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Have girls been left behind during the COVID-19 pandemic? Gender differences in pandemic effects on children's mental wellbeing

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Using data from the UK, we show that girls have been affected more than boys by the COVID-19 pandemic in terms of their mental wellbeing. These gender differences are more pronounced in lower-income families. Our results are consistent with previous findings of larger pandemic effects on mental health of women.

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1. Introduction

The COVID-19 pandemic has impacted men and women differently. Gender gaps exist not only in the direct disease effects (Richardson et al., 2020) but also in the way lockdowns and the stress of home-schooling have affected mental health of individuals (Brooks et al., 2020). There is a push for more research on the gendered experiences of the pandemic (Brady et al., 2021).

More gender-specific analysis is also required on the impact of the pandemic on children. On average, the pandemic led children’s mental health to deteriorate (Blanden et al., 2021). Yet, it remains unclear if the effects are equally shared by boys and girls. Previous studies suggest that younger boys are more sensitive to adverse circumstances (Autor et al., 2020). By contrast, older girls’ greater pre-existing vulnerabilities in mental health may make them more sensitive compared to older boys (Davis et al., 2019). A health pandemic may involve experiences that make it different to other sources of disadvantage. Furthermore, gendered impacts may occur because of differences in parental time and money inputs (Del Bono et al., 2021).

In this paper, we ask: (1) Does the COVID-19 pandemic have a gendered impact on the mental wellbeing of children? and (2) Are the gendered impacts offset or exacerbated by the pre-existing circumstances? Understanding if the pandemic has differently affected girls’ and boys’ mental health and the potential buffers against such effects is important. First, it may undermine society’s efforts to achieve gender equality. Second, children’s mental health spills over to educational outcomes and longer-term wellbeing (Waite et al., 2021).

We focus on the United Kingdom’s (UK) experience with the COVID-19 pandemic. Children were directly affected by the closure of schools and childcare facilities. In all parts of the UK, the closures began on 20 March during the first wave of the pandemic and applied to most children with the exception of vulnerable children and for children of health, social care, and other critical workers (Blanden et al., 2021). Schools partially re-opened in June 2020. The re-opening was staggered to allow children in Reception, Year 1 and Year 6 to return first, followed by Year 10 and Year 12 children (on a part-time basis), whereas children from other year levels only returned to school in September.
Schools remained open during the second lockdown between November and December 2020. Schools were closed again on 4 January 2021, when the third lockdown started, followed by another staged relaxation of restrictions. Schools re-opened on 8 March, and the final restrictions were lifted on 19 July 2021.

Our results point to strong gendered impacts. The COVID-19 pandemic negatively impacted on girls to a larger extent than boys, in terms of their mental wellbeing. We find that these gender differences are more pronounced in lower-income families.

We contribute to two bodies of work. First, we add to the literature on the impacts of the COVID-19 pandemic on children's outcomes (e.g., Waite et al., 2021). Second, we contribute to the literature on the determinants of gender inequality in schooling and non-cognitive outcomes (e.g., Pope and Sydnor, 2010; Bertrand and Pan, 2013).

2. Data and methods

Our analysis is based on the data from the UK Household Longitudinal Study (UKHLS), known as Understanding Society. As part of the study, approximately 40,000 households have been surveyed annually since 2009–10. Ten waves of data are currently available. In April 2020, all respondents of the UKHLS were invited to take part in a new COVID-19 survey, which includes questions on the impact of the pandemic. The participants who accepted the invitation have been surveyed once a month (every two months from July 2020). We use all COVID-19 surveys available to date, which include information about children's mental well-being (July; September and November 2020 and March 2021). In the analysis period, schools were closed during the first and third lockdowns but not during the second lockdown, as explained above (see Online Appendix A for detailed information on the UK's experience with the COVID-19 pandemic).

As a measure of child mental wellbeing, we use the scores of the Strengths and Difficulties Questionnaire (SDQ). The SDQ is a behavioural screening questionnaire for children, which includes 25 questions covering five areas: hyperactivity/inattention, emotional symptoms, conduct problems, peer relationship problems, and pro-social behaviour. \(^1\) Answers to these questions (excluding those on prosocial behaviour) are summed to create a ‘total difficulties’ score ranging from 0 to 40. In every UKHLS wave, parents answer the SDQ for 5- and 8-year-old children. In every second wave, 10–15-year-old children self-complete the SDQ. In the COVID-19 survey, parents complete the SDQ for 5–11-year-old children, and 10–15-year-old children self-complete the SDQ in selected waves. \(^2\) Our analysis mainly focuses on 10–15-year-old children, whose answers to the SDQ are expected to measure their mental wellbeing more accurately. The results on 5–8-year-old children, which are largely consistent but less precise, are presented in Online Appendix C.

We use all waves of the regular and the COVID-19 survey available to-date (as of July 2021). Excluding observations with missing information, the sample of 10–15-year-old children includes over 21,000 observations. Table 1 presents the descriptive statistics of this sample.

To analyse whether the COVID-19 pandemic affected boys' and girls' mental wellbeing differently, we estimate difference-in-difference (DID) models. The child's SDQ scores are regressed on an indicator for whether the child is female, an indicator for the COVID-19 waves, and the interaction of these two variables. The coefficients on the interaction term show the gender-differences in the effect of the pandemic on child mental wellbeing. We control for the child's age and ethnicity, the mother's age at birth and education, and wave fixed-effects.

To attribute estimated gender differences to the COVID-19 pandemic, we assume that girls' and boys' mental wellbeing would have evolved in the same way in the absence of the pandemic (parallel trends assumption). We also assume that any gender differences in reporting of mental wellbeing\(^3\) either remain constant over time or evolve in the same manner. To test the validity of these assumptions, we include gender-specific linear trends in the DID models. We also assume that the sample composition of girls and boys remains the same over time, except for any changes in the observed variables. As a robustness check, we include child fixed-effects in the DID models. Additionally, we estimate DID models with gender and age interactions to allow for gender-differences in the evolution of mental wellbeing as children get older.

3. Results

Graph A of Fig. 1 presents the estimates of the DID model.\(^4\) We find that girls' mental wellbeing during the COVID-19 pandemic (relative to pre-pandemic years) declined more than boys' mental wellbeing. Girls' total emotional and behavioural difficulties increased by 1.619 points more compared to boys (corresponding to 28% of a standard deviation). This difference is statistically significant at the 1% level. Before the pandemic, there was no difference in total difficulties by gender. During the pandemic, total difficulties increased among girls, but not among boys. We observe a larger increase among girls compared to boys across most domains of the SDQ (emotional symptoms, hyperactivity, conduct problems, and peer problems). Conduct problems decreased among both boys and girls during the pandemic, but more so among boys.

Table 1: Means and Standard Deviations of Key Variables in 10–15-year-old Children Sample

| Child's SDQ scores: | Total Difficulties (0–40) | Emotional Symptoms (0–10) | Hyperactivity/inattention (0–10) | Conduct Problems (0–10) | Peer Relationship Problems (0–10) | Prosocial Behaviour (0–10) | Child female | Child's age | Child's ethnicity: White | Mother's ethnicity: White | Mother's age at child's birth | Mother's education: Degree/Other HE qualification | Mother's education: A levels | Mother's education: GCSE | Mother's education: Other or no qualification | COVID-19 wave |
|---------------------|--------------------------|---------------------------|---------------------------------|-------------------------|----------------------------------|-----------------------------|--------------|-------------|-------------------------|---------------------------|-----------------------------|-----------------------------|--------------------------|-------------------|-----------------------------|----------------|
| Observations        | 21,269                   |                           |                                 |                         |                                  |                             |              |             |                         |                           |                              |                              |              |                   |                           | 0.12             |

Standard deviations of continuous variables are presented in parentheses. HE stands for higher education. GCSE stands for General Certificate of Secondary Education.

\(^1\) See Online Appendix B for the questionnaire.

\(^2\) See Goodman (1997) for a detailed analysis of SDQ.

\(^3\) Parents completed the SDQ in July and September 2020, and March 2021, and children in July and November 2020, and March 2021.

\(^4\) Studies in the psychological literature find that females tend to recognise and admit their true state of mental health (such as loneliness) more easily than males. This is especially true during adolescence and young adulthood according to Boys and Perlman (1985).

\(^5\) Online Appendix Table D.1 presents numerical coefficient estimates and standard errors.
The main results remain robust to the inclusion of child fixed-effects (graph B), gender-specific linear trends (graph C), and gender-age interactions (graph D). The increase in total difficulties is 1.780 point higher among girls than among boys in the fixed-effects model, 1.051 point higher in the model with gender-specific trends, and 1.116 point higher in the model with gender-age interaction. Gender differences in specific SDQ domains largely persist, although some differences become statistically insignificant once gender-specific trends are included. This is unsurprising, since these trends absorb a large portion of gender-specific evolution of SDQ scores. Consistently, Online Appendix Table D.2 shows a larger increase in overall life dissatisfaction among older girls than among boys during the pandemic. Girls also experienced a larger increase in dissatisfaction with school, friends, and appearance, compared to boys.

Fig. 2 shows larger gender differences in pandemic effects on the mental wellbeing of older children from lower-income families, although both income groups are affected. Girls from lower-income families experienced a 2.162 point (37% of a standard deviation) higher increase in total difficulties compared to boys during the COVID-19 pandemic. In higher-income families, the gender difference is 1.306 points (22% of a standard deviation). The triple difference model (Online Appendix Table D.4) shows, however, that the difference in the results by income is statistically significant only in peer problems. Gender differences in pandemic effects are somewhat larger among children with worse pre-pandemic mental health but not statistically significantly so, as shown in Online Appendix Tables D.3 and D.4.

4. Conclusions

We find that emotional and behavioural difficulties increased more among 10–15-year-old girls than boys during the COVID-19 pandemic relative to the pre-pandemic years. The results on life satisfaction are consistent. We find gender differences in pandemic effects on children’s mental wellbeing among all income groups, although these differences are more salient in lower-income families. The findings (presented in Online Appendix C) are qualitatively similar for younger children, but less statistically significant and robust. Our results suggest that the COVID-19 pandemic affected the mental wellbeing of girls more than boys, especially those from lower-income families. In future research, it would be interesting to explore if the results depend on whether parental or child reports of SDQ scores are used and if school closures affected mental wellbeing of boys and girls differently.
Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.econlet.2022.110458.

References

Autor, David, Figlio, David N., Karbownik, Krzysztof, Roth, Jeffrey, Wasser- man, Melanie, 2020. Males at the tails: How socioeconomic status shapes the gender gap. National bureau of economic research. No. w27196. 2020. https://www.nber.org/papers/w27196.

Bertrand, M., Pan, J., 2013. The trouble with boys: Social influences and the gender gap in disruptive behaviour. Am. Econ. J.: Appl. Econ. 5 (1), 32–64.

Blanden, J., Crawford, C., Fumagalli, L., Rabe, B., 2021. School Closures and Children’s Emotional and Behavioural Difficulties. ISER Report 2021, https://www.iser.essex.ac.uk/research/publications/536633.

Borys, S., Perlman, D., 1985. Gender differences in loneliness. Personality Soc. Psychol. Bull. 11 (1), 63–75.

Brady, E., Nielsen, M.W., Andersen, J.P., Oertelt-Prigione, 2021. Lack of consideration of sex and gender in COVID-19 clinical studies. Nature Commun. 12 (4015).

Brooks, S.K., Webster, R.K., Smith, L.E., Woodland, L., Wessely, S., Greenberg, N., Rubin, C.J., 2020. The psychological impact of quarantine and how to reduce it: Rapid review of the evidence. Lancet 395 (10227), 912–920.

Davis, J., Vizard, T., Forbes, N., Pearce, N., Nafilyan, V., Merad, S., et al., 2019. Mental health of children and young people in England 2017: Predictors of mental disorders. NHS digital. London. https://files.digital.nhs.uk/85/TFFC57/MHCYP%202017%20Predictors.pdf.

Del Bono, E., Fumagalli, L., Holford, A., Rabe, B., 2021. Coping with School Closures: The Changing Responses of Schools, Parents and Children During COVID-19. ISER Report 2021, https://www.iser.essex.ac.uk/files/news/2021/little-inequality-homeschool/coping-with-school-closures.pdf.

Goodman, R., 1997. The strengths and difficulties questionnaire: a research note. J. Child Psychol. Psychiatry 38, 581–586.

Pope, D.G., Sydnor, J.R., 2010. Geographic variation in the gender differences in test scores. J. Econ. Perspect. 24 (2), 95–108.

Richardson, S., Hirsch, J.S., Narasimhan, M., Crawford, J.M., McGinn, T., Davidson, K.W., et al., 2020. Presenting characteristics, comorbidities, and outcomes among 5700 patients hospitalized with COVID-19 in the new york city area. JAMA 323 (20), 2052–2059.

Waite, P., Pearcey, S., Shum, A., Raw, J.A., Patalay, P., Creswell, C., 2021. How did the mental health symptoms of children and adolescents change over early lockdown during the COVID-19 pandemic in the UK? JCPP Adv. 1 (1), e12009.