

BMJ Open Exploring correlates of depression, quality of life and alcohol misuse: a nationwide cross-sectional study of international migrants during the COVID-19 epidemic in China

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ABSTRACT

Objectives The COVID-19 pandemic has overwhelmed health systems globally. With the increase of global migration, quantifying the health needs and key correlates of these outcomes is a global health priority. This study assessed migration characteristics, COVID-19 attitudes and the postmigration social environment as key correlates of depression, quality of life and alcohol misuse among international migrants in China.

Design A nationwide cross-sectional online survey was conducted from 17 February and 1 March 2020.

Setting Links to the online survey were disseminated by migrant-focused community-based organisations through WeChat.

Participants English speaking international migrants who met the inclusion criteria. Inclusion criteria were being born in a country outside of China, aged 18 years or over, cumulatively living in China for 1 month or more and staying in China between December 2019 and February 2020.

Outcome measures Depression, quality of life and alcohol misuse.

Results Regression models indicated that planning or considering leaving China due to COVID-19, lacking the confidence to protect themselves and not being confident that the epidemic would end soon was associated with greater depression, lower quality of life and greater levels of alcohol misuse. Worry about contracting COVID-19 and feeling helpless to prevent infection were associated with greater depression and lower quality of life. General perceived social support, and trust in Chinese people, institutions and systems were protective factors for depression and associated with higher reported quality of life.

Conclusions This study identifies key correlates that, if adequately addressed through public health outreach, may safeguard migrant well-being during a public health emergency. Trust in people and systems within the postmigration environment is an important consideration for future public health planning efforts.

INTRODUCTION

The COVID-19 epidemic began in December 2019 in Wuhan, Hubei, China, and rapidly

Strengths and limitations of this study

- This nationwide cross-sectional study of international migrants in China is the first study known to assess symptoms of depression, alcohol misuse and quality of life among migrants during a public health emergency.
- The sampling of migrants using social media provided wide coverage of migrants hailing from more than 70 countries who were in China during the COVID-19 epidemic.
- The cross-sectional nature of the design limits causal inference.
- The study was conducted following the onset of the COVID-19 outbreak, and therefore, preoutbreak mental health is not known.

spread across the country. The WHO declared a Public Health Emergency of International Concern on 30 January 2020, and a pandemic on 11 March 2020.¹ Widespread uncertainty and fear about the virus and its lethality predominated the early period leading up to these declarations. Social distancing, quarantines and reduced economic activity are associated with increased burden of common mental disorders and substance misuse at the population level.² The epidemic highlighted the potential inequalities in health status, especially among the most vulnerable in society, including international migrants, who may be at increased risk of poor mental health during a public health emergency.^{3,4} The current study is the first known to assess well-being and substance misuse in a national sample of international migrants during the COVID-19 pandemic.

Population migration increased dramatically in recent years, and now over 250 million people are living outside their

home countries.⁵ Migrants are exposed to adversities and adverse postmigration social environments known to increase the burden of mental ill health.⁶ This is especially true in 'south-south' migration, where an estimated 73 million people⁷ move between countries in the global south. Migration to China in particular has increased in the past decade, primarily motivated by economic, educational and cultural exchange opportunities.^{8,9} Two major forces encouraging this migration is the Forum on China-African Cooperation^{10,11} and the *Belt and Road Initiative*, which aims to enhance China's relationships with countries regionally and across the world (Institute for Security and Development Policy). While China has become a destination for international migrants,^{9,12-14} limited information is known about their health and well-being.

The social determinants of health, a broad health framework, suggests that the quality of the social and structural environments within which migrants live, exert influences on their overall health and well-being. The recent *Lancet Commission on Migration and Health* highlighted several key social determinants including factors related to migration, living and working conditions and interactions with the host population.^{6,15} According to a systematic review of 24 000 migrants sampled across 35 studies, the overall pooled prevalence of common mental disorders was 20.0%.¹⁶ Migrants are at higher risk of mental ill health compared with non-migrant populations living in host countries. This key inequality in population well-being challenges health systems and takes an economic toll on the host country. In China, international migrants experience substantial barriers to health services and may also experience discrimination, worsening their well-being.^{6,17-19}

During public health emergencies, the mental health of the general population is affected,^{20,21} but few studies specifically explore the mental health and well-being of migrant populations in these contexts. The limited data available suggest that these events disproportionately affect migrants relative to host country communities,²² and these data are inadequate to inform public health planning and preparedness for this population.²³ Public health responses are often focused on citizens; therefore, migrant populations may be excluded. Data are crucially needed that highlight the needs of diverse and vulnerable populations, including migrants, in order to inform public health emergency response and preparedness.

In this study, we addressed critical gaps in knowledge related to international migrant well-being during public health emergencies. We assessed depression, quality of life (QoL) and alcohol misuse as outcomes. Migration characteristics, COVID-19 attitudes, and the postmigration social environmental influences were evaluated as correlates. We used the migrant health and social determinants frameworks to inform our selection of key correlates expected to influence the well-being of international migrants during the pandemic.²⁴

METHODS

Study design and participants

An online cross-sectional survey was conducted between 17 February and 1 March 2020. Links to the online survey were disseminated by migrant-focused community-based organisations (CBO) through WeChat (a popular Chinese messaging app). It was hosted by WenJuanXing (Changsha Haoxing Information Technology Co, Ltd, China). The survey questionnaire was available in English and created based on discussions with CBO stakeholders, policymakers and experts on international migrants. English is the common language among international migrants from diverse countries of origin living in China. The survey was pilot tested with 20 international migrants to ensure the survey was clear and well understood by our target population. These pilot data were excluded in the final analysis.

All participants who clicked the link for the survey were screened for eligibility. Inclusion criteria were: being born in a country outside of China, aged 18 years or over, cumulatively living in China for 1 month or more and staying in China between December 2019 and February 2020. The survey was restricted to one phone number and a single device to minimise the risk of people participating multiple times.

Main outcomes

Depressive symptoms

Depressive symptoms were measured by the Centre for Epidemiologic Studies Depression Scale (CES-D). The CES-D scale is a 20-item self-report inventory.²⁵ Each item is scored 0–3 on a Likert-type scale for a frequency of depressive symptoms in the last week and summed for a total score range of 0–60. Higher scores indicate greater symptom severity. The CES-D demonstrated good internal consistency in this study (Cronbach's alpha: 0.88).

Quality of life

QoL was measured by the WHO Quality of Life (WHOQOL-BREF) and is composed of 26 items.²⁶ It has been validated in several migrant populations.²⁷⁻³⁰ The WHOQOL-BREF measures the following broad domains: physical health (seven items), psychological (six items), social relationships (three items) and environment (eight items) and two items that measure overall QoL and general health. Following scoring conventions, the items were coded from 1 to 5, and the total scores were converted to a 0–100 scale, with higher score indicating better QoL. In the current study, the Cronbach's alpha for the scale was 0.93.

Alcohol use

Alcohol use was measured with two items from the WHO-AUDIT³¹ (WHO. The Alcohol Use Disorders Identification Test, 2010), including the frequency of drinking alcoholic beverages and the number of drinks consumed on a typical day. These items were summed, with higher scores indicating greater alcohol misuse.

Correlates

Migration characteristics included region of origin, purpose of migration (business, study and employment), cumulative length of stay in China and cumulative length of stay in China during the epidemic outbreak period (from December to February).

Attitude towards the COVID-19 epidemic were answered on a four-point Likert-type scale ranging from strongly disagree to strongly agree and included confidence of protecting themselves from contracting COVID-19, worry that they or their friends or loved ones will contract COVID-19, helplessness to prevent COVID-19 and confidence that the epidemic would end soon. One additional question asked whether they will return to their home country due to the epidemic, with no, yes or unsure response options.

Social environment

Perception of Chinese people's attitude towards foreigners was measured with a single item on a 5-point Likert scale ranging from 1 'very unfriendly' to 5 'very friendly'.

Perceived social support was measured by the Multidimensional Scale of Perceived Social Support (MSPSS).³² The MSPSS contains 12 items, reflecting support from family, friends and significant others, with each domain consisting of four items rated on a seven-point Likert-type scale, ranging from 1: 'very strongly disagree' to 7: 'very strongly agree'. Total scores range from 12 to 84, with higher scores indicating greater perceived social support.

Trust towards Chinese institutions and groups during the COVID-19 outbreak

Trust towards Chinese institutions and groups included eight items¹³: the Central Government, the department that is responsible for health, the department that handles immigration, the hospital system, doctors and medical professionals, the information you are receiving about the COVID-19, the police and the Chinese people. The scoring of each item of the scale ranged from 0 to 100 with intervals of 10. A score of 0 implies no trust at all, and 100 indicates complete trust. All items were summed for an overall trust score. Each item and the total score were trichotomised into low, medium and high trust.

Participant characteristics included gender, age, marital status, educational attainment, annual income, living arrangement in China, religion, health insurance, infectious diseases experience, diagnosis with COVID-19, history of mental illness and past year mental health treatment.

Statistical analysis

We report descriptive statistics for the distribution of the sample regarding social demographic, attitude towards the COVID-19 epidemic, social support, depressive symptoms, QoL and alcohol use.

Univariate and multivariable linear regressions were performed to explore correlates of depressive symptoms, QoL and alcohol use. Multivariable models evaluating

migration characteristics, attitudes towards the COVID-19 epidemic and the social environment were adjusted for gender, age, marital status, education, income, living arrangement, religion, health insurance, infectious disease in past year, diagnoses with COVID-19, past diagnosis with mental disorder and past year treatment for mental health conditions, which were selected a priori as potential confounders. Due to the large number of students who were included in our sample, we conducted a sensitivity analysis with the student subgroup to explore whether the patterns of findings in the overall sample were robust. Statistical significance was set at $p < 0.05$ for model coefficients. Analyses were performed using SAS V.9.4.

Patient and public involvement

The participants and general public were not involved in the development of the research question, outcome measures, design, recruitment and conduct of this study.

RESULTS

The survey platform was accessed by 2494 people. Ninety-five people did not provide informed consent. Among the remaining 2399 individuals, 973 did not meet eligibility requirements (355 were born in China, 522 were less than 18 years old, 28 cumulatively lived in China less than 1 month and 68 did not stay in China during COVID-19 outbreak). A total of 1362 individuals completed the online survey (see [figure 1](#) and online supplemental table 1), originating from 77 countries and 6 continents (see online supplemental table 2). The measures of trust in Chinese institutions and groups was deleted by the survey platform after responses were recorded from 868 individuals due to political sensitivity.

The majority of participants were male (60.9%), between 16 and 35 years old (89.8%), never married (87.5%), had a college degree or higher (57.9%), had an annual income less than US\$2000 (63.4%) and originated from African countries (74.7%). More than half migrated for study (64.0%). The majority stayed in China for the entire 3-month epidemic period between December 2019 and February 2020 (79.5%). Most were not diagnosed with COVID-19 (99.0%) (see [table 1](#)).

Most individuals were confident in knowing how to protect themselves from COVID-19 (89.0%), not worrying about themselves (58.0%) contracting COVID-19, not feeling helpless to prevent COVID-19 (64.7%) and most were confident that the COVID-19 epidemic would end soon (88.1%). However, more than half (58.2%) reported worrying about loved ones/friends contracting COVID-19. The majority did not plan to leave China due to COVID-19 (66.8%). Most reported that Chinese people had friendly attitudes towards them (65.0%), and a little more than half reported a high level of trust in Chinese people, systems and institutions (52.5%).

Correlates of depression

The average depressive symptom severity was 17.7 (SD=11.2). In multivariable models, greater depressive

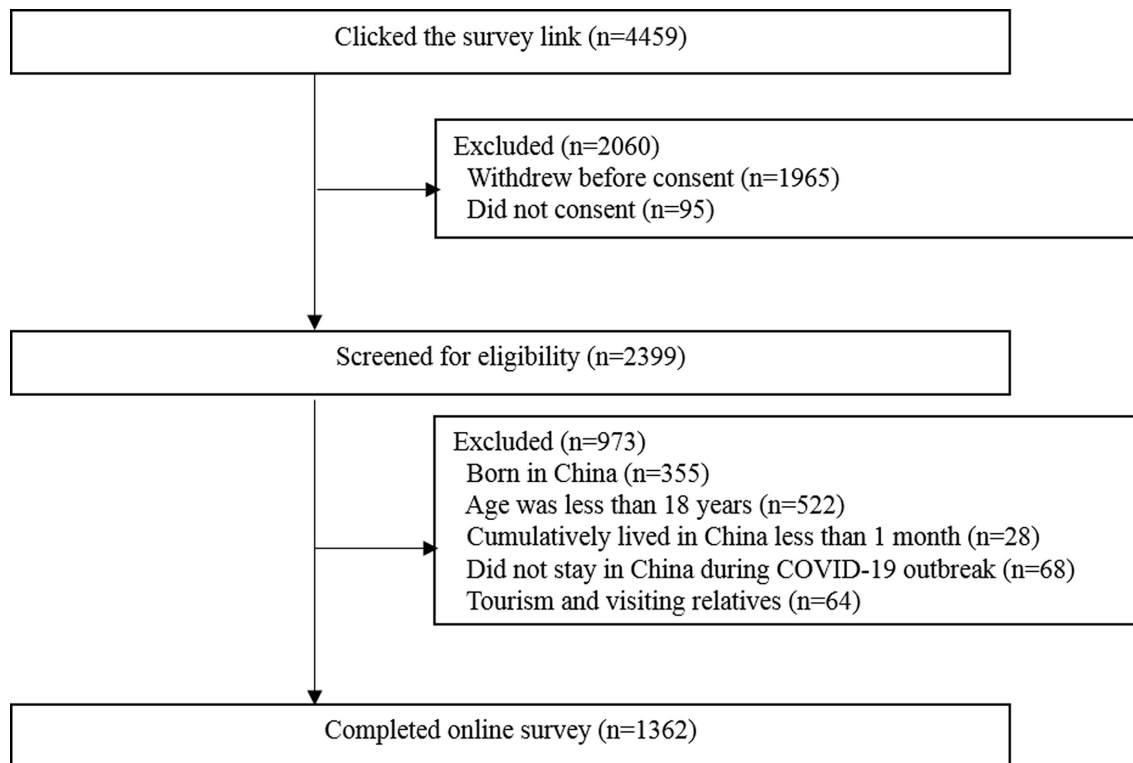


Figure 1 Flow chart.

symptom severity was significantly associated with country of origin, with people from non-Asian countries reporting lower depressive symptoms when compared with African migrants. Compared with students, people who migrated for business reported greater depressive symptom severity. Among attitudes towards the COVID-19 epidemic, planning to leave China, or being unsure about leaving China, not being confident to protect themselves, worry about contracting COVID-19 themselves and about loved ones contracting COVID-19, feeling helpless to prevent COVID-19 and not being confident the epidemic would end soon were all associated with greater depressive symptom severity. Friendly attitudes from Chinese people and greater social support were associated with lower depressive symptom severity. The pattern of findings for trust was consistent across Chinese people, systems and institutions such that high levels of trust were associated with lower depressive symptom severity (see [table 2](#)).

Correlates of QoL

The total score of the WHOQOL-BREF scale was 65.9 ± 14.4 . People who migrated from non-Asian countries reported greater QoL compared with migrants from African countries. For attitudes towards the COVID-19 epidemic, planning to leave China or being unsure about leaving China, not being confident to protect themselves, worry about contracting COVID-19 themselves, feeling helpless to prevent COVID-19 and not being confident the epidemic would end soon were all associated with lower QoL. Friendly attitudes from Chinese people and greater social support were associated with greater QoL. The pattern of findings for trust was consistent across

measured variables such that high levels of trust were associated with greater QoL (see [table 2](#)).

Correlates of alcohol misuse

People who migrated from Asian countries reported less alcohol misuse compared with migrants from African countries. Compared with students, people who migrated for business reported lower alcohol misuse. For attitudes towards the COVID-19 epidemic, planning to leave China or being unsure about leaving China, not being confident to protect themselves and not being confident the epidemic would end soon were associated with increased alcohol misuse. Social support, friendly attitudes from Chinese people and trust were not associated with alcohol misuse in this sample (all $ps > 0.11$) (see [tables 2 and 3](#)).

Sensitivity analysis for student subsample

The general pattern of results for the student subsample were similar to the overall migrant sample (see online supplemental table 3). No notable differences were observed for the QoL outcome. However, unlike in the overall sample, among students, being married/engaged was associated with greater depression, and income, having health insurance, having an infectious disease in the past year were not statistically related to depressive symptoms. In addition, and in contrast to the overall sample, students who had COVID-19, a history of mental disorder diagnosis or treatment in the past year and were not confident to protect themselves were not statistically related to alcohol use, and being married/engaged was associated with less alcohol use. Higher reported social support was associated with lower alcohol misuse.

Table 1 Participant characteristics of international migrants in a nationwide cross-sectional survey in China, 2020 (n=1362)

Variable	N (%)
Gender	
Male	830 (60.9)
Female	532 (39.1)
Age (years)	
16–25	877 (64.4)
26–35	346 (25.4)
36–45	125 (9.2)
>45	14 (1.0)
Marital status	
Never married	1192 (87.5)
Married/engaged	170 (12.5)
Educational attainment	
High school or below	417 (30.6)
Some college	156 (11.5)
Bachelor's degree and above	789 (57.9)
Annual income (US\$)	
< \$2000	864 (63.4)
\$2000–\$5000	245 (18.0)
\$5000–\$10000	120 (8.8)
>\$10000	133 (9.8)
Living arrangement in China	
Hotel	70 (5.1)
Guest apartment	27 (2.0)
Purchased apartment	9 (0.7)
Rental apartment	473 (34.7)
Staff/student dormitory	762 (55.9)
No fixed residence	21 (1.5)
Religion	
Christianity	892 (65.5)
Islam	303 (22.2)
Buddhism	14 (1.0)
Other	51 (3.7)
None	102 (7.5)
Health insurance in China	
No	1149 (84.4)
Yes	213 (15.6)
Infectious disease (past year)	
No	1015 (74.5)
Yes	347 (25.5)
Being diagnosed with the COVID-19	
No	1349 (99.0)
Yes	13 (1.0)
Past mental disorder diagnosis	

Continued

Table 1 Continued

Variable	N (%)
No	1303 (95.7)
Yes	59 (4.3)
Mental health treatment (past year)	
No	1301 (95.5)
Yes	61 (4.5)
Migration characteristics	
Region of origin	
Asia	308 (22.6)
Africa	1017 (74.7)
Others*	37 (2.7)
Purpose of migration	
Business	373 (27.4)
Study	872 (64.0)
Employment	117 (8.6)
Cumulative stay in China	
1–6 months	168 (12.3)
7–12 months	123 (9.0)
1 year and above	1071 (78.6)
Duration of stay in China (December–February)	
1 day–2 weeks	23 (1.7)
2 weeks–1 month	21 (1.5)
1 month–2 months	235 (17.3)
3 months	1083 (79.5)
Attitude towards the COVID-19 epidemic	
Confident to protect themselves	
Strongly agree	832 (61.1)
Agree	380 (27.9)
Disagree	134 (9.8)
Strongly disagree	16 (1.2)
Worry about contracting COVID-19	
Strongly disagree	593 (43.5)
Disagree	197 (14.5)
Agree	279 (20.5)
Strongly agree	293 (21.5)
Worry about friends/loved ones contracting COVID-19	
Strongly disagree	413 (30.3)
Disagree	156 (11.5)
Agree	259 (19.0)
Strongly agree	534 (39.2)
Feel helpless to prevent COVID-19	
Strongly disagree	338 (24.8)
Disagree	544 (39.9)
Agree	373 (27.4)
Strongly agree	107 (7.9)
Confident that the epidemic will end soon	

Continued



Table 1 Continued

Variable	N (%)
Strongly agree	529 (38.8)
Agree	672 (49.3)
Disagree	105 (7.7)
Strongly disagree	56 (4.1)
Plan to leave China due to COVID-19	
No	910 (66.8)
Yes	148 (10.9)
Unsure	304 (22.3)
Social environment	
Chinese people's attitude towards foreigners	
Very friendly	250 (18.4)
Friendly	574 (42.1)
Neutral	449 (33.0)
Not friendly	33 (2.4)
Very unfriendly	56 (4.1)
Social support (mean±SD)	65.3±15.0
Study outcomes	
Depression (mean±SD)	17.7±11.2
Quality of life (mean±SD)	65.9±14.4
Alcohol use (mean±SD)	1.5±1.9

*Others refer to Europe, South America, North America and Oceania.

DISCUSSION

International migration is a global public health issue, and protecting the health and well-being of these migrants should become a priority.^{3 8 17} This nationwide cross-sectional study of international migrants in China is the first study known to assess symptoms of depression, alcohol misuse and QoL among migrants during a public health emergency. The sampling of migrants using social media provided wide coverage of migrants hailing from more than 70 countries, who were in China during the COVID-19 epidemic.

The findings of our study suggest several key social determinants as correlates of well-being. First, among the migration characteristics measured, migrants from non-Asian countries reported lower depression, greater QoL and lower alcohol misuse relative to African migrants. This may reflect differences in exposures to stress or other factors associated with their migration process. People who migrated for business reported greater depression, perhaps reflecting the economic burdens expected for those who are attempting to transact business in China during the pandemic or reflect the difficulties of this activity in China.⁶

Attitudes towards COVID-19 emerged as key correlates across well-being outcomes. Public health outreach efforts that enhance awareness, reduce uncertainty related to the pandemic and inform the community how to effectively

prevent infection are indicated. Programmes can engage international migrants in the cocreation of content, which can empower communities and enhance their integration within the host society. A focus on mental health and psychosocial responses, which may not be prioritised during COVID-19, may also address fears and uncertainties about the virus (Inter-Agency Standing Committee Reference Group on Mental Health and Psychosocial Support in Emergency Settings: Interim Briefing Note: Addressing mental health and psychosocial aspects of COVID-19 Outbreak, V.1.5).

The receiving country context is a key correlate of migrant well-being.³³ Friendliness from local Chinese people, general perceived social support and trust in Chinese people, institutions and systems were protective factors for depression and associated with higher reported QoL. The association between friendly attitudes from locals was consistent with a previous study conducted before the COVID-19 pandemic among African migrants in China, which demonstrated local attitudes was a correlate of lower depression (under review). Similar to this study, the self-reported friendliness from locals was high (60.5%), and only 6.5% of the population reported unfriendly attitudes (8% in the previous study). Perceived social support is a robust correlate of well-being among many migrant communities, and this finding is well supported in this literature.^{34–36}

Migrant trust is an understudied topic, and it emerged as a key and robust correlate in this study. A dose–response relationship was observed such that greater levels of trust were associated with lower depression and higher QoL. Trust, a form of social capital, may be considered a vital resource for communities, especially among those occupying vulnerable and minority social positions. Enhancing the welfare of international migrants within China, and encouraging positive social exchange, is needed in order to achieve a key pillar of the *Belt and Road Initiative*, which is to enhance people-to-people bonds.^{19 37}

Together, these results suggest that creating social spaces for migrants to integrate and overcome cultural differences, and programming to enhance trust through outreach and inclusion activities may safeguard the health of migrants. Community-based approaches that attempt to enhance community resilience, or community engagement with the broader social environment, may be useful to promote well-being among migrants. This approach may be especially worthwhile to consider within the broader context of south–south migration, where mental health services are largely underdeveloped and unavailable to migrants in particular.³⁸

There are several study limitations. First, the cross-sectional nature of the design limits causal inference. Second, the study was conducted following the onset of the COVID-19 outbreak, and therefore, preoutbreak mental health is not known. This was partially mitigated by the measurement and adjustment of previous mental health diagnosis and treatment. Third, the analytic sample was reduced for trust variables due to limitations

Table 2 Associations between participant characteristics, migration characteristics, attitudes about COVID-19 and social environment with depression, quality of life and alcohol use among international migrants, a nationwide cross-sectional survey in China, 2020 (n=1362)

Variable	Depression			Quality of life			Alcohol use					
	c β (95% CI)	P value	a β (95% CI)*	P value	c β (95% CI)	P value	a β (95% CI)*	P value	c β (95% CI)	P value	a β (95% CI) *	P value
Gender												
Male	Ref	-	-	Ref	-	-	Ref	-	Ref	-	-	-
Female	-0.51 (-1.72 to 0.71)	0.41	-	-1.02 (-2.60 to 0.55)	0.20	-	-0.55 (-0.75 to -0.35)	<0.0001	-	-	-	-
Age (years)												
16-25	Ref	-	-	Ref	-	-	Ref	-	Ref	-	-	-
26-35	2.09 (0.72 to 3.47)	0.00	-	-3.18 (-4.97 to -1.39)	0.01	-	0.05 (-0.18 to 0.28)	0.67	-	-	-	-
36-45	4.37 (2.30 to 6.45)	<0.0001	-	-3.42 (-6.11 to -0.73)	0.01	-	-0.73 (-1.08 to -0.39)	<0.0001	-	-	-	-
>45	-5.06 (-10.90 to 0.79)	0.09	-	4.59 (-3.00 to 12.18)	0.24	-	0.56 (-0.41 to 1.54)	0.26	-	-	-	-
Marital status												
Never married	Ref	-	-	Ref	-	-	Ref	-	Ref	-	-	-
Married/engaged	1.31 (-0.49 to 3.10)	0.15	-	0.38 (-1.94 to 2.70)	0.75	-	-0.24 (-0.54 to 0.06)	0.12	-	-	-	-
Educational attainment												
Bachelor's and above	Ref	-	-	Ref	-	-	Ref	-	Ref	-	-	-
Some college	-3.00 (-4.91 to -1.09)	0.00	-	-0.23 (-2.71 to 2.26)	0.86	-	0.32 (0.00 to 0.64)	0.05	-	-	-	-
High school or below	-1.90 (-3.22 to -0.58)	0.00	-	0.26 (-1.45 to 1.98)	0.77	-	-0.13 (-0.35 to 0.09)	0.24	-	-	-	-
Annual income (US\$)												
<\$2000	Ref	-	-	Ref	-	-	Ref	-	Ref	-	-	-
\$2000-\$5000	4.16 (2.60 to 5.73)	<0.0001	-	-3.01 (-5.06 to -0.97)	<0.0001	-	0.18 (-0.08 to 0.45)	0.17	-	-	-	-
\$5000-\$10000	2.48 (0.37 to 4.59)	0.02	-	-0.84 (-3.60 to 1.91)	0.55	-	0.73 (0.38 to 1.08)	<0.0001	-	-	-	-
>\$10000	3.19 (1.18 to 5.21)	0.00	-	0.00 (-2.64 to 2.63)	1.00	-	0.52 (0.18 to 0.86)	0.00	-	-	-	-
Living arrangement in China												
Dormitory	Ref	-	-	Ref	-	-	Ref	-	Ref	-	-	-

Continued

Table 2 Continued

Variable	Depression			Quality of life			Alcohol use				
	c β (95% CI)	P value	a β (95% CI)*	P value	c β (95% CI)	P value	a β (95% CI)*	P value	c β (95% CI)	P value	a β (95% CI) * P value
Hotel	6.91 (4.20 to 9.62)	<0.0001	-	-	-4.65 (-8.18 to -1.12)	0.01	-	-	0.23 (-0.22 to 0.69)	0.31	-
Guest apartment	3.58 (-0.67 to 7.83)	0.10	-	-	-3.53 (-9.07 to 2.01)	0.21	-	-	-0.11 (-0.82 to 0.60)	0.77	-
Purchased apartment	0.76 (-6.51 to 8.04)	0.84	-	-	1.83 (-7.65 to 11.31)	0.70	-	-	-0.59 (-1.81 to 0.63)	0.34	-
Rental apartment	1.52 (0.25 to 2.79)	0.02	-	-	0.34 (-1.32 to 1.99)	0.69	-	-	0.30 (0.09 to 0.51)	0.01	-
No fixed residence	0.84 (-3.96 to 5.64)	0.73	-	-	-1.03 (-7.28 to 5.23)	0.75	-	-	-0.99 (-1.79 to -0.18)	0.02	-
Religion											
Christianity	Ref	-	-	-	Ref	-	-	-	Ref	-	-
Islam	5.10 (3.67 to 6.53)	<0.0001	-	-	-3.00 (-4.87 to -1.12)	0.00	-	-	-0.97 (-1.20 to -0.73)	<0.0001	-
Buddhism	3.53 (-2.26 to 9.33)	0.23	-	-	-7.26 (-14.86 to 0.34)	0.06	-	-	0.20 (-0.76 to 1.16)	0.68	-
Other	-0.77 (-3.87 to 2.33)	0.63	-	-	1.88 (-2.18 to 5.94)	0.36	-	-	-0.05 (-0.56 to 0.46)	0.85	-
None	1.53 (-0.72 to 3.78)	0.18	-	-	0.29 (-2.66 to 3.24)	0.85	-	-	0.24 (-0.13 to 0.62)	0.20	-
Health insurance in China											
Yes	Ref	-	-	-	Ref	-	-	-	Ref	-	-
No	2.79 (1.16 to 4.42)	0.01	-	-	-5.62 (-7.71 to -3.52)	<0.0001	-	-	-0.27 (-0.54 to 0.00)	0.05	-
Having had infectious diseases in the past year											
No	Ref	-	-	-	Ref	-	-	-	Ref	-	-
Yes	1.42 (0.06 to 2.78)	0.04	-	-	-3.57 (-5.32 to -1.82)	<0.0001	-	-	0.63 (0.41 to 0.86)	<0.0001	-
Being diagnosed with the COVID-19											
No	Ref	-	-	-	Ref	-	-	-	Ref	-	-
Yes	8.51 (2.42 to 14.59)	0.01	-	-	-1.58 (-9.48 to 6.31)	0.69	-	-	1.09 (0.07 to 2.10)	0.04	-
Past mental disorder diagnosis											
No	Ref	-	-	-	Ref	-	-	-	Ref	-	-

Continued

Table 2 Continued

Variable	Depression			Quality of life			Alcohol use					
	c β (95% CI)	P value	a β (95% CI)*	P value	c β (95% CI)	P value	a β (95% CI)*	P value	c β (95% CI)	P value	a β (95% CI) *	P value
Yes	8.59 (5.71 to 11.46)	<0.0001	-	-	-11.61 (-15.33 to -7.89)	<0.0001	-	-	1.15 (0.67 to 1.63)	<0.0001	-	-
Mental health treatment (past year)												
No	Ref	-	-	-	Ref	-	-	-	Ref	-	-	-
Yes	5.86 (3.01 to 8.71)	<0.0001	-	-	-5.15 (-8.85 to -1.44)	0.01	-	-	0.68 (0.21 to 1.16)	0.01	-	-
Migration characteristics												
Original country												
Africa	Ref	-	-	-	Ref	-	-	-	Ref	-	-	-
Asia (outside of China)	2.80 (1.39 to 4.22)	0.00	1.34 (-0.20 to 2.89)	0.09	-1.62 (-3.45 to 0.22)	0.08	-0.78 (-2.82 to 1.25)	0.45	-0.85 (-1.08 to -0.62)	<0.0001	-0.85 (-1.10 to -0.60)	<0.0001
Others†	-3.82 (-7.46 to -0.19)	0.04	-6.73 (-10.49 to -2.97)	0.00	5.87 (1.14 to 10.60)	0.02	7.59 (2.64 to 12.54)	0.00	0.38 (-0.21 to 0.98)	0.21	0.21 (-0.40 to 0.82)	0.50
Purpose of migration												
Study	Ref	-	-	-	Ref	-	-	-	Ref	-	-	-
Business	4.71 (3.38 to 6.04)	<0.0001	4.90 (1.84 to 7.97)	0.00	-2.42 (-4.16 to -0.67)	0.01	-1.25 (-5.29 to 2.78)	0.54	-0.29 (-0.51 to -0.06)	0.01	-0.58 (-1.09 to -0.08)	0.02
Employment	1.73 (-0.39 to 3.85)	0.11	-5.41 (-14.11 to 3.29)	0.22	-1.51 (-4.29 to 1.28)	0.29	-4.06 (-15.53 to 7.40)	0.49	0.65 (0.30 to 1.01)	0.01	0.83 (-0.61 to 2.26)	0.26
Cumulative stay in China												
1 year and above	Ref	-	-	-	Ref	-	-	-	Ref	-	-	-
7–12 months	-1.03 (-3.12 to 1.05)	0.33	-1.76 (-3.82 to 0.30)	0.09	1.82 (-0.87 to 4.52)	0.18	2.27 (-0.43 to 4.98)	0.10	0.02 (-0.33 to 0.37)	0.90	-0.04 (-0.38 to 0.30)	0.83
1–6 months	0.81 (-1.00 to 2.63)	0.38	0.76 (-1.04 to 2.57)	0.41	-1.17 (-3.52 to 1.18)	0.33	-0.99 (-3.36 to 1.38)	0.41	-0.19 (-0.49 to 0.12)	0.23	-0.25 (-0.55 to 0.05)	0.10
Duration of stay in China (December–February)												
1 day–2 weeks	Ref	-	-	-	Ref	-	-	-	Ref	-	-	-
2 weeks–1 month	-4.02 (-10.62 to 2.59)	0.23	-4.40 (-10.91 to 2.11)	0.19	4.34 (-4.20 to 12.90)	0.32	4.76 (-3.80 to 13.32)	0.28	-0.64 (-1.74 to 0.46)	0.26	-0.43 (-1.50 to 0.65)	0.44
1 month–2 months	-3.57 (-8.35 to 1.21)	0.14	-4.05 (-8.76 to 0.66)	0.09	3.20 (-3.00 to 9.39)	0.31	3.55 (-2.64 to 9.74)	0.26	-0.40 (-1.19 to 0.40)	0.33	-0.28 (-1.06 to 0.50)	0.48
3 months	-3.14 (-7.75 to 1.47)	0.18	-2.85 (-7.39 to 1.68)	0.22	2.43 (-3.54 to 8.40)	0.42	2.47 (-3.49 to 8.44)	0.42	-0.36 (-1.13 to 0.41)	0.36	-0.25 (-1.00 to 0.49)	0.51

Continued

Table 2 Continued

Variable	Depression			Quality of life			Alcohol use				
	c β (95% CI)	P value	a β (95% CI)*	P value	c β (95% CI)	P value	a β (95% CI)*	P value	c β (95% CI)	P value	a β (95% CI) * P value
Attitude towards the COVID-19 epidemic											
Planning to leave China because of COVID-19											
No	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Yes	3.21 (1.28 to 5.14)	0.00	3.23 (1.33 to 5.13)	0.00	-3.28 (-5.75 to -0.80)	0.01	-3.51 (-5.98 to -1.03)	0.01	0.49 (0.17 to 0.81)	0.01	0.45 (0.14 to 0.76)
Unsure	2.05 (0.61 to 3.50)	0.01	2.34 (0.92 to 3.77)	0.00	-5.88 (-7.72 to -4.03)	<0.0001	-6.13 (-7.98 to -4.28)	<0.0001	0.41 (0.17 to 0.65)	0.01	0.40 (0.17 to 0.63)
Confident to protect themselves	2.30 (1.48 to 3.11)	<0.0001	2.28 (1.47 to 3.08)	<0.0001	-5.03 (-6.06 to -3.99)	<0.0001	-5.02 (-6.06 to -3.99)	<0.0001	0.11 (-0.03 to 0.25)	0.12	0.13 (0.00 to 0.26)
Worry about contracting COVID-19	1.02 (0.53 to 1.50)	<0.0001	1.25 (0.76 to 1.73)	<0.0001	-1.09 (-1.73 to -0.46)	0.01	-1.29 (-1.93 to -0.65)	<0.0001	0.07 (-0.01 to 0.15)	0.09	0.06 (-0.02 to 0.14)
Worry about loved ones	0.66 (0.20 to 1.13)	0.01	0.93 (0.47 to 1.40)	<0.0001	-0.11 (-0.71 to 0.50)	0.73	-0.27 (-0.88 to 0.34)	0.39	0.02 (-0.06 to 0.10)	0.60	0.02 (-0.06 to 0.09)
Feel helpless to prevent COVID-19	2.41 (1.76 to 3.06)	<0.0001	2.40 (1.76 to 3.04)	<0.0001	-3.09 (-3.93 to -2.25)	<0.0001	-3.04 (-3.88 to -2.19)	<0.0001	0.03 (-0.08 to 0.14)	0.65	0.05 (-0.05 to 0.16)
Confident that the epidemic will end soon	1.29 (0.51 to 2.07)	0.01	1.16 (0.38 to 1.93)	0.01	-3.93 (-4.92 to -2.95)	<0.0001	-3.98 (-4.98 to -2.98)	<0.0001	0.23 (0.10 to 0.36)	0.01	0.21 (0.08 to 0.33)
Social environment											
Local people's attitude	-1.19 (-1.82 to -0.56)	0.01	-1.44 (-2.07 to -0.82)	<0.0001	3.61 (2.82 to 4.41)	<0.0001	3.83 (3.03 to 4.63)	<0.0001	-0.09 (-0.19 to 0.02)	0.11	-0.09 (-0.19 to 0.02)
Social support	-0.22 (-0.26 to -0.18)	<0.0001	-0.21 (-0.24 to -0.17)	<0.0001	0.43 (0.38 to 0.47)	<0.0001	0.44 (0.39 to 0.48)	<0.0001	-0.01 (-0.01 to 0.00)	0.03	-0.01 (-0.01 to 0.00)

*The analysis was adjusted for gender, age, marital status, education, income, living arrangement, religion, health insurance, infectious disease in past year, diagnoses with COVID-19, past diagnosis with mental disorder and past year treatment for mental health condition.

†Others refer to Europe, South America, North America and Oceania.

a β , adjusted β ; c β , crude β .

Table 3 Associations between trust to Chinese institutions and groups, and depression, quality of life and alcohol use among international migrants, a national wide cross-sectional survey in China, 2020 (n=863)

Variable	Depression			Quality of life			Alcohol use					
	c/β (95% CI)	P value	aβ (95% CI)*	P value	c/β (95% CI)	P value	aβ (95% CI)*	P value	c/β (95% CI)	P value	aβ (95% CI)*	P value
The Central Government												
Low trust	Ref		Ref		Ref		Ref		Ref		Ref	
Medium trust	-1.49 (-3.35 to 0.37)	0.12	-0.50 (-2.46 to 1.47)	0.62	-0.92 (-3.33 to 1.49)	0.46	-0.79 (-3.32 to 1.73)	0.54	0.22 (-0.09 to 0.54)	0.17	0.23 (-0.10 to 0.56)	0.17
High trust	-5.04 (-6.29 to -3.80)	<0.0001	-3.81 (-5.25 to -2.37)	<0.0001	5.84 (4.22 to 7.45)	<0.0001	5.44 (3.59 to 7.30)	<0.0001	-0.04 (-0.25 to 0.17)	0.69	-0.02 (-0.26 to 0.22)	0.90
The department that handles health												
Low trust	Ref		Ref		Ref		Ref		Ref		Ref	
Medium trust	-0.93 (-2.76 to 0.90)	0.32	0.27 (-1.73 to 2.27)	0.79	-1.39 (-3.77 to 0.99)	0.25	-1.58 (-4.15 to 1.00)	0.23	0.14 (-0.17 to 0.45)	0.39	0.18 (-0.15 to 0.51)	0.29
High trust	-5.24 (-6.48 to -4.00)	<0.0001	-3.91 (-5.38 to -2.43)	<0.0001	5.74 (4.13 to 7.35)	<0.0001	5.29 (3.39 to 7.20)	<0.0001	0.02 (-0.19 to 0.24)	0.82	0.07 (-0.18 to 0.32)	0.57
The department that handles immigration												
Low trust	Ref		Ref		Ref		Ref		Ref		Ref	
Medium trust	0.14 (-1.79 to 2.06)	0.89	1.24 (-0.82 to 3.30)	0.24	-3.41 (-5.92 to -0.91)	0.01	-3.69 (-6.35 to -1.03)	0.01	0.33 (0.00 to 0.66)	0.05	0.40 (0.05 to 0.74)	0.02
High trust	-5.28 (-6.51 to -4.06)	<0.0001	-3.98 (-5.45 to -2.51)	<0.0001	5.21 (3.62 to 6.80)	<0.0001	4.67 (2.77 to 6.57)	<0.0001	0.03 (-0.18 to 0.24)	0.76	0.13 (-0.12 to 0.38)	0.30
The hospital system												
Low trust	Ref		Ref		Ref		Ref		Ref		Ref	
Medium trust	-1.00 (-2.92 to 0.91)	0.30	0.22 (-1.85 to 2.30)	0.83	-1.74 (-4.22 to 0.75)	0.17	-1.89 (-4.56 to 0.79)	0.17	0.21 (-0.12 to 0.53)	0.21	0.20 (-0.15 to 0.54)	0.27
High trust	-4.82 (-6.05 to -3.58)	<0.0001	-3.34 (-4.81 to -1.86)	<0.0001	5.01 (3.41 to 6.62)	<0.0001	4.33 (2.43 to 6.23)	<0.0001	0.03 (-0.18 to 0.24)	0.75	0.08 (-0.17 to 0.32)	0.53
Doctors and medical professionals												
Low trust	Ref		Ref		Ref		Ref		Ref		Ref	
Medium trust	-1.23 (-3.17 to 0.72)	0.22	-0.22 (-2.32 to 1.88)	0.84	-2.95 (-5.48 to -0.41)	0.02	-3.42 (-6.13 to -0.70)	0.01	0.07 (-0.26 to 0.41)	0.66	0.10 (-0.25 to 0.46)	0.56
High trust	-5.52 (-6.74 to -4.29)	<0.0001	-4.34 (-5.82 to -2.86)	<0.0001	4.99 (3.39 to 6.58)	<0.0001	4.40 (2.49 to 6.32)	<0.0001	0.04 (-0.17 to 0.25)	0.71	0.12 (-0.13 to 0.37)	0.36
The information you are receiving about COVID-19												
Low trust	Ref		Ref		Ref		Ref		Ref		Ref	

Continued

Table 3 Continued

Variable	Depression			Quality of life			Alcohol use					
	c β (95% CI)	P value	a β (95% CI)*	P value	c β (95% CI)	P value	a β (95% CI)*	P value	c β (95% CI)	P value	a β (95% CI)*	P value
Medium trust	-1.95 (-3.67 to -0.23)	0.03	-0.61 (-2.45 to 1.23)	0.52	0.12 (-2.10 to 2.33)	0.92	0.10 (-2.25 to 2.46)	0.93	0.18 (-0.11 to 0.47)	0.23	0.24 (-0.07 to 0.55)	0.13
High trust	-5.07 (-6.36 to -3.78)	<0.0001	-3.65 (-5.11 to -2.19)	<0.0001	7.02 (5.36 to 8.68)	<0.0001	6.70 (4.83 to 8.57)	<0.0001	0.01 (-0.21 to 0.23)	0.92	0.08 (-0.16 to 0.33)	0.50
The police												
Low trust	Ref		Ref		Ref		Ref		Ref		Ref	
Medium trust	-1.54 (-3.40 to 0.33)	0.11	-0.58 (-2.58 to 1.43)	0.57	-0.19 (-2.61 to 2.23)	0.88	0.58 (-2.00 to 3.16)	0.66	0.32 (-0.01 to 0.63)	0.05	0.32 (-0.01 to 0.66)	0.06
High trust	-5.25 (-6.50 to -4.01)	<0.0001	-3.93 (-5.38 to -2.48)	<0.0001	6.22 (4.61 to 7.83)	<0.0001	6.12 (4.26 to 7.99)	<0.0001	0.09 (-0.29 to 0.13)	0.42	-0.03 (-0.27 to 0.21)	0.80
The Chinese people												
Low trust	Ref		Ref		Ref		Ref		Ref		Ref	
Medium trust	-2.50 (-4.27 to -0.74)	0.01	-1.22 (-3.08 to 0.64)	0.20	-0.58 (-2.86 to 1.69)	0.61	-0.80 (-3.19 to 1.58)	0.51	0.15 (-0.15 to 0.45)	0.32	0.21 (-0.10 to 0.52)	0.18
High trust	-4.56 (-5.87 to -3.25)	<0.0001	-3.22 (-4.68 to -1.77)	<0.0001	6.42 (4.73 to 8.10)	<0.0001	5.98 (4.12 to 7.84)	<0.0001	-0.13 (-0.35 to 0.10)	0.27	-0.09 (-0.33 to 0.15)	0.48
Overall												
Low trust	Ref		Ref		Ref		Ref		Ref		Ref	
Medium trust	-2.33 (-3.91 to -0.75)	0.00	-1.16 (-2.90 to 0.59)	0.19	0.65 (-1.39 to 2.69)	0.53	0.75 (-1.49 to 2.99)	0.51	0.05 (-0.22 to 0.33)	0.69	0.08 (-0.22 to 0.37)	0.61
High trust	-5.79 (-7.09 to -4.49)	<0.0001	-4.57 (-6.07 to -3.07)	<0.0001	7.43 (5.75 to 9.11)	<0.0001	7.36 (5.43 to 9.29)	<0.0001	-0.02 (-0.24 to 0.20)	0.85	0.03 (-0.22 to 0.28)	0.82

*The analysis was adjusted with gender, age, marital status, education, income, living arrangement, religion, health insurance, infectious disease in past year, diagnoses with COVID-19, past diagnosis with mental disorder and past year treatment for mental health condition.

a β , adjusted β ; c β , crude β .

placed on the data collection that were outside of our control. The results were robust and unlikely to change qualitatively if a larger sample was obtained. Fourth, depression and alcohol use were not assessed with formal diagnostic interviews, which limits our ability to draw conclusions regarding population prevalence of these disorders during the epidemic, as screening instruments may not accurately reflect population prevalence.³⁹ Fifth, the study population was composed of international migrants who were primarily students or traders, so inferences from this study may not generalise to other international migration populations with lower socioeconomic status or forced migrants.³⁵ Sixth, the measures of trust in Chinese institutions and groups was deleted by the survey platform after responses were recorded from 868 individuals due to political sensitivity. Consequently, some significant differences between the sample who reported their trust and those who were unable to do so were observed. The group who reported trust date were younger, never married, less educated, had lower income, lived more frequently in dormitories, were comprised of more Christians and fewer Muslims, less frequently reported having health insurance, stayed in China longer, had reported lower depression and higher QoL compared with those who were unable to report their trust (see online supplemental table 4). The smaller trust sample may not be as representative of the larger population. Finally, although the study population includes people from multiple countries, selection bias due to non-response, the survey only in English and non-random sampling may affect the study inferences.

CONCLUSIONS

This was the first nationwide study known to evaluate the mental health and well-being of international migrants during a public health emergency. Findings from this study can guide efforts to build more effective public health approaches to reduce the burden of mental health among vulnerable populations within China and globally.

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