

# Research on the Influencing Mechanism of COVID-19 Vaccination Willingness on the Efficiency of Public Health Event Management in the Post-COVID-19 Era

Tianye Wang<sup>1, a, \*</sup>, Zhazhan Xuan<sup>2, b</sup>, Wen Yin<sup>3, c</sup>, Han Zhou<sup>4, d</sup>

<sup>1</sup>Shanghai University of Finance and Economics, Shanghai, China

<sup>2</sup>Shanghai Sanda University, Shanghai, China

<sup>3</sup>Hunan Normal University, Changsha, Hunan, China

<sup>4</sup>Shanghai University of International Business and Economics, Shanghai, China

<sup>a</sup>yey223@foxmail.com, <sup>b</sup>274983394@qq.com, <sup>c</sup>843705368@qq.com,

<sup>d</sup>polariszhou99@gmail.com

These authors contributed equally to this work

## Abstract

**In the context that COVID-19 will coexist with human for a long time, universal vaccination is the most effective and safest way to combat the pandemic. This paper aims to analyse the factors influencing the public's willingness to vaccinate from four dimensions: individual, media, virus variation, and convenience of vaccination service, with the intention of improving management efficiency for the subsequent government implementation of vaccination, so as to reduce government management costs.**

## Keywords

**Post-COVID-19 era; Government management; Public health emergency.**

## 1. Introduction

According to the Pandemic Real-Time Big Data Report (Data source: COVID-19 Pandemic Real-Time Big Data Report, [https://voice.baidu.com/act/newpneumonia/newpneumonia/?from=osari\\_aladin\\_banner](https://voice.baidu.com/act/newpneumonia/newpneumonia/?from=osari_aladin_banner), collected on 12 September 2021, more than 120,000 people have been infected with COVID-19 in China since late 2019, with a 4.6% death rate. As a global public health emergency, the outbreak of COVID-19 has a significant economic impact on governments, while the efficiency of governance and crisis management of major public health emergencies is directly linked to government administrative costs. From the outbreak to April 2020 when the pandemic was mainly contained, the Chinese government's rigorous prevention measures and the trust of the people led to the rapid and effective containment of the pandemic in China; and in the Post-COVID-19 era, where the continued mutation of COVID-19 and the long-term existence of the virus with humans are mainstream issues, vaccination has become the focus of the government's subsequent prevention efforts. As the virus is expected to coexist with humans in the long term, universal vaccination is the most effective and safest way to combat the pandemic.

As of 6 September 2021, China's vaccination rate had reached 77.6% (Data source: Wu Liang, Deputy Director of the Disease Control Bureau of the National Health Commission, said at a press conference on 7 September on the State Council's Joint Prevention and Control Mechanism: "As of 6 September, the total number of people vaccinated across China reached 1.095 billion, covering 77.6% of the country's total population). While the promotion of

vaccination at all levels, from the national level to the community level, has been instrumental, the efficient promotion of future vaccination efforts is key to helping the government in the long-term sustainability of the pandemic. Much of the previous literature on the COVID-19 has focused on the impact of the pandemic on the economic development of the country and industry, regional people's perceptions and willingness to vaccinate, but the government, media and virus mutation were not taken into consideration, while this paper aims to understand more comprehensively the factors influencing the public's willingness to vaccinate through in-depth interviews, with the intention of improving management efficiency for the subsequent government implementation of vaccination, so as to reduce government management costs.

## 2. Study Design

In the research on the factors influencing vaccination, the main factors that cause vaccine hesitancy have been elucidated in the literature (Macdonald, 2015), including three major dimensions of trust, complacency, and convenience of vaccine services. In addition, in the context of negative vaccine events, government trust also influences public behavior through the mediating variable of risk acceptance (Huang, Wang, Fang, & Wu, 2019), Behavioral economics reveals factors influencing vaccination intentions and related government interventions from a dual-system perspective of decision making (Wei, Wang, Leng, & Wang, 2021). Based on these papers, the factors influencing vaccination intention are developed in four dimensions: individual perceptions, media, virus mutation and convenience of vaccination services. Individual perceptions are further divided into three dimensions: individual perceptions of vaccine safety, individual decision-making psychology and national identity.

To ensure the scientific validity of the study, a total of 12 interviewees, six of each gender, were set up, all of whom were suitable for vaccination, in three age groups: 18-25 years old, 26-45 years old and over 45 years old. During the actual interviews, the interviewees ranged in age from 21-50 years old and came from five provinces, including Shanghai, Hunan and Guangdong. 91.6% of the interviewees were vaccinated, and their education was in the high school to doctoral range, with a large variation to avoid chance to a certain extent. The interviews mainly covered (1) the level of expectation of the safety and efficacy of the COVID-19 vaccine; (2) the impact of negative events of the COVID-19 vaccine on individuals' willingness to vaccinate; (3) the evaluation of government and official media on vaccine propaganda; (4) the impact of virus mutation on willingness to vaccinate; (5) the preference of vaccination types and vaccination service.

**Table 1.** Basic information of interviewees

Gender	Age range	NO.	Age	Education	Occupation	Region	Vaccination status
Male	18-25	01	21	Undergraduate	Student	Hunan	Vaccinated
		02	23	Master	Student	Zhejiang	Vaccinated
	25-45	03	29	Bachelor	Bank worker	Hunan	Vaccinated
		04	32	Bachelor	Bank worker	Zhejiang	Vaccinated
	45+	05	47	Bachelor	Public security	Hunan	Vaccinated
		06	48	Ph.D.	Securities Practitioner	Shanghai	Vaccinated
Female	18-25	07	21	Bachelor	Student	Shanghai	Not vaccinated
		08	21	Bachelor	Student	Guangdong	Vaccinated
	25-45	09	30	Master	Fund Practitioner	Shanghai	Vaccinated
		10	37	Master	Teacher	Tianjin	Vaccinated
	45+	11	47	High school	Individual businessman	Zhejiang	Vaccinated
		12	50	High school	dorm keeper	Shanghai	Vaccinated

### 3. Influencing Factors of Vaccination Intention

#### 3.1. Individual Factors

##### 3.1.1. Individual Cognition and Judgment of Covid-19 Vaccine

Individuals' cognition and judgment of vaccines are the main factors affecting their willingness to vaccinate, however, their cognition of vaccines themselves is mainly reflected in the acceptability of adverse reactions after vaccination, the acceptability of the upper limit of mortality caused by vaccination, and their expectation of the effectiveness and safety of vaccines.

According to the evaluation of adverse reactions after vaccination, most respondents believed that fatigue, lethargy, and flu-like symptoms were routine adverse reactions after vaccination. While a small number of respondents would experience fever, dizziness, redness and pain at the vaccination site, only a small number of respondents would experience diarrhea, urticaria and other symptoms. However, the respondents' highest acceptance of adverse reactions is usually confined to mild reactions such as fever, while severe reactions that affect people's normal life such as vomiting and diarrhea are often difficult to be accepted.

50% of the respondents did not know the death rate of COVID-19 vaccine, which is also because the country has not fully disclosed the data. Twenty-five percent put the fatality rate at about 1 in 10 million. Respondents expected the vaccine fatality rate to be as low as possible, with 50% agreeing to a rate of 1 in 1 million and 25% wanting it to be one in ten million.

In terms of the safety and effectiveness of vaccines, the majority of respondents believed that safety was more important than effectiveness. More attention is being paid to the safety of vaccines for the protection of life safety. However, some argue that effectiveness is the key. "Since vaccines are made to fight epidemics, they must be targeted at the virus, and there is no point in only ensuring safety." But as soon as possible to develop a vaccine against a variety of mutated viruses with the basis of safety can maximize the effectiveness of the vaccine and reduce the side effects and mortality of the vaccine, increasing safety and durability, forming the herd immunity and defeating the virus is a general consensus.

##### 3.1.2. Psychology of Individual Behavior Decision Making

According to the changes of the surrounding environment, individuals will make relatively satisfactory decisions in a short period of time during the implementation of behavioral decisions. For individual vaccination decisions, they are mainly affected by herd psychology and the necessity of vaccination.

Most of the respondents agree that "The Effect of Sheep Flock" has influence on their own vaccination, considering that "if everyone vaccinated individuals produce a herd mentality, so I prefer to vaccination", "if everyone vaccinated, and it's nothing serious, then I will vaccinate ". At the same time, interviewees believe that in the general environment of group action, individuals who do not conduct similar behaviors will be regarded as "incompatible". Due to the particularity of the virus, such "incompatible" will also be regarded as a minority group vulnerable to infection and then infect others.

In the interview, we learned that the necessity considerations and egoism of vaccination are actually influenced by conformity, and they often stay in the relevant thoughts but still choose vaccination in reality. 75 percent of respondents did not think that "everyone around me is vaccinated and the environment is safe, so I do not need to be vaccinated", while respondents who had thought this way also indicated that vaccination in an environment where vaccination services are convenient was a relatively optimal choice, as provincial and municipal mobility increased the possibility of infection without vaccination. Egoism (not taking the risk of being vaccinated) is undermined by the high vaccine penetration rate because respondents who were on the fence before the vaccine was widely introduced believe that the high vaccination rate

proves that the vaccine is safe and will actively reduce their distrust of vaccines. In addition, egoism is still a minority group, and more respondents said that out of family and social responsibility, they would actively cooperate with vaccination and encourage others to get vaccinated.

### 3.1.3. Trust in Government and Vaccination Willingness

The relationship between the public and government is a form of bilateral expectation relationship (Cheng, 2004). People hold reasonable expectations of the government policy and its administrative management system. Meanwhile, the government looks forward to the active respond and cooperate from the public to build up the cooperation relationship. There is a positive correlation between the public's trust in the government and the public's response to the government's promotion of vaccination.

The role of mutual trust between the Chinese government and its people

During this COVID-19 pandemic, the effective control of the government in the early stage of the outbreak greatly met the public's expectation for the government's policy and helped to establish the people's trust in the government and the country. "Our country has made it to manage the pandemic occurred last year. All the measures were taken well. So, we can trust to the policy to vaccine. We can trust that it should be done, and its effectiveness is guaranteed. I feel that is the relationship of mutual trust" (09). This trust reinforces the willingness of the public to cooperate with the government during vaccination campaigns, thus enabling the government to improve efficiency and reduce administrative costs in the management of public health events.

On the contrary, the distrust in the government's decision making will greatly reduce the efficiency in management and make it more difficult for the government to control the transmission of COVID-19. "In European countries and the United States, ordinary people are half-suspicious of government policies and often promote some conspiracy theories. When the final vaccine policy comes out, there are many naysayers. However, many people still choose to believe these naysayers in the end, because for them, the government is always playing a negative role in their daily cognition" (06).

Domestic vaccines vs overseas vaccines

83% of respondents said that they preferred domestic vaccines, while another 17% of the respondents said they were more concerned about the safety of vaccines instead of the countries that developed them. Among the people with preference of domestic vaccine, support and trust of the government is the key factor. To get to the bottom of it, the reasons can be found relate to the government's early treatment and effective control of the outbreak. "First of all, under the effect of the epidemic, China is the country with the best prevention measures in the world. And the research and development of the vaccine is definitely awesome, too" (04). Meanwhile, most of the domestic people come into contact with more negative information of overseas vaccine which directly affected the national acceptance of overseas vaccine, "Because when I watch the news, I found that many overseas vaccines had more or less side effects after vaccinated, which made me very worried" (02), "foreign mortality rate of vaccine is high, and negative impact varies" (12).

## 3.2. Media factor

The influence of media on the willingness to vaccinate is mainly reflected in the dissemination of negative information about COVID-19 vaccines by unofficial media and the positive publicity of vaccines by official media.

### 3.2.1. The Negative Information from Unofficial Media

In the interview cases, more than 58% of respondents indicated that negative reports on vaccines from unofficial media channels such as "We Media" were not enough to influence

individuals' willingness to vaccinate. The main reason for this is that the dissemination of such information is treated as an individual case, while the risk associated with the vaccine, controlled within a certain range, is considered acceptable. As for the spread of negative information about COVID-19 vaccine, there are some particularities. Three respondents said that their trust in vaccines comes from their trust in the country and the country's endorsement of vaccines, i.e., "More trust our country, even if there is a bit of negative news, will feel that it is an exception" (08), "I have a lot of faith in our country. Most of the negative news is rumor, and some people are deliberately unpatriotic and belittling our country" (12). 33% of respondents indicated that negative media reports on vaccine models and manufacturers would lead to panic about their own subsequent vaccination, which is caused by the potential side effects of vaccines, so respondents would choose to avoid vaccine models with serious side effects reported.

In the process of information dissemination, unofficial media often have the characteristics of fast dissemination and incomplete information disclosure, which makes it easier to cause the phenomenon that rumors are widely spread but difficult to clarify, especially in the network platform. For this characteristic, although most of the respondents said they would not be misled by the negative cases which are caused by personal health problems, there are still some suggested that the coverage of the incidents online shall clearly state the facts, otherwise easy to cause unnecessary misunderstanding of vaccine information.

### 3.2.2. The Positive Information from Official Media

As the mouthpiece of the government, the official media can have an impact on the audience's ideology by clarifying the truth, spreading positive energy and developments to a certain extent. In this case, official media have actively supported the work including pandemic prevention and control and encouraged vaccination through positive guidance. For example, the official Weibo of People's Daily and the official WeChat account of Xinhua News Agency regularly disclosed the number of COVID-19 vaccine doses nationwide. Seventy-five percent of respondents said positive publicity about vaccines in the state media would increase their confidence in vaccination, mainly because the data disclosure in the state media revealed the high prevalence and acceptance of vaccines so that the public felt safe and confident about vaccines. At the same time, the positive publicity of the official media also makes the public associate vaccination with social responsibility to a certain extent. "If you get vaccinated, you will not get severe illness even if you are infected, and it is safer for people around you, as the transmission of the virus would weaken. That's a sense of social responsibility" (09).

However, in the opinion of respondents, the positive guidance of the state for vaccines also has pros and cons, including two views: first, the free provision and active publicity of COVID-19 vaccines by the state makes some people doubt the quality and effectiveness of vaccines; second, the only positive publicity of vaccines by the official media makes the audience question the objectivity of the information provided. In this regard, more respondents hope that the government can disclose data on vaccine safety, including mortality rate and effectiveness, through official media, which can greatly increase public confidence in subsequent vaccination.

### 3.3. Pandemic Variation Factors

As the world's response to COVID-19 continues to evolve, the virus is also evolving in adaptation. From the Alpha strain with ability to beat immunity found in the UK, to the Beta strain which can evade vaccines found in South Africa, to the Gamma strain with characteristic of exponential growth found in Brazil, to the notorious Delta strain with high infectious found in India, different strains have their own characteristics and present new constant threats to human. In May 2021, Shenzhen, China, was hit by the Alpha strain, and in July, Nanjing, China, was hit by the Delta strain. Under the new situation of the pandemic, people's cognition of the mutated virus and their estimates of its harmfulness is of great significance.

### 3.3.1. Public's Estimates of the Harm of the Epidemic

The public's willingness to vaccinate largely comes from their estimates of the harmfulness of the epidemic. In the post-COVID-19 era, the harmfulness of the pandemic is mainly reflected in the degree of virus mutation. This study measures the public's perception of the danger of the pandemic after virus mutation from two aspects: infection rate and mortality rate. The public's cognition of the change in infection rate caused by the mutated virus is basically similar, and it is generally believed that the infection rate will increase, which reflects the sufficient cognition of public to the severity of the epidemic. However, there is a significant difference in the cognition of mortality rate, and the full trust in the government's pandemic prevention will weaken the public's perception of mortality rate to some extent.

According to the interview results, respondents' understanding of virus mutation can be divided into three categories: 16% of the respondents belong to the category of "completely unknown", 67% of the category of "partially understood", and the other 17% belong to the category of "relatively understood". 5 respondents understand the mutated virus infection rate and mortality rate changes. 2 people talked about the spread of the virus mutation speed and style changes, agreed that the propagation speed has largely improvement. In addition, some respondents mentioned changes in the applicability of the vaccines under the mutation of virus, when it comes to vaccine still has certain protective effect and talked about in the face of the threat of a mutated virus, vaccine still has certain protective effect.

In terms of the perception of infection rate changes after virus mutation, only 1 respondent believes that the infection rate will decrease, because of his trust in pandemic prevention and control. "As the current control of COVID-19 is relatively good, the mutation will not greatly increase the infection rate and mortality rate" (01). The remaining 8 respondents all believed that the infection rate would increase and said that they had learned about the current mutation of the virus from different sources. One of them mentioned that the mutation of the virus was "very scary" and "my mother told me that I would be infected in 14 seconds even if I just walked pass without touching it (the virus)" (08).

In the aspect of the perception of the mortality rate of the mutated virus, it is worth noting that the respondents in the category of "partially understood" mentioned above showed great differences. 5 respondents believed that the mortality rate would decrease, among which 4 respondents gave the reason for their trust in the pandemic prevention situation in China, and 1 said that it was based on the law of mutation development that "the more the virus mutates, the lower mortality rate will be" (10). The other 4 respondents believed that the mortality rate will increase, and the reason given is the recognition of the actual situation through various information channels, such as the publicity of news media and the influence of people and events occurred around them. They believed that the mortality rate is increasing in practice.

### 3.3.2. The Effect of Virus Variation on Vaccination Willingness

After investigating the respondents' understanding of the virus mutation and their perception of its harm, we asked the respondents to subjectively analyze the impact of the virus mutation on their willingness to vaccinate by ask them the question "whether the virus mutation would enhance or weak your willingness to vaccinate". As for the prerequisite of virus mutation, 91.6% of the respondents believed that their willingness to be vaccinated is enhanced. As for the reasons, 9 respondents believed that it provides an added degree of protection by follow-up vaccination; Another 2 respondents believed that what increased their willingness was due to social responsibility and the need to establish a dense line of "nationwide anti-epidemic" after the virus mutated. And 1 respondent indicated that free vaccine provided a basic guarantee for his willingness to get follow-up vaccination.

On the question of "whether you would be willing to participate in the follow-up vaccination if new vaccines are launched", 5 of the respondents clearly indicated that they were willing to

take it. As for the reasons, 1 respondent said that it was out of a kind of psychology that he wanted to be prepared for the mutation of the virus in advance to prevent it from happening. 1 respondent accepted the effectiveness of existing vaccine and would continue to vaccinate as long as the effectiveness of subsequent vaccines was not weakened. 2 respondents said vaccination made them feel psychologically safer and keep them more secure. Another respondent suggested that vaccination can reduce the trouble she may cause to her family while taking a sense of social responsibility and keeping pace with the country. However, it is worth mentioning that the respondent also expressed her concerns about “the adequacy of vaccine prevention effects when our country needs to open the door to the world in the future”, given the different pandemic prevention concepts at home and abroad (12).

#### 4. Conclusion

In the context that the pandemic will exist for a long time, thanks to the good pandemic prevention measures taken by the Chinese government in the early stage of the pandemic outbreak (early 2020), the public has built trust in the government. Therefore, more groups are willing to support the domestic COVID-19 vaccines and even play a leading role in the population. This successful construction of government trust also makes false and negative information about domestic vaccines less misleading to the public. Positive publicity of vaccines by official media can increase people's confidence in vaccination and advocate social responsibility. However, clear data disclosure on the safety and effectiveness of vaccines by official media can enhance people's confidence in subsequent vaccination. In addition, the high coverage and little negative information of domestic vaccines as well as the unavoidable population flow between the provinces and cities, establish high psychological security and vaccination necessity will for individual, namely the individual's perception of vaccine risk relative to a minimum. On this basis, a herd mentality drives more self-interested individuals which was not willing to take risks to consistent convergence with others, which further improve the vaccination rate.

In the case of COVID-19 mutation, due to the enhancement of self-awareness of pandemic prevention and the trust in the effectiveness of vaccines, the subsequent promotion of vaccination will change from the government's vigorous advocacy to the daily management of voluntary cooperation of the masses. However, there is a possibility that someone may reduce their willingness to be vaccinated if the vaccine charges. Comparatively speaking, free vaccines, herd immunity versus closed-off management, and bulk Nucleic acid testing can minimize financial costs and workload. The public's average expectation is that the adverse reactions of vaccines should be limited to fever, the mortality rate should be limited to 1 in 1 million, and the effectiveness of vaccines should be increased to more than 90% while ensuring safety. In terms of the convenience of vaccination service, the public pays less attention to the type of vaccine injection and more hopes that the vaccine can be compatible with their own physical conditions. Therefore, on the premise of informing the efficacy and adverse reactions of the vaccine, vaccines with 1 to 3 doses can be independently booked for people with different needs. For the convenience of working staff, vaccination sites can be set up in community health centers and hospitals within 1 km of home or work place in residential communities to avoid queuing and improve the satisfaction of vaccination service.

#### References

- [1] Maganioti, A.E., Chrissanthi, H.D., Charalabos, P.C., Andreas, R.D., George, P.N. and Christos, C.N. (2010) Cointegration of Event-Related Potential (ERP) Signals in Experiments with Different Electromagnetic Field (EMF) Conditions. *Health*, 2, 400-406.

- [2] Bootorabi, F., Haapasalo, J., Smith, E., Haapasalo, H. and Parkkila, S. (2011) Carbonic Anhydrase VII—A Potential Prognostic Marker in Gliomas. *Health*, 3, 6-12.
- [3] He Chengying, Wen Yuechun, Chang Yali, Geng Xiaoxu. Measurement analysis of the impact of COVID-19 on China's economy [J]. *Journal of quantitative and technical economics*,2020,37(05):3-22. and *technical economic research*, 2020,37(05):3-22.
- [4] Wu Guo-wei, DENG Ting, ZHANG Man-qi, LIU Zhe-ning, PU Wei-dan, WANG Jian-xin. A survey of attitudes towards COVID-19 vaccination and its psychosocial impact factors[J]. *Chinese Journal of Clinical Psychology*, 2021,29(03):622-625.
- [5] MACDONALD NE. Vaccine hesitancy: definition, scope and determinants [J]. *Vaccine*, 2015, 33(34): 4161-4164.
- [6] Huang Yi-hui, WANG Xiao, FANG Huiyan, WU Qiu-di. The impact of government trust on public health risk management: A situational study based on the event of Anaphylaxis vaccine [J]. *Journal of Public Administration*,2019,16(04):83-95+172-173.
- [7] Wei Chuanyong, Wang Daoqiao, Leng Anli, Wang Jian. The enlightenment of behavioral economics to public health emergency Management [J]. *Chinese Health Economy*,2021,40(07):14-16.
- [8] Cheng Qian. Government Trust Relationship: Value and Its Construction [J]. *Theory and Reform*, 2004(04):34-37.