Well-Being of Children and Adolescents with and without Special Health Care Needs Following the Lifting of Pandemic-Related Restrictions

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Objective To examine the physical, psychological, and social well-being of children with and without special health care needs (SHCN) after pandemic-related restrictions were lifted.

Study design Drawing on three-wave data from the SEROCoV-KIDS prospective, population-based cohort, we performed an outcome-wide, longitudinal analysis to investigate the association of SHCN (none, moderate, or complex needs) at time 1 (September 2022 through February 2023) with physical, psychological, and social well-being (15 outcomes) at time 2 (May through September 2023), adjusting for characteristics and prior outcome values at time 0 (December 2021 through June 2022).

Results Of 1993 participants aged 2 through 17 years, 1533 completed the time 1 questionnaire (median age 10, 49.6% female) with 10.6% having moderate needs, and 3.3% complex needs. Although children with SHCN had not been more often infected with SARS-CoV-2 than healthy children, in 2023, they experienced more severe psychosocial consequences, especially poorer well-being, with a gradient according to the complexity of their needs. Children with moderate needs had more difficulties with physical (adjusted odds ratio 2.84 [95% confidence interval 1.42-5.67]) and social functioning (2.20 [1.33-3.65]) as well as externalizing difficulties (3.68 [1.67-8.11]) compared with their healthy peers but showed similar levels of prosocial behavior or social support. Those with complex needs were particularly at risk of poor physical, psychological, and social well-being.

Conclusions Children and adolescents with SHCN suffered from poor well-being after pandemic-related restrictions were lifted, with no obvious improvement over time. Establishing sustained monitoring and tailored interventions is crucial to improve their persistent suboptimal well-being as we move beyond the pandemic era. *(J Pediatr 2025;281:114528)*.

Children with special health care needs (SHCN) are children who "have or are at increased risk for a chronic physical, developmental, behavioral, or emotional condition and who also require health and related services of a type or amount beyond that required by children generally."[1] The prevalence of SHCN in children and adolescents has risen markedly in recent decades, especially for respiratory and allergic diseases, obesity, and behavioral disorders.[2-8] SHCN interfere with the adequate performance of ordinary role-related activities and require constant readjustment across a broad range of functioning levels.[7,9] Consequently, children and adolescents with SHCN face greater challenges compared with their healthy peers, particularly in terms of mental health issues and diminished quality of life.[5,7,10-12]

CI	Confidence interval
OR	Odds ratio
PedsQL	Pediatric Quality of Life Inventory
SDQ	Strengths and Difficulties Questionnaire
SHCN	Special health care needs
T0	Time 0
T1	Time 1
T2	Time 2

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The COVID-19 pandemic further exacerbated these challenges, due to substantial disruptions in daily routines, family life, schooling, and health care access.[10,13,14] In addition to pre-existing vulnerabilities, children and adolescents with SHCN were at increased risk for both physical COVID-19-related outcomes (hospitalization, death, or long COVID) and psychosocial effects of the pandemic context (stress, anxiety).[5,15-22] However, much of the current evidence is limited by mostly relying on cross-sectional designs, small non-representative samples with a disease-specific approach, and a primary focus on the mental health consequences of lockdowns.[5,13,14,23-27] There is very little information, if any, on the well-being of children and adolescents during later phases of the pandemic, including after all pandemic-related restrictions were lifted. This period is an opportunity to assess how children, including those with pre-existing conditions, adapted and recovered from a global crisis, in order to effectively inform current and future clinical practices and public health policies.[5,28,29]

In this study, we aimed to (1) assess the physical and psychosocial impacts of the pandemic on children and adolescents with and without SHCN, (2) to describe the evolution of their well-being between 2022 and 2023, and (3) to assess their physical, psychological, and social well-being after all pandemic-related restrictions were lifted.

Methods

Study Design and Setting

We used data from the SEROCoV-KIDS prospective cohort study, which aims to evaluate the impact of the COVID-19 pandemic on the health and well-being of children and adolescents (aged 6 months to 17 years at baseline) living in the canton of Geneva, Switzerland.[30] Switzerland and the canton of Geneva faced severe COVID-19 waves, particularly in spring 2020 and late 2020, straining health care systems.[31] Strict COVID-19 measures were imposed in March 2020, including an initial lockdown and school closures until May 2020, gradually easing them as cases subsided and vaccinations rolled out. In later waves, Switzerland avoided prolonged or nationwide lockdowns, focusing instead on vaccinations, mask mandates, remote work, and COVID certificates. By February 2022, most restrictions were lifted, with all remaining measures removed by May 2022.

We recruited a population-based sample by inviting eligible participants who were randomly selected from state registries either specifically for this study or for COVID-19 population-based seroprevalence studies conducted by our group.[31] The registries were provided by the Swiss Federal Office of Statistics or the Cantonal Office for Population and Migration.

The baseline assessment consisted of a serological blood test to measure anti-SARS-CoV-2 antibodies, and the completion of an inclusion questionnaire (time 0 [T0], December 2021-June 2022) by a referent parent (or legal guardian) on behalf of their participating child(ren). Parents also completed an additional questionnaire about themselves and their household. Subsequent questionnaires were administered between September 2022 and February 2023 (time 1 [T1]), and between May and September 2023 (time 2 [T2]) (**Figure 1**). At each assessment, adolescents aged 14 or older also answered their own questionnaire tailored to their age group. A raffle for a small gift (voucher, movie ticket, etc.) was organized after each questionnaire to encourage families to participate. All questionnaires were completed online on the Specchio-Hub digital platform,[32] except for a few participants who preferred a paper-based format.

Ethics

The Geneva Cantonal Commission for Research Ethics approved this study (N° 2021-01973). Adolescents and parents of participants provided electronic or written informed consent. Children gave oral assent to participate.

Study Sample

For this analysis, we included all participants aged 2 through 17 years old at baseline, with a measure of SHCN at T1 (**Figure 1**). We excluded children aged 6-23 months (n = 55) because the scales we used are not validated for this age group.

Measures

We defined the covariates, exposure, and outcomes in their temporal order by leveraging the three-wave panel structure of the data.[33] Further details on definitions and timing of assessments can be found in **eTable 1**; available at www.jpeds.com.

Exposure. We identified the exposure, children and adolescents with SHCN at T1 using the SHCN screener,[34] a five-item parent-reported screening instrument. This screener assesses the need or use of prescription medication; the use or need of above-routine medical, mental health or educational services; limitations in activities compared with similar age children; need or use of specialized therapies; and the need or use of treatment or counseling for emotional, behavioral, or developmental conditions. We only considered needs linked to a health or developmental condition anticipated to last for 12 months or more (**eTable 1**; available at www.jpeds.com). The score ranges from 0 to 5, with higher scores indicating higher complexity (ie, resulting in more healthcare needs and daily life impacts). Our main exposure was categorized into 3 mutually exclusive groups of children and adolescents with no special needs (score = 0), moderate needs (score = 1-2), and complex needs (score = 3-5).[29]

COVID-19 Pandemic Impact. The physical impact of the pandemic was assessed based on positive serological test results (Elecsys; Roche Diagnostics), distinguishing anti-SARS-CoV-2 S antibodies (vaccination and/or infection-induced antibodies) and anti-SARS-CoV-2 N antibodies (infection-induced antibodies).[31] The psychosocial consequences of the pandemic context were measured with

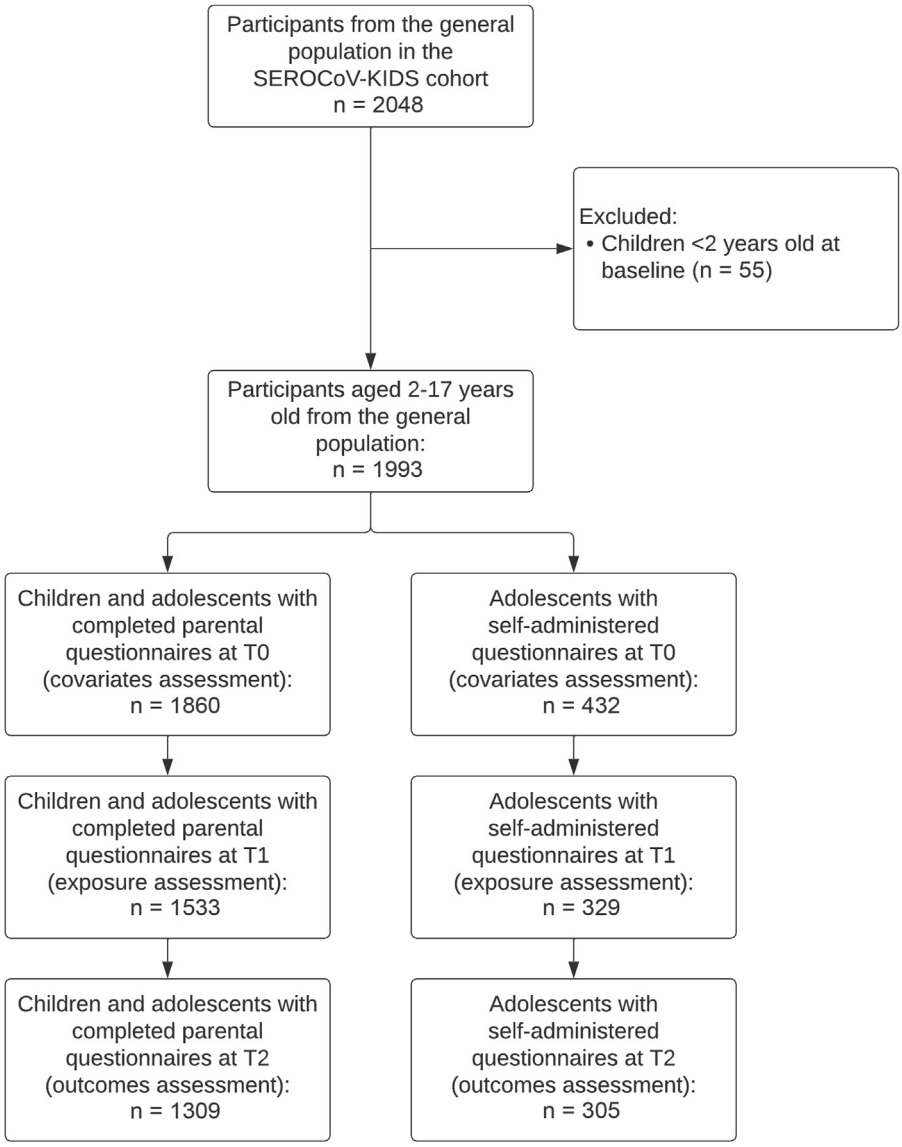

Figure 1. Flow chart. T0: Time 0 - baseline assessment (December 2021-June 2022), T1: Time 1 - first follow-up assessment (September 2022-February 2023), T2: Time 2 – second follow-up assessment (May-September 2023). The population-based sample was recruited from December 2021 to June 2022 by inviting eligible participants who were randomly selected from state registries either specifically for this study or for COVID-19 population-based seroprevalence studies conducted by our group. A clinical sample was also recruited from June to December 2022, using a similar procedure. It included children and adolescents diagnosed with a chronic medical condition who were cared for at the Geneva Children's Hospital in pediatric pneumology, immunology, allergology, gastroenterology, neurology, and rheumatology. This sample was excluded from this analysis due to its nonrandom recruitment.

the Coronavirus Impact Scale (impact subscale with 8 items covering the impact of the pandemic on routine, income, food access, physical and mental health care access, access to social and family support, stress, and family discord, measured at T0)[35] and the COVID-19 Exposure and Family Impact Scales (distress subscale measuring children's and caregiver's distress on a 10-point distress scale, measured at T1) (**eTable 1**; available at www.jpeds.com).[36] A severe pandemic impact was defined as a Coronavirus Impact Scale score higher than 1 SD above the study sample mean. We considered COVID-19 Exposure and Family Impact Scales scores at least 1 SD above the mean as high distress scores.[37]

Outcomes. We selected 15 outcomes that tap into distinct facets of well-being. They were measured at T0 and T2, based on validated scales whenever possible, and parent-reported or adolescent-reported. Outcomes included several dimensions of physical well-being (parent-reported health, physical functioning [Pediatric Quality of Life Inventory -

PedsQL-physical],[38,39] sleep quality, forgoing health care), psychological well-being (emotional functioning [PedsQL-emotional], internalizing difficulties [Strengths and Difficulties Questionnaire - SDQ],[40,41] externalizing difficulties [SDQ], self-esteem in adolescents [Rosenberg Self-esteem Scale],[42] well-being in adolescents [World Health Organization-5 well-being index]),[43] and social well-being (social functioning [PedsQL-social], prosocial behavior [SDQ], school functioning [PedsQL-school], extracurricular activity, quality of child-parent relationship, and perceived social support in adolescents [Multidimensional Scale of Perceived Social Support]).[44] All outcomes were dichotomized using published thresholds corresponding to an impaired well-being (**eTable 1**; available at www.jpeds.com).

Covariates. All covariates were drawn from the questionnaire at T0 and selected based on the literature.[14,45-49] They included age, sex, preterm birth, migrant background, single parenthood, highest educational level in household, household financial situation, parental perceived physical health, and parental perceived mental health (**eTable 1**; available at www.jpeds.com).

Statistical Analysis

Sociodemographic, parental and health characteristics, as well as the measures of pandemic impact and outcomes were described as frequencies and percentages. We estimated the probability of SHCN and severe pandemic impact using marginal prediction after multinomial regression and generalized estimating equations, respectively, adjusting for clustering by household and for age, sex, preterm birth, migrant background, single parenthood, education, financial situation, and parental physical and mental health. Categorical variables were compared across the 3 groups of SHCN using chi-square or Fisher exact tests, as appropriate. Medians of quantitative variables were compared by nonparametric equality-of-medians tests. We also compared the characteristics of responders and nonresponders at T1 and T2, respectively (**eTable 2**; available at www.jpeds.com).

To examine changes in well-being from T0 to T2 and determine if these changes differ across SHCN groups, we plotted and compared outcome frequencies at both time points using weighted paired *t*-tests and stratifying by group. As changes over time may reflect attrition rather than within-individual change, we used inverse probability weighting to take into account loss to follow-up.[50,51] Variables potentially affecting loss to follow-up (parental age, sex, migrant background, education, financial situation, health status, mental health status, single parenthood) were used to estimate the probability of response using multivariable logistic regression, and to define a weight inversely proportional to this probability. Weights were computed at the household level.

In this longitudinal outcome-wide analysis, we used generalized estimating equation with an exchangeable correlation structure and a robust variance to analyze the prospective associations of SHCN with well-being outcomes at T2, adjusting for clustering by household. We did not find any significant interactions between our exposure and all outcomes according to relevant variables (in particular age and sex). We separately examined the association of SHCN with each well-being outcome, controlling for a common set of pre-exposure covariates (previously defined sociodemographic, parental, and health characteristics), as well as pre-exposure values of the outcomes to mitigate the problem of confounding and reverse causality without adjusting for potential mediators.[52] We estimated odds ratios (ORs) and 95% confidence intervals (CIs) for all binary outcomes. We also computed the adjusted proportions of each outcome by SHCN status and age using marginal prediction after each model (**eFigure 1**; available at www.jpeds.com). All analyses were weighted to account for questionnaire nonresponse using the previously described household weights.

Bonferroni correction was applied to account for multiple testing. As recommended, *P* values can be interpreted based on the conventional threshold ($P < .05$) or the Bonferroni-corrected threshold ($P = .05/15$ outcomes $= P < .0033$).[53] When interpreting the results with a public health lens, we put the emphasis on noncorrected *P* values, as the Bonferroni correction is highly conservative when the outcomes are correlated.[54] Finally, we calculated E-values to evaluate potential unmeasured confounding.[52] We assessed the E-values for effect estimates, ie, the minimum strength of association on the OR scale that an unmeasured confounder would need to have with both the exposure and the outcome to fully explain away the observed association, conditional on the measured covariates. In addition, the E-values for the limit of the 95% CI closest to the null denote the minimum strength of association on the OR scale that an unmeasured confounder would need to have with both the exposure and the outcome to shift the CI to include the null value, conditional on the measured covariates. All analyses were conducted in Stata (Version 15.1, STATA Corp. LLC).

Results

Sample Characteristics

Among participants aged 2-17 years at T0, questionnaire completion rates at T0, T1, and T2 were 93.3% (1860/1993), 76.9% (1533/1993), and 65.7% (1309/1993) for parents, and 82.3% (432/525), 62.7% (329/525), and 58.1% (305/525) for adolescents, respectively. Overall, 96.0% (1913/1993) of children and adolescents had at least 1 questionnaire completed (**Figure 1**). At each step, nonrespondents were more likely to be older, non-Swiss, and from families with a single-parent or an average-to-poor financial situation, compared with respondents (**eTable 2**; available at www.jpeds.com). There was no association between the clinical diagnosis of a chronic condition and loss to follow-up.

A total of 1533 participants were included in the analysis (**Table I**). The adjusted probability of SHCN was 13.9%, with 10.6% (95% CI 9.0-12.2) having moderate needs, and 3.3% (95% CI 2.4-4.3) having complex needs. Children and adolescents with complex needs tended to be older,

Table I. Participants' Characteristics at Time 0 by Special Health Care Needs

Characteristics	Special health care needs* None (n = 1320) n (%)	Moderate needs (n = 162) n (%)	Complex needs (n = 51) n (%)	*P* value
Sociodemographic characteristics				
Age at baseline (yrs), median (IQR)	10 (6-13)	10 (8-13)	11 (8-14)	.29
Age at baseline (yrs) (n = 1533)				
2-4	168 (12.7)	10 (6.2)	2 (3.9)	.006
5-9	476 (36.1)	48 (29.6)	20 (39.2)	
10-13	418 (31.7)	67 (41.4)	14 (27.5)	
14-17	258 (19.5)	37 (22.8)	15 (29.4)	
Sex (n = 1533)				.49
Male	661 (50.1)	78 (48.2)	31 (60.8)	
Female	656 (49.7)	84 (51.8)	20 (39.2)	
Other	3 (0.2)	0 (0)	0 (0)	
Migrant background (n = 1533)				.82
Swiss	830 (62.9)	104 (64.2)	34 (66.7)	
Non-Swiss	490 (37.1)	58 (35.8)	17 (33.3)	
Parental characteristics				
Single parenthood (n = 1533)	62 (4.7)	10 (6.2)	9 (17.7)	.000
Highest educational level in household (n = 1533)				.43
Tertiary	1108 (83.9)	130 (80.2)	44 (86.3)	
Mandatory/Secondary	212 (16.1)	32 (19.8)	7 (13.7)	
Household financial situation (n = 1533)				.10
Very good	489 (37.0)	51 (31.5)	16 (31.4)	
Good	553 (41.9)	71 (43.8)	23 (45.1)	
Average to poor	202 (15.3)	36 (22.2)	11 (21.6)	
Do not wish to say	76 (5.8)	4 (2.5)	1 (1.9)	
Perceived physical health (n = 1532)				.007
Very good	627 (47.5)	60 (37.0)	16 (31.4)	
Good	611 (46.3)	85 (52.5)	29 (56.9)	
Average to poor	81 (6.1)	17 (10.5)	6 (11.8)	
Perceived mental health (n = 1532)				.01
Very good	463 (35.1)	42 (25.9)	11 (21.6)	
Good	702 (53.2)	97 (59.9)	28 (54.9)	
Average to poor	154 (11.7)	23 (14.2)	12 (23.5)	
Children's health history				
Preterm birth (n = 1532)	96 (7.3)	16 (9.9)	3 (5.9)	.49
Any diagnosed chronic condition (n = 1532)				<.000
None	815 (61.8)	47 (29.0)	9 (17.6)	
Any physical condition†	413 (31.3)	69 (42.0)	10 (19.6)	
Any mental condition	44 (3.3)	24 (14.8)	13 (25.5)	
Both	47 (3.6)	23 (14.2)	19 (37.3)	

*Special health care needs were categorized into 3 mutually exclusive groups of healthy children with no special needs (score = 0), children with moderate needs (score = 1-2) and children with complex needs (score = 3-5).
†Including allergies.

more often lived in single-parent households than their counterparts, and less often had parents with a very good physical or mental health. There were no significant differences in sex, migrant background, or history of preterm birth by SHCN. Participants with SHCN at T1 were more likely to have been reported by their parents as having been diagnosed with a physical or mental chronic condition at T0. Some of the most frequent diagnoses were allergies to common pneumoallergens (19.6%), dermatological problems such as eczema (7.6%), asthma (5.3%), learning disabilities (4.4%), and obesity (3.3%).

Pandemic Impact

Most participants had developed anti-S and anti-N SARS-CoV-2 antibodies, with no difference by SHCN. The overall adjusted probability of a severe impact of the pandemic was predicted to be 11.4% (95% CI 9.6-13.2), ranging between 10.2% (8.4-12.1) among children and adolescents with no SHCN, 18.2% (12.4-24.1) among those with moderate needs, and 20.7% (12.2-29.2) among those with complex needs (Table II). Pandemic-related distress scores among children followed the same pattern. We observed no difference in parents' distress scores between the 3 groups.

Evolution of Well-Being by Special Health Care Needs

All well-being dimensions were measured both at T0 and T2, at a 16-month interval (mean: 67 weeks; SD: 13). We observed clear differences in the well-being of children and adolescents by SHCN status (Figure 2). At both measurement points, children and adolescents with SHCN had poorer outcomes for almost all domains assessed, with a gradient according to the complexity of their needs. Between 2022 and 2023, all 3 groups experienced an

Table II. Physical and Psychosocial Impact of the Pandemic by Special Health Care Needs

Physical and psychosocial impact of the pandemic	Special health care needs: None (n = 1320) n (%) or % [95%CI]	Moderate needs (n = 162) n (%) or % [95%CI]	Complex needs (n = 51) n (%) or % [95%CI]	*P* value
Physical pandemic impact				
Positive serology (anti-SARS-CoV-2 S antibodies) (n = 1434)	983/1235 (79.6)	122/150 (81.3)	42/49 (85.7)	.52
Positive serology (anti-SARS-CoV-2 N antibodies) (n = 1423)	828/1226 (67.5)	95/148 (64.2)	36/49 (73.5)	.47
Psychosocial pandemic impact				
Severe pandemic impact (n = 1532)	128/1319 (9.7)	36/162 (22.2)	10/51 (19.6)	<.000
Predicted probability of severe pandemic impact* (n = 1528)	10.2 [8.4-12.1]	18.2 [12.4-24.1]	20.7 [12.2-29.2]	
High distress score among children (n = 1523)	249/1310 (19.0)	48/162 (29.6)	17/51 (33.3)	.001
Predicted probability of high distress score among children* (n = 1521)	18.9 [16.5-21.3]	29.8 [23.4-36.2]	35.9 [23.1-48.7]	
High distress score among parents (n = 1497)	255/1290 (19.8)	40/159 (25.2)	11/48 (22.9)	.26
Predicted probability of high distress score among parents* (n = 1495)	20.1 [17.6-22.6]	24.4 [20.5-28.3]	24.4 [20.4-28.5]	

*Margins command, after adjusting a generalized estimating equation model for all confounders considered in the main models: special health care needs, age, sex, preterm birth, migrant background, single parenthood, highest educational level in the household, household financial situation, parental physical health, parental mental health.

increase in poor emotional and social functioning, and low social support, but the changes were more pronounced in children and adolescents with complex needs. In adolescents without SHCN, poor well-being increased while the quality of the child-parent relationship improved. Conversely, poor well-being decreased in adolescents with moderate needs.

Association of Special Health Care Needs with Well-Being at T2

After adjusting for sociodemographic, parental, and health characteristics, having moderate needs was associated with higher odds of poor physical (aOR 2.84 [95% CI 1.42-5.67]), emotional (1.72 [1.18-2.53]) and social functioning (2.20 [1.33-3.65]), and externalizing difficulties (3.68 [1.67-8.11]) at T2 (**Figure 3**). Having complex needs was strongly associated with higher odds of poor parent-reported health, poor physical (5.65 [1.95-16.39]) and emotional functioning (5.07 [2.45-10.47]), externalizing difficulties (8.82 [3.08-25.22]) and poor child-parent relationship (3.05 [1.54-6.04]). All these associations hold after Bonferroni correction. We also found modest evidence for the associations between complex needs and higher odds of internalizing difficulties (3.30 [1.18-9.20]), poor social (3.02 [1.14-7.98]) and school functioning (2.70 [1.26-5.78]), and poor well-being (among adolescents); however, these additional associations did not reach significance after accounting for multiple testing. Children and adolescents with moderate needs exhibited similar levels of prosocial behavior, social support, forgoing health care, and participation in extracurricular activities as their healthy peers. E-values suggest that most associations were robust to unmeasured confounding.

Discussion

In this population-based study, 1 in 7 children and adolescents had SHCN. Although children and adolescents with SHCN had not been more often infected with SARS-CoV-2 than healthy children and adolescents, they did experience a more severe psychosocial impact during the pandemic. At both measurement points, well-being was notably poorer among children and adolescents with SHCN, with a gradient according to the complexity of their needs. Children and adolescents with moderate needs had more difficulties with physical and social functioning and externalizing difficulties than their healthy peers, but showed similar levels of prosocial behavior, social support, and participation in extracurricular activities. Those with complex chronic conditions were particularly at risk of poor physical, psychological, and social well-being. Between 2022 and 2023, after all pandemic-related restrictions were lifted, only a few well-being dimensions improved and a number of others worsened.

The prevalence of SHCN was in line with published estimates using the same definition, ranging between 12% and 19% for the population aged 18 and under.[12,55-59] In line with previous seroprevalence studies, we confirmed that in 2022 most children and adolescents had been infected with the SARS-CoV-2 virus, regardless of their health status.[31] With the benefit of 2 years' hindsight, we confirmed that families of children and adolescents with SHCN more frequently perceived the overall psychosocial impact of the pandemic as severe. These findings underscore the importance of paying even greater attention to children and adolescents with health issues, a sizable population that was already more vulnerable before the pandemic and experienced a greater impact.

This study enhances our scientific understanding of the physical, psychological, and social well-being of children and adolescents with and without SHCN following the lifting of pandemic-related restrictions. This is particularly significant given the lack of prospective, longitudinal research in this area. Psychological well-being and quality of life in all its intertwined dimensions were particularly poorer in children and adolescents with SHCN, aligning with findings commonly reported in prepandemic literature.[7,11,47,60,61] Although childhood and adolescence are periods of life characterized by high sensitivity to social stimuli and need for peer interaction,[10] chronic conditions limit age-appropriate

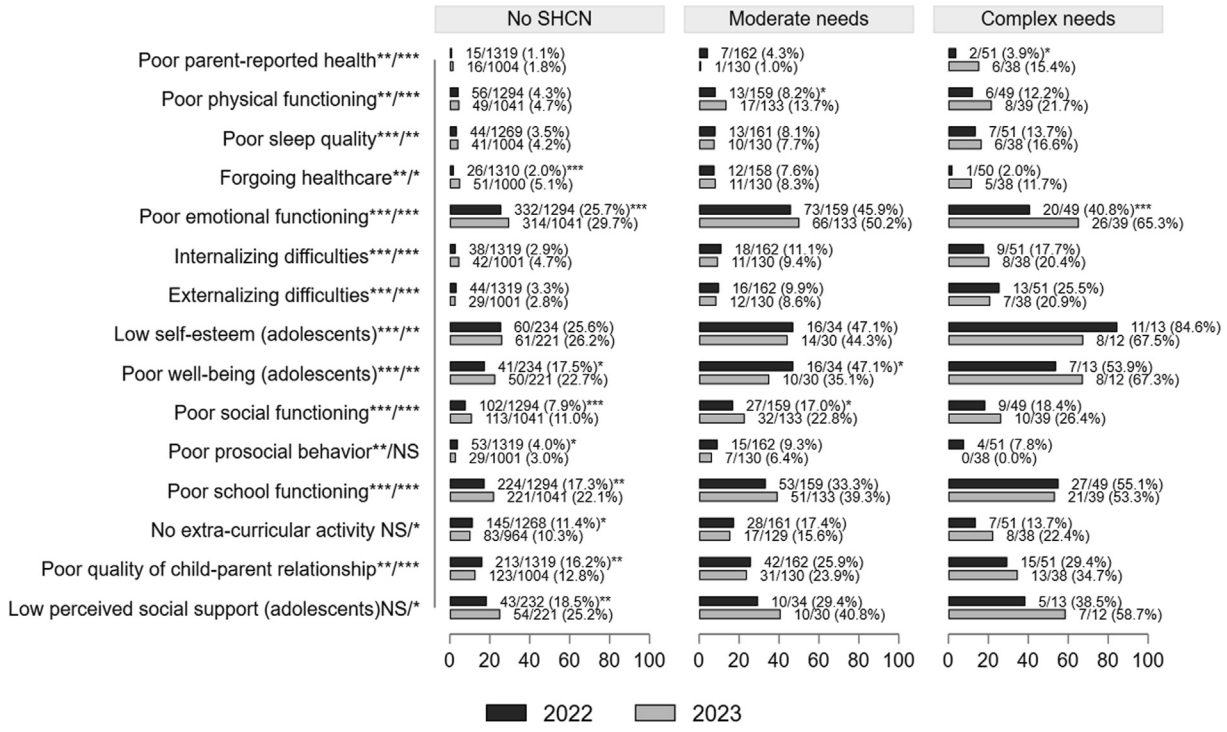

Figure 2. Physical, psychological, and social wellbeing at time 0 and time 2 by special health care needs. Sleep quality and extracurricular activity are presented among children aged 3 and older at baseline. Data are presented as n/N, observed percentage of children and adolescents presenting each outcome at T0 (black). Data are presented as n/N, weighted percentages that take into account loss to follow-up at T2 (grey). Symbols placed after the outcome name refer to the comparison of outcome frequency across the 3 groups at T0/at T2, respectively. Symbols placed in the graph after the brackets refer to the evolution of outcome frequency from T0 to T2. NS: *P* value ≥ .05 * *P* value < .05, ** *P* value < .01, *** *P* value < .001.

functioning, activities, and social roles.[47] Physical symptoms, cognitive or behavioral difficulties, and disease management can disrupt daily life, including regular school attendance and functioning, participation in positive activities and peer relationships, potentially fostering feelings of frustration, isolation, and peer rejection.[57,62] Factors like lack of control over the disease, frightening symptoms, or inappropriate parental behaviors (ranging from excessive protectiveness to rejection) can further negatively impact psychological well-being.[11,63] Conversely, forgoing health care was low, which suggests that clinical needs were met. This could be a positive consequence of the health care services organization, the mandatory health insurance system in Switzerland, or be related to the quite high levels of education and income in our sample.[59,64]

Although we observed consistent trends across outcomes in children and adolescents with complex needs, not surprisingly results were more mixed in those with moderate needs. This could be related to less demanding management of their condition, or an easier mobilization of resources to cope with difficult circumstances, such as social support, as children and adolescents with moderate needs were very similar to healthy children in terms of prosocial behavior and social support.[65] Promoting social interactions and participation could therefore be a focus of public health interventions at the individual, interpersonal, and community levels.[7,66]

Several hypotheses can be considered when interpreting the evolution of well-being over time. At the start of the study, few restrictions directly affected children, which may explain the absence of a clear improvement in well-being after the lifting of restrictions. Alternatively, this may reflect a more persistent impact of the pandemic, particularly among children with complex SHCN. The complexity of the needs themselves may also outweigh any potential benefits from the lifting of restrictions. In addition, the observed changes might partly reflect pre-existing trends in poor mental health in this population,[67] and/or age-related development, as children naturally experience evolutions in well-being as they grow. Overall, these findings highlight the need for long-term postpandemic monitoring, especially for children and adolescents with SHCN.

Since many health conditions and behavioral problems in childhood and adolescence are difficult to prevent through lifestyle changes and often cannot be cured,[5] health care professionals must focus on mitigating their adverse consequences on the lives of young patients. Although it remains challenging to disentangle the respective contributions of pandemic, age, and SHCN on well-being, the priority should shift towards improving the well-being of children and adolescents. As the psychosocial consequences of SHCN are substantial and potentially long-lasting, we recommend pediatricians and physicians to perform routine screening

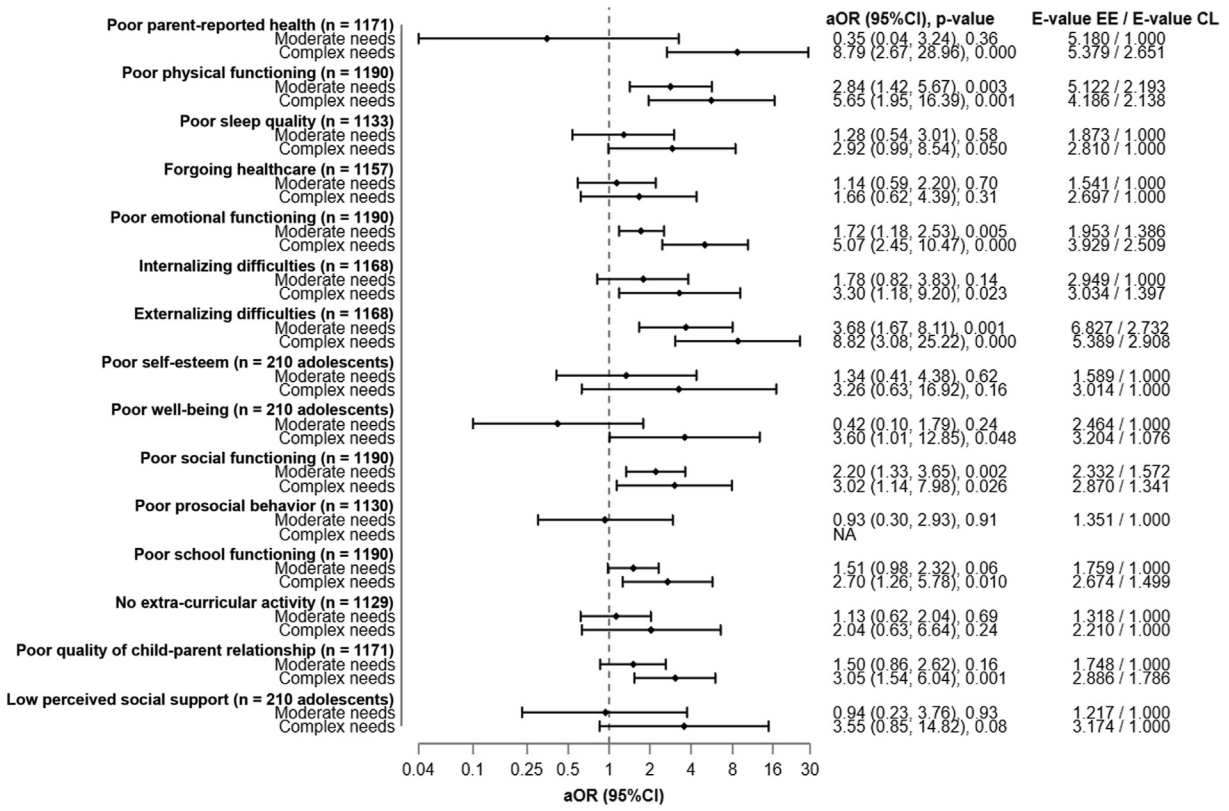

Figure 3. Association of special health care needs at T1 (reference: healthy children) and well-being outcomes at T2, and robustness to unmeasured confounding. Legend: *E-value EE*, E-value for effect estimate; *E-value CL*, E-value for confident interval limit; *NA*, not applicable. T0: baseline assessment (December 2021-June 2022), T1: first follow-up assessment (September 2022-February 2023), T2: second follow-up assessment (May 2023-September 2023). All models were adjusted for age, sex, preterm birth (except for the model whose outcome was poor parent-reported health, due to collinearity), migrant background, single parenthood, highest educational level in the household, household financial situation, parental health, and parental mental health; and were weighted to account for questionnaire nonresponse. Sleep quality and extracurricular activity are presented among children aged 3 and older at baseline. *P* values can be interpreted as crude or after Bonferroni correction (cutoff: $P = .05/15$ outcomes $= P < .0033$). E-values for effect estimates are the minimum strength of association on the OR scale that an unmeasured confounder would need to have with both the exposure and the outcome, above and beyond the measured covariates, to fully explain away the observed associations of SHCN with the outcomes. E-values for the 95% confident interval limit closest to the null denote the minimum strength of association on the OR scale that an unmeasured confounder would need to have with both the exposure and the outcome, above and beyond the measured covariates, to shift the 95% confident interval to include the null value.

of the quality of life among all children and adolescents with SHCN to target those who would benefit most from prevention and early interventions.

Strengths of this study include the large population-based sample covering 2- to 17-year-old children, and longitudinal assessment with 3 timepoints. We identified children and adolescents with SHCN and the complexity of their needs using a non-condition-specific, population-based tool based on a broad and inclusive definition that addresses many of the limits of diagnosis checklists and enables international comparisons.[56,68] The outcome-wide approach is rarely used in pediatric research, despite its advantages in drawing a comprehensive portrait of the holistic health and well-being of children. Limitations lie in relatively short intervals between repeated assessments, the lack of prepandemic data, attrition over time (compensated for by inverse probability weighting), and lack of power in the adolescent subgroup. Despite adjusting for a rich set of covariates, including prior levels of outcomes, we cannot exclude the possibility of unmeasured confounding. The E-values do, however, suggest strong evidence for some outcomes.

In conclusion, a significant proportion of children and adolescents with SHCN experienced poor well-being after the lifting of pandemic-related restrictions, particularly in terms of quality of life and externalizing difficulties, with no obvious improvement over time. These results demonstrate the need for long-term monitoring of postpandemic well-being and targeted interventions. By prioritizing these efforts, we can strive towards fostering healthier and more resilient futures for our youth, transcending the obstacles posed by the pandemic and existing health conditions. ■

CRediT authorship contribution statement

Elsa Lorthe: Writing – original draft, Visualization, Methodology, Investigation, Funding acquisition, Formal analysis, Conceptualization. **Roxane Dumont:** Writing – review & editing, Methodology, Investigation, Data curation. **Viviane Richard:** Writing – review & editing, Methodology, Investigation, Data curation. **Andrea Loizeau:** Writing – review & editing, Project administration, Investigation, Funding acquisition. **Géraldine Blanchard-Rohner:** Writing – review & editing, Investigation. **Stephanie Schrempft:** Writing – review & editing, Validation, Investigation. **Hélène Baysson:** Writing – review & editing, Validation, Investigation. **Maria-Eugenia Zaballa:** Writing – review & editing, Validation, Investigation. **Julien Lamour:** Writing – review & editing, Validation, Data curation. **Philippe Eigenmann:** Writing – review & editing, Investigation. **Stéphanie Garcia-Tarodo:** Writing – review & editing, Investigation. **Manel Mejbri:** Writing – review & editing, Investigation. **Nathalie Rock:** Writing – review & editing, Investigation. **Isabelle Ruchonnet-Métrailler:** Writing – review & editing, Investigation. **Mayssam Nehme:** Writing – review & editing, Supervision. **Rémy P. Barbe:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization. **Klara M. Posfay-Barbe:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization. **Idris Guessous:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization. **Silvia Stringhini:** Writing – review & editing, Supervision, Project administration, Funding acquisition, Conceptualization.

Declaration of Competing Interest

Klara M. Posfay-Barbe is a member of the Advisory Boards for pneumococcal vaccine and varicella vaccine at MSD. The other authors have no relevant financial or non-financial interests to disclose.

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Declaration of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this work the authors used ChatGPT to improve readability and language. After using this tool, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

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