



COVID-19 within families amplifies the prosociality gap between adolescents of high and low socioeconomic status

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COVID-19 has had worse health, education, and labor market effects on groups with low socioeconomic status (SES) than on those with high SES. Little is known, however, about whether COVID-19 has also had differential effects on noncognitive skills that are important for life outcomes. Using panel data from before and during the pandemic, we show that COVID-19 affects one key noncognitive skill, that is, prosociality. While prosociality is already lower for low-SES students prior to the pandemic, we show that COVID-19 infections within families amplify the prosociality gap between French high school students of high and low SES by almost tripling its size in comparison to pre-COVID-19 levels.

COVID-19 | prosociality | socioeconomic status | experiment | France

The COVID-19 pandemic has been hitting poorer and less-educated adults much more than their richer and better-educated counterparts, both with respect to health conditions and economic outcomes (1–6). While the evidence for adults of different socioeconomic status (SES) yields a consistent pattern, there is less evidence on the effects on children and adolescents. It seems that the pandemic has induced worse mental health (7), lower educational attainment and academic aspirations, and larger dropout rates from school for children and adolescents from low-SES families (8, 9). However, evidence of how the pandemic affects noncognitive skills is almost nonexistent. Yet, such noncognitive skills and their formation in childhood and adolescence have been shown to have long-term effects on life outcomes, including education, labor market outcomes, and health (10–15). Studying the effects of the pandemic in general on noncognitive skills of children and adolescents is challenging, not least because the pandemic, with its plethora of health, social, and economic consequences, is so multifaceted that it is difficult to identify the specific aspects of it that affect these skills. For this reason, we take a straightforward approach and study with a panel how COVID-19 infections within a family affect noncognitive skills of adolescents.

We focus on prosociality as one important noncognitive skill (16, 17). Around the whole world, the degree of prosociality has been shown to be positively related to labor market success (18). Independent of and prior to the pandemic, prosociality (typically covering cooperation, altruistic behavior, and trust) has been shown to be related to SES. Children from poorer and less-educated families have been found to be significantly less altruistic, more selfish, and less cooperative and trusting (19–21). Given this relationship between prosociality and SES, recent research has investigated ways of reducing the social gap in children's prosociality, finding that interventions in families and schools, including mentoring programs and parent academies, can substantially narrow the prosociality gap by increasing low-SES students' prosociality by as much as 0.4 to 0.6 SDs (22, 23). While such research confirms that well-designed interventions can level the playing field between low- and high-SES students, malleability of

preferences also implies that disrupting life events (24) could play out in the other direction and thus reinforce social inequalities.

Here, we provide evidence on how a COVID-19 infection within families affects the prosociality of high- and low-SES students. More specifically, we ask whether COVID-19 exposure, measured by an adolescent or a family member having COVID-19, reinforces inequalities in prosociality between high- and low-SES adolescents. There are several reasons as to why COVID-19 could affect the prosociality of low- and high-SES adolescents in different ways. One reason is medical: conditional on having COVID-19, chances of being hospitalized might differ for low-SES and high-SES students' families (due to differences in comorbidities or distance to hospitals, for instance). Hospitalization may affect prosociality through fear, which can affect ethical decision-making (25). Other reasons relate to concomitant effects of an infection, since it might be related to unemployment, which can affect preferences (26, 27), and by which low-SES families have been struck more heavily. Another channel may be the presence of a comforting parent at home during lockdown, which can contain mental health issues associated with COVID-19 (28), such as stress, depression, or anxiety, which may affect one's preferences (29). Considering that parents from a high-SES background might have more opportunities to work from home during the pandemic, this channel might also induce differences in adolescents' prosociality. While the channels mentioned so far let us expect increasing differences in prosociality between students

Significance

Noncognitive skills are important for lifetime outcomes. Here, we study how COVID-19 infections affect the prosociality—one key noncognitive skill with important relations to labor market outcomes—of French high school students. We put a major focus on the question whether COVID-19 has a differential effect on students from low or high socioeconomic status (SES). While it is known by now that COVID-19 has had more negative health and economic effects on people with low SES, the effects on noncognitive skills have not been studied so far. We find that COVID-19 within families amplifies the gap in prosociality between adolescents of high and low SES.

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The authors declare no competing interest.

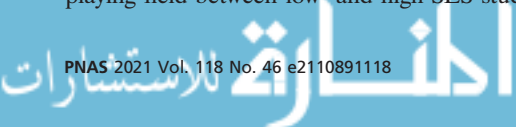
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from high- and low-SES families, there might also be countervailing effects. Recent work has found that social distancing varies by income, with less distancing in low-SES families (30, 31). Less social distancing and thus more social contacts even during the lockdown may preserve relatively more prosociality in low-SES students, for which reason the overall effect of COVID-19 infections is open to empirical investigation.

Data

In October and November 2019, with Institutional Review Board approval from the Toulouse School of Economics and based on informed consent that complied with Europe's General Data Protection Regulation, we set up a panel to measure high-school students' prosociality in three regions of France (Nantes, Montpellier, and Créteil). Initially, 67 schools agreed to participate, which meant that over 5,000 students, aged 15 to 17 y (grades 10 to 12), participated in the first wave of data collection in fall 2019. With the advent of COVID-19 in France in March 2020, all schools were closed from March 16, 2020, to June 22, 2020. Most schools from our first wave preferred to delay a second wave of data collection until after the pandemic. Yet, some schools suggested to contact students electronically and let them participate remotely from home during lockdown. Thus, 363 students from the first wave also participated in May and June 2020, meaning that we have data for them for two waves, allowing us to identify the effects of COVID-19 on prosociality. Our study of these students relies on merging three data sources: 1) data on prosociality comes from incentivized experiments that adolescents played both in fall 2019 (in school) and spring 2020 (at home), in both waves, data collection was done on an online platform that we had created; 2) data on the effects of COVID-19 on students and their families comes from a survey we designed and administered online in May and June 2020 (at the end of the incentivized games); and 3) the French Ministry of Education provided administrative data on parents' SES.

In order to reduce measurement error, we used multiple components to construct a measure for a subject's prosociality. We considered an adolescent's behavior in four different games or tasks (reference *SI Appendix* for details): 1) the relative frequency of cooperation in a repeated prisoner's dilemma game; 2) trust as the amount a first mover transfers to a second mover in a standard trust game (32)*; 3) altruism as the frequency with which subjects donate a fixed amount of money to a vaccination campaign (against measles), run by UNICEF (33), rather than taking a (successively) increasing amount of money for themselves; and 4) generosity as the share of each student's total payoff from all tasks that he or she decides to donate to a nongovernmental organization. All tasks were incentivized by converting the students' credits into gift vouchers. In both waves, students were given the same instructions that we would randomly draw 300 students to receive the vouchers. In order to construct the dependent variable of prosociality, we transform our four different measures (cooperation, trust, altruism, and generosity) into a single principal component index of prosociality in order to get an encompassing measure of prosociality that does not rely only on a single game [following earlier work using this approach (18)].

In May and June 2020, the majority of students filled in an extensive survey on COVID-19 (however, since this was at the end of the incentivized games, some students skipped that part). The survey included questions on whether parents had a job that exposed them to COVID-19 (e.g., working in the

health sector or in a supermarket), whether anyone in the family (including the student, parents, siblings, grandparents, or other family members) had COVID-19, and, if so, whether that family member was hospitalized. We also asked whether parents (and siblings) stayed at home during the French lockdown, whether any parent lost their job (at least temporarily), how much time students spent reading COVID-19-related news (which we use as a proxy for knowledge about the disease and measures to protect against it), and to what extent they complied with safety rules to avoid an infection.

Finally, we matched our experimental and survey data with administrative data on students, which was provided by the French Ministry of Education. This dataset contains extensive information on students' demographic characteristics (including gender and parents' profession). Following the guidelines from the French Statistical Office (INSEE), we define a student as having low SES if the occupation of the parent who is the head of household is either a manual worker ("ouvrier" in French) or nonmanual worker ("employé"). Of the students in our sample, 12.4% have a household head who is a nonmanual worker and 17.9% a household head who is a manual worker. Nonmanual workers include, among others, professions like postman, ambulance driver, caregiver, cashier, shop seller, police officer, security agent, or secretary. Manual workers include, for instance, professions like electrician, carpenter, painter, taxi driver, gardener, or builder. *SI Appendix, Table S1* contains the list of professional classifications by INSEE, their relative frequency, the mean wage, and the fraction of workers with a high-school degree in each profession (referring to the whole French working population). From this table, one can see that the groups of nonmanual workers and manual workers have below average wages and education.

Methods

Establishing whether having COVID-19 in one's family has any effect on adolescents' prosociality is difficult because of potential reverse causality, as prosociality might determine COVID-19 exposure levels (34). We assuage this potential selection problem by employing panel regression models to construct estimates of the effect of COVID-19 exposure in the family. Our prosociality measures, available before the onset of COVID-19 and during the first lockdown, allow us to examine changes in prosociality within adolescents over time (instead of using cross-sectional comparisons between adolescents). Our econometric approach therefore controls for differences in students' characteristics that are fixed over time and might have endogenously determined COVID-19 exposure.[†] Our estimating equation is as follows:

$$Y_{it} = \alpha_i + \gamma_t + \beta \cdot \text{COVID19}_{it} + \gamma \cdot \text{COVID19}_{it} \cdot \text{LowSES}_{it} + \delta X_{it} + \varepsilon_{it},$$

where Y_{it} is the outcome of student i at time t (and $t = 1$ for Pre-COVID-19 in October and November 2019 and $t = 2$ in May and June 2020), α_i is a student fixed effect, γ_t is a time fixed effect (taking the value 1 for the second wave and 0 for the first wave), and COVID19_{it} is whether the student or a family member had COVID-19. X_{it} is a vector of control variables that includes gender, region, and grade (which is included as a linear variable, ranging from 10th grade—when students are 15 y old—to 12th grade—when students are 17 y old), all separately interacted with COVID-19 exposure. We cluster SEs at the class level.

Results

Pre-COVID-19 Differences in Prosociality between High- and Low-SES Adolescents and Development during the Pandemic. In fall 2019, students of different SES already differed significantly in their prosociality, which confirms previous findings (Panels A and B of Table 1) (19). The principal component index for prosociality is significantly lower (−0.33 points) for low-SES students than for high-SES students, a difference that represents 0.27 SDs. In the four different games, low-SES students were, on average, less

*We let students play both roles in the trust game, as first mover to measure trust and as second mover to measure trustworthiness. Unfortunately, the computer program for the second mover decisions contained a bug that overwrote students' actual decisions with a fixed number (5). For this reason, we are unable to include trustworthiness in our index of prosociality.

[†]Our identification relies on the assumption that time-varying student characteristics are independent from COVID-19 exposure.

Table 1. Prosociality before and during the pandemic and survey on COVID-19

	All (1)	Low SES (2)	High SES (3)	Difference (4) = (2) – (3)	P value
Panel A: Pre-COVID-19 prosociality (October/November 2019)[†]					
Prosociality index (principal components analysis)	0.046	−0.183	0.145	−0.328***	0.001
Cooperation	0.474	0.465	0.478	−0.014	0.565
Trust	2.489	2.335	2.556	−0.221	0.117
Altruism	3.261	3.078	3.342	−0.264**	0.024
Generosity	0.467	0.365	0.509	−0.144***	0.000
Panel B: Prosociality during COVID-19 pandemic (May/June 2020)					
Prosociality index (principal components analysis)	−0.043	−0.316	0.070	−0.386**	0.002
Cooperation	0.485	0.446	0.502	−0.056**	0.013
Trust	2.650	2.428	2.738	−0.311**	0.023
Altruism	3.167	3.115	3.189	−0.075	0.556
Generosity	0.407	0.301	0.448	−0.147***	0.000
Number (#) of observations in each wave	363	110	253		
Panel C: Survey on COVID-19 (May/June 2020)[‡]					
COVID-19 infection in family	0.240	0.156	0.274	−0.118**	0.042
Hospitalization	0.068	0.016	0.089	−0.074***	0.008
Compliance with safety rules [§]	0.853	0.934	0.821	0.114**	0.010
Time reading COVID-19–related news [¶]	1.833	1.968	1.778	0.190	0.235
# of parents with contact job	0.571	0.766	0.490	0.275**	0.012
At least one parent with contact job	0.457	0.562	0.413	0.150**	0.043
# of parents losing job in pandemic	0.355	0.475	0.307	0.169*	0.077
At least one parent losing job	0.313	0.377	0.287	0.090	0.213
# of parents at home during lockdown	1.223	1.000	1.314	−0.314***	0.005
At least one parent home in lockdown	0.791	0.726	0.817	−0.091	0.161
Father at home during lockdown	0.535	0.371	0.601	−0.230***	0.002
Mother at home during lockdown	0.688	0.629	0.712	−0.083	0.245
# of siblings at home	1.075	0.970	1.122	−0.152	0.308
Family size (members)	4.258	4.177	4.291	−0.114	0.511

***: significant at *P* level of 0.01/0.05, respectively.

[†]The four different tasks/games are described in detail in *SI Appendix* that also includes the experimental instructions.

[‡]The survey can be found in *SI Appendix*.

[§]This is a dummy variable coded as 1 if a student answered “all the time” to any of the questions about the frequency of complying with safety conditions (for washing hands/social distancing/distance greetings/wearing a mask); the variable is 0 otherwise.

[¶]This scale was coded as follows: 1 = less than 15 min; 2 = between 15 to 30 min; 3 = between 30 min and 1 h; 4 = between 1 h and 2 h; and 5 = more than 5 h per day.

cooperative, less trusting, less altruistic, and less generous than high-SES students. Panel B of Table 1 shows that these differences in prosociality get even larger (with the exception of altruism) during the COVID-19 pandemic. The principal component index of low-SES students is 0.39 points lower in May/June 2020 than the index of high-SES students (representing about 0.32 SDs), and except for altruism, the differences between low- and high-SES students are significant for cooperation, trust, and generosity.

Survey Evidence on Differential Effects of COVID-19 on High- and Low-SES Families. Families of high-SES students were more likely to experience a COVID-19 infection (27.4% versus 15.6%; $P = 0.042$)[‡], and they were also more often treated in hospital (8.9% versus 1.6%) (Panel C of Table 1). One explanation for these differences could be that high-SES families may have better access to both testing and health care in case of an infection (36).

Parents of low-SES students had a considerably higher likelihood of having a job where they are regularly in contact with others and thus potentially with COVID-19 (0.766 versus 0.49 parents per family on average; $P < 0.05$). This might explain

why students of low SES reported significantly higher compliance with safety rules than high-SES students ($P = 0.01$), since their parents are more exposed and hence may emphasize the importance of compliance more. The fact that low-SES students spent more time reading COVID-19–related news fits into this picture as well.[§]

Concerning the economic effects of COVID-19 on students’ families, parents of low-SES students were significantly more likely to have lost their job or be on a partial unemployment scheme than parents of high-SES students (0.475 versus 0.307 parents per family on average; $P = 0.077$)[¶]. Despite more frequent job losses in families of low-SES students, their parents stayed less frequently at home during the lockdown than parents of high-SES students (1.00 parents versus 1.31 parents; $P = 0.005$). This can be explained by more ample opportunities for high-SES families to work from home. The difference in the number of parents staying at home is caused by differences for fathers (0.37 versus 0.60 fathers at home during lockdown; $P = 0.002$), while for mothers there is no significant difference

[‡]Overall, we have 24% of adolescents with a COVID-19 infection in their families. Estimations for France projected 4.4% of the population having been infected with COVID-19 by May 2020 (35). This implies that the likelihood of having an infection within a household of 4 to 5 people (which reflects our sample) was about 20%. Since we were asking also about grandparents and other family members, our slightly higher fraction of families with a COVID-19 case seems a good representation of the French situation in spring 2020.

[§]Recent work has shown that COVID-19–related media consumption is positively related to psychological distress and anxiety (37, 38). Low income and job losses—both more prevalent in low-SES groups—have also been related to more psychological distress and anxiety (39, 40). Our pattern of low-SES students reading more COVID-19–related news is consistent with these empirical findings.

[¶]In May 2020, 45.1% of the low-SES workers reported being unemployed in France, according to the French statistical agency (36.3% for nonmanual workers and 53.9% for manual workers). Source: <https://www.insee.fr/fr/statistiques/4801313#titre-bloc-8>

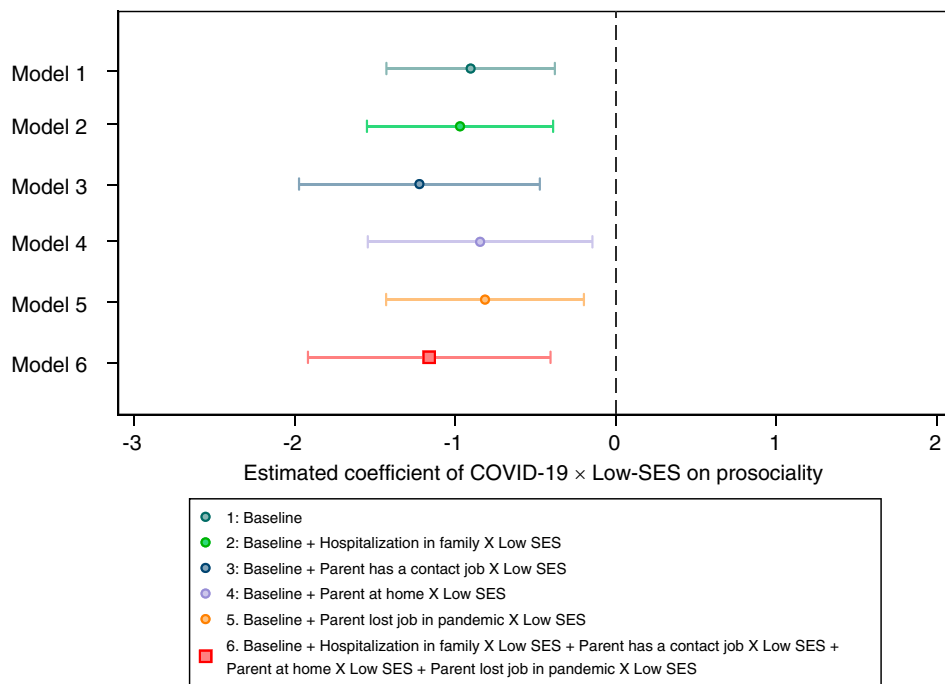


Fig. 1. Effect of COVID-19 infections on prosociality of adolescents from low-SES families (relative to high-SES adolescents). Notes: The figure shows the estimated coefficient of the interaction term COVID-19 × Low-SES background on adolescents' prosociality index. The whiskers denote the 95% CI. SEs are clustered at the class level. From *Top to Bottom*, we present the estimated coefficient for six different models. The dependent variable is always an adolescent's prosociality index. Model 1 corresponds to the baseline model from the *Methods* section whose results are discussed in the *Results* section of the paper. The independent variables include a student fixed effect, a time fixed effect, a binary variable for COVID infection in the family (COVID), the interaction term COVID × Low-SES background (whose coefficient is reported in this figure), as well as the following control variables: COVID × Gender, COVID × Grade, COVID × Region, whether the student participated from a mobile phone, whether the partner for cooperation and trust games was from the same class (versus from another school or region), and the number of games/tasks included in the composite index. Model 2 adds the following control variables to Model 1: "at least one family member hospitalized" and the interaction term "hospitalization" × Low SES. Model 3 adds the following control variables to Model 1: "at least one parent has a contact job" and the interaction term "parent has a contact job" × Low-SES. Model 4 adds the following control variables to Model 1: "at least one parent at home during lockdown" and the interaction term "parent at home during lockdown" × Low-SES. Model 5 adds the following control variables to Model 1: "at least one parent has lost job in the pandemic" and the interaction term "parent has lost job in the pandemic" × Low-SES. Model 6 includes all variables considered in Models 1 to 5. *SI Appendix, Table S4* shows the regression results for all six models in detail.

between students of high or low SES. Families of different SES also do not differ with respect to the number of siblings at home during the lockdown or the average family size.

Association between COVID-19 Infections in Families and Adolescents' Prosociality. Panel B of Table 1 has shown that the gap in prosociality has widened, in the aggregate, between low- and high-SES students during the pandemic. *SI Appendix, Table S2* shows that this increase is not significant in most specifications. Yet, here we are in particular interested in whether having COVID-19 affects prosociality. For this reason, we now zero in on how COVID-19 infections within families affect the prosociality of students of different SES. Fig. 1 presents our main result. We show, for different model specifications, the coefficient of an interaction term between a COVID-19 infection within an adolescent's family and having low SES. In all models, the interaction term is significantly negative, ranging from 0.81 to about 1.22 points of the principal component index. This is equivalent to 0.61 to 0.94 of an SD of the prosociality index. These are very strong effects, considering the pre-COVID-19 difference of 0.27 SDs between high- and low-SES adolescents. This means that COVID-19 infections within families amplify the difference in prosociality between high- and low-SES students, by increasing the gap by a factor of two to three in case of a COVID-19 infection.[#] Putting this result in perspective, having

a COVID-19 infection in a low-SES family has approximately 2 times the effect—in absolute terms but in reverse direction—of a mentoring program studied previously (23). It is also interesting to note that exposure to COVID-19 among relatives has no significant effect on prosociality for high-SES adolescents (as shown by the nonsignificant coefficient of "Relatives with COVID" in *SI Appendix, Table S4*). The increased gap in prosociality we document is therefore driven by low-SES adolescents becoming less prosocial when one of their relatives has COVID-19.

Taking into Account the Potential Effects of Parental Job Loss, Contact Job, Home Office, and Hospitalizations. In Fig. 1, we show as the baseline model a specification where we control for gender, age, and region of students (i.e., their interaction with COVID-19 infection). In the following models (from top to bottom), we add single control variables to the baseline model, considering hospitalizations (Model 2), whether parents have a job with lots of potential contact during the pandemic (Model 3), how many parents stayed at home during the lockdown (Model 4), and whether any parent lost (at least temporarily) their job in the pandemic (Model 5). In Model 6 (at the bottom), we add all of those controls to the baseline model. In all models, the negative effect of a COVID-19 infection on the prosociality of adolescents with low SES remains significant and sizable, thus confirming the baseline model's result.

Interestingly, none of the control variables included in the models (job loss, contact job, working from home, hospitalization) themselves have a main effect on adolescents' prosociality (*SI*

[#]This result also holds true when splitting SES status by the median income of the different professions. Reference *SI Appendix, Table S3*.

Appendix, Table S4). Taken together, the evidence in Fig. 1 and SI Appendix, Table S4 suggests, first, that a COVID-19 infection in a family is the main driver of the increasing social gap in prosociality and, second, that in contrast, the large differences we observe between high- and low-SES adolescents in terms of job loss, contact job, or ability to work from home do not reinforce inequalities in prosociality. Finally, SI Appendix, Fig. S1 and Table S5 document the effect of COVID-19 exposure on each component of the prosociality index separately (cooperation, altruism, trust, and generosity). A COVID-19 infection within a family has a negative effect on each component, although only the effect on cooperation and altruism are statistically significant (at the 10% level for altruism).

Conclusion

Our paper has measured the effects of COVID-19 infections within families on adolescents' prosociality in a longitudinal panel, by matching experimental choices with survey data and administrative records on adolescents' socioeconomic background. Accounting for likely channels through which the COVID-19 pandemic might have affected high- and low-SES adolescents' prosociality (e.g., parents' having a high-contact job or losing their job), our study is better positioned to examine questions of inequality in terms of SES and the likely causal pathways than earlier analyses of COVID-19 and prosociality, which relied on cross-sectional analyses or priming the salience of COVID-19 (29, 41–43).

Overall, our study suggests that exposure to COVID-19 within a family widens the prosociality gap between low- and high-SES students (19). Considering the importance of noncognitive skills in general and of prosociality in particular (10–15, 18), the negative effects of COVID-19 infections on adolescents from low-SES families may have severe, negative long-term consequences for these adolescents, in particular since the pandemic appears to reverse any attempts at closing the gap in noncognitive skills between high- and low-SES adolescents (22, 23). Future research should be directed at ascertaining whether the effects that we report here persist over the longer run and whether and how potential interventions may undo the increased gap in prosociality of low-SES and high-SES adolescents through COVID-19.

Data Availability. Study data have been deposited in Edmond–Open Research Data Repository of the Max Planck Society (<https://edmond.mpg.de/imeji/collection/zqbomPp9anZDIIvI>) (44).

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