heavy psychological burden. Therefore, positive publicity and accurate scientific information from credible media are important. On the one hand, it can alleviate the anxiety of the public and correct their misconceptions about the virus with some rescue methods. On the other hand, it can bring concerns from all around the world to the frontline medical workers, reduce their psychological burden, and enable them to devote themselves more actively to the fight against the epidemic.

### **2.3. The construction of a network platform to promote the development of anti-epidemic countermeasures**

In the process of combating the epidemic, two network platforms play an irreplaceable role [8]. They are the Ebola Response Anthropology Platform (EPAP) and the EB-SHS network.

EPAP is a sub-project of the "Research for Health in Humanitarian Crises" (R2HC) project. Its main function is to provide advice and guidance to relevant departments and institutions in the UK involved in the response to the Ebola outbreak. At the same time, it provides a broad discussion space for scholars around the world, allowing scholars from different regions to freely express their views. It also helps international workers organize ethnic data in the affected areas and even allows international workers to lead research projects. This platform was awarded the International Impact Award by the Economic and Social Research Council (ESRC) of the UK in 2016 for its outstanding contributions to the pandemic.

The EB-SHS network platform focuses on assisting the government in formulating strategies and providing funding for research. Besides, it has played an important role and continues to provide assistance even during the global COVID-19 pandemic that emerged years later.

The establishment of these two platforms has provided significant assistance to local organizations and international aid in responding to the Ebola outbreak in West Africa. It has also greatly facilitated the integration of new media technologies with the global public health governance system, allowing new media technologies to play an indelible role in epidemic prevention and control.

### **2.4. Satellite to simplify defense and control planning**

In addition to the effects of Ebola vaccines and drugs such as ZMapp monoclonal antibodies, satellite remote sensing technology has been an important form of New Media's contribution during the Ebola crisis[18]. By using high-resolution satellite imagery, scholars can easily analyze various issues existing in epidemic areas, such as the lack of infrastructure and overcrowded population distribution. In addition, visual data can greatly facilitate the deployment and determination of planning personnel in the epidemic.

Despite providing intuitive image displays, satellites can also be used to supplement the lack of infrastructure and public health education for epidemic prevention measures. The European communication satellite company Eutelsat has deployed a satellite connected to terminals provided by the non-profit organization NetHope to assist aid workers in containing the spread of the Ebola virus. The satellite operator SES has launched an educational channel called "Fight Against Ebola" [12], and broadcast it to the affected countries via satellite to deliver practical and culturally appropriate public health information to the affected populations.

In addition, thanks to online diagnosis technology and real-time monitoring of infection numbers, as well as various functions such as tracking the movement trajectory of infected patients, satellite networks have greatly facilitated epidemic prevention and control, effectively limiting the spread of the epidemic and the treatment of patients

### **2.5. Big data analytics to enhance disease prevention and control**

The application of big data analysis plays a significant role in the field of public health. Constructing infectious disease transmission models can greatly enhance people's understanding of diseases. By being based on this, we can adjust existing epidemic prevention strategies and prepare for future outbreaks of the disease effectively. In this epidemic, the modified SEIR model and parameter estimation process developed by scholars such as Paul Diaz[13], as well as the local and global indicators of hospital resource requirements determined in their experiments, can be used to determine the optimal resource allocation strategy for future epidemics. Through the integration of literature data since 1976, researcher Basilia[14] has systematically evaluated the basic reproduction number ( $R_0$ ) of Ebola virus disease. Taking special factors into consideration, it is inferred that the summary value of Ebola virus  $R_0$  falls within the range of 1.3-2.0, meaning that each infected person can infect two people on average and 50% of the community would need to be immunized to attain

herd immunity. The application of big data in epidemic situations allows us to better understand the virus, develop corresponding prevention strategies, and provide better guidance to implement epidemic prevention policies at the national and local levels to reduce the damage caused by the epidemic. At the same time, in the process of researching the virus, it also continuously promotes the improvement and development of the public health governance system.

### **3. Problems posed in the epidemic and suggestions for their solution**

Despite experiencing the emergence of various epidemic diseases such as acute respiratory infections, avian influenza, H1N1, and Middle East respiratory syndrome, the Ebola epidemic in 2014 once again sounded the alarm for the international public health governance system. In this unprecedented, highly destructive, and multi-crisis epidemic, although New Media also played its corresponding function, it also faced multiple problems, and these problems are getting worse in the coming COVID-19 pandemic. The most obvious of these is the problem of misinformation and "Vaccine Hesitancy" brought about mainly by social media. In the following, I will briefly introduce these issues and solutions corresponding to New Media.

#### **3.1. The problem of Misinformation and "Vaccine Hesitancy"**

During the COVID-19 pandemic in 2019, the World Health Organization (WHO) proposed a new term, "Infodemic" (Information+Epidemic). Dr. Sylvie Briand, Director of Global Infectious Hazard Preparedness at WHO, believes that in the era of New Media, people's exposure to a large amount of information that cannot be verified as true or false can make it difficult for them to identify trustworthy sources of information and reliable guidance, thereby leading to a series of problems [15]. This was evident even before the Ebola outbreak, with misconceptions on social media about autism and its available treatments causing opportunity costs and direct harm to people with autism and those around them [16]. What is more, misinformation about e-cigarettes sent out by tobacco companies in an effort to boost sales affected people's purchasing decisions [17], among others. At the time of the Ebola outbreak, the cases of Ebola detected in the United States were few, but its presence on social media made it receive avid attention. Information itself is a way of disseminating facts, but in the case of the Ebola outbreak, health-related issue was interlinked with divisive social and political issues in a provocative manner by some media outlets, completely misinterpreting its original meaning. Misinformation like fake treatments and impure motives of international healthcare workers seriously affects the prevention and control of the epidemic in the infected areas, and can bring a series of problems such as declining public trust and anxiety about the epidemic. [19]

Epidemic anxiety, one of the main manifestations of the infodemic, has continued to influence vaccination measures in epidemics, with "Vaccine Hesitancy" being one of the most notable phenomena in the 2019 COVID epidemic. Scholars such as Rathje S[20] have shown that social media behavior is associated with vaccination attitudes even when controlling for a significant number of relevant variables (e.g., self-reported ideology and education level, etc.) in surveys of Twitter influencers and social media in the United States. The impact of social media on vaccine hesitancy is mainly twofold: the politicization of the COVID-9 vaccine and the function of its "Echo chamber".

Political elites and famous people play a unique role in vaccination attitudes, and the different attitudes towards vaccines of Donald Trump and Joe Biden during the epidemic, as well as the clash between the vaccine hesitancy of right-leaning media figures (e.g., Candace Owens) and the vaccine-confident viewpoints of the left-leaning media (The Washington Post), essentially exemplified the politicization of vaccines.[21]

Interpretation and reception of information vary by personal identity and belief. However, social media has a unique "Echo chamber" effect [22], which selectively exposes people to like-minded views. This property leads to the fact that people who have "Vaccine Hesitancy" in the "Echo chamber" are less likely to be exposed to accurate information or corrective notifications, and vaccine hesitant people may be more inclined not to vaccinate.

In addition to vaccine hesitancy, outbreak anxiety may also lead to misbehavior in the general population, especially in those who cannot easily identify misinformation and distinguish between misleading information and health facts, such as panic buying and unprotected mass gatherings [23], and the action to drink saline and bleach to fight against the virus. [24]

### 3.2. Approaches to Misinformation and Epidemic Anxiety

There is a close relationship between the misinformation problem and epidemic anxiety. Misinformation can lead to epidemic anxiety among the public, and people caught in a state of epidemic anxiety may in turn amplify the propagation of misinformation, thus reaching a vicious circle, but the essence of it is solving the misinformation problem. The success of solving misinformation problems can largely alleviate epidemic anxiety and promote the correct implementation of epidemic prevention and control policies.

Dealing with the misinformation problem is not simple; misinformation on social media is often a mixture of falsehoods and facts, which are usually difficult to distinguish. Therefore, it is crucial to distinguish between correct information and false messages. Also, reducing misinformation without decreasing the dissemination of true information or the ability of the public to speak out is important. In this regard, scholars such as Roozenbeek J have proposed three approaches to misinformation: the debunking method, the Accuracy Primes method, and the inoculation theory [25]. The debunking method requires that the debunking be accompanied by a good explanation and the giving of real information, and the Accuracy Primes method is a method of coping with misinformation by training people to pay attention to accuracy, which has been experimentally shown to be helpful in reducing misinformation sharing [26]. Inoculation theory is a method of preemptive refutation of an argument, like a vaccine, based on a small amount of misinformation stimulus, which then causes the subject to become resistant to the misinformation. In addition, with the "Echo chamber" effect of social media, seeking to engage with participants who may be hostile or vulnerable in some way [27] to increase participation rates can be helpful. Public health awareness campaigns and facilitating collaboration between social media and public health organizations [19] can also help to address the problem of misinformation.

## 4. Conclusion

A comprehensive analysis of the performance of New Media in the Ebola epidemic shows that its multiple functions of connecting the dots, easing the pressure of the epidemic, facilitating the development of countermeasures, simplifying the planning of prevention and control of the disease have not only played a role in the 2014 Ebola epidemic but will also grow in importance in the future prevention and control of the epidemic. What can be said is that the role of new media technologies in epidemic control is essential. However, while the use of new media technologies brings convenience, the spread of misinformation, the impact of epidemic anxiety and other problems also ensue. How to correctly deal with these problems while the New Media and public health system continue to integrate will be the key to continuing to improve the role of the new media technologies in the epidemic, as well as in the future when the epidemic situation is a necessary problem for us to face.

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