Social Capital Changes After COVID-19 Lockdown Among Youths in China: COVID-19 Impact on Lifestyle Change Survey (COINLICS)

Bin Yu1†, Miyang Luo2,3†, Meijing Liu4, Junmin Zhou4, Shujuan Yang4,3* and Peng Jia5,3*

†These authors have contributed equally to this work

Introduction: Social capital, the effective functioning of social groups through networks of relationships, can affect mental health and may be affected by COVID-19. We aimed to examine the changes in social capital before and after the COVID-19 lockdown among the Chinese youth.

Methods: A national convenience sample of 10,540 high school, undergraduate, and graduate students, from the COVID-19 Impact on Lifestyle Change Survey (COINLICS), reported their demographic and social capital information before and after the COVID-19 lockdown. Social capital was retrospectively measured at four levels: individual (ISC), family (FSC), community (CSC), and society (SSC). The changes of social capital were also compared across three educational levels.

Results: Overall, ISC and CSC scores generally decreased after lockdown (15.1 to 14.8 and 13.4 to 13.1, respectively), while FSC and SSC scores increased significantly (12.7 to 13.0 and 7.1 to 7.2, respectively). At the individual level, most participants showed a constant perceived social capital; more of the remaining participants showed decreased ISC (30.5% vs. 17.0%) and CSC scores (28.4% vs. 19.1%), while more participants showed increased than decreased FSC (21.7% vs. 9.2%) and SSC scores (10.3% vs. 3.9%). Heterogeneities in social capital changes existed across educational levels.

Conclusions: Our findings would provide health professionals and policy-makers solid evidence on the changes in social capital of youths after lockdowns, and therefore help the design of future interventions to rebuild or improve their social capital after epidemics/disasters.

Keywords: COVID-19, social capital, mental health, youths, lockdown
INTRODUCTION

Social capital is broadly defined as the sum of trustworthy, reciprocal and resource-rich network connections (1). As a sophisticated formulation of the broader concepts of “social cohesion,” “social support,” “social integration,” or “civil society,” social capital is of great significance to both individuals and society (1, 2). From an individual perspective, social capital has been revealed as a crucial determinant of multiple health outcomes (e.g., adolescent well-being, mental health), with plausible pathways from social capital to health (1). From a society perspective, social capital is also proved as an asset to empower and mobilize a society and its members (3, 4). Especially highlighted is the crucial role of social capital when a nation’s people face disasters or catastrophes (5). For instance, a survey in Japan showed that social capital buffered the effects of natural disasters and helped to resume groups’ health during the 2011 Great East Japan Earthquake and Tsunami (5, 6). Given its crucial roles, preventing the possibility of dramatic post-disaster decline in social capital deserves attention, especially for youths who are fairly dependent on society and family (7). The youth might be more likely to show a significant change in social capital when facing disasters, which may directly or indirectly affect their mental health and also vary by age and level of maturity (i.e., youths of different levels of maturity may perceive social capital differently) (8, 9).

The coronavirus disease 2019 (COVID-19) that broke out nearly all over the world is undoubtedly disastrous (10). In China, to curb the spread of the epidemic, the government adopted strict policies including conducting a lockdown (11, 12). Thus, many factors closely related to social capital of the youth, such as social participation and interpersonal communication, may have undergone significant changes. For instance, even when social media platforms were available, face-to-face communication could not be achieved with the long period of social distancing and stay-at-home recommendations during the lockdown. Currently, despite the lockdown has been lifted, the abovementioned adverse situations have aroused the concern that social capital of youths might have been affected and changed. These changes might be negative because some factors, such as excessive reaction to the lockdown policy and poor psychological status (for stressful life events, extended home confinement, brutal grief information pollution on social media), might affect interpersonal or social cohesion (13–15). On the other hand, with effective emergency management, the whole society may have greater solidarity when facing disasters, leading to a positive change in social capital. However, the impacts of COVID-19 on social capital of the youth remain unknown in China. Furthermore, considering the heterogeneity in maturity and lifestyles (e.g., living at school or home) among youths, the level of social capital at baseline (i.e., at normal times before COVID-19 lockdown) and the degree of change in social capital after COVID-19 lockdown that may vary across educational levels, the social capital changes across educational levels are also examined.

This study aimed to examine differences in social capital in the months before COVID-19 lockdown was implemented (January 2020, also referred to as before lockdown) and after COVID-19 lockdown was lifted (May 2020, also referred to as after lockdown), as well as the variation in social capital changes across the educational levels, on the basis of a national convenience sample of 10,540 Chinese youths. Our findings would provide empirical evidence and references for targeted interventions of social capital reconstruction among youths in China, and may also benefit other countries which have encountered lockdown measures to different extents.

METHODS

Data

The data used in this study were from the COVID-19 Impact on Lifestyle Change Survey (COINLICS), a national retrospective online survey designed by an expert panel consisting of epidemiologists, statisticians, health psychologists, and sociologists. A snowball sampling strategy was adopted to distribute the online questionnaire via social media platforms in May 2020 among youths at three educational stages (i.e., high school, college, and graduate students) in China (16). A total of 10,540 individuals completed the questionnaire anonymously. All subjects voluntarily participated in our study with informed consent, and the study was carried out in accordance with the Helsinki Declaration of 1964.

Measurement of Social Capital

The individual social capital (ISC), family social capital (FSC), and community social capital (CSC) comprehensively reflect one’s perception of social capital from peers/friends, family members, and neighbors, which have been proved to be associated with youths’ health promotion or risk behaviors (17, 18). Also, measures taken by the government and relevant sectors to contain the COVID-19 pandemic have unprecedentedly attracted substantial social attention and possibly raised public trust, which could be reflected by the society social capital (SSC) (19).

The measurements of the four dimensions of social capital above (ISC, FSC, CSC, and SSC) were adapted from the scales of a validated Chinese version of Health-related Social Capital Measurement (20). According to characteristics of the living and studying environments of the youth, we tailored the 15 items in four dimensions (Table 1). The answer to each item ranges from 1 (strongly disagree) to 5 (strongly agree), with a higher total score indicating stronger social capital.

Statistical Analysis

Descriptive statistics were used for the participants’ demographic characteristics and social capital, with mean and standard deviation (SD) for continuous variables, and percentages for categorical variables. Differences in demographic characteristics, the changes of social capital before and after the lockdown, and the frequency differences at the individual level among youths of different educational levels were compared based on t-tests/ANOVA for continuous variables, or χ² tests for categorical variables. R 3.6.2 was used to perform all statistical analyses. Statistical significance was declared if a two-sided p < 0.05.
### Table 1: Social Capital After COVID-19 Lockdown

The percentages of the participating Chinese youths who (strongly) agreed each survey question of social capital before and after the COVID-19 lockdown in the COVID-19 Impact on Lifestyle Change Survey (COILICS).

| Variables | All ($n = 10,540$) | High school ($n = 2,855$) | Undergraduate ($n = 7,419$) | Graduate ($n = 266$) |
|-----------|-------------------|---------------------------|-----------------------------|---------------------|
| **Individual social capital** | | | | |
| Q1 You have many close contacts. | | | | |
| Before lockdown | 7.3 | 4.3 | 8.2 | 11.7 |
| After lockdown | 4.0 | 2.8 | 4.5 | 4.5 |
| Q2 You have many social interactions with people other than your family members. | | | | |
| Before lockdown | 8.6 | 5.5 | 9.4 | 16.9 |
| After lockdown | 5.9 | 4.1 | 6.6 | 6.8 |
| Q3 You always trust people who have social interaction with you. | | | | |
| Before lockdown | 60.4 | 49.9 | 64.1 | 70.3 |
| After lockdown | 58.5 | 47.4 | 62.5 | 67.3 |
| Q4 You always receive emotional/financial/instrumental support from friends/classmates. | | | | |
| Before lockdown | 54.2 | 43.5 | 57.8 | 66.5 |
| After lockdown | 54.2 | 43.0 | 58.0 | 66.8 |
| Q5 You have a good relationship with your classmates. | | | | |
| Before lockdown | 71.8 | 61.4 | 75.5 | 80.5 |
| After lockdown | 70.4 | 59.7 | 74.2 | 79.7 |
| **Family social capital** | | | | |
| Q6 You live with family members. | | | | |
| Before lockdown | 74.1 | 87.6 | 70.1 | 38.7 |
| After lockdown | 90.2 | 93.1 | 89.5 | 80.1 |
| Q7 You have a good relationship with your family (mainly including parents, brothers and sisters). | | | | |
| Before lockdown | 81.6 | 75.9 | 83.5 | 87.6 |
| After lockdown | 79.2 | 74.5 | 80.8 | 85.0 |
| Q8 You always receive emotional/financial/instrumental support from family members. | | | | |
| Before lockdown | 73.5 | 64.2 | 76.9 | 79.0 |
| After lockdown | 73.7 | 64.3 | 77.1 | 80.5 |
| **Community social capital** | | | | |
| Q9 You frequently participate in activities organized by community organizations. | | | | |
| Before lockdown | 13.8 | 4.7 | 17.5 | 9.0 |
| After lockdown | 10.9 | 3.5 | 13.9 | 7.9 |
| Q10 You always receive support from community organizations. | | | | |
| Before lockdown | 8.4 | 4.7 | 9.9 | 6.4 |
| After lockdown | 7.9 | 4.4 | 9.2 | 7.1 |
| Q11 You always receive emotional/financial/instrumental support from your teachers or instructors. | | | | |
| Before lockdown | 26.0 | 20.9 | 27.8 | 30.8 |
| After lockdown | 29.3 | 22.2 | 31.8 | 35.7 |
| Q12 You are very concerned about what happens in the same community/dormitory building. | | | | |
| Before lockdown | 36.5 | 33.7 | 37.3 | 45.1 |
| After lockdown | 41.4 | 35.8 | 43.0 | 54.9 |
| Q13 You agree that people who live in the same community/dormitory can be trusted. | | | | |
| Before lockdown | 24.2 | 25.7 | 31.6 | 25.4 |
| After lockdown | 24.6 | 26.4 | 33.1 | 26.1 |

(Continued)
TABLE 1 | Continued

| Variables | All (n = 10,540) | High school (n = 2,855) | Undergraduate (n = 7,419) | Graduate (n = 266) |
|-----------|-----------------|------------------------|--------------------------|------------------|
| Society social capital | | | | |
| Q14 You trust other health organizations/governmental organizations very much. | | | | |
| Before lockdown | 57.7 | 64.7 | 55.1 | 56.8 |
| After lockdown | 60.6 | 68.6 | 58.3 | 59.4 |
| Q15 You agree with the statement that talented people will be recognized by the society. | | | | |
| Before lockdown | 46.9 | 48.4 | 46.8 | 54.5 |
| After lockdown | 48.0 | 47.4 | 48.1 | 51.9 |

RESULTS

Of 10,540 participants in the study, 2,855 participants were high school students, 7,419 participants were undergraduate students, and 266 participants were graduate school students (Table 2). The participants aged from 15 to 33 years, with a mean age of 19.9±2.3. Most of them were female (71.3%), of Han ethnicity (94.9%), non-urban residents (61.8%), and from the west region (87.1%). Around half of the participants had a household income of 12,000–60,000 yuan per year. Significant differences were observed for all demographic characteristics among the three educational levels. More specifically, the percentages of urban residents were higher in undergraduate students (42.6%) and graduate students (62.8%) than in high school students (24.3%), and no high school students from the central region were enrolled.

The score of all dimensions of social capital showed significant differences (all p < 0.001) among three educational levels both before and after the lockdown (Table 3). Overall, the ISC score decreased from 15.1 to 14.8 and CSC score decreased from 13.4 to 13.1, while the FSC score increased from 12.7 to 13.0 and SSC score increased from 7.1 to 7.2 (all p < 0.001). In different educational groups, the ISC score and CSC decreased in all subgroups (all p < 0.01); the FSC score of undergraduate students increased (p < 0.001); and the SSC score increased in all subgroups (all p < 0.05).

At the individual level, most of the youths participating in the study showed constant social capital scores between the two time points, with the percentage ranging from 52.5 to 85.8% across four scales (Table 3). In addition, overall, more participants had decreased than increased ISC scores (30.5% vs. 17.0%) and CSC scores (28.4% vs. 19.1%), and more participants had increased rather than decreased FSC scores (21.7% vs. 9.2%) and SSC scores (10.3% vs. 3.9%). Participants at different educational levels also showed the same trend as the whole group. Among graduate students, 45.9% of participants had decreased ISC score and 47.0% of them had increased FSC score, which were higher than the other groups; among undergraduate students, the percentages of the participants with decreased CSC (30.3%) and increased SSC (10.6%) scores were higher than the other groups. Differences in the composition ratio of individual-level changes among educational levels were found (all p < 0.05) in all dimensions of social capital.

DISCUSSION

This is a retrospective study based on a national sample, which provided a picture of changed social capital among youths before and after the lockdown. We found significant changes in social capital of all dimensions across educational levels, except for the FSC in high school and graduate students. At the individual level, most youths’ social capital after lockdown was constant compared to before lockdown. However, more youths showed a decline in their ISC and CSC than those showed an ascent; more youths showed an ascent in their FSC and SSC than those with decreased scores. Heterogeneities in social capital changes existed across educational levels.

Several explanations may account for the changes in social capital among youths, especially regarding the significant decline of ISC and CSC. Previous research has suggested that social contact and community participation among population might be disrupted in the face of a disaster or catastrophe (e.g., earthquake or tsunami) (7). During the COVID-19 outbreak, although the lockdown in China was lifted in April, social distancing was still recommended, and parents may adopt the advice to prevent youths away from networking activities (e.g., wedding, club parties, classmate gathering). These measures may affect their social contact especially with their friends and community, as online communication platforms cannot compensate for the emotional demands of face-to-face communication and community participation (21). In addition, the decline might also attribute to the adverse mental health status affected by COVID-19, which was conducive to interpersonal communication.

Different from previous studies on post-disaster social capital concerns (7), the improvements in FSC and SSC found in this study suggested that the impact of COVID-19 on social capital is not entirely negative. COVID-19 and the accompanying lockdown, in some sense, granted opportunities for family members to communicate internally, which might account for the improvement in FSC. In terms of SSC,
the possible mechanism accounted for the increase might be the government's effective disaster management and social governance. Specifically, the Chinese public has a high level of trust in the government. In face of the disaster, the Chinese government and health agencies has actively and rationally taken countermeasures during the epidemic to curb the spread of COVID-19, which strengthened the social cohesion. All industries (especially the health industry) were united against COVID-19, and positive news reports promoted solidarity. Furthermore, the lockdown lifted per se demonstrated the effectiveness of national unity in the fight against the pandemic, which may have profoundly strengthened the social capital among youths. These factors might grant youths the spirit of solidarity and sense of security in facing the disaster, thus increasing the SSC to some extent (22).

There are some suggestions to policy-makers and health professionals on the basis of our findings. For example, to prevent further decreases in or even increase ISC and CSC among youths, health professionals could collaborate with schools to develop online peer communication activities and thus provide emotional support (14); policy-makers should take measures to improve community services, and develop guidelines and instructions to anticipate the needs of vulnerable youths, especially those who used to take less advantage of social capital (23). To maintain or further increase SSC, relevant authorities may strengthen the monitoring of social media to curb the spread of false information. In addition, what aroused our concern is that the decline in ISC and CSC may persist even after lockdown. Since a previous study suggested that the coronavirus may have a long-term transmission trend (24), social distancing is still inevitable. New strategies are needed to reshape social capital especially the ISC and CSC. For example, opening some public places under strict monitoring in low-risk areas (such as cinemas and bookstores) may promote the participation of community activities. Since many countries are still under lockdown, we hope our study could provide some references for other countries or regions. Our study also found the heterogeneities in social capital changes existed across educational levels before and after the lockdown, which implies that policy-makers should take
TABLE 3 | Changes in social capital before and after the COVID-19 lockdown among the participating youths in the COVID-19 Impact on Lifestyle Change Survey (COINLICS).

| Variable                  | Median [p25, p75] or percentage (%) | P-value† |
|---------------------------|-------------------------------------|----------|
| Population-level          |                                     |          |
| Individual social capital |                                     |          |
| Before lockdown           | All (n = 10,540) 15 (13, 17)        | <0.001   |
|                          | High school (n = 2,855) 14 (12, 16) |          |
|                          | Undergraduate (n = 7,419) 16 (13, 17) |          |
|                          | Graduate (n = 266) 14 (12, 16)      |          |
| After lockdown            | All (n = 10,540) 15 (13, 17)***     |          |
|                          | High school (n = 2,855) 14 (12, 16)*** |          |
|                          | Undergraduate (n = 7,419) 15 (13, 17)*** |          |
|                          | Graduate (n = 266) 14 (12, 16)***   |          |
| Family social capital     |                                     |          |
| Before lockdown           | All (n = 10,540) 13 (11, 15)        | <0.001   |
|                          | High school (n = 2,855) 13 (11, 15) |          |
|                          | Undergraduate (n = 7,419) 13 (11, 15) |          |
|                          | Graduate (n = 266) 13 (11, 15)      |          |
| After lockdown            | All (n = 10,540) 13 (12, 15)***     |          |
|                          | High school (n = 2,855) 13 (11, 15)*** |          |
|                          | Undergraduate (n = 7,419) 14 (12, 15)*** |          |
|                          | Graduate (n = 266) 13 (11, 15)***   |          |
| Community social capital  |                                     |          |
| Before lockdown           | All (n = 10,540) 13 (11, 15)        | <0.001   |
|                          | High school (n = 2,855) 12 (10, 14) |          |
|                          | Undergraduate (n = 7,419) 14 (11, 16) |          |
|                          | Graduate (n = 266) 12 (10, 14)      |          |
| After lockdown            | All (n = 10,540) 13 (11, 15)***     |          |
|                          | High school (n = 2,855) 12 (10, 14)** |          |
|                          | Undergraduate (n = 7,419) 13 (11, 15)*** |          |
|                          | Graduate (n = 266) 12 (10, 14)**    |          |
| Society social capital    |                                     |          |
| Before lockdown           | All (n = 10,540) 7 (6, 8)           | <0.001   |
|                          | High school (n = 2,855) 7 (6, 8)    |          |
|                          | Undergraduate (n = 7,419) 7 (6, 8)  |          |
|                          | Graduate (n = 266) 7 (6, 8)         |          |
| After lockdown            | All (n = 10,540) 7 (6, 8)***        |          |
|                          | High school (n = 2,855) 7 (6, 8)*   |          |
|                          | Undergraduate (n = 7,419) 7 (6, 8)*** |          |
|                          | Graduate (n = 266) 7 (6, 8)*        |          |
| Individual-level          |                                     |          |
| Individual social capital |                                     | <0.001   |
| Increased                | All (n = 10,540) 17.0                |          |
|                          | High school (n = 2,855) 17.3        |          |
|                          | Undergraduate (n = 7,419) 16.9       |          |
|                          | Graduate (n = 266) 17.3              |          |
| Constant                 | All (n = 10,540) 52.5                |          |
|                          | High school (n = 2,855) 54.9         |          |
|                          | Undergraduate (n = 7,419) 52.1       |          |
|                          | Graduate (n = 266) 36.8              |          |
| Decreased                | All (n = 10,540) 30.5                |          |
|                          | High school (n = 2,855) 27.7         |          |
|                          | Undergraduate (n = 7,419) 31.0        |          |
|                          | Graduate (n = 266) 45.9              |          |
| Family social capital     |                                     | <0.001   |
| Increased                | All (n = 10,540) 21.7                |          |
|                          | High school (n = 2,855) 11.7         |          |
|                          | Undergraduate (n = 7,419) 24.7        |          |
|                          | Graduate (n = 266) 47.0              |          |
| Constant                 | All (n = 10,540) 69.1                |          |
|                          | High school (n = 2,855) 80.0         |          |
|                          | Undergraduate (n = 7,419) 65.8        |          |
|                          | Graduate (n = 266) 43.2              |          |
| Decreased                | All (n = 10,540) 9.2                 |          |
|                          | High school (n = 2,855) 8.3          |          |
|                          | Undergraduate (n = 7,419) 9.5         |          |
|                          | Graduate (n = 266) 9.8               |          |
| Community social capital  |                                     | <0.001   |
| Increased                | All (n = 10,540) 19.1                |          |
|                          | High school (n = 2,855) 13.6         |          |
|                          | Undergraduate (n = 7,419) 21.1        |          |
|                          | Graduate (n = 266) 22.9              |          |
| Constant                 | All (n = 10,540) 52.6                |          |
|                          | High school (n = 2,855) 63.1         |          |
|                          | Undergraduate (n = 7,419) 48.7        |          |
|                          | Graduate (n = 266) 47.4              |          |
| Decreased                | All (n = 10,540) 28.4                |          |
|                          | High school (n = 2,855) 23.3         |          |
|                          | Undergraduate (n = 7,419) 30.3        |          |
|                          | Graduate (n = 266) 29.7              |          |
| Society social capital    |                                     | 0.025    |
| Increased                | All (n = 10,540) 10.3                |          |
|                          | High school (n = 2,855) 9.7          |          |
|                          | Undergraduate (n = 7,419) 10.6        |          |
|                          | Graduate (n = 266) 7.5               |          |
| Constant                 | All (n = 10,540) 85.8                |          |
|                          | High school (n = 2,855) 86.8         |          |
|                          | Undergraduate (n = 7,419) 85.4        |          |
|                          | Graduate (n = 266) 85.7              |          |
| Decreased                | All (n = 10,540) 3.9                 |          |
|                          | High school (n = 2,855) 3.5          |          |
|                          | Undergraduate (n = 7,419) 4.0         |          |
|                          | Graduate (n = 266) 6.8               |          |

Values under a given variable were marked by asterisks, if the difference before and after COVID-19 lockdown within a given educational level was significant (*p < 0.05, **p < 0.01, ***p < 0.001). †P-values tested the significance of the differences in each variable across educational levels. All P-values were based on t-tests/ANOVA for continuous variables or χ² tests for categorical variables. All significant p-values (p < 0.05) were bolded.

into consideration the educational level and types of social capital while developing tailored interventions for recovery of social capital.

Our study has some limitations. First, since our study measures a before and after scenario by asking about the “before” retrospectively and the social capital data are self-reported, there may be recall and reporting bias; particularly, this recall was made during a traumatic ongoing event, which may further skew the perception of all levels of social capital (e.g., being under-perceived) due to negative or depressive emotion during the long-lasting pandemic. However, the self-assessment of social capital at two time points might reflect their perceived changes which are usually closely correlated with their actual changes (16, 25, 26). Second, we only measured two time points in this study, thus were not able to track the dynamic trends of social capital during the whole period (27). Third, this study was conducted based on a national convenience sample that may not be fully representative of the Chinese youth. Using a snowball sampling technique may lead to some notable skewness in the collected data (28, 29), such as a considerably large proportion of females and youths from western regions of China in our study. Besides, all participating youths were students, so the results may not be extrapolated to other youth groups (e.g., out-of-school youth). However, this large convenience sample, promptly recruited online, presents unique strengths by drawing important conclusions from the targeted population during the epidemic without risk of infection. Note that this approach and the resultant findings may differ in the context of many natural disasters (e.g., earthquake, tsunami) which can cause the loss of ability to stay in touch or trade information via electronic means, and thus affect the ability to build or use social capital.
Our large-scale nationwide study suggested the changes of social capital among the Chinese youths before and after the COVID-19 lockdown. Specifically, the social capital at individual and community level generally declined, while the family-level social capital and society-level social capital generally ascended. Our findings would inform policy-makers and health professionals of the changed social capital among youths during COVID-19 lockdown, for better policy making and clinical practice to improve youths’ mental health in the post-COVID era. School administrators should also be informed of these changes, so in-class and extracurricular programs could be designed to counteract them. Although our findings also serve as important references for other countries or regions in which lockdown measures are in effect or to be (re)considered, perceptions on and changes in social capital, especially SSC, under similar situations in those countries and regions with more individualistic subcultures and/or less trust in governments may be significantly different or even reversed. Therefore, more efforts in the countries of different cultures are warranted to increase all dimensions of social capital in adaptive approaches.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

REFERENCES

1. Szreter S, Woolcock M. Health by association? Social capital, social theory, and the political economy of public health. *Int J Epidemiol.* (2004) 33:650–67. doi: 10.1093/ije/dyh013

2. Abbott S, Freeth D. Social capital and health: starting to make sense of the role of generalized trust and reciprocity. *J Health Psychol.* (2008) 13:874–83. doi: 10.1177/1359105308099506

3. Wang W, Yang N, Li X, Xiao H, Gao M, Yan H, et al. A pathway analysis of exploring how HIV-related stigma affects social capital among people living with HIV/AIDS in China. *Psychol Health Med.* (2019) 24:1100–10. doi: 10.1080/13548506.2019.1595677

4. Imbulana Arachchi J, Managi S. The role of social capital in COVID-19 deaths. *BMC Public Health.* (2021) 21:434. doi: 10.1186/s12889-021-10475-8

5. Hikichi H, Tsuboyu T, Aida J, Matsuyama Y, Kondo K, Subramanian SV, et al. Social capital and cognitive decline in the aftermath of a natural disaster: a natural experiment from the (2011). Great East Japan Earthquake and Tsunami. *Lancet Planetary Health.* (2017) 1:e105–13. doi: 10.1016/S2354-5196(17)30041-4

6. Yagi J, Fujisawa T, Yambe T, Okuyama M, Kawachi I, Sakai A. Does social capital reduce child behavior problems? Results from the Great East Japan earthquake follow-up for children study. *Soc Psychiatry Psychiatr Epidemiol.* (2016) 51:1117–23. doi: 10.1007/s00127-016-1227-2

7. Sato K, Amemiya A, Haseda M, Takagi D, Kanamori M, Kondo K, et al. Post-disaster changes in social capital and mental health: a natural experiment from the 2016 Kumamoto earthquake. *Am J Epidemiol.* (2020) 189:910–21. doi: 10.1093/aje/kwa041

8. Rimmer A. Covid-19 could widen mental health inequalities for a generation, warns charity. *BMJ.* (2020) 369:m2466. doi: 10.1136/bmj.m2466

9. Cao W, Fang Z, Hou G, Han M, Xu X, Dong J, et al. The psychological impact of the COVID-19 epidemic on college students in China. *Psychiatry Res.* (2020) 287:112934. doi: 10.1016/j.pscychres.2020.112934

10. Yang S, Yu C, Jia P. Spatiobehavioral characteristics - defining the epidemiology of new contagious diseases at the earliest moment possible. *Trends Parasitol.* (2021) 37:179–81. doi: 10.1016/j.pt.2020.12.004

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Sichuan University Medical Ethical Review Board (KS2020414). Written informed consent to participate in this study was provided by the participants’ legal guardian/next of kin.

AUTHOR CONTRIBUTIONS

BY, MLi, SY, and PJ took a principal role in designing the study, writing the protocol, developing methodologies, analyzing the data, and drafting the manuscript. PJ contributed to the proposal writing and made a critical revision to the manuscript. JZ contributed to the write up of the study protocol and made a revision to the manuscript. MLi and BY performed the statistical analysis. SY and PJ supervised the study and edited the manuscript. All authors read and approved the final manuscript.

ACKNOWLEDGMENTS

We thank the International Institute of Spatial Lifecourse Epidemiology (ISLE) and The Hong Kong Polytechnic University (1-BE58) for research support.

11. Lau H, Khosrawipour V, Kochach P, Mokolajczyk A, Schubert J, Bania J, et al. The positive impact of lockdown in Wuhan on containing the COVID-19 outbreak in China. *J Travel Med.* (2020) 27:taa037. doi: 10.1093/jtm/taa037

12. Yang S, Dai S, Huang Y, Jia P. Pitfalls in modeling asymptomatic COVID-19 infection. *Front Public Health.* (2021) 9:295. doi: 10.3389/fpubh.2021.593176

13. Corvo E, De Caro W. COVID-19 and spontaneous singing to decrease loneliness, improve cohesion, and mental well-being: an Italian experience. *Psychol Trauma.* (2020) 12:5247–8. doi: 10.1037/tra0000838

14. Chaturvedi H, Vishwakarma DK, Singh N. COVID-19 and its impact on education, social life and mental health of students: a survey. *Child Youth Serv Rev.* (2021) 121:105866. doi: 10.1016/j.childyouth.2020.105866

15. Mamun MA, Sakib N, Gozal D, Bhiyani AI, Hossain S, Bodrud-Doza M, et al. The COVID-19 pandemic and serious psychological consequences in Bangladesh: a population-based nationwide study. *J Affect Disord.* (2021) 279:462–72. doi: 10.1016/j.jad.2020.10.036

16. Jia P, Zhang L, Yu W, Yu B, Liu M, Zhang D, et al. Impact of COVID-19 lockdown on activity patterns and weight status among youths in China: the COVID-19 Impact on Lifestyle Change Survey (COINLICS). *Int J Obes.* (2020) 45:695–99. doi: 10.1038/s41366-020-00710-4

17. McPherson KE, Kerr S, Morgan A, McGee E, Chester FM, McLean J, et al. The association between family and community social capital and health risk behaviours in young people: an integrative review. *BMC Public Health.* (2013) 13:971. doi: 10.1186/1471-2458-13-971

18. Knorst JK, Menegazzo GR, Emmanuelli B, Mendes FM, Ardenghi TM, Effect of neighborhood and individual social capital in early childhood on oral health-related quality of life: a 7-year cohort study. *Qual Life Res.* (2019) 28:1773–82. doi: 10.1007/s11136-019-02384-3

19. Gregor G. Global evidence on the determinants of public trust in governments during the COVID-19. *Appl Res Qual Life.* (2021) 5:1–20. doi: 10.1007/s11842-020-09902-6

20. Han J, Jia P, Huang Y, Gao B, Yu B, Yang S, et al. Association between social capital and mental health among older people living with HIV: the Sichuan Older HIV-Infected Cohort Study (SOHICS). *BMC Public Health.* (2020) 20:581. doi: 10.1186/s12889-020-08705-6
21. Li SS, Chang YY, Chiou WB. Things online social networking can take away: reminders of social networking sites undermine the desirability of offline socializing and pleasures. Scand J Psychol. (2017) 58:179–84. doi: 10.1111/sjop.12348
22. Sibley CG, Greaves LM, Satherley N, Wilson MS, Overall NC, Lee CHJ, et al. Effects of the COVID-19 pandemic and nationwide lockdown on trust, attitudes toward government, and well-being. Am Psychol. (2020) 75:618–30. doi: 10.1037/amp0000662
23. Codagnone C, Bogliacino F, Gomez C, Folkvord F, Liva G, Charris R, et al. Restarting “Normal” Life after Covid-19 and the Lockdown: evidence from Spain, the United Kingdom, and Italy. Soc Indic Res. (2021) 8:1–25. doi: 10.1007/s11205-021-02697-5
24. Kissler SM, Tedijanto C, Goldstein E, Grad YH, Lipsitch M. Projecting the transmission dynamics of SARS-CoV-2 through the postpandemic period. Science. (2020) 368:860–8. doi: 10.1126/science.abb5793
25. Yu B, Zhang D, Yu W, Luo M, Yang S, Jia P. Impacts of lockdown on dietary patterns among youths in China: the COVID-19 impact on lifestyle change survey. Public Health Nutr. (2021) 17:1–12. doi: 10.1111/13689465.003170
26. Zhou J, Xie X, Guo B, Pei R, Pei X, Yang S, et al. Impact of COVID-19 lockdown on physical activity among the Chinese youths: the COVID-19 Impact on Lifestyle Change Survey (COINLICS). Front Public Health. (2021) 9:592795. doi: 10.3389/fpubh.2021.592795
27. Jia P. A changed research landscape of youth’s obesogenic behaviours and environments in the post-COVID-19 era. Obes Rev. (2021) 22(Suppl. 1):e13162. doi: 10.1111/obr.13162
28. Andridge RR, West BT, Little RJA, Boonstra PS, Alvarado-Leiton F. Indices of non-ignorable selection bias for proportions estimated from non-probability samples. J R Stat Soc Ser C Appl Stat. (2019) 68:1465–83. doi: 10.1111/rssc.12371
29. Barendregt C, van der Poel A, van de Mheen D. Tracing selection effects in three non-probability samples. Eur Addict Res. (2005) 11:124–31. doi: 10.1159/000085547

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher’s Note: All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

Copyright © 2021 Yu, Luo, Liu, Zhou, Yang and Jia. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.