

Online appendix

Remote Instruction and Student Mental Health. Swedish Evidence from the Pandemic.

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Appendix A. Survey by Statistics Sweden of remote instruction

In the fall of 2021, Statistics Sweden conducted a survey of school principals on the extent of remote instruction during three phases of the pandemic: the spring of 2020, the fall of 2020, and the spring of 2021. Respondents gave an estimate on the number of weeks of remote instruction by grade level and upper-secondary program type. Using school and personal identifiers, their responses are linked to individual students, based on information in the school register. Since students could be exempted from remote instruction for personal reasons, the survey does not provide an individual measure of the amount of remote instruction. Instead, the responses measure the extent of remote instruction for a typical student at a certain school, program, and grade level. Matching the survey to the individual-level data, we have information for 43 percent of the upper-secondary and 51 percent of the lower-secondary students.

Using these survey data, this appendix presents an analysis of whether the mental health of the school's student population is correlated with the probability of moving to remote instruction. We do this by constructing an indicator of whether or not the student had been in contact with mental healthcare services before the pandemic, more precisely between July 2019 and March 2020. We estimate the relationship between this indicator (Previous care) and the probability that the student received remote instruction in the spring of 2020 and the fall of 2020 (Remote). Thus, we estimate the following model for student i in an upper-secondary school in 2020:

$$Remote_i = \beta Previous\ care_i + X_i + \alpha Program_i + \varepsilon_i,$$

where X includes indicators for sex, birth month, if newly arrived in Sweden or arrived less than eight years ago in Sweden, foreign background, parents' education level, any unemployment, welfare, sick leave, pension payments, income percentile by age and sex, if the parents live together, and the total number of children in the household. Program refers to indicators for academic, vocational, and preparatory programs.

We also estimate a model using the population of upper-secondary school students in 2019 and 2020 to control for school fixed effects (γ_s) and cohort fixed effects (δ_t):

$$Remote_{it} = \gamma_s + \delta_t + \beta Previous\ care_{it} + \mathbf{X}_{it} + \alpha Program_{it} + \varepsilon_{it}.$$

Finally, we estimate these models for the probability to be remotely taught in the fall of 2020, for students who attended grades 10 and 11 in the spring of 2020.

Table A1, columns 1–4 present the estimated effect of prior care on remote teaching in the spring of 2020 and show it is negative and statistically significant. The effect remains significant even after including an extensive battery of variables and controlling for school fixed effects. Including indicators for program reduces the estimate, and it is no longer statistically significant (column 4). However, as discussed in the main text, most of the variation in remote instruction in the spring of 2020 was between programs, meaning there is little variation left in the specification. For students who continue in upper-secondary school in the fall of 2020, that is, students in grades 10 and 11, there is a statistically significant effect of the previous use of mental healthcare services on the probability of remote teaching in the fall, even when controlling for program type (column 6). Given that the well-being of children and students was of the utmost importance during the pandemic—which was why schools for those below age 16 were kept open—this result is not surprising. Rather, it suggests that principals used their discretion to keep schools open in the way intended.

TABLE A1. ANY REMOTE TEACHING

	(1)	(2)	(3)	(4)	(5)	(6)
	Spring 2020	Spring 2020	Spring 2020	Spring 2020	Fall 2020	Fall 2020
Previous care	-0.052 (0.012)	-0.054 (0.010)	-0.014 (0.003)	-0.003 (0.002)	-0.114 (0.014)	-0.023 (0.002)
Controls	No	Yes	Yes	Yes	No	Yes
School & cohort FE	No	No	Yes	Yes	No	Yes
Program FE	No	No	No	Yes	No	Yes
Population year	2020	2020	2019-20	2019-20	2020	2019-20
N	149,187	149,187	288,428	288,428	105,376	204,015
R2	0.002	0.040	0.807	0.812	0.006	0.676

Note: Controls include sex, birth month, indicators for if newly arrived in Sweden or living in Sweden for less than eight years, foreign background, indicators for parents' education level, any unemployment, welfare, sick leave, pension payments, income percentile by age and sex, indicators of if the parents live together, and the total number of children in the household. Standard errors clustered by school are in parentheses.

The survey also contains information on how schools handled the canceled national tests. Principals were asked if and how they replaced the tests, and the responses are shown in Table A2. Schools could replace the tests by several different ways, so the responses are not mutually exclusive.

TABLE A2. REPLACEMENT OF NATIONAL TESTS

	2019/20		2020/21	
	Grade 9	Upper secondary	Grade 9	Upper secondary
Old test	0.55	0.58	0.55	0.58
Own test	0.30	0.61	0.30	0.62
Any test	0.61	0.76	0.61	0.76
N	58,473	146,506	59,836	153,202

Note: The table shows principals' most common responses when asked if and how schools replaced the canceled national tests. The responses are not mutually exclusive.

Appendix B. Survey of healthcare regions

In March and April 2023, we reached out to all 21 healthcare regions in Sweden, asking to interview a representative responsible for adolescent (up until age 18) psychiatric care. Ultimately, we got responses from 15 regions, including the three largest (Stockholm, Västra Götaland, and Skåne). The six nonresponses (Halland, Jönköping, Kronoberg, Norrbotten, Värmland, and Västernorrland) are evenly distributed over the country. Semi-structured interviews were conducted over the phone, but a few representatives responded by email. The interviews covered the following questions:

- 1) What are the pathways to specialized psychiatric care for lower- and upper-secondary students? Was this pathway affected by the pandemic, and was there a change in referral patterns?
- 2) Are there systematic patterns in the type of referrals from different sources (schools, families, other sources), and were these affected by the pandemic?
- 3) Are you aware of systematic health screenings by school healthcare services, and if so, have you received indications that these were affected by the pandemic?
- 4) Was there a change in the type of diagnoses and treatment during the pandemic, and did you perceive any changes between lower- and upper-secondary students?
- 5) Are you aware if access to psychiatric care was affected by the pandemic and if so, in what ways, and did it differ between lower- and upper-secondary students?

The interviews ended with an open-ended question regarding other noticeable changes during the pandemic. Interviewees generally did not have access to hard data regarding referrals, diagnoses, or treatments and were then asked to give a rough estimate where applicable. Not all representatives were willing to answer the questions in ways that allow for easy coding. We therefore summarize the responses in Table B1.

TABLE B1. SURVEY OF HEALTHCARE REGIONS

Question	Answer	Comment
Self-referrals possible	Yes=14, No=1	As of April 2021, yes=15
Fraction school referrals (approx.)	Mean=42% (min=20, max=75)	9 responses
Fraction self-referrals (approx.)	Mean=34% (min=20, max=50)	9 responses
Fraction other referrals (approx.)	Mean=33% (min=20, max=40)	9 responses
Referral type from schools	ADHD/ neuropsychiatric	10 responses; all stating ADHD was by far the most common
Changes in referral patterns during the pandemic	No=12, All down=1 Emergency up=1	
Awareness of school health screenings	Yes=3	No noted change among the few aware of screenings
Changes in patterns of diagnoses	Eating disorders up=12, No pattern=3	
Changes in type of care	Group treatment down, digital sessions up	15 responses
Changes between lower- and upper-secondary students	No=15	Vague answers to questions regarding this
Sense of changes in access	No=15	
Problems due to sickleave	Yes=4	Not seen as severe in any region

Appendix C. Data

The database we use in this paper is part of the research program “COVID-19 in Sweden: Infection Tracing, Control and Effects on Individuals and Society” at Stockholm University. Ethical approval for the study was obtained from the Swedish Ethical Review Authority, application 2020-06492. The estimation sample is constructed using the Student Register held by Statistics Sweden and consists of all students in upper- and lower-secondary school during the academic years 2015–2016 to 2020–2021 (Statistics Sweden, 2020a, c). Each student has a personal identifier and is connected to their biological or adoptive parents using the Multi-Generational Register (Statistics Sweden, 2020f). Information on parents’ demographic and socioeconomic variables are taken from the Swedish Longitudinal Integrated Database for Health Insurance and Labor Market Studies (LISA) maintained by Statistics Sweden (2020e). Data on contacts with doctors in specialized psychiatric care and hospital visits are available in the patient register, and drug prescriptions are available in the drug register. Both these registers are held by the National Board of Health and Welfare (2021b, c).

Definitions of outcome variables are described in the main text. The control variables are self-explanatory except for the income measure. The measure of parental income is based on individual disposable income and is constructed as follows. We use the average income for the years 2015–2019 and percentile rank each individual by birth cohort and sex. Note that the rank measure is constructed using all individuals in Sweden. For newly immigrated individuals, we only use the income after immigration. When dividing the sample by income, a student is coded as “high income” if any of their parents has an income rank in the fourth quartile.

As a composite measure of student background characteristic envisaging school performance, we create an index by predicting grade point average (GPA) in grade 9 from an OLS regression for the period 2015–2019. GPA data is from Statistics Sweden (2020b). The explanatory variables used to predict GPA are student indicators for birth month, if the student arrived in Sweden less than four years ago or arrived four to eight years ago, if the student is born in a foreign country, if both or one of the parents are born in a foreign country, if the parents live together, and the number of children in the family. For respective parents, we include 98 indicators of educational level by field, income percentile (linear), indicators of receiving social assistance, unemployment benefit, sickness pay (spells exceeding two weeks) or old age pension, and indicators of parent civil status (unmarried, married, divorced, widowed, or other). The indicator for receiving unemployment insurance and the indicator for social assistance are interacted with an indicator of being foreign born. We also include indicators of not being in the register, which means that the parent does not live in Sweden or is deceased. The model

explains 0.3 of the variance in GPA. The predicted values are used to percentile rank students by year and school grade. Based on the ranking, we divide the students into three equally sized groups.

To determine which occupational groups are more likely to work from home, we use the classification of the feasibility of working remotely developed by Dingel and Neiman (2020). The original classification at the Standard Occupational Classification (SOC) 12-digit level is aggregated to SOC10. SOC10 is then translated to the Swedish classification system SSYK2012 via the International Standard Classification of Occupations 8-digit level using the cross-table in Hensvik et al. (2020). At each step, we use the average value of feasibility of working remotely. From Hensvik et al. (2020), we also collect the variable Share of work conducted at home defined according to the American Time Use Survey at the four-digit SSYK2012 level.

Using these classifications, we create the variable Teleworkable occupation. A parent is categorized as having a teleworkable occupation if the Dingle and Neimark classification “teleworkable” takes a value in the range of 0.5–1 and is not teleworkable if it takes a lower value. We adjust categories by coding the occupation as teleworkable if more than 35 percent of the work could be conducted from home according to Hensvik et al. (2020). The occupation is coded as not teleworkable if less than 10 percent of the work could be conducted at home. Finally, we make some manual changes and categorize the following as not being teleworkable occupations: school and preschool personnel below upper-secondary school (SSYK2012 1411–1492, 2341–2359, 4116, 5311–5312), military personnel (110–310), some healthcare occupations (1511–1532), and traffic instructors (3441). Due to the restrictions on public gatherings, artists (2651–2655, 3433–3439) and politicians (1111) are classified as teleworkable occupations, as are priests (3412), a missing occupational category in the original data.

The medical risk group has been constructed based on current and previous lists of conditions that Swedish authorities throughout the pandemic has identified might lead to a higher risk of infection or higher risk of severe COVID-19 if infected. A binary indicator was created that identifies individuals with pre-existing medical conditions. These were identified up to five years prior 2020 in inpatient care or in specialized outpatient care or by purchases of prescribed medications in the year before 2020.

TABLE C1 DEFINITION OF RISK FACTORS

Category	ICD	ATC	KVÅ
Cardiovascular disease	I20 I21 I22 I23 I24 I25 I48 I50 I60 I61 I63 I64 I649 I69 I70	N02BA C01DA B01AC24	
Hypertension	I109 I11 I110 I12 I13 I15	C02 (not including C02AC02) C03 C09 C08CA C07AB02	
Diabetes	E10 E11 E12 E13 E14	A10	
Adrenocortical insufficiency	E271 E274		
Chronic lung disease	J40 J41 J42 J43 J44 J45 J46 J47 J60 J61 J62 J63 J64 J65 J66 J67 J684 J69 J701 J703 J849 J841 J848 J840 J961 J968 J969 E840 E849 E848 E841	R03AK R03AL R03BA R03AC12 R03AC13 R03AC18 R03AC19 R03CC12 R03BB04 R03BB05 R03BB06 R03BB07	
Dementia	F00 F01 F02 F039 G30 F107A	N06D	
Cancer	C Z85		DT107 DT108 DT112 DT116 DT135
Chronic liver disease	K70 K71 K73 K74 K75 K76 K77		
Chronic renal failure	I12 I13 N00 N01 N02 N03 N04 N05 N07 N08 N11 N14 N18 N19 Z992 E102 E112		
Neuromuscular/neurodegenerative diseases	G10 G11 G12 G13 G14 G20 G21 G22 G23 G24 G25 G26 G30 G31 G32 G35 G36 G37 G70 G71 G72 G73 G80 G81 G82 G83		
Immunocompromised	D8 D80 D81 D82 D83 D84 D85 D86 D87 D88 D89		
Alcohol-related diagnoses	F10 E244 G312 G621 G721 I426 K292 K852 K860 Q860 Z714 Z721	N07BB	
Substance addiction	F11 F12 F13 F14 F15 F16 F17 F18 F19	N07BC	
Psychiatric illness	F20 F25 F30 F31	N05AN	

Appendix D. Figures and tables

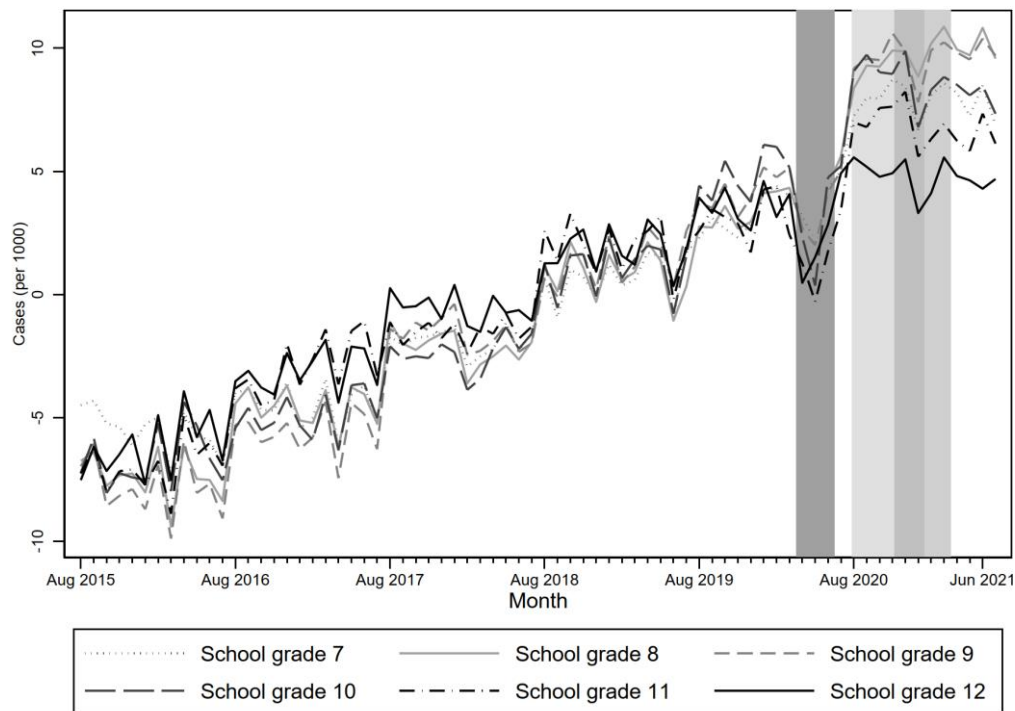


FIGURE D1. TRENDS IN THE SHARE OF STUDENTS RECEIVING PSYCHIATRIC CARE WITH MONTHLY EFFECTS REMOVED BY SCHOOL GRADE

Notes: The table displays the residuals from a regression of the share of students in school years 7-12 receiving psychiatric care (a diagnosis within the ICD10 chapter F or a prescription for drug within ATC-code N05, N06A, N06B, C02AC02) on month fixed effects for the period August 2015-July 2021. The shaded areas indicate periods with different remote teaching regimes. See discussion in main text Section 1.A. From the left: April-June 2020, most upper secondary students had remote teaching and lower secondary students had teaching in school; August-November 2020 some, mainly upper-secondary students were exposed to some remote teaching; December 2020- January 2021 large share of both lower- and upper secondary students were exposed to remote teaching; February-March 2021 some students in both upper-and lower secondary schools had remote teaching.

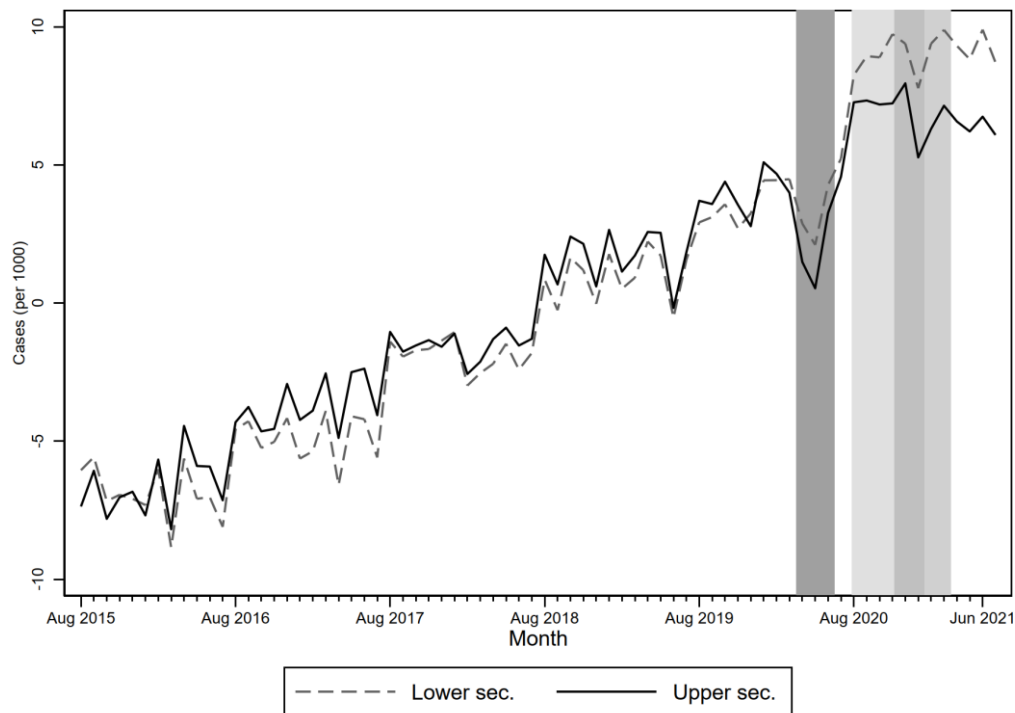


FIGURE D2. TRENDS IN THE SHARE OF STUDENTS RECEIVING PSYCHIATRIC CARE WITH MONTHLY EFFECTS REMOVED BY UPPER-AND LOWER SECONDARY LEVEL

Notes: The table displays the residuals from a regression of the share of students in upper-and lower secondary school receiving psychiatric care (a diagnosis within the ICD10 chapter F or a prescription for drug within ATC-code N05, N06A, N06B, C02AC02) on month fixed effects for the period August 2015-July 2021. The shaded areas indicate periods with different remote teaching regimes. See discussion in main text Section 1.A. From the left: April-June 2020, most upper secondary students had remote teaching and lower secondary students had teaching in school; August-November 2020 some, mainly upper-secondary students were exposed to some remote teaching; December 2020-January 2021 large share of both lower- and upper secondary students were exposed to remote teaching; February-March 2021 some students in both upper-and lower secondary schools had remote teaching

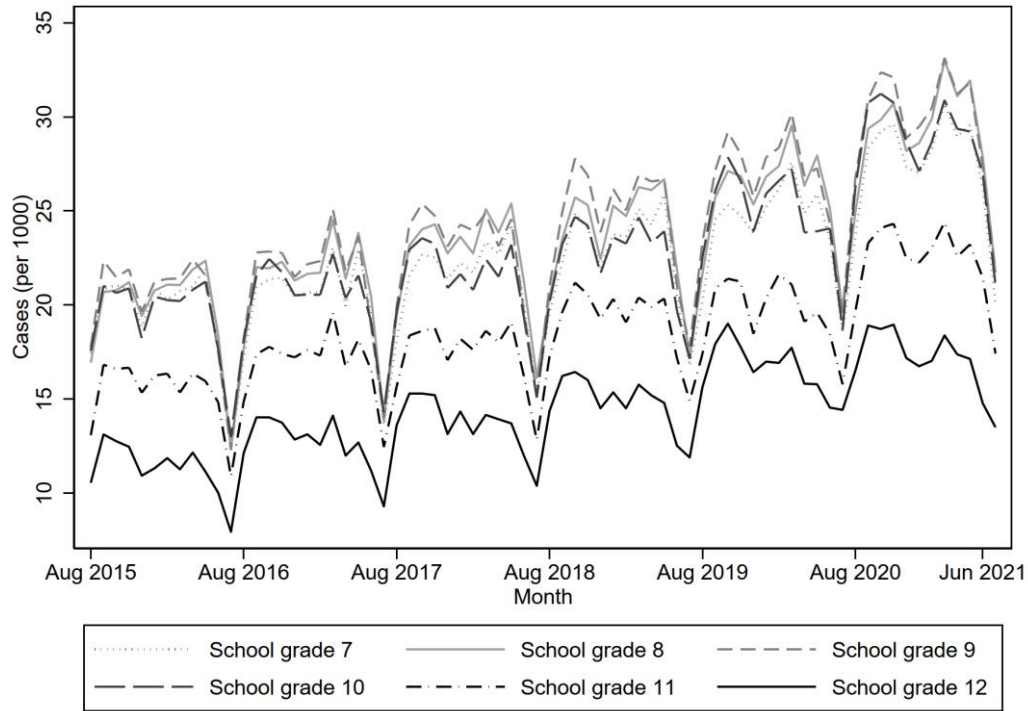


FIGURE D3. SHARE OF STUDENTS RECEIVING CARE OR PRESCRIPTION DRUGS FOR ADHD BY SCHOOL GRADE

Notes: The table displays the share of students in school years 7-12 receiving care related to ADHD (a diagnosis within the ICD10 chapter F90 or a prescription for drug within ATC-code N06A or C02AC02), per month August 2015-June 2021. The shaded areas indicate periods with different remote teaching regimes. See discussion in main text Section 1.A. From the left: April-June 2020, most upper secondary students had remote teaching and lower secondary students had teaching in school; August-November 2020 some, mainly upper-secondary students were exposed to some remote teaching; December 2020- January 2020 2020 large share of mainly upper secondary students were exposed to remote teaching; February-March 2021 some students in both upper-and lower secondary schools had remote teaching.

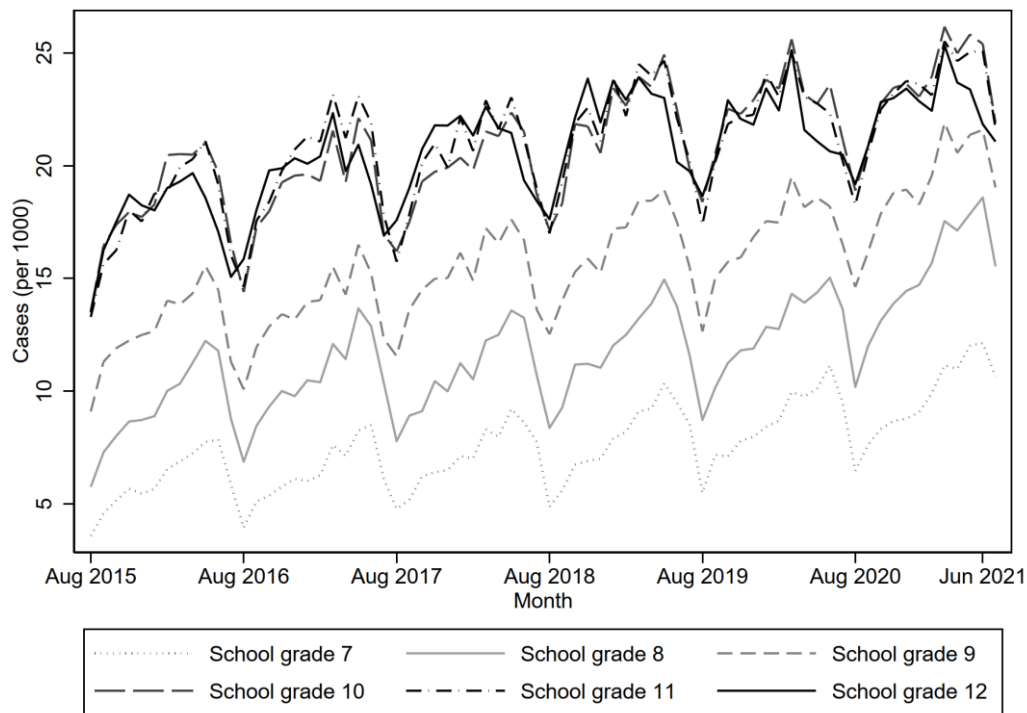


FIGURE D4. SHARE OF STUDENTS RECEIVING CARE OR PRESCRIPTION DRUGS FOR DEPRESSION AND ANXIETY BY SCHOOL GRADE

Notes: The table displays the share of students in school years 7-12 receiving care related to depression or anxiety (a diagnosis within the ICD10 chapter F32-F34, F40-F43 or a prescription for drug within ATC-code N05), per month August 2015-July 2021. The shaded areas indicate periods with different remote teaching regimes. See discussion in main text Section 1.A. From the left: April-June 2020, most upper secondary students had remote teaching and lower secondary students had teaching in school; August-November 2020 some, mainly upper-secondary students were exposed to some remote teaching; December 2020- January 2020 2020 large share of mainly upper secondary students were exposed to remote teaching; February-March 2021 some students in both upper-and lower secondary schools had remote teaching.

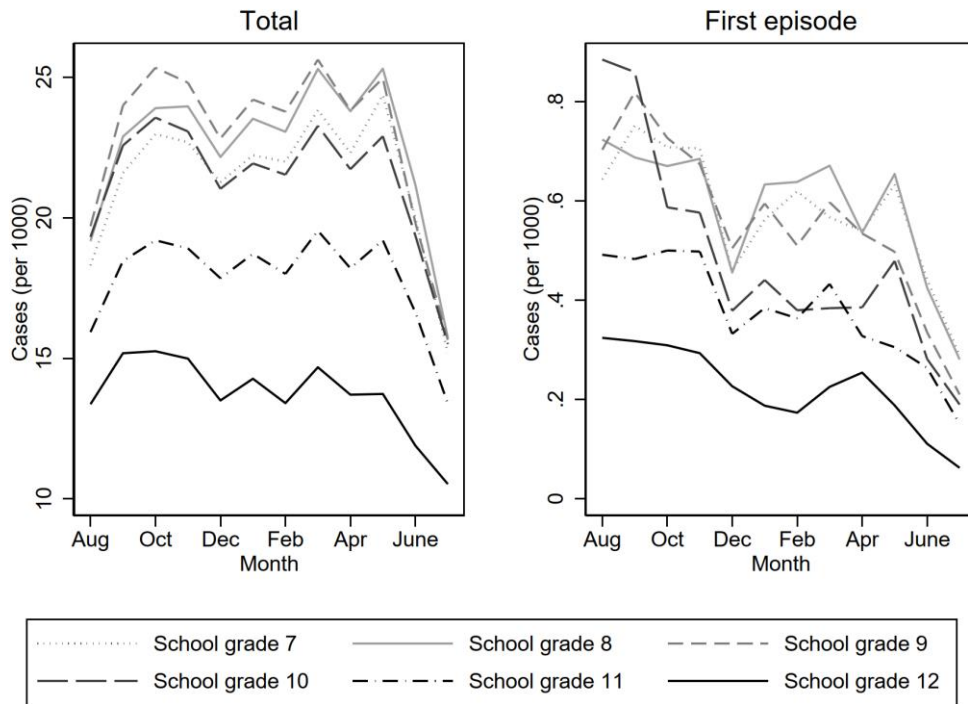


FIGURE D5. ADHD OVER THE SCHOOL YEAR, AVERAGE 2016-2019

Notes: The left panel displays the share of students in school years 7-12 receiving care related to ADHD (a diagnosis within the ICD10 chapter F90 or a prescription for drug within ATC-code N06A or C02AC02), per month, average 2016-2019. The right panel displays the share of student receiving an ADHD diagnoses or prescription since July 2015, average 2017-2019.

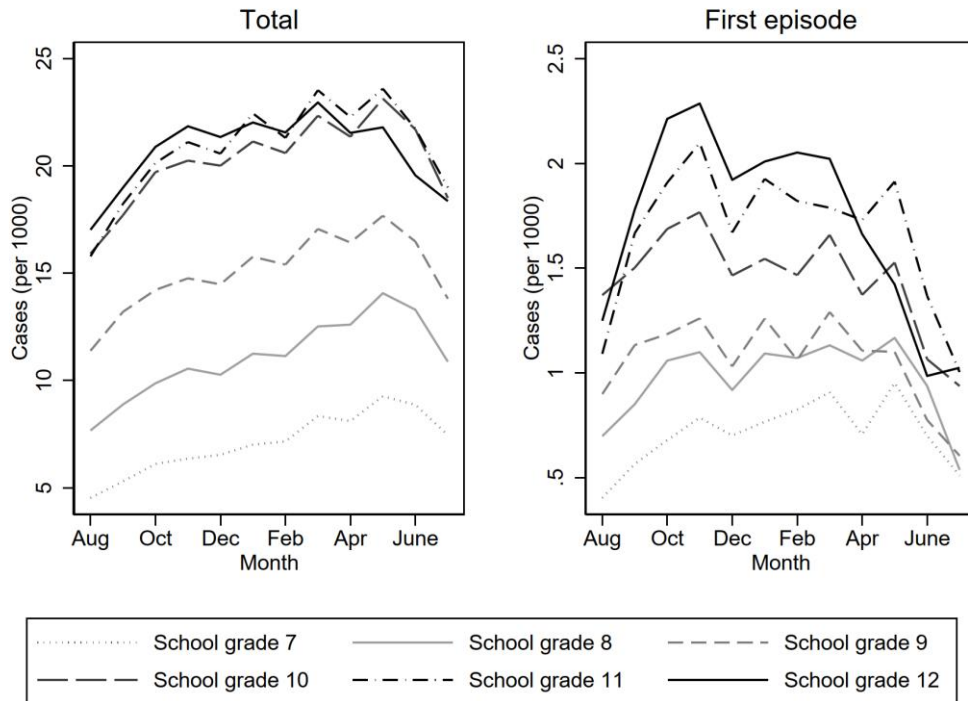


FIGURE D6. DEPRESSION AND ANXIETY OVER THE SCHOOL YEAR, AVERAGE 2016-2019

Notes: The left panel displays the share of students in school years 7-12 receiving care related to depression or anxiety (a diagnosis within the ICD10 chapter F32-F34, F40-F43 or a prescription for drug within ATC-code N05), per month, average 2017-2019. The right panel displays the share of student receiving a diagnoses or prescription since July 2015, average 2017-2019.

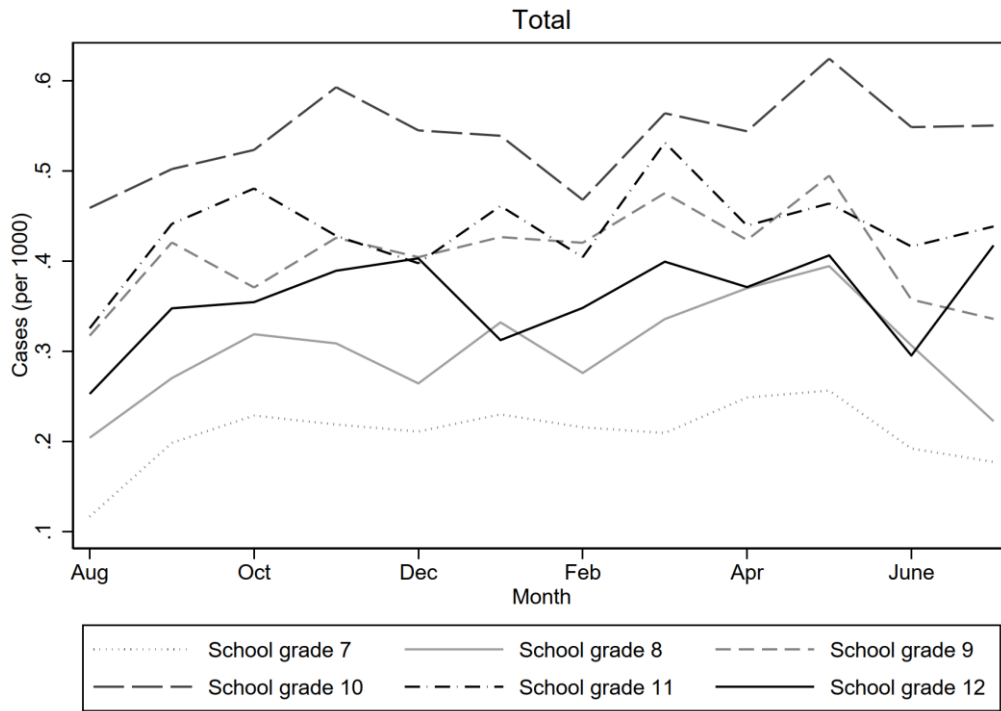


FIGURE D7. SELF-DESTRUCTIVE BEHAVIOR OVER THE SCHOOL YEAR, AVERAGE 2016-2019

Notes: The table displays the share of students in school years 7-12 receiving care related to self-destructive behavior (a diagnosis within the ICD10 chapters X6, X7, X80-X84, Y1, Y2, Y30-Y34 FXXX), per month, average 2017-2019.

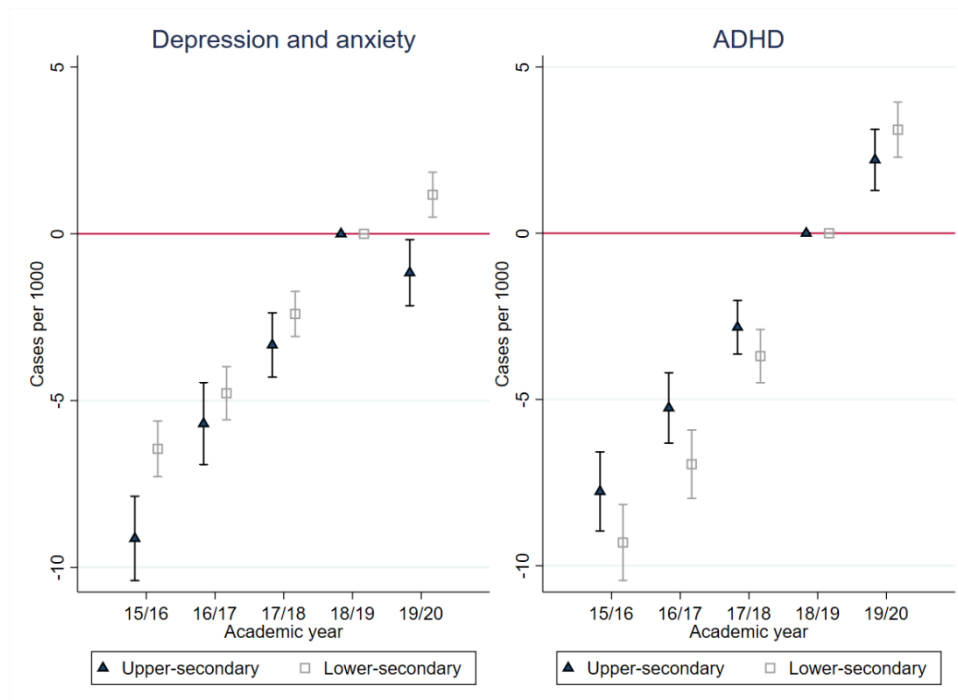


FIGURE D8. TRENDS IN DEPRESSION AND ANXIETY AND ADHD, APRIL-JUNE

Notes: The left panel shows diagnoses or prescriptions for depression and anxiety (diagnoses ICD10 F40-F42, F32-F34, and antidepressants ATC N06A) and the right panel for ADHD (diagnoses ICD10 F90, prescription ATC N06B and C02AC02) during April-June each respective academic year, with 2018/19 used as the reference year. The figures show estimates from separate linear regressions for upper- and lower-secondary students using year fixed effects and control variables: sex, birth month, newly immigrated to Sweden, parental foreign background, income, education, income from social security systems, family size, and if the biological parents live in the same household. Standard errors are clustered at the school level, and 95 percent confidence intervals are indicated.

Tables

TABLE D1. MENTAL HEALTHCARE CONTACTS, APRIL-JUNE

	(1) Without controls	(2) With controls
Upper-sec × 2016	-0.42 (1.27)	-1.13 (1.21)
Upper-sec × 2017	0.64 (1.17)	0.26 (1.11)
Upper-sec × 2018	-0.14 (0.91)	-0.15 (0.88)
2019 (ref)	Ref	Ref
Upper-sec × 2020	-3.83 (0.94)	-3.71 (0.90)
Mean dep var (2019)	85.21	85.21
Estimate (%)	-4.49	-4.35
R2	0.001	0.025
N	3,276,398	3,276,398

Notes: DID estimates from model (1), corresponding to Figure 3. The dependent variable is mental healthcare contacts (diagnoses or prescription drugs) scaled to represent cases per 1000. The model in column (1) is without covariates. The model in column (2) adjusts for: sex, birth month, newly immigrated to Sweden, parental foreign background, income, education, income from social security systems, family size and if the biological parents live in the same household. Lower-secondary students act as the control group for upper-secondary students. Standard errors in parentheses are clustered at school level.

TABLE D2. RESULTS BY STUDENT AND PROGRAM CHARACTERISTICS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Males	Females	Academic	Vocational	Preparatory	Recent care	No recent care
Upper-sec × 2016	1.83 (1.43)	-4.49 (1.67)	1.24 (1.37)	-6.37 (1.81)	1.14 (3.16)	-7.96 (5.49)	0.47 (0.44)
Upper-sec × 2017	0.02 (1.25)	0.49 (1.63)	2.19 (1.28)	-3.21 (1.65)	0.92 (2.98)	4.66 (5.42)	0.12 (0.43)
Upper-sec × 2018	-1.07 (1.04)	0.91 (1.31)	0.92 (1.02)	-1.75 (1.38)	-2.87 (2.29)	2.49 (4.91)	0.61 (0.41)
2019 (ref)	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Upper-sec × 2020	-4.25 (1.10)	-3.22 (1.29)	-4.93 (0.97)	-2.80 (1.35)	-0.49 (2.60)	1.65 (4.69)	-2.39 (0.42)
Mean dep var (2019)	67.69	104.90	68.65	102.81	123.51	600.34	14.38
Estimate (%)	-6.28	-3.07	-7.18	-2.72	-0.40	0.27	-16.58
R2	0.025	0.028	0.021	0.026	0.042	0.034	0.003
N	1,706,036	1,570,362	2,600,185	2,111,199	1,829,838	331,399	2,944,999

Notes: DID estimates from model (1), corresponding to Figure 4. The dependent variable is mental healthcare contacts (diagnoses or prescription drugs) scaled to represent cases per 1000. The model in column adjusts for: sex, birth month, newly immigrated to Sweden, parental foreign background, income, education, income from social security systems, family size and if the biological parents live in the same household. Lower-secondary students act as the control group for upper-secondary students. Standard errors in parentheses are clustered at school level.

TABLE D3. NUMBER OF STUDENTS BY PREDICTED GPA AND PARENTS' OCCUPATION TELEWORKABLE 2020

	Not teleworkable	Teleworkable	No information of occupation	Total
Predicted GPA lowest tercile	139 941	25 058	63 368	229 267
Predicted GPA mid tercile	138 052	90 632	7 524	236 208
Predicted GPA highest tercile	65 482	161 584	2 196	229 262
Total	343 475	278 174	73 088	694 737

Notes: Students split by tercile of predicted grade point average (GPA) tabulated against at least one parent having a teleworkable occupation, and missing information on parents' occupation.

TABLE D4. RESULTS BY STUDENT BACKGROUND AND PARENTAL CHARACTERISTICS

	(1) Low GPA	(2) Medium GPA	(3) High GPA	(4) Tele- workable	(5) Not tele- workable	(6) In risk group	(7) Not risk group
Upper-sec × 2016	3.44 (1.94)	-2.22 (1.83)	-4.14 (1.67)	-2.19 (1.76)	0.36 (1.61)	-0.93 (1.82)	-1.41 (1.34)
Upper-sec × 2017	3.84 (1.75)	-0.59 (1.73)	-2.01 (1.62)	-0.79 (1.63)	1.32 (1.49)	0.46 (1.63)	0.13 (1.28)
Upper-sec × 2018	2.61 (1.48)	-0.30 (1.47)	-2.28 (1.33)	-1.51 (1.36)	1.36 (1.22)	0.18 (1.40)	-0.35 (1.01)
2019 (ref)	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Upper-sec × 2020	-1.28 (1.51)	-5.36 (1.53)	-4.84 (1.27)	-5.37 (1.28)	-2.56 (1.24)	-4.70 (1.47)	-2.48 (1.03)
Mean dep var (2019)	85.93	91.45	78.05	89.19	90.82	99.59	77.74
Estimate (%)	-1.49	-5.86	-6.20	-6.02	-2.81	-4.72	-3.19
R2	0.049	0.015	0.010	0.015	0.028	0.026	0.024
N	1,081,228	1,113,973	1,081,197	1,239,372	1,624,261	1,313,115	1,893,005

Notes: DID estimates from model (1), corresponding to Figure 5. The dependent variable is mental healthcare contacts (diagnoses or prescription drugs) scaled to represent cases per 1000. Low/Medium/High GPA refers to terciles of predicted grade point average. Definitions of teleworkable parental occupation and parental medical risk group in Online Appendix C. The model in column adjusts for: sex, birth month, newly immigrated to Sweden, parental foreign background, income, education, income from social security systems, family size and if the biological parents live in the same household. Lower-secondary students act as the control group for upper-secondary students. Standard errors in parentheses are clustered at school level.

TABLE D5. RESULTS BY STUDENT CHARACTERISTICS FOR STUDENTS IN ACADEMIC PROGRAMS

	(1)	(2)	(3)	(4)
	Males	Females	Recent care	No recent care
Upper sec × 2016	2.73 (1.56)	0.11 (1.87)	-7.41 (6.96)	0.42 (0.50)
Upper sec × 2017	0.92 (1.35)	3.48 (1.82)	8.07 (6.73)	0.36 (0.50)
Upper sec × 2018	-0.40 (1.16)	2.36 (1.46)	2.03 (6.10)	0.63 (0.46)
2019 (ref)	Ref	Ref	Ref	Ref
Upper sec × 2020	-4.32 (1.19)	-5.60 (1.35)	-3.61 (5.80)	-2.25 (0.46)
Mean dep var (2019)	51.73	84.06	613.63	12.45
Estimate (%)	-8.35	-6.66	-0.59	-18.07
R2	0.025	0.020	0.025	0.003
N	1,299,383	1,300,802	228,186	2,371,999

Notes: DID estimates from model (1). Sample consists of lower secondary students and students in academic upper-secondary programs. The dependent variable is mental healthcare contacts (diagnoses or prescription drugs) scaled to represent cases per 1000. The model in column adjusts for: sex, birth month, newly immigrated to Sweden, parental foreign background, income, education, income from social security systems, family size and if the biological parents live in the same household. Lower-secondary students act as the control group for upper-secondary students. Standard errors in parentheses are clustered at school level.

TABLE D6. RESULTS BY STUDENT BACKGROUND AND PARENTAL CHARACTERISTICS FOR STUDENTS IN ACADEMIC PROGRAMS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Low GPA	Medium GPA	High GPA	Tele-workable	Not tele-workable	In risk group	Not risk group
Upper-sec × 2016	5.53 (2.39)	1.11 (2.06)	-1.82 (1.70)	0.77 (1.85)	5.21 (1.76)	3.33 (2.02)	0.29 (1.49)
Upper-sec × 2017	8.30 (2.30)	1.55 (1.93)	-0.68 (1.66)	1.58 (1.73)	4.25 (1.62)	3.23 (1.80)	1.88 (1.42)
Upper-sec × 2018	5.70 (1.96)	-0.41 (1.63)	-1.00 (1.36)	-0.18 (1.43)	2.95 (1.38)	1.87 (1.53)	0.31 (1.14)
2019 (ref)	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Upper-sec × 2020	-1.22 (1.96)	-6.33 (1.63)	-5.63 (1.30)	-7.03 (1.32)	-3.81 (1.32)	-6.48 (1.54)	-3.99 (1.11)
Mean dep var (2019)	67.24	71.99	66.82	73.03	66.51	77.94	62.53
Estimate (%)	-1.81	-8.79	-8.43	-9.63	-5.73	-8.31	-6.39
R2	0.046	0.013	0.008	0.012	0.026	0.022	0.020
N	722,887	883,066	994,232	1,097,647	1,248,441	1,028,654	1,552,107

Notes: DID estimates from model (1). Sample consists of lower secondary students and students in academic upper-secondary programs. The dependent variable is mental healthcare contacts (diagnoses or prescription drugs) scaled to represent cases per 1000. Low/Medium/High GPA refers to terciles of predicted grade point average. Definitions of teleworkable parental occupation and parental medical risk group in Online Appendix C. The model in column adjusts for: sex, birth month, newly immigrated to Sweden, parental foreign background, income, education, income from social security systems, family size and if the biological parents live in the same household. Lower-secondary students act as the control group for upper-secondary students. Standard errors in parentheses are clustered at school level.

TABLE D7. TYPES OF CARE

	(1) Diagnoses	(2) Prescriptions	(3) Unrelated diagnoses	(4) Planned	(5) Not planned	(6) Emergency
Upper-sec × 2016	1.18 (0.81)	-1.03 (1.10)	0.31 (0.61)	1.38 (0.81)	0.25 (0.38)	-0.28 (0.22)
Upper-sec × 2017	2.08 (0.79)	0.13 (1.01)	0.96 (0.58)	1.94 (0.78)	0.56 (0.36)	0.45 (0.22)
Upper-sec × 2018	0.87 (0.67)	-0.31 (0.80)	0.31 (0.53)	0.69 (0.67)	0.99 (0.35)	0.11 (0.21)
2019 (ref)	Ref	Ref	Ref	Ref	Ref	Ref
Upper-sec × 2020	-1.98 (0.67)	-3.05 (0.83)	0.07 (0.51)	-1.45 (0.67)	-1.65 (0.33)	-0.89 (0.20)
Mean dep var (2019)	40.91	72.94	25.61	38.95	11.91	4.92
Estimate (%)	-4.84	-4.18	0.26	-3.73	-13.88	-18.13
R2	0.012	0.023	0.001	0.011	0.002	0.002
N	3,276,398	3,276,398	3,276,398	3,276,398	3,276,398	3,276,398

Notes: DID estimates from model (1), corresponding to Figure 6. The dependent variable is mental healthcare contacts of different types scaled to represent cases per 1000. “Diagnoses” refers to any mental health diagnoses from specialized psychiatric care; “Prescriptions” to any prescription drug related to mental health issues; “Unrelated” diagnoses to any diagnoses unrelated to mental health or COVID-19; “Planned”/“Unplanned”/“Emergency” refers to type of care visit. The model in column adjusts for: sex, birth month, newly immigrated to Sweden, parental foreign background, income, education, income from social security systems, family size and if the biological parents live in the same household. Lower-secondary students act as the control group for upper-secondary students. Standard errors in parentheses are clustered at school level.

TABLE D8. BY SCHOOL GRADE AND PROGRAM

	(1) All	(2) Academic	(3) Vocational
School year 7 × 2020	-0.95 (1.25)	-0.96 (1.25)	-0.97 (1.25)
School year 8 (ref)	Ref	Ref	Ref
School year 9 × 2020	-0.73 (1.36)	-0.68 (1.36)	-0.71 (1.36)
School year 10 × 2020	-2.62 (1.53)	-6.58 (1.56)	1.12 (2.41)
School year 11 × 2020	-5.04 (1.46)	-5.76 (1.59)	-2.98 (2.26)
School year 12 × 2020	-4.43 (1.45)	-7.12 (1.61)	0.26 (2.12)
Mean dep var gr 7 2019	64.90	64.90	64.90
Effect (%) gr 7	-1.46	-1.48	-1.49
Mean dep var gr 9 2019	84.21	84.21	84.21
Effect (%) gr 9	-0.86	-0.81	-0.84
Mean dep var gr 10 2019	91.67	66.50	115.61
Effect (%) gr 10	-2.85	-9.90	0.97
Mean dep var gr 11 2019	85.52	70.75	104.62
Effect (%) gr 11	-5.90	-8.15	-2.85
Mean dep var gr 12 2019	76.13	68.90	85.83
Effect (%) gr 12	-5.81	-10.34	0.31
R2	0.026	0.021	0.026
N	3,276,398	2,600,185	2,111,199

Notes: DID estimates from model (2), corresponding to Figure 7. The outcome is mental healthcare contacts (diagnoses or prescription drugs) per 1000 students, measured April–June. The model in column adjusts for: sex, birth month, newly immigrated to Sweden, parental foreign background, income, education, income from social security systems, family size and if the biological parents live in the same household. Lower-secondary students act as the control group for upper-secondary students. Standard errors in parentheses are clustered at school level.

TABLE D9. MENTAL HEALTHCARE CONTACTS SCHOOL GRADES 9 AND 10

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Any contact			Depression/anxiety			ADHD		
	All	Acad	Voc	All	Acad	Voc	All	Acad	Voc
Upper-sec × 2016	0.77 (1.88)	2.46 (2.06)	-3.49 (2.91)	-1.63 (1.22)	1.08 (1.41)	-3.16 (1.84)	1.79 (1.32)	2.90 (1.26)	-2.34 (2.26)
Upper-sec × 2017	1.46 (1.85)	3.68 (2.02)	-0.94 (2.99)	-0.37 (1.24)	2.32 (1.42)	-1.91 (1.97)	1.57 (1.31)	2.20 (1.29)	-1.91 (2.22)
Upper-sec × 2018	0.08 (1.69)	1.14 (1.88)	0.81 (2.77)	-1.46 (1.14)	-0.05 (1.32)	-1.39 (1.82)	1.98 (1.17)	2.31 (1.18)	1.25 (2.10)
2019 (ref)	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref	Ref
Upper-sec × 2020	-1.45 (1.76)	-4.24 (1.82)	1.04 (2.92)	-2.35 (1.14)	-3.02 (1.27)	-2.54 (1.88)	0.09 (1.31)	-1.35 (1.27)	0.82 (2.19)
Mean dep var (2019)	91.67	66.50	115.61	45.05	36.62	50.69	41.24	22.78	63.05
Estimate (%)	-1.58	-6.37	0.90	-5.21	-8.26	-5.01	0.22	-5.92	1.30
R2	0.032	0.025	0.030	0.021	0.016	0.020	0.024	0.021	0.021
N	1,170,040	877,611	703,538	1,170,040	877,611	703,538	1,170,040	877,611	703,538

Notes: DID estimates from model (1). Including only school grades 9 and 10. The outcome is mental healthcare contacts (diagnoses or prescription drugs) per 1000 students, measured April–June. (1)–(3) refers to any mental healthcare contact, (4)–(6) to contacts related to depression/anxiety, (7)–(9) to contacts related to ADHD. Acad/Voc refers to academic respective vocational programs. The model in column adjusts for: sex, birth month, newly immigrated to Sweden, parental foreign background, income, education, income from social security systems, family size and if the biological parents live in the same household. Lower-secondary students act as the control group for upper-secondary students. Standard errors in parentheses are clustered at school level.

TABLE D10. MENTAL HEALTHCARE CONTACTS JULY TO DECEMBER 2020

	(1)	(2)	(3)
	Any mental health care use	Depression and anxiety	ADHD
Upper-sec × 2016	-0.38 (1.55)	-2.20 (0.98)	0.60 (1.07)
Upper-sec × 2017	-0.71 (1.47)	-1.15 (0.98)	0.26 (1.03)
Upper-sec × 2018	0.26 (1.18)	0.21 (0.81)	-0.42 (0.81)
2019 (ref)	Ref	Ref	Ref
Upper-sec × 2020	-6.76 (1.25)	-2.72 (0.81)	-2.50 (0.88)
Mean dep var (2019)	113.25	59.76	46.55
Estimate (%)	-5.97	-4.55	-5.36
R2	0.034	0.026	0.026
N	2,256,637	2,256,637	2,256,637

Notes: DID estimates from model (1), corresponding to Figure 8. Population includes students in grades 7–8, and 10–11 in the spring of 2020. The outcome is mental healthcare contacts (diagnoses or prescription drugs) per 1000 students, measured July–December. (1) Refers to any mental healthcare contact, (2) to contacts related to depression/anxiety, and (3) to contacts related to ADHD. The model in column adjusts for: sex, birth month, newly immigrated to Sweden, parental foreign background, income, education, income from social security systems, family size and if the biological parents live in the same household. Lower-secondary students act as the control group for upper-secondary students. Standard errors in parentheses are clustered at school level.

TABLE D11. MENTAL HEALTHCARE CONTACTS THROUGH DECEMBER 2021

	(1)	(2)	(3)	(4)
	Apr-Jun 20	Jul-Dec 20	Jan-Jun 21	Jul-Dec 21
Upper sec × 2016	-0.98 (1.04)	0.05 (1.21)	1.11 (1.22)	1.46 (1.22)
Upper sec × 2017	0.41 (0.89)	0.57 (1.02)	0.40 (1.05)	0.30 (1.03)
2018 (ref)	Ref	Ref	Ref	Ref
Upper sec × 2020	-3.55 (1.09)	-5.50 (1.25)	-6.03 (1.27)	-7.89 (1.23)
Mean dep var (2018)	80.49	103.81	108.80	106.70
Estimate (%)	-4.41	-5.29	-5.54	-7.39
R2	0.025	0.030	0.031	0.031
N	2,600,531	2,600,531	2,600,531	2,600,531

Notes: DID estimates from model (1), corresponding to Figure 9. The outcome is any type of mental healthcare contact (diagnoses or prescription drugs) per 1000 students for the indicated time-periods. The model in column adjusts for: sex, birth month, newly immigrated to Sweden, parental foreign background, income, education, income from social security systems, family size and if the biological parents live in the same household. Lower-secondary students act as the control group for upper-secondary students. Standard errors in parentheses are clustered at school level.