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## Brief Report

## Youth mental health before and after the control of the coronavirus disease 2019: A nationally representative cohort study of Chinese college students

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## ABSTRACT

**Background:** To investigate youth mental health changes over the course of coronavirus disease 2019 (COVID-19) using a national probability sample and longitudinal design.

**Methods:** A representative sample of 4918 Chinese college students were surveyed during the initial outbreak of the COVID-19 pandemic for the first wave and after the new cases steadily declined for the second wave. Mental health was measured by the ten-question Kessler Psychological Distress Scale (K-10). Logistic regression model was fitted to compare changes in psychological distress before and after the peak of the pandemic.

**Results:** Of the respondents of both waves, 45.04% reported psychological distress during the initial outbreak of the pandemic and 26.49% reported it when new COVID-19 cases steadily declined. Psychological distress significantly reduced after the peak of the pandemic but persisted in some students.

**Limitations:** The study measured psychological distress once after the initial control of the COVID-19. More psychiatric disorders need to be traced as the pandemic continues to evolve.

**Conclusions:** Although effective control of COVID-19 benefited young people's mental health, psychiatric disorders continued to be prevalent. Future research public health policies should target the speedy recovery of the high-risk cases with persistent mental health problems.

## 1. Introduction

While ample research evidenced high prevalence rates of psychiatric disorders of young people during the outbreak of coronavirus disease 2019 (COVID-19), few studies used both probability sample and longitudinal design to trace mental health status of this vulnerable population over the course of the pandemic (Cohen et al., 2020; Pierce et al., 2020). The study used the first large-scale, nationally representative panel survey of Chinese college students before and after the peak of the COVID-19 pandemic to study whether its initial control in the country benefited youth mental health.

In the country of the first outbreak of COVID-19, over 37 million Chinese college students were impacted psychologically, who have been shown to suffer anxiety, depression, post-traumatic stress disorders (PTSD) and somatic symptoms (Cao et al., 2020; Chen et al., 2020; Chi et al., 2020; Liang et al., 2020; Qi et al., 2020; Tang et al., 2020; Wang and Zhao, 2020; Wang et al., 2020). These important findings, however, were all based on convenience samples that were subject to sampling and non-response biases and had limited generalizability for

national public health policies (Li and Wang, 2020; Pierce et al., 2020). Thus, the first objective of the study was to conduct a nationally representative survey of college students to offer a broader view and more precise estimates of mental disorders during the COVID-19 pandemic. Moreover, past studies assessed mental health outcomes before or during the peak of the pandemic, offering little evidence on whether the mental health problems would alleviate after new cases steadily declined (Cao et al., 2020). According to the "six Rs" theory of disaster mental health management, public policies and clinical practices needed to move beyond readiness, response, and relief before and during the public health emergency to the post-disaster rehabilitation, recovery and resilience (Math et al., 2015). The initial control of the contagion might improve young people's mental health as a result of lowered infection risks and their adaptation to disasters through recovery and resilience (Williams et al., 2008). Therefore, the second goal of the study was to use longitudinal design and panel data to compare psychological distress at the time of initial outbreak to when the pandemic began to be controlled.

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## 2. Methods

### 2.1. Sampling

The survey used a multistage, stratified and equal probability sampling to pre-identify 9000 Chinese college students before the COVID-19 pandemic. Eighteen diverse universities in fifteen provinces across China were randomly selected as primary sampling units. With the assistance from university staffs, the survey team randomly selected eight academic disciplines as secondary sampling units within each university. Within each discipline, four classes (one in each academic cohort) were randomly selected, each consisting of around 25 students.

### 2.2. Procedures

The Coronavirus 2019 was first confirmed in December 2019 in China. The first wave of survey was sent out online before the peak of the pandemic in January 2020. New cases declined since early February: there were 119 new cases nationwide on March 3, 2020 and less than 150 daily afterwards, marking an initial containment of contagion (World Health Organization, 2020). To track longitudinal changes in college students' mental health at this later stage, the second wave of the survey was conducted on the same respondents of the first wave using the same methods from March 4 to March 18, 2020. The survey was approved by the Ethics Committee of Chinese Academy of Social Sciences.

### 2.3. Variables and measures

The primary outcome, psychological distress, was measured by the widely used Chinese version of ten-question Kessler Psychological Distress Scale (K-10), with scores above 20 coded as caseness (Kessler et al., 2003). The independent variable is the timing of the COVID-19 pandemic: before and after the peak (Pierce et al.,). The survey measured a wide range of demographic and socioeconomic covariates identified as risk or protective factors in this context (Dsouza et al., 2020), including sex, age, hometown (in Hubei Province or not), legal residence status (rural or urban), graduating class, living with parents, and father's occupation as a proxy for college students' socioeconomic status (Brand and Xie, 2010). All control variables are measured using standard items from past national surveys.

### 2.4. Statistical analyses

Logistic regression model was fitted to compare the odds of psychological distress before and after the peak of the pandemic. Fixed-effects model was fitted to control for unobserved individual-level confounders as a robustness check (Pierce et al.,). Diagnostic tests suggested that the model assumptions were met. Statistical significance was defined as two-tail  $P$  values less than 0.05. The analyses were performed in STATA 15.

## 3. Results

Out of 9000 participants invited, 8500 completed the first wave of the survey, yielding a response rate of 94.44%. Of these respondents, 5142 (60.49%) completed the second wave of the survey, who did not significantly differ in demographics from non-respondents of this wave. The characteristics of the analytic sample dropping missing values ( $N = 4918$ ) were described in Table 1 below. Note that during the second wave of the survey, there was still a nationwide university closure, so most students lived with their parents at home.

As shown in Table 1, the number of students who reported psychological stress was 2215 (45.04%) during the initial outbreak of the pandemic and 1303 (26.49%) when new cases steadily declined. The total number of cases decreased after the initial control of the pandemic. We

**Table 1**  
Sample characteristics.

	Participants, No. or mean (% or S.D.)
<b>Initial outbreak of the COVID-19</b>	
No psychological distress	2703 (54.96%)
Psychological distress	2215 (45.04%)
<b>Initial control of the COVID-19</b>	
No psychological distress	3615 (73.51%)
Psychological distress	1303 (26.49%)
<b>Sex</b>	
Male	2205 (44.84%)
Female	2713 (55.16%)
<b>Age</b>	
	20.17 (1.90)
<b>Residence<sup>1</sup></b>	
Rural	3174 (64.54%)
Urban	1744 (35.46%)
<b>Father's highest education</b>	
Middle school or below	2932 (59.62%)
High school	1113 (22.63%)
College and above	873 (17.75%)
<b>Hometown</b>	
In Hubei <sup>2</sup>	176 (3.5%)
Outside Hubei	4742 (96.40%)
<b>School year</b>	
Non-graduating	3500 (71.17%)
Graduating this year	1418 (28.83%)
<b>Living with parents (second wave)</b>	
No	217 (4.42%)
Yes	4701 (95.59%)
Total	4918

Note: 1. Legal Residence Status (Hukou). 2. Province most affected by COVID-19.

conducted further analyses on the trends of psychological distress (Table A1 in the online supplement). Of the respondents of both waves, 1234 (25.09%) had psychological distress in the first wave but not in the second wave (recovered), 977 (19.87%) reported psychological distress in both waves (persistently ill), and 325 (6.61%) reported psychological distress only in the second wave (new cases). While there were a small number of new cases and many students recovered, a large number of students had persistent psychological distress.

As shown in Table 2, the odds of psychological distress significantly decreased after the initial containment of the disease (95% CI, 0.402 to 0.477;  $P < .001$ ). Graduating students (95% CI, 1.212 to 1.473;  $P < .001$ ) were at higher risks for psychological distress compared to other students. There was no significant association between other demographic variables and psychological distress, suggesting a widespread impact.

As robustness analysis, the fixed effects model (available upon request) also shows a significant decrease in psychological distress after accounting for individual traits (95% CI, 0.233 to 0.297;  $P < .001$ ).

## 4. Discussion

Using a national probability sample and longitudinal design, we yielded two important findings on Chinese college students' mental health after the initial control of the COVID-19 pandemic.

On one hand, we found that psychological distress significantly reduced after the successful control of the COVID-19 in the country. The study added to the literature that relied on cross-sectional data by finding that Chinese college students' psychological distress decreased after new COVID-19 cases steadily declined in the country (Chi et al., 2020). It was the first study to our knowledge to compare the youth mental health from the early outbreak of the pandemic to when it was initially under control. Although the optimistic finding should be interpreted within the context of this population, it provided the first piece of evidence on the mental health benefits to young people of the control of COVID-19 pandemic. Our findings corroborated with the theory that the later mental health stages of public health disasters could be rehabilitation, recovery and resilience (Math et al., 2015).

**Table 2**  
Psychological distress before and during the COVID-19.

	Odds ratio	P	95% CI	
<b>Timing of the COVID-19</b> (ref. Before the peak of the COVID-19)	0.438	0.000	0.402	0.477
<b>Sex</b> (ref. Male)				
Female	0.919	0.052	0.845	1.001
<b>Age</b>	0.977	0.048	0.954	1.000
<b>Residence status</b> (ref. Rural)				
Urban	1.026	0.650	0.920	1.143
<b>Father's highest education</b> (ref. Middle school or below)				
High school	0.947	0.337	0.847	1.058
College and above	0.902	0.149	0.785	1.037
<b>Hometown</b> (ref. Outside Hubei)				
In Hubei	0.663	0.092	0.410	1.070
<b>School year</b> (ref. Non-graduating)				
Graduating this year	1.336	0.000	1.212	1.473
<b>Living with parents</b> (ref. No)				
Living with parents	0.934	0.511	0.761	1.146
Constant	1.393	0.207	0.833	2.332

Note: ref. = reference group. CI = Confidence Intervals.

On the other hand, we found a high prevalence rates of psychological distress during the COVID-19 pandemic, even after it plateaued in the country. Besides extending previous findings based on convenience samples to college students across China (Cao et al., 2020), we reduced the response bias by identifying the respondents before the pandemic (Li and Wang, 2020; Pierce et al.,). While there were not many new cases, nearly half of the students who had psychological distress in the first wave continued to have it in the second wave. Future research could examine who among the young adults had persistent symptoms of psychological distress and whether there were social disparities in the speed of mental health recovery (Math et al., 2015). Clinical practices should ideally follow up on the young patients who reported psychiatric disorders at the onset of the pandemic (Liu and Wang, 2020).

A limitation of the study was that we did not measure specific psychiatric disorders that could develop over longer time. Future research could use representative, longitudinal data to trace the mental health trends of young adults in other parts of the world as the pandemic continues to evolve. Public health policies should address the mental health needs of young adults who had persistent psychological distress, developing mental health promotional programs such as internet-based counselling sessions and affordable access to mental health care on a regular basis (Wang et al., 2020; Xia et al., 2020).

#### Declaration of Competing Interest

None.

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#### Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.jadr.2020.100066](https://doi.org/10.1016/j.jadr.2020.100066).

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