Role of neighborhood social support in stress coping and psychological wellbeing during the COVID-19 pandemic: Evidence from Hubei, China

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ABSTRACT

The COVID-19 pandemic that emerged in Wuhan, the capital city of Hubei province in China, has caused severe health problems and imposed a tremendous psychological impact on the public. This study investigated the risk and protective factors associated with psychological distress among Hubei residents during the peak of the outbreak. Data were obtained from a combined online and telephone survey of 1,682 respondents. Various COVID-19-related stressors, including risk exposure, limited medical treatment access, inadequate basic supplies, reduced income, excessive exposure to COVID-19-related information, and perceived discrimination, were associated with psychological distress. Neighborhood social support can reduce psychological distress and buffer the effect of COVID-19-related stressors, whereas support from friends/relatives affected stress coping limitedly. Interventions to reduce stressors and promote neighborhood support are vital to reduce psychological distress during infectious disease outbreaks.

1. Introduction

The coronavirus disease (COVID-19) outbreak was first reported in Wuhan, the capital city of Hubei province, China, on December 31, 2019 and has been spreading rapidly nationwide. To contain the spread of the virus, Chinese authorities imposed a lockdown on Wuhan on January 23 and enforced similar measures in 16 neighboring cities in Hubei province, affecting approximately 57 million people (Xiong, 2020). During the following weeks, COVID-19 cases escalated rapidly and overwhelmed the health care system. The situation improved when the Chinese government constructed massive temporary medical facilities to house COVID-19 patients and relocated numerous medical personnel to Hubei. The authorities relaxed the Hubei lockdown since March 23 and officially lifted the Wuhan lockdown on April 8, 2020 after no new deaths transpired for the first time (He, 2020).

The COVID-19 pandemic has imposed a great psychological impact on the public because of its high infectivity and fatality rate, the absence of effective treatment, and strict quarantine and physical-distancing measures. Recent surveys from China suggested that over 25% of the general population experienced moderate to severe levels of stress- or anxiety-related symptoms due to COVID-19 (Qiu et al., 2020; Wang

et al., 2020). Considering that over 80% of COVID-19 cases and 96% of deaths from the virus in mainland China materialized in Hubei, Hubei residents may experience great fear, panic, and psychological distress. However, Hubei residents were surprisingly underrepresented in previous studies of the psychological impact of COVID-19 (e.g., only 2.7% in the study of Gao et al., [2020]). Only several studies have focused on the psychological wellbeing of the general population in Hubei or Wuhan (e.g., Miao, Zeng and Shi, 2020; Fu et al., 2020; Liu et al., 2020).

This study aims to fill this gap by systematically examining factors associated with psychological distress among Hubei residents during the COVID-19 pandemic. Psychological distress refers to an unpleasant emotional state typically characterized by symptoms of depression and anxiety, which have both emotional and physiological manifestations (Mirowsky and Ross, 2003; Drapeau et al., 2012). A review of empirical evidence on the epidemiology of psychological distress in the general population has split its risk and protective into three categories: (1) sociodemographic variables; (2) stress-related factors; and (3) personal resources (Drapeau et al., 2012). The sociodemographic variables (e.g., age, gender, education) represent the role of individuals in the social structure, which are the common associated factors of psychological distress. The stress-related factor covers the stressful events and life

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conditions that exert negative effects on the psychological wellbeing of individuals. The social resources category encompasses the resources that are available to individuals to cope with stress and reduce psychological distress. Based on previous research on psychological distress, this study focuses on the role of life stressors and social support in COVID-19-fueled psychological distress among Hubei residents, while adjusting for their sociodemographic backgrounds.

Various life stressors during infectious disease outbreaks and quarantines may contribute to individuals' psychological distress. Brooks et al. (2020) reviewed the literature on the psychological impact of quarantine during previous pandemics (e.g., SARS, Ebola, the 2009 and 2010 H1N1 influenza pandemic) and summarized seven major types of stressors, including fear of infection, longer quarantine duration, frustration and boredom, inadequate life supplies, inadequate information, financial loss, and stigma. Taylor et al. (2020) recently developed a COVID-19-related stress scale, which includes five dimensions of stressors, i.e., COVID-19 danger and contamination fears, fear about economic consequences (e.g., job loss), disease-related xenophobia, compulsive checking and reassurance seeking, and COVID-19 traumatic stress symptoms (nightmares, intrusive thoughts). This scale has been validated in large, population-representative samples from Canada and the United States. Based on previous studies on stressors related to infectious disease outbreaks and China context, we examined the effects of five types of stressors during the COVID-19 pandemic on psychological wellbeing: (1) disease-related stress that includes risk exposure to COVID-19 and access to medical treatment; (2) inadequate supplies of life necessities; (3) actual and anticipated economic loss due to the pandemic; (4) excessive attention on COVID-19-related information; and (5) perceived discrimination. We did not include traumatic stress symptoms suggested in Taylor et al.'s (2020) scale because we believe they are more likely symptoms of psychological distress rather than the cause of it.

Experience of the above stressors may promote psychological distress among Hubei residents during the pandemic. First, Hubei residents were faced with a highly contagious disease with no known cure, along with a health care system on the verge of its breaking point. Emotional reactions and psychosocial morbidity can naturally arise from high-risk exposure to COVID-19 and limited access to medical treatment. Second, Hubei residents had to endure the inconvenience associated with draconian lockdowns. Having inadequate routine supplies, e.g., food, water, or accommodation during quarantine is a source of frustration (Blendon et al., 2004; Wilken et al., 2017). The lack of face masks and disinfectants in the marketplace and the inability to obtain regular medical care and prescriptions can also cause intense anxiety (Blendon et al., 2004; Cava et al., 2005). Third, while effective for disease containment, the strict quarantine and social-distancing policies disrupted economic activities in China (Fernandes, 2020). The number of unemployed people in urban China increased by five million between January and February (Huang et al., 2020). Previous studies have shown that economic loss due to COVID-19 is positively associated with mental distress (Lei et al., 2020; Xiong et al., 2020). Fourth, as the outbreak was first found in Wuhan, people in Wuhan and surrounding areas are considered infectious, are blamed for spreading the virus, and have experienced discrimination and stigmatization (Rong, 2020), which may greatly affect them mentally. Lastly, people rely on technology and (social) media to keep them safe, informed, productive, and connected during the COVID-19 pandemic, which may amplify an infodemic, i.e., an overabundance of information, which may undermine the public health response and exacerbate anxiety and fear toward the pandemic (World Health Organization, 2020a). Thus, excessive consumption of COVID-19-related information may negatively affect the psychological wellbeing of Hubei residents.

Although residents in Hubei province may have experienced various life stressors, social support is likely to mitigate the adverse effects of life stressors on psychological wellbeing. Social support refers to support accessible to an individual through social ties to other individuals,

groups, and the larger community (Cooke et al., 1988). Social support can serve as a problem- and emotional-focused coping strategy by providing information or tangible assistance to solve a problem or by regulating emotions that arise from stressful events (Mo et al., 2020). The beneficial role of social support in psychological health is either through its direct effect on mental wellbeing or as a stress-buffering mechanism in which the social support may have an ameliorating effect on life stressors, particularly for individuals under greater stress (Cohen and Wills, 1985; Cohen, 2004). The beneficial effect of social support on psychological wellbeing has been well documented among the general population in the wake of natural disasters and infectious disease outbreaks (Mcguire et al., 2018; Reblin and Uchino, 2008). For example, social support reduces post-disaster psychological distress and moderates the traumatic stress among earthquake and tsunami survivors (Teramoto, Matsunaga and Nagata, 2015; Arnberg et al., 2012). Also, social support functions as a protective factor against psychological distress during infectious disease outbreaks, such as SARS and Ebola (Mak et al., 2009; James et al., 2020).

Most studies on the psychological impact of COVID-19 focus on social support from family members, friends, and colleagues (e.g., Moore & Lucas; 2020; Yu et al., 2020). Even though people were not allowed to meet face-to-face during quarantine, they can share life experiences and provide emotional support to one another through online platforms (Qian and Hanser, 2020; Van Bavel et al., 2020). The protective role of social support in reducing COVID-19-induced anxiety, depression, and mental distress has been found among the general Chinese population (Yu et al., 2020), health care workers (Hou et al., 2020), adolescents (Qi et al., 2020), and college students (Ye et al., 2020) in China. A negative relationship between social support (mostly from family and friends) and psychological distress was also found in the general population in Western societies (Cruza-Guet et al., 2020; El-Zoghby, Soltan and Salama, 2020; González-Sanguino et al., 2020; Bauer et al., 2020; Saltzman, Hansel and Bordnick, 2020). However, previous studies have shown that social capital is not of universal benefit in reducing psychological distress (Ang and Malhotra, 2016; Croezen et al., 2012). One recent study found that social support from family and work colleagues was not significant in reducing worries or psychological distress during the COVID-19 pandemic (Moore and Lucas, 2020). It was perhaps because most support was in the virtual form of encouragement, rather than face-to-face, which reduced its effectiveness.

Notably, social support from neighborhoods may play an important role in residents' mental wellbeing during catastrophic events (Klinenberg, 2018). The value of neighborhoods during a disease outbreak lies in its diffusion of health information, its promotion of access to local health services, and its provision of effective support via cohesive social networks (Kim, Subramanian and Kawachi, 2006). During the COVID-19 pandemic in China, neighborhood/rural committees were critical in overseeing the lockdown and containing the spread of the virus. As the grassroots arm of the government in China, neighborhood/rural committees are staffed by Communist Party officials and volunteers, and are responsible for keeping order, responding to citizen needs, and addressing numerous concerns, including public health (Bray, 2008; Tang, 2020). When Wuhan and other cities in Hubei implemented lockdown measures, neighborhood committees provided the institutional infrastructure for limiting and monitoring movements, conducting regular door-to-door temperature checks, and supplying groceries and other necessities to residents under quarantine. Services provided by neighborhood committees and volunteer groups significantly help residents cope with stressful events and decrease the adverse impact of the outbreak on residents' mental health (Qian and Hanser, 2020; Miao, Zeng and Shi, 2020).

On the basis of the classic models of stress-distress (Mirowsky and Ross, 2003) and the stress-buffering effect of social support (Cohen and Wills, 1985), we investigated whether COVID-19-related stressors and different sources of social support (i.e., from relatives/friends and from neighborhoods) affected psychological wellbeing among Hubei

residents. This study is among the first to differentiate the role of support from personal networks (i.e., relatives/friends) and from neighborhood organizations (i.e., neighborhood/rural committees) in reducing psychological distress and buffering the negative effects of COVID-19-related stressors. The data were collected from an online survey of residents in Hubei during the peak of the pandemic, supplemented with a telephone survey to reach populations that have limited Internet access (e.g., the elderly, rural population). This study contributes to the understanding of how life stress and social support, as well as their interaction, are associated with psychological distress in the context of the COVID-19 pandemic. The findings would be useful for designing effective psychological intervention programs targeting vulnerable populations in the face of the pandemic.

2. Methods

2.1. Study design and participants

The data of this study were obtained from the "Public Attitude toward the Novel Coronavirus Pandemic in Hubei province" survey launched by The China Academy of Science and Technology Development Strategy, the Social Policy Research Institute at Renmin University, and the Institute of Sociology of the Chinese Academy of Social Sciences. The survey was conducted between February 2 and 8, approximately two weeks after Wuhan first announced its closure on January 23, 2020. The authorities imposed similar measures in 16 neighboring cities in Hubei province since the Wuhan lockdown.

The survey targeted all urban and rural area residents of Hubei. The online survey was carried out on Epanel, a professional survey platform in China. The platform sent a notification with a link to allow access to the questionnaire to respondents in their sample bank. Only Hubei residents (with IP address locations in Hubei) can answer the questionnaire. In total, 1,854 completed questionnaires were returned. We supplemented the web-based survey with a telephone survey to recruit non-Internet users who are typically older and living in rural areas to overcome the limitation of the online survey. The phone survey was guided by the respondent-driven sampling (RDS, Salganik and Heckathorn, 2004) to interview people with limited Internet access. First, five initial eligible participants (seeds) who were older than 60, lived in rural areas, and had limited Internet access were selected. After completion of the interviews, they were requested to invite five peers with similar characteristics to join the study. With consent and confirmed eligibility, subsequent referrals were similarly interviewed and were further asked to refer eligible peers to join the study. Research has confirmed that RDS samples show statistical properties approaching those of random samples (Magnani et al., 2005). The phone survey was conducted by trained research assistants who are university students in Hubei. A total number of 390 respondents were interviewed by phone. After deleting cases with at least one missing value, the final sample included 1,682 respondents, of which 1,523 (90.65%) completed the online survey, and 157 (9.35%) completed the phone survey. Ethical standards set forth by the Chinese Academy of Social Sciences were followed in conducting the study. Informed consent from the participants was obtained.

2.2. Measures

Psychological distress. Respondents were asked to rate on a five-point Likert scale how anxious, fearful, and worrisome they felt about the pandemic (1 = not at all to 5 = extremely). The average score of these three items was used to represent the level of psychological distress, with higher scores indicating higher levels of distress during the pandemic (3-item scale, alpha = 0.82). A similar measure was used in previous studies (e.g., Wang and Ying 2020).

Life stressors during the current pandemic were assessed from five dimensions. First, disease-related stress was measured by *risk exposure* and *medical care access*. The respondents were asked whether they and/

or any of their family members, acquaintances, and residents in the same neighborhood had a fever since January 1, 2020 (0 = none; 1 = yes). High-risk exposure was identified if the respondent answered yes to any of these questions. Respondents with high-risk exposure (they and/or their family members, neighbors, and residents in the same neighborhood had a fever recently) were asked whether these people could not obtain medical treatment (0 = no; 1 = yes). Second, economic stress was gauged by *actual and anticipated economic loss due to the pandemic*. The respondents were asked whether their income was affected by the pandemic (0 = no; 1 = yes). In addition, they were asked whether they expected that the pandemic would have negative effects, such as current job loss, reduced income, increased difficulty in finding new jobs, and increased difficulty in running their business in the future this year, their work, and income (0 = no; 1 = yes). Third, the variable of *inadequate supplies* was assessed by asking the respondents whether they experience food, drugs, and face masks shortages currently (0 = no; 1 = yes). Fourth, individuals' *perceived discrimination* was assessed. Respondents chose yes, no, or unsure to the question of whether they felt being discriminated against due to the pandemic. Perceived discrimination was identified if one reported yes to the question. Sensitivity analysis showed similar results when unsure was coded as missing. Previous studies used a similar single item to assess perceived discrimination because of COVID-19 (Xin et al., 2020). Lastly, *excessive information exposure* was measured by the level of attention the respondent paid to COVID-19-related information, such as suspected and confirmed cases and deaths, local medial supplies, and updated medical research on COVID-19 (1 = paid no attention to 4 = paid much attention; alpha = 0.80). Excessive exposure to COVID-19-related information was confirmed if the average score of the six items equaled to 3.5 or higher; otherwise, the respondents did not experience excessive information exposure.

Social support. The measures of social support from friends/relatives and neighborhoods were adapted from the Received Social Support Questionnaire (Kaniasty and Norris, 1995), which focuses on both emotional support (e.g., expressions of assurance) and tangible assistance (e.g., receiving food) in the wake of traumatic events. Social support from the neighborhoods was assessed by asking the respondent whether he/she received assistance from the neighborhood or rural committees through the provision of masks/drugs, groceries, child/-elderly care, and expressions of assurance during the pandemic. Each urban neighborhood in China contains a residents' committee (*ju wei hui*) run by paid staff, which functions as a link between residents and the municipal authorities (Read, 2003). In rural China, villagers elect their leaders for villagers' committees (*cun wei hui*), and rural committees carry out important functions to control and redistribute local resources (Tzeng, 2020). Responses for each item were recoded as 0 for never and 1 for having received. Response scores were summed up to construct neighborhood social support with a theoretical range of 0–4, with higher values indicated more support from the neighborhood. Similarly, support from relatives or friends were assessed on the basis of the assistance in the above aspects offered by relatives or friends. A similar method for constructing neighborhood support was used for relatives/friends' support.

Control variables include age (≤25, 26–35, 36–50, or ≥51), sex (male vs. female), monthly income (no income to over 8,000 yuan), occupation (managerial/professional position; manual/service/part-time worker; unemployed/peasant/student/other), China Communist Party (CCP) membership (party member vs. non-party member)area (rural vs. urban), region (Wuhan vs. non-Wuhan), and type of neighborhood (luxury housing, regular apartment, sold public housing, low-rent housing, shanty town, or villages).

2.3. Analytical strategy

All the analyses were performed using Stata 14.1. Descriptive statistics were used to characterize the study population. A series of

regression models were used to examine the association between numerous COVID-19-related stressors and psychological distress, with support from neighborhoods and support from friends/relatives as potential moderators of such associations. The relationship between multiple sociodemographic variables and psychological distress was first investigated through ordinary least squares (OLS) regression. We then examined the main effects of various COVID-19-related stressors and two types of social support (neighborhoods and friends/relatives) on psychological distress, controlling for background variables. Next, all the stress variables were combined into a single scale to estimate whether exposure to a number of stressors has a cumulative effect on psychological distress. The two-way interaction term between the composite strain and neighborhood social support was then computed to examine whether the relationship between life stressors and psychological distress was moderated by neighborhood social support. Such analysis was repeated for the social support gained from friends or relatives to ascertain the interaction between strain and support gained from friends or relatives on psychological distress when exposed to the COVID-19 pandemic. Variance inflation factors (VIFs) of the independent variables were estimated to check whether multicollinearity exists in the models. All the VIFs are below 2, suggesting that multicollinearity is not a significant concern.

3. Results

3.1. Sociodemographic characteristics of survey participants

Descriptive statistics are displayed in Table 1. Of the 1,682

Table 1
Characteristics of the study population (n = 1,682).

Variable	%
Age	
≤25	26.93
26-35	33.95
36-45	23.07
46-55	10.40
>55	5.65
Sex	
Female	43.40
Male	56.60
Education	
Middle school or below	16.11
High school	26.63
College or above	57.25
Monthly income	
No income	6.48
≤2000 *yuan*	18.55
2000–4000 *yuan*	33.59
4001–6000 *yuan*	21.34
6001–8000 *yuan*	12.13
>8000 *yuan*	7.91
Occupation	
Managerial/professional position	24.02
Manual/service/part-time worker	59.61
Unemployed/peasant/student/other	16.47
Communist Party membership	
Yes	15.76
No	84.24
Area	
Urban	88.94
Rural	11.06
Region	
Wuhan residents	15.22
Non-Wuhan residents	84.78
Type of neighborhood	
Regular apartment	35.61
Luxury housing	5.41
Sold public housing	8.03
Low-rent housing	13.26
Shanty town	8.68
Village	29.01

respondents, approximately 60% were under 35 years old and about 57% were men. A majority (89%) of the respondents lived in the cities. About 15% of respondents were Wuhan residents. As for the type of neighborhood, about 36% of respondents lived in commercial housing (regular apartment), about 5% of respondents resided in high-end commercial housing and villas, almost 30% of respondents lived in village, and the remaining 30% of respondents lived in sold public housing, low-rent housing, or shanty town.

3.2. Descriptive statistics and correlation between key covariates

Table 2 presents the descriptive statistics and bivariate correlations between key covariates. During the peak of the pandemic, the average score of psychological distress was high at 4.17 (out of a maximum of 5) among Hubei residents. As for COVID-19-related stressors, about 25% of respondents were exposed to a high risk of COVID-19 and about 9% of respondents reported having limited access to medical treatment. A majority of respondents experienced income loss (79%) and anticipated to experience economic loss (85%). About 60% of respondents reported having inadequate supplies during the quarantine and about 44% of respondents perceived being discriminated against due to COVID-19. Besides, nearly 2/3 of respondents paid an excessive amount of attention to COVID-19-related information. Most stressors were correlated with psychological distress in the expected directions. However, the correlation between inadequate supplies and psychological distress was not statistically significant. Although there was an insignificant correlation between support from friends or relatives and psychological distress, support from the neighborhood was significantly correlated with distress. There also existed a modest and significant correlation between the two types of support (r = 0.12). The correlations between other covariates were all below 0.5, thereby also showing a low possibility of multicollinearity.

3.3. Regression results

Table 3 presents the results from OLS regression models of psychological distress on sociodemographic variables, COVID-19-related stressors, and different sources of social support. Model 1 shows the association between sociodemographic variables and psychological distress. Compared with respondents under 25 years old, respondents aged 26–35 years old experienced a higher level of distress, whereas respondents over 46 years old reported a lower level of psychological distress. Younger people may have lower adaptive capacities and less mature cognitive abilities, which make them vulnerable to psychological distress (Cénat and Derivois, 2014). In addition, CCP members seemed more likely to experience psychological distress than non-CCP members. It may be because at the onset of the pandemic, CCP members, especially those who belonged to grass-root government organizations and medical teams, were assigned to execute anti-pandemic measures and were exposed to higher risk and stress. Other sociodemographic variables, including sex, education, occupation, income, rural/urban area, Wuhan/non-Wuhan residence, and type of neighborhood were not significantly associated with psychological distress, suggesting that these subpopulations experienced similar levels of psychological distress during the peak of the pandemic.

Model 2 in Table 3 displays the association between various life stressors with psychological distress after adjusting for sociodemographic variables. The results show that risk exposure (b = 0.206, p < 0.01) and unable to obtain medical treatment (b = 0.124, p = 0.06) were associated with psychological distress, although the effect of medical treatment access was only marginally significant. In addition to disease-related stressors, reduced income due to COVID-19 was also significantly associated with psychological distress (b = 0.225, p < 0.001). Nevertheless, anticipated economic loss was not associated with psychological distress. As expected, the shortage of daily necessities during compulsory quarantine was positively associated with psychological

Table 2
Bivariate relationships between independent and dependent variables (n = 1,682).

Variables	1	2	3	4	5	6	7	8	9	10	11
1 Psychological distress	1.00										
2 Risk exposure	0.13***	1.00									
3 Access to medical treatment	0.11***	0.43***	1.00								
4 Income loss due to COVID-19	0.16***	0.06	0.04	1.00							
5 Expected economic loss	0.09***	0.05	0.06	0.43***	1.00						
6 Inadequate supplies	0.04	−0.03	−0.04	−0.03	−0.06	1.00					
7 Perceived discrimination	0.15***	0.18***	0.21***	0.03	0.16***	−0.08	1.00				
8 Excessive exposure to COVID-19-related information	0.13***	0.03	0.01	0.14***	0.02	0.02	−0.03	1.00			
9 Composite stress	0.26***	0.42***	0.43***	0.53***	0.50***	0.33***	0.50***	0.44***	1.00		
10 Support from the community	−0.09***	0.01	−0.03	0.05	0.02	−0.05	0.07	0.02	0.03	1.00	
11 Support from relatives and friends	−0.04	−0.05	−0.03	−0.02	−0.07**	0.02	−0.09***	−0.01	−0.08	0.12***	1.00
Mean	4.17	0.25	0.09	0.79	0.85	0.60	0.44	0.66	3.49	0.50	0.46
SD	(0.72)	(0.26)	(0.29)	(0.41)	(0.35)	(0.29)	(0.50)	(0.48)	(1.24)	(0.74)	(0.77)

Note: All correlations are Pearson's correlations.
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table 3
OLS regression of psychological distress on COVID-19-related stressors, neighborhood social support, and support from relatives and friends among residents in Hubei province, China (n = 1,682).

	Model 1		Model 2		Model 3	
COVID-19-related stressors						
Risk exposure			0.206**	(0.072)	0.206**	(0.072)
Access to medical treatment			0.124#	(0.066)	0.122#	(0.066)
Actual income loss due to COVID-19			0.225***	(0.047)	0.217***	(0.049)
Expected economic loss due to COVID-19			0.018	(0.054)	0.015	(0.054)
Inadequate supplies			0.077*	(0.035)	0.070*	(0.039)
Perceived discrimination			0.210***	(0.036)	0.210***	(0.037)
Excessive exposure to COVID-19-related information			0.175***	(0.037)	0.154***	(0.037)
Social support						
Neighborhood social support					−0.054*	(0.024)
Support from relatives and friends					−0.020	(0.023)
Sociodemographic variable						
Age (ref: ≤25)						
26-35	0.089#	(0.051)	0.059	(0.049)	0.060	(0.049)
36-45	0.002	(0.056)	0.010	(0.055)	0.012	(0.055)
46-55	−0.158*	(0.069)	−0.133*	(0.067)	−0.129#	(0.067)
>55	−0.087	(0.091)	0.003	(0.090)	0.013	(0.090)
Sex (ref: male)						
Female	0.042	(0.036)	0.074*	(0.035)	0.074*	(0.035)
Education (ref: middle school or below)						
High school	−0.060	(0.060)	−0.064	(0.058)	−0.065	(0.058)
College or above	0.010	(0.057)	0.017	(0.055)	0.017	(0.055)
Monthly income (ref: no income)						
≤2000 *yuan*	−0.001	(0.085)	−0.000	(0.082)	0.001	(0.082)
2000–4000 *yuan*	0.003	(0.088)	0.007	(0.085)	0.009	(0.085)
4001–6000 *yuan*	−0.040	(0.093)	−0.017	(0.090)	−0.013	(0.090)
6001–8000 *yuan*	−0.044	(0.102)	−0.066	(0.098)	−0.063	(0.098)
>8000 *yuan*	−0.102	(0.109)	−0.090	(0.105)	−0.088	(0.105)
Occupation (ref: managerial/professional position)						
Manual/service/part-time worker	0.071	(0.045)	0.074#	(0.044)	0.075#	(0.044)
Unemployed/peasant/student/other	−0.030	(0.070)	0.017	(0.068)	0.019	(0.068)
Communist Party member (ref: non-party member)						
Party member	0.092#	(0.049)	0.056	(0.048)	0.057	(0.048)
Area (ref: urban)						
Rural	0.056	(0.065)	0.063	(0.063)	0.068	(0.063)
Region (ref: non-Wuhan)						
Wuhan resident	0.004	(0.050)	−0.013	(0.048)	−0.011	(0.048)
Type of neighborhood (ref: regular apartment)						
Luxury housing	−0.123	(0.082)	−0.165*	(0.079)	−0.165*	(0.079)
Sold public housing	−0.030	(0.069)	−0.029	(0.067)	−0.031	(0.067)
Low-rent housing	0.019	(0.057)	−0.014	(0.055)	−0.015	(0.055)
Shanty town	−0.056	(0.067)	−0.046	(0.064)	−0.047	(0.065)
Village	−0.009	(0.049)	0.014	(0.047)	0.014	(0.047)
Constant	4.132***	(0.111)	3.638***	(0.121)	3.649***	(0.121)

Note: Standard errors in parentheses. Model 1 examines the effects of sociodemographic variables on psychological distress. Models 2 and 3 examine the effects of eight COVID-19-related stressors and neighborhood social support and friends/relatives support on psychological distress among Hubei residents when adjusting for sociodemographic variables.
#$p < 0.10$, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

distress (b = 0.077, p < 0.05). Moreover, Hubei residents who perceived being discriminated against during the pandemic also experienced more psychological distress (b = 0.210, p < 0.001). Lastly, respondents who experienced infodemic when they were highly concerned about COVID-19 related information (b = 0.175, p < 0.001) reported high levels of psychological distress.

Model 3 added neighborhood social support and support from friends or relatives. Neighborhood social support was negatively associated with psychological distress (b = −0.054, p < 0.05). Inconsistent with our hypothesis, support from friends or relatives was not significantly associated with psychological distress.

Table 4 presents the results of the interactive effects between COVID-19-related stressors and two types of social support on psychological distress. To reduce multicollinearity, we combined the eight types of stressors into a single variable and then computed the two-way interaction terms between the composite strain and neighborhood social support. We computed the interaction between the composite strain and support from friends or relatives using a similar method. Model 1 examines the main effects of composite strain and two types of social support on psychological distress. The results show that the composite strain variable was positively associated with psychological distress after controlling for sociodemographic variables (b = 0.177, p < 0.001), indicating that respondents who experienced accumulative stressful events were more likely to experience psychological distress. Ultimately, neighborhood social support was negatively associated with psychological distress (b = −0.081, p < 0.05), whereas social support from relatives or friends was not associated with psychological distress.

Model 2 in Table 4 included the interaction terms between the composite strain and two types of social support to examine whether the relationship between life stressors and psychological distress was moderated by social support. A negative interaction between composite strain and neighborhood social support emerged, suggesting that the relationship between accumulated COVID-19-related stress and psychological distress were weaker among those with more neighborhood social support. Such results confirmed the buffering effect of neighborhood social support in reducing psychological distress when people are faced with major stressful events. Contrastingly, there existed no significant interaction between life stress and support from friends or relatives, indicating that the relationship between life stress and psychological distress was not conditioned on support from friends or relatives.

Table 4
OLS regression of psychological distress on the interaction between COVID-19-related stressors and neighborhood social support and support from friends and relatives among residents in Hubei province, China (n = 1,682).

	Model 1		Model 2	
Composite strain	0.177***	(0.024)	0.193***	(0.030)
Neighborhood social support	−0.081*	(0.039)	0.181	(0.121)
Social support from relatives and friends	−0.021	(0.038)	−0.084	(0.102)
Composite strain x Support from neighborhood			−0.066*	(0.032)
Composite strain x Support from relatives and friends			0.019	(0.028)

Note: The eight stressors were combined into a single scale (i.e., composite strain) to estimate whether exposure to a number of stressors has a cumulative effect on psychological distress. The two-way interaction term between the composite strain and neighborhood social support was computed. Such analysis was repeated for the interaction between composite strain and social support gained from friends or relatives. All models have adjusted for sociodemographic covariates, including age, sex, education, monthly income, occupation, Communist Party membership, rural/urban residence, Wuhan vs. non-Wuhan, and type of neighborhood.
Standard errors in parentheses.
#p < 0.10, *p < 0.05, **p < 0.01, ***p < 0.001.

4. Discussion

This study was conducted in a critical period (i.e., the early stage of the COVID-19 outbreak) and was timely in capturing how COVID-19-related stressful experiences affect psychological distress in a large sample of community residents in Hubei, the early epicenter of the pandemic. Using the data obtained from a combination of the web-based and telephone surveys of 1,682 Hubei residents, we examined the relationship between various stressful life events and psychological distress during the pandemic and the buffering role of different types of social support in this relationship. The results showed that several COVID-19-related stressors were positively associated with psychological distress, including high risk exposure to COVID-19, unable to obtain medical care, inadequate basic supplies, reduced income, perceived discrimination, and an overload of COVID-19-related information. A differential effect between neighborhood social support and support from friends/relatives was suggested. Neighborhood social support tended to reduce psychological distress and mitigate the negative effect of various stressful life events on psychological distress. However, support from friends or relatives had limited main effects or stress-buffering effects on psychological distress. The study yielded several important findings.

First, in addition to the significant effect of risk exposure and inadequate supplies on psychological distress that was well-documented in prior studies (Brooks et al., 2020; Serafini et al., 2020), our findings highlighted economic loss caused by the pandemic as a major source of psychological distress among Hubei residents. Most employees and business owners in Hubei suffered from slashed pay or layoffs as the authorities shut down all nonessential companies during the peak of the pandemic (Xie, 2020). The economic impact of the pandemic may be more devastating for low-income families as they are more likely to experience income and job loss during difficult times (Qian and Fan, 2020). Moreover, families with lower socioeconomic status tend to have less access to health care and lower savings and social security protection to protect against financial catastrophe than other families. Those employed in small and medium-sized enterprises reported a pessimistic view of economic gain in the near future (Huang et al., 2020), which may deteriorate their mental health. These vulnerable groups should be the focus of efforts to improve their economic gain and psychological wellbeing.

Second, a high proportion (about 44%) of respondents in our sample experienced COVID-19-related discrimination, which was significantly associated with psychological distress. Considering that stigma toward the affected population of infectious diseases could continue even after containment of the outbreak (Brooks et al., 2020), it requires a long-term, sustained commitment to reducing stigma and discrimination. Public health officials should deliver rapid and clear messages effectively to the entire population because an accurate understanding of the pandemic can reduce stigmatizing attitudes in the general public (Person et al., 2004). Moreover, as discrimination and stigma may prompt sick people to avoid seeking medical help (Pellecchia et al., 2015), effective behavioral and health education interventions are needed to prevent discrimination and stigmatization against virus-affected communities and encourage the appropriate health-seeking behaviors of the infected population.

Third, excessive exposure to COVID-19-related information was positively associated with psychological distress among Hubei residents, which was consistent with previous studies among other populations (Gao et al., 2020; Yu et al., 2020). Consuming excessive COVID-19-related information may compel fear and anxiety to people through the constantly changing alerts and sensationalized news headlines and images regarding the rapid spread of the virus. Such information-induced anxiety was reduced later when established medical experts in China clarified the pandemic situation to dispel rumors and raise public awareness to comply with preventive measures. Thus, disseminating authentic, accurate, and up-to-date information and

scientific knowledge about emerging infectious diseases to increase compliance and ease public panic is necessary (Nougairède et al., 2010). Also, individuals should carry out an "information diet" by controlling the extent and type of information they consume. As the WHO suggests, people should minimize watching, reading, or listening to news about COVID-19 that cause anxious or distressed feelings and seek good-quality and accurate information from trusted sources, such as the WHO website and local health authority platforms, once or twice, preferably at specific times during the day (World Health Organization, 2020b).

In addition to identifying COVID-19-related stressors that may affect psychological distress, this study showed the importance of social support in reducing psychological distress during the pandemic. More importantly, we found a differential role of social support from neighborhood versus from friends or relatives in psychological wellbeing during the current pandemic. While neighborhood social support reduced psychological distress directly and indirectly through its stress-buffering effect, friends/relatives' support played a limited role in psychological wellbeing among Hubei residents. Given the compulsory quarantine during the peak of the pandemic in Hubei, the importance of neighborhoods is likely to increase as people are compelled to stay at home and spend more time in their immediate neighborhoods. Notably, neighborhood/rural committees in China have made a significant contribution to vanguard the virus and helping people navigating the lockdown (Qian and Hanser, 2020). The functional grassroots-level governance and effective mobilization of resources may improve residents' sense of belonging and security, assuring them that there are people close by they can turn to if they need help. Well-established neighborhood/rural organizations may also promote residents' trust in the government, which may contribute to a positive outlook in overcoming the current difficulties and increase compliance with public health measures during the pandemic (Wu, 2020). The material help, information, emotional support the residents received from neighborhoods and more confidence in the prospects of fighting the pandemic may effectively decrease COVID-19-fueled psychological distress among Hubei residents.

Contrastingly, support from friends/relatives was less effective in mitigating psychological distress regarding the main and buffering effects on life stress during pandemic emergencies. As a result of the lockdown of all the cities in Hubei province, residents in these cities have limited face-to-face connections with their friends and relatives and have to resort to online platforms for communication, which may decrease social support effectivity (Moore and Lucas, 2020). Moreover, sharing uncertainties and discussing about the virus with relatives and friends may further spread anxiety and contribute to increased stress when facing the pandemic (Coyne, Wortman and Lehman, 1988). Thus, although social support from personal networks may be helpful for coping with ordinary stressful life events, it may not function as importantly as support from official organizations during a pandemic with unprecedented scale and magnitude.

Some potential limitations of this study should be noted. First, this was a cross-sectional study, and thus causality was difficult to ascertain. Additional longitudinal studies, such as cohort studies or nested case-control studies, are essential in the future. Second, the sociodemographic profile of the sample is somewhat different from the general population in Hubei since the survey was mostly done through online platforms. However, online surveys may be the swiftest and most feasible mode of data collection during a crisis, like COVID-19. To ameliorate, we have controlled for relevant sociodemographic characteristics in our analysis, as advised by previous empirical and methodological studies (Qian and Fan 2020; Winship and Radbill 1994). Future studies may try various sampling methods to gain a population-based representative sample. Third, self-selected bias might exist because those who agreed to participate in the study might be healthy and less likely to report stress and psychological distress. Fourth, the items for measuring the nonspecific psychological distress were not validated,

although they were adapted from previous studies (Wang and Ying, 2020), and the internal consistency was satisfactory. Future studies may further test the validity of these variables among the Chinese population. Also, self-reported anxiety and fear may not be aligned with the objective assessment made by mental health professionals. Nevertheless, psychological impact and stress are more based on personal feelings, and the self-reporting method is widely used during the COVID-19 pandemic (Tan et al., 2020). Moreover, self-report data may be subject to social desirability bias. Future studies may evaluate key variables through additional methods besides self-report, including family members' evaluations or direct observations of key variables. Lastly, since we did not know the neighborhood the respondent lived in, we were unable to control for the contextual effect of social support. Future studies may adjust for neighborhood-level social support to distinguish the contextual effect and the individual effect of social support.

Despite the limitations, this study is among the first to examine various COVID-19-related stressors and their interaction with neighborhood social support and support from friends/relatives on psychological distress during the COVID-19 pandemic in China. Numerous COVID-19-related stressors, including risk exposure to the virus, the lack of medical care, economic loss, inadequate basic supplies, perceived discrimination, and excessive exposure to COVID-19-related information, were associated with psychological distress among Hubei residents. This study also extended the understanding of the role of neighborhood resources in stress coping. The provision of material and emotional support by the neighborhood/rural committees during the pandemic could effectively mitigate the effect of various stressful experiences on psychological distress. Our findings suggested that the power of the neighborhood is crucial during pandemic emergencies and should be maximized in preparedness for future infectious disease outbreaks. Moreover, stakeholders and health policymakers should collaborate to provide timely and high-quality crisis psychological services to affected populations and create strategic neighborhood-led initiatives that safeguard the health of their residents.

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