

# COVID-19-related stigma and its impact on psychological distress: A cross-sectional study in Wuhan, China

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## Abstract

**Background and Aims:** Health-related stigma arises from the perceived association between a person or group of certain characteristics and a specific disease. Coronavirus disease 2019 (COVID-19) has brought about stigma targeted at individuals and groups who are perceived to be connected with the virus. Wuhan of China was not only the locale where the first COVID-19 cases were detected in the world but was also the hardest hit across China.

**Methods:** Using new data ( $N = 1153$ ) from a survey conducted in Wuhan in August 2020, this cross-sectional study aims to reveal the stigma experienced by residents in Wuhan during the COVID-19 pandemic and the impact of this experienced stigma on psychological distress, specifically posttraumatic stress disorder.

**Results:** 69.47% (95% confidence interval (CI): 66.81%–72.13%) of the surveyed Wuhan residents have experienced some forms of stigma related to COVID-19. The average posttraumatic stress disorder score based on the impact of event scale–revised is 20.28 (95% CI: 19.096–21.468) out of 88. In particular, 27.75% (95% CI: 25.17%–30.34%) of the respondents display clinically significant distress symptoms. Moreover, this stigma not only aggravates individuals' posttraumatic stress disorder score by 10.652 (95% CI: 8.163–13.141) but also elevates the chance of developing clinically significant distress symptoms. Specifically, the probability of clinical distress is significantly higher ( $p < 0.001$ ) among those who have experienced stigma (33.66%) than those who have no such experiences (12.62%).

**Conclusion:** The public should be aware of the distress-inducing impact of stigma related to COVID-19 and prevent it from causing more harm to certain individuals and groups.

## KEYWORDS

China, COVID-19, posttraumatic stress disorder, psychological distress, stigma, Wuhan

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## 1 | INTRODUCTION

Wuhan, the capital city of China's Hubei Province, was the locale where the novel coronavirus disease 2019 (COVID-19) was first detected in December 2019. Due to the highly transmissible nature of the virus, confirmed cases of COVID-19 infection soon started to emerge outside of Wuhan in late January 2020.<sup>1-3</sup> As of the end of 2020, 1 year after the first case was discovered in Wuhan, COVID-19 had already engulfed the globe and had caused millions of confirmed cases and over 1.5 million deaths globally. The numbers of confirmed cases and deaths are still rising as of today. On January 30, 2020, the World Health Organization (WHO) declared COVID-19 as a public health emergency of international concern and then upgraded it to a pandemic on March 11, 2020.

Besides its immense impact on global health, the COVID-19 pandemic also has profound social consequences. It has brought about stigma targeted at individuals and groups who are perceived to be connected with the virus.<sup>4</sup> Many people have experienced labeling, stereotyping, and discrimination because of their perceived link to COVID-19.<sup>5-8</sup> When the stigma is experienced by individuals, this individual-level "experienced stigma" can be blame, mistreatment, and personal attacks, and can cause racial discrimination or even international tensions.<sup>4</sup> Abundant anecdotal evidence and media reports have emerged that many Chinese or those of Asian descent have fallen victim to verbal and physical attacks during the COVID-19 pandemic.<sup>5,9-12</sup>

Wuhan was not only the locale where the first COVID-19 cases were reported in the world but was also the hardest hit all around China. The numbers of confirmed cases and deaths in Wuhan alone accounted for more than 52% and more than 81% of China's totals, respectively, as of December 16, 2020. There is also a large disparity in mortality rates between Wuhan (>3%) and other provinces of China (about 0.7% on average).<sup>13</sup> Due to Wuhan's close connection with COVID-19, people from Wuhan were potentially subject to stigma in Chinese society, according to anecdotes and media reports.<sup>5,12</sup> Wuhan residents were shunned and blamed during the early stage of the COVID-19 pandemic; abusive comments about Wuhan and its people were commonly seen online; vehicles with Hubei license plates could cause panic and were denied entry in many places; even products made in Wuhan could receive lots of discriminatory comments at online shopping platforms.<sup>12</sup> The observed stigmatization could potentially add to the suffering of Wuhan residents who were already hit hard by a deadly novel virus. However, due to the lack of large-scale empirical data, it remains an open question whether (and to what extent) ordinary Wuhan residents have experienced COVID-19-related stigma and how the experienced stigma has affected their mental health. With the newly available survey data on Wuhan residents' experiences during the COVID-19 pandemic, this study fills this lacuna. It first reveals the stigma related to COVID-19 experienced by residents in Wuhan and then investigates the impact of this individually experienced stigma on their psychological distress, specifically posttraumatic stress disorder.

## 2 | STIGMA RELATED TO COVID-19

Social stigma can be defined as the devaluation of a particular individual or group on the basis of certain social attributes. One classical definition can trace back to Goffman.<sup>14</sup> According to him, social stigma is an attribute that makes an individual or social group be seen as the "tainted and undesirable" other by society. Social stigma is closely related to the idea of "othering," which labels a person or a group as an inferior and discounted category. It is deeply discrediting and leads to labeling, stereotyping, segregation, status loss, and discrimination.<sup>15</sup> In practice, social stigma is experienced by individuals of certain attributes, and this individual-level stigmatizing experience, or experienced stigma, is a salient manifestation of social stigma.

Stigma in the context of health is the perceived association between a person or group of certain characteristics and a specific disease, as defined by UNICEF.<sup>4</sup> People who do not have the disease may also suffer from stigma just because they are believed to share similar characteristics with infected individuals.<sup>4</sup> Health-related stigma is particularly prominent during highly contagious epidemics and pandemics. For example, stigmatization has long been noticed in all major global outbreaks such as leprosy, tuberculosis, human immunodeficiency virus (HIV), and severe acute respiratory syndrome (SARS),<sup>16-19</sup> leading to the stigmatization of people infected and groups or regions affected. More recently, stigmatization was observed in the 2003 SARS<sup>20</sup> and 2013 West Africa Ebola outbreaks.<sup>21</sup> In both cases, many infected individuals and even recovered ones encountered exclusion, rejection, and discrimination by their communities and employers.

Stigmatization has also been observed in the current COVID-19 pandemic. COVID-19-related stigma has been revealed in various studies and media reports.<sup>5,8-12</sup> The uncertainty of this novel virus and the fear about its possible fatal outcome give rise to myths and rumors directed at those who are perceived to be linked to the virus.<sup>12</sup> The high human-to-human transmission brings about distrust and blaming of others.<sup>5-8</sup> As there were no effective medicine or vaccines in the first few months, efforts to fight COVID-19 have been primarily focused on prevention and slowing down its spread. These efforts include quarantine, isolation, and social distancing. These measures are necessary to contain the transmission of the virus, but, in practice, segregation resulting from these measures can further add to the stigma. Segregation is often associated with and reinforces othering, misunderstanding, and stereotyping across social groups.<sup>22,23</sup>

Wuhan was widely considered the epicenter of an unknown virus, especially in the initial stage of the COVID-19 outbreak. It was not only the hardest hit city in China but was also the first city put under a stringent lockdown "unprecedented in public health history" (according to WHO)<sup>24</sup> which lasted from January 23 to April 8, 2020. This 76-day "Wuhan Lockdown" effectively cut the city off from the outside world and put it into almost total isolation.<sup>25</sup> Traffic leaving Wuhan was banned and public transportation within the city was suspended. Residents could not even leave their residential

compounds without authorized permission. Under these circumstances, it is plausible that stigma targeted at Wuhan residents might have emerged in Chinese society. The first goal of this study is to empirically reveal the COVID-19-related stigma experienced by Wuhan residents and its extent.

### 3 | IMPACT OF COVID-19-RELATED STIGMA ON PSYCHOLOGICAL DISTRESS

Stigma has long been recognized as a stressor causing poor psychological and physical health outcomes. There is a wealth of empirical evidence linking stigma with various psychological problems,<sup>15,22,23,26</sup> such as psychological distress in particular.<sup>27–30</sup> Psychological distress may emerge as a naturally evolved defense against perceived external threats.<sup>31</sup> When people have multiple threatening experiences induced by stigmatization, they may develop psychological distress which produces emotional (anxiety and depression) and behavioral (flight and withdrawal) changes to keep themselves away from perceived external threats. Stigma related to infectious diseases may have similar negative psychological impacts.<sup>6,7</sup> It adds to the suffering of those with the disease and causes psychological distress, thereby further weakening their health.<sup>3</sup> Those without the disease may also be subject to this stigma-induced distress simply because of certain social attributes. Thus, during the COVID-19 pandemic, COVID-19-related stigma may harm Wuhan residents' mental health and aggravate their psychological distress. The second goal of this study is to investigate the impact of COVID-19-related stigma on psychological distress among Wuhan residents.

## 4 | DATA AND METHODS

This study is based on data from a cross-sectional social survey conducted by Central China Normal University in Wuhan. The General Social Survey on COVID-19 in Hubei was the first large-scale survey about Wuhan residents' personal experiences during the COVID-19 pandemic. The survey was approved and carefully designed and implemented in August 2020 by Central China Normal University. It also received assistance from the Hubei Provincial Federation of Trade Unions. The survey reached a large population aged between 16 and 70 and recruited participants through the popular social media app "WeChat" (*weixin*). WeChat is the most widely used social media app in China and has penetrated ordinary Chinese citizens' daily life.<sup>32</sup> It now has over 1 billion monthly active users within China.<sup>33</sup> Thanks to the popular WeChat platform and the support from the Hubei Provincial Federation of Trade Unions, this survey was able to reach a large number of Wuhan residents and asked about their experiences during the COVID-19 pandemic.

A sample of 1153 residents living in Wuhan participated in the mental health module of the survey and their data are analyzed in this study. Statistical power analysis based on the latest Stata command

"power oneslope"<sup>34</sup> confirms that this sample size is sufficiently large in detecting statistical effects in regression models.<sup>35,36</sup> While the sampling was not totally random, it provided valuable and timely data on ordinary Wuhan residents' COVID-19-related experiences when the pandemic was still fast evolving. In particular, the data provided a rare opportunity to look into the stigma related to COVID-19 experienced by many ordinary Wuhan residents and its impact on psychological distress.

### 4.1 | Dependent variables

I use the well-established impact of event scale – revised (IES-R)<sup>37</sup> to measure posttraumatic stress disorder, a specific type of psychological distress. The IES-R is a self-reported index that assesses psychological distress triggered by a traumatic event (such as COVID-19). It consists of a total of 22 items, with each item rated on a 5-point scale ranging from 0 (not at all), 1 (seldom), 2 (occasionally), 3 (often), to 4 (always). As a revised and updated version of the original 15-item IES,<sup>38</sup> the IES-R has been found to be a reliable index of posttraumatic symptoms and has been validated and employed by empirical research.<sup>39–42</sup> The survey adopted the Chinese version of the IES-R measurement and included all 22 items. The 22 items were directly translated from the English version of the IES-R, only with the event replaced by "COVID-19." The 22 items asked respondents to indicate how much distress caused by COVID-19 they experienced in the recent 2 weeks. The 22 items of the IES-R are presented in Table 1.

The IES-R has a total score between 0 and 88, and a larger score represents greater COVID-19-related psychological distress. This total IES-R score is used as the first dependent variable of psychological distress. The Cronbach's  $\alpha$  of the 22 items is 0.980, suggesting a high level of internal consistency and thus outstanding reliability of the total IES-R score as a composite measure.

In particular, on the IES-R scale, a score of 33 is often used as the cutoff point to classify individuals as experiencing psychological distress above or below the clinical threshold.<sup>43,44</sup> Accordingly, I create the second dependent variable, clinical distress, which identifies distress of clinical significance. It is a binary variable, with IES-R scores equal to or above 33 coded as 1 and those below 33 coded as 0.

### 4.2 | Key explanatory variable

The survey employed six questions to capture the stigma experienced by the respondent since the outbreak of COVID-19 in January 2020, including (1) "Did you see cursing or abusive languages targeted at Wuhan people online?" (2) "When you travelled to your hometown for the Chinese New Year, were you stopped by local administrations or local communities and not allowed to get in?" (3) "Were you rejected for services such as lodging when visiting places outside of Wuhan?" (4) "When you were visiting your hometown for

**TABLE 1** The impact of event scale–revised measuring COVID-19-related psychological distress (posttraumatic stress disorder)

In the recent 2 weeks, have you experienced the following symptoms?	
1	Any reminders brought uncomfortable feelings about COVID-19.
2	I had trouble staying asleep.
3	Other things kept making me think about COVID-19.
4	I thought about COVID-19 when I didn't mean to.
5	Pictures about COVID-19 popped into my mind.
6	I found myself acting or feeling affected by COVID-19.
7	I felt I was being surrounded by COVID-19.
8	I had dreams about COVID-19.
9	I avoided letting myself get upset by COVID-19.
10	I felt COVID-19 was surreal.
11	I tried to stay away from reminders about COVID-19.
12	I tried not to think about COVID-19.
13	I was aware that I still had a lot of feelings about COVID-19 and did not know how to handle them.
14	My feelings about COVID-19 were kind of numb.
15	I tried to remove COVID-19 from my memory.
16	I tried not to talk about COVID-19.
17	I felt irritable and angry.
18	I was jumpy and easily startled.
19	I had trouble falling asleep.
20	I had trouble concentrating.
21	Reminders about COVID-19 caused me to have physical reactions.
22	I felt watchful and on guard.

Note: Each item is rated on a 5-point scale including 0 (not at all), 1 (seldom), 2 (occasionally), 3 (often), and 4 (always).

Abbreviation: COVID-19, coronavirus disease 2019.

the Chinese New Year, were you blamed, rejected or even attacked by local people?" (5) "When you returned to your work, were you refused employment due to being from Wuhan?" and (6) "When you returned to your work, were you avoided or rejected by your colleagues due to being from Wuhan?" The response to each question is either yes or no. If the respondent had any of these stigmatizing experiences, it is coded as 1. If none of them were experienced, it is coded as 0. Hence, experienced stigma here is coded as a binary variable.

It is worth noting that before Wuhan was put under a stringent lockdown on January 23, 2020, many Wuhan residents already traveled out of Wuhan for the Chinese New Year that fell on January 25. The Chinese New Year is the most important holiday in Chinese culture, and families gather together during this holiday. People all across China travel home to reunite with their families before the

arrival of the Chinese New Year, resulting in the world's largest annual human migration.<sup>45,46</sup> The lockdown in Wuhan was too late in the sense that massive human migration into and out of Wuhan had already taken place as many Wuhan residents had already traveled back to their hometowns in other parts of China for the Chinese New Year holiday.<sup>47</sup> As a result, in late January, confirmed COVID-19 cases soon emerged outside of Wuhan and spread across China.<sup>1</sup>

### 4.3 | Other control variables

Demographic and socioeconomic variables that may affect psychological distress in the Chinese context<sup>29,33,42</sup> are also considered in the analyses. These control variables include gender, age, ethnicity, education, income, marital status, family size, residence type, and migrant status. The gender variable is binary with 1 indicating male and 0 indicating female. The age variable is measured in years. I also tried a quadratic term of age (or age-squared) to explore the possibility of a potential curvilinear effect of age, and the quadratic term showed no significant effect. The ethnicity variable is binary, with 1 indicating the Han ethnicity and 0 indicating non-Han minority ethnicities. The education variable is on a 6-point scale measuring the respondent's highest degree received, which includes (1) elementary school or below, (2) junior middle school, (3) senior middle school or secondary vocational school, (4) junior college, (5) university, and (6) postgraduate education. The income variable is on a 16-point scale about one's average monthly household income (in Chinese Yuan) in 2020 and includes (1) under 1000, (2) 1000–2000, (3) 2000–3000, and up to (16) above 15,000. Marital status is captured by the dummy variable of "married" and the dummy variable of "divorced or widowed," with "single (never married)" as the reference category. The variable of family size is measured by the number of family members (including the respondent) living in the household. The binary variable of residence type is about the respondent's household registration (or *hukou*) type, with 1 indicating rural and 0 indicating urban. I also consider whether the respondent is a migrant currently living in Wuhan but outside of their hometown. In the binary variable of migrant status, 1 indicates a migrant, and 0 indicates not.

Infection with COVID-19 by oneself and their family members is a significant stressor during the pandemic<sup>42</sup> and should be controlled too. I further create two variables measuring whether respondents and their family members were infected with COVID-19. The variables of "self-infection" and "family-infection" capture whether the respondent and anyone in the respondent's family contracted COVID-19, respectively. The two variables are both binaries, with yes coded as 1 and no coded as 0.

### 4.4 | Modeling strategy

Because the two dependent variables measuring psychological distress are of different nature, I adopt two different modeling tactics. When analyzing the first dependent variable, distress score,

which is on a 0–88 point scale, the ordinary least squares (OLS) model is used. The model is specified as follows, in which  $Y$  is the level of distress,  $\beta$  is the coefficient, and  $\epsilon$  the error term:

$$Y = \beta_0 + \beta_1 \text{Stigma} + \beta_2 \text{Gender} + \beta_3 \text{Age} + \beta_4 \text{Ethnicity} + \beta_5 \text{Education} + \beta_6 \text{Income} + \beta_7 \text{Marital} + \beta_8 \text{Family} + \beta_9 \text{Rural} + \beta_{10} \text{Migrant} + \beta_{11} \text{Self-Infection} + \beta_{12} \text{Family-Infection} + \epsilon.$$

The second dependent variable, clinical distress, measures whether one displays distress of clinical significance and is a binary variable. I thus use logistic regression and specify the model as follows.  $p$  is defined as the probability of the respondent experiencing clinically significant distress.

$$\text{Log}[p/(1-p)] = \beta_0 + \beta_1 \text{Stigma} + \beta_2 \text{Gender} + \beta_3 \text{Age} + \beta_4 \text{Ethnicity} + \beta_5 \text{Education} + \beta_6 \text{Income} + \beta_7 \text{Marital} + \beta_8 \text{Family} + \beta_9 \text{Rural} + \beta_{10} \text{Migrant} + \beta_{11} \text{Self-Infection} + \beta_{12} \text{Family-Infection} + \epsilon.$$

## 5 | RESULTS

The descriptive statistics of the variables used in the analyses are presented in Table 2. Here, I pay major attention to COVID-19-related psychological distress and stigma experienced by the surveyed Wuhan residents. Figure 1 shows the distribution of psychological distress among the respondents. The average distress score based on the IES-R is 20.28 out of 88. There are large variations among individuals. In particular, 27.75% of the respondents report scores above 33 and thus display clinically significant distress symptoms.

Figure 2 displays the distribution of various COVID-19-related stigmas experienced by the surveyed individuals. More than two-thirds, or 69.47%, of the surveyed Wuhan residents, have experienced some form of stigma related to COVID-19. Specifically, 50.22% of the respondents reported seeing curses and abusive languages targeted at Wuhan people online; 30.62% were stopped by local administrations or local communities and not allowed to get in when returning to their hometowns for the Chinese New Year; 23.33% were rejected for services such as lodging when visiting places outside of Wuhan; 17.78% experienced blame, rejection, or even attack by local people when visiting their hometowns for the Chinese New Year; when they returned to work, 19.77% were refused employment and 15.09% were avoided or rejected by their colleagues. Note that among the sampled 1153 Wuhan residents, 244 of them (21.16%) work outside of Wuhan. Hence, if we only look at those who work outside of Wuhan, 93.43% of them were refused employment and 71.31% were avoided or rejected by their colleagues.

First, I employ OLS regression to analyze the dependent variable of distress scores. The result is shown as Model 1 in Table 3. Among all the explanatory variables, only four variables show statistically significant effects on distress scores. Stigma related to COVID-19 displays a significant and positive effect on distress scores. Those who have experienced COVID-19-related stigma report higher levels of psychological distress. Besides experienced stigma, education, family size, and family members' infection also show significant

**TABLE 2** Descriptive statistics for dependent and independent variables ( $N = 1153$ )

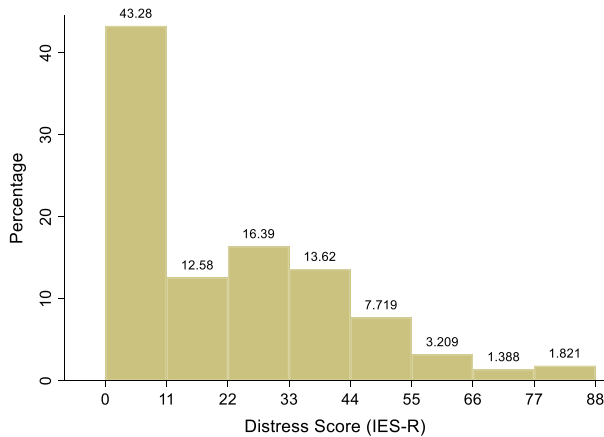
Categorical variables	Categories	N (%)		
Clinical distress	Yes	320 (27.75%)		
	No	833 (72.25%)		
Experienced stigma	Yes	801 (69.47%)		
	No	352 (30.53%)		
Gender	Male	650 (56.37%)		
	Female	503 (43.63%)		
Ethnicity	Han	1121 (97.22%)		
	Non-Han minorities	32 (2.78%)		
Education	Elementary school or below	29 (2.52%)		
	Junior middle school	65 (5.64%)		
	Senior middle school or secondary vocational school	287 (24.89%)		
	Junior college	232 (20.12%)		
	University	487 (42.24%)		
	Postgraduate education	53 (4.60%)		
Marital status	Single	352 (30.53%)		
	Married	781 (67.74%)		
	Divorced or widowed	20 (1.73%)		
Residence type	Rural	210 (18.21%)		
	Urban	943 (81.79%)		
Migrant	Yes	314 (27.23%)		
	No	839 (72.77%)		
Self-infection	Yes	21 (1.82%)		
	No	1132 (98.18%)		
Family infection	Yes	35 (3.04%)		
	No	1118 (96.96%)		
Continuous variables	Mean	SD	Minimum	Maximum
Distress score	20.282	20.521	0	88
Age	30.631	9.230	16	70
Income	5.951	3.144	1	16
Family size	3.876	1.656	1	15

Abbreviation: SD, standard deviation.

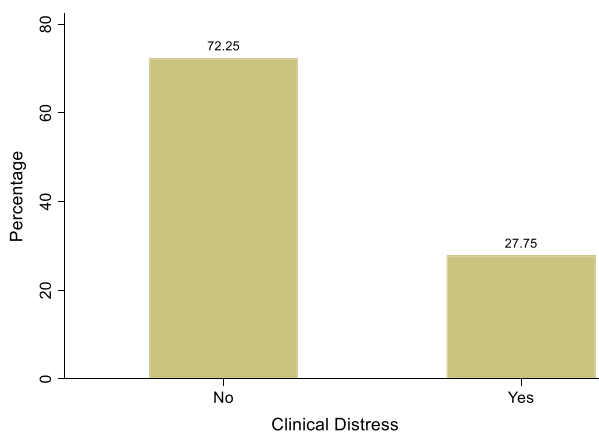
effects. Those who have higher levels of education, those living with more family members, and those who have family members infected with COVID-19 all display greater distress.

Instead of specifying a model with all the explanatory variables *ex ante*, I apply the stepwise (forward) modeling procedure and let the stepwise model selection technique select significant variables for the final model. This resultant Model 2 confirms the findings from the

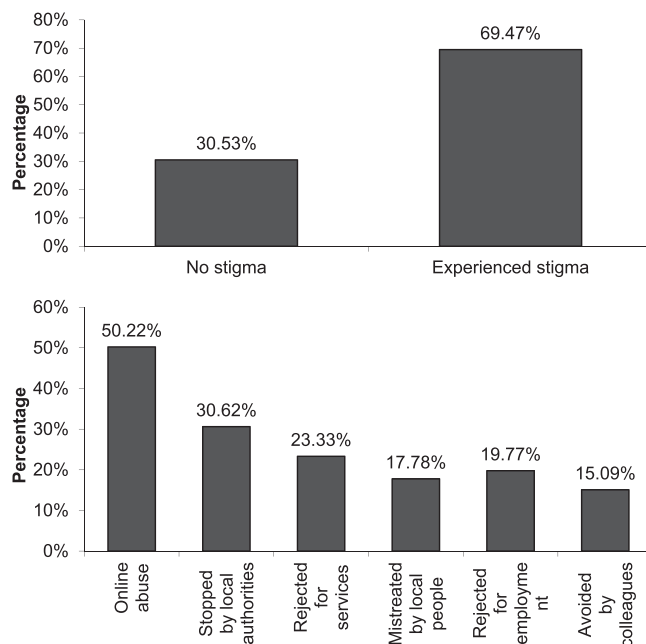
(A) Distress Score (Impact of Event Scale Revised, or IES-R)



(B) Distress of Clinical Significance



**FIGURE 1** Distribution of psychological distress (Wuhan, China, 2020): (A) distress score (impact of event scale-revised or IES-R) and (B) distress of clinical significance.



**FIGURE 2** Coronavirus disease 2019 (COVID-19)-related stigma experienced (Wuhan, China, 2020).

**TABLE 3** Regression analysis of psychological distress

	Distress score		Clinical distress	
	Model 1	Model 2	Model 3	Model 4
Experienced stigma	10.652*** (1.269)	10.525*** (1.254)	1.257*** (0.181)	1.245*** (0.179)
Gender (male)	-0.599 (1.175)		-0.055 (0.141)	
Age	0.098 (0.071)		0.006 (0.009)	
Ethnicity (Han)	-4.183 (3.523)		-0.417 (0.397)	
Education	1.884** (0.569)	1.969*** (0.505)	0.149* (0.069)	0.155* (0.061)
Income	0.117 (0.200)		-0.004 (0.024)	
Marital status				
Married	-2.348 (1.468)		-0.196 (0.175)	
Divorced/ widowed	2.989 (4.590)		0.244 (0.558)	
Number of family members	1.399*** (0.360)	1.309*** (0.348)	0.124** (0.042)	0.117** (0.040)
Rural	-0.175 (1.601)		-0.127 (0.198)	
Migrant	-1.556 (1.333)		-0.158 (0.163)	
Self-infection	8.076 (5.017)		.671 (0.539)	
Family-infection	11.158** (3.904)	14.476*** (3.371)	1.055* (0.413)	1.338*** (0.364)
Intercept	2.064 (5.060)	-0.573 (2.716)	-2.592*** (0.600)	-3.052*** (0.350)
R <sup>2</sup>	0.107	0.100	0.072	0.068

Note: (1) Models 1 and 2 are ordinary least squares regression models, while Models 3 and 4 are logistic regression models; (2) numbers in parentheses are standard errors; (3) from two-tailed tests, and (4) the reference group for marital status is single (never married).

\* $p < 0.05$ ; \*\* $p < 0.01$ ; \*\*\* $p < 0.001$ .

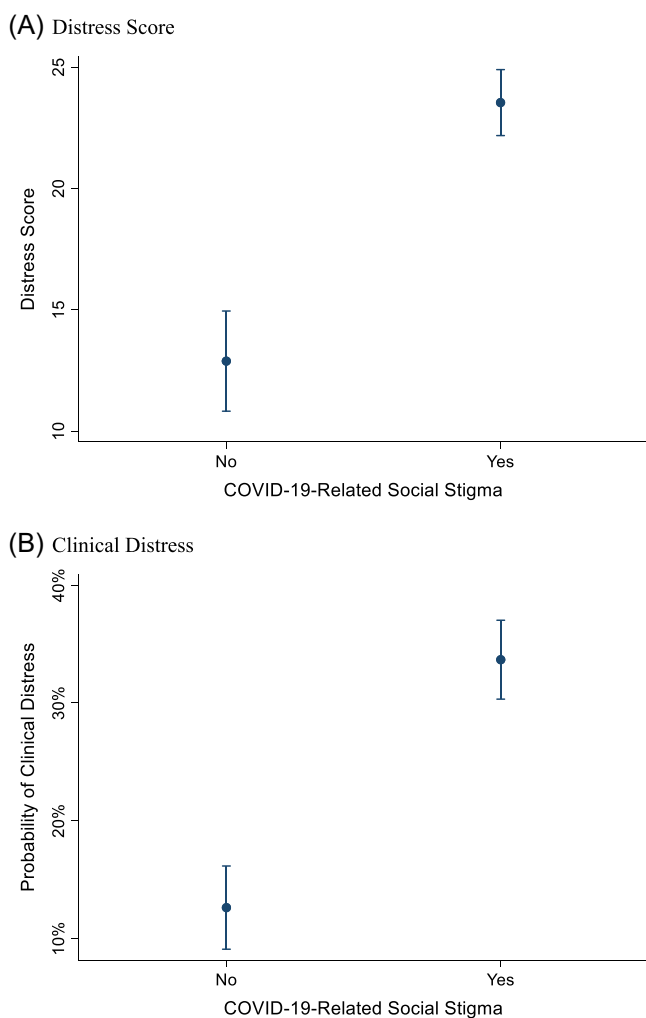
previous model. Significant influences on distress scores are found to be experienced stigma, education, family size, and family members' infection.

Next, I utilize logistic regression to examine the dependent variable of clinical distress. Model 3 presents the result. Similar to the findings about distress scores, four explanatory variables are found to have significant effects on clinical distress, including experienced

stigma, education, family size, and family members' infection. People who have experienced COVID-19-related stigma are more likely to develop distress of clinical significance. In addition, better-educated individuals, those living with larger families, and those with infected family members also have a higher probability of developing clinical distress. The findings from Model 3 are further confirmed by Model 4 generated by the stepwise (forward) modeling procedure.

Based on Models 1 and 3 in Table 3, I calculate and visualize the significant influences of COVID-19-related stigma on psychological distress, when holding all other variables at their mean values.

Figure 3A compares the average distress scores between those with stigmatizing experiences and those without. When all other explanatory variables are held at their mean values, the average distress score of those with stigmatizing experiences is 23.53, whereas that of those without is 12.88. This difference is substantial and statistically significant.



**FIGURE 3** Visualizing the effect of coronavirus disease 2019 (COVID-19)-related stigma (with 95% confidence intervals) on psychological distress (Wuhan, China, 2020): (A) Distress score and (B) clinical distress. Note: The figures are derived from Models 1 and 3 in Table 3, respectively, with all other explanatory variables held at their mean values.

Figure 3B is the comparison of those with stigmatizing experiences and those without in the probability of displaying clinical distress, with all other variables held at their mean values. The probability of reporting clinical distress is significantly higher among those who have experienced stigma (33.66%) than those who have no such experiences (12.62%).

## 6 | DISCUSSION

Using newly emerging survey data, this study provides quantitative evidence on the extent of stigmatization Wuhan residents have experienced in relation to the COVID-19 pandemic. It finds that more than two-thirds of Wuhan residents have stigmatizing experiences in one form or another. They have been stigmatized either online or in practice simply due to the fact that they come from Wuhan. Moreover, this study looks into the negative impact of these stigmatizing experiences and reveals the significant distress-inducing effect of COVID-19-related stigma. This stigma not only aggravates individuals' posttraumatic stress disorder in general but also elevates the chance of developing clinically significant distress symptoms.

In addition to experiencing stigma, three more factors such as education, family size, and family members' infection are also found to have significant effects on psychological distress. First, while individuals with more education are often expected to report less distress due to their possession of more resources in coping with stress,<sup>48,49</sup> the finding here suggests that better educated Wuhan residents are actually more distressed during the COVID-19 pandemic. More educated individuals have greater self-awareness about their own health and follow distressing COVID-19 news more closely, which contributes to their higher levels of distress.<sup>50</sup> Second, those who live with a larger family are more distressed by COVID-19. Schools and many public facilities remain closed due to COVID-19, so respondents living with larger families face more onerous family obligations. Additionally, as a result of COVID-19's high human-to-human transmissibility, those who live with more family members come into contact with more people and are thus under greater infection risks.<sup>33,42</sup> While larger families are an important source of social support in normal circumstances, they may induce greater distress due to the increased risk of infection and the heavier burden of family responsibilities. Third, having a family member infected with COVID-19 would further exacerbate one's own infection risk and increase family care responsibilities, thereby rendering an individual more distressed.

## 7 | CONCLUSION

To be sure, this study is not without its limitations. First, while the survey data here offer timely and valuable insights into many ordinary Wuhan residents' experiences during the COVID-19 pandemic, they are not generated from a strictly random sample.

The exclusion of individuals who do not use WeChat from the survey also limits the representativeness of the sample. We should thus use caution when applying the findings here to the whole population in Wuhan. Second, it is worth noting that the explanatory variables in the regression models explain 10.0%–10.7% of the variation in distress scores and 6.8%–7.2% of the variation in clinical distress, according to the coefficients of determination ( $R^2$ ). Hence, much remains unexplained by the models here. The variation explained by the models should not be considered trivial, however, as much psychological distress can be attributed to idiosyncratic characteristics such as personality traits and personal life history.<sup>51,52</sup> In future surveys, more data on people's personality traits and life history should be collected to further increase the explanatory power of the models. Despite these data limitations, this study does provide empirical evidence in support of the prevalence of COVID-related stigma and its harmful impact among a large number of Wuhan residents. With the world still engaging in the fight against COVID-19, besides the medical aspect of this pandemic, we should also pay close attention to its social ramifications. Stigmatization brings additional suffering to those affected the most by COVID-19. It leads to greater social inequalities as it further devalues and discriminates against those who have already borne the brunt of the disease.

Given the fact that experienced stigma is among the four major factors, out of a list of factors included in the model, that significantly contribute to Wuhan residents' psychological distress, this study confirms the harmful impact of stigma on individuals' mental health during the COVID-19 pandemic. With the COVID-19 situation in Wuhan already being under control and the stringent "Wuhan Lockdown" being lifted on April 8, 2020, Wuhan is no longer seen as the epicenter of COVID-19 in China nowadays. However, the psychological damage stemming from COVID-19-related stigma was already done to Wuhan residents. As revealed by the survey in August 2020 or 4 months after the lifting of the "Wuhan Lockdown," many Wuhan residents still displayed significant symptoms of posttraumatic stress disorder. The findings here suggest that we should take preemptive measures against stigma at the very early stage of a future epidemic or pandemic. For example, we should spread more scientifically based facts about a disease and its prevention and treatment, which helps dispel myths, rumors, and unfair accusations against affected individuals, groups, and regions. Journalistic and social media reporting should put more emphasis on stories and images of local people who have experienced and recovered from the disease and those who have supported and taken care of others during the pandemic, which all help create a positive social environment of empathy and care. These actions should be taken early to preempt stigmatization. Last but not least, words matter. We should avoid attaching any ethnicity or location to a disease and carefully choose words when describing the disease. For example, naming the new coronavirus disease "COVID-19," not "Wuhan virus," helps reduce the stigmatization against Wuhan residents.

This distress-inducing impact of stigma may further translate into a serious impediment to global efforts in containing the virus. Stigma drives people to hide their illness to avoid discrimination and discourages them from seeking proper and timely health care. People with the disease or those at risk of catching it may become unwilling to disclose behaviors related to transmission, thereby making it much harder for public health authorities to trace contacts and control the disease.<sup>4</sup> This negative consequence of stigma is well documented in the literature on HIV, as the pervasive HIV-related stigma has aggravated the ongoing HIV epidemic.<sup>53</sup> Therefore, stigma can stand in the way of the efforts to control the COVID-19 pandemic.<sup>5,8,54</sup> The public should be made aware of the potential danger of stigma related to COVID-19. This novel virus has already caused much harm to global health, and we should prevent it from creating more social fissures and injustices.

#### AUTHOR CONTRIBUTIONS

**Min Zhou:** Conceptualization; formal analysis; investigation; methodology; visualization; writing—original draft; and writing—review and editing.

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#### CONFLICT OF INTEREST

The author declares no conflict of interest.

#### DATA AVAILABILITY STATEMENT

Data will be available upon reasonable request to the corresponding author.

#### TRANSPARENCY STATEMENT

Min Zhou confirms that this manuscript is an honest, accurate, and transparent account of the study being reported and that no important aspects of the study have been omitted.

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