

COVID-19 and Adolescent Mental Health in the UK

(Author accepted manuscript, forthcoming in *Journal of Adolescent Health*)

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Acknowledgements

We are grateful for the constructive comments from the anonymous peer reviewers and editors. The United Kingdom Household Longitudinal Survey is an initiative funded by the ESRC and various Government Departments and the Understanding Society COVID-19 survey is funded by the UKRI, with scientific leadership by the ISER, University of Essex, and survey delivery by NatCen Social Research and Kantar Public. Neither the original collectors of the data nor the Archive bears any responsibility for the analyses or interpretations presented here.

Conflict of Interest

The authors have no conflict of interest to declare.

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Abstract

Purpose: This study examines the mental health impact of the COVID-19 pandemic on adolescents in the UK as well as social, demographic, and economic variations in the impact.

Methods: Nationally representative longitudinal panel data from the Understanding Society COVID-19 survey were analyzed. The analytical sample comprises 886 adolescents aged 10–16 surveyed both before and during the pandemic. The Strengths and Difficulties Questionnaire (SDQ) was used to measure adolescents' mental health.

Results: The results from person fixed-effects regression models show that adolescents with better-than-median mental health before the pandemic have experienced an increase in their emotional problems, conduct problems, hyperactivity, and peer relationship problems, but a decrease in their prosocial tendency during the pandemic. In contrast, adolescents with worse-than-median mental health before the pandemic have experienced opposite changes in each SDQ domain. Further results from lagged dependent variable regression models show that compared with girls, boys have experienced a smaller increase in emotional problems but a greater decrease in prosocial tendency. The negative mental health impact is particularly prominent among adolescents in one-parent, one-child, and low-income households. Adult household members' COVID-19 symptoms and illness have undermined adolescents' peer relationships.

Conclusions: The results reveal the pandemic's diverse impacts on adolescent mental health, which vary with adolescents' prepandemic mental health and sociodemographic backgrounds. The findings underline the need for tailored mental health support for adolescents and targeted measures to mitigate inequalities in the mental health impact of the pandemic.

Keywords: Adolescents, COVID-19, inequality, mental health, the United Kingdom.

Implications and Contribution: This study provides the first nationally representative evidence regarding the impact of the COVID-19 pandemic on adolescent mental health in the UK. It reveals considerable disparities in the impact across social, demographic, and economic groups.

The outbreak of the coronavirus disease 2019 (COVID-19) pandemic has had wide-ranging impacts on individual wellbeing. A growing body of research has shown that the pandemic and its associated lockdown, school closure, and social distancing measures have considerably undermined adults' mental health [1–3]. However, less attention has been paid to the mental health impact of the pandemic on adolescents [4, 5]. Although adolescents are less likely than adults to become severely ill due to COVID-19 [6], the pandemic may impair adolescents' mental health through stress spillover from other family members, contextual and policy changes, and the disruption of everyday life routines [4, 7–9]. Therefore, our research is motivated by a need to address the relative scarcity of research examining adolescent mental health during the pandemic.

In the nascent body of research exploring the impact of the COVID-19 pandemic on adolescent mental health [4, 5, 7, 9, 10], a few notable limitations exist. First, existing research tends to draw on cross-sectional data collected during the pandemic [7, 11, 13]. While researchers have reported clear evidence of a negative association between adolescents' COVID-19 exposure and their mental wellbeing [7, 13], analysis of cross-sectional data collected during the pandemic is insufficient in capturing the impact of the pandemic. Second, understandably due to limited opportunities for face-to-face contact during the pandemic, existing research is mostly based on online surveys of convenience samples of adolescents [4, 7, 11, 12]. However, online surveys may underrepresent adolescents with limited access to the internet. Because adolescents with limited digital connections are more likely to experience social isolation and a lack of internet access is often associated with socioeconomic deprivation [14], existing analyses based on online survey data may have underrepresented adolescents who are particularly vulnerable to the pandemic. Third, despite growing evidence for the overall impact of the COVID-19 pandemic on adolescent mental health [7–12], we still know relatively little about how the

impact may vary across different groups of adolescents characterized by distinct demographic attributes, socioeconomic backgrounds, and household members' experiences of COVID-19.

This study addresses the above gaps by providing the first nationally representative evidence of the pandemic's impact on adolescent mental health. To do so, we analyze new, high-quality nationwide data collected from adolescents aged 10–16 in the United Kingdom (UK) using a postal paper questionnaire. The survey collected data from the same group of adolescents both before the outbreak of the COVID-19 pandemic in the UK and during the pandemic in July 2020. The two-wave panel allows us to estimate the mental health impact of the pandemic. We also examine how the impact varies with the adolescents' age, gender, ethnicity, family circumstances, parents' socioeconomic status, and adult household members' experiences of COVID-19 symptoms and illness.

Methods

Data and sample

We analyze data from the youth panel of the Understanding Society (USOC) COVID-19 survey and the preceding main USOC survey (for more information, see www.understandingsociety.ac.uk/topic/covid-19). Initiated in 2009, USOC is a nationally representative longitudinal panel survey [15]. The survey contains a youth panel, which surveyed adolescents aged between 10 and 16 across the UK both before COVID-19 (before March 2020, with over 99.0% of the adolescents surveyed before 2020) in the preceding main survey and during the COVID-19 pandemic (in July 2020) in the USOC COVID-19 survey. While existing research on adolescents' mental health during COVID-19 often relies on parents' reports [16], the USOC data provide us with a unique opportunity to examine adolescents' own reports. Particularly, we combine data from the main USOC survey and the COVID-19 survey to trace continuity and changes in adolescents' mental health before and

during the pandemic. The USOC survey has also collected data from adults, including parents, living in the same household as the adolescents. The main USOC survey collects data from face-to-face interviews, complemented by mixed-mode techniques [15]. In collecting information on adolescent mental health, a self-completion paper questionnaire was used in both the main and COVID-19 youth surveys, which ensures consistency in data collection methods and that the sample represents adolescents with differential access to the internet. A survey weight provided by the USOC team is used in our analysis where appropriate to adjust for complex survey design and potential non-response bias.

To construct our analytical sample, we limited the sample to 901 adolescents who were surveyed both before and during the COVID-19 pandemic. In preparing the dataset, we used as many sources as possible (e.g., from the adult and household panels) for constructing time-invariant variables to minimize the rate of missing values. Then, we listwise deleted 15 adolescents with missing values on the variables used. Our final analytical sample contains 886 adolescents aged 10–16 in July 2020 ($M = 13.3$, $SD = 1.38$) who were surveyed both before and during COVID-19—i.e., each adolescent was observed twice ($N = 1,772$ person-wave observations). The characteristics of the analytical sample are presented in Table 1.

[Insert Table 1 Here]

The secondary data analyzed here were collected under a protocol compliant with the Helsinki Declaration on human subjects testing, with full ethical approval at the institution of the original data collector (i.e., the University of Essex), and with informed consent from all participants (www.understandingsociety.ac.uk/documentation/mainstage/user-guides/main-survey-user-guide/ethics). The anonymized dataset was then released through the UK Data Archive (UKDA). Because we conducted only analysis of a fully anonymized secondary dataset and we had agreed to the relevant conditions of confidentiality and terms of use set out by the UKDA, further ethical approval from our own institutions was not required.

Measures

Adolescent mental health. The USOC measured adolescent mental health using the the Strengths and Difficulties Questionnaire (SDQ)—a standard set of measures that are widely used to capture adolescents’ self-reported mental health [17]. The SDQ contains 25 items covering five subscales (five items for each subscale, see www.sdqinfo.org for item wordings): emotional problems, conduct problems, hyperactivity, peer relationship problems, and prosocial tendency. The response to each item was recorded using three options—not true (0), somewhat true (1), and certainly true (2)—denoting whether an adolescent had experienced a given mental health issue. The scores for each subscale, ranging from 0 to 10, were calculated by summing up the scores for its constituent items. A higher score indicates a worse state of mental health for the first four subscales, whereas a higher score indicates better mental health for the prosocial tendency subscale. Our further analysis shows that each SDQ subscale has good reliability and internal consistency, with a Cronbach’s alpha of 0.6 or above and an eigenvalue from factor analysis above 1. Although the subscales can be summed up to generate a total SDQ score, we analyze the separate subscales to provide a nuanced understanding of the impact of the pandemic on adolescent mental health.

Age. Adolescents’ age at the time of the COVID-19 survey (in July 2020) is measured using a continuous variable.

Gender. We use a dummy variable to distinguish between girls (=0; 52%) and boys (=1; 48%). The USOC surveys did not ask about adolescents’ non-binary gender identity.

Ethnic minority. Due to notable ethnic inequalities in COVID-19 infection and mortality rates and in the cascading socioeconomic impact of the pandemic in the UK [18, 19], we use a dummy variable to distinguish between white British/Irish adolescents (=0; 84%) and ethnic minority adolescents (=1; 16%). Small cell sizes prevented us from disaggregating ethnic minority adolescents into more detailed subgroups.

Co-residence with other children during COVID-19. The presence of other child(ren) may make a substantial difference to one's opportunity for peer interaction. Thus, we use a dummy variable to distinguish whether an adolescent lived with at least one other child under 18 years of age (62%) during the pandemic.

One-parent household. We use a dummy variable to distinguish whether an adolescent lived with one or both parent figures (including both biological parents and step-parents). We measure parents' co-residential status rather than their marital or relationship status, because parents' physical presence or absence in the household is more salient in shaping adolescents' wellbeing [20, 21].

Parents' prepandemic income level. As the impact of the COVID-19 pandemic and adolescents' resilience may vary with their socioeconomic positions, we measure parents' income before the pandemic and divide the sample into three equal groups to distinguish adolescents from low-, middle-, and high-income families.

COVID-19 symptoms and illness in the household. Although adolescents are unlikely to exhibit (severe) COVID-19 symptoms [6], the presence of COVID-19 symptoms or illness in the household not only limits adolescents' socializing opportunities due to state-mandated self-isolation, it can also place a mental strain on the adolescents. Based on the monthly COVID-19 adult surveys (April–July 2020), we create a dummy variable to capture whether any adult household member who responded to the COVID-19 surveys currently have or had ever reported COVID-19 symptoms or illness between April and July 2020 (13%).

Pandemic "treatment" variable. We use a dummy variable to distinguish the observations before and during the pandemic for each adolescent.

In our supplementary analysis, we also tested additional covariates, including rural–urban residence, household size, household income loss during COVID-19, adult household members' essential/key worker status, and parental education. These variables were not

associated with changes in adolescent mental health and including them neither affected the results for other variables nor improved the overall model fit. Therefore, they are not included in the analysis presented in this article.

Statistical analysis

We conduct the analysis in two steps. First, we run person fixed-effects models to estimate changes in the adolescents' mental health before and during the pandemic. As the distributions of the SDQ subscale scores were within a range sufficient to assume a normal distribution, we used a linear specification for the models. A fixed-effects regression model effectively captures within-person change in mental health by controlling for each adolescent's time-invariant attributes that are both observed and unobserved [22]. In the models, we use the pandemic "treatment" variable as the sole predictor. As adolescents with different mental health states before the pandemic may be susceptible to the pandemic in distinct ways, we also fit separate person fixed-effects models for adolescents falling above and below the median of the prepandemic distribution of each SDQ subscale.

Then, we fit lagged dependent variable models to estimate how the mental health impact of the pandemic vary with the covariates [23]. In the models, the adolescents' SDQ subscale scores during the pandemic are regressed on the covariates, while controlling for adolescents' prepandemic SDQ subscale scores. The lagged dependent variable approach explicitly models changes in mental health by conditioning the adolescents' mental health before the pandemic; thus, the coefficients for the covariates in the models denote how the predictors relate to *changes* in SDQ scores [23]. While it is less straightforward to model multiple time-invariant covariates in fixed-effects models [22], our robustness checks using a fixed-effects approach yielded findings that are consistent with those reported below. As it is

possible for multiple adolescents to live in the same household, we estimate robust standard errors to account for sample clustering at the household level [24].

Results

The impact of the COVID-19 pandemic on adolescent mental health

Figure 1 presents the histograms of the adolescents' SDQ subscale scores before and during the pandemic. The results show a decrease in the proportion of adolescents with a low level of emotional problems and peer relationship problems (i.e., scores 0–1) and those with a high level of prosocial tendency (i.e., score 9–10), suggesting worsened adolescent mental health during the pandemic. However, during the pandemic, the proportion of adolescents exhibiting little or no conduct problems has increased, possibly because more time spent at home and under parental supervision [20] prevented adolescents from enacting problem behaviors such as fighting with or bullying other children.

[Insert Figure 1 Here]

Figure 2 depicts the impact of the COVID-19 pandemic on adolescent mental health and how the impact varies with the adolescents' prepandemic mental health, estimated using person fixed-effects models. In the full sample, although changes in some SDQ subscales are statistically significant at the 5% level, the effect sizes seem small across the board. Specifically, compared with before the pandemic, UK adolescents have experienced an increase in emotional problems ($B = 0.23$; 95% CI: 0.09, 0.38; $p = 0.002$) and peer relationship problems ($B = 0.27$; 95% CI: 0.15, 0.40; $p < 0.000$), and a decrease in prosocial tendency ($B = -0.13$, 95% CI: $-0.26, -0.01$; $p = 0.030$). Meanwhile, the prevalence of conduct problems has decreased during the pandemic ($B = -0.18$, 95% CI: $-0.30, -0.07$; $p = 0.002$). However, no change has been found in the level of hyperactivity ($B = -0.01$; 95% CI: $-0.16, 0.14$; $p = 0.847$).

[Insert Figure 2 Here]

After separating the sample based on the adolescents' prepandemic mental health, we find that the small effect sizes in the overall sample are due to heterogeneous trends in different subgroups. On the one hand, adolescents with better-than-median mental health before the pandemic have experienced a notable increase in emotional problems ($B = 1.05$; 95% CI: 0.88, 1.22; $p < 0.001$), conduct problems ($B = 0.28$; 95% CI: 0.16, 0.39; $p < 0.001$), hyperactivity ($B = 0.64$; 95% CI: 0.46, 0.82; $p < 0.001$), and peer relationship problems ($B = 0.94$; 95% CI: 0.79, 1.08; $p < 0.001$), and they have also become less prosocial ($B = -0.89$; 95% CI: $-1.03, -0.75$; $p < 0.001$). On the other hand, opposite trends are noted among adolescents with worse-than-median mental health before the pandemic—i.e., a marked decrease in emotional problems ($B = -0.49$; 95% CI: $-0.70, -0.28$; $p < 0.001$), conduct problems ($B = -0.96$; 95% CI: $-1.19, -0.73$; $p < 0.001$), hyperactivity ($B = -0.86$; 95% CI: $-1.09, -0.63$; $p < 0.001$), and peer relationship problems ($B = -0.31$; 95% CI: $-0.50, -0.13$; $p < 0.001$), and an increase in prosocial tendency ($B = 0.42$; 95% CI: 0.26, 0.59; $p < 0.001$).

Sociodemographic variations in the mental health impacts

Table 2 shows how changes in the adolescents' mental health from before to during the pandemic vary with their sociodemographic backgrounds and household experiences of COVID-19. We report results that are statistically significant at the 10% level given the relatively small sample size. Compared with their younger counterparts, older adolescents have experienced a greater decrease in conduct problems and a greater increase in prosocial tendency, but they have shown a greater increase in hyperactivity during the pandemic. Boys have experienced a smaller increase in emotional problems but a greater decrease in prosocial tendency than girls. Ethnic minority adolescents have exhibited a slightly smaller increase in

peer relationship problems during the pandemic, compared with their white ethnic majority counterparts.

[Insert Table 2 Here]

The results also highlight the important role played by household composition in shaping the impact of the pandemic on adolescent mental health. The presence of other children in the household is found to protect the adolescents from the adverse impact of the pandemic on their emotional and social wellbeing. As shown in Table 2, the increase in emotional and peer relationship problems is greater among adolescents who did not live with any other child than those living with at least one other child during the pandemic. In addition, compared with adolescents living with both parents, adolescents living in one-parent households have experienced a greater increase in peer relationship problems.

The pandemic's impact on adolescent mental health also varies with parents' socioeconomic positions. Compared with adolescents whose parents fall in the bottom tertile of the prepandemic income distribution, adolescents with high-earning parents have experienced a greater decrease in conduct problems and a smaller increase in hyperactivity and peer relationship problems during the pandemic. Thus, adolescents from low-income families have experienced a greater decline in mental health than their better-off counterparts.

Finally, experiences of COVID-19 symptoms or illness in the household are found to heighten adolescents' risk of peer relationship problems. Compared with adolescents whose household members have not had any COVID-19 symptoms or illness, adolescents living with adult household members who currently have or ever had COVID-19 symptoms or illness have experienced a greater increase in their peer relationship problems during the pandemic.

Discussion

The COVID-19 pandemic has affected adolescents' mental health in the UK and elsewhere [5–13]. However, our findings show that the pandemic's impact on adolescent mental health is by no means universal. Rather, it varies considerably with adolescents' prepandemic mental health and their differential sociodemographic backgrounds.

First, our findings show that adolescents with distinct levels of prepandemic mental health have experienced divergent mental health trajectories during the pandemic in the UK. Adolescents with relatively good mental health before the pandemic have experienced a notable mental health decline during the pandemic. In contrast, those with a relatively high level of mental health problems before the pandemic have experienced an improvement in all five SDQ subscales. It is possible that enhanced parent-child interactions and increased adult supervision during the pandemic have helped ameliorate the mental health of adolescents with a high level of pre-existing mental health problems [25]. Our findings indicate that although the mental health impact of the pandemic on all adolescents seems moderate, unpacking the overall impact highlights considerable, divergent changes in the mental health of different subgroups of adolescents. Therefore, it is important to scratch the surface of aggregate patterns and go beyond a one-size-fits-all approach to attend to adolescents' diverse mental health needs.

Second, our findings demonstrate the heterogeneous mental health impacts of the pandemic across adolescents with diverse demographic and socioeconomic backgrounds. Although we focused on a relatively narrow age range of 10 to 16, our finding regarding age differences in the mental health impact of the pandemic suggests that adolescents at different developmental stages experience the pandemic in different ways and have different needs for mental health support. Notably, we have found that the pandemic has had a particularly adverse impact on the mental health of adolescents from one-parent, one-child, and low-

income families. These findings underscore the importance of household structure (and its associated implications for parent-child and peer interactions [20, 21]) and economic resources in shaping adolescents' mental resilience and vulnerability during the pandemic. The findings highlight potential ways in which the pandemic (re)produces and exacerbates adolescent mental health disparities along the lines of family structure and socioeconomic status.

Third, although adolescents are unlikely to contract COVID-19 or become severely ill as a result of catching the coronavirus [6], our results show that they are not immune to the mental health impacts caused by their family members' COVID-19 symptoms and illness. We find that family members' experiences of COVID-19 symptoms and illness undermine adolescents' peer relationships. This may be because COVID-19 symptoms or illness entail self-isolation and social distancing that directly restrict the adolescents' peer interactions and stigmas associated with COVID-19 may render the adolescents susceptible to being bullied and socially marginalized [26]. Therefore, to cater for adolescents' social and mental health needs, it is crucial to establish support programs for COVID-19 patients and families who self-isolate and/or face stigmas and marginalization due to COVID-19.

The limitations of this study raise several important questions for ongoing research on COVID-19 and adolescent health. First, although we have reported diverse mental health impacts of the pandemic on adolescents, we are unable to ascertain the explanations for the impacts. Nonetheless, our findings of the unequal mental health impacts provide insights into where efforts of further investigation and intervention may be warranted. Second, the USOC COVID-19 youth survey was conducted in July 2020, when the UK was not in a national lockdown and the COVID-19 infection and mortality rates were relatively low. Arguably, however, a large proportion of British families still observed social distancing rules, and social interactions outside the household were relatively limited at the time of the COVID-19

survey. Future research could more specifically examine the impact of lockdown and school closure measures during the pandemic on adolescents' mental health [4, 8]. Third, while person fixed-effects models account for adolescents' time-invariant characteristics, the potential omission of relevant time-varying factors limits the models' ability to precisely estimate the causal effect of the pandemic on adolescent mental health. Finally, analyzing the two-wave panel data is an important first step towards tracing continuity and changes in adolescent mental health before and during COVID-19. To achieve a fuller understanding of the causal impact of the pandemic, future research needs to collect more waves of data and chart adolescents' mental health trajectories throughout and after the pandemic.

Adolescents are at a critical developmental stage, and the detrimental impact of the pandemic on their mental health can undermine their immediate wellbeing and harm their long-term development [11, 12, 16]. Despite the limitations of our research, it is clear from our findings that efforts should be made to mitigate the mental health impact of the pandemic on children and adolescents—an issue that has often been left out of key public health and policy conversations [16]. Our findings also urge policymakers to mitigate disparities in the pandemic's impact on adolescent mental health, interrogate how these disparities are rooted in prepandemic socioeconomic inequalities, and intervene in future inequalities that may arise from the pandemic's differential mental health impacts.

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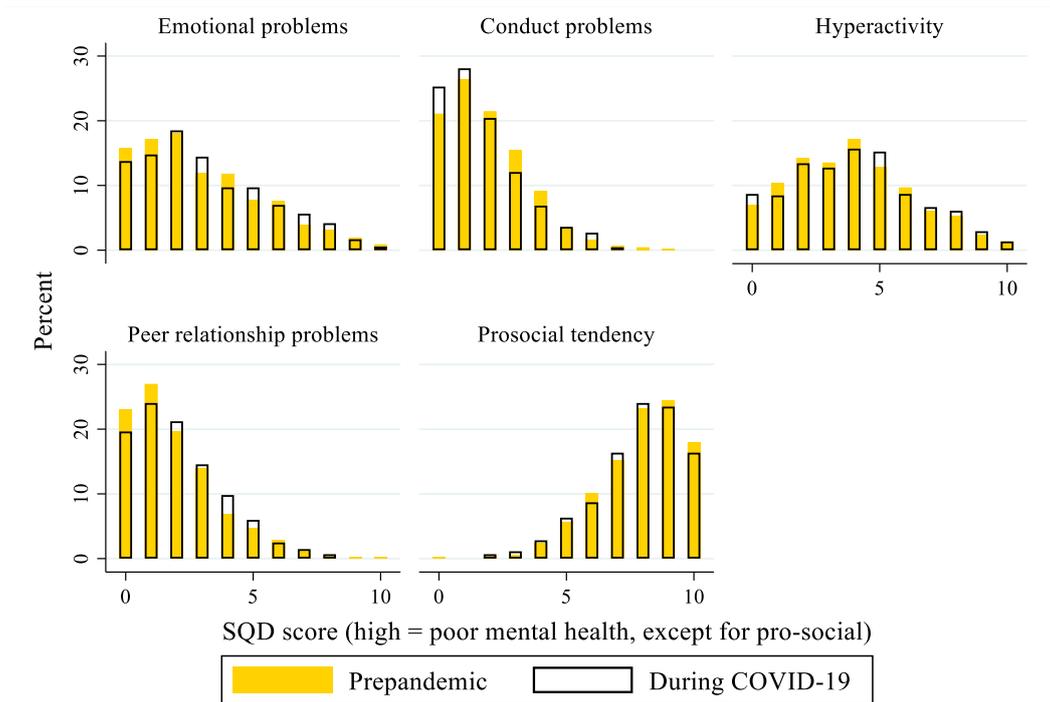
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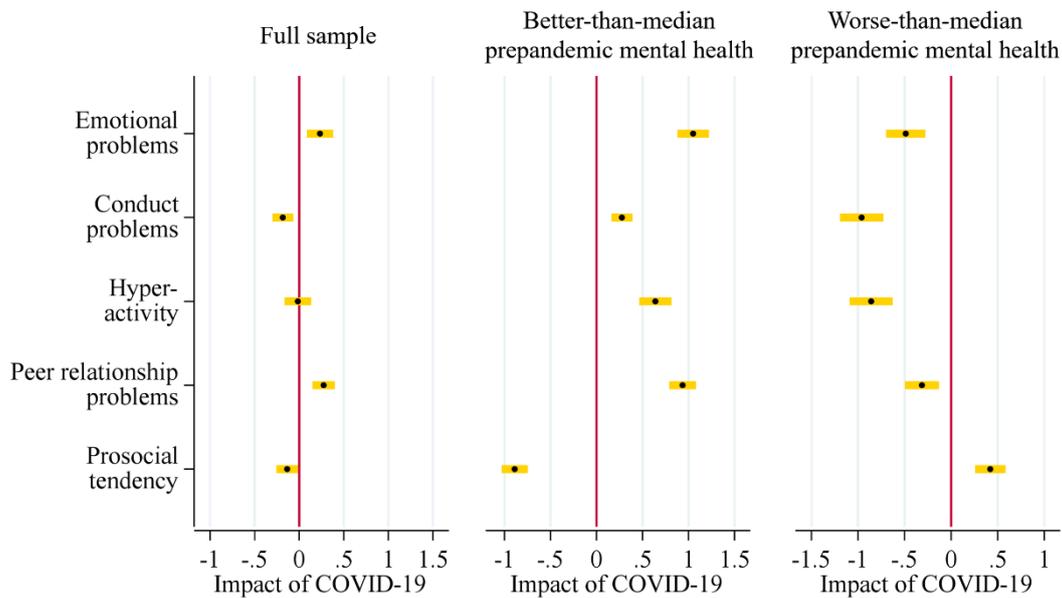
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Figure 1. Histograms of adolescents’ SDQ scores before and during the COVID-19 pandemic.



Note: SDQ = Strengths and Difficulties Questionnaire. $N = 886$ adolescents who were observed twice—before and during the COVID-19 pandemic. For prosocial tendency, a higher score indicates a better state of mental health, which is opposite to the other four SDQ subscales. Unweighted results, as probability weights cannot be applied in histograms.

Figure 2. The impact of the COVID-19 pandemic on adolescents' SDQ scores, estimated using person fixed-effects models.



Note: SDQ = Strengths and Difficulties Questionnaire. Color bands indicate 95% confidence intervals. Better-than-median mental health refers to the lower 50% of SDQ scores for the first four subscales and the higher 50% of scores for the prosocial tendency subscale, and worse-than-median mental health refers to the higher 50% of SDQ scores for the first four subscales and the lower 50% of scores for the prosocial tendency subscale. For prosocial tendency, a higher score indicates a better state of mental health, which is opposite to the other four SDQ subscales. Effects estimated using person fixed-effects models, controlling for within-person time-invariant traits. $N = 886$ adolescents who were observed twice—before and during the COVID-19 pandemic. Weighted statistics with unweighted sample size.

Table 1
Sample characteristics

Variables	Min.	Max.	<i>n</i>	Mean/ Prop.	<i>SD</i>
SDQ before COVID-19 ^a					
Emotion problems	0	10	886	3.22	2.44
Conduct problems	0	9	886	2.12	1.62
Hyperactivity	0	10	886	4.26	2.40
Peer relationship problems	0	10	886	2.02	1.78
Prosocial tendency	0	10	886	7.86	1.68
SDQ during COVID-19 ^b					
Emotion problems	0	10	886	3.45	2.44
Conduct problems	0	9	886	1.94	1.64
Hyperactivity	0	10	886	4.25	2.47
Peer relationship problems	0	9	886	2.30	1.78
Prosocial tendency	0	9	886	7.73	1.72
Age ^b	10	16	886	13.26	1.38
Gender ^a					
Girl	0	1	453	.52	
Boy	0	1	433	.48	
Ethnicity ^a					
White majority	0	1	676	.84	
Ethnic minority	0	1	210	.16	
Other child(ren) under 18 in household ^b					
No	0	1	343	.38	
Yes	0	1	543	.62	
One-parent household ^a					
No	0	1	766	.76	
Yes	0	1	120	.24	
Tertile of parental income ^{a,c}					
Low	0	1	296	.41	
Middle	0	1	295	.32	
High	0	1	295	.27	
COVID-19 symptoms/illness in household April–July 2020 ^b					
No	0	1	783	.87	
Yes	0	1	103	.13	

Note: ^a Measured before the COVID-19 pandemic. ^b Measured during the COVID-19 pandemic. ^c The distribution does not follow three equal groups due to weighting. Min. = Minimum. Max. = Maximum. Prop. = Proportion. *N* = 886 adolescents who were observed twice—before and during the COVID-19 pandemic. *SD* = Standard deviation. SDQ = Strengths and Difficulties Questionnaire. Ref. = reference category. Dummy variables are indicated by a minimum value of 0 and a maximum value of 1. For prosocial tendency, a higher score indicates a better state of mental health, which is opposite to the other four SDQ subscales. Weighted statistics with unweighted sample sizes.

Table 2

Lagged dependent variable regression models estimating changes in SDQ scores before and during the COVID-19 pandemic

Predictors	Model 1	Model 2	Model 3	Model 4	Model 5
	Emotional problems	Conduct problems	Hyperactivity	Peer relationship problems	Prosocial tendency
	<i>B</i> [95% CI]	<i>B</i> [95% CI]	<i>B</i> [95% CI]	<i>B</i> [95% CI]	<i>B</i> [95% CI]
Age	0.02 [-0.09,0.13]	-0.13* [-0.22,-0.03]	0.15* [0.03,0.26]	-0.01 [-0.15,0.14]	0.12* [0.02,0.23]
Boy (ref. = girl)	-0.81*** [-1.14,-0.47]	-0.06 [-0.38,0.26]	0.15 [-0.16,0.47]	-0.07 [-0.38,0.25]	-0.33* [-0.63,-0.03]
Ethnic minority (ref. = white)	-0.28 [-0.64,0.07]	-0.15 [-0.57,0.26]	-0.12 [-0.51,0.26]	-0.27+ [-0.59,0.04]	0.11 [-0.25,0.47]
Other child(ren) in household (ref. = no)	-0.55** [-0.93,-0.17]	-0.12 [-0.45,0.20]	-0.18 [-0.52,0.16]	-0.30* [-0.58,-0.01]	-0.13 [-0.39,0.14]
One-parent household (ref. = no)	0.20 [-0.38,0.78]	0.25 [-0.26,0.75]	0.11 [-0.44,0.65]	0.56* [0.01,1.11]	-0.09 [-0.57,0.40]
Tertile of parental income (ref. = low)					
Middle	-0.06 [-0.56,0.45]	-0.16 [-0.59,0.28]	-0.12 [-0.56,0.32]	-0.24 [-0.70,0.23]	-0.27 [-0.68,0.14]
High	-0.27 [-0.75,0.20]	-0.32+ [-0.70,0.05]	-0.47* [-0.91,-0.04]	-0.33+ [-0.73,0.06]	-0.09 [-0.47,0.29]
COVID symptoms/illness (ref. = no)	-0.10 [-0.55,0.35]	0.11 [-0.44,0.66]	0.19 [-0.29,0.68]	0.99** [0.30,1.69]	-0.25 [-0.66,0.16]
SDQ before COVID-19					
Emotion problems	0.63*** [0.57,0.70]				
Conduct problems		0.57*** [0.44,0.71]			
Hyperactivity			0.59*** [0.53,0.66]		
Peer relationship problems				0.54*** [0.44,0.63]	
Prosocial tendency					0.52*** [0.41,0.64]
Intercept	2.00* [0.46,3.53]	2.58*** [1.13,4.03]	-0.07 [-1.74,1.61]	1.46 [-0.60,3.51]	2.38* [0.28,4.48]
<i>R</i> ²	0.48	0.38	0.41	0.38	0.32

Note: *N* = 886 adolescents who were observed twice—before and during the COVID-19 pandemic. SDQ = Strengths and Difficulties Questionnaire. Dependent variable = SDQ scores during the COVID-19 pandemic. CI = Confidence intervals. Ref. = reference category. For prosocial tendency, a higher score indicates a better state of mental health, which is opposite to the other four SDQ subscales. Weighted statistics with unweighted sample size.

+ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.