Stigma Towards Wuhan People During the COVID-19 Epidemic: An Exploratory Study Based on Social Media

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Research article

Keywords: Stigma, COVID-19, Infectious disease, Social media, Weibo

DOI: https://doi.org/10.21203/rs.3.rs-80111/v1

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Abstract

**Background:** Stigma associated with infectious diseases is common and causes various negative effects on stigmatized people. With Wuhan as the center of the COVID-19 outbreak in China, its people have become an object of stigmatization. To provide necessary information for stigma mitigation, this study aims to identify the stigmatizing attitudes towards Wuhan people and trace their changes as the COVID-19 progressed in China by analyzing related posts on social media.

**Methods:** We collected a total of 19,780 Weibo posts containing the keyword 'Wuhan people' and performed a content analysis to identify stigmatizing attitudes in the posts. Then we divided our observation time into three periods and performed Repeated Measures ANOVA to compare the differences in attitudes in three periods.

**Results:** Results show that stigma was mild with 2.46% of related posts being stigmatizing. The percentages of stigmatizing posts differed significantly in 3 periods (F (2,66) = 5.60, p <.01, η² = 0.15). The percentages of ‘Infectious’ posts (F (2,66) = 3.69, p <.05, η² = 0.10) and ‘Stupid’ posts (F (2,66) = 3.65, p <.05, η² = 0.10) are significantly different in 3 periods. The percentages of ‘Irresponsible’ posts is not significant different in 3 periods (F (2,66) = 0.63, p =.53, η² = 0.02). After government interventions, stigma didn’t reduce significantly, and stigma with ‘Infectious’ attitude even increased. It was until the government interventions took effect that stigma significantly reduced.

**Conclusions:** This study found that stigma towards Wuhan people included diverse attitudes and changed at different periods. After government interventions but before they took effect, stigma with ‘Infectious’ attitude increased. After government interventions took effect, general stigma, and stigma with ‘Infectious’ and ‘Stupid’ attitudes decreased. This study constitutes an important endeavor to understand the stigma towards Wuhan people in China during the COVID-19 epidemic. Implications for stigma reduction and improvement of the public's perception in different periods of epidemic control are discussed.

1. **Background**

Emerging infectious diseases may lead to stigmatization towards patients and those living in epidemic-stricken areas, which has negative effects on target groups [1]. First, individuals suffering from stigma are at increased risks of mental and physical health problems, such as depression, hypertension, coronary heart diseases, and stroke [2–4]. Second, stigmatized patients may avoid seeking health care, which create difficulties for the public health authorities to controlling the disease [5]. Third, if people avoid areas related to the disease, stigma can cause considerable economic losses [6]. In short, stigma caused by epidemics has a disastrous effect on victims, which is similar in severity to diseases [7].

At the end of 2019, the first COVID-19 patient from China was diagnosed in Wuhan. Afterward, the disease spread rapidly across China, which exerted a huge impact on society. Evidence and concerns about social stigma associated with COVID-19 were raised [8–12]. While these studies mainly focused on
the stigma towards the Asians or Chinese, there is no empirical research on stigma towards Wuhan people in China. As a group living in the place where the disease first broke out, social stigma in China may influence many aspects of Wuhan people's life. Therefore, understanding and mitigating the social stigma in China towards Wuhan people are necessary.

Targeting the specific attitudes associated with stigma and tracing changes in stigma are important steps for stigma mitigation. Strategies that target-specific corresponding attitudes are more effective for changing stigma than the traditional methods [13, 14]. For example, a widely known fact is that educating the public on factual knowledge about infectious diseases could reduce stigma. However, if people are very worried about getting the disease, then high levels of factual knowledge are correlated with increased stigma [6]. Thus, target-specific stigma strategies should focus on relieving anxiety. In other cases, if the public believes that a disease is preventable and attribute responsibility to individuals for acquiring such a disease, then educating the public on factual knowledge may be less effective [7]. In other words, target-specific stigma strategies should focus on changing their biased attributions.

An increasing number of researches have considered stigma as changing over the course of a single illness [15–18]. In particular, longitudinal studies that detected stigma changes have established causations and reduced stigma from the source [7]. Social context is changing as the epidemic matures, and knowing about changes in stigma over time is essential for researchers to design mitigation strategies targeted at the social context [17]. However, such studies mainly focused on small groups [16, 19, 20], which are limited by the lack of representativeness. Studies that included large groups typically measured stigma changes over long-term and fixed intervals (e.g. several months or years) [17, 18]. In terms of emerging infectious diseases, public attitudes may rapidly change with the progression of an epidemic [21]. Such long-time intervals are insufficient to describe the fine-grained dynamics of stigma. Other than that, most of the existing studies relied on retrospective investigations conducted long time after the disease outbreak, the conclusions from them are discredited because of potential recall bias [18, 19]. To explore the detailed changes of stigma associated with emerging infectious diseases, proposing a new data collection and analytical method is necessary.

In recent years, Online Social Networks (OSN) has become an increasingly popular approach for analyzing stigma and associated attitudes [22–24]. OSN (e.g., Weibo, Twitter) provides chances to comprehensively understand the psychological state of participants in a non-invasive way [25]. Additionally, using records of user behavior on OSN can avoid recall bias. In China, Sina Weibo (weibo.com), which is the most popular Chinese microblogging service provider in the country, has 550 million monthly active users. Similar to Twitter, users in China are used to share their opinions and interact with each other through Weibo functions (e.g., publish, forward, reply, @function), which form rich user behavior data. From Weibo, the researchers can collect a large number of timely samples and analyze fine-grained stigma changes [26]. This sample size is expected to improve the representativeness and time sensitiveness of the findings when tracing stigma changes over the progression of a disease.
Specifically, this study examined stigma towards the Wuhan people using data extracted from Weibo during COVID-19 (from December 1, 2019 to April 18, 2020). By identifying the attitudes and stigma changes during an epidemic in China, we can provide important information for mitigating the stigma towards people in epidemic center areas.

2. Methods

2.1. Data Collection

The samples were from the Weibo data pool [27] containing 1.16 million active users. The retrieved data included user profiles, network behaviors (e.g., forward, reply), and posts’ contents. In this study, we first collected Weibo posts (microblogs) from the data pool by the following criteria:

1. Published from December 1, 2019 to April 18, 2020.
2. Containing the keywords ‘Wuhan People’ ("武汉")

We decided the time because the disease was first identified in December 2019 in Wuhan and the thoroughfare leaving Wuhan was re-opened on April 8.

2.2 Coding

After data collection, human coders performed content analysis to identify stigmatizing expressions in Weibo posts.

The coding framework was built based on evidence and consensus. In specific, the setting of the coding framework first refers to some previous research [1, 7, 23]. After browsing all the content on Weibo, the researchers summarized several categories of stigmatizing attitudes: infectious, irresponsible, and stupid (See Table 1). The whole process of coding work can be found in Fig. 1. First, the coders should judge whether a post is related to the COVID-19 and whether the post is stigmatizing. If so, the coders should assign the post into one of the stigmatizing attitude categories. The detailed criteria for judgment are in Supplementary.

Four graduate students major in psychology took part in the work. Firstly, the coders were trained on a small sample of 500 posts randomly selected from the total posts to reach a substantial consistency on the training sample. Secondly, they analyzed the total posts, each analyzing a different subset of the total posts.
Table 1
Coding framework for stigmatizing content

| Item     | Definition                                                                 | Example                                                                 |
|----------|-----------------------------------------------------------------------------|------------------------------------------------------------------------|
| Stigma Type |                                                                                          |                                                                                     |
| Infectious  | Wuhan people are infectious.                                                             | People in Wuhan now are mobile viruses. I suggest all the Wuhan people should be isolated. |
| Irresponsible | The spread of the virus or the spread of the epidemic is due to the irresponsibility of Wuhan people. | If Wuhan people had taken their responsibility and stopped going everywhere, the epidemic would be better than now! |
| Stupid     | The outbreak was caused by the ignorance and stupidity of Wuhan people, or it was caused by some backward or uncivilized habits of Wuhan people. | I used to say that the Cantonese people are barbaric to eat all kinds of wild animals, but now it seems that Wuhan people have better appetite than Cantonese. |

2.3. Data Elimination

Before statistical analysis, we identified the users who posted related posts as well as their geo-location and gender. Our further analysis focused on the epidemic and was based on the provincial area in China, so we eliminated posts by the following criteria:

1. Not related to the COVID-19 according to the human coders.
2. Without User’s location information, or with users located overseas.

2.4. Statistics

First, we performed inter-rater reliability analysis to assess the degree that coders consistently recognized stigmatizing Weibo posts and identified specific attitudes of stigma in the study. We calculated Light’s kappa coefficient [28] using Siegel & Castellan’s variant [29] for the 4 coders’ coding results on the training sample. The Siegel & Castellan’s variant is used to correct bias problems of the coding results [30].

To analyze the changes in stigma over time. We calculated daily percentages of stigmatizing posts in total posts and draw the picture of their time trends. Furthermore, we divided our observation time into 3 periods as follows:

1. Period 1 is before government interventions (pre-GI), from Dec 31, 2019 to Jan 22, 2020. On Dec 31, 2019, Wuhan Centre for Disease Control notified the cases of COVID-19 for the first time. The number of confirmed cases began to rise, but the government did not adopt strict isolation measures until Jan 23, 2020.
2. Period 2 is the period after government interventions but before they took effect (post-GI). It is from Jan 23, 2020 to Feb 20, 2020. On Jan 23, 2020, the government began to take strict measures to
control the disease including lockdown of Wuhan city and home quarantine orders. But the rising of confirmed cases speeded up because it took time for the interventions to take effect.

3. Period 3 is after government intervention took effect (eff-GI). It is from Feb 21, 2020 to Apr 8, 2020. On Feb 21, the Chinese government issued official documents to promote the resumption of work and production[31], indicating effective control of the local epidemic. In this period, the rising of confirmed cases slowed down. On Apr 8, 2020, the thoroughfare leaving Wuhan was re-opened.

We calculated the percentages of stigmatizing posts in total posts by the provincial area. Then we performed Repeated Measures ANOVA on these percentages to test for the changes in stigma in different periods.

To test for gender differences, we calculated the percentages of male/female users who posted stigmatizing posts in total users by the provincial area, and we performed Paired-Samples T-Test.

3. Results

3.1. Participants

The total number of posts we gathered using the keywords “Wuhan people” is 19,780. And 15,656 posts remained after elimination, which include 8,326 users. The users’ gender and location distribution are shown in Fig. 2.

3.2. Coding

The Light’s kappa coefficients for stigmatization and attitude type were 0.76 and 0.68, respectively. The resulting kappa indicated substantial agreement between the coders on recognizing stigmatizing Weibo posts and identifying specific attitudes of stigma.

3.3. Number of stigmatizing posts and different attitudes

The numbers of stigmatizing posts and posts that are assigned to different attitude categories are shown in Table 2.
Table 2

| Category    | Sub-category | Number of posts | Percentage | Sum      |
|-------------|--------------|-----------------|------------|----------|
| Stigmatization | Stigmatizing | 385             | 2.46%      | 15656    |
|             | Not stigmatizing | 15271         | 97.54%     |          |
| Attitudes   | Infectious   | 142             | 36.88%     | 385      |
|             | Irresponsible | 116             | 30.13%     |          |
|             | Stupid       | 127             | 32.99%     |          |

3.4. Daily percentages of posts of stigma and different attitude categories

The changes in the number of related posts over time are shown in Fig. 3. We divided the numbers of posts in each category by the number of related posts to get percentages, which is shown in Fig. 4.

In Fig. 3, the first peak point of the number of related posts is January 23, which is the day when Wuhan was lockdown (GI), and the second peak point is January 27, the day after Wuhan government notified ‘5 million people left Wuhan before lockdown’ to explain why government intervention hadn’t taken effect (post-GI) [32]. Then related Weibo gradually declined until Wuhan was ‘unlocked’ on April 8, and the related discussions reached a small peak (eff-GI).

In Fig. 4, the percentages of stigmatizing posts reached the highest point on January 18 (pre-GI), and generally showed a downward trend afterward. Percentages of ‘Stupid’ and ‘Irresponsible’ posts rose earlier than ‘Infectious’.

3.5. Changes of stigma in different periods

The means and standard deviations of post percentages in 34 provincial area are shown in Table 3. The percentages of stigmatizing posts differed significantly in 3 periods (F (2,66) = 5.60, p < .01, η² = 0.15). Among the three attitude categories, percentages of ‘Infectious’ posts (F (2,66) = 3.69, p < .05, η² = 0.10) and ‘Stupid’ posts (F (2,66) = 3.65, p < .05, η² = 0.10) are significantly different in 3 periods. Percentages of ‘Irresponsible’ posts are not significant different in 3 periods (F (2,66) = 0.63, p = .53, η² = 0.02).

Results of the post-hoc test show that there is no significant difference for the percentages of stigmatizing posts between pre-GI and post-GI, but a significant reduction from post-GI to eff-GI (t = -0.017, p < .01). For the percentages of ‘Stupid’ posts, there is no significant difference between pre-GI and post-GI, but a significant reduction from post-GI to eff-GI (t = -0.003, p < .05). For the percentages of ‘Infectious’ posts, there is a significant increase from pre-GI to post-GI (t = 0.005, p < .05), and a significant reduction from post-GI to eff-GI (t = -0.006, p < .05).
Table 3
Percentages of stigmatizing posts in 3 periods

| Category       | Period | Mean  | Std. Deviation |
|----------------|--------|-------|----------------|
| All (Stigmatizing) | pre-GI | 2.14% | 4.52%         |
|                | post-GI | 1.98% | 2.29%         |
|                | eff-GI  | 0.31% | 0.72%         |
| Attitude category | Infectious |       |                |
|                | pre-GI  | 0.30% | 1.00%         |
|                | post-GI | 0.85% | 1.41%         |
|                | eff-GI  | 0.24% | 1.05%         |
|                | Irresponsible |       |                |
|                | pre-GI  | 1.32% | 6.85%         |
|                | post-GI | 0.74% | 1.05%         |
|                | eff-GI  | 0.43% | 1.92%         |
|                | Stupid  |       |                |
|                | pre-GI  | 1.02% | 2.32%         |
|                | post-GI | 0.52% | 0.65%         |
|                | eff-GI  | 0.20% | 0.52%         |

3.6. Gender differences in stigma and attitudes

The results of the Paired Sample T-Test showed no significant difference in the percentages between male and female users who posted stigmatizing posts. Besides, there is no significant difference in percentages between male and female users who posted posts with any specific attitude in the category.

4. Discussion

This study analyzed Weibo posts that contain stigma towards Wuhan people during the COVID-19 epidemic to target-specific stigmatizing attitudes and analyzed their changes in different periods of the epidemic. Results indicated that there are different attitudes associated with the stigma towards Wuhan people in Weibo and they changed in different periods of the epidemic.

Among posts related to the COVID-19, stigmatizing posts only account for 2.46%, which is relatively low compared with stigmatizing tweets towards the Chinese in America between March 9 and March 25 [8]. Nevertheless, according to Fig. 4, the percentage of stigmatizing posts reached a peak point above 16% on Jan 18, 2020 and percentages of ‘Stupid’ and ‘Irresponsible’ posts rose earlier than ‘Infectious’. These results indicate that stigma towards Wuhan people on Weibo was relatively mild in severity from the whole period, but it was rather severe at pre-GI with ‘Irresponsible’ and ‘Stupid’ attitudes.
While the daily percentages of posts depict subtle changes of stigma, the results from repeated measures ANOVA give a statistical comparison of stigma in different periods. The main effects of periods on stigmatizing posts, 'Infectious' posts, and 'Stupid' posts are significant, whereas 'Irresponsible' posts are not. This suggests that government interventions can reduce stigma with 'Infectious' and 'Stupid' attitudes, but they have no significant influence on stigma with 'Irresponsible' attitude.

In the post-hoc analysis, we focus on the difference from pre-GI to post-GI, and from post-GI to eff-GI. Although not significantly, the stigmatizing posts, 'Stupid' posts, and 'Irresponsible' posts reduced from pre-GI to post-GI according to Table 3. In the meantime, however, 'Infectious' posts increased significantly. From post-GI to eff-GI, stigmatizing posts, 'Stupid' posts, and 'Infectious' posts reduced significantly. These results suggest that the government interventions (GI) have a negative short-term effect on 'Infectious' stigma, but a positive long-term effect on 'Stupid' stigma, 'Infectious' stigma, and general stigma.

‘Wuhan people are infectious’ is the most common attitude associated with stigma compared with the two other types. This type of stigma is very common in other diseases [33–35]. Previous research found that Ebola-related stigma subsided as the Ebola virus disease relieved in Liberia and increased every time the disease re-emerged. In this study, we found the same consistency between ‘Infectious’ stigma and severity of the disease. From pre-GI to post-GI, the number of confirmed COVID-19 cases continued increasing, and ‘Infectious’ posts increased significantly. From post-GI to eff-GI, as the epidemic under control, it decreased significantly. More importantly, government interventions such as city lockdown and home quarantine orders may reinforce public's biased perceptions about the stigmatized group without realizing it because they are following their supervisors[12]. This also explained why ‘Infectious’ stigma increased at post-GI.

The reason for the occurrence of ‘Stupid’ stigma may be that, people at pre-GI are facing a novel disease, thus speculating that the outbreak may be related to the consumption of wild animals based on the experience of SARS in the past. This form of stigmatizing attitude associates local culture with the disease and obfuscates the scientific causes of epidemics, which was also common during the SARS and H1N1 epidemic [20, 33]. At post-GI, ‘Stupid’ stigma did not decrease significantly, indicating the popularization to the public of scientific causes of the disease was not enough at this period. Fortunately, ‘Stupid’ labels decreased significantly at eff-GI.

Unlike other attitudes, the 'Irresponsible' stigma didn't decrease significantly at eff-GI. According to the attribution theory [7], when people gain a strong sense of control over infectious diseases, assuming responsibility for the occurrence of a disease is easy to be attributed to the individuals. At eff-GI, effective control of the epidemic made the public raise their expectations for individuals to avoid spreading the disease. As a result, although the number of confirmed cases decreased, people are more likely to blame the affected individuals for these cases. Thus, stigmatizing posts continued labeling Wuhan people irresponsible for escaping isolation orders.
Researches on other diseases found gender differences exist in stigma expressions [14, 36, 37]. In this study, however, no gender difference was found in general stigma or any attitudes of stigma. More researches are needed to identify gender-specific demographic and cognitive factors associated with stigma related to COVID-19.

With previous studies proved stigma exists long after SARS [38], and with the potential re-emergence of COVID-19 any time in the future, COVID-19 related stigma could be a long-lasting problem. Our findings can provide certain information for stigma mitigation. First, government interventions for disease control cannot mitigate stigma immediately. Second, stigma mitigation strategies should target specific attitudes in different periods of the epidemic. At pre-GI, a blank in scientific understanding existed for a relatively long period. During this stage, stigma with ‘Stupid’ attitude is prevalent due to the lack of scientific explanations of the disease. Target-specific strategies should be correcting the biased explanations about the origins of the disease. At post-GI, policymakers should consider the effects of isolation measures on stigma to avoid reinforcing stigma with ‘Infectious’ attitude. At eff-GI, people tended to attribute the spread of the epidemic to individuals and label the individuals with ‘Irresponsible’ tags. This notion suggests that officials should explain the objective reasons for the spread of the epidemic to the public in a timely manner.

This study has certain limitations. Firstly, attitudes towards Wuhan people online may differ from attitudes displayed offline. Secondly, social media users form only a sample of the Chinese population, which may not be representative of all people in China. Thirdly, users’ demographic information is obtained from profiles, which cannot be verified. Finally, changes in different periods can only be compared over time, thus the direct causality between government interventions and stigma cannot be guaranteed.

5. Conclusion

This study collected data from Weibo posts containing the keyword ‘Wuhan people’ published from December 1, 2019 to April 18, 2020 to analyze stigma towards Wuhan people in China during the COVID-19 epidemic. This study revealed that COVID-19 related stigma in China included various attitudes and changed over time. After government interventions but before they took effect, stigma with ‘Infectious’ attitude increased. After government interventions took effect, general stigma, and stigma with ‘Infectious’ and ‘Stupid’ attitudes decreased. Our findings can provide information for timely appropriate and attitudes-specific measures for the administration to ameliorate stigma associated with infectious diseases.

List Of Abbreviations

COVID-19: Corona Virus Disease 2019; ANOVA: Analysis of Variance; OSN: Online Social Networks; GI: government interventions; pre-GI: the period before government interventions; post-GI: the period after
government interventions but before they took effect; eff-GI: the period after government interventions took effect.

**Declarations**

**Ethics approval and consent to participate**

This study is approved by Institutional Review Boards at the Institute of the Psychology, Chinese Academy of Sciences and the ethics code is H15009. Because the Sina microblog are freely accessible, and following the procedure and ethical principles in the research field [39], informed consent was waived by the Ethics Committee, Institute of Psychology, Chinese Academy of Sciences.

**Consent for publication**

Not applicable.

**Availability of data and materials**

The data used in the current study are available from the corresponding author on reasonable request.

**Competing interests**

The authors declare that they have no competing interests.

**Funding**

This research is funded by China Social Science Fund (17AZD041)

**Authors' contributions**

YD, AL and XL conceived this study. YD, AL and TZ developed the methods. TZ and XL collected the data. YD, HL, PW, SY performed the coding work. YD performed the statistical analysis and wrote the manuscript. AL, HL, TZ and MZ revised the manuscript critically. All authors read and approved the final manuscript

**Acknowledgments**

Not Applicable
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