



# What influence Chinese people's attitude and hesitancy toward COVID-19 vaccination? A national survey study

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**Abstract.** The study examines the factors associated with vaccine hesitancy from socio-demographic and psychological perspectives based on Health Belief Model (HBM) framework. A national survey with multiple cluster sampling was conducted in China, with 1419 participants involved. Results from the multiple hierarchical regression analysis reveal that while socio-demographic factors are not significant predictors, the HBM factors are significantly associated with both vaccine attitude and vaccine hesitancy. Past negative vaccine experience and cues to action have the most significant negative impacts on vaccine attitude, resulting in vaccine hesitancy. Perceived susceptibility and perceived barriers also led to vaccine hesitancy. Meanwhile, perceived benefits to action and perceived severity are found to lower vaccine hesitancy. The study provides directions to the health practice of altering vaccine hesitancy and the current situation of the coverage of COVID-19 vaccination in China.

**Keywords:** China, COVID-19 vaccine, vaccine hesitancy, perceived risk

## 1 Introduction

Caused by SARS-CoV-2, the Coronavirus disease 2019 (COVID-19) pandemic has been rapidly spread throughout the world (Ciotti et al., 2020). The COVID-19 pandemic not only causes global health crisis, but also results in significant impacts on global energy, economy and environment (Priya et al., 2020). To prevent any more outbreaks, it is suggested to increase the coverage of vaccination to establish herd immunity (Randolph and Barreiro, 2020). As new variants of virus are continue evolving over time, vaccination seems to be more urgent so that the risks brought by further evolution could be reduced (van Oosterhout et al., 2021).

However, there are still a number of Chinese citizens show negative vaccine attitude and hesitate for getting vaccinated (Wang et al., 2020). Vaccine hesitancy refers to delay in acceptance or refusal of vaccination despite availability of vaccination services (MacDonald, 2015), which has been listed as one of the top 10 global health threats by World Health Organization (Trogen et al., 2020). Previous studies have been mainly researched on socio-demographic and psychological determinants on vaccine hesitancy (Okamoto et al., 2022; Al-Amer et al., 2021; Murphy et al., 2021).

It has been reported that psychological factors in Health Belief Model (HBM) were relevant to the attitude towards COVID-19 vaccination, including cues to action, perceived benefits, perceived barriers, perceived susceptibility, and perceived severity (self-efficacy is not investigated in this study). The HBM is a conceptual framework which has been widely tested empirically and used to predict preventive health behaviors from the perspective of belief patterns (Teitler-Regev et al., 2011). It has been observed that perceived risk and susceptibility were relevant to the attitude towards COVID-19 vaccination, indicating that the ones who perceived themselves at a higher risk or greater susceptibility to COVID-19, are more likely to have higher vaccine acceptance or lower vaccine hesitancy (Al-Amer et al., 2021; Graffigna et al., 2020). In addition, it has been found out that people with more cues to action received were more likely to accept COVID-19 vaccines (Wong et al., 2021). Therefore, this study is also going to aim at the effects of demographic and psychological (HBM) factors on COVID-19 vaccine attitude and hesitancy among Chinese citizens.

To date, no study has been researched on the determinants of COVID-19 vaccine attitude and vaccine hesitancy among Chinese citizens at demographic and psychological levels before. Therefore, the study might fill the gap and provide some useful information of the cause of vaccine attitude and vaccine hesitancy for COVID-19 vaccines in China.

## **2 Method**

### **2.1 Procedures**

A nationwide cross-sectional survey was conducted from July to August 2021, to investigate the vaccination status of COVID-19 among Chinese citizens. By using the multistage cluster sampling method, we first classify the 34 provinces and municipalities of China into 7 main districts (i.e., East, South, North, Central, Southwest, Northwest, and Northeast), in consideration of geographical and population distribution. Then, the simple sampling approach was adopted to select two provinces or municipalities from each of the seven main districts. On the next step, one to three cities were randomly chosen from the 14 selected provinces (municipalities were not included in this step), with a total of 26 cities included in the survey. Finally, to guarantee that sample distribution of each age group mainly followed the present demographic characteristics in China, quota sampling was conducted in each included city based on the age distribution. Two researchers were recruited in each chosen city to assist and conduct the survey, and both of them had undergone professional survey training before data collection. Ultimately, the experimental data will be analyzed by multiple hierarchical regression in the SPSS software.

### **2.2 Measurement**

Besides demographic background, the survey collected key information of past experience and HBM-related constructs. Past experience of infection and vaccination were measured by dichotomous scale. Participants were asked to indicate if they have any

interaction with COVID-19 and past negative experience of vaccine (e.g. “Have you ever been infected with COVID-19?”), by “Yes” (1) or “No” (2). A higher score indicates less infection experience with COVID-19 and less past negative experience of vaccine. The reliability of interaction with COVID-19 and past negative experience of vaccine are .373 and .694, respectively.

The measurement of HBM constructs were adopted from Becker et al.’s (1974) study, including cues to action, perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. Cues to action was measured by a dichotomous scale of “Yes” (1) or “No” (2). The rest of the 4 variables were measured on a 7-point Likert scale ranging from “Strongly disagree” (1) to “Strongly agree” (7). The reliability of cues to action, perceived benefit and perceived barriers are .719, .875 and .906, respectively. The variables perceived susceptibility and perceived severity are singled-items, so there is no corresponding reliability.

### 3 Results

The study is aimed to examine the influence of various demographic and psychological factors on Chinese citizens’ vaccine attitude and vaccine hesitancy, including interaction with COVID-19, past negative experience of vaccine, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, and cues to action.

Table 1 demonstrates the predicted results of the regression analysis of vaccine attitude. The findings found that the basic demographic factors (i.e. age, gender, and education) are not quite statistically associated with vaccine attitude. However, the influence of infection and vaccination experience is significant. Among all, past negative experience of vaccine has the most significant negative effect ( $\beta = -.095$ ,  $p < .001$ ). Results also indicate that the factors in HBM have great impact on vaccine attitude, including cues to action and perceived benefits. The more cues to action people received, the worse vaccine attitude they have ( $\beta = -.050$ ,  $p = .034$ ). Among all, perceived benefits has the strongest association with vaccine attitude ( $\beta = .431$ ,  $p < .001$ ), suggesting that the vaccine attitude is more likely to be positive if citizens perceive more benefits, even though they have been through some struggles with vaccine.

**Table 1.** Regression analysis predicting vaccine attitude and vaccine hesitancy

	$\beta$	$\Delta R^2$ (%)	$R^2$ (%)	$\beta$	$\Delta R^2$ (%)	$R^2$ (%)
	Vaccination attitude			Vaccination hesitancy		
<b>Block 1</b>						
Age	0.02			-0.107		
Gender	0.012			0.041		
Education	0.033	0.1	-0.1	-0.061	2.1	1.9
<b>Block 2</b>						
Interaction with COVID-19	-0.046			0.038		

Past negative experience of vaccine	-0.164***	3.0***	2.8	0.23***	5.6***	7.4
<b>Block 3</b>						
Cues to action	-0.05*			0.064**		
Perceived severity	0.044			-0.056*		
Perceived susceptibility	0.006			0.154***		
Perceived benefit	0.431***			-0.212***		
Perceived barriers	-0.025	20.7***	23.4	0.154***	13.5***	20.6

Note. Standardized  $\beta$  from the last step of the regression equation. Statistical significance indicated by \* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

For vaccine hesitancy, results indicate that age, gender and education are not statistically associated with vaccine hesitancy (also see Table 1). Different from demographic factors, the effect of past negative experience of vaccine is significant ( $\beta = .153$ ,  $p = .000$ ), suggesting that people are more likely to hesitate getting vaccinated if they have past negative experience of vaccine. The findings also demonstrate that almost all factors in HBM influence vaccine hesitancy. Both perceived severity ( $\beta = -.056$ ,  $p = .027$ ) and perceived benefits ( $\beta = -.212$ ,  $p < .001$ ) have the negative impacts on vaccine hesitancy, suggesting that if people have higher perceived severity of COVID-19 infection and more benefits of COVID-19 vaccine, they will less likely hesitate for getting vaccinated. Both perceived barriers and perceived susceptibility have the positive impact on vaccine hesitancy (both are  $\beta = .154$ ,  $p < .001$ ), and the effect of cues to action has the least influence among all factors ( $\beta = .064$ ,  $p = .007$ ).

## 4 Discussion

The study is aimed to investigate the influencing factors on Chinese citizens' COVID-19 vaccine attitude and vaccine hesitancy at demographic and psychological levels. Similar to a previous study (Stasiuk et al., 2021), the results indicate that negative vaccine experience is the most significant factor which leads to a worse vaccine attitude and higher vaccine hesitancy. This may due to the mistrust built after the negative experience, resulting in the panic for the possibility of undergoing the struggles again. Or, according to the results of the just-mentioned study, individuals with negative vaccination experience tend to believe all sorts of anti-vaccine arguments, which finally lead to a reinforced negative attitude towards vaccine (Stasiuk et al., 2021). Consistent with a recent study, perceived benefits and perceived barriers are both indicated to be strongly associated with vaccine attitude and vaccine hesitancy (Limbu et al., 2022). The more benefits of vaccines people acknowledge (e.g. immunity enhancement), the better vaccine attitude they may have, the less likely they hesitate for vaccination so that they could enjoy the benefits. However, the latter factor creates an opposite effect

to the vaccine attitude and vaccine hesitancy comparing to the former one. It is also interesting to find that cues to action is negatively associated with both vaccine attitude and vaccine hesitancy, which is different from results of previous studies. It is showed that active vaccination promotion by health care workers can improve the uptake of influenza vaccines (Rashid et al., 2016). And the vaccination acceptance of people with more cues to action from media reports was also higher in the UK and Turkey (Wang et al., 2021). This may due to the different contexts that people live in. In this case, Chinese citizens may feel stressful when there are too many cues to action pushing them in their living environment. The results of a previous review also indicate that individuals with negative vaccination experience tend to believe all sorts of anti-vaccine arguments, which finally lead to a reinforced negative attitude towards vaccine (Stasiuk et al., 2021). It is also interesting to find that cues to action is negatively associated with both vaccine attitude and vaccine hesitancy. However, a previous study showed that active vaccination promotion by health care workers can improve the uptake of influenza vaccines (Rashid et al., 2016). And the vaccination acceptance of people with more cues to action from media reports was also higher in the UK and Turkey (Wang et al., 2021). Therefore, the same factor may result in different impacts based on different contexts. In addition, perceived benefits and barriers are both indicated to be strongly associated with vaccine attitude and hesitancy, yet the former results in a positive impact while the latter creates a negative one, and a recent study also came out this result (Limbu et al., 2022).

The conclusion may provide some directions to the practice of preventing more outbreaks. Less vaccination-promoting may be an effective solution to improve vaccine attitude and diminish vaccine hesitancy. Instead, more detailed information of vaccination can be provided so that people would perceive more benefits based on the information, thus improving vaccine attitude. Such information and recommendations could be provided by healthcare professionals, so that the message would be more accurate comparing to misleading information. In addition, inconvenience of vaccination should be minimized. For instance, adding more vaccination sites nearby residential areas, schools or companies. Vaccination expenses should be more affordable as well, so that more people with different incomes would be more likely to consider taking the action. In this way, people would perceive less barriers of vaccination. When perceived benefits outweigh perceived barriers, more people might have better attitude towards vaccination and lower the hesitancy. Therefore, the findings may contribute to the further understanding of the motives for vaccine attitude and vaccine hesitancy among Chinese citizens and may provide directions of altering the current situation of the coverage of COVID-19 vaccination in the society.

There are several limitations in the study. First, by only applying survey data at a certain period of time, the results may only reflect the features of Chinese citizens' attitudes toward COVID-19 vaccines at that time point. As the situation of pandemic develops, the determinants of vaccine attitude and hesitancy may also alter. Therefore, future studies may apply data collected across longer time periods, to investigate the effects of demographic and HBM factors at different phases of the pandemic. Furthermore, the study only discusses limited factors mentioned above. Apart from these, there is a variety of other factors that may cause impacts on people's vaccine attitude and

hesitancy. In different socio-cultural contexts, the determinants may also be more complex (Dubé et al., 2013).

## 5 Conclusion

Through a cross-sectional survey conducted in China, the study investigated the influencing factors of COVID-19 vaccine attitude and hesitancy based on HBM framework. From the results, negative vaccine experience was found to be the key essential factor, followed by perceived barriers. Therefore, suggestions such as reducing inconvenience and difficulties of getting vaccination is provided according to the findings. Future work is suggested to collect data of various influencing factors at different phases of the pandemic for more accurate results.

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