A cluster-randomised trial of the impact of a policy of daily testing for contacts of COVID-19 cases on attendance and COVID-19 transmission in English secondary schools and colleges: Supplementary material

Supplementary methods

Study design

A cluster randomised design was used as school-based contact events and transmissions affect a network of individuals attending the same school. Different interventions potentially affect not just the individuals randomised, but also their direct and indirect contacts.

Randomisation

Schools were randomly assigned 1:1 to either a policy of offering contacts daily testing over 7 days to allow continued school attendance (intervention arm) or to follow usual policy of isolation of contacts for 10 days (control arm). Schools were enrolled by UK Government Department of Health and Social Care staff who provided lists of participating schools for randomisation to investigators at University of Oxford. Where multiple schools were listed to be randomised, randomisation was performed in alphabetical order, but proceeded without otherwise using school names. Randomisation was performed in blocks of 2 and stratified using nine strata to ensure a sample representative of schools and colleges in England. Randomisation lists were generated using random number generation provided by Stata (version 16). The Stata programme used, had a pre-set seed, and was written by an independent statistician (Sarah Walker). Study arm allocations were generated as required once schools had agreed to participate, and not available to those involved in recruitment. Stratification was performed according to school type, size, presence of a sixth form, presence of residential students and proportion of students eligible for free school meals (as a marker of social deprivation), the nine strata are listed in Table 1. Randomisation was performed by a trial team member (TEAP), who played no role in the enrolment of schools. 205 schools were randomised, however two did not consent to be randomised and were randomised in error. Two schools were listed for randomisation twice (under different names), and retained their first random allocation. In total therefore 201 schools are reported.

Group assignment was not masked during the study procedures or in analysis.

10 schools participated in a non-randomised pilot of the study protocol in March 2021. During the main study they continued to follow the intervention procedures, but do not contribute to the analysis of randomised outcomes.

Procedures

Forms of close contact applicable to schools as defined in national guidelines were, face to face contact (within 1 metre for any length of time) or skin to skin contact or someone the case coughed on; or within 1 metre for ≥1 minute; or within 1-2 metres for >15 minutes. Any person who met the definition of being in close contact with a case in the two days prior to symptom onset (or prior to positive test if asymptomatic) to 10 days after was required to self-isolate for 10 days.

In the intervention group, daily contact testing was performed with a lateral flow device on arrival at school or college each morning. Day 1 of testing began the day after a case was identified. Where there was a delay to the start of testing, contacts could opt to start DCT within 3 days of a case being identified. Testing was done over 7 consecutive days, and a minimum of 5 test was required (allowing for no testing on weekends). Five negative tests, including one on or after the 7th day of testing was required to complete DCT, at which point contacts were released from self-isolation. Contacts who opted to stop testing during the process reverted to self-isolation for 10 days. Contacts who tested positive during DCT were instructed to self-isolate for 10 days from the positive test.

Data collection

Data were collected using a web-based data capture system and managed by the Office for National Statistics.

Schools reported in aggregate the number of staff and students present on each school day, and numbers absent for COVID-19-related reasons and separately numbers absent for other reasons. Schools routinely seek and record the reasons for student and staff absences. For students reasons for absence are based on reporting by the student, their parent or carer. These reports were aggregated and submitted by each school each day. Attendance data for individual participating students and staff members were not recorded within the study.

For consented randomised schools that stopped active participation where available a list of students and available information on school absences was provided by UK Government Department for Education (DfE). School student lists came from National Pupil Database. Attendance data came from voluntary school reporting to DfE. This data was made available under a Data Sharing Agreement between DfE and DHSC, on the same basis that schools provided lists of staff and student without individual consent, namely that it was a task carried out in the public interest.

PCR testing

Results of routine community tests performed outside of the study for SARS-CoV-2 in staff and students were obtained from national public health data ("NHS Test and Trace"). Matching of results to study participant identifiers was undertaken by the DHSC, following each school's agreement for this process. Results were matched based on an exact match of (surname, date of birth, home postcode) OR (first name, surname, date of birth, testing centre and school lower-tier local authority [LTLA]) OR (first name, surname, year of birth, home postcode). An iterative approach with manual review of school-reported and Test and Trace cases was used to define the matching rules. Test and Trace results recorded whether the individual was symptomatic or not prior to testing.

Routine community-based testing was undertaken by a network of accredited diagnostic laboratories, with high-throughput national "Lighthouse laboratories" undertaking testing with the ThermoFisher TaqPath assay undertaking the most tests.

Dedicated study PCR testing was also undertaken. All individuals who tested positive for SARS-CoV-2 by either LFD or PCR for SARS-CoV-2 infection who consented were asked to provide a swab of nose and throat for PCR testing. Additionally, all close contacts in either study arm who consented to participate were asked to provide a swab of nose and throat for PCR testing on day 2 and day 7 of their testing/isolation period. For contacts undergoing DCT the test was done on the nearest school day.

Swabs for PCR testing were sent by courier or mail to a central laboratory and forwarded for testing at an accredited clinical microbiology laboratory (Oxford University Hospitals NHS Foundation Trust). Samples were stored at -20°C for up to 2 weeks. RNA extraction was performed using the KingFisher (Thermo Fisher) automated extraction system. SARS-CoV-2 PCR was performed using the Thermo Fisher TaqPath COVID-19 kit. Detection of both N and orf1ab targets was required for a positive result, with the cycle threshold (Ct) for one target ≤32 and the other ≤33. Samples with no detected viral targets were considered negative and all other samples indeterminate.

Statistical analysis

The rate of COVID-19-related absences from school amongst those otherwise eligible to be in school (i.e. not absent for another reason) were compared between the study arms. Students and staff were considered at risk of a COVID-related absence, while not absent for other reasons, on school days following enrolment of the school into the study from 19-April-2021 onwards until 27-June-2021. Weekend days, national holidays, the school half-term holiday (31-May-2021 to 04-June-2021), and individual school non-school days were excluded.

Total rates of COVID-19-related absence per school were compared on an intention to treat (ITT) basis, testing for superiority of the intervention, for all schools with available data irrespective of whether they participated after randomisation or not. Models were fitted using quasi-Poisson regression to account for overdispersion (test for over-dispersion, p=0.004). Pre-specified adjustment was made for 6 study stratification groups (Government-funded, 11-16y, free school meals ≤17%; Government-funded, 11-18y, free school meals ≤17%; Government-funded, 11-16y, free school meals >17%; Government-funded, 11-18y, free school meals >17%; Independent schools; Other), combining several of the smaller original randomisation strata given small numbers in these strata, and for participant type (student or staff). Repeated daily measurements from the same school were accounted for using robust standard errors with clustering by school. The following R code shows the model fitted:

```
m = glm(covid_related_absence ~  study_arm +
                                 strata_group +
                                 participant_type,
        offset = log(at_risk),
        family = quasipoisson(link = "log"),
```

```
        data = …)
```

Standard errors were calculated as follows using the sandwich library:

```
cov.m = vcovCL(m, type = "HC1", cluster = ~ school_id)
std.err = sqrt(diag(cov.m))
```

We also present results combining data from each school during the study without robust standard errors.

For the second co-primary end point, school-based SARS-CoV-2 transmission was estimated from rates of symptomatic PCR-positive infections recorded by NHS Test and Trace, after controlling for community case rates. This approach was pre-specified in the statistical analysis plan, which was finalised before unblinding of the data for analysis. In the original study protocol three potential methods to estimate transmission were identified: twice weekly regular asymptomatic LFD screening (both study arms), PCR results from symptomatic individuals from NHS Test and Trace (both study arms), and in-school LFD results from DCT performed as part of the study (intervention arm only). In the statistical analysis plan symptomatic PCR-positive infections were chosen as the primary outcome measure as reporting of regular asymptomatic LFD screening results was not performed consistently during the study (after development of the trial protocol this testing was moved to home-based testing, with reporting direct the NHS Test and Trace rather than via schools). Further, as asymptomatic individuals testing LFD-positive were requested to obtain a confirmatory PCR test, these individuals are included in a secondary analysis considering all PCR-positive results whether done for symptoms or not. For this secondary analysis we originally proposed to exclude first order contacts on both arms, but as it is likely that not all contacts were reported, we present this secondary analysis without this exclusion.

We compared the incidence of symptomatic PCR-positive SARS-CoV-2 infection between arms using quasi-Poisson regression (test for over-dispersion, $p<0.001$). Individuals were considered at risk of an infection on all calendar days (school days and non-school days) from the later of the date of the start of the study (19-April-2021) or enrolment of their school, up until the end of the last week of the study (27-June-2021). Weekly incidence data were used, adjusting for the 6 study stratification groups above, participant type, and community PCR-positive case rates in the local population in the prior week. Adjustment for community case rates was designed to allow the analysis to assess any excess in cases in the intervention arm over and above that expected from importation of community-acquired cases into the school. Sensitivity analyses examined the impact of using differing lag periods between community and school case counts of 1 and 4 weeks prior, and without adjustment for community case counts. Community case counts were obtained from nationally reported data, publicly available on the gov.uk website, at the LTLA level, using data from the LTLA within in which the school was situated. Repeated measurements from the same school were accounted for using robust standard errors with clustering by school. The relationship between community case rates in the prior week and the outcome was modelled using natural cubic splines to allow for non-linearity, up to 5 default-placed knots were allowed, choosing the final number of knots based on model fit according to the Bayesian Information Criterion. To avoid undue influence of outliers, community case rates were truncated at the 2.5^{th} and 97.5^{th} centiles.

No interaction terms were included in either of the co-primary outcome models, however we tested for heterogeneity in the effect of the intervention on students and staff in separate models. We also present subgroup analyses in students and staff separately.

The R code for the fitted model, using the ns function from the splines library is:

```
m = glm(sx_pcr_pos ~  study_arm +
                      strata_group +
                      participant_type +
                      ns(community_rate, 3),
        offset = log(at_risk),
        family = quasipoisson(link = "log"),
        data = …)
```

Robust standard errors adjusting for clustering by school were calculated as above.

To account for incomplete participation in DCT, we present complier average causal effects (CACE) estimates for both primary outcomes, estimated using the randomisation arm as an instrumental variable and a two-stage regression approach. In this approach, we first fit two models: 1) the relationship between study arm and measured compliance, adjusting for the covariates above; 2) the relationship between measured compliance and the outcome, adjusting for covariates, but not study arm. These estimates are combined to estimate the impact of the intervention amongst those actively participating.

Compliance was calculated per school, week, and participant type, as the sum over all study school days of individuals eligible for DCT returning a test result or already having completed follow up each day, divided by the sum of individuals eligible for DCT. For schools in the control arm and those in the intervention arm not actively participating compliance was set to zero. For participating schools without any eligible contacts in a given week the median compliance per school was used, and where no eligible contacts were identified during the study the median compliance per randomisation stratification group. Sensitivity analyses were performed using the 25^{th} and 75^{th} centiles for imputation instead of the median value.

To account for repeated measurements by school, confidence intervals for CACE estimates were generated from 1000 bootstrap samples, using bias-corrected and accelerated bootstrap intervals, and sampling based on school clusters.

R code for fitting CACE models used the ivtools package as follows, using the symptomatic PCR positive outcome as an example:

```
# model the relationship between
# compliance and study arm + covariates
fitX.LZ = glm(compliance ~ study_arm +
                           strata_group +
                           participant_type +
                           ns(comm_rate_100,3),
              data=df)

# model relationship between outcome and compliance + covariates
fitY.LX = glm(sx_pcr_pos ~ compliance +
                           strata_group +
                           participant_type +
                           ns(comm_rate_100,3),
              offset = log(at_risk),
              family=quasipoisson(link = "log"),
              data = df)

# generate CACE estimate
fitIV = ivglm(estmethod="ts",
              fitX.LZ=fitX.LZ,
              fitY.LX=fitY.LX,
              data = df,
              ctrl=TRUE)
```

We report uptake of LFD testing for intervention arm participants, on a per day and per participant basis. For the per day analysis, we identified all school days between a contact being identified and day 10 following their first exposure to the index case. Participation was defined as either return of a test result or where testing had been completed, i.e. ≥5 test results were already available or a prior positive test had occurred. For the per participant analysis, we pre-defined participation as a school recording ≥3 negative or ≥1 positive LFD test result for the participant. We used Poisson regression with robust variance estimation to investigate factors associated with per individual participation rates, including the randomisation stratification groups, participant type, age, sex, and ethnicity. We used variance adjustment as above to allow for clustering of results by school. This approach was used in place of logistic regression as the outcome of interest was common.

The proportion of close contacts testing positive on an asymptomatic research PCR test was compared between study arms using logistic regression, given there were relatively few events, adjustment was made only for randomisation strata groups and local case counts in the previous week (at the LTLA level as above). As individuals could be contacts on multiple occasions, including simultaneously with different index cases, we deduplicated our data to present one result per non-overlapping contact episode, defining each episode as the 10 days from the index case. We also use symptomatic community-based testing data from NHS Test and Trace to present the proportion of contact episodes associated with a symptomatic PCR positive result in the 10 days following the diagnosis of the index case. For both asymptomatic and symptomatic analyses we only consider contacts at risk prior to their first positive result in the study, as any subsequent result within the 70 days of the

study could represent residual RNA from the first infection. We account for clustering of results by school as above.

We compared the performance of LFD to PCR testing in participants tested by both methods on the same day, regarding PCR testing as the reference standard. Additional data from a pilot phase of the study, involving 10 non-randomised intervention schools was included in this analysis only.

Secondary analyses relating to analysis of transmission clusters within schools will be reported separately once the results of viral whole-genome sequencing are available. Similarly, a qualitative analysis of interviews with participants to understand why some participated and others did not will be presented separately.

Analyses were performed using R (version 4.1), and the following libraries: tidyverse (version 1.3.1), ivtools (version 2.3), sandwich (version 3.0.1), and gtsummary (version 1.4.1).

Sample size and power

The challenge with setting a non-inferiority margin for transmission events is that the margin's meaning is highly dependent on the control group event rate, as discussed in the main methods. Given the uncertainties in the absolute rates of transmission events in each arm, we powered to trial to detect a difference in school attendance. We assumed of 100 similarly-sized schools randomised to each arm, ~50% would participate. In the control arm we assume 30% participation in national twice weekly LFD testing outside the trial, such that index cases would be identified at a rate of 1 per school per month, with each associated with 50 contacts. Hence with an isolation period of 10 days, 510 isolation days per school per month would occur in the control arm. For the intervention arm, we assume the intervention would increase uptake of routine LFD testing two-fold to 60% with the barrier of potential isolation removed. Therefore, the expected rate of index case detection from routine testing doubles to 2 per month. We assume that 70% of contacts will participate in DCT, such that only 15 per index case self-isolate, with an additional 2 per index case self-isolating following a positive LFD in DCT, but without further contacts outside of the existing contacts. This results in an expected 170 missed school days per index case or 360 per month. Based on these assumptions we estimated that 58 participating schools in each arm provides 80% power (two-sided alpha=0.05) to detect a difference in attendance between the study arms. However, the number of pupils varied substantially by school and therefore the original analysis based on the sample size calculation (which assumed approximately equal school sizes) was not appropriate. Further, there was substantial evidence of over-dispersion which we also had to account for in the analysis.

Trial Steering Committee

Martin Llewelyn (University of Sussex) (Independent Chair), Carole Torgerson (University of York) (Independent member, educational research), John Tomsett (Independent member, head teacher), Susan Blenkiron (Independent member, parent). Non-voting members: Sidonie Kingsmill (DHSC Sponsor), Tessa Griffiths (DfE), Sarah Maclean (DfE), Tom Fowler (Public Health England), Catherine Hewitt (University of York) (Statistical advisor), Lucy

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Writing Committee

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Supplementary tables

School name	Randomisation stratum
Alperton Community School	Government-funded, 11-18y, free school meals ≤17%
Archbishop Holgate's School, A Church of England Academy	Government-funded, 11-18y, free school meals ≤17%
Ashby School	Government-funded, 11-18y, free school meals ≤17%
Beauchamp College	Government-funded, 11-18y, free school meals ≤17%
Birkenhead Sixth Form College	Government-funded, 11-18y, free school meals ≤17%
Bishop Luffa School, Chichester	Government-funded, 11-18y, free school meals ≤17%
Bishop Ramsey Church of England School	Government-funded, 11-18y, free school meals ≤17%
Bosworth Academy	Government-funded, 11-18y, free school meals ≤17%
Caroline Chisholm School	Government-funded, 11-18y, free school meals ≤17%
Countesthorpe Academy	Government-funded, 11-18y, free school meals ≤17%
Cramlington Learning Village	Government-funded, 11-18y, free school meals ≤17%
Eckington School	Government-funded, 11-18y, free school meals ≤17%
Edgbarrow School	Government-funded, 11-18y, free school meals ≤17%
Erasmus Darwin Academy	Government-funded, 11-18y, free school meals ≤17%
Europa School UK	Government-funded, 11-18y, free school meals ≤17%
Hall Cross Academy	Government-funded, 11-18y, free school meals ≤17%
Hayesfield Girls School	Government-funded, 11-18y, free school meals ≤17%
Hillview School for Girls	Government-funded, 11-18y, free school meals ≤17%
Holcombe Grammar School	Government-funded, 11-18y, free school meals ≤17%
Ivybridge Community College	Government-funded, 11-18y, free school meals ≤17%
Malbank School and Sixth Form College	Government-funded, 11-18y, free school meals ≤17%
Marling School	Government-funded, 11-18y, free school meals ≤17%
Mascalls Academy	Government-funded, 11-18y, free school meals ≤17%
Mayflower High School	Government-funded, 11-18y, free school meals ≤17%
Midhurst Rother College	Government-funded, 11-18y, free school meals ≤17%
Newent Community School and Sixth Form Centre	Government-funded, 11-18y, free school meals ≤17%
Newstead Wood School	Government-funded, 11-18y, free school meals ≤17%
Notre Dame High School	Government-funded, 11-18y, free school meals ≤17%
Notre Dame High School, Norwich	Government-funded, 11-18y, free school meals ≤17%
Orleans Park School	Government-funded, 11-18y, free school meals ≤17%
Poole Grammar School	Government-funded, 11-18y, free school meals ≤17%
Poynton High School	Government-funded, 11-18y, free school meals ≤17%
Prudhoe Community High School	Government-funded, 11-18y, free school meals ≤17%
Queen Elizabeth's	Government-funded, 11-18y, free school meals ≤17%
Queen Mary's College	Government-funded, 11-18y, free school meals ≤17%
Rainford High Technology College	Government-funded, 11-18y, free school meals ≤17%
Ringwood School Academy	Government-funded, 11-18y, free school meals ≤17%
Sharnbrook Academy	Government-funded, 11-18y, free school meals ≤17%

Shenley Brook End School	Government-funded, 11-18y, free school meals ≤17%
Sir Joseph Williamson's Mathematical School	Government-funded, 11-18y, free school meals ≤17%
Sponne School	Government-funded, 11-18y, free school meals ≤17%
Springwood High School	Government-funded, 11-18y, free school meals ≤17%
St Mary's Catholic High School	Government-funded, 11-18y, free school meals ≤17%
St Mary's College, Voluntary Catholic Academy	Government-funded, 11-18y, free school meals ≤17%
Tapton School	Government-funded, 11-18y, free school meals ≤17%
Tauheedul Islam Boys' High School	Government-funded, 11-18y, free school meals ≤17%
Tauheedul Islam Girls' High School	Government-funded, 11-18y, free school meals ≤17%
Teign School	Government-funded, 11-18y, free school meals ≤17%
The Cardinal Vaugh Memorial School	Government-funded, 11-18y, free school meals ≤17%
The Crompton House Church of England Academy	Government-funded, 11-18y, free school meals ≤17%
The Frances Bardsley Academy for Girls	Government-funded, 11-18y, free school meals ≤17%
The Hart School	Government-funded, 11-18y, free school meals ≤17%
The Harvey Grammar School	Government-funded, 11-18y, free school meals ≤17%
The Kimberley School	Government-funded, 11-18y, free school meals ≤17%
The Kingston Academy	Government-funded, 11-18y, free school meals ≤17%
The Marlborough Church of England School	Government-funded, 11-18y, free school meals ≤17%
Thomas Telford School	Government-funded, 11-18y, free school meals ≤17%
Tonbridge Grammar School	Government-funded, 11-18y, free school meals ≤17%
Tudor Grange Academy, Solihull	Government-funded, 11-18y, free school meals ≤17%
Urmston Grammar Academy	Government-funded, 11-18y, free school meals ≤17%
UTC Oxfordshire	Government-funded, 11-18y, free school meals ≤17%
UTC Swindon	Government-funded, 11-18y, free school meals ≤17%
Wath Academy	Government-funded, 11-18y, free school meals ≤17%
West Lakes Academy	Government-funded, 11-18y, free school meals ≤17%
Whitmore High School	Government-funded, 11-18y, free school meals ≤17%
Wilts South Grammar School	Government-funded, 11-18y, free school meals ≤17%
Alvechurch CofE Middle School	Government-funded, 11-16y, free school meals ≤17%
BBG Academy	Government-funded, 11-16y, free school meals ≤17%
Bishop Rawstorne Church of England Academy	Government-funded, 11-16y, free school meals ≤17%
Bridgewater High School	Government-funded, 11-16y, free school meals ≤17%
Brighton Hill Community School	Government-funded, 11-16y, free school meals ≤17%
Dorothy Stringer School	Government-funded, 11-16y, free school meals ≤17%
Eden Boys' School, Preston	Government-funded, 11-16y, free school meals ≤17%
Elizabeth Woodville School	Government-funded, 11-16y, free school meals ≤17%
Greenbank High School	Government-funded, 11-16y, free school meals ≤17%
Hasmonean High School for Girls	Government-funded, 11-16y, free school meals ≤17%
Perton Middle School	Government-funded, 11-16y, free school meals ≤17%
Saint Aidan's Church of England High School	Government-funded, 11-16y, free school meals ≤17%

St Bede's Catholic Middle School	Government-funded, 11-16y, free school meals ≤17%
St Bernard's Catholic High School	Government-funded, 11-16y, free school meals ≤17%
St Edmund's Girls' School	Government-funded, 11-16y, free school meals ≤17%
The Chantry School	Government-funded, 11-16y, free school meals ≤17%
Arrow Vale RSA Academy	Government-funded, 11-18y, free school meals >17%
Aylesford School and Sixth Form College	Government-funded, 11-18y, free school meals >17%
Bay Leadership Academy	Government-funded, 11-18y, free school meals >17%
Bentley Wood High School	Government-funded, 11-18y, free school meals >17%
Bobby Moore Academy	Government-funded, 11-18y, free school meals >17%
Brinsworth Academy	Government-funded, 11-18y, free school meals >17%
Bristol Metropolitan Academy	Government-funded, 11-18y, free school meals >17%
Burntwood School	Government-funded, 11-18y, free school meals >17%
Campsmount_Academy	Government-funded, 11-18y, free school meals >17%
Chiswick School	Government-funded, 11-18y, free school meals >17%
Cranford Community College	Government-funded, 11-18y, free school meals >17%
Derby Moor Academy	Government-funded, 11-18y, free school meals >17%
Didsbury High School	Government-funded, 11-18y, free school meals >17%
Dinnington High School	Government-funded, 11-18y, free school meals >17%
Drapers' Academy	Government-funded, 11-18y, free school meals >17%
Dyke House Sports and Technology College	Government-funded, 11-18y, free school meals >17%
Earl Mortimer College and Sixth Form Centre	Government-funded, 11-18y, free school meals >17%
Eden Boys' Leadership Academy, Birmingham East	Government-funded, 11-18y, free school meals >17%
Eden Boys' Leadership Academy, Manchester	Government-funded, 11-18y, free school meals >17%
Eden Girls' Leadership Academy , Manchester	Government-funded, 11-18y, free school meals >17%
Freebrough Academy	Government-funded, 11-18y, free school meals >17%
Grace Academy Coventry	Government-funded, 11-18y, free school meals >17%
Haileybury Turnford	Government-funded, 11-18y, free school meals >17%
Harris Academy Wimbledon	Government-funded, 11-18y, free school meals >17%
Heanor Gate Science College	Government-funded, 11-18y, free school meals >17%
Hope Academy	Government-funded, 11-18y, free school meals >17%
Lord Grey Academy	Government-funded, 11-18y, free school meals >17%
Maghull High School	Government-funded, 11-18y, free school meals >17%
Maltby Academy	Government-funded, 11-18y, free school meals >17%
Northampton Academy	Government-funded, 11-18y, free school meals >17%
Oasis Academy Hadley	Government-funded, 11-18y, free school meals >17%
Oasis Academy South Bank	Government-funded, 11-18y, free school meals >17%
Outwood Academy Portland	Government-funded, 11-18y, free school meals >17%
Paddington Academy	Government-funded, 11-18y, free school meals >17%
Patchway Community School	Government-funded, 11-18y, free school meals >17%
RSA Academy	Government-funded, 11-18y, free school meals >17%
Sheffield Springs Academy	Government-funded, 11-18y, free school meals >17%

Sir Thomas Wharton Academy	Government-funded, 11-18y, free school meals >17%
Small Heath Leadership Academy	Government-funded, 11-18y, free school meals >17%
Stone Lodge School	Government-funded, 11-18y, free school meals >17%
The Blyth Academy	Government-funded, 11-18y, free school meals >17%
The Elizabethan Academy	Government-funded, 11-18y, free school meals >17%
The Swan School	Government-funded, 11-18y, free school meals >17%
Thorp Academy	Government-funded, 11-18y, free school meals >17%
Villiers High School	Government-funded, 11-18y, free school meals >17%
Walbottle Academy	Government-funded, 11-18y, free school meals >17%
Beaumont Leys School	Government-funded, 11-16y, free school meals >17%
Burnt Mill Academy	Government-funded, 11-16y, free school meals >17%
Chorlton High School	Government-funded, 11-16y, free school meals >17%
Dean Trust Ardwick	Government-funded, 11-16y, free school meals >17%
Eden Boys' School Bolton	Government-funded, 11-16y, free school meals >17%
Eden Girls' Leadership Academy, Birmingham	Government-funded, 11-16y, free school meals >17%
Ercall Wood Academy	Government-funded, 11-16y, free school meals >17%
Essa Academy	Government-funded, 11-16y, free school meals >17%
Firth Park Academy	Government-funded, 11-16y, free school meals >17%
Gilbert Inglefield Academy	Government-funded, 11-16y, free school meals >17%
Handsworth Grange Community Sports College	Government-funded, 11-16y, free school meals >17%
Harris Church of England Academy	Government-funded, 11-16y, free school meals >17%
Harrop Fold School	Government-funded, 11-16y, free school meals >17%
Highfield Leadership Academy	Government-funded, 11-16y, free school meals >17%
James Bateman Middle School	Government-funded, 11-16y, free school meals >17%
Kearsley Academy	Government-funded, 11-16y, free school meals >17%
Kingswood Academy	Government-funded, 11-16y, free school meals >17%
Kirk Balk Academy	Government-funded, 11-16y, free school meals >17%
Lealands High School	Government-funded, 11-16y, free school meals >17%
Looe Community Academy	Government-funded, 11-16y, free school meals >17%
Manor Community Academy	Government-funded, 11-16y, free school meals >17%
North Shore Academy	Government-funded, 11-16y, free school meals >17%
Queensbridge School	Government-funded, 11-16y, free school meals >17%
Red House Academy	Government-funded, 11-16y, free school meals >17%
Royds Hall, A Share Academy	Government-funded, 11-16y, free school meals >17%
Sale High School	Government-funded, 11-16y, free school meals >17%
St James School	Government-funded, 11-16y, free school meals >17%
Stanley High School	Government-funded, 11-16y, free school meals >17%
Starbank School	Government-funded, 11-16y, free school meals >17%
The Boulevard Academy	Government-funded, 11-16y, free school meals >17%
The Grangefield Academy	Government-funded, 11-16y, free school meals >17%
The Oldham Academy North	Government-funded, 11-16y, free school meals >17%

The Rudheath Senior Academy	Government-funded, 11-16y, free school meals >17%
The Winstanley School	Government-funded, 11-16y, free school meals >17%
Thornhill Community Academy, A Share Academy	Government-funded, 11-16y, free school meals >17%
Waterhead Academy	Government-funded, 11-16y, free school meals >17%
Whittington Green School	Government-funded, 11-16y, free school meals >17%
Barnard Castle School	Residential school
Beechen Cliff School	Residential school
Earlscliffe (Sussex Summer Schools Ltd)	Residential school
Pencalenick School	Residential school
Queen Ethelburga's College	Residential school
Reach Academy Feltham	Residential school
Royal High School GDST	Residential school
Scarborough College	Residential school
St Lawrence College	Residential school
The National Mathematics and Science College	Residential school
Trent College	Residential school
Cornfield School, Littlehampton	Special needs or alternate provision
Heybridge Co-Operative Academy	Special needs or alternate provision
Maidstone and Malling Alternative Provision	Special needs or alternate provision
Mo Mowlam Academy	Special needs or alternate provision
Morecambe Road School	Special needs or alternate provision
New Bridge School	Special needs or alternate provision
Newman School	Special needs or alternate provision
Silverwood School	Special needs or alternate provision
Spring Brook Academy	Special needs or alternate provision
Strathmore School	Special needs or alternate provision
Barton Peveril Sixth Form College	Further education college, 16-18y
Darlington College	Further education college, 16-18y
Dudley College of Technology	Further education college, 16-18y
London South East Colleges	Further education college, 16-18y
Middlesbrough College	Further education college, 16-18y
Eaton House the Manor School	Independent day school ≥500 pupils
Leicester Grammar SchoolTrust	Independent day school ≥500 pupils
Nottingham High School	Independent day school ≥500 pupils
Surbiton High School	Independent day school ≥500 pupils
Sydenham High School GDST	Independent day school ≥500 pupils
The Harrodian School	Independent day school ≥500 pupils
Moon Hall School, Reigate	Independent day school <500 pupils
Riverside Education	Independent day school <500 pupils
Rochdale Islamic Academy	Independent day school <500 pupils

Tawhid Boys School, Tawhid Educational Trust	Independent day school <500 pupils
Westhoughton High School	Not randomised – pilot study school
Rainhill High	Not randomised – pilot study school
Blue Coat Church of England Academy	Not randomised – pilot study school
Woolston Brook School	Not randomised – pilot study school
Hindley High School	Not randomised – pilot study school
Birchwood	Not randomised – pilot study school
Uffculme School	Not randomised – pilot study school
Swindon Academy	Not randomised – pilot study school
Nova Hreod Academy	Not randomised – pilot study school
Catmose College	Not randomised – pilot study school

Table S1. 201 Participating schools and randomisation strata and 10 pilot study schools. Note one additional school was randomised in error, as they had not given consent. This school is excluded from this list. 10 pilot schools were not randomised, but participated in an early phase of the study, then followed intervention arm study procedures through the period of this study. Data from these schools is included in performance of lateral flow devices. Only data from randomised schools is included in primary end points and all other secondary end points.

	Descriptive			ITT, Univariable			ITT, Multivariable			CACE, Multivariable	
Characteristic	**COVID-related absences**	**Days at risk**	**Rate per 1000**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**
Study arm											
Control	59,422	3,659,017	16.2	—	—		—	—		—	—
Intervention	51,541	3,845,208	13.4	0.83	0.54, 1.26	0.38	0.80	0.54, 1.19	0.27	0.61	0.30, 1.23
Strata group											
Government-funded, 11-18y free school meals ≤17%	35,430	3,073,722	11.5	—	—		—	—		—	—
Government-funded, 11-16y free school meals ≤17%	6,820	494,285	13.8	1.20	0.73, 1.97	0.48	1.20	0.74, 1.93	0.47	1.19	0.64, 1.93
Government-funded, 11-18y free school meals >17%	22,209	1,727,779	12.9	1.12	0.71, 1.74	0.63	1.12	0.71, 1.76	0.62	1.08	0.70, 1.75
Government-funded, 11-16y free school meals >17%	36,956	1,160,915	31.8	2.76	1.59, 4.80	<0.001	2.77	1.60, 4.81	<0.001	2.63	1.51, 4.48
Other	6,955	836,041	8.3	0.72	0.39, 1.35	0.31	0.79	0.43, 1.47	0.46	0.75	0.38, 1.52
Independent day school	2,593	211,483	12.3	1.06	0.41, 2.73	0.90	1.17	0.49, 2.82	0.73	1.23	0.14, 2.08
Participant type											
Student	104,327	6,397,918	16.3	—	—		—	—		—	—
Staff	6,636	1,106,307	6.0	0.37	0.29, 0.47	<0.001	0.39	0.31, 0.48	<0.001	0.40	0.33, 0.51

Table S2. Co-primary outcome: rate of COVID-related absence in students and staff. Results of a quasi-Poisson regression model using data accounting for clustering by school using variance adjustment. [1]IRR = Incidence Rate Ratio, CI = Confidence Interval. ITT, intention to treat; CACE, complier average causal effect.

	Descriptive			Univariable			ITT, Multivariable			CACE, Multivariable	
Characteristic	**COVID-related absences**	**Days at risk**	**Rate per 1000**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**
Study arm											
Control	59,422	3,659,017	16.2	—	—		—	—		—	—
Intervention	51,541	3,845,208	13.4	0.83	0.61, 1.12	0.22	0.80	0.62, 1.03	0.085	0.62	0.29, 1.33
Strata group											
Government-funded, 11-18y free school meals ≤17%	35,430	3,073,722	11.5	—	—		—	—		—	—
Government-funded, 11-16y free school meals ≤17%	6,820	494,285	13.8	1.20	0.68, 2.12	0.54	1.20	0.69, 2.07	0.53	1.19	0.73, 1.94
Government-funded, 11-18y free school meals >17%	22,209	1,727,779	12.9	1.12	0.77, 1.61	0.56	1.12	0.78, 1.60	0.54	1.08	0.69, 1.69
Government-funded, 11-16y free school meals >17%	36,956	1,160,915	31.8	2.76	2.00, 3.81	<0.001	2.77	2.04, 3.78	<0.001	2.64	1.58, 4.41
Other	6,955	836,041	8.3	0.72	0.41, 1.27	0.26	0.79	0.46, 1.37	0.41	0.75	0.41, 1.39
Independent day school	2,593	211,483	12.3	1.06	0.44, 2.56	0.89	1.17	0.50, 2.73	0.72	1.22	0.56, 2.68
Participant type											
Student	104,327	6,397,918	16.3	—	—		—	—		—	—
Staff	6,636	1,106,307	6.0	0.37	0.20, 0.68	0.002	0.39	0.23, 0.66	<0.001	0.40	0.30, 0.52

Table S3. Co-primary outcome: rate of COVID-related absence in students and staff (aggregated dataset). Results of a quasi-Poisson regression model using data aggregating data to a single row per school and participant type. [1]IRR = Incidence Rate Ratio, CI = Confidence Interval. ITT, intention to treat; CACE, complier average causal effect.

Sensitivity analysis	CACE multivariable IRR for intervention vs. control arm	95% CI
Missing compliance imputed using 50th centile (main analysis)	0.61	0.30, 1.23
Missing compliance imputed using 25th centile	0.59	0.28, 1.30
Missing compliance imputed using 75th centile	0.62	0.34-1.21

Table S4. Co-primary outcome, sensitivity analysis: rate of COVID-related absence in students and staff and compliance imputation strategy. Results of quasi-Poisson regression models using data accounting randomisation strata group, participant type and for clustering by school using variance adjustment are shown. IRR, Incidence Rate Ratio, CI = Confidence Interval, CACE, complier average causal effect.

	Descriptive			ITT, Univariable			ITT, Multivariable			CACE, Multivariable	
Characteristic	**COVID-related absences**	**Days at risk**	**Rate per 1000**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**
Study arm											
Control	55,718	3,092,515	18.0	—	—		—	—		—	—
Intervention	48,609	3,305,403	14.7	0.82	0.53, 1.26	0.36	0.80	0.53, 1.21	0.29	0.61	0.30, 1.26
Strata group											
Government-funded, 11-18y free school meals ≤17%	33,436	2,676,486	12.5	—	—		—	—		—	—
Government-funded, 11-16y free school meals ≤17%	6,533	428,125	15.3	1.22	0.73, 2.05	0.45	1.22	0.74, 2.01	0.44	1.20	0.63, 2.05
Government-funded, 11-18y free school meals >17%	21,198	1,514,353	14.0	1.12	0.71, 1.77	0.63	1.13	0.71, 1.79	0.61	1.08	0.67, 1.75
Government-funded, 11-16y free school meals >17%	35,347	1,014,609	34.8	2.79	1.58, 4.93	<0.001	2.81	1.59, 4.95	<0.001	2.67	1.47, 4.33
Other	5,441	610,678	8.9	0.71	0.36, 1.42	0.34	0.71	0.36, 1.41	0.33	0.68	0.32, 1.43
Independent day school	2,372	153,667	15.4	1.24	0.49, 3.14	0.66	1.22	0.51, 2.95	0.65	1.27	0.18, 2.17

Table S5. Co-primary outcome, subgroup analysis: rate of COVID-related absence in students. Results of a quasi-Poisson regression model using data accounting for clustering by school using variance adjustment. [1]IRR = Incidence Rate Ratio, CI = Confidence Interval. ITT, intention to treat; CACE, complier average causal effect.

	Descriptive			ITT, Univariable			ITT, Multivariable			CACE, Multivariable	
Characteristic	**COVID-related absences**	**Days at risk**	**Rate per 1000**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**	**p-value**	**95% CI[1]**	**p-value**
Study arm											
Control	3,704	566,502	6.5	—	—		—	—		—	—
Intervention	2,932	539,805	5.4	0.83	0.55, 1.25	0.37	0.83	0.55, 1.25	0.37	0.71	0.34, 1.57
Strata group											
Government-funded, 11-18y free school meals ≤17%	1,994	397,236	5.0	—	—		—	—		—	—
Government-funded, 11-16y free school meals ≤17%	287	66,160	4.3	0.86	0.51, 1.47	0.59	0.86	0.50, 1.47	0.59	0.85	0.47, 1.48
Government-funded, 11-18y free school meals >17%	1,011	213,426	4.7	0.94	0.60, 1.48	0.80	0.95	0.60, 1.49	0.82	0.92	0.54, 1.39
Government-funded, 11-16y free school meals >17%	1,609	146,306	11.0	2.19	1.50, 3.20	<0.001	2.21	1.52, 3.21	<0.001	2.11	1.40, 2.95
Other	1,514	225,363	6.7	1.34	0.64, 2.82	0.44	1.32	0.63, 2.79	0.46	1.26	0.55, 2.72
Independent day school	221	57,816	3.8	0.76	0.29, 2.02	0.58	0.78	0.30, 2.00	0.60	0.76	0.08, 1.34

Table S6. Co-primary outcome, subgroup analysis: rate of COVID-related absence in staff. Results of a quasi-Poisson regression model using data accounting for clustering by school using variance adjustment. [1]IRR = Incidence Rate Ratio, CI = Confidence Interval. ITT, intention to treat; CACE, complier average causal effect.

	Descriptive			ITT, Univariable			ITT, Multivariable			CACE, Multivariable	
Characteristic	**All absences**	**Days at risk**	**Rate per 1000**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**
Study arm											
Control	774,063	4,186,862	184.9	—	—		—	—		—	—
Intervention	790,557	4,411,847	179.2	0.97	0.78, 1.21	0.78	0.97	0.82, 1.16	0.77	0.89	0.71, 1.18
Strata group											
Government-funded, 11-18y free school meals ≤17%	642,114	3,651,905	175.8	—	—		—	—		—	—
Government-funded, 11-16y free school meals ≤17%	90,207	576,652	156.4	0.89	0.61, 1.29	0.54	0.90	0.62, 1.30	0.56	0.89	0.60, 1.23
Government-funded, 11-18y free school meals >17%	305,225	1,964,367	155.4	0.88	0.78, 1.00	0.042	0.88	0.78, 0.99	0.038	0.88	0.76, 0.99
Government-funded, 11-16y free school meals >17%	280,004	1,380,240	202.9	1.15	0.77, 1.72	0.49	1.16	0.79, 1.70	0.46	1.13	0.81, 1.57
Other	224,470	864,460	259.7	1.48	0.98, 2.22	0.060	1.64	1.16, 2.33	0.005	1.61	0.97, 2.06
Independent day school	22,600	161,085	140.3	0.80	0.50, 1.28	0.35	0.91	0.56, 1.48	0.71	0.96	0.27, 1.42
Participant type											
Student	1,472,809	7,489,096	196.7	—	—		—	—		—	—
Staff	91,811	1,109,613	82.7	0.42	0.34, 0.53	<0.001	0.39	0.31, 0.49	<0.001	0.39	0.32, 0.50

Table S7. Secondary outcome: rate of all-cause absence in students and staff. Results of a quasi-Poisson regression model using data accounting for clustering by school using variance adjustment. [1]IRR = Incidence Rate Ratio, CI = Confidence Interval. ITT, intention to treat; CACE, complier average causal effect. Overall, all-cause absences were considerably higher than COVID-related absences, 19.7% in students and 8.3% in staff, in part because students in two school years were granted study leave during weeks 7-10 of the study, and only a minority of several large further education college students were expected to attend each day.

Category	Control arm	Intervention arm
Index case matched to Test and Trace data	265	354
Index case based only of lateral flow device result, so matching not possible	16	48
Index case, with case reporting a positive confirmatory PCR result, no matching result in Test and Trace identified	57	48
Case present in Test and Trace only, active school, symptomatic at test	229	260
Case present in Test and Trace only, active school, asymptomatic at test	109	175
Case present in Test and Trace only, non-participating school or school holiday, symptomatic at test	231	227
Case present in Test and Trace only, non-participating school or school holiday, asymptomatic at test	167	131

Table S8. School reported index cases and national community-based testing results reconciliation. Index cases were reported to schools by students and staff and recorded by schools in study records. Details of students and staff at schools allowed matching to national testing data (NHS Test and Trace).

	Descriptive			ITT, Univariable			ITT, Multivariable			CACE, Multivariable	
Characteristic	**Symptomatic PCR positives**	**Days at risk**	**Rate per 100,000 per week**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**
Study arm											
Control	657	7,782,537	59.1	—	—		—	—		—	—
Intervention	740	8,379,749	61.8	1.05	0.71, 1.55	0.82	0.96	0.75, 1.22	0.72	0.86	0.55, 1.34
Strata group											
Government-funded, 11-18y free school meals ≤17%	618	6,705,405	64.5	—	—		—	—		—	—
Government-funded, 11-16y free school meals ≤17%	50	976,206	35.9	0.56	0.28, 1.10	0.091	0.39	0.20, 0.74	0.004	0.40	0.16, 0.70
Government-funded, 11-18y free school meals >17%	268	3,513,748	53.4	0.83	0.53, 1.30	0.41	0.78	0.57, 1.07	0.12	0.79	0.56, 1.05
Government-funded, 11-16y free school meals >17%	335	2,266,789	103.5	1.60	1.01, 2.56	0.047	0.78	0.56, 1.10	0.16	0.78	0.55, 1.09
Other	105	2,383,752	30.8	0.48	0.27, 0.85	0.012	0.63	0.41, 0.96	0.032	0.62	0.38, 0.91
Independent day school	21	316,386	46.5	0.72	0.25, 2.06	0.54	0.64	0.26, 1.60	0.34	0.67	0.00, 0.97
Participant type											
Student	1,297	14,547,064	62.4	—	—		—	—		—	—
Staff	100	1,615,222	43.3	0.69	0.55, 0.88	0.003	0.75	0.61, 0.92	0.006	0.76	0.61, 0.93

Table S9. Co-primary outcome: incidence of symptomatic PCR positive infection in students and staff. Results of a quasi-Poisson regression model accounting for clustering by school using variance adjustment. In the adjusted analysis, adjustment is also made for community case counts in the prior week using a 4 knot spline (default placed knots, with number up to five chosen on the basis of BIC in a Poisson regression model) (see Figure S3). [1]IRR = Incidence Rate Ratio, CI = Confidence Interval. ITT, intention to treat; CACE, complier average causal effect.

Sensitivity analysis	ITT multivariable IRR for intervention vs. control arm	95% CI
Adjustment for community case rates in prior week (main analysis)	0.96	0.75, 1.22
Adjustment for community case rates in week 2 weeks prior	0.95	0.75, 1.21
Adjustment for community case rates in week 3 weeks prior	0.99	0.76, 1.30
Adjustment for community case rates in week 4 weeks prior	1.06	0.77, 1.45
No adjustment for community case rates	1.06	0.74, 1.51

Table S10. Co-primary outcome, sensitivity analysis: incidence of symptomatic PCR positive infection in students and staff and impact of community case rate adjustment. Results are shown for quasi-Poisson regression models adjusting for randomisation strata group and participate type, accounting for clustering by school using variance adjustment, with varying adjustments for community case rate. Adjustment for community case counts in the prior week is using a 4 knot spline (default placed knots). [1]IRR = Incidence Rate Ratio, CI = Confidence Interval. ITT, intention to treat; CACE, complier average causal effect.

Sensitivity analysis	CACE multivariable IRR for intervention vs. control arm	95% CI
Missing compliance imputed using 50th centile (main analysis)	0.86	0.55, 1.34
Missing compliance imputed using 25th centile	0.86	0.53, 1.46
Missing compliance imputed using 75th centile	0.86	0.56, 1.35

Table S11. Co-primary outcome, sensitivity analysis: incidence of symptomatic PCR positive infection in students and staff and compliance imputation strategy. Results are shown of quasi-Poisson regression models using data adjusting randomisation strata group, participant type, and community case rates in the prior week, with allowance for clustering by school using variance adjustment. IRR, Incidence Rate Ratio, CI = Confidence Interval, CACE, complier average causal effect.

	Descriptive			ITT, Univariable			ITT, Multivariable			CACE, Multivariable	
Characteristic	**Any PCR positives**	**Days at risk**	**Rate per 100,000 per week**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**
Study arm											
Control	1,062	7,782,537	95.5	—	—		—	—			
Intervention	1,198	8,379,749	100.1	1.05	0.70, 1.57	0.82	0.96	0.76, 1.20	0.71	0.88	0.57, 1.41
Strata group											
Government-funded, 11-18y free school meals ≤17%	949	6,705,405	99.1	—	—		—	—			
Government-funded, 11-16y free school meals ≤17%	84	976,206	60.2	0.61	0.32, 1.14	0.12	0.43	0.24, 0.76	0.004	0.43	0.19, 0.72
Government-funded, 11-18y free school meals >17%	439	3,513,748	87.5	0.88	0.56, 1.38	0.58	0.84	0.61, 1.14	0.26	0.84	0.61, 1.18
Government-funded, 11-16y free school meals >17%	584	2,266,789	180.3	1.82	1.13, 2.93	0.014	0.89	0.64, 1.23	0.47	0.88	0.61, 1.19
Other	165	2,383,752	48.5	0.49	0.26, 0.91	0.025	0.65	0.42, 1.01	0.056	0.64	0.40, 1.02
Independent day school	39	316,386	86.3	0.87	0.30, 2.49	0.80	0.80	0.32, 1.96	0.62	0.82	<0.01, 0.96
Participant type											
Student	2,114	14,547,064	101.7	—	—		—	—			
Staff	146	1,615,222	63.3	0.62	0.50, 0.77	<0.001	0.67	0.57, 0.79	<0.001	0.68	0.57, 0.80

Table S12. Secondary outcome: incidence of any PCR positive infection in students and staff. Results of a quasi-Poisson regression model accounting for clustering by school using variance adjustment. In the adjusted analysis, adjustment is also made for community case counts in the prior week using a 4 knot spline (default placed knots, with number up to five chosen on the basis of BIC in a Poisson regression model) (see Figure S3). [1]IRR = Incidence Rate Ratio, CI = Confidence Interval. ITT, intention to treat; CACE, complier average causal effect.

	Descriptive			ITT, Univariable			ITT, Multivariable			CACE, Multivariable	
Characteristic	**Symptomatic PCR positives**	**Days at risk**	**Rate per 100,000 per week**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**
Study arm											
Control	614	6,988,884	61.5	—	—		—	—		—	—
Intervention	683	7,558,180	63.3	1.03	0.69, 1.53	0.89	0.94	0.73, 1.20	0.61	0.85	0.49, 1.51
Strata group											
Government-funded, 11-18y free school meals ≤17%	579	6,105,148	66.4	—	—		—	—		—	—
Government-funded, 11-16y free school meals ≤17%	48	890,988	37.7	0.57	0.28, 1.14	0.11	0.40	0.21, 0.76	0.005	0.41	0.15, 0.71
Government-funded, 11-18y free school meals >17%	246	3,180,058	54.1	0.82	0.52, 1.29	0.38	0.77	0.56, 1.07	0.11	0.77	0.54, 1.02
Government-funded, 11-16y free school meals >17%	308	2,049,572	105.2	1.58	0.98, 2.55	0.058	0.77	0.54, 1.09	0.15	0.77	0.52, 1.07
Other	97	2,085,153	32.6	0.49	0.27, 0.89	0.018	0.65	0.43, 1.00	0.051	0.64	0.37, 0.97
Independent day school	19	236,145	56.3	0.85	0.28, 2.53	0.77	0.74	0.29, 1.88	0.52	0.77	<0.01, 0.77

Table S13. Co-primary outcome, subgroup: incidence of symptomatic PCR positive infection in students. Results of a quasi-Poisson regression model accounting for clustering by school using variance adjustment. In the adjusted analysis, adjustment is also made for community case counts in the prior week using a 4 knot spline (default placed knots, with number up to five chosen on the basis of BIC in a Poisson regression model) (see Figure S3). [1]IRR = Incidence Rate Ratio, CI = Confidence Interval. ITT, intention to treat; CACE, complier average causal effect.

	Descriptive			ITT, Univariable			ITT, Multivariable			CACE, Multivariable	
Characteristic	**Symptomatic PCR positives**	**Days at risk**	**Rate per 100,000 per week**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**
Study arm											
Control	43	793,653	37.9	—	—		—	—		—	—
Intervention	57	821,569	48.6	1.28	0.74, 2.21	0.38	1.21	0.81, 1.81	0.35	1.33	0.70, 2.56
Strata group											
Government-funded, 11-18y free school meals ≤17%	39	600,257	45.5	—	—		—	—		—	—
Government-funded, 11-16y free school meals ≤17%	2	85,218	16.4	0.36	0.09, 1.45	0.15	0.26	0.06, 1.05	0.059	0.26	<0.01, 0.20
Government-funded, 11-18y free school meals >17%	22	333,690	46.2	1.01	0.51, 2.02	0.97	0.91	0.53, 1.57	0.74	0.95	0.46, 1.62
Government-funded, 11-16y free school meals >17%	27	217,217	87.0	1.91	1.00, 3.66	0.050	1.00	0.62, 1.63	>0.99	1.04	0.57, 1.75
Other	8	298,599	18.8	0.41	0.20, 0.85	0.017	0.48	0.26, 0.91	0.024	0.51	0.21, 1.00
Independent day school	2	80,241	17.4	0.38	0.10, 1.42	0.15	0.31	0.08, 1.14	0.078	0.30	<0.01, 0.21

Table S14. Co-primary outcome, subgroup: incidence of symptomatic PCR positive infection in staff. Results of a quasi-Poisson regression model accounting for clustering by school using variance adjustment. In the adjusted analysis, adjustment is also made for community case counts in the prior week using a 4 knot spline (default placed knots, with number up to five chosen on the basis of BIC in a Poisson regression model) (see Figure S3). [1]IRR = Incidence Rate Ratio, CI = Confidence Interval. ITT, intention to treat; CACE, complier average causal effect.

	Descriptive			ITT, Univariable			ITT, Multivariable			CACE, Multivariable	
Characteristic	**All PCR positives**	**Days at risk**	**Rate per 100,000 per week**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**
Study arm											
Control	1,001	6,988,884	100.3	—	—		—	—		—	—
Intervention	1,113	7,558,180	103.1	1.03	0.68, 1.55	0.89	0.94	0.74, 1.18	0.58	0.85	0.52, 1.43
Strata group											
Government-funded, 11-18y free school meals ≤17%	895	6,105,148	102.6	—	—		—	—		—	—
Government-funded, 11-16y free school meals ≤17%	81	890,988	63.6	0.62	0.32, 1.19	0.15	0.43	0.24, 0.79	0.006	0.44	0.19, 0.75
Government-funded, 11-18y free school meals >17%	408	3,180,058	89.8	0.88	0.56, 1.38	0.57	0.83	0.60, 1.14	0.25	0.83	0.58, 1.13
Government-funded, 11-16y free school meals >17%	545	2,049,572	186.1	1.81	1.12, 2.95	0.016	0.87	0.62, 1.23	0.44	0.87	0.59, 1.20
Other	150	2,085,153	50.4	0.49	0.26, 0.93	0.029	0.66	0.42, 1.03	0.068	0.64	0.41, 1.07
Independent day school	35	236,145	103.7	1.01	0.34, 2.98	0.98	0.89	0.35, 2.23	0.80	0.92	<0.01, 0.89
[1]IRR = Incidence Rate Ratio, CI = Confidence Interval											

Table S15. Secondary outcome, subgroup: incidence of any PCR positive infection in students. Results of a quasi-Poisson regression model accounting for clustering by school using variance adjustment. In the adjusted analysis, adjustment is also made for community case counts in the prior week using a 4 knot spline (default placed knots, with number up to five chosen on the basis of BIC in a Poisson regression model) (see Figure S3). [1]IRR = Incidence Rate Ratio, CI = Confidence Interval. ITT, intention to treat; CACE, complier average causal effect.

	Descriptive			ITT, Univariable			ITT, Multivariable			CACE, Multivariable	
Characteristic	**Any PCR positives**	**Days at risk**	**Rate per 100,000 per week**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**	**p-value**	**IRR[1]**	**95% CI[1]**
Study arm											
Control	61	793,653	53.8	—	—		—	—		—	—
Intervention	85	821,569	72.4	1.35	0.82, 2.20	0.24	1.29	0.91, 1.83	0.15	1.46	0.89, 2.85
Strata group											
Government-funded, 11-18y free school meals ≤17%	54	600,257	63.0	—	—		—	—		—	—
Government-funded, 11-16y free school meals ≤17%	3	85,218	24.6	0.39	0.13, 1.20	0.10	0.28	0.11, 0.75	0.011	0.29	0.00, 0.23
Government-funded, 11-18y free school meals >17%	31	333,690	65.0	1.03	0.59, 1.82	0.91	0.93	0.60, 1.42	0.73	0.98	0.62, 1.55
Government-funded, 11-16y free school meals >17%	39	217,217	125.7	2.00	1.10, 3.63	0.024	1.09	0.70, 1.68	0.70	1.13	0.68, 1.71
Other	15	298,599	35.2	0.56	0.27, 1.15	0.11	0.65	0.36, 1.19	0.17	0.69	0.38, 1.54
Independent day school	4	80,241	34.9	0.55	0.20, 1.51	0.25	0.43	0.17, 1.08	0.071	0.41	0.00, 0.39

Table S16. Secondary outcome, subgroup: incidence of any PCR positive infection in staff. Results of a quasi-Poisson regression model accounting for clustering by school using variance adjustment. In the adjusted analysis, adjustment is also made for community case counts in the prior week using a 4 knot spline (default placed knots, with number up to five chosen on the basis of BIC in a Poisson regression model) (see Figure S3). [1]IRR = Incidence Rate Ratio, CI = Confidence Interval. ITT, intention to treat; CACE, complier average causal effect.

		Descriptive		Univariable			Multivariable		
Characteristic	**n**	**Positive / indeterminate research PCR**	**Percentage**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Study arm									
Control	886	14	1.6%	—	—		—	—	
Intervention	2,981	44	1.5%	0.93	0.41, 2.11	0.87	0.73	0.33, 1.61	0.44
Strata group									
Government-funded, 11-18y free school meals ≤17%	1,542	23	1.5%	—	—		—	—	
Government-funded, 11-16y free school meals ≤17%	304	2	0.7%	0.44	0.10, 1.98	0.28	0.39	0.09, 1.66	0.20
Government-funded, 11-18y free school meals >17%	807	6	0.7%	0.49	0.21, 1.16	0.10	0.49	0.21, 1.13	0.093
Government-funded, 11-16y free school meals >17%	719	15	2.1%	1.41	0.58, 3.41	0.45	1.24	0.54, 2.84	0.61
Other	352	9	2.6%	1.73	0.62, 4.88	0.30	2.05	0.68, 6.14	0.20
Independent day school	143	3	2.1%	1.42	0.67, 3.00	0.37	1.53	0.84, 2.80	0.16
Community rate per 100k population in prior week, per 100 change	3,867	58	1.5%	1.30	0.96, 1.75	0.089	1.34	1.01, 1.76	0.041

Table S17. Secondary outcome: proportion of contacts testing PCR-positive while asymptomatic on a research PCR test. Results of a logistic regression model are shown, with variance adjustment to allow for repeated measurements in participants from the same school. [1]OR = Odds Ratio, CI = Confidence Interval. As a sensitivity analysis the model was also refitted regarding those with indeterminate results as positive, yielding an adjusted OR for the intervention arm of 0.89 (95%CI 0.34, 1.86; p=0.76). Among contacts testing positive by research PCR, 53/58 (91.4%) had S gene target detected, and are likely to be Delta variant.

	Descriptive			Univariable			Multivariable		
Characteristic	**n**	**Positive symptomatic PCR**	**Percentage**	**OR[1]**	**95% CI[1]**	**p-value**	**OR[1]**	**95% CI[1]**	**p-value**
Study arm									
Control	4,665	44	0.9%	—	—		—	—	
Intervention	5,955	79	1.3%	1.41	0.66, 3.03	0.38	1.21	0.82, 1.79	0.34
Strata group									
Government-funded, 11-18y free school meals ≤17%	3,426	53	1.5%	—	—		—	—	
Government-funded, 11-16y free school meals ≤17%	728	3	0.4%	0.26	0.07, 0.94	0.040	0.28	0.07, 0.76	0.031
Government-funded, 11-18y free school meals >17%	2,498	25	1.0%	0.64	0.26, 1.58	0.33	0.64	0.39, 1.03	0.072
Government-funded, 11-16y free school meals >17%	3,038	28	0.9%	0.59	0.29, 1.21	0.15	0.54	0.33, 0.86	0.012
Other	662	5	0.8%	0.48	0.18, 1.34	0.16	0.50	0.17, 1.14	0.14
Independent day school	268	9	3.4%	2.21	1.16, 4.22	0.016	2.02	0.92, 4.00	0.058
Community rate per 100k population in prior week, per 100 change				1.29	0.98, 1.69	0.066	1.33	1.12, 1.55	<0.001

Table S18. Secondary outcome: proportion of contacts testing PCR-positive on community-based symptomatic PCR testing. Results of a logistic regression model are shown, with variance adjustment to allow for repeated measurements in participants from the same school. [1]OR = Odds Ratio, CI = Confidence Interval

	PCR detected SARS-CoV-2 RNA	PCR negative for SARS-CoV-2 RNA	Total	
LFD positive for SARS-CoV-2	32	2	34	Positive predictive value (95% CI) = 94% (80-99)
LFD negative for SARS-CoV-2	28	3164	3192	Negative predictive value (95% CI) = 99.12 (98.7-99.4)
Total	60	3166		
	Sensitivity (95% CI) = 53% (40-66)	Specificity (95% CI) = 99.93 (99.77-99.99)		

Table S19. Secondary outcome: performance of lateral flow device (LFD) testing in close contacts compared with paired polymerase chain (PCR) testing. Sensitivity, specificity, positive predictive and negative predictive values given, with 95% confidence intervals calculated by exact binomial method.

	PCR detected SARS-CoV-2 RNA	PCR negative for SARS-CoV-2 RNA	Total	
LFD positive for SARS-CoV-2	32	2	34	Positive predictive value (95% CI) = 94% (80-99)
LFD negative for SARS-CoV-2	26	2943	2969	Negative predictive value (95% CI) = 99.12 (98.7-99.4)
Total	58	2945		
	Sensitivity (95% CI) = 55% (42-68)	Specificity (95% CI) = 99.93 (99.75-99.99)		

Table S20. Secondary outcome: performance of lateral flow device (LFD) testing in student close contacts compared with paired polymerase chain (PCR) testing. Sensitivity, specificity, positive predictive and negative predictive values given, with 95% confidence intervals calculated by exact binomial method.

	PCR detected SARS-CoV-2 RNA	PCR negative for SARS-CoV-2 RNA	Total	
LFD positive for SARS-CoV-2	0	0	0	Positive predictive value = NA
LFD negative for SARS-CoV-2	2	221	223	Negative predictive value (95% CI) = 99.1 (96.8-99.9)
Total	2	221		
	Sensitivity (95% CI) = 0% (0-84)	Specificity (95% CI) = 100 (98.3-100)		

Table S21. Secondary outcome: performance of lateral flow device (LFD) testing in staff close contacts compared with paired polymerase chain (PCR) testing. Sensitivity, specificity, positive predictive and negative predictive values given, with 95% confidence intervals calculated by exact binomial method.

Supplementary figures

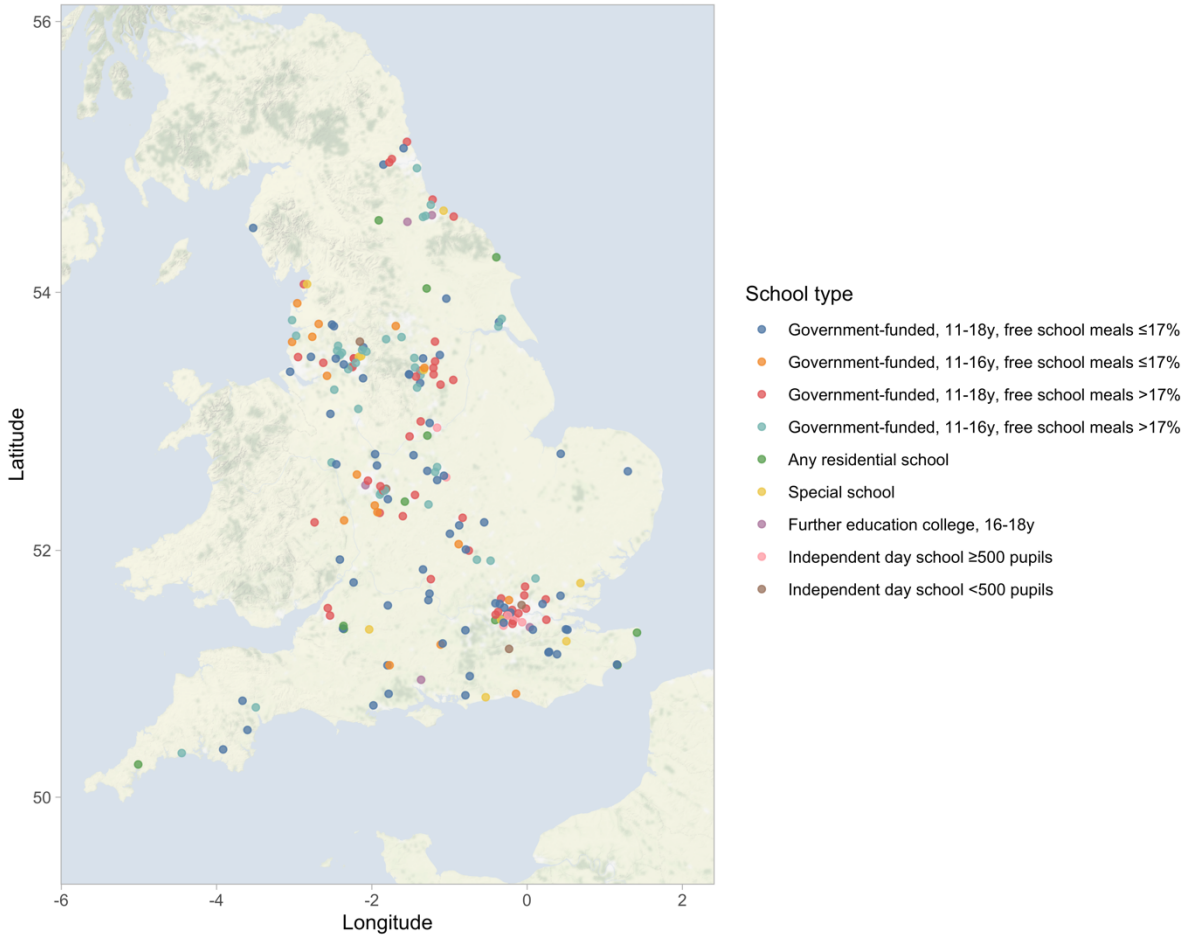

Figure S1. The location of 201 randomised schools by school type.

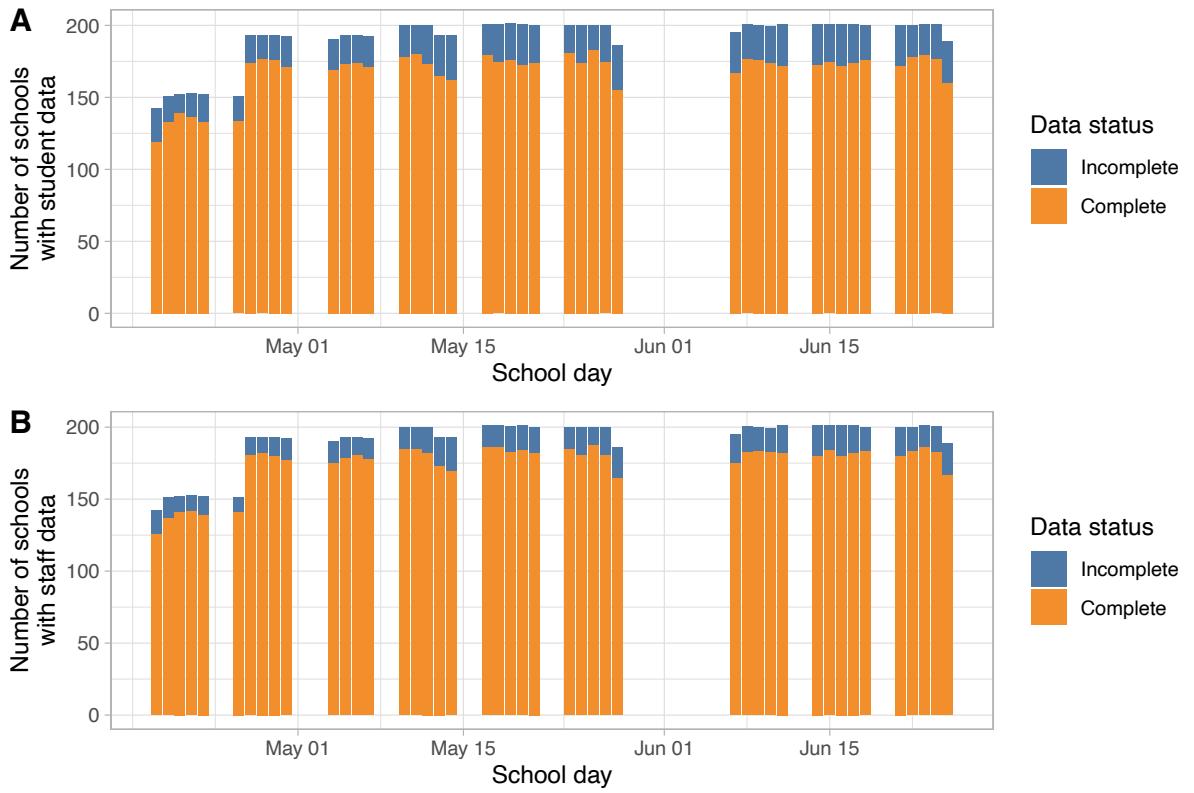

Figure S2. Student (panel A) and staff (panel B) attendance data completeness by study day. Individuals were considered at risk of a COVID-related absence on school days following enrolment of the school into the study from 19-April-2021 onwards up to 25-June-2021. National holidays, the school "half-term" holiday (31-May-2021 to 04-June-2021), and individual school non-school days were excluded. The total height of the bar represents the number of randomised schools entered into the study on that day excluding any schools with a non-school day. Although 4 schools continued throughout the half-term holiday, this period was removed from the analysis for all schools.

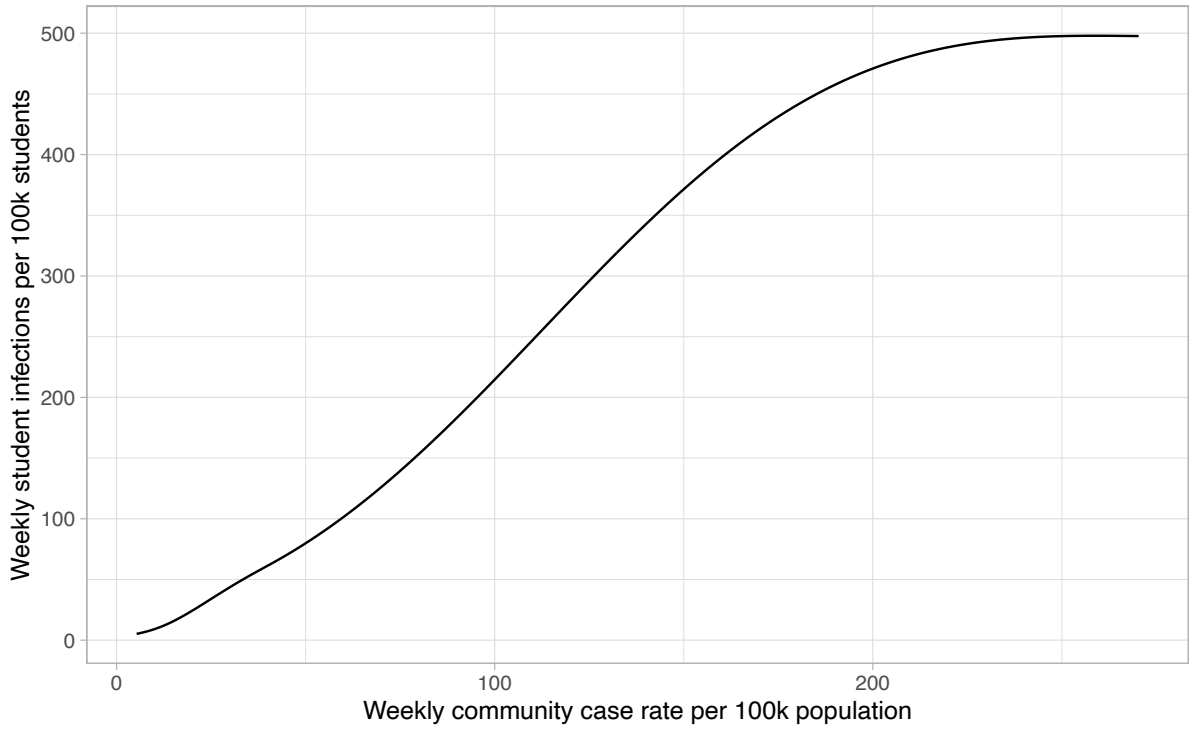

Figure S3. Relationship between community case rates and weekly incidence of PCR-confirmed infections in students. Model, with a 4 knot spline (with default positioned knots) adjusted for strata group and study arm, shown for Government-funded, 11-18y, free school meals ≤17% schools in the control arm.

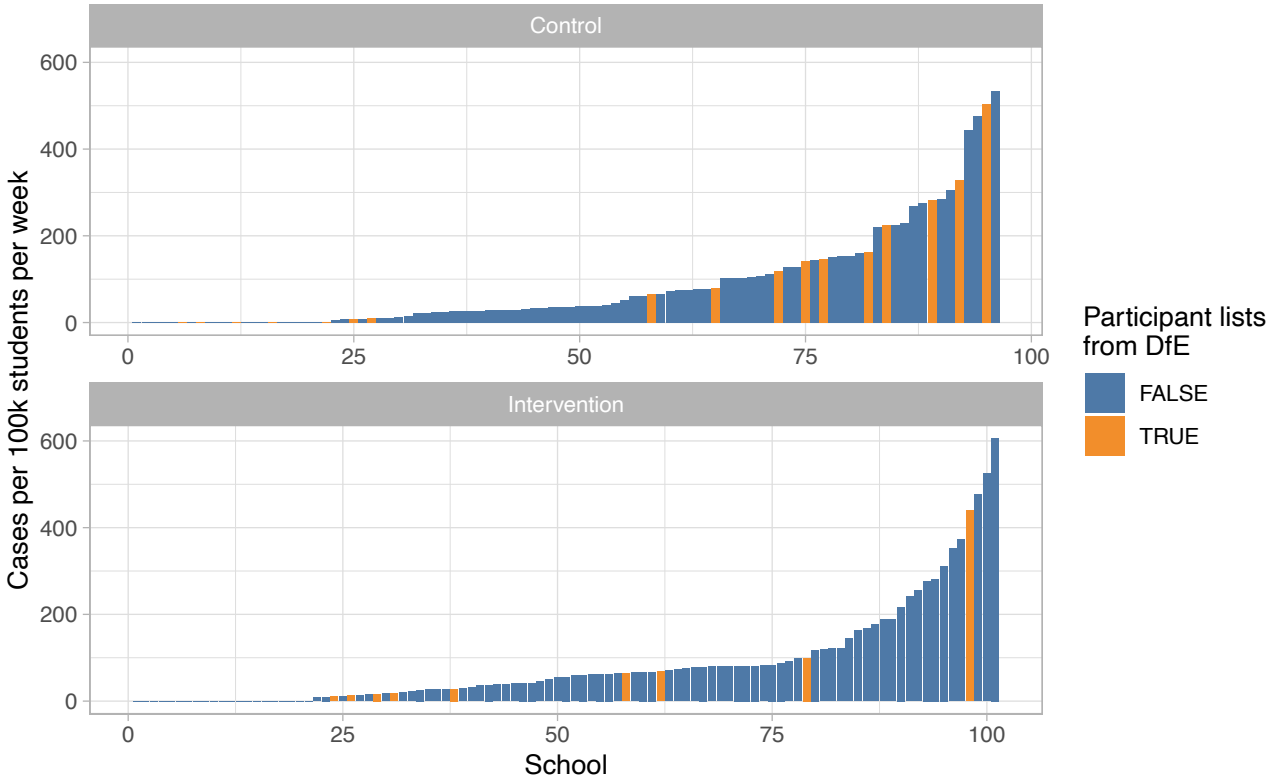

Figure S4. Incidence of symptomatic PCR-confirmed infection by study arm and school. Schools actively participating in the study and therefore potentially reporting contacts are shown in blue. Schools not actively participating, for which, student lists where obtained from the Department for Education (DfE) are shown in orange.

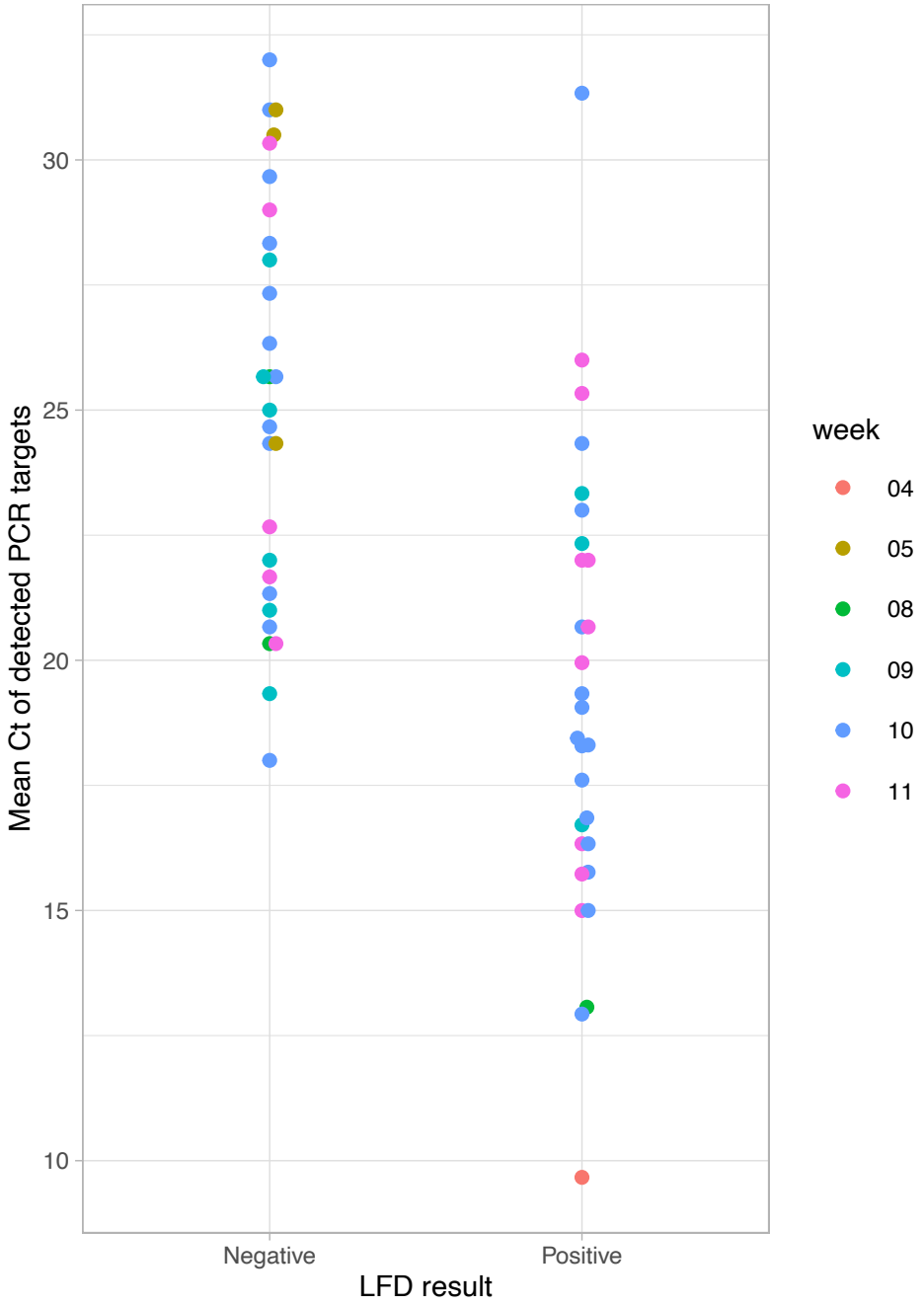

Figure S5 Lateral flow device (LFD) results and mean Cycle threshold (Ct) value of Polymerase Chain Reaction (PCR) target detection in 57 contacts with SARS-CoV-2 detected. Among contacts testing positive by LFD, Ct values were available in 29/32 (90%). Points are coloured according to the period of the study in which the swab was collected, with 19-April-2021 as the start of week 1.