journalism and media

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Media Matters: How Information Release Shapes Monkeypox Vaccination Willingness

Huan Wang [1] **and Nan Wu** [2,*]

[1] School of Government and Public Affairs, Communication University of China, Beijing 100024, China; huanwang@cuc.edu.cn
[2] School of Journalism, Communication University of China, Beijing 100024, China
* Correspondence: wunan@cuc.edu.cn

Abstract: Despite the growing body of evidence addressing the reasons behind vaccine hesitancy, the positive role of media as a key environmental factor influencing vaccination, as well as its function in publicizing and encouraging vaccination, has been less thoroughly explored. This study focuses on the context of the current Monkeypox epidemic, examining the influence of media release channels and message framing on the public's willingness to receive the Monkeypox vaccine. The findings are empirically validated through a survey experiment conducted in China. The study reveals that both media channels—traditional TV media, official online media, and user-generated media—and media content framings, specifically thematic and episodic, significantly impact the public's willingness to be vaccinated against Monkeypox. Notably, in the context of this public health event, individuals were more inclined to trust the episodic framing of traditional TV media and the thematic framing of official online media. Compared to thematic framing, episodic framing generally enhances respondents' willingness to vaccinate. Furthermore, user-generated media exhibited a more negative effect on vaccination intentions during the Monkeypox epidemic, particularly when combined with episodic framing. Heterogeneity analysis indicated a significant difference in the effectiveness of official online media based on audience identity (student vs. non-student), with the student group showing a preference for official online media channels. The findings underscore the importance of public health communication in carefully selecting media release types and message framings. Additionally, it is crucial to consider audience heterogeneity and to employ differentiated communication methods to enhance the effectiveness of vaccine promotion.

Keywords: vaccine hesitancy; Monkeypox; health communication; media channels; framing effect; survey experiment; China

Citation: Wang, Huan, and Nan Wu. 2024. Media Matters: How Information Release Shapes Monkeypox Vaccination Willingness. *Journalism and Media* 5: 1802–1816. https://doi.org/10.3390/journalmedia5040109

Academic Editor: Andreu Casero-Ripollés

Received: 11 October 2024
Revised: 23 November 2024
Accepted: 23 November 2024
Published: 27 November 2024

1. Introduction

Vaccination is an effective method of preventing disease, significantly contributing to the establishment of herd immunity against pandemic diseases and the maintenance of public health (Anderson and May 1985). However, individuals are not always motivated to vaccinate, and vaccine hesitancy can manifest in behaviors such as refusing vaccination or delaying it despite the availability of vaccination services (MacDonald 2015). It is essential to recognize that vaccine hesitancy is a global phenomenon that has been exacerbated by mass communication, posing a significant barrier to immunization programs in public health. For instance, during the COVID-19 pandemic, the World Health Organization (WHO) identified vaccine hesitancy as one of the top ten threats to global health in 2019 (Zhang and Wang 2024). Public skepticism regarding the importance, safety, and efficacy of vaccines has delayed global immunization efforts. In the aftermath of COVID-19, Monkeypox has emerged as a new epidemic challenge to public health, prompting various national health organizations to actively develop and promote Monkeypox vaccines. In this context, systematic studies of public vaccination intentions are crucial for enhancing

our understanding of the factors influencing vaccine hesitancy, thereby informing the implementation of public health policies and providing insights for a broader rollout of Monkeypox vaccination programs.

A substantial body of literature has been established regarding vaccination intentions and behaviors across multiple disciplines (MacDonald 2015; Hobson-West 2003; Schmid et al. 2017). The literature encompasses various factors, including vaccine characteristics (e.g., program design in public health, vaccination schedules), individual or group characteristics (e.g., knowledge, beliefs, emotions, perceptions, and social norms), and environmental factors (e.g., culture, religion, politics). Although mass media has received some attention, its role in the discourse surrounding vaccine hesitancy remains underexplored compared to discussions in public health, medicine, and biological sciences. The Strategic Advisory Group of Experts on Immunization (SAGE) Vaccine Hesitancy Working Group has emphasized that while communication is not a determining factor, it serves as a critical tool for addressing vaccine hesitancy. Conversely, poor communication can undermine vaccine acceptance.

Health communication is an evolving field of research, and effective communication can significantly influence public health behaviors, including vaccine hesitancy, when strategies are carefully planned and implemented in an integrated manner. The literature indicates that the diversification of communication tools is crucial for developing and executing health communication programs. It is essential to determine the appropriate combination of media channels and communication tools, as well as to accurately target subgroups with these strategies (Goldstein et al. 2015). Thus, we seek to address several key questions: Which communication tools can enhance the public's willingness to vaccinate against Monkeypox? How do media channels, as sources of information, and various message framings affect this willingness? Is there an optimal mix of channels and frames? How effective are these communication tools among different subgroups? Answering these questions is vital for scholars and practitioners aiming to gain a comprehensive understanding of the social–ecological system surrounding vaccination, ultimately improving the effectiveness of public health communication campaigns, including those related to vaccines.

Furthermore, most studies on vaccine hesitancy or Monkeypox vaccines have primarily focused on Western countries. While these studies contribute to our understanding of non-Western contexts, their findings may have limited generalizability due to differences in institutional environments and cultural contexts. Additionally, in the realm of health communication, existing research has predominantly concentrated on the impact of profit-and-loss framing on health behaviors (Guenther et al. 2021), leaving a gap in the exploration of other message framings and information release channels. This presents an opportunity for theoretical development in our study. The objective of this research is to examine the effects of information release channels and message framings related to the Monkeypox vaccine on public willingness to vaccinate. We will also investigate the heterogeneity of findings across different demographic groups and analyze these aspects empirically through a survey experiment conducted in China.

The sections of the article are organized as follows: next, we formulate the hypotheses of this paper based on the existing literature; then, we introduce the experimental design part of the paper, and then present the corresponding empirical analysis results. Finally, the findings are summarized and discussed.

2. Literature Review

The causes of "vaccine hesitancy" have emerged as a significant cross-disciplinary research topic spanning medicine, psychology, public policy, and news communication. Empirical studies grounded in the classic Health Belief Model (HBM) indicate that individuals' willingness to vaccinate is closely linked to their perceptions of susceptibility to and severity of epidemics, as well as their beliefs regarding vaccine effectiveness and potential side effects. Additionally, factors such as the expertise and attitudes of policymakers, health-

care workers, and media figures, along with individual characteristics, can significantly influence public attitudes toward vaccines (Dubé et al. 2013). Overall, "vaccine hesitancy" is not merely a medical issue; it is a social phenomenon arising from the interplay of science and technology, public policy, social cognition, media communication, and other factors. Among these, the media serves as a crucial source and potentially influential factor in shaping public health awareness and behaviors (Bullock and Shulman 2021). The media fulfills essential functions, including information surveillance and delivery, interpretation and packaging of information, and socialization (Gollust et al. 2019; Malik et al. 2021). Consequently, it plays a vital role in enhancing public responsiveness and behavior related to health issues (Guenther et al. 2021).

2.1. Media Channels as Message Source

The impact of information sources on persuasive effectiveness has been discussed in the established literature (Chaiken 1980), including public health agencies (Nan et al. 2017), social media (Lee and Jin 2019), and different levels of government (Huang and Liu 2022). However, few studies have focused on systematic discussions of the persuasive effects of different channel sources in the context of the current Monkeypox epidemic, and such studies can help deepen the understanding of public behaviors regarding the Monkeypox epidemic.

In China, mass media, especially state-controlled media, is not only a medium for delivering news and information, disseminating knowledge, and providing entertainment, but also the mouthpiece of the Party and the government, assuming the political task of maintaining national security and stability, which is a typical feature that distinguishes it from democratic countries. Therefore, in the context of the Monkeypox epidemic, mass media is the main source of public vaccination information and public education. Currently in China, mass media can be categorized into official and unofficial media according to whether it is controlled by the state or not, forming two major opinion forums: the former consisting of the official media channels of the state TV station, the Party newspaper, and the state news agency, and the latter being the opinion forums formed on the Internet, which is filled with a variety of voices and interest claims (Su et al. 2021). In addition, it can also be categorized into traditional media and the Internet according to the degree of technological embeddedness. Therefore, mainstream mass media can be categorized into three types, i.e., there are three channels through which the public obtains information on Monkeypox outbreaks and vaccines: the traditional official media channel represented by television, the official new media channels represented by the online Internet, and a large number of unofficial user-generated media channels that are active on Internet platforms. It should be noted that with the process of media marketization, there also exists a large number of mass media with corporate attributes in China, but their volume, scope of influence, and impact are relatively small compared to the above three (Su et al. 2021). Therefore, this study focuses on the impact effects of these three types of media channels.

Unlike in Western countries, the media plays a pivotal role in Chinese state politics and individual daily life, and can have a possible shaping effect on individual social values and behavioral norms (Lu et al. 2014). China's official media is considered as the mouthpiece of the Party and the government, and its core task is to publicize state policies, guide public behavioral norms, and shape public values and perceptions, etc. (Shen and Guo 2013). The China Media Group (CMG), as a typical representative of official media, is directly under the State Council and under the leadership of the Central Propaganda Department. With the advancement of Internet technology, CMG is also actively exploring new media channels, as evidenced by the establishment of various new media applications and online news websites.

In addition, the Internet remains the most influential form of media after television. Beyond the online accounts of official media, user-generated media created by individuals or organizations to express their interests has gained a certain degree of independence from state-controlled spaces due to the openness of the Internet (Huang and Liu 2022).

Individuals can disseminate a wide range of information online and are encouraged to produce content, share it, and engage in real-time interactions with other user-generated content. This phenomenon suggests that user-generated media contributes to a more equitable, free, interconnected, and open social system. While studies have examined the impact of the Internet and user-generated media communication on individual health behaviors (Moorhead et al. 2013; Naab and Sehl 2017), fewer studies have compared user-generated media to other types of media channels. Given the relatively limited empirical research in this area, we propose the following research question:

Research Question 1 (RQ1): Do media channels, as different sources of information, impact the public's willingness to receive the Monkeypox vaccination?

2.2. Message Framing for Encouraging Vaccination

Given that one of the primary goals of health communication is to promote future-oriented behaviors that entail long-term benefits—often at the expense of immediate gratification or convenience, as seen with vaccinations—the development of persuasive messages is a critical area of focus (Kim et al. 2022). According to Chong and Druckman, framing refers to the process of shaping individuals' perceptions and understanding of an issue, thereby readjusting their cognitive approach to that issue (Chong and Druckman 2007). In other words, varying the presentation of issues through message framing can alter cognitive processes and enhance the effectiveness of information dissemination.

Message framing has been validated across multiple disciplines, including journalism and communication, political science, and marketing, demonstrating its broad effectiveness. In the realm of health communication, message framings have been employed to encourage positive health behaviors. Specifically, in the context of vaccination, researchers have empirically validated the impact of different message framings—such as positive versus negative framing, gain versus loss framing, and expressions of social proximity (Guenther et al. 2021; Kim et al. 2022; Limaye et al. 2021). This body of literature provides a theoretical foundation for further understanding the effects of message framing on willingness to receive the Monkeypox vaccination.

This paper focuses on the effects of thematic and episodic framing. Iyengar discussed how media and politicians utilize the framing effect to influence citizens' political perceptions and attitudes (Iyengar 1990). Specifically, thematic framing involves the use of general, collective, and abstract language to describe issues, emphasizing relevant data and broader trends (Iyengar 1990; Hart 2011; Scheufele 1999). In contrast, episodic framing engages the audience by narrating specific characters, cases, or events (Scheufele 1999; Gross 2008). The mechanisms of thematic and episodic framing are grounded in Construal Level Theory (CLT) (Trope and Liberman 2010). This theory posits that individuals perceive and interpret the views and opinions of others based on the psychological distance of objects and events from themselves. CLT categorizes this psychological interpretation into high-level and low-level construals: high-level construals arise when individuals focus on the overarching context, while low-level construals emerge when attention is directed toward specific details (Trope and Liberman 2010). Consequently, thematic framing encourages high-level construals, whereas episodic framing primarily stimulates low-level construals.

When thematic framing is employed to describe a phenomenon or issue, the audience gains objective information and knowledge, but also tends to attribute blame to societal factors (Iyengar 1990). Specifically, when thematic framing is used to discuss the Monkeypox vaccine—by detailing aspects such as the vaccine's components, safety, effectiveness, common reactions and countermeasures, and the global trends in Monkeypox vaccination—it stimulates high-level construals and aids readers in grasping essential information about the vaccine and its global context. As vaccination becomes a globally recognized and accepted social norm, the public perceives vaccination not merely as a personal choice but as a collective responsibility. This shift can increase receptiveness to vaccination due to social norms. Therefore, the use of thematic framing regarding Monkeypox vaccination can enhance the public's willingness to receive the vaccine.

However, in practice, news reports typically employ narrative, case-based, and other message frames for health communication. Episodic framing avoids the coldness of objective statistics by presenting more relatable stories about individuals and events, thereby reducing psychological distance and eliciting richer emotional responses from readers (Iyengar 1990). For instance, when promoting the Monkeypox vaccine using episodic framing, narrating the real-life experience of an ordinary individual who successfully received the vaccine—including their pre-vaccination concerns, experiences during the vaccination process, and post-vaccination feelings—can evoke empathy and enhance readers' willingness to get vaccinated. Thus, we propose the following research question:

Research Question 2 (RQ2): Does message framing affect the public's willingness to receive the Mnkeypox vaccination? To address this question, we propose a pair of competing hypotheses:

H1a: *The use of thematic message framing enhances the public's willingness to receive the Monkeypox vaccination.*

H1b: *The use of episodic message framing enhances the public's willingness to receive the Monkeypox vaccination.*

Additionally, we aim to test the interaction effect between information release channels and message framing. That is, different combinations of information channels and differentiated message framing may yield more effective communication. According to CLT, psychologically distant objects are typically interpreted at high-level construals, involving more abstract and general generalizations, while proximal objects are interpreted at low-level construals, focusing on details and specifics (Trope and Liberman 2010). Given that individuals may perceive varying psychological distances between official and user-generated media, their responses regarding the willingness to receive the Monkeypox vaccine may differ. Furthermore, these differences may also depend on the levels of construals involved in the message framing, suggesting a potential interaction between media channels and content framing. Therefore, we pose the following research question:

Research Question 3 (RQ3): Is there an interaction between media channels and message framing on public willingness to receive the Monkeypox vaccination?

3. Experiment Design

3.1. Design, Procedure, and Materials

We used an online survey experiment to examine the impact of release media and framing on the public's willingness to receive the Monkeypox vaccine. The experiment design and procedure are shown in Figure 1.

At the beginning of the experiment, participants would read a paragraph of basic information about the current Monkeypox epidemic in China, which is from various official websites, China's Law on Prevention and Control of Infectious Diseases, and the Guidelines for Public Protection against Monkeypox (2023), which guarantees authenticity and reliability. The content primarily addressed the severity of the Monkeypox epidemic, transmission routes, and clinical manifestations. After reviewing this information, participants were randomly assigned to one of six experimental groups, which comprised three information release media (traditional TV media, official online media, and user-generated media) and two message framings (thematic framing and episodic framing). The manipulations for each media type were as follows: for traditional TV media, the statement was, "Recently, a report about the Monkeypox epidemic was broadcast on CCTV News"; for official online media, it was, "Recently, a video about the Monkeypox epidemic was posted on CCTV's official Douyin[1] account"; and for user-generated media, it was, "Recently, a video about the Monkeypox epidemic was posted on a knowledge-based influencer's Douyin account."

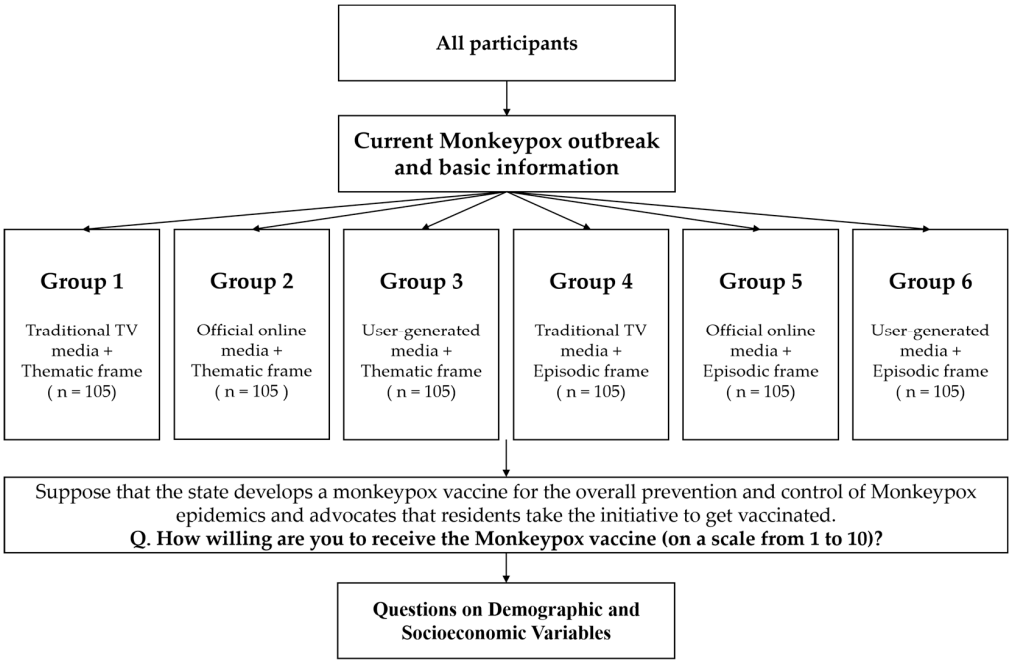

Figure 1. Experiment design and procedure.

It is important to note that CCTV News is a significant official news TV program that is well known across China and is referred to as the "barometer of Chinese politics." It represents traditional TV media and primarily caters to the viewing needs of its audience. The official Douyin account of CCTV, which serves as a representative product of mainstream media exploring media convergence, emphasizes immediacy and interactivity, allowing users to access the latest video reports. User-generated media refers to channels through which individuals or small teams publish content on social media platforms, existing outside of mainstream media. This type of media features decentralized, open, and participatory information dissemination channels.

The thematic experimental manipulation primarily involves an objective and scientific introduction to the Monkeypox vaccine, focusing on its components, vaccination safety, and immune efficacy. It cites data from the National Health Commission, emphasizing the vaccine's high efficacy and safety in clinical trials. Additionally, it systematically lists common reactions following vaccination and provides scientific evidence and coping strategies aimed at alleviating public concerns about vaccination. Ultimately, it highlights the importance and universality of vaccination in curbing the global spread of Monkeypox. In contrast, the episodic framing of the experimental text features a narrative about an individual who successfully received the Monkeypox vaccine. It recounts the genuine experience of a person named Xiao Zhang, detailing his initial doubts before vaccination, his experience during the process, and his feelings afterward. The narrative is emotionally resonant and aims to evoke empathy among the audience. Furthermore, he emphasizes the importance of vaccination, sharing the sense of security and confidence in health he felt post-vaccination. He also briefly explains the symptoms and transmission methods of Monkeypox to help the audience better understand the necessity of the vaccine. Finally, he encourages everyone to prioritize their health and actively get vaccinated to protect themselves and others.

After reading the experimental materials, all participants answered questions regarding their willingness to be vaccinated against Monkeypox. Participants were then asked to answer a number of demographic variables, socioeconomic variables, and other control variables.

3.2. Sample

We conducted this experiment using the Credamo platform, a reliable data collection platform in China similar to Qualtrics and MTurk, with coverage of over 3 million individuals across mainland China. We recruited 700 participants from the Credamo online support group. Concerns may arise regarding the attentiveness of respondents or the discrepancy between the survey conditions and real scenarios. To address this, we included an attention-check question and two manipulation-check questions to assess whether participants correctly received the experimental information.

After excluding 12 respondents who took over 1000 s to complete the survey, 16 who took less than 100 s, 8 who failed the attention check, and 34 who did not correctly answer the manipulation checks (including 20 related to media channels and 14 related to framing), we obtained a valid sample of 630 participants. According to G*Power 3.1, our study required at least 158 respondents to detect an effect size of 0.25 with a significance level of 0.05 and a statistical power of 80%. Each valid response was compensated with RMB 2 (approximately USD 0.28).

Demographic characteristics and descriptive analyses of the experimental sample are presented in Table 1. The average age of participants was 30.222 years (SD = 7.354), ranging from 18 to 68 years. By tracking the respondents' IP addresses, we found that, with the exception of Tibet, the participants were nearly representative of all provinces in mainland China.

Table 1. Sample demographics and descriptive statistics.

Variables	**Group 1**		**Group 2**		**Group 3**		**Group 4**		**Group 5**		**Group 6**	
Gender												
Female	66	62.86	74	70.48	72	68.57	74	70.48	82	78.10	69	65.71
Male	39	37.14	31	29.52	33	31.43	31	29.52	23	21.90	36	34.29
Education level												
Below high school	-	-	-	-	-	-	1	0.95	-	-	1	0.95
High school, Secondary school	6	5.71	3	2.86	3	2.86	4	3.81	2	1.90	3	2.86
Junior college	8	7.62	10	9.52	8	7.62	8	7.62	14	13.33	8	7.62
Bachelor's degree	72	68.57	68	64.76	76	72.38	76	72.38	71	67.62	78	74.29
Master's degree	19	18.10	22	20.95	16	15.24	15	14.29	18	17.14	15	14.29
Ph.D. degree			2	1.90	2	1.90	1	0.95				
Student status												
No	84	80.00	85	80.95	80	76.19	83	79.05	94	89.52	94	89.52
Yes	21	20.00	20	19.05	25	23.81	22	20.95	11	10.48	11	10.48
CPC membership *												
No	95	90.48	85	80.95	84	80.00	89	84.76	84	80.00	90	85.71
Yes	10	9.52	20	19.05	21	20.00	16	15.24	21	20.00	15	14.29
Marital status												
Single	45	42.86	47	44.76	43	40.95	47	44.76	35	33.33	37	35.24
Married	60	57.14	58	55.24	62	59.05	58	55.24	70	66.67	68	64.76
STI **												
No	102	97.14	103	98.10	102	97.14	102	97.14	104	99.05	100	95.24
Yes	3	2.86	2	1.90	3	2.86	3	2.86	1	0.95	5	4.76
Heterosexuality												
No	4	3.81	5	4.76	4	3.81	7	6.67	2	1.90	2	1.90
Yes	101	96.19	100	95.24	101	96.19	98	93.33	103	98.10	103	98.10

	Obs	**Mean**	**Std. Dev.**	**Min**	**Max**
Age	630	30.222	7.354	18	68
Self-reported health	630	4.151	0.636	2	5
Monkeypox knowledge	630	2.77	0.561	1	4
Vaccine importance	630	4.414	0.579	1	5
Vaccine safety	630	4.095	0.633	2	5
Vaccine effective	630	4.227	0.6	2	5
News attention	630	2.965	0.997	1	5
Radio attention	630	2.997	1.077	1	5
TV attention	630	3.589	0.774	2	5
Internet attention	630	4.637	0.51	3	5

* CPC = Communist Party of China; ** STI = sexually transmitted infection.

3.3. Measures

Dependent variables: The dependent variable was measured from Monkeypox vaccination willingness. Participants were asked the question, "Suppose that the state develops a Monkeypox vaccine for the overall prevention and control of Monkeypox epidemics and advocates for residents to take the initiative to get vaccinated. How willing are you to receive the Monkeypox vaccine (on a scale from 1 to 10)?"

Independent variables: Traditional TV media = 1, official online media = 2, user-generated media = 3. For framing, thematic framing = 0, episodic framing = 1.

Potential covariates: Gender values were 1 and 0 for male and female participants, respectively. Educational level was categorized as follows: less than high school (1), high school or junior college (2), college (3), bachelor's degree (4), master's degree (5), and doctorate (6). Student status was categorized as 1 and other as 0. Political affiliation was categorized as 1 for CPC members and other as 0. Marital status was categorized as 1 and other as 0. Having contracted a sexually transmitted disease was categorized as 1 and never having contracted one was categorized as 0. Heterosexuality was categorized as 1 and other was categorized as 0.

The study also measured self-reported health status, level of knowledge about the Monkeypox vaccine, perceptions of the importance, safety, and efficacy of the vaccine, as well as attention to newspapers, radio, TV, and the Internet. All measurements utilized a 5-point Likert scale ranging from low to high.

4. Empirical Results

To assess the effectiveness of randomization in the experiment, we analyzed the means of demographic and other variables across the experimental groups. Except for student status, which showed a significant difference, no other variables exhibited significant differences in means between the experimental groups.

4.1. The Effects of Media Type and Framing on Willingness to Vaccinate

Figure 2 illustrates the distribution of respondents' willingness to receive the Monkeypox vaccine across the six experimental groups. It is evident that the combination of traditional TV media with the episodic framing results in the highest public willingness to vaccinate. Conversely, when the episodic framing is paired with user-generated media, the public's willingness to vaccinate is at its lowest. The official online media and episodic framing group fall in between. Additionally, under the thematic framing, the differences among the three communication channels are minimal, with the highest public willingness to vaccinate observed in the official online media group.

To further analyze the effects of media channels and media framing on the public's willingness to receive the Monkeypox vaccine, we employed ordinary least squares (OLS) regression, with results presented in Table 2. Model 1 primarily examines the impact of media channels on the dependent variable, while Model 2 focuses on the influence of media framing. Model 3 incorporates the interaction terms between media channels and media framing to display their effects on the dependent variable. Additionally, we included demographic and other control variables in all three models to account for potential confounding factors.

Model 1 in Table 2 indicates that, compared to traditional TV media, respondents' willingness to vaccinate decreases in the contexts of official online media and user-generated media. Specifically, respondents' willingness to vaccinate significantly declined by 0.342 when exposed to user-generated media compared to traditional TV media. The results of Model 2 show that, relative to thematic framing, episodic framing leads to higher willingness to vaccinate among respondents, although this result is not statistically significant.

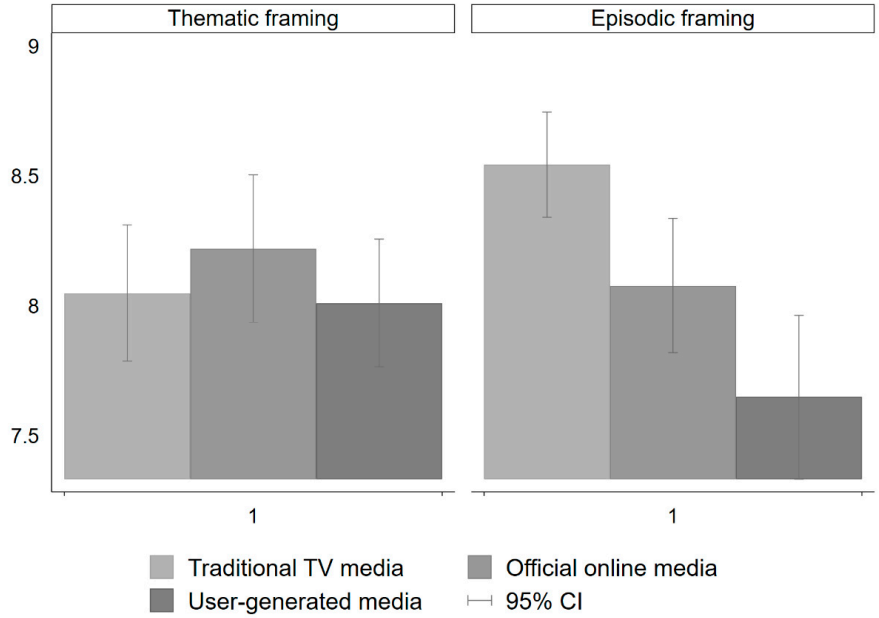

Figure 2. Distribution of public vaccination willingness in the experimental groups.

Table 2. Effects of media channels and media frames on public willingness to receive Monkeypox vaccination.

Variables	Willingness to Vaccinate		
	Model 1	Model 2	Model 3
Official online media *Ref. Traditional TV media*	−0.049		0.248
	(0.116)		(0.176)
User-generated media *Ref. Traditional TV media*	−0.342 **		0.082
	(0.125)		(0.172)
Episodic framing *Ref. Thematic framing*		0.064	0.540 ***
		(0.103)	(0.160)
Official online media # episodic framing			−0.592 *
			(0.234)
User-generated media # episodic framing			−0.846 ***
			(0.250)
Gender	0.061	0.053	0.079
	(0.113)	(0.114)	(0.112)
Age	−0.008	−0.006	−0.009
	(0.011)	(0.011)	(0.011)
Education level	0.051	0.057	0.048
	(0.094)	(0.092)	(0.094)
Whether student	0.178	0.185	0.141
	(0.171)	(0.171)	(0.168)
CPC membership	−0.125	−0.139	−0.151
	(0.149)	(0.151)	(0.152)
Married	−0.236	−0.262	−0.233
	(0.168)	(0.168)	(0.168)
Self-reported health	0.056	0.047	0.059
	(0.089)	(0.091)	(0.089)
Monkeypox knowledge	0.014	0.025	0.034
	(0.100)	(0.101)	(0.100)
STI	0.032	−0.014	0.051
	(0.235)	(0.236)	(0.228)

Table 2. *Cont.*

Variables	Willingness to Vaccinate		
	Model 1	Model 2	Model 3
Heterosexuality	0.124	0.097	0.167
	(0.351)	(0.346)	(0.339)
Vaccine importance	0.404 ***	0.422 ***	0.396 ***
	(0.100)	(0.100)	(0.100)
Vaccine safety	0.451 ***	0.465 ***	0.460 ***
	(0.099)	(0.101)	(0.098)
Vaccine effective	0.374 ***	0.389 ***	0.375 ***
	(0.100)	(0.100)	(0.099)
News attention	0.075	0.079	0.072
	(0.064)	(0.063)	(0.063)
Radio attention	0.019	0.009	0.019
	(0.059)	(0.060)	(0.059)
TV attention	0.061	0.057	0.050
	(0.082)	(0.081)	(0.080)
Internet attention	0.098	0.088	0.074
	(0.105)	(0.105)	(0.103)
_cons	1.799	1.504	1.622
	(1.023)	(1.005)	(1.019)
N	630	630	630
R2	0.197	0.187	0.214

Note. Robust standard errors in parentheses; *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$.

Model 3 reveals that, holding other variables constant, when official online media employs episodic framing for Monkeypox vaccination promotion, respondents' willingness to vaccinate decreases by 0.592 compared to the baseline. In other words, the combination of episodic framing with official online media may significantly lower vaccination willingness, indicating that this combination is less effective than the combination of TV with episodic framing. Similarly, when user-generated media uses episodic framing, the willingness to vaccinate decreases by 0.846, suggesting that user-generated media under episodic framing has an even more negative impact, potentially significantly suppressing vaccination willingness. In summary, the results of the interaction terms indicate that, under episodic framing, the use of both official online media and user-generated media is associated with a decrease in vaccination willingness, with the impact of user-generated media being particularly pronounced.

Figure 3 visually illustrates these research findings. Under the TV channel, the episodic framing significantly outperforms the thematic framing. However, when the communication channels are official online media and user-generated media, the situation changes: using episodic framing in these channels results in relatively lower public willingness to vaccinate, while thematic framing leads to higher vaccination willingness.

We further conducted a post hoc analysis of the media channels, with results presented in Table 3. Compared to TV, when the source of the Monkeypox vaccine news is official online media, the estimated value is −0.048, indicating that the communication effect of official media on the Internet is 0.048 units lower than that of TV, though this difference is not statistically significant. Similarly, there is no significant difference between user-generated media and official online media. However, when the source of the Monkeypox vaccine news is user-generated media, its effect is significantly lower than that of TV by 0.341 units. In summary, the effectiveness of TV in encouraging public willingness to receive the Monkeypox vaccine is significantly greater than that of user-generated media, while the difference between official online media and TV is not significant, nor is there a significant difference between user-generated media and official online media.

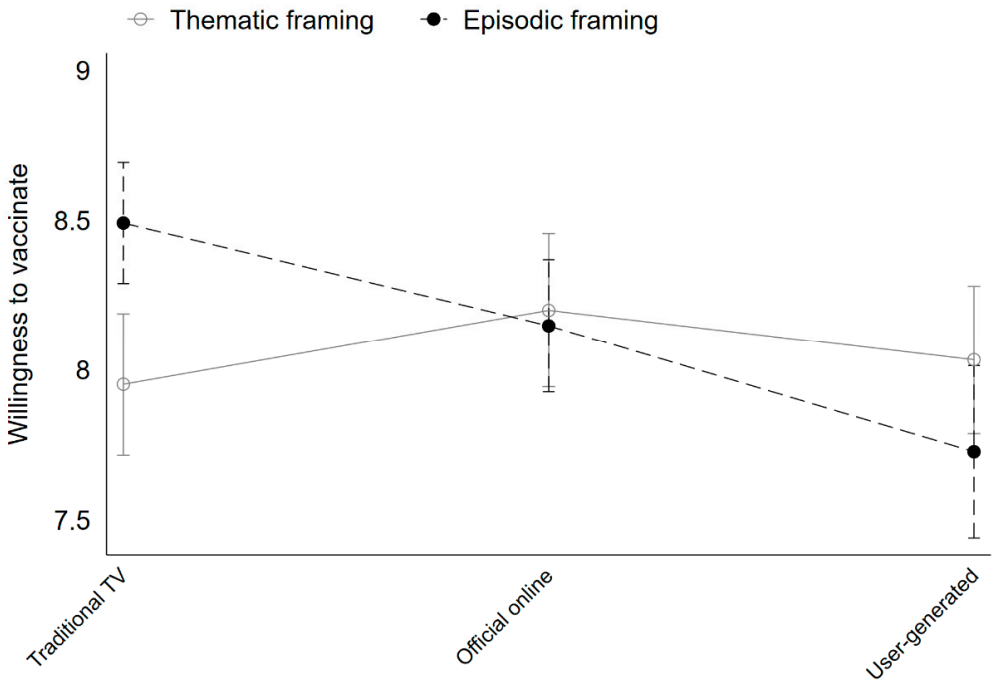

Figure 3. The effects of media types and frames on willingness to vaccinate.

Table 3. Post hoc results.

Pairwise Comparisons	Contrast	Std. Err.	[95% Conf. Interval]
Official online media vs. Traditional TV media	−0.048	0.115	[−0.3243, 0.2294]
User-generated media vs. Official online media	−0.294	0.129	[−0.6058, 0.0179]
User-generated media vs. Traditional TV media	−0.341	0.124	[−0.6393, −0.0434]

4.2. Heterogeneity Analysis

The article further examines the heterogeneity of the research results across different age, education, and student status groups, with results presented in Table 4. Regarding age, there are no differences in willingness to vaccinate based on media channels or media framing; both younger individuals and those over 35 show no preference for a specific media channel but tend to favor episodic framing. In terms of education, individuals with an education level below a bachelor's degree do not exhibit a preference for specific media channels or framing; however, those with a bachelor's degree or higher prefer episodic expressions. Regarding student status, students show a greater preference for and acceptance of official online media compared to TV, but there is a no clear preference between user-generated media and TV, with no specific preference for a certain framing style. In contrast, non-student groups lean towards episodic framing.

The interaction results between media channels and media framing indicate that for younger individuals, those with a bachelor's degree or higher, and non-student groups, official online media and user-generated media with episodic framing significantly lower their willingness to vaccinate.

In summary, there are significant differences in the effectiveness of official online media based on student status, with students showing a preference for official media's online channels. Additionally, episodic framing generally enhances respondents' willingness to vaccinate compared to thematic framing. Lastly, user-generated media tends to exert a negative influence on respondents' willingness to vaccinate in the context of Monkeypox vaccination promotion, especially when combined with episodic framing. Overall, the

findings highlight the significant impact of the interaction between media channels and framing across different groups, emphasizing the need to consider audience heterogeneity when developing communication strategies for vaccination to optimize information dissemination effectiveness.

Table 4. Heterogeneity analysis of age, education, and student status.

Variables	Willingness to Vaccinate					
	Model 1 *Age* ≤ **35**	**Model 2** *Age* > **35**	**Model 3** *Bachelor's Degree or Below*	**Model 4** *Bachelor's Degree and Above*	**Model 5** *Student*	**Model 6** *Non-Student*
Official online media	0.268	−0.319	−0.826	0.313	0.760 *	0.049
Ref. Traditional TV media	(0.190)	(0.474)	(0.692)	(0.176)	(0.306)	(0.201)
User-generated media	0.092	−0.259	−0.030	0.050	0.290	0.004
Ref. Traditional TV media	(0.181)	(0.534)	(0.520)	(0.179)	(0.357)	(0.198)
Episodic framing	0.412 *	0.931 *	0.496	0.486 **	0.246	0.573 **
Ref. Thematic framing	(0.175)	(0.455)	(0.500)	(0.167)	(0.308)	(0.184)
Official online media	−0.526 *	−0.299	0.234	−0.618 *	−0.468	−0.545 *
# episodic framing	(0.255)	(0.634)	(0.802)	(0.241)	(0.424)	(0.266)
User-generated media	−0.822 **	−0.313	−0.415	−0.846 **	−0.563	−0.864 **
# episodic framing	(0.263)	(0.713)	(0.784)	(0.260)	(0.497)	(0.285)
_cons	1.940	0.303	−4.103	2.684 **	2.513	1.350
	(1.024)	(2.146)	(2.590)	(0.999)	(1.366)	(1.264)
N	516	114	79	551	110	520
R2	0.176	0.452	0.471	0.209	0.403	0.223

Note. Robust standard errors in parentheses; *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$; all the potential covariates were controlled for in the models in Table 3.

5. Discussion and Conclusions

Vaccine hesitancy, as a social phenomenon arising from the interaction of various factors such as science and technology, public policy, social cognition, and media communication, has been poorly explored in terms of the important role of communication in existing research. This paper focuses on the media factors contributing to public vaccine hesitancy, primarily discussing the effects of media channels and media framing on public willingness to receive the Monkeypox vaccine, as well as the heterogeneous responses of different groups. Based on a survey experiment conducted in China, the study finds that, among a variety of communication tools, episodic framing in traditional TV media and thematic framing in official online media can enhance public willingness to vaccinate against Monkeypox. Compared to thematic framing, episodic framing generally increases respondents' willingness to vaccinate. Furthermore, student groups show a preference for official online channels. The findings provide empirical evidence from China for understanding public health communication and deepen the academic understanding of Monkeypox vaccine hesitancy.

First, the research reveals that traditional TV media continues to play an important role in public health events such as the Monkeypox epidemic. Despite the rapid development of the Internet, TV is often considered an outdated communication channel. However, due to its long-standing authoritative status and credibility, traditional TV media effectively conveys public health information. Our experimental evidence supports this, especially when combined with episodic framing. In the face of urgent public health crises, the public tends to rely on sources perceived as authoritative. TV media, through strict news standards and fact-checking, provides high-quality information, which is particularly crucial during an epidemic. When viewers see familiar news anchors or experts discussing vaccines on TV, they are more likely to accept and trust the conveyed information.

Second, the study highlights the effectiveness of episodic framing in health communication. According to the CLT, episodic framing effectively narrows the psychological distance to the public by providing specific cases and vivid scenarios, thereby stimulating emotional resonance and increasing willingness to vaccinate. In public health communication, episodic framing not only vividly demonstrates the necessity of Monkeypox

vaccination but also helps the audience feel a direct connection to their own lives. For instance, the experimental manipulation that tells the story of an individual successfully controlling the outbreak through vaccination effectively enhances public identification with and willingness to participate in vaccination. This emotional connection is particularly pronounced in traditional TV media, as it combines images, sound, and narrative to create a more vivid and immersive experience.

Third, the research identifies the appeal of official new media and the limitations of user-generated media in health communication. The proliferation of emerging communication channels such as the Internet and social media has facilitated the exchange of health information and public participation, but it has also posed unprecedented challenges to scientific authority. On the one hand, the public seeks vaccination advice online, but the mixed-quality and hard-to-verify vaccine information they encounter can significantly lower their willingness to vaccinate. On the other hand, the interconnectedness of the Internet has brought together certain minority groups, such as religious individuals and anti-vaccine advocates, forming numerous virtual communities centered around "anti-vaccine" sentiments. These groups have amassed large followings in cyberspace, leading to more fluctuating public attitudes toward vaccines (Kata 2010). In other words, while the Internet offers rapid information dissemination and extensive interactivity, the quality and credibility of that information are often difficult to ensure. In this regard, traditional TV media can serve as an important complement, providing verified information and in-depth analysis. When official media combines with online channels—specifically, the official media's online presence—it becomes a crucial outlet for the public seeking authentic and authoritative information. The lack of authoritative endorsement and information overload can distract attention, making it difficult for user-generated media to persuade the public regarding Monkeypox-related information.

Finally, the study underscores the necessity of combining communication tools. Different audience preferences for media channels and framing may influence vaccination willingness. Understanding audience characteristics and information reception methods can help formulate more effective communication strategies. This finding provides important insights for public health communication. Policymakers and communicators should consider the choice of media types and information framing to maximize public willingness to vaccinate. Flexibly employing different communication methods tailored to specific groups and contexts will be more effective. Moreover, it should be recognized that, although the rise of new media is irreversible, the role of traditional TV media in public health communication should not be overlooked. When designing vaccination promotion campaigns, integrating the authority of traditional media with the emotional resonance of episodic framing can more effectively enhance public willingness to vaccinate. Multi-channel integrated communication strategies should also be considered to leverage the strengths of various media and improve overall communication effectiveness.

The article acknowledges several limitations for future research development. First, while the Planned Behavior Theory suggests a strong correlation between willingness and behavior, willingness does not necessarily represent actual behavior. Future studies could utilize behavioral data to discuss the factors influencing public vaccine uptake. Second, the sample in this study may suffer from representativeness issues. The selection of the sample may not adequately cover diverse groups in terms of age, gender, education level, and socioeconomic background, thus affecting the generalizability of the findings. Future research should consider using a broader and more diverse sample to ensure the representativeness and applicability of the results. Additionally, cross-cultural studies could provide richer perspectives to help understand the similarities and differences in media influence across different social contexts. Finally, although this study explored the impact of media types and framing on willingness to receive the Monkeypox vaccine, other critical elements of media still require further exploration. For instance, factors such as the frequency of information, the manner of information presentation, and the credibility of the media may also significantly influence the dependent variable.

Author Contributions: Conceptualization, H.W. and N.W.; methodology, H.W.; formal analysis, H.W.; writing—original draft preparation, H.W.; writing—review and editing, H.W. and N.W.; supervision, N.W.; project administration, N.W.; funding acquisition, H.W. and N.W. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by National Natural Science Foundation of China [72304254] and Humanities and Social Sciences Foundation, Ministry of Education of China [24YJC860028].

Institutional Review Board Statement: This study was conducted with the approval of the Communication University of China Ethics Committee (CUC-XSLL20241029-1), date of approval 28 October 2024.

Informed Consent Statement: Informed consent was obtained from all participants online before proceeding with the questionnaire.

Data Availability Statement: The data that support the findings of this study are available from the corresponding author, upon reasonable request.

Acknowledgments: The authors would like to thank all participants in this study.

Conflicts of Interest: The authors declare no competing interests.

Note

[1] Douyin, known as TikTok outside of China, is a popular short-video platform that allows users to create and share engaging content. Launched in 2016, Douyin features a wide range of videos, including music, dance, and tutorials, and has rapidly gained a massive user base.

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