

Coping with school closures: changes in home-schooling during COVID-19

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Executive summary

In an effort to control the spread of COVID-19, schools in almost all countries around the world were closed for extended periods of time. In the UK there were two periods of school closures, during which schools were expected to provide learning materials to their students, parents were expected to help their children with their schoolwork, and children were expected to complete schoolwork at home.

It was widely predicted that school closures would exacerbate inequalities between children from different socioeconomic backgrounds, and new evidence is now emerging that this might indeed be the case. From a policy perspective what matters is not only to document these inequalities but also to identify the channels that contributed to widening the socio-economic gradient in children's educational attainment. This report studies inequalities in learning inputs during the two periods of school closures in the UK by focusing on the inputs into children's learning by schools, parents, and the children themselves. We consider how schools, parents and children responded to the switch to distance learning, how this differed by family background, and how parents and children engaged with the provision of learning materials and lessons by schools.

We use data from the *Understanding Society* COVID-19 survey for around 3,500 children in April 2020, during the first period of school closures in the UK, and 1,900 children in January 2021, the second period of school closures. As well as a rich set of school and family background characteristics, we have information on the following learning inputs reported by parents for each child in primary and secondary school:

- the number of school-provided live, real-time lessons ('online lessons') and worksheets, assignments, video materials ('offline lessons');
- the time parents spent helping the child with their schoolwork;
- the time spent by the child doing schoolwork; and
- the use of additional learning resources including work materials, apps, exercise books and online teaching services that were either free or paid for.

Key findings

Learning inputs from schools, parents and children

Schools improved their distance learning provision between the first and the second period of school closures, with secondary schools offering three times more online lessons in the second closure period than in the first. In April 2020, primary schools offered less than one (0.6) daily online lesson and just over two (2.1) offline learning materials ('offline lessons'). The situation was similar in secondary schools, which provided one online and 2.4 offline lessons on average per day. During the second period of closures, in January 2021, the provision had greatly improved: primary schools provided 1.4 online and 3.2 offline lessons each day, while secondary schools kept their provision of offline lessons unchanged, but increased their online provision to three daily lessons on average.

Children's time spent on schoolwork increased between the first and second period of school closures, particularly among secondary school students. Parental time spent helping children with schoolwork increased only for primary school children. During the first period of school closures, children in primary schools spent 2.3 hours daily on schoolwork and their parents almost two hours. When schools closed again in January 2021, the amount of time children spent on schoolwork increased by one hour, while parents helped for an additional 30 minutes. In secondary schools, students spent three hours on average on schoolwork in March 2020, while parents helped for about one hour. During the second lockdown secondary school students spent an extra 80 daily minutes on schoolwork, but parental time did not change.

The use of freely available additional learning resources decreased between the first and the second period of school closures, while the use of paid-for resources remained constant. During the first period of school closures, 65% of primary and 49% of secondary school students used freely available additional learning resources, while only 8% of primary and 12% of secondary school students used paid-for resources. The proportion of children using paid-for resources remained relatively modest and stable through to the second period of school closures, while the use of free resources decreased to 49% and 38% for primary and secondary students, respectively.

Learning inputs and background characteristics

The number of online and offline lessons provided by schools in England did not significantly differ by school characteristics or the composition of the pupil intake. Across primary and secondary stages of education and looking at both periods of school closures, a large number of school-level characteristics, including the percentage of pupils registered for free school meals and with English as additional language, Ofsted ratings and pupil-teacher ratios were weekly, and not systematically associated with the number of online and offline lessons provided. After controlling for child, parent and school characteristics, a large proportion (from 72% to 87%) of the variation across schools in their distance learning provision remains unexplained. Children's time spent on schoolwork was lower in disadvantaged families, but parental time spent on home schooling did not differ by indicators of socioeconomic background. Children with more educated parents (in the case of secondary school students) or higher household income (in the case of primary school children) spent slightly more time on schoolwork than children from less educated or lower-income households and Pakistani or Bangladeshi backgrounds. By contrast, the time spent by parents was not associated with those indicators, or other parental characteristics such as work status.

There are clear age and gender patterns in how much time parents spent helping with schoolwork and children spent working. Older children both in primary and in secondary schools studied more and received less help from their parents. Boys spent less time on schoolwork than girls, particularly at secondary school level, but they received more parental help than girls.

Use of freely available additional learning materials did not differ much across families with different socioeconomic backgrounds. Children from more advantaged families did not make greater use of freely available educational resources than children from disadvantaged families, and this is true irrespective of the stage of education or the period considered. Families with higher incomes and more educated parents were slightly more likely to use additional paid-for resources (e.g. tutoring or app subscriptions) during both periods of school closures, but the use of these resources was not widespread (around one in 10 families).

How the number of school lessons affected inputs by parents and children

More online or offline lessons offered by primary schools increased the time spent by both parents and children on schoolwork. An additional online lesson offered by primary schools increased children's time by 17 minutes and parents time by 4 minutes, while an additional offline lesson increased the time spent by children by 17 minutes and parents 11 minutes.

In secondary school, an increase in school inputs increased students' study time, but had a mixed impact on parental time: extra offline lessons increased time by parents while extra online lessons decreased it.

An additional offline lesson provided to secondary school students increased student time by 8 minutes a day on average and increased parental time by 3 minutes. An additional online lesson increased student time by 20 minutes a day on average but decreased parental time by 4 minutes, suggesting that parents considered online lessons as substitutes for their own involvement. For both primary and secondary school students, an increase in school inputs – and particularly in online lessons – led to a decrease in the free learning resources used, suggesting that freely available learning resources were used as substitutes for lacking school inputs. An additional online lesson provided by schools reduced the likelihood of using freely available learning resources by 7 percentage points in primary schools, and by 4 percentage points in secondary schools. Offline lessons had a minimal effect on the use of free learning resources.

The provision of on-line lessons had an equalising effect: it reduced differences in the time primary school children from different socio-economic backgrounds spent on schoolwork, and in secondary schools reduced gender differences in students' study time. An increase in school inputs, and particularly on-line lessons, increased the time children spent on schoolwork and the use of paidfor resources for primary school children from less educated families, the use of paid-for resources from higher educated families actually decreased. An increase in the number of lessons offered increased study time for both boys and girls in secondary schools, and because this increase was larger for boys it reduced the gender gap in time spent on schoolwork.

Overall, our results show that socio-economic circumstances did not hugely determine differences in engagement in home schooling between families. On the contrary, the increased offer of learning inputs from schools between the two closure periods helped to reduce some of the differences in parent and child learning inputs that did exist. This does not mean that learning outcomes will be equitable across families; differences in families' ability to help effectively with schoolwork, as well as their access to space, computing devices and internet may still affect how the time invested by parents and children translates into learning achievement. Inequalities are also likely to arise from regional differences in rates of COVID-19 infections which led to additional periods of absence from school, particularly for children in deprived areas who were asked to isolate at home when children in their 'bubbles' tested positive. Therefore, despite the best effort by parents from all backgrounds, factors largely outside their control may have hampered learning considerably more for some children than others.

1 Introduction

The COVID-19 pandemic and the measures adopted to combat the spread of the virus resulted in unprecedented restrictions to almost all aspects of daily life around the world. Children's education was hit particularly hard. In the UK all nurseries, primary, secondary schools and further education colleges were closed to all pupils except vulnerable children and the children of key workers at the end of March 2020, and all end-of-year assessments were cancelled. Children returned to school in the autumn of 2020, but schools were closed again to most children in early January 2021. While the exact dates and durations of school closures differ between the nations of the UK, all schools were closed for at least two months during each of these periods.¹

It is widely expected that school closures will result in large learning losses and that these will be unequally distributed, with larger negative impacts on younger children and children from more disadvantaged socio-economic backgrounds.² Indeed, initial estimates of the effects on primary school children in England seem to suggest that the first period of school closures resulted in about two months delay in progress in both reading and maths, with some indication that the negative impacts could be larger for disadvantaged pupils.³ A recent analysis of the Renaissance Learning's STAR Reading and Maths programme indicates that the combined negative effects of the two periods of school closures on primary school children in England could be as high as 2.3 months for reading and 3.6 months for mathematics.⁴

There is strong evidence of learning losses due to school closures also in other countries. Results for the Netherlands compare national assessments taken before and after 8 weeks of school closures in the spring of 2020 to equivalent tests taken in the three academic years prior to the pandemic. Children lost about eight weeks progress in maths and reading, i.e. made virtually no progress while at home. The learning loss was about 60% higher for children from less educated parents.⁵ Analysis of data from standardised tests at the end of primary school in Belgium (where school closures lasted 9 weeks) finds that the 2020 cohort experienced a learning loss of 19% and 29% of a standard deviation in Maths and Dutch, respectively. Schools with a larger proportion of students from disadvantaged backgrounds recorded larger losses.⁶ Analysis for the US compares the increase in reading and mathematics skills of children in Grades 2 to 8 in all US states between the autumn of 2019 and 2020 with expected achievement based on previous years. The children most affected were in the higher grades (4 to 8) and in schools with higher percentages of lowincome families.⁷

As the COVID-19 pandemic continues to affect the lives of families and individuals, further periods of school closures cannot be ruled out. To reduce the risk of widening socioeconomic differences in educational attainment it is important to understand the mechanisms that may contribute to producing these inequalities, in particular any differences in learning inputs received by children during periods of school closures. In this report we take a broad approach to studying inequalities in learning inputs during the two periods of school closures in the UK by focusing on the inputs into children's learning provided by schools, parents, and the children themselves. We consider how schools, parents and children responded to the switch to distance learning, how this differed by family background, and how parents and children engaged with the provision of learning materials and lessons by schools.

We use data from the *Understanding Society* COVID-19 survey collected for around 3,500 children in April 2020, during the first period of school closures in the UK, and 1,900 children in January 2021, the second period of school closures.⁸ The data include information on the number of online and offline lessons provided by schools, the time spent by parents helping their children with schoolwork, the time spent by children on schoolwork, and the use of additional learning materials

- 4 Understanding progress in the 2020/21 Academic Year. Initial findings from the Spring term, June 2021. Renaissance Learning and Education Policy Institute, a report for the Department of Education.
- 5 Engzell, P., Frey, A. and Verhagen, M. D. (2020). Learning inequality during the Covid-19 pandemic. SocArXiv. https://doi.org/10.31235/osf.io/ve4z7
- 6 Maldonado, J. and De Witte, K. (2020). *The effect of school closures on standardised student test outcomes.* FEB Research Report Department of Economics, Report No. DPS20.17.
- 7 Renaissance Learning (2020). How kids are performing: Tracking the impact of COVID-19 on reading and mathematics achievement. Special Report series, Fall 2020. https://www.renaissance.com/how-kids-are-performing/.
- 8 University of Essex, Institute for Social and Economic Research (2021). Understanding Society: COVID-19 Study, 2020. 8th Edition. UK Data Service. SN: 8644, http://doi.org/10.5255/UKDA-SN-8644-8, Waves 1-7.

¹ The first period of school closures began, in most schools in the UK, on 21 March 2020 for all children except vulnerable children and the children of key workers. In England, some primary school children in Reception, Year 1 and Year 6 returned to school from 1 June up to the summer holiday, some secondary school students returned from 15 June, and all children returned to school in the autumn term, from September. All students in Wales returned to school on 29 June for one month before the summer holiday on a part-time basis, while students in Scotland and Northern Ireland did not return until August for their new academic year. The second period of school closures began on 4 January in Scotland, Wales and Northern Ireland and 5 January in England. England and Northern Ireland had a staggered return to school from 8 March, Wales and Scotland from 15 March (with the very young in school from 22 February).

² Burgess, S. and Sievertsen, H. (2020). 'Schools, skills, and learning: The impact of COVID-19 on education'. <u>https://voxeu.org/article/impact-covid-19-education</u>

³ Rose, S., Twist, L., Lord, P., Rutt, S. Badr, K., Hope, C. and Styles, B. (2021). Impact of school closures and subsequent support strategies on attainment and socioemotional wellbeing in Key Stage 1: Interim Paper 1. National Foundation for Educational Research for the Education Endowment Foundation.

not provided by schools (free and paid-for resources). We analyse how these learning inputs varied according to the characteristics of the school, family or individual, and how they differed between the first and second period of school closures. We also consider how parents' and children's investments responded to changes in school provision of online and offline lessons, and whether this adjustment was different by socioeconomic background or other individual characteristics.

There are different ways in which socio-economic inequalities might be exacerbated by periods of school closures. Families sort into schools based on their socioeconomic background, with children from more advantaged families generally attending schools with higher than average attainment and Ofsted ratings, for example. If these schools were better placed to provide access to online and offline learning inputs, this would be an important channel through which inequalities might emerge. A survey of teachers conducted in March 2020, just one week after schools were closed for the first time in the UK, shows that 55% of teachers from schools in the least deprived areas had used resources to be shared online with students, compared to 45% of schools in the most deprived areas. The same data shows that schools in more deprived areas were more likely to rely on physical worksheets or workbooks (48%) than schools in the least deprived areas (22%).⁹ The difference in the balance between online and offline learning materials could simply reflect the way in which schools tried to accommodate differences in access to digital resources amongst their pupils. However, if online resources were more productive or engaging for the children, this could result in differences in learning outcomes.

A second important aspect is the help parents can offer to their children, especially the youngest who are less able to learn independently. There is a large literature that documents significant socio-economic differences in the amount of time parents spend with their children, including in educational

activities.¹⁰ It is therefore possible that the closure of schools increased attainment differences by family background because children had to rely more on their parents for their learning.¹¹ A recent study for the US shows that online searches for learning resources increased dramatically during school closures, and relatively more in affluent areas.¹² Administrative data from public libraries in the Netherlands shows that the gap in the use of digital learning resources between advantaged and disadvantaged families widened during the period of school closures.¹³ However, this is mostly indirect evidence, and a time use survey conducted in the US over a large sample of families (>200,000) indicates that, after accounting for differences in school provision, less educated parents spent no less time helping children than better educated parents.¹⁴ This is similar to early evidence from the UK, which shows that the amount of time parents spent helping their children with home schooling did not vary much by level of education of the main respondent.15

The impact of the pandemic on parental time could explain the absence of a relationship between background and parental help, as many workers lost their job or were furloughed. Evidence from a survey conducted in March and April 2020 shows large job losses in the UK and US, with women and low educated workers most affected.¹⁶ As parents lose their jobs, more time might become available for other activities. This implies that the pandemic might have helped to balance more evenly the time parents can spend helping their children with their schoolwork. In the US, for example, research shows that households that experienced a job loss since the beginning of the pandemic spent about three-quarters of an hour per day more helping children with their school activities than households which had not experienced job losses.¹⁷ Similarly, data collected in the UK shows that fathers who were employed but on furlough spent on average 17 hours a week helping with childcare and home schooling, compared

⁹ Cullinane, C. and Montacute, R. (2020). COVID-19 and Social Mobility Impact Brief #1: school closures. Sutton Trust. <u>https://www.suttontrust.com/our-research/covid-19-and-social-mobility-impact-brief/</u>

¹⁰ Del Bono, E., M. Francesconi, Y. Kelly and Sacker, A. (2016). 'Early Maternal Time Investment and Early Child Outcomes'. *Economic Journal*, vol. 126 (October): F96-F135.

¹¹ Agostinelli, F., Doepke, M., Sorrenti, G. and Zilibotti, F. (2020). When the Great Equalizer Shuts Down: Schools, Peers, and Parents in Pandemic Times. NBER Working Paper No. 28264, December 2020.

¹² Bacher-Hicks, A., Goodman, J., & Mulhern, C. (2021). 'Inequality in household adaptation to schooling shocks: Covid-induced online learning engagement in real time'. *Journal of Public Economics*, 193, 104345. <u>https://doi.org/10.1016/j.jpubeco.2020.104345</u>

¹³ Jæger, M. M., and Blaabæk, E. H. (2020). 'Inequality in learning opportunities during Covid-19: Evidence from library takeout'. *Research in social stratification and mobility*, vol. 68. <u>https://doi.org/10.1016/j.rssm.2020.100524</u>

¹⁴ Bansak, C., and Starr, M. (2021). 'Covid-19 shocks to education supply: How 200,000 US households dealt with the sudden shift to distance learning'. *Review of Economics of the Household*, 19(3), 1–28. https://doi.org/10.1007/s11150-020-09540-9

¹⁵ Benzeval, M., Borkowska, M., Burton, J., Crossley, T.F., Fumagalli, L., Rabe, B. and Read, B. (2020). *Briefing note COVID-19 survey: Home Schooling*. No. 2020-12. *Understanding Society* at the Institute for Social and Economic Research, 2020. <u>https://www.understandingsociety.ac.uk/sites/default/files/downloads/</u> working-papers/2020-12.pdf

¹⁶ Adams-Prassl, A., Boneva, T., Golin, M. and Rauh, C. (2020). 'Inequality in the Impact of the Coronavirus Shock: Evidence From Real Time Surveys'. Journal of Public Economics, 189:104245.

¹⁷ Bansak, C., and Starr, M. (2021), cited above.

to 10 hours for employed fathers (for mothers the difference was smaller, 20 hours vs. 18 hours).¹⁸ We will consider parents' work status when documenting the determinants of parents' time investments.

Finally, we need to consider the amount of time children themselves spent learning during periods of school closures. Here the UK data shows significant socio-economic differences during the first lockdown. Children whose parents have a degree were more likely to spend four hours or more studying than children whose parents have a GCSE level qualification (23% compared to 18%).¹⁹ Similarly, while 58% of children from higher income households submitted all their assignments, only 38% of children from lower income families did.²⁰ The effort children exert is likely to depend on the inputs received by schools and parents, but it might also depend on their ability to learn independently. This may be related to noncognitive skills (e.g. self-regulation) and previous attainment. For example, a survey conducted in Germany in June 2020 suggests that low-achieving students are more likely to replace study time with less productive activities like TV or computer games than higher-achieving students. This differential was found to be no larger or smaller according to socio-economic status, and it was mainly observed for boys rather than girls.²¹ This finding suggests that the channels through which socioeconomic gaps in children's learning inputs emerge might be more complex than simply attributing these differentials to parents or schools.

Most of the available evidence on learning loss during school closures is related to the first period of school closures at the beginning of the pandemic. Subsequent waves of infections provoked further emergency measures, including renewed closure of schools in many countries. In the UK the second period of school closures was different from the first. Most importantly, in the first period of school closures in England provision of learning relied largely on school initiative, while from October 2020 all English schools were under a legal obligation to provide high-quality remote education resources and plan a programme of equivalent length as the core teaching students would receive in school for any student unable to attend lessons.²² This policy change induced an increase in school inputs and gives us the opportunity to analyse the channels through which socio-economic

inequalities emerge, going beyond a simple snapshot description of the links between school, family and child inputs.

Our results show that, from the first period of school closures to the second, primary and secondary schools significantly increased the number of online and – in the case of primary schools - offline lessons they offered. Parents of primary school children increased the time they spent helping with schoolwork and children increased the time they spent doing schoolwork. In the first closure period, when schools offered only a few lessons, families resorted to freely available learning materials for their children. More online and offline lessons in the second period of school closures resulted in families relying less on free learning resources. The level of paid-for resources used was low and did not change over time. The improved offline lessons offer had the effect of engaging parents and children more with schoolwork in general. The offer of more online lessons, in contrast, led to children studying more, but parents responded differently; while parents of primary school children marginally increased their help, parents of secondary school children decreased the time spent helping with schoolwork. Perhaps surprisingly, we find that school characteristics explain little of the difference in the number of lessons offered. Throughout our analysis we show that parents helped their children with schoolwork regardless of their socioeconomic backgrounds. Children from more affluent families and girls in secondary schools tended to work slightly more, but these inequalities were lessened when the offer of online lessons increased.

The fact that socio-economic circumstances do not seem to be the most significant driver of differences in parental engagement in home schooling does not mean that learning losses will be equally distributed. Apart from the time spent helping children with schoolwork, there are other factors that might vary by socio-economic background that we are not able to observe, or do not observe across the two periods of school closure. Such factors include the effectiveness of parental help, with some surveys reporting that parents in lower-income household find it more difficult to support their children with schoolwork than parents in higher-income households.^{23 24} Another issue might be the availability of a device to access learning materials and online lessons. However, a survey conducted during the first school closure period reported

¹⁸ Benzeval et al., (2020), cited above.

¹⁹ Benzeval et al. (2020), cited above.

²⁰ Andrew et al. (2020), cited above.

²¹ Grewenig, E., Lergetporer, P., Werner, K., Woessmann, L. and Zierow, L. (2020). COVID-19 and Educational Inequality: How School Closures Affect Low-and High-Achieving Students. IZA Discussion Paper 13820.

²² Provision of remote education (England) temporary continuity direction. The Coronavirus Act 2020, The London Gazette, Notice 3642261.

²³ Andrew, A., Cattan, S., Costa Dias, M., Farquharson, C., Kraftman, L., Krutikova, S., Phimister, A. and Sevilla, A. (2020). 'Inequalities in children's experiences

of home learning during the COVID-19 lockdown in England'. *Fiscal Studies* 41(3): 653–83. <u>https://onlinelibrary.wiley.com/doi/10.1111/1475-5890.12240</u> 24 Bol, T. (2020). *Inequality in homeschooling during the Corona crisis in the Netherlands: First results from the LISS panel*. SocArXiv. https://doi.org/10.31235/osfio/

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relatively small differentials in access to learning devices by family background.²⁵ Socio-economic inequalities are also likely to arise from differences in COVID-19 infections. COVID-19 risk is unequally distributed, with individuals from ethnic minorities and low-income households being more exposed either due to different underlying health status, housing conditions, or rates of employment in 'key worker' jobs.²⁶ In addition to this, children living in more disadvantaged areas might have experienced additional periods of absence from school due to the 'bubble' system. This means that despite the best efforts of parents from all backgrounds, factors largely outside their control may have hampered learning more for some children than others.

25 Benzeval et al. (2020), cited above.

²⁶ Baylis, P., Beauregard, P.-L., Connolly, M., Fortin, N., Green, D.A., Gutierrez-Cubillos, P., Gyetvay, S., Haeck, C., Molnar, T.L., Simard-Duplain, G., Siu, H.E., Nyenhuis, M. and Warman, C. (2020). *The Distribution of COVID-19 Related Risks*. NBER Working Paper No. 27881, October 2020.

2 Data

The main data we use come from the *Understanding Society* COVID-19 survey.²⁷ The *Understanding Society* COVID-19 survey is an integral part of the *Understanding Society* study, a nationally representative longitudinal household survey. It was collected in April, May, June, July, September and November 2020 and January and March 2021, with the aim of enabling analysis of the consequences of the pandemic on society. All sample members of the mainstage *Understanding Society* household panel who, in April 2020, were 16 or older and were from households that had taken part in at least one of the two latest waves of *Understanding Society* COVID-19 survey. Parents and carers were asked to provide information on children aged 4-18, including on home schooling.

We use data from Waves 1 and 7, collected by web interview in the last week of April 2020 and in the last week of January 2021, respectively. These give a snapshot of educational activities during the first and second period of school closures respectively. For some of our analysis we use school-level information. We link information about schools for each child in a responding household attending a state school in England by using school codes collected in the main *Understanding Society* study at Wave 11 and the COVID-19 survey in September 2020.²⁸ Because the school-level data we have is for state schools in England only, analysis using school-level characteristics excludes children in private schools and those outside England. School-level data is also missing if parents did not report the child's school.

We are interested in the schools' provision of learning inputs, measured as the number of daily lessons provided by the school for each child. We distinguish between offline worksheets, assignments and video clips (referred to here as 'offline lessons' for simplicity), and online live (real-time) lessons. Information on daily online and offline lessons is collected in bands. We transformed these banded variables into continuous variables as shown in Table 1.

Our main indicators of learning inputs from parents and children are: i) daily hours spent on schoolwork by each child; and ii) daily hours spent by the parent helping each child with their schoolwork. Information on parents and children's learning inputs is given by each parent (if present) for each child in the household (see question wording in Table 2). While the information is provided by parents, the data are at the child level. Daily hours spent by children on schoolwork and daily hours spent by parents helping each child with their homework

Table 1 Creation of the variables measuringschool inputs

Question wording	Banded option	Continuous variable
How many offline lessons (such as worksheets, assignments, watching videos) does {childname}'s school provide for them?	None	0
	Less than one a day	0.5
	About one a day	1.5
	About two a day	2.5
	About three a day	3.5
	About four or more a day	4.5
How many online (live or real time) lessons or meetings does {childname}'s school provide for them?	None	0
	Less than one a day	0.5
	About one a day	1.5
	About two a day	2.5
	About three a day	3.5
	About four or more a day	4.5

²⁷ University of Essex, Institute for Social and Economic Research (2021), cited above.

²⁸ Data on Ofsted ratings, religious denomination of the school, type of school, whether the school has a Sixth form, and rural/urban classification of the schools' location come from the Edubase dataset. Data on the student composition (school size, whether the school is a single-sex school, percentage of Free School Meal eligible students, percentage of people speaking English as a second language, percentage of students by ethnicity) come from the School, Pupils and their Characteristics (SPC) data. Finally, data on pupil/teacher ratios and on teachers' salaries were obtained from the Workforce Census. Edubase, the SPC and the Workforce Census are all compiled by the Department of Education and freely available online under Government Open Data Licence.

are recorded in bands. We transformed these banded variables into continuous variables as shown in Table 2.

Our second set of indicators of household learning inputs are variables measuring the use of educational resources, online tutoring, educational apps, website subscriptions and exercise books. This information is reported by parents for each child. We created two binary variables indicating i) whether free educational resources are used for the child; and ii) whether paid-for resources are used for the child.

Information about school, parent and child learning investments is sometimes reported by more than one parent/ guardian for the same child at the same point in time. We aggregated this information by first considering data reported by the mother or female guardian, and, when missing, by using data from the father or male guardian. We used the same strategy to create controls at the parent and household level.

Our sample are children observed in Waves 1 and 7 in primary and secondary school and not attending school in person at time of interview. Our analysis is at the child level on the sample of observations with non-missing information on the variables used. In the April wave we have about 3,500 children in primary or secondary education with full information on child, parent and household characteristics; in the January wave, the number of children in primary of secondary education with full information on child, parent and household's characteristics is about 1,900.

Table 2 Creation of the variables measuring time inputsfrom children and parents

Question wording	Banded option	Continuous variable
Thinking about the situation now, on an average day when they are doing schoolwork, how much time does {childname} spend on this?	The child does not have to do schoolwork at home	0
	Less than one	0.5
	1 to 2 hours	1.5
	2 to 3 hours	2.5
	3 to 4 hours	3.5
	4 to 5 hours	4.5
	5 or more hours	5.5
And how much time do you or other family members spend actively helping {childname}?	The child does not have to do schoolwork at home	0
	None	0
	Less than one	0.5
	1 to 2 hours	1.5
	2 to 3 hours	2.5
	3 to 4 hours	3.5
	4 to 5 hours	4.5
	5 or more hours	5.5

3 Methods

We present three sets of results: i) a description of the learning inputs by schools, parents and children during the two periods of school closure; ii) an analysis of the factors associated with schools', parents' and children's learning inputs; and iii) an analysis of how parents' and children's provision of learning inputs reacts to schools' provision of learning inputs. Our methods are briefly described here.

Learning inputs by schools, parents and children during school closures

In Section 4 we present three bar charts showing average inputs across responding households. Each contrasts learning inputs during the first and second school closure, in separate panels for primary and secondary-age children. We present one graph focusing on online versus offline school lessons, one on parents' versus children's time, and one on free versus paid-for resources. We present 95% confidence intervals with each bar. This is the range of values that contain the true average with 95% confidence. We also provide a table showing a breakdown of the frequency of respondents reporting each level of input, again distinguishing between the first and second period of closures, and primary and secondary-age children.

Factors associated with schools', parents' and children's learning inputs

In Section 5 we present results from two sets of regressions. The first set studies the variables which are more closely associated with the school provision of learning resources; the second studies the time spent by parents and children on schoolwork and the use of learning resources. All regressions are estimated using Ordinary Least Squares (OLS) models (or Linear Probability Models for the case of learning resources, when the dependent variable is binary), with standard errors clustered at the parent level. All models are estimated at the child level, as school, parent and child learning inputs are reported for each child.

Our first set of regressions studies the main factors associated to the schools' provision of learning inputs. As dependent variables we use the continuous variables indicating the number of daily online and offline lessons provided by the school for the child. These numbers vary across children and over time (first and second period of school closure). If a child was not given schoolwork, the number of both online and offline lessons for that time period is recorded as zero. We regress school inputs on a wide range of school-level variables (see more details on the explanatory variables in the notes to the figures), separately for each period of school closure and for primary and secondary school students. We also enter child and parent characteristics in our regressions to control for possible reporting bias. Note that these regressions reflect associations rather than a causal relationship, as there may be factors unobserved by us – the motivation of the head teacher, for example – that may affect both the school inputs and our explanatory variables, resulting in biases of the estimates.

The second set of regressions studies the factors associated with parents' and children's learning inputs. The dependent variables are the number of daily hours spent by the parent and child on schoolwork, as well as binary variables indicating whether free or paid-for learning resources were used for the child. Again, if a child was not given schoolwork in the time period considered, the number of hours spent by the child and hours spent by the parent is recorded as zero. We regress each dependent variable on a set of child, parent and household characteristics. The estimated coefficients show the associations between child/parent/household characteristics and child and parent learning inputs. As before, the coefficients cannot be given a causal interpretation.

How parents and children react to schools' provision of learning inputs.

Our third piece of analysis studies how child and parent learning inputs react to the provision of learning inputs by the school. Unlike the previous sets of regressions, which describe the association of different factors with parents' and children's inputs, these regressions focus on only two independent variables (number of offline lessons and number of online lessons) and study how the investment by parents and children reacts to the school investments. Cases where the children are not given schoolwork are excluded from this part of the analysis, as time spent by parents and children doing schoolwork is not recorded in these cases.

To go beyond a simple description of associations, we make use of the fact that for some families the educational investments by schools, parents and the children themselves is observed twice: during the first and in second period of school closures, that is in April 2020 and in January 2021. With multiple observations for the same child, we can estimate an individual fixed effects model. With two waves only, this is equivalent to estimating a first differences model where the change in the dependent variable, for example the time spent on schoolwork by children, between the first and the second lockdown is regressed on the change in the school provision of learning inputs. Using changes between the first and the second period of school closures eliminates the effect of any time-invariant factor (both observed and unobserved) correlated with both the provision of learning inputs by the school and the provision of learning inputs by the child and gives us the possibility to give our results a causal interpretation. However, time-varying factors potentially

correlated with both the school provision of learning inputs and the time spent by the child doing schoolwork can drive the coefficients and confound the estimates. To account for this, we control for potentially important time-varying factors, such as parent's work status and hours worked.²⁹

In Section 6 we discuss these responses on average across the sample, and in Section 7 show how these differ when the same models are estimated for distinct sub-groups, i.e. by ethnicity (Non-Whites, Whites), gender of the student (girl, boy) and education of the parent (below A-level, A-level and above).

²⁹ We assume that parental working status and hours of work are not jointly determined with hours spent helping the child with schoolwork and are instead dictated by external circumstances. This is a strong assumption, but it could be justified during the period of time we consider, as adjustments to parental labour supply were dictated by the closures of entire sectors of the economy that were outside the individual (and the employer's) control and individuals had minimal opportunities to move jobs.

4 Learning inputs by schools, parents and children during school closures

Figure 1 focuses on learning materials provided by schools during the first and second period of school closures. It shows the number of daily live, real-time online lessons and of offline worksheets, assignments, video materials (referred to as 'offline lessons' for simplicity) offered by schools. The bars indicate the average number of daily lessons provided by schools in our sample, that is, all children who were out of school, including those who were not given any schoolwork. The black lines show the 95% confidence intervals for that average.

In primary schools less than one (0.6) daily online lesson and just over two (2.1) offline lessons were provided by schools during the first school closure (see left panel of Figure 1, first set of bars). These averages are across considerable differences between schools. Nearly two thirds of primary school children received no online lesson during the first period of school closures (see Table 3, top panel, first column), and only 8.6% received four or more lessons. Almost 60% of primary school children received at least two offline lessons per day during the first period, 10% received none, and 18% received four or more (see Table 3, second panel, first column). During the second period of school closures, primary schools markedly increased their offer of both online and offline lessons, with 1.4 online and 3.2 offline lessons being offered each day (see left panel of Figure 1, second set of bars). This increase was mainly driven by schools' legal obligation to offer remote learning for children, as well as schools learning over time how to improve their offer.

Secondary schools offered one daily online lesson and 2.4 offline lessons during the first period of school closures (see right panel of Figure 1, first set of bars). Again, there was a lot of variation between schools in the number of daily lessons. 55% of secondary schools provided no online lessons and 16% no offline lessons, while 11% of schools offered four or more daily online lessons and 28% provided four or more offline lessons (see Table 3, top panel, third column). Like primary schools, secondary schools considerably increased their offer of online lessons by the time schools were closed again in January 2021, to 3 daily lessons. Only 7% of secondary schools did not offer online lessons and 47% offered four or more a day (see Table 3, top panel, third column). In contrast, the number of offline lessons remained stable over time (right panel of Figure 1). In the next section we will look at the school characteristics associated with the daily number of online and offline lessons offered.

Figure 2 summarises the time parents spent helping children with their schoolwork and the time children spent doing schoolwork, separately by primary and secondary school phase. If children were not given schoolwork, the time is set to zero for both parents and children. During April 2020 parents of primary school children spent 1.9 hours a day helping the **Figure 1** Online and offline lessons provided by schools during first and second period of school closures, by school phase



Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in primary school (left panel) and secondary school (right panel) with non-missing information on both online and offline lessons. Sample sizes: primary school: first closure 1,880, second closure 866; secondary school: first closure 1,651, second closure 1,043.

Figure 2 Parent and child time spent doing schoolwork during first and second period of school closures, by school phase



Notes Understanding Society COVID-19 Survey, Waves 1 and 7. Sample of children in primary school (left panel) and secondary school (right panel) with non-missing information on both time spent by parent and time spent by child. Sample sizes: primary school: first closure 1,881, second closure 868; secondary school: first closure 1,656, second closure 1,054.

Table 3 Distribution of school, parent and child learning inputs in primary and secondary school during the first and second period of school closures

	Primary school		Secondary school	
Online lessons	First closure	Second closure	First closure	Second closure
None	64.47	23.44	55.12	6.90
Less than one a day	9.95	19.17	9.81	7.48
About one a day	10.21	20.21	7.87	7.77
About two a day	6.81	17.67	8.48	13.23
About three a day	4.10	10.05	7.87	17.83
About four or more a day	4.47	9.47	10.84	46.79
N	1880	866	1651	1043
Offline lessons	First closure	Second closure	First closure	Second closure
None	9.79	4.39	15.87	11.98
Less than one a day	9.41	2.66	7.21	9.88
About one a day	21.12	6.70	11.99	11.98
About two a day	19.26	13.51	16.29	18.70
About three a day	22.45	29.56	20.59	17.26
About four or more a day	17.98	43.19	28.04	30.20
Ν	1880	866	1651	1043
Parent's time	First closure	Second closure	First closure	Second closure
None	6.33	2.42	25.48	20.68
Less than an hour	18.55	13.94	37.98	49.24
one to two hours	34.45	27.53	24.09	19.73
two to three hours	21.64	25.69	7.61	5.60
three to four hours	11.27	17.63	2.60	1.99
four to five hours	5.32	8.53	1.39	1.80
five or more hours	2.45	4.26	0.85	0.95
Ν	1881	868	1656	1054
Child's time	First closure	Second closure	First closure	Second closure
None	5.00	1.27	9.96	1.04
Less than an hour	11.22	3.92	6.34	1.71
one to two hours	28.60	13.13	17.27	3.89
two to three hours	25.57	26.04	19.02	9.20
three to four hours	18.87	27.88	20.29	15.37
four to five hours	8.03	17.86	15.40	28.75
five or more hours	2.71	9.91	11.71	40.04
Ν	1881	868	1656	1054

Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in primary school (left) and secondary school (right) not currently attending school and with non-missing information on both online and offline lessons (top two panels) and both parent's and child's time (bottom two panels). Cases where children are not given schoolwork are treated as zeros.

children with their schoolwork (see left panel of Figure 2, first bar). Primary school children spent on average 2.3 hours doing their schoolwork (see left panel of Figure 2, second bar), indicating that primary school children spent an average of 24 minutes a day doing schoolwork on their own. Again, these averages mask large differences between parents and between children. 25% of parents of primary school children helped their children with schoolwork for less than an hour a day and 8% of parents spent four or more hours daily helping their children (see Table 3, third panel, first column). Most parents spent one to two hours helping primary school children. Children's time is similarly distributed, likely owing to the fact that at primary school age parents and children work together (see Table 3, fourth panel, first column).

By the time schools were closed again in January 2021, both primary school children and their parents spent more time doing schoolwork. Parents increased their time by about half an hour a day, and children increased their time by almost an hour a day. Again, there was large variation in time inputs by parents and children, but only 16% of parents reported helping their child for less than an hour a day (see Table 3, third panel, second column). Like previously, this is mirrored in the children's time inputs.

Figure 2 shows that secondary school students were able to do schoolwork without their parents for a lot of the time. During the first period of school closures they spent almost three hours a day on schoolwork, while their parents spent almost one hour a day helping (see right panel of Figure 2, first two bars). 16% of secondary school students worked for less than an hour a day, and 12% worked for more than five hours (see Table 3, fourth panel, first column). By the second period of school closures, secondary school students increased their time investment to 4.3 hours of daily schoolwork, while parental time inputs did not increase (see right panel of Figure 2, third and fourth columns). Less than 3% of secondary school students were working for less than an hour in January 2021, and 40% were spending five or more hours on schoolwork (see Table 3, third panel, fourth column).

Apart from working on the online and offline lessons and work materials provided by schools, many families used resources such as work materials, apps, exercise books and online teaching services to help children with their learning. Figure 3 shows the proportion of parents that report using freely available resources and the proportion of parents that report using paid-for resources for their children. During the first period of school closures, freely available resources were used for 65% of primary and 49% of secondary school students used free resources according to parent reports, while 12% of primary and 8% of secondary school students used paid-for resources. The proportion of children using paid-for resources remained stable during the second period of school closures

Figure 3 Use of free and paid-for learning resources during first and second school closures, by school phase



Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in primary school (left panel) and secondary school (right panel) with non-missing information on use of free and use of paid-for resources. Sample sizes: primary school: first closure 1,877, second closure 871; secondary school: first closure 1,654, second closure 1,056.

(compare second and fourth bars in each panel of Figure 3), while the use of free resources reduced to 49% and 38% for primary and secondary students, respectively (compare first and third bars in each panel of Figure 3). It is possible that this reduction is in reaction to the increase of schoolwork observed between the first and second school closure periods – something we will investigate in Section 5.

5 Factors associated with schools', parents' and children's learning inputs

School inputs

As highlighted in the previous section, there was sizeable variation across schools in the number of online and offline lessons and work materials provided to children and young people during the two periods of school closure. In Figure 4 we show the school-level factors associated with the learning inputs provided by primary schools, as reported by parents. The analysis is limited to children not at school (so excludes children of key workers and vulnerable children attending school), but includes children whose school did not provide schoolwork. For this analysis, we also restrict the sample to state schools in England owing to the fact that detailed schoollevel characteristics are not available for private schools and schools in the other nations of the UK.

The dots in Figure 4 show the estimated coefficients from the regressions that indicate the association between school characteristics and the number of daily lessons provided during the first (in red) and second period of school closures (in grey). The lines around the markers show the 90% confidence intervals, that is, the range of values where we are 90% confident that the true parameter lies. If these lines cross the vertical dashed line marking zero, we are less than 90% confident that there is any association. The first set of coefficients at the top of each graph show the association in comparison to a baseline category. For example, the first marker at the top shows how lessons offered differ between those attending a local authority (LA) maintained school and those attending an Academy school (i.e. the baseline). The associations between Ofsted ratings and lessons offered shown are in comparison with schools rated Ofsted 'Inadequate'. The school characteristics in the lower part of the figures, such as school size or the percent of a school's student body that are of Black ethnicity are standardised to have mean zero and standard deviation (a measure of the dispersion of the variable in the sample) equal to one. Therefore, the estimated coefficients need to be interpreted in terms of standard deviations.

The left panel of Figure 4 considers the associations between school characteristics and online lessons offered by schools. It shows that LA maintained primary schools offered fewer online lessons than Academy schools during both periods of school closures (about a third of a lesson a day less). Similarly, primary schools with a religious denomination offered fewer online lessons than non-denominational schools during the second school closure. Other school-level characteristics we consider – such as urban location, school Ofsted ratings, school size, pupil-to-teacher ratios and the composition of the student





Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in primary school in England not currently attending school in person with non-missing information on the variables used in the regression. Cases where children are not given schoolwork are entered as zeros for both online and offline lessons. Method: Ordinary Least Squares regression with standard errors clustered at the parent level. 90% confidence intervals. The omitted categories are: 'Academy' for type of school, 'Inadequate' for Ofsted rating, 'White (%)' for shares of ethnicities. All continuous characteristics are standardised. Additional school level controls are indicators for other school type and for Ofsted information missing and share of people with unclassified ethnicity (coefficients not displayed). Child, parents and household controls include child's gender and age, parent's age, whether the respondent is the mother, whether the parent is single, parent's education, ethnicity, work status, hours worked, whether the parent has ever worked from home, household earnings (in quartiles) and Government Office Region of residence. Sample size: online lessons: first closure 621, second closure 335; offline lessons: first closure 621, second closure 336.

Figure 5 Determinants of online and offline lessons offered by secondary schools during the first and second period of school closures



Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in secondary school not currently attending school in person with non-missing information on the variables used in the regression. Cases where children are not given schoolwork are entered as zeros for both online and offline lessons. Method: Ordinary Least Squares regression with standard errors clustered at the parent level. 90% confidence intervals. The omitted categories are: 'Academy' for type of school, 'Inadequate' for Ofsted rating, 'White (%)' for shares of ethnicities. All continuous characteristics are standardised. Additional school level controls are indicators for other school type, and for Ofsted information missing and share of people with unclassified ethnicity. Child, parent and household controls include child's gender and age, parent's age, whether the respondent is the mother, whether the parent is single, parent's education, ethnicity, work status, hours worked, whether the parent has ever worked from home, household earnings (in quartiles) and Government Office Region of residence. Sample size: online lessons: first closure 701, second closure 523; offline lessons: first closure 701, second closure 521.

body in terms of their eligibility for free school meals, language spoken at home and ethnicity – made little difference to the number of online lessons provided by primary schools during either of the two periods considered.³⁰

The right panel of Figure 4 explores the associations between school characteristics and the number of offline worksheets (offline lessons), assignments and videos offered by schools. Similarly to online lessons, there are some schoollevel characteristics associated with providing more offline materials, but there is no consistent pattern across the two periods of school closures or across online and offline lessons. During the first period of school closures larger schools offered fewer offline lessons than smaller schools and schools with a religious denomination offered more. During the second period of school closures these differences reduced and others emerged. For example, primary schools in urban areas and with higher proportions of students of Indian and Black ethnicities offered more offline lessons, and schools with higher proportions of Pakistani and Bangladeshi students offer fewer offline lessons. All of these differences are at the very margin of statistical significance.

Figure 5 shows the associations between school characteristics and the offer of online and offline lessons in secondary schools during both periods of school closures. The panel about online lessons, on the left-hand side, again shows that there are only few characteristics statistically significantly associated with the offer of online lessons. During the first period of school closures, schools rated 'Outstanding' by Ofsted offered 0.7 more daily online lessons than schools rated 'Inadequate', and schools with a high proportion of Pakistani and Bangladeshi students offered fewer (0.2 lessons less). During the second period of school closures, urban schools, those with high proportions of students whose first language is not English and schools with a religious denomination offered more online lessons.³¹

The right panel of Figure 5 shows associations of school characteristics with the provision of offline lessons. Most of the lines surrounding the circular markers cross the dashed zero line, indicating that there are few statistically significant associations. Exceptions are single sex schools that offered

³⁰ During the first closure period, schools with a high proportion of Other ethnicities offered fewer online lessons compared to schools with a high proportion of students of White ethnicity.

³¹ For more analysis of regional differences, see also Green, F. (2020). Schoolwork in lockdown: new evidence on the epidemic of educational poverty. Centre for Learning and Life Chances in Knowledge Economies and Societies (LLAKES).

fewer offline lessons during the first closure than coeducational schools and schools with a religious denomination which offered fewer offline lessons than non-denominational schools.

In summary, across primary and secondary schools, offline and online lessons and both periods of school closures there are few school-level characteristics that help explain the number of online and offline lessons offered by schools, and none of these characteristics are systematically relevant across time-periods and types of lessons. In fact, even after controlling for child, parent and school characteristics, a large proportion (from 72% to 87%) of the variation across schools in their online and offline work provision remains unexplained, with school, child, parent and household characteristics doing particularly poorly in explaining the variation of lessons offered to secondary school children in the first period of school closures. This lack of predictive power of our regressions suggests that other factors that are unobservable to us, and possibly to parents, determined the inputs that students received from schools.

Parent and child time investments

Figures 6 and 7 chart the factors associated with the time investments of parents and children during the two periods of school closures. We relate parental and child time spent on schoolwork to individual and household characteristics of the students and their parents, including children's gender and age and parents' characteristics such as partnership status, education, work status, ethnicity and household earnings. Figure 6 shows this for primary school students. Again, our sample is composed of children not in school, and includes children who were not given schoolwork. For children who were not given schoolwork, both the time spent on schoolwork by children and the time spent by parents helping them is recorded as zero.

The left panel of Figure 6 shows that parents helped older children less than younger ones, especially in the first period of school closures. The graph also shows that parents who never worked at home (compared to sometimes or always working at home, or not working) or were of Pakistani or Bangladeshi ethnicity (compared to White ethnicity) spent less time helping their children with schoolwork, which is a result also found in earlier analyses of parental time inputs.³² These associations remain mostly stable over time. During the second period of school closures, parents helped boys slightly more than girls. Parents who always work away from the home helped their children more, rather than less as in the first closure period. It is notable that none of the variables that proxy socio-economic background, including education and household earning, are associated with parental time investments.

The right panel of Figure 6 shows the factors associated with the time spent by primary school children doing schoolwork. In line with the expectation that parents and children work mostly together on schoolwork at this age, some of the determinants of child time investments are the same as those of parent time investments. During the first school closure this is true of the age of the child, whether the parent works away from the home and ethnic background. However, the coefficient estimate for child age has the opposite sign, suggesting that primary school children invest more study time as they get older and parents consequently reduced their own time investment. Figure 6 also shows that boys tended to work less than girls. Again, this is the opposite of what we see for parents and points towards a substitution between parent and child effort. Moreover, we find that children from the highest earnings quartile and with selfemployed parents spent more time doing schoolwork, while children whose parents did not work spent less time. By the time schools were closed again in January 2021, differences in time spent doing schoolwork were mainly driven by children's age and highest household earnings quartile which was associated with 0.5 more study hours per day, compared to the lowest earnings quartile. In summary, differences by family socio-economic background are apparent in child but not parental time investments.

Figure 7 shows the determinants of parent and child time investments for secondary school students. As seen for parents of primary school children, parental help decreases with the age of the child and is higher for boys than girls (see left panel). Apart from this, there is no clear pattern emerging that consistently explains the time parents invest helping their children during periods of school closures. In contrast to what we find for primary school students, parents' ethnicity and work status does not seem to be associated with the help given to secondary school students (apart from more help from selfemployed parents during the second closures). The only other thing to notice is that during the first period of school closures lower educated parents helped slightly less than higher educated parents and during the second period single parents helped more than parents in couples.

Some of the associations between secondary students' background and time investment estimated on data from the first school closures reach statistical significance (see right panel of Figure 7, red markers). Boys worked about half an hour per day less than girls, and older students worked less than younger ones (a standard deviation in child age is associated with a decrease of more than an hour and a half in the time spent by secondary school students doing their schoolwork). Secondary students from less educated and

32 Bayrakdar, S. and Guveli, A. (2020). Inequalities in home learning and schools' provision of distance teaching during school closure of COVID-19 lockdown in the UK. ISER Working Paper 2020-09.





Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in primary school not currently attending school in person and with nonmissing information on the variable used in the regression. Cases where children are not given schoolwork are entered as zeros for both parent's and child's time. Method: Ordinary Least Squares regression with standard errors clustered at the parent level. 90% confidence intervals. The omitted categories are: 'University Degree' for parent's education, 'HH earnings Q1' (bottom household earnings quartile) for household earnings, 'Employed, with no self-employment' for work status And 'White' for ethnicity. Continuous characteristics are standardised. We also control for a binary variables indicating that the parent has none of the listed qualifications, that information on ethnicity is missing and for Government Office Region of residence (estimated coefficients not shown). Sample size: parent's time: first closure 1,869, second closure: 861; child's time: first closure 1,871, second closure: 862.



Figure 7 Determinants of time spent by parents and children doing schoolwork during the first and second period of school closures, for secondary school children and their parents

Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in secondary school not currently attending school in presence and with nonmissing information on the variable used in the regression. Cases where children are not given schoolwork are entered as zeros for both parent's and child's time. Method: Ordinary Least Squares regression with standard errors clustered at the parent level. 90% confidence intervals. The omitted categories are: 'University Degree' for parent's education, 'HH earnings Q1' (bottom household earnings quartile) for household earnings, 'Employed, with no self-employment' for work status and 'White' for ethnicity. Continuous characteristics are standardised. We also control for binary variables indicating that the parent has none of the listed qualifications, that information on ethnicity is missing and for Government Office Region of residence (estimated coefficients not shown). Sample size: parent's time: first closure 1,650, second closure 1,049; child's time: first closure 1,651, second closure: 1050. less affluent families spent less time on schoolwork. Students whose parents have GCSE or equivalent as their highest qualification spent about 15 minutes a day less time doing schoolwork than students whose parents have a university degree. Students in the top quartile of household earnings spent over 20 minutes a day more doing homework than students in the bottom quartile. Secondary students' study time was also related to ethnicity during the first school closure: on average, students of Pakistani and Bangladeshi background studied about 24 minutes a day less than White students, while students of Indian background and students of other ethnicities studied 34 and 44 minutes more than White students, respectively. By January 2021, we still observe boys investing less time into study than girls and students whose parents are educated to GCSE or equivalent level working almost a quarter of an hour less a day than those whose parents have a university degree. Most other determinants of students' time inputs were no longer relevant however. One exception is that students of Black ethnicity spent around 16 minutes a day more doing schoolwork than White students.

In summary, for primary school children we see a relationship between time spent by parents on schoolwork and parents' working hours and home working status. In contrast, time spent by parents helping their children is unrelated to parents' socio-economic or ethnic background. Because children of primary school age seem to be working mostly with their parents, the determinants of children's study time are similar to those of parents. The exception is age of the child, with older children having more study time and less parental time helping. Moreover, children from more affluent families worked more than those from lower earnings households while the help by parents did not differ by background. This suggests that there is substitutability between parents' and children's work.

Parental help for secondary school students is less dependent on parents' work status than help for primary school children and shows little association with background characteristics. In contrast, secondary students' own time investment was associated with several background characteristics (socioeconomic background and ethnicity) during the first period of school closures, but these associations got weaker by the second period. As with the determinants of the number of lessons provided by schools, a considerable proportion of the variation (from 83 to 94%) in time inputs by parents and students remains unexplained by observable characteristics.

Free and paid-for learning resources

Apart from school inputs and time inputs by parents and students themselves, families can decide to use resources such as websites, apps, exercise books or tutoring to support children in their home learning. Figure 3 showed that a high proportion of students used freely available resources while a smaller proportion – around 10% – had access to paid-for learning resources. Figures 8 and 9 show the factors associated with the use of these resources during the two periods of school closures for children who were out of school.

Figure 8 shows the results of our analysis for primary school children. The use of free resources was lower in families where the parent was not working, working away from home, single or with Pakistani or Bangladeshi background during the first period of school closures (see Figure 8, left panel, red dots). During the second closures period, the use of free resources was lower for older children, and for children of Pakistani or Bangladeshi ethnic background; it was higher for children of Black and Indian ethnic background (see Figure 8, left panel, grey dots). There seems to be a gradient in the use of paid-for resources by socioeconomic background: parents with GCSE and equivalent level education were less likely to use paid-for resources than parents with a degree and parents in the top household earnings quartiles were more likely to use paid-for resources than parents in the bottom household earnings quartile. This gradient is more pronounced in the first period of school closures (red dots). The use of paid-for resources is also correlated with work status: in both periods of school closures self-employed parents were more likely to pay for learning resources, while parents who never worked from home were less likely to do so. Finally, Indian families are less likely to pay for learning resources. As Indian families have been found to be more likely to use free resources, these results together point towards some substitutability between free and paid-for resources.

Figure 9 shows the variables most strongly associated to the use of learning resources for secondary school students. Family background emerges as an important factor. Families in the lower household earnings quartiles were more likely to use free resources (see left panel), although this relationship is clearer in the case of the first school closure (red dots) than the second (grey dots). This relationship is reversed in the case of paid-for resources (see right panel): parents with lower levels of education were less likely to use paid-for resources than parents with a degree (especially during the second school closure) and parents in higher earnings quartiles were more likely to use paid-for resources than parents in the bottom earnings quantile (especially in the first school closure). Coefficient estimates for other characteristics generally fall short of statistical significance.

In summary, the use of free learning resources was widespread and not strongly correlated with family background for children of all ages. In contrast, affluent and highly educated families tended to pay for learning resources in both periods of school closures, though this was not common. A large proportion of the variation (from 88% to 97%) in the use of additional learning resources cannot be explained by child characteristics, family background or work status.





Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in primary school not currently attending school in person and with nonmissing information on the variable used in the regression. Method: Ordinary Least Squares regression with standard errors clustered at the parent level. 90% confidence intervals. The omitted categories are: 'University Degree' for parent's education, 'HH earnings Q1' (bottom household earnings quartile) for household earnings, 'Employed, with no self-employment' for work status and 'White' for ethnicity. Continuous characteristics are standardised. We also control for binary variables indicating that the parent has none of the listed qualifications, that information on ethnicity is missing and for Government Office Region of residence (estimated coefficients not shown). Sample size: free resources: first closure 1,865, second closure: 864; paid-for resources: first closure 1,865, second closure: 864; paid-for resources: first closure 1,865, second closure 864.





Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in secondary school not currently attending school in presence and with nonmissing information on the variable used in the regression. Method: Ordinary Least Squares regression with standard errors clustered at the parent level. 90% confidence intervals. The omitted categories are: 'University Degree' for parent's education, 'HH earnings Q1' (bottom household earnings quartile) for household earnings, 'Employed, with no self-employment' for work status and 'White' for ethnicity. Continuous characteristics are standardised. We also control for binary variables indicating that the parent has none of the listed qualifications, that information on ethnicity is missing and for Government Office Region of residence (estimated coefficients not shown). Sample size: free resources: first closure 1,648, second closure: 1,051; paid-for resources: first closure 1,648, second closure 1,051.

6 Parent and child responses to school inputs

Section 5 looked separately at the factors associated with investments by schools, parents and children into distance learning. We showed that school, child, parent and household characteristics explain very little of the school's provision of online and offline lessons and child, while parent and household characteristics only explained a small proportion of the variation in learning inputs by parents and children. In this section we study how learning investments by parents and children respond to changes in school provision of learning inputs.

We restrict the sample to students who were out of school and whose schools provided schoolwork. This is because the time investment of parents and children is not observed in cases where the child was not given schoolwork. We make use of the fact that many students are observed twice (during the first and second period of school closures) and thus we can observe how changes in parent and child inputs relate to changes in school inputs. The focus on changes has the advantage that factors that do not change over time (observed characteristics of individuals such as ethnicity or unobserved factors such as parents' motivation for education) are controlled for.

Figure 10 shows the results of this modelling for parent and child time inputs. The left panel is for primary and the right panel is for secondary school students. Within each panel, the figure charts the effects that one additional daily lesson (online or offline) provided by schools had on the average daily time spent by parents (in green) and children (in orange) on home schooling across the two periods of school closure. The circular markers show the effect on hours per day, and the lines around the markers show the range of values where we are 90% confident that the true effect lies. Where those lines cross the dashed zero line, we cannot be certain that the effect is different to zero, and where adjacent lines overlap we cannot be sure that estimates are different from each other.

Results for primary school children (left panel) show that an additional live, real-time lesson offered by primary schools caused children to spend about 17 minutes more time learning each day. In contrast, the effect on parental time was small: an extra live online lesson caused parents to spend just 0.07 of an hour (four minutes) more helping children with their schoolwork, suggesting that parents do not feel they have to support support children attending online lessons. This is different for offline materials offered by primary schools. Figure 10 shows that each additional offline lesson provided by schools increased time investments of children and parents by 17 and 11 minutes respectively (though the time inputs are not statistically significantly different from each other, as indicated by the overlapping lines in the figure). This analysis therefore indicates that lessons offered by schools drove up the time spent by children and parents on schoolwork. The increase in

Figure 10 Effect of online and offline lessons provided by schools on time spent by parents and children doing schoolwork, by school phase



Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in primary school (left) and secondary school (right) not currently attending school and with non-missing information on the variables used in the regression. Cases where children are not given schoolwork are excluded. Method: individual fixed effects with standard errors clustered at the child level. 90% confidence intervals. The regressions control for parent's employment status and hours of work. Sample size: primary school: parent's time 2,623, child's time: 2,621; secondary school: parent's time: 2,502, child's time: 2,508.

lessons offered between the first and second period of school closure was about one additional online and one additional offline lesson on average, and this can explain much of the increase in time spent by parents and children from the first to the second closure period.

The right panel of Figure 10 reports results for secondary school students. On average, an additional live online lesson provided by secondary schools drove up the daily time investment by students by 20 minutes. In contrast, an additional online lesson decreased by an average four minutes a day the time parents spent helping their children with schoolwork. This indicates that parents of secondary school students saw their own time inputs as substitutes for school inputs when these inputs came in the form of real-time lessons. For each offline activity provided by the school, secondary school students increased their study time by about eight minutes a day, while parents increased their time helping by an average three minutes a day. Our results thus show that real-time lessons engaged students for more time than offline materials (20 minutes vs. eight minutes). This may be because live lessons took up more time to start with and/or because the take up of online lessons among secondary students was higher than the take-up of offline material.

In summary, for primary school, additional offline lessons increased the time students and their parents engaged in distance learning about equally, whereas additional live lessons induced more time investment from students than parents. For secondary school children, additional offline lessons translated into a much larger increase in the time spent by students if compared to the time spent by parents, while additional online lessons greatly increased the time spent by students, and at the same time decreased the time spent by parents helping their children. The latter suggest that, for secondary students, parents saw online lessons as substitutes – rather than complements – to their own time investment.

Figure 11 charts the effects of an additional online/offline lesson on the probability of using free and paid-for learning resources. The left panel is for primary school children. It shows that an additional online lesson provided by schools reduced the likelihood of using freely available learning resources by seven percentage points, while an additional offline lesson reduced that likelihood by three percentage points. This is equivalent to an 11% reduction for an online and 4% for an offline lesson offered, based on the 65% of primary school children who were using freely available resources during the first period of school closures. In contrast, the use of paid-for learning resources, which, according to Figure 3, remained stable across the two periods of school closures, was unaffected by the number of online and offline lessons offered. This indicates that freely available learning resources

Figure 11 Effect of online and offline lessons provided by schools on use of free and paid-for learning resources, by school phase



Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in primary school (left) and secondary school (right) not currently attending school and with non-missing information on the variables used in the regression. Cases where children are not given schoolwork are excluded. Method: individual fixed effects with standard errors clustered at the child level. 90% confidence intervals. The regressions control for parent's employment status and hours of work. Sample size: primary school 2,627, secondary school 2,515.

were considered substitutes for school inputs, while paid-for resources were used regardless of the level of school inputs.

The right panel of Figure 11 displays estimates of the effects of providing an additional online/offline lesson on the use of free learning resources for secondary school students who, in both periods of school closure, were less likely than primary school students to use freely available learning resources. An additional online lesson provided by schools reduced the likelihood that secondary school students used freely available resources by about 4 percentage points, or 8% of the average use during the first closure period. There was no effect of providing offline lessons on the use of free resources. Similarly to the situation of primary school students, the use of paid-for learning resources for secondary school students remained unaffected by school inputs.

In summary, families tried to compensate for a lack in the provision of school inputs by using free resources and they used them less once school inputs increased. Paid-for resources were only used by a minority of families and their use did not react to changes in the school inputs. The next section explores how the effect of school inputs on parent and child inputs into learning differ by family background.

7 Parent and child responses to school inputs by background

Here we investigate how parental and child responses to changes in school inputs results vary by family and child characteristics. We also analysed variation by parent working status, but no significant patterns emerged, so these results are not presented here.

Figures 12-15 show the effect of increasing online and offline lessons on our measures of parental and child investment by ethnicity (Non-Whites, Whites), gender of the student (girl, boy) and education of the parent (below A-level, A-level and above). As before, the dots indicate the estimated effect and the lines around the dots indicate the range of values where we can be 90% confident that the true effect lies. Overlapping lines between estimates suggest we cannot be sure estimates are different from each other. This is the case for most of the estimated effects presented here; they do not differ substantially by students' or households' characteristics. However, some of the presented effects, and particularly those by parent's education, show an interesting pattern.

Figures 12 and 13 focus on primary school children and show the effect of increasing online and offline lessons on the time parents and children spent doing schoolwork. Across all the four graphs (effect of online lessons on parent time, effect of offline lessons on parent time, effect of online lessons on child time, effect of online lessons on parent time), the estimated effects for children whose parent's education is below A-level are larger than those estimated for children whose parent's education is A-level or above. In two cases, namely the case of the effect of online lessons on child time and the case of the effect of offline lessons on parent time, there is very little or no overlap in the confidence intervals estimated for these two groups. This indicates that increasing the offer from schools should contribute to closing learning gaps between primary school children from more and less educated families. We also find that the effects of additional lessons estimated for Whites are always larger than those estimated for non-Whites, but the confidence intervals of the effects for the latter group are very large, which makes it difficult to be sure this is a statistically significant difference.

Figures 14 and 15 show the effect of increasing school inputs on parent and child time investments for secondary school children. Unlike what we saw for primary school children, the estimated effects of school inputs on time investments of children and parents follow different patterns for secondary school students. This is likely to be the case because secondary school students work mostly on their own with some supplementary help from parents. For both online and offline lessons, the effect of increasing school inputs on child time is larger for boys than for girls – possibly because boys find it harder to work independently – and there is little or no overlap in the effects estimated for these two groups. This suggests that provision of online lessons contributed to closing the gender **Figure 12** Heterogeneous effects of online and offline lessons provided by schools on time spent by parents helping primary school children with schoolwork



Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in primary school not currently attending school and with non-missing information on the variables used in the regression. Cases where children are not given schoolwork are excluded. Method: individual fixed effects with standard errors clustered at the child level. 90% confidence intervals. The regressions control for parent's employment status and hours of work. Sample size: full: 2,623; non-White 464, White: 2,156; girl 1,263, boy 1,359; below A-level 1,098, A-level or above 1,525.

Figure 13 Heterogeneous effects of online and offline lessons provided by schools on time spent by primary school children doing schoolwork



Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in primary school not currently attending school and with non-missing information on the variables used in the regression. Cases where children are not given schoolwork are excluded. Method: individual fixed effects with standard errors clustered at the child level. 90% confidence intervals. The regressions control for parent's employment status and hours of work. Sample size: full: 2,621; non-White 464, White 2157; girl 1,261, boy 1,359; below A-level 1096, A-level or above: 1,525.

gap in study time in secondary schools. Again, the estimated effects on child time are larger for White than for non-White students, but the size of the confidence intervals estimated for non-Whites makes it impossible to make any clear statement. Finally, if we compare the estimated effects of online lessons on parent and child time, we note that cases where online lessons had the largest positive estimated effects on child time (namely for boys and White students) are also those in which online lessons had the largest negative effects on parents' time investment. This adds further evidence suggesting that parents see online lessons as a substitute for their own effort: the more time secondary school students spent in online lessons, the less time parents spent helping them.

Figures 16 and 17 show the effect of increasing school inputs on the use of free and paid-for resources for primary school children. Here the only interesting differences are those between groups with different parental education. For low educated families, we find that the use of free resources is crowded out when providing more online lessons, while the use paid-for resources increases with more online lessons. For higher educated families, online lessons crowd out both free and paid-for resources, although the effects are imprecisely estimated. This pattern is reversed in the case of secondary school students (Figures 18 and 19) with online lessons crowding out free resources and increasing use of for paid-for resources in the case of children whose parents have an A-level degree or above.

In summary, the increase in school inputs observed between the first and the second period of school closures, and particularly the increase in online lessons offered by schools, increased the time children spent on schoolwork and the use of paid-for resources in less educated families of primary school children. By contrast, the use of paid-for resources from higher educated families slightly decreased. Interestingly, an increase in the number of lessons offered by schools increased study time for both boys and girls in secondary schools, and because this increase was larger for boys it reduced the gender gap in time spent on schoolwork. **Figure 14** Heterogeneous effects of online and offline lessons provided by schools on time spent by parents helping secondary school children with schooolwork



Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in secondary school not currently attending school and with nonmissing information on the variables used in the regression. Cases where children are not given schoolwork are excluded. Method: individual fixed effects with standard errors clustered at the child level. 90% confidence intervals. The regressions control for parent's employment status and hours of work. Sample size: full: 2502; non-White 407, White 2,095; girl 1,240, boy 1,262; below A-level 1,125, A-level or above 1,377.

Figure 15 Heterogeneous effects of online and offline lessons provided by schools on time spent by secondary school children doing schoolwork



Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in secondary school not currently attending school and with non-missing information on the variables used in the regression. Cases where children are not given schoolwork are excluded. Method: individual fixed effects with standard errors clustered at the child level. 90% confidence intervals. The regressions control for parent's employment status and hours of work. Sample size: full: 2508; non-White 410, White 2,098; girl 1,245, boy 1,263; below A-level 1,125, A-level or above 1,383.





Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in primary school not currently attending school and with non-missing information on the variables used in the regression. Cases where children are not given schoolwork are excluded. Method: individual fixed effects with standard errors clustered at the child level. 90% confidence intervals. The regressions control for parent's employment status and hours of work. Sample size: full: 2,627; non-White 467, White 2,160; girl 1,265, boy 1,361; below A-level 1,100, A-level or above 1,527.

Figure 17 Heterogeneous effects of online and offline lessons provided by schools on use of paid-for learning resources for primary school children



Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in primary school not currently attending school and with non-missing information on the variables used in the regression. Cases where children are not given schoolwork are excluded. Method: individual fixed effects with standard errors clustered at the child level. 90% confidence intervals. The regressions control for parent's employment status and hours of work. Sample size: full: 2,627; non-White 467, White 2;160; girl 1,265, boy 1,361; below A-level 1,100, A-level or above 1,527.

Figure 18 Heterogeneous effects of online and offline lessons provided by schools on use of free learning resources for secondary school children



Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in secondary school not currently attending school and with non-missing information on the variables used in the regression. Cases where children are not given schoolwork are excluded. Method: individual fixed effects with standard errors clustered at the child level. 90% confidence intervals. The regressions control for parent's employment status and hours of work. Sample size: full: 2,515; non-White 409, White 2106; girl 1,249, boy 1,266; below A-level 1,132, A-level or above 1,383.

Figure 19 Heterogeneous effects of online and offline lessons provided by schools on use of paid-for learning resources for secondary school children



Notes *Understanding Society* COVID-19 Survey, Waves 1 and 7. Sample of children in secondary school not currently attending school and with non-missing information on the variables used in the regression. Cases where children are not given schoolwork are excluded. Method: individual fixed effects with standard errors clustered at the child level. 90% confidence intervals. The regressions control for parent's employment status and hours of work. Sample size: full: 2,515; non-White 409, White 2106; girl 1,249, boy 1,266; below A-level 1,132, A-level or above 1,383.

8 Conclusions

Our results show that family background is not the main factor associated with the time parents spent helping children with their schoolwork during the two periods of school closures in the UK. While a higher socio-economic status shows some association with the time children spent on schoolwork, again this is not the main driver of observed differences. This suggests that parents and children from a variety of social and economic backgrounds generally engaged with schoolwork in similar measure. In the first period of school closures, when schools were offering fewer online and offline inputs into children's home learning, families resorted to additional freely available learning resources - again, mostly independently of their background. During the second period of closures, schools were under the legal obligation to provide highquality remote education resources and plan a programme equivalent to the length of core teaching in school. Primary and secondary schools therefore stepped up their offer of online and - in the case of primary schools - offline lessons. This in turn led parents and children to invest more time into home schooling. An interesting finding here was that a higher number of online lessons offered to secondary school children resulted in a decrease of parental time spent helping with schoolwork. We also see that the increase in school inputs during the second period of school closures, and particularly the improved provision of online lessons reduced differences in the time primary school children from different socio-economic backgrounds spent on schoolwork, and in secondary schools reduced gender differences in children's own study time.

From a policy perspective, three messages emerge from this study. First, socio-economic differences in learning outcomes due to school closures may have relatively little to do with differences in learning provision by schools or the time parents spent home schooling. They might instead be much more closely related to structural differences across families, which affect factors such as the learning set-up parents can offer their children at home, parents' ability to help children effectively with their schoolwork and local COVID-19 infection rates, to name a few. The second message is that other inequalities than those by socio-economic background, in particular by gender and prior attainment, might have been equally if not more severely affected by the COVID-19 pandemic and warrant further consideration. The final message is a positive one, in that the offer of online and offline lessons provided by schools seems to have been well-received, resulting in more engagement from students and from parents of primary school children in particular, in some cases leading to a reduction of socio-economic differentials. Any future school closures should ensure a high number of education resources is provided by schools to all families and be accompanied by measures that mitigate the disadvantages arising from a home environment that makes effective home schooling more difficult.