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Research paper

Socioeconomic inequality in child mental health during the COVID-19 pandemic: First evidence from China

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ABSTRACT

Background: There are increasing concerns that the coronavirus disease (COVID-19) pandemic will disproportionately affect socioeconomically disadvantaged children. However, there lacks empirical evidence on socioeconomic inequalities in child mental health and associated factors.

Methods: We conducted a population-based online survey in 21,526 children in China, when children were confined at home for nearly two months during the pandemic. We assessed child mental health problems with the Strengths and Difficulties Questionnaire (SDQ). Parental education level and provincial gross domestic product (GDP) per capita were treated as proxies for individual- and population-level socioeconomic status (SES), respectively. Lifestyle and family environment factors included sleep disturbances, physical activity, screen time, primary caregiver, parental mental health, and harsh parenting.

Results: Of the children, 32.31% demonstrated mental health problems. Parental education from the highest (undergraduate and above) to the lowest (middle school and below) increased the adjusted odds ratio (aOR) for child mental health problems by 42% (aOR, 1.42; 95% CI, 1.29-1.57); provincial GDP per capita (RMB) from the highest (>¥100K) to the lowest (≤¥70K) increased aOR by 41% (aOR, 1.41; 95% CI, 1.28-1.55). Sleep disturbances, physical activity <1 h/day, media exposure ≥2 h/day, non-parental care, poor parental mental health, and harsh parenting were independently associated with increased child mental health problems, regardless of SES.

Limitations: The potential sampling bias, subjective measures, and the cross-sectional design are the main limitations.

Conclusion: The first evidence from China suggests socioeconomic inequality in child mental health during the pandemic. As unhealthy lifestyle and unfavorable family environment are contributory factors, prioritized interventions are needed to reduce socioeconomic inequality in child mental health problems.

1. Introduction

1.1. Mental health crisis for children during the COVID-19 pandemic

To prevent the coronavirus disease 2019 (COVID-19) from spreading, most countries temporarily closed their schools. China was the first country to implement school closures, resulting in 180 million primary and secondary students and 47 million preschoolers being confined at homes during the pandemic (Wang, Zhang, et al., 2020). While the confinement was largely successful in controlling the COVID-19 spread, researchers have raised concerns regarding the negative effects of prolonged school closures and home confinement on child well-being, during which children are more vulnerable to mental health problems (Wang, Zhang, et al., 2020; Jefsen et al., 2020; Liu et al., 2023).

Abbreviations: COVID-19, Coronavirus disease 2019; WHO, World Health Organization; UNICEF, United Nations International Children’s Emergency Fund; SDQ, Strengths and Difficulties Questionnaire; SES, Socioeconomic status; GDP, Gross domestic product.

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Moreover, these worsened child mental health outcomes may reflect socioeconomic inequalities. Currently, the pandemic has triggered an unprecedented financial crisis worldwide and pushed further millions of children below the poverty line (Save the Children and UNICEF, 2020). As poverty has been identified as one of the strongest factors impeding child developmental potentials (Walker et al., 2011), there raised increasing concerns that the pandemic may disproportionately affect socioeconomically disadvantaged children, particularly those from poorer families and living in deprived areas (Dooley et al., 2020). Such socioeconomic inequality in child mental health, unfortunately, presents with both short- and long-term consequences that are not only detrimental to vulnerable children, but also to the wider society (Clark et al., 2020). However, empirical evidence regarding socioeconomic inequalities in child mental health during the pandemic in China or other countries is still limited.

1.3. Lifestyle and family environment factors associated with child mental health

Evidence-based and multifaceted proactive responses are in urgent need to tackle the widening disparities. The effort priorities should determine intervenable factors that can mitigate the negative effects of the pandemic and the socioeconomic inequality. During home confinement, children are vulnerable to unhealthy lifestyle, such as sleep disturbances, less physical activity, and longer media exposure (Wang, Zhang, et al., 2020). These unhealthy lifestyle factors have been conceptually linked to poorer child mental health during the pandemic (Mittal et al., 2020; Becker and Gregory, 2020). The family environment is considered as another factor that could affect child mental health during the pandemic. Grief or fear caused by parental loss or separation during the pandemic can influence child mental health (Liu et al., 2020). Parental mental illness, particularly maternal depression, negatively affects the developmental potential and socioemotional well-being of young children (Walker et al., 2011). Regarding parenting strategies, the American Academy of Pediatrics recommends against physical and verbal punishment of children in favor of more effective disciplines for raising healthy children (Sege and Siegel, 2018). Unfortunately, during the pandemic, there are increased risks of child abuse because of the heightened stress and social isolation (Cluver et al., 2020; Rosenthal and Thompson, 2020). However, whether and how these lifestyle and family environment factors are associated with mental health problems in children from different socioeconomic backgrounds during the pandemic remains unclear.

1.4. The current study

The current study took the initiative and conducted a large population-based online survey in mainland China during the pandemic to explore socioeconomic inequality in child mental health together with lifestyle and family environment factors that could influence child mental health during the pandemic. We hypothesized that socioeconomic disadvantage would be associated with increased child mental health problems, and so would unhealthy lifestyle and unfavorable family environment factors.
It is a standardized and internationally recognized instrument consisting of 33 items covering eight domains: bedtime resistance, sleep anxiety, sleep onset delay, sleep duration, night waking, parasomnia, daytime sleepiness, and sleep disordered breathing. Parents rated the frequency of each item occurring in their children in the past week on a 3-point scale (usually, sometimes, rarely). A total score >41 indicates global sleep disturbances. The Cronbach’s $\alpha$ is 0.76 in the current sample.

Daily time spent on moderate and vigorous physical activity in the past week was reported and dichotomized to <1h versus $\geq$1h. Daily exposure to media in the past month was reported and dichotomized to $\geq$2h/day versus <2h/day (Zhang et al., 2017). Primary caregiver was defined as the main caretaker of the child and was dichotomized to parental care versus non-parental care.

The World Health Organization-Five Well-Being Index (WHO-5) was used to assess parental mental health in the past two weeks (WHO Collaborating Centre in Mental Health, 2020). On five mental health related statements, parents were asked to rate the frequency on a six-point Likert scale (0=Never to 5=All the time). A total score was calculated, with a score of >13 indicating mental health problems. The Cronbach’s $\alpha$ is 0.92 in the current sample.

Harsh parenting was evaluated by two questions: 1) In order to discipline and regulate child’s behavior, how many times have you physically punished your child (spanking or kicking) without hurting him/her or leaving bruises or marks? 2) In order to discipline and regulate child’s behavior, how many times have you ever scolded your child (yelling, shouting or using words to humiliate him or her)? Parents reported the frequency of each statement on a 5-point scale (never, 1 or 2 times per week, 3 or 4 times per week, 5 or 6 times per week, almost every day).

Parents also reported on child’s age and sex, family income per year, presence of siblings, and family type (e.g., nuclear family, extended family, etc.).

4. Statistical analysis

Missing data for all key variables were less than 5% and were handled by listwise deletion. Descriptive analyses were applied to characterize sociodemographic and child mental health. Multivariate logistic regression models were used to examine: 1) the association of parental education or provincial GDP per capita with child mental health problems; 2) the association between parental education and child mental health problems stratified by provincial GDP per capita, and 3) the independent association and interactive effects of lifestyle factors and family environment factors on child mental health problems. We calculated the odds ratio (OR), adjusted OR (aOR), and 95% confidence interval (CI). All key variables were adjusted for in the logistic regression models wherever appropriate, including child age and sex, parental income, presence of siblings, and family type. Data analysis was conducted using STATA15.1 (Stata Corp Inc). Two-tailed $p$ values <0.05 were considered statistically significant.

4. Results

4.1. Sample characteristics

The study included 21,526 children (52.41% male; mean age=5.21 years, SD=1.40). Parental education distribution was 24.02% with the highest level of undergraduate and above, 21.89% with junior college, 27.68% with high school or technical secondary school, and
26.41% with the lowest level of middle school or below. The provincial GDP per capita (RMB) across 28 provinces was 14.27% with >¥100K, 12.71% with ¥70-100K, and 73.01% with <¥70K (Table 1).

4.2. Socioeconomic inequality in child mental health

Table 1 presented the prevalence of child mental health problems stratified by SES. Of this total, 6,956 children (32.31%) demonstrated mental health problems. For parental education, the prevalence of child mental health problems increased by ~6% from the highest (29.15%) to lowest (35.43%). For provincial GDP per capita, the prevalence of child mental health problems increased by ~9% from the highest (25.39%) to lowest (34.10%).

Table 2, Fig. 2A and B presented the risks of child mental health associated with socioeconomic disadvantage at individual and population levels. There were main effects of parental education and provincial GDP per capita on child mental health problems. From the highest to the lowest parental education, the aOR for child mental health problems increased by 41% (aOR, 1.41; 95%CI, 1.28-1.55). From the highest to the lowest provincial GDP per capita, the aOR for child mental health problems increased by 42% (aOR, 1.42; 95%CI, 1.29-1.57).

Table 3 and Fig. 2D presented the interactive effect of parental education and provincial GDP per capita on the risks of child mental health problems. Significant associations were found between parental education and child mental health problems only for the lowest provincial GDP per capita group. Using the highest education level of undergraduate and above as the reference, the aOR for child mental health problems increased by 20%, 29%, and 51% for junior college (aOR, 1.20; 95%CI, 1.15-1.25), high school or technical secondary school (aOR, 1.29; 95%CI, 1.25-1.34), and middle school and below (aOR, 1.33; 95%CI, 1.23-1.45), respectively.

4.3. Lifestyle and family environment factors associated with child mental health problems

Table 3 and Fig. 2D presented the risks of child mental health problems associated with lifestyle and family environment factors adjusted for SES and other confounders. Sleep disturbances (aOR, 2.98; 95%CI, 2.74-3.25), physical activity <1h/day (aOR, 1.16; 95%CI, 1.09-1.23), media exposure >2h/day (aOR, 1.22; 95%CI, 1.14-1.29), non-parental care (aOR, 1.25; 95%CI, 1.16-1.34), poor parental mental health (aOR, 2.25; 95%CI, 2.10-2.40), and harsh parenting (aOR, 2.06; 95%CI, 1.91-2.23) were associated with increased risks for child mental health problems after adjusting for SES. No significant interactive effects were found between these factors and SES, meaning unhealthy lifestyles and unfavorable family environment were associated with child mental health problems regardless of individual and population SES.

5. Discussion

In a large-scale and socioeconomically diverse sample recruited...
during the early stage of the COVID-19 pandemic in China, we provided the first evidence to delineate socioeconomic inequality in child mental health. First, we found socioeconomic inequality in child mental health during the pandemic. Specifically, lower individual or population level SES was associated with increased child mental health problems. Of note, the association between parental education and child mental health problems was significant only among children within the lowest provincial GDP per capita, highlighting that the poorest children living in the most deprived areas are the most vulnerable to mental health problems during the pandemic. Furthermore, we found that unhealthy lifestyle (sleep disturbances, less physical activity, and more media exposure) and unfavorable family environment factors (non-parental care, poor parental mental health, and harsh parenting) were independently associated with increased child mental health problems, regardless of SES.

Our findings confirmed the increasing concerns that the COVID-19 pandemic disproportionately affected children from lower socioeconomic background and the exacerbated socioeconomic inequalities in child mental health (Armitage and Nellums, 2020; Dooley et al., 2020; Golberstein et al., 2020). As the sample was socioeconomically diverse, our findings have significant implications for children in China and other countries, particularly in low- and middle-income countries affected by the pandemic. However, it should be noted that socioeconomic inequality in child mental health is not unique to the pandemic, and has long been a public health issue in many countries and regions (Elgar et al., 2015; Walker et al., 2011). As a result, the current study

Fig. 2. Socioeconomic, lifestyle and family environment factors associated with child mental health problems. Abbreviation: GDP, Gross Domestic Product
(A) Adjusted by children’s age and sex, family income per year, the presence of siblings, family type, global sleep disturbances, primary caregiver, parental mental health, harsh parenting, physical activity, media exposure, and provincial GDP per capita in 2018
(B) Adjusted by children’s age and sex, family income per year, the presence of siblings, family type, global sleep disturbances, primary caregiver, parental mental health, harsh parenting, physical activity, media exposure, and parental education
(C) Adjusted by children’s age and sex, family type, family income per year, parental education level, provincial GDP per capita in 2018, and the presence of siblings, as well as rest life style and family environment factors.
Error bars indicate 95% CIs.
Socioeconomic inequality in child mental health during the pandemic by S. Dorn et al., 2020. Our findings provided a basis for eliminating mental health problems. In summary, the current study offers the first empirical evidence from China, suggesting socioeconomic inequalities in child mental health during the pandemic. As unhealthy lifestyle and unfavorable family environment factors were associated with more child mental health problems during the pandemic. However, we did not identify interactive effects between these factors and SES at either individual or population level on child mental health as expected. Instead, it seemed that healthy lifestyle and positive family environment factors would be universally beneficial for child mental health above and beyond the influence of individual and population SES levels. Our findings have significant implications for prioritizing prevention and intervention efforts to reduce and eliminate socioeconomic inequalities in child mental health during and following the pandemic, particularly by promoting a healthy lifestyle and positive family environment at the individual level and tackling poverty at the population level. For example, positive parenting such as effective parent-child communication regarding the pandemic is indispensable for children’s psychological well-being, demonstrating not only short-term, but also long-term protective effects (Clark et al., 2020; Dalton et al., 2020; Tang et al., 2021). While open-access and evidence-based online parenting resources during the COVID-19 have been created with more than 100 languages (https://www.covid19parenting.com/home), multi-sectoral efforts enlisting governments, communities, schools, parents and children themselves should ensure optimal and timely implementation (Wang, Zhang et al., 2020).

We aimed to recruit a demographically representative and socioeconomically diverse sample. However, given the specific situations in different regions and countries, the generalizability of our results may be limited. Additionally, the methodology of our data collection (i.e., online survey with convenience and snowball sampling) may pose restrictions to certain groups, such as those without internet access or a smartphone. For future high-quality data collection, online survey would better apply stratified cluster random sampling with predesigned and standardized procedures. With the confinement order being removed, future research efforts are needed to reach out to these participants. Finally, due to the cross-sectional nature of the current study, a longitudinal impact of the pandemic on socioeconomic inequality in child mental health cannot be established. A follow-up intervention study is warranted to extend our understanding of these critical issues.

In summary, the current study offers the first empirical evidence from China, suggesting socioeconomic inequalities in child mental health during the pandemic. As unhealthy lifestyle and unfavorable family environment factors were associated with more child mental health problems, regardless of SES, prioritized interventions targeting these factors are needed to reduce socioeconomic inequality in child mental health problems. In the pandemic context of worldwide economic downturn, soaring child poverty, and limited financial help, intervention efforts and public health policies should tackle mental health problems in vulnerable populations to ensure our children survive and thrive, and to build a better world for our children and future generations.

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**Declaration of Competing Interest**

The authors declare no conflicts of interest.

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**Table 3**

Lifestyle and family environment factors associated with risk for children’s mental health problems.

| Risk/Protective factors | Children’s mental health problems * | Unadjusted OR (95%CI) | P value | Adjusted OR b (95%CI) | P value |
|-------------------------|------------------------------------|-----------------------|---------|------------------------|---------|
| Global sleep disturbances | No (N=5,5438) | REF. | 3.51 (3.24-3.81) | <0.001 | REF. | 2.98 (2.74-3.26) | <0.001 |
|                          | Yes (N=16,088) | 1.20 (1.14-1.29) | <0.001 | 1.22 (1.14-1.29) | <0.001 |
| Physical activity ≥1 h/day | No (N=13,190) | REF. | 2.76 (2.59-2.95) | <0.001 | REF. | 2.25 (2.10-2.40) | <0.001 |
|                          | Yes (N=4,336) | 1.25 (1.17-1.33) | <0.001 | 1.25 (1.16-1.34) | <0.001 |
| Media exposure ≥2 h/day | No (N=9,938) | REF. | 2.43 (2.26-2.61) | <0.001 | REF. | 2.06 (1.91-2.23) | <0.001 |
|                          | Yes (N=15,797) | 1.33 (1.25-1.40) | <0.001 | 1.22 (1.14-1.29) | <0.001 |

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* SDQ Total difficulties score ≥14 indicates mental health problems.

b Adjusted by children’s age and sex, family type, family income per year, parental education level, provincial/municipality GDP per capita in 2018, and the presence of siblings, as well as rest lifestyle and family environment factors.

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Abbreviation: SDQ, the Strengths and Difficulties Questionnaire; GDP, Gross Domestic Product.
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