

## Mental Health of Children with and without Special Healthcare Needs and of their Caregivers during COVID-19

### Supplementary Material

#### A. Instruments

##### *Strengths and Difficulties Questionnaire (SDQ)*

The Total Difficulties score (values from 0-40) covers four subscales: hyperactivity/inattention, emotional symptoms, conduct problems and peer problems. Higher scores indicate a higher likelihood that a child or adolescent might have a mental disorder. Following the German National Health Interview and Examination Survey for Children and Adolescents (KiGGS) and to allow for comparison with other German studies (1–3), we used a cut-off of 13 on the Total Difficulties Score to group slightly raised and high scores compared to average scores of 0-12 (4). Results of the sensitivity analysis using a cut-off of 14, conforming to the recent four-band categorisation ([www.sdqinfo.org](http://www.sdqinfo.org)), can be found in Supplement Table S1.

#### B. Note on the construction of the SES Index

Household net equivalent income was calculated as the monthly net family income adjusted for household size using a modified scale proposed by the Organisation for Economic Cooperation and Development (OECD, (5)). Weights were assigned to the household head (=1), to household members aged 14 or above (=0.5) and to household members younger than 14 years (=0.3). The monthly net family income was divided by the sum of weights per household. For caregiver education and occupation, the respective higher level of each caregiver was assigned to each household. Each indicator of SES takes values between 1-7 and the final SES index ranges from 3 to 21, with higher values indicating higher SES. It was used both as a continuous and categorical measure. To compare the 20% most disadvantaged and the 20% most advantaged families in the sample, the SES index was divided into quintiles and grouped into three levels: low (quintile 1), middle (quintiles 2-4) and high (quintile 5) SES.

#### C. Hierarchical logistic regression modelling approach

**Block 1** represents associations between parent-reported child mental health problems, disease complexity and SES, which have been widely described:

- child's age
- gender
- socioeconomic status
- disease complexity
- age and gender of parent/caregiver

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**Block 2** represents potential associations between parental wellbeing during the pandemic and child mental health problems:

- Block 1 + WHO-5 score

**Block 3** represents additional COVID-19 related burden for both parents and children:

- Block 2 +
- increase in family conflict
- financial difficulties
- inadequate social support
- area of residence

### D. Additional data on participants excluded from further analysis

N=641 participants met the inclusion criteria, i.e. having a child  $\leq 18$  years and consent to participate. Of those, n=120 were excluded for more than two missing values in the key variables SDQ total score, WHO-5 total score, CSHCN screener score and SES variables (monthly household income, occupation and education).

There is no data available on the sociodemographic characteristics such as age, gender, relationship to the child or household income of those 120 respondents, as none of them completed the relevant section of the questionnaire. However, non-participation was equal among families with and without children with SHCN, with n=54 families with a SHCN child and n=59 families without a child with SHCN among the 120 excluded responses (n=7 missing). The mean age of their children was 7.7 years (SD 3.8), which is only slightly younger than the mean age of the children included in the study (8.4 years).

Among the 120 excluded participants, n=41 discontinued their survey response in the first section on Children with Special Healthcare needs (30 items); n=33 accessed the survey and provided their consent, but did not continue their response after the first 10 items (age and number of children, CSHCN-screener).

Reasons for discontinued participation might be the length of the survey, failure to capture aspects/topics relevant to both families with and without children with SHCN or the wording of the survey questions. Based on the available data we assume that there was no systematic bias due to disease severity among non-respondents, as both families with and without children with SHCN were affected.

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## D. Supplement Tables

**Table S1: Impact of socioeconomic status and psychosocial burden on child mental health problems. Sensitivity analysis for SDQ cut off value  $\geq 14$ .** Hierarchical logistic regression modelling of the outcome SDQ total score  $\geq 14$  in children older than 2 years of age. Adjusted Odds Ratios and the corresponding 95% confidence interval (95% CI) are reported for associations of the outcome and the respective exposure variable. Adjusted Odds Ratios with p-value  $< 0.05$  in bold. **SDQ:** Strengths and Difficulties Questionnaire; **CSHCN:** Children with Special Health Care Needs Screener; **SES-Index:** Index of socioeconomic status.

Variables	Model 1		
	all children (N=427)		
Block 1	OR	95% CI	p
<i>Disease complexity</i>			
No special healthcare needs (referent)			
Chronic condition	1.36	0.64; 2.88	0.42
Complex chronic condition	2.17	1.33; 3.57	0.002
<i>SES-Index</i>			
Low	0.82	0.39; 1.75	0.61
Middle	1.29	0.71; 2.33	0.40
High (referent)			
Age of child	1.12	1.04; 1.21	0.004
<i>Gender of child</i>			
Male (referent)			
Female	0.94	0.60; 1.47	0.79
Age of respondent	0.96	0.92; 1.01	0.08
<i>Gender of respondent</i>			
Male (referent)			
Female	1.49	0.70; 3.17	0.30
<b>Model fit after block 1</b>			
Nagekerke's R <sup>2</sup>	0.07		
Block 2	OR	95% CI	p
WHO-5 Score $\leq 50$	2.24	1.35; 3.71	0.002
<b>Model fit after block 2</b>			
Nagekerke's R <sup>2</sup>	0.16		
$\Delta R^2$	0.09		
Block 3	OR	95% CI	p
Increase in family conflict	3.63	2.26; 5.82	<0.001
Financial difficulties	0.96	0.50; 1.83	0.89
Inadequate social support	2.28	1.44; 3.59	<0.001
<i>Area of residence</i>			
City or suburb (referent)			
Outside a city	1.35	0.86; 2.12	0.20
<b>Model fit after block 3</b>			
Nagekerke's R <sup>2</sup>	0.29		
$\Delta R^2$	0.13		
% correct prediction of SDQ Score $\geq 14$	81.1		

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**Table S2: Correlations (Pearson's correlation coefficients) between WHO-5 and SDQ-subcales (N=445).**

**WHO-5:** WHO-5 Wellbeing Index. **SDQ:** Strengths and Difficulties Questionnaire. \*p-value <0.001.

	WHO-5
Emotional symptoms	-0.304*
Conduct problems	-0.346*
Hyperactivity/inattention	-0.335*
Peer problems	-0.255*
SDQ total score	-0.462*

**Table S3: SDQ score by disease complexity according to CSHCN-Screener (N=450)** Estimation by Pearson's Chi Square Statistics. **df:** degrees of freedom; **SDQ:** Strengths and Difficulties Questionnaire; **CSHCN:** Children with Special Health Care Needs Screener; Analysis restricted to children aged >2 years.

Disease complexity of child	SDQ		Chi <sup>2</sup>	df	p-value
	Score <13 n(%)	Score ≥13 n(%)			
No special healthcare needs (CSHCN= 0)	89 (44.3)	112 (55.7)	21.67	2	<0.001
Chronic disease (CSHCN ≤ 2 criteria)	16 (33.3)	32 (66.7)			
Complex chronic disease (CSHCN ≥ 3 criteria)	45 (22.3)	156 (77.6)			

**Table S4: Stratified analysis of disease complexity by socioeconomic status (N=502)** Estimation by Pearson's Chi Square Statistics. **SES:** socioeconomic status; **df:** degrees of freedom; **CSHCN:** Children with Special Health Care Needs Screener; percentages given as row percentages.

Disease complexity of child	Low SES	Middle SES	High SES	Chi <sup>2</sup>	df	p-value
	n(%)	n(%)	n(%)			
No special healthcare needs (CSHCN= 0)	31 (14.4)	134 (62.0)	51 (23.6)	11.69	4	0.02
Chronic disease (CSHCN ≤ 2 criteria)	10 (19.6)	31 (60.8)	10 (19.6)			
Complex chronic disease (CSHCN ≥ 3 criteria)	61 (26.0)	138 (58.7)	36 (15.3)			

**Table S5: Stratified analysis of perceived pandemic burden by socioeconomic status (N=504).** Unadjusted Odds Ratios (OR) are estimated by logistic regression modelling and reported with the corresponding 95% confidence interval and p-value. **SES:** socioeconomic status.

	Low SES	Middle SES	p-value (reference group: High SES)
	OR (95% CI)	OR (95% CI)	
Increase in family conflict	1.12 (0.68; 1.82)	0.90 (0.58; 1.38)	0.60
Inadequate social support	0.93 (0.57; 1.52)	0.96 (0.62; 1.48)	0.96
Financial difficulties	8.72 (3.75; 20.26)	2.88 (1.24; 6.67)	<0.001

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**References**

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