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# The impact of COVID-19 pandemic on mental health in gay, bisexual, and other men who have sex with men in China: Difference by HIV status

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## ABSTRACT

Population-based measures and public health response to stem the spread of the coronavirus may have caused unintended isolation and increased the risk of psychiatric illnesses. The objective of this study is to assess psychological distress among gay, bisexual, and other men who have sex with men (MSM) in China during the COVID-19 pandemic and examine whether these mental health outcomes differ by HIV status. Data were derived from a cross-sectional survey on the impact of COVID-19 on users of Blued, the largest gay social networking app in July 2020. All active users on Blued were invited to complete a survey regarding sexual behaviors, HIV prevention and treatment service utilization, and various health and mental health outcomes. Among all participants ( $n = 1205$ ), over half (53.2%) of the participants screened mild to severe psychological distress: 34.9% screened mild, 11.6% screened moderate, and 6.6% screened severe psychological distress. Of all participants, 20.9% met the criteria for anxiety and 19.6% for depression. Psychological distress was associated with younger age having a degree below college, being unemployed, and having lower income. MSM with HIV were more likely to report depression or anxiety compared to HIV negative/unknown status MSM after adjusting for study covariates (AOR = 1.80, 95%CI 1.01–3.26; AOR = 2.04, 95%CI 1.11–3.67, respectively). MSM in China experience a high burden of psychological distress during the COVID-19 pandemic. Integrated HIV treatment and mental health services are needed to provide adequate and timely mental health support to MSM living with HIV.

## 1. Introduction

Population-based measures and public health response to stem the spread of the coronavirus may have caused unintended isolation and increased the risk of psychiatric illnesses. A recent systematic review revealed the high rates of depression, anxiety, stress, and other psychological distress in the general population (Xiong et al., 2020). Fear, social isolation, and loneliness during this unprecedented time also contribute to worsening mental health outcomes among more vulnerable populations, such as sexual and gender minorities, including gay, bisexual, and other men who have sex with men (MSM), a population that is already disproportionately impacted by adverse mental health conditions due to experiences of discrimination, homophobia, sexism, and other minority stressors (Meyer, 2003). Emerging evidence has

documented the unique concerns and challenges in accessing health-care, HIV prevention and care services, and mental health well-being experienced by MSM since the pandemic began (Hong et al., 2021; Kamal et al., 2021; Santos et al., 2022).

Indeed, MSM already had higher psychological burdens such as anxiety, depression, and post-traumatic stress disorder (PTSD) than their heterosexual counterparts before the pandemic (Meyer, 2003; Ross et al., 2018). This is particularly true in China, where MSM experience additional stressors and rejections from their families due to the traditional culture that overemphasizes the value of marriage and fertility (Liu et al., 2018). These vulnerabilities highlight the importance of assessing the impact of physical distancing and lockdown measures on their mental health during the pandemic when social distancing policies dictate leaving home only for essential activities. However, to our knowledge,

**Abbreviations:** MSM, men who have sex with men; PLWH, people living with HIV; GSN, geo-social networking; PHQ, Patient Health Questionnaire; GAD, Generalized Anxiety Disorder.

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no investigation has measured the psychological distress among this vulnerable population in mainland China since the pandemic began, and little is known about the factors associated with poor mental health outcomes during the COVID-19 crisis.

One potential factor that could exacerbate MSM's underlying mental health issues is HIV infection (Ciesla and Roberts, 2001). In many settings, MSM live in communities and societies where gay sexual orientation and HIV infection are strongly stigmatized (Starks et al., 2013). Numerous studies have demonstrated the elevated rates of depression, anxiety, and PTSD among MSM living with HIV around the globe, due to reasons such as lack of social support (Collins et al., 2006; Jones et al., 2021; Tabler et al., 2021). There is also emerging evidence demonstrating the disproportionately high levels of depression and anxiety symptoms experienced by people living with HIV (PLWH) since the pandemic began (Jones et al., 2021; Marbaniang et al., 2020; Siewe Fodjo et al., 2020). In China, Sun et al. found that PLWH reported high depressive and anxiety symptoms during the COVID-19 (Sun et al., 2020). However, the study was not specifically among MSM living with HIV and how these psychological distresses were measured is unknown. These considerations suggested the need and value assess the mental health issues among Chinese MSM during the pandemic. Therefore, this study aimed to examine the prevalence of depression and anxiety among MSM during the COVID-19 pandemic and their associated factors. We also sought to understand whether mental health outcomes differ by HIV status among Chinese MSM recruited online.

## 2. Material and methods

### 2.1. Study design and recruitment

We conducted a cross-sectional survey in July 2020 on Blued, a geo-social networking (GSN) app for MSM in China. Recruitment occurred through the built-in advertising function within the app, including advertising banners, pop-up messages, clickable links, etc. The survey was primarily advertised to Blued users in Beijing and Chengdu, but it was open to all Blued users. Potential participants were asked if they would like to participate in a short survey. Those who indicated interest and clicked the link were directed to a survey platform designed by Sojump within the Blued app for further study information and eligibility screening. Eligible criteria for the study include male gender at birth, current Blued user, and aged 18 and above. All eligible participants provided informed consent electronically before completing the online survey. To be eligible for this current analysis, we limited the sample to those who reported being gay or bisexual and completed the questionnaire on mental health. The study protocol and procedures were approved by the Institution Review Board of the Beijing Center for Disease Prevention and Control.

### 2.2. Measures

**Psychological distress.** A 4-item Patient Health Questionnaire (PHQ-4) was used to measure anxiety and depression symptoms among the participants, which was previously validated in other Chinese populations (Xiong et al., 2015). The questionnaire asked about the frequency of being bothered by nervousness, worry, depression, and loss of interest in the past two weeks. Response options include (0) not at all; (1) several days; (2) more than half of the day; (3) nearly every day. A total score is determined by the sum of the 4 items and ranges from 0–12. Psychological distress was categorized as normal (0–2), mild (3–5), moderate (6–8), and severe (9–12). A score of 3 or higher for the first 2 items suggests anxiety symptoms, and a score of 3 or higher for the last 2 items indicates depression symptoms. Cronbach's alpha in the sample was 0.92, indicating very good internal consistency of the items in our sample.

**Self-reported HIV status.** Participants were asked, "What was the result of your last HIV test?" (negative, positive, I don't know, I am not

sure). The variable was then dichotomized into 1 = HIV positive and 0 = HIV negative/unknown.

**Sociodemographic characteristics.** Participants were asked to report their age, residing city, sexual orientation, gender identification, highest education level, employment status, and income level. Participants were also asked about their relationship status and substance use history over the past 6 months.

### 2.3. Data analysis

Descriptive statistics were reported using frequency measures. We used bivariate analyses to examine associations between sociodemographic characteristics, substance use, and self-reported HIV status. In addition, we used a multivariable logistic regression model to examine the association between anxiety and depression with self-reported HIV status, adjusting for significant variables at  $p < 0.05$  in bivariate analyses. Data were analyzed using R software.

## 3. Results

### 3.1. Participant characteristics

A total of 1308 MSM completed the survey, of whom 1205 participants were eligible for this analysis. Among those, 4.7% ( $n = 59$ ) self-reported being HIV positive. The average age of participants was 31.40 (SD = 8.73, range: 18–70). Nearly eighty percent (79.7%) were identified as gay, and 96.8% were cis-gender males. Most participants had some college degree (69.1%) and were employed (79.9%). About half (52.0%) had a monthly income of 7000 RMB or higher (~\$1000 USD). Over thirty (30.6%) were in a primary relationship, and 32.2% reported having used substances in the past six months (see Table 1).

### 3.2. Psychological distress and associated factors

PHQ-4 scores indicated that over half (53.2%) of the participants screened mild to severe psychological distress: 34.9% screened mild, 11.6% screened moderate, and 6.6% screened severe psychological distress. Of all participants, 20.9% met the criteria for anxiety and 19.6% for depression. The correlation between anxiety and depression was 0.84. Complete descriptive characteristics of PHQ-4 items and GAD2 & PHQ2 subscales were in Table 3.

In bivariate analyses, being screened for anxiety was associated with younger age, being gay (vs. bisexual), being transgender, having a degree below college, being unemployed (vs. employed), and having lower income (<3000 RMB vs. >10,000 RMB), and self-reported being HIV positive ( $p < 0.05$  for all). All these factors were significantly associated with depression as well ( $p < 0.05$  for all). Mental health outcomes did not differ by relationship status and recent substance use.

### 3.3. Depression and anxiety by HIV status

MSM living with HIV reported significantly higher rates of psychological distress (63.7% vs. 52.7%,  $p < 0.05$ ). Specifically, the prevalence of anxiety and depression among MSM self-reported positive was significantly higher than those who were HIV negative or unknown status (35.6% vs. 20.2%, 35.6 vs. 18.8%,  $p < 0.05$  for both). In multivariable analyses, self-reported HIV positive was significantly associated with being screened for anxiety and depression (AOR = 1.80, 95%CI 1.01–3.26; AOR = 2.04, 95%CI 1.11–3.67, respectively), adjusting for age, sexual orientation, gender identity, education level, employment status, and income level (see Table 2).

## 4. Discussion

This study is among the first to examine the mental health status among MSM in China during the COVID-19 pandemic. Overall, the

**Table 1**

Characteristics and associations with depression and anxiety among Chinese gay, bisexual, and other men who have sex with men (n = 1251).

	N (%)
Age	31.40 (8.73)
City	
Beijing	682 (54.5%)
Chengdu	280 (22.4%)
Others	289 (23.1%)
Sexual orientation	
Gay	997 (79.7%)
Bisexual	254 (20.3%)
Gender identification	
Cisgender men	1211 (96.8%)
Transgender	40 (3.2%)
Ethnicity	
Han	1170 (93.5%)
Ethnic minorities	81 (6.5%)
Education level	
College and higher	865 (69.1%)
Below college	386 (30.9%)
Employment status	
Employed	999 (79.9%)
Student	160 (12.8%)
Unemployed	59 (4.7%)
Others	33 (2.6%)
Income level	
<3000 RMB	222 (17.7%)
3000–6999 RMB	378 (30.2%)
7000–10000 RMB	267 (21.3%)
>10000 RMB	384 (30.7%)
Being in a primary relationship	383 (30.6%)
Substance use in the past 6 months*	403 (32.2%)
Self-reported HIV positive	59 (4.7%)
Psychological distress	
Normal (0–2)	586 (46.8%)
Mild (3–5)	437 (34.9%)
Moderate (6–8)	145 (11.6%)
Severe (9–12)	83 (6.6%)
Anxiety (GAD2 ≥ 3)	262 (20.9%)
Depression (PHQ2 ≥ 3)	245 (19.6%)

\*Substances include includes any of the following: rush popper, meth, 0 capsules, G-spot liquid, K powder, Ecstasy, and “others.”

prevalence of psychological distress was high, with more than half of the respondents reporting mild to severe psychological distress, which was higher than findings before the pandemic in this population (Fu et al., 2020; Su et al., 2018). These findings were consistent with studies on the impact of COVID-19 on mental health in sexual and gender minorities in Hong Kong, the U.S., and the U.K. (Gonzales et al., 2020; Kneale and Bécars, 2020; Suen et al., 2020). Our finding highlighted the ways that the COVID-19 pandemic may exacerbate underlying mental health issues experienced by Chinese MSM. China was among the first countries to implement strict social distancing orders to control the COVID-19 transmission. These measures required MSM to stay at home, resulting in further social isolation and a lack of social connections and community support compared to pre-pandemic (Suen et al., 2020). This is particularly concerning given that MSM living in China already had limited access to mental health support and recourses due to various barriers before the pandemic (Liu et al., 2018). Further research on how to provide appropriate mental health services and care among Chinese MSM is warranted.

Similar to pre-pandemic, socioeconomic status (SES) was significantly associated with mental health outcomes among sexual and gender minorities (Liu et al., 2018; Shangani et al., 2020). In our analyses, MSM reported having lower SES, such as lower education level, lower-income level, and unemployed were more likely to experience psychological distress during the pandemic. This is especially important given the severe economic impact and consequences experienced by MSM due to the COVID-19, such as loss of employment, reductions in income, and food insecurity (Santos et al., 2022). The fear of losing jobs,

**Table 2**

Psychological distress by HIV status among Chinese gay, bisexual, and other men who have sex with men (n = 1251).

	Anxiety		Depression	
	OR [95% CI]	AOR [95% CI]	OR [95% CI]	AOR [95% CI]
Self-reported HIV positive	<b>2.18</b> [1.24, 3.75]	<b>1.80</b> [1.01, 3.26]	<b>2.38</b> [1.35, 4.11]	<b>2.04</b> [1.11, 3.67]
Age	<b>0.96</b> [0.95, 0.98]	0.95 [0.94, 0.98]	<b>0.96</b> [0.95, 0.98]	<b>0.96</b> [0.94, 0.98]
City				
Beijing	ref		ref	
Chengdu	0.95 [0.67, 1.34]		1.16 [0.81, 1.65]	
Others	1.30 [0.93, 1.79]		1.43 [1.02, 1.99]	
Sexual orientation				
Gay	ref	ref	ref	ref
Bisexual	<b>0.65</b> [0.45, 0.93]	<b>0.67</b> [0.45, 0.98]	<b>0.60</b> [0.40, 0.87]	<b>0.62</b> [0.42, 0.92]
Gender identification				
Cisgender men	ref	ref	Ref	ref
Transgender	<b>4.00</b> [2.11, 7.60]	<b>3.92</b> [1.98, 7.78]	<b>4.87</b> [2.57, 9.28]	<b>4.96</b> [2.50, 9.92]
Ethnicity				
Han	ref		ref	
Ethnic minorities	1.40 [0.78, 2.23]		1.28 [0.73, 2.14]	
Education level				
College and higher	ref	ref	Ref	ref
Below college	<b>1.83</b> [1.38, 2.43]	<b>1.50</b> [1.19, 2.06]	<b>1.66</b> [1.24, 2.22]	1.33 [0.96, 1.85]
Employment status				
Employed	ref	ref	ref	ref
Student	1.18 [0.78, 1.74]	0.83 [0.46, 1.50]	1.11 [0.73, 1.67]	0.62 [0.33, 1.15]
Unemployed	<b>1.86</b> [1.04, 3.24]	1.57 [0.77, 3.12]	<b>2.04</b> [1.13, 3.55]	1.47 [0.70, 2.97]
Others	0.39 [0.09, 1.11]	0.38 [0.09, 1.12]	0.59 [0.17, 1.52]	0.57 [0.16, 1.53]
Income level				
<3000 RMB	<b>2.31</b> [1.50, 3.55]	<b>1.72</b> [1.12, 2.66]	<b>2.20</b> [1.44, 3.37]	1.80 [0.96, 3.34]
3000–6999 RMB	<b>2.52</b> [1.73, 3.70]	<b>1.95</b> [1.29, 2.98]	<b>2.02</b> [1.39, 2.98]	<b>1.63</b> [1.07, 2.50]
7000–10000 RMB	<b>1.99</b> [1.31, 3.03]	1.61 [0.87, 2.96]	<b>1.62</b> [1.06, 2.47]	1.40 [0.90, 2.17]
>10000 RMB	ref		ref	
Being in a primary relationship	1.21 [0.90, 1.65]		1.16 [0.85, 1.58]	
Substance use in last 6 months*	0.97 [0.72, 1.30]		1.04 [0.78, 1.41]	

\*Substances include includes any of the following: rush popper, meth, 0 capsules, G-spot liquid, K powder, Ecstasy, and “others.”

AOR: adjusted odds ratio. Multivariable model adjusted for age, sexual orientation, gender identification, education level, income, employment status. Bold values are statistically significant p values of less than or equal to 0.05. CI: confidence interval.

financial insecurity, and inability to cover basic needs may be additional stressors during this unprecedented time. Our study adds to the literature substantially by indicating the critical role of SES on psychological health among sexual and gender minorities. Interventions to promote mental health well-being should consider addressing the socioeconomic and structural inequalities to maximize the effort and the long-term effect (Rojas-García et al., 2015).

**Table 3**  
Correlations between GAD2, PHQ2, and PHQ-4 (n = 1251).

	Mean	SD	Cronbach's alpha
Anxiety items (GAD2)			
Feeling nervous, anxious or on edge	0.84	0.85	
Not being able to stop or control worrying	0.77	0.87	
GAD2 sum score	1.61	1.59	0.82
Depression items (PHQ2)			
Little interest or pleasure in doing things	0.88	0.86	
Feeling down, depressed, or hopeless	0.71	0.88	
PHQ2 sum score	1.60	1.64	0.88
Total scale score (PHQ4)	3.21	3.10	0.92

MSM living with HIV reported higher psychological distress during the pandemic in China, which is consistent with findings in other settings (Ballivian et al., 2020; Delle Donne et al., 2021; Pizzirusso et al., 2021). These results highlight the intersectional vulnerabilities related to HIV and COVID-19 among Chinese MSM. Recent studies have confirmed that PLWH reported having difficulties seeing their providers or refilling their antiretroviral medications (Ridgway et al., 2020; Siewe Fodjo et al., 2020), and these perceived disruptions to HIV treatment and care services may exacerbate the existing mental health burdens faced by this population. In turn, these poor mental health outcomes may influence HIV treatment and lead to unsuppressed viral loads, drug resistance, and treatment failure. Therefore, there is an urgent need to provide innovative strategies to guarantee ongoing HIV treatment and integrate mental health screening and treatment services at HIV clinics to provide comprehensive support to individuals with intersectional vulnerabilities during the pandemic (Beltran et al., 2022).

Our study findings should be interpreted in light of some limitations. First, data relied on self-report and are therefore subject to social desirability bias and recall bias. MSM were recruited through a popular GSN app residing in two major cities; therefore, the generalizability of our findings to other geographic regions in China and those who do not use BlueD is uncertain. Future studies should investigate how dating app use may relate to mental health outcomes and examine the differences in mental health outcomes between Chinese MSM who use and do not use dating apps such as BlueD. In addition, the sample size of MSM living with HIV is relatively small. Therefore the analysis might not be well-powered when comparing the differences in mental health outcomes between HIV serodiscordant MSM. Lastly, the data were cross-sectional and cannot be used to establish causality. Longitudinal research is needed to understand the impact of the COVID-19 pandemic on mental health among Chinese MSM.

Despite the limitations, our study offers important insights into the mental health outcomes among Chinese MSM during a global pandemic. Findings suggested the need for additional effort to address depression and anxiety and provide mental health support for a population already disproportionately burdened by psychological distress. Integrated HIV treatment and mental health services are needed to provide adequate and timely mental health support to MSM living with HIV.

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### Author contributions

C.H. conceptualized research questions, analyzed the data, written up the manuscript. F.Y., X.H., D.Z., and G.M. designed the research project and collected the data. All authors provided critical feedback to the manuscripts and agreed to submission.

### Disclosure of potential conflicts of interest

All authors declare no conflict of interest.

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