

Impact of the COVID-19 pandemic on children and adolescents: determinants and association with quality of life and mental health - a cross-sectional study

Child and Adolescent Psychiatry and Mental Health - Supplementary material

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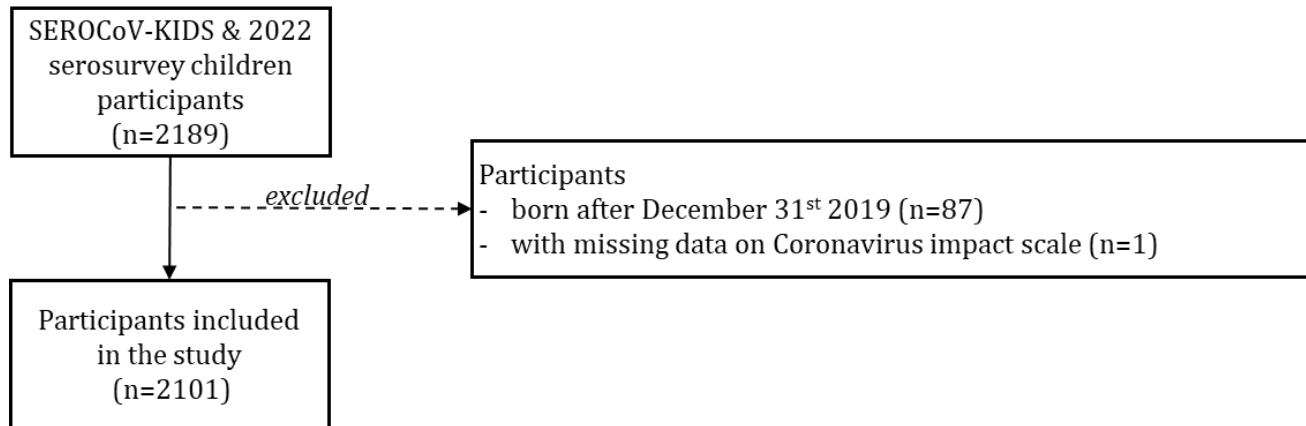


Figure S1. Flow chart of the study participants



Figure S2. Directed acyclic graph of the potential determinants of the COVID-19 pandemic impact. Age and sex were deemed covariates for all other variables (see Methods); arrows are not drawn for readability purpose.

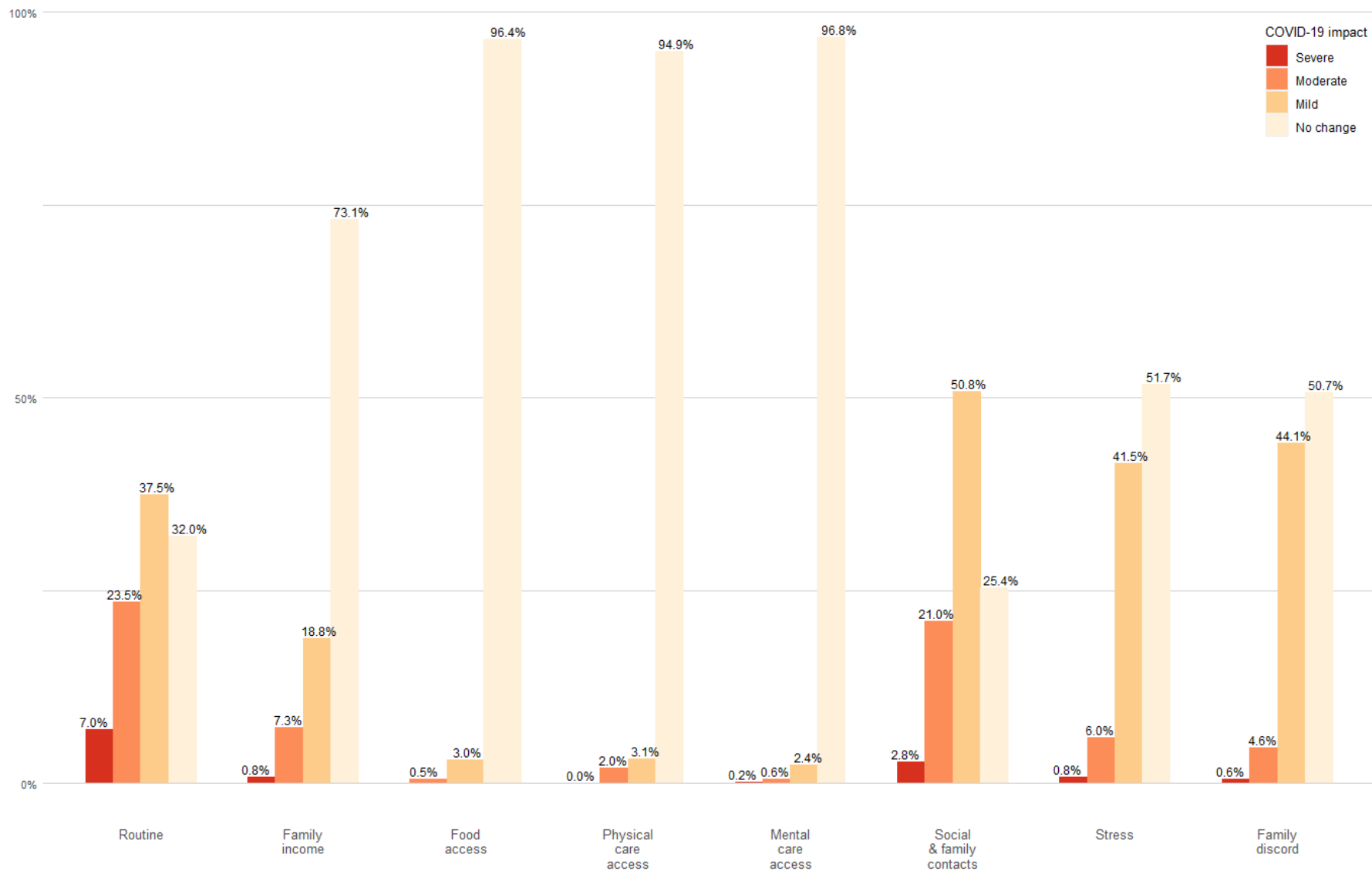


Figure S3. Individual item responses to the Coronavirus Impact scale. Parents reported on behalf of their children how each domain had been impacted by the COVID-19 pandemic, n=2101.

Table S1. Physical and mental health condition distribution in the sample as reported by parents (n=2101)

Physical disease or condition	n	%	Mental behavioural and neurodevelopmental disorder	n	%
No physical disease or condition	1797	85.5	No mental disease or disorder	1913	91.1
Chromosomal abnormality	4	0.2	Developmental delay	8	0.4
Asthma	84	4.0	Anxiety disorder	24	1.1
Other lung disease	9	0.4	Learning disability	83	4.0
Diabetes	2	0.1	Attention deficit hyperactivity disorder	75	3.6
Other endocrine disease	8	0.4	Autism spectrum disorder	15	0.7
Epilepsy	4	0.2	Eating disorder	11	0.5
Heavy or frequent headache, migraine	42	2.0	Mood disorder	9	0.4
Physical disability	6	0.3	Gender identity disorder	1	0.0
Haematological disease	8	0.4	Obsessive-compulsive disorder	2	0.1
Rheumatic disease	4	0.2	Other mental disease or disorder	19	0.9
Disease or malformation of the skeleton, joints, or muscles	24	1.1			
Inflammatory bowel disease	4	0.2			
Other bowel disease	6	0.3			
Gastroesophageal reflux	11	0.5			
Overweight or obesity	20	1.0			
Hearing problem	15	0.7			
Heart disease or malformation	13	0.6			
Renal or genitourinary disease or malformation	13	0.6			
Immune disorder	5	0.2			
Other physical disease or condition	66	3.1			

Results are numbers (n) and percentages (%) of children and adolescents with physical or mental health condition. Parents could report more than one condition and thus percentages do not add up to 100%.

Table S2. Outcomes comparison according to recruitment period (n=2101)

	Before measures lifting	After measures lifting	
	Median (IQR)	Median (IQR)	P-value
Coronavirus impact score	3.0 (2.0 - 5.0)	3.0 (2.0 - 5.0)	1.000
Health-related quality of life (PedsQL total score)	86.7 (77.1 - 95.0)	86.7 (75.0 - 93.3)	0.057
Mental health (SDQ total score)	6.0 (3.0 - 10.0)	6.0 (4.0 - 10.0)	0.021

Results are median (interval interquartile) and p-values are from Kruskal-Wallis test adjusted for multiple comparison with the Bonferroni method. COVID-19-related sanitary measures were lifted on February 3rd 2022 in Switzerland.

Table S3. Determinants of a severe COVID-19 pandemic impact score among children and adolescents. Sensitivity analyses with data imputation and severe impact definition.

	Level	Severe pandemic impact defined as > mean + SD		Severe pandemic impact defined as highest tertile	
		Complete case analyses (n=2043)	Analyses with imputed data ^a (n=2098)	Complete case analyses (n=2043)	Analyses with imputed data ^a (n=2098)
		aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
Age	Years	1.03 (0.99 - 1.06)	-	1.03 (1.00 - 1.06)	-
Sex ^b (ref. female)	Male	0.92 (0.71 - 1.19)	-	0.94 (0.76 - 1.15)	-
Health condition (ref. no)	Yes	1.85 (1.38 - 2.48)	1.88 (1.41 - 2.50)	1.92 (1.51 - 2.45)	1.96 (1.55 - 2.48)
Anti-SARS-CoV-2 serological status ^c (ref. negative)	Positive	0.91 (0.69 - 1.22)	0.90 (0.68 - 1.20)	1.05 (0.83 - 1.33)	1.01 (0.80 - 1.27)
	Undetermined	0.42 (0.06 - 3.01)	0.39 (0.05 - 2.96)	0.83 (0.25 - 2.75)	0.75 (0.22 - 2.51)
Friends (ref. several)	One	1.87 (1.33 - 2.62)	-	1.55 (1.17 - 2.06)	-
	None	3.22 (1.76 - 5.90)	-	2.39 (1.37 - 4.15)	-
	Unknown / na	1.49 (0.89 - 2.48)	-	1.40 (0.95 - 2.08)	-
Change in physical activity ^{d,e} (ref. similar or increase)	Decrease	3.86 (2.85 - 5.23)	-	4.11 (3.17 - 5.34)	-
	Unknown / na	1.61 (1.03 - 2.50)	-	1.74 (1.23 - 2.45)	-
Change in leisure screen time ^{d,e} (ref. similar or decrease)	Increase	1.98 (1.48 - 2.64)	1.98 (1.48 - 2.64)	2.27 (1.79 - 2.87)	2.29 (1.81 - 2.89)
	Unknown / na	0.78 (0.42 - 1.47)	0.87 (0.48 - 1.57)	1.14 (0.73 - 1.78)	1.21 (0.78 - 1.86)
Change in time spent with parent ^d (ref. similar)	Increase	2.08 (1.54 - 2.80)	-	2.13 (1.69 - 2.69)	-
	Decrease	6.48 (4.08 - 10.28)	-	5.35 (3.45 - 8.31)	-
	Unknown	6.58 (3.57 - 12.10)	-	5.04 (2.83 - 8.97)	-
Parent-child relationship (ref. good)	Rather good	1.85 (1.34 - 2.57)	1.89 (1.38 - 2.59)	1.79 (1.38 - 2.34)	1.82 (1.40 - 2.36)
	Average-to-poor	4.64 (2.26 - 9.52)	4.24 (2.10 - 8.53)	5.66 (2.78 - 11.53)	5.56 (2.79 - 11.07)
Parent mood (ref. good)	Average-to-poor	2.98 (2.16 - 4.10)	2.86 (2.09 - 3.93)	2.38 (1.79 - 3.18)	2.28 (1.72 - 3.03)
Household financial situation (ref. very good)	Good	1.76 (1.23 - 2.50)	1.79 (1.27 - 2.54)	1.69 (1.29 - 2.21)	1.74 (1.33 - 2.26)
	Average-to-poor	4.63 (3.18 - 6.75)	4.73 (3.26 - 6.87)	3.22 (2.37 - 4.39)	3.28 (2.42 - 4.45)
	No answer	1.24 (0.64 - 2.39)	1.30 (0.69 - 2.46)	1.15 (0.69 - 1.90)	1.17 (0.71 - 1.91)

Results are adjusted odds ratios (aOR) with 95% confidence intervals (95% CI) from generalized estimating equations taking the household clustering into account, adjusted for age and sex. Model for parent mood adjusted for age, sex, health condition and financial situation; model for parent-child relationship adjusted for age, sex and parent mood. Not applicable (na) if stated so by parents or if the child was younger than 6 years at questionnaire completion for friends, than 1 year at pandemic onset for leisure screen time change or than 2 years at pandemic onset for physical activity change. ^a Missing data imputed using chained equations, see methods. ^b The sex category "Other" was not included because of too small number of observations. ^c Complete case analysis based on participants with available anti-SARS-CoV-2 serology (N=1966). ^d participant-reported change as a result of the COVID-19 pandemic. ^e Similar level and increase in physical activity as well as similar level and decrease in screen time are grouped. When analyzed separately; coefficients were of comparable magnitude.

Table S4. Association between having been severely impacted by the pandemic and health-related quality of life (HRQoL) or mental health of children and adolescents. Sensitivity analyses with data imputation and severe impact definition.

Severe pandemic impact score on:	Severe pandemic impact defined as > mean + SD		Severe pandemic impact defined as highest tertile	
	Complete case analyses (n=2043)	Analyses with imputed data (n=2098)	Complete case analyses (n=2043)	Analyses with imputed data (n=2098)
	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
Poor overall HRQoL	3.14 (2.26 - 4.35)	3.12 (2.25 - 4.32)	2.44 (1.82 - 3.27)	2.43 (1.82 - 3.26)
Poor psychosocial HRQoL	3.20 (2.40 - 4.25)	3.07 (2.30 - 4.09)	2.65 (2.07 - 3.40)	2.57 (2.00 - 3.29)
Poor physical HRQoL	2.06 (1.33 - 3.20)	2.14 (1.38 - 3.31)	1.59 (1.08 - 2.32)	1.63 (1.11 - 2.38)
Poor overall mental health	3.93 (2.49 - 6.20)	3.72 (2.38 - 5.83)	3.56 (2.32 - 5.46)	3.62 (2.38 - 5.51)
Internalizing problems	4.16 (2.64 - 6.56)	4.15 (2.63 - 6.55)	3.85 (2.47 - 6.00)	3.98 (2.59 - 6.13)
Externalizing problems	2.36 (1.40 - 3.97)	2.38 (1.44 - 3.94)	2.62 (1.67 - 4.13)	2.66 (1.71 - 4.14)

Results are adjusted odds ratios (aOR) with 95% confidence intervals (95% CI) from generalized estimating equations taking the household clustering into account and adjusted for age, sex and health condition. Missing data on HRQoL and mental health imputed using chained equations (see methods).

Table S5. Association between having been severely impacted by the pandemic and health-related quality of life (HRQoL) or mental health of children and adolescents, stratified by sex

Severe pandemic impact score on:	Girls (n=1013)	Boys (n=1030)
	aOR (95% CI)	aOR (95% CI)
Poor overall HRQoL	3.56 (2.33 - 5.43)	2.81 (1.71 - 4.61)
Poor psychosocial HRQoL	3.12 (2.10 - 4.65)	3.29 (2.19 - 4.92)
Poor physical HRQoL	1.95 (1.05 - 3.63)	2.00 (1.00 - 3.99)
Poor overall mental health	3.96 (1.97 - 7.96)	3.95 (2.15 - 7.26)
Internalizing problems	4.58 (2.55 - 8.25)	2.98 (1.14 - 7.78)
Externalizing problems	1.24 (0.41 - 3.70)	3.14 (1.70 - 5.80)

Results are adjusted odds ratios (aOR) with 95% confidence intervals (95% CI) from generalized estimating equations taking the household clustering into account and adjusted for age, sex and health condition. Severe pandemic impact defined as a score > mean + 1SD.

Table S6. Association between the COVID-19 pandemic impact score and the health-related quality of life of children of adolescents according to different adjustment strategies (n=2043)

		Demographic	Demographic + Health	Demographic + Health + Lifestyle	Demographic + Health + Family	Demographic + Health + Lifestyle + Family
		aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
Severe pandemic impact (ref. none or mild)	Severe	3.32 (2.40 - 4.59)	3.14 (2.26 - 4.35)	2.64 (1.89 - 3.69)	2.00 (1.40 - 2.85)	1.80 (1.25 - 2.58)
Age	Years	1.13 (1.09 - 1.17)	1.12 (1.08 - 1.16)	1.12 (1.06 - 1.18)	1.11 (1.07 - 1.16)	1.12 (1.06 - 1.18)
Sex ^a (ref. female)	Male	0.76 (0.58 - 1.00)	0.76 (0.57 - 1.00)	0.75 (0.57 - 1.00)	0.76 (0.57 - 1.01)	0.75 (0.56 - 1.01)
Health condition (ref. no)	Yes		1.70 (1.25 - 2.30)	1.61 (1.18 - 2.20)	1.55 (1.13 - 2.14)	1.51 (1.09 - 2.08)
Friends (ref. several)	One			1.57 (1.10 - 2.23)		1.39 (0.96 - 2.01)
	None			2.43 (1.22 - 4.85)		2.05 (1.02 - 4.09)
	Unknown / na			1.49 (0.77 - 2.87)		1.50 (0.77 - 2.93)
Change in physical activity time (ref. similar or increase)	Decrease			1.23 (0.86 - 1.74)		1.13 (0.78 - 1.64)
	Unknown / na			0.92 (0.52 - 1.62)		0.84 (0.47 - 1.51)
Change in leisure screen time (ref. similar or decrease)	Increase			1.43 (1.05 - 1.97)		1.41 (1.01 - 1.95)
	Unknown / na			1.15 (0.61 - 2.18)		1.16 (0.60 - 2.24)
Change in time spent with parent (ref. similar)	Increase				1.05 (0.75 - 1.46)	0.99 (0.70 - 1.40)
	Decrease				2.10 (1.22 - 3.62)	1.85 (1.09 - 3.15)
	Unknown				1.35 (0.65 - 2.82)	1.27 (0.60 - 2.68)
Parent-child relationship (ref. good)	Rather good				1.88 (1.33 - 2.66)	1.81 (1.28 - 2.58)
	Average-to-poor				2.78 (1.48 - 5.25)	2.78 (1.45 - 5.34)
Parent mood (ref. good)	Average-to-poor				1.66 (1.11 - 2.47)	1.67 (1.12 - 2.50)
Household financial situation (ref. very good)	Good				1.70 (1.17 - 2.47)	1.67 (1.15 - 2.43)
	Average-to-poor				2.29 (1.50 - 3.50)	2.20 (1.43 - 3.38)
	No answer				1.72 (0.89 - 3.29)	1.75 (0.93 - 3.31)

Results are adjusted odds ratios (aOR) with 95% confidence intervals (95% CI) from generalized estimating equations taking the household clustering into account. Severe pandemic impact defined as a score > mean + 1SD. Not applicable (na) if stated so by parents or if the child was younger than 6 years at questionnaire completion for friends, than 1 year at pandemic onset for leisure screen time change or than 2 years at pandemic onset for physical activity change. ^a The sex category "Other" was not included because of too small number of observations.

Table S7. Association between the COVID-19 pandemic impact score and the mental health of children of adolescents according to different adjustment strategies (n=2043)

		Demographic	Demographic + Health	Demographic + Health + Lifestyle	Demographic + Health + Family	Demographic + Health + Lifestyle + Family
		aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)	aOR (95% CI)
Severe pandemic impact (ref. mild)	Severe	4.53 (2.94 - 6.97)	3.93 (2.49 - 6.20)	3.01 (1.86 - 4.87)	2.85 (1.68 - 4.85)	2.45 (1.40 - 4.30)
Age	Years	0.97 (0.92 - 1.02)	0.93 (0.88 - 0.98)	0.95 (0.88 - 1.04)	0.88 (0.84 - 0.93)	0.91 (0.84 - 0.99)
Sex ^a (ref. female)	Male	1.40 (0.93 - 2.12)	1.36 (0.89 - 2.08)	1.40 (0.91 - 2.16)	1.47 (0.94 - 2.30)	1.48 (0.94 - 2.34)
Health condition (ref. no)	Yes		4.73 (3.13 - 7.15)	4.42 (2.89 - 6.77)	5.44 (3.52 - 8.41)	5.36 (3.44 - 8.36)
Friends (ref. several)	One			3.56 (2.13 - 5.93)		3.56 (2.09 - 6.07)
	None			5.00 (2.06 - 12.16)		4.59 (1.58 - 13.34)
	Unknown / na			2.47 (1.02 - 5.98)		2.24 (0.91 - 5.54)
Change in physical activity time (ref. similar or increase)	Decrease			1.48 (0.86 - 2.55)		1.37 (0.73 - 2.57)
	Unknown / na			1.56 (0.77 - 3.19)		1.60 (0.79 - 3.28)
Change in leisure screen time (ref. similar or decrease)	Increase			1.11 (0.69 - 1.80)		1.04 (0.64 - 1.70)
	Unknown / na			0.65 (0.25 - 1.67)		0.66 (0.26 - 1.63)
Change in time spent with parent (ref. similar)	Increase				1.57 (0.96 - 2.55)	1.56 (0.96 - 2.55)
	Decrease				1.77 (0.91 - 3.41)	1.42 (0.71 - 2.82)
	Unknown				1.33 (0.38 - 4.64)	1.02 (0.27 - 3.90)
Parent-child relationship (ref. good)	Rather good				5.36 (3.30 - 8.70)	5.36 (3.24 - 8.87)
	Average-to-poor				14.28 (6.27 - 32.49)	14.05 (5.72 - 34.49)
Parent mood (ref. good)	Average-to-poor				0.94 (0.52 - 1.69)	1.00 (0.54 - 1.83)
Household financial situation (ref. very good)	Good				1.38 (0.81 - 2.33)	1.27 (0.75 - 2.16)
	Average-to-poor				1.09 (0.54 - 2.18)	0.85 (0.41 - 1.77)
	No answer				1.47 (0.53 - 4.10)	1.66 (0.61 - 4.50)

Results are adjusted odds ratios (aOR) with 95% confidence intervals (95% CI) from generalized estimating equations taking the household clustering into account. Severe pandemic impact defined as a score > mean + 1SD. Not applicable (na) if stated so by parents or if the child was younger than 6 years at questionnaire completion for friends, than 1 year at pandemic onset for leisure screen time change or than 2 years at pandemic onset for physical activity change. ^a The sex category “Other” was not included because of too small number of observations.