Children's Task and finish Group: Paper on Higher Education Settings

Background and aim

Higher Education (HE) courses are delivered at levels 4 and above (Diploma/certificate of HE, Foundation degree, Bachelor's degree, Masters, Medicine, PGCE and PhDs) and include both academic and technical qualifications. They are delivered at a range of different settings (e.g., universities, FE colleges, private providers).

In September 2020, a SAGE paper[1] described the principles of managing SARS-CoV-2 transmission associated with HE. This paper highlighted that there was a significant risk that HE could amplify local and national transmission, requiring national oversight; that it was essential to develop clear strategies for testing, tracing and isolation; that safe provision of education must be based on a hierarchy of risk; that accommodation and social interactions may be a high-risk environment for transmission; that specific strategies may be required to consider the wider physical and mental health of students; and that communication strategies are a critical part of minimising transmission associated with HE.

In response to a request from the Department for Education (DfE), this paper provides an update on evidence related to COVID-19 in HE settings, drawing upon data from the Office of National Statistics (ONS), Public Health England (PHE), and the COVID-19 Genomics UK (COG UK) consortium.

This paper does not aim to cover all aspects comprehensively (e.g., the impacts of COVID-19 on the mental health and wellbeing of student populations; infection/mortality risk to HE staff). Some of these have been covered in more detail elsewhere[2].

The data sources used for this report are as follows:

- Descriptive analysis of the percentage of 16–24-year-olds testing positive for COVID-19, by employment status from the ONS COVID-19 Infection Survey (CIS)
- PHE national routine lab-based surveillance data (Data source: SGSS Pillar 1 (NHS and PHE testing) and Pillar 2 (community testing)) presented by educational-aged-cohorts
- NHS Test & Trace contact tracing data from PHE
- ONS outbreak investigations drawing on information from 10 Universities
- PHE national routine surveillance of COVID-19 outbreaks in educational settings (Data Source: HPZone)
- PHE: A Cross-Sectional Study Examining the Seroprevalence of SARS-CoV-2 Antibodies in University Students in England, December 2020
- COG-UK investigations of Portsmouth, Glasgow and Cambridge Universities
- ONS Student COVID Insights Survey
- REACT-2 antibody prevalence data
- Investigation of cumulative confirmed cases and seroprevalence in students at a research-intensive provincial university
- Updated evidence and analysis provided by SPI-B

[1] https://www.gov.uk/government/publications/principles-for-managing-sars-cov-2-transmission-associated-with-higher-education-3-september-2020

[2] E.g. SPI-B: Return to campus for Spring term: risk of increased transmission from student migration (13 January 2021) [currently unpublished]

Executive Summary:

- **Multiple data sources (including ONS, PHE and COG-UK) show that the rates of COVID-19 infection rose among many HE student populations in October 2020** (moderate evidence, moderate data)**, with rates of infection subsequently reducing** in November (high confidence).
- PHE testing data suggests that the first peak of infection among those attending HE, and of the main HE aged cohorts (18-22 years) coincided with the timing of when HE institutions opened and closed, and was prior to peaks seen in younger age groups (medium confidence). However, this also reflected the broader epidemic curve at the time, and many of those in the main HE aged cohorts would not have been enrolled in HE. In contrast, the timing of the second peaks at the end of 2020 did not differ significantly between different age groups. This evidence is limited and not reflective of the whole HE student population.
- **Several case studies of individual outbreaks and/or transmission in HE settings document outbreaks among students in HE settings in late September - October 2020**.
- Evidence from ONS outbreak investigations, PHE surveillance data, genomic and antibody studies in a number of HE settings **suggest a higher risk of transmission in residential settings**, and particularly in some halls of residence (medium confidence). ONS **outbreak analyses** from Exeter and Loughborough **found greater transmission spikes in halls of residence than private accommodation** (medium confidence), and antibody studies from two universities suggest higher prevalence of antibodies among those living in halls of residence (medium confidence)
- Limited, anecdotal evidence from 10 universities presented by ONS suggests that when face-to-face learning was happening, minimal cases of transmission were attributed to face-to-face learning environments. Instances where transmission did occur were associated with guidance not being followed, for example, the removal of a face mask, rather than systemic failures (low confidence).
- **Evidence from genomic studies in a limited number of universities suggests that mitigation measures were successful in minimising transmission**. Limited evidence suggests that environmental and behavioural infection control measures, increased testing, use of remote learning, and self-isolation by students appear to have been effective during the small amount of face-to-face learning over the Autumn term, and may have contributed to reducing prevalence in student communities (low confidence).
- As noted in previous advice, transmission related to HE settings has the potential to increase rates of local community transmission. Whilst genomic data presented here indicates student-student transmission and some evidence of potential onward transmission to the local community, current evidence comes from a limited number of HE settings, and it is unclear how generalisable the results are across different HE settings. A range of factors will influence the potential impact on levels of local community transmission, including factors such as the relative incidence of infection in the community and student populations; and the types and levels of social connection between students and the wider community.
- **There is strong evidence that the majority of HE students (those aged 18-24 years), because of their age, are less susceptible to severe clinical disease than older people** (high confidence). However, some HE students are older (DfE estimate 70% of HE students are aged 18-24 years; 11% are aged 25-29, and 19% are aged 30 and over) and may or may have underlying conditions that make them vulnerable to COVID-19.
- **Survey evidence related to COVID-19 indicates disruption to research and learning, lower wellbeing, and increased mental distress in HE students** (medium confidence). Recent data from the ONS Student Insights Survey finds that a greater proportion of students reported being dissatisfied or very dissatisfied with their academic experience since the start of the autumn

term, with limited opportunities for social or recreational activity, meeting others, and access to sports and fitness facilities driving dissatisfaction (low confidence).

- The assessments are limited by the lack of representativeness of several data sources, including the exclusion of those living in student residences from ONS COVID Infection survey data, and PHE data by educational age cohort excluding mature students, and including young people (aged 18-22 years) who are not enrolled in HE. Evidence on the amount and approach to face-to-face teaching over the period are lacking. Further evidence, including on the differential approaches to mitigation measures applied across the sector or the level of compliance within different institutions would help inform mitigation actions.
- Maximising uptake of testing and protective health behaviours must be underpinned by greater understanding of the costs, feasibility and acceptability of approaches to testing. Communication and tailored support packages are needed to enable self-isolation (high confidence).

Background

Higher education settings consist of a diverse demographic of people. However, in England approximately 70% of HE students are aged 24 and under, and study for various levels of qualifications ranging from Diplomas (Level 4) to Bachelor's degree (Level 6) to PhDs (Level 8)[3]. Alongside studies, approximately 62% of students in the HE sector undertake employment, with 24% in part-time employment, 13% with zero hours contracts, and 12% in full-time employment[4]. Of those who hold jobs alongside their studies, 87% have had to make adjustments to their work since the start of the COVID-19 pandemic, for example via furlough (18%), unpaid leave (14%), reduction in hours (12%) and redundancy (11%)[5]. According to published HESA data, around 37% of all full-time students lived in either the parental/guardian home or their 'own' residence during term time. The remaining 63% presumably moved to attend UK HE institutions[5]. In 2014-2015 (the most recent year with available data), 74.4% of full-time, under 20-year-old students moved home to attend while enrolled at UK HE institutions ('Movers'). The vast majority of the remainder commuted a 'short' distance from their family home to their provider ('Commuters')[6]. Data from 8 universities in England suggest that 50-85% of students have returned to campus or will not be travelling (especially those who are remaining overseas), and therefore the proportion of students who would be considered 'movers' may be minimal. There appears to be variation in the amount of face-to-face learning that took place during October to December 2020, with one university reporting 35% of students being taught face-to-face, and one reporting 85%[7].

1 Risk of COVID-19 infection among higher education students

There is evidence from multiple data sources (including ONS and PHE) that the rate of COVID-19 infection rose among many HE student populations in October 2020, following the start of autumn term and reflecting broader increasing community prevalence at the time, with rates of infection subsequently reducing (high confidence). The wider prevalence of COVID-19 infection within the general population began to rise in late August. Prevalence began to drop among all 16/17 to 24-year-olds and age 11/12 to 15/16-year-olds towards the end of October, although prevalence in the latter group rose again in early November. Meanwhile, prevalence among other age groups continued to rise or remained relatively flat (reported until mid-November)[8].

1.1 Evidence from ONS COVID-19 Infection Survey (CIS)

Summary

ONS CIS data by employment status which can distinguish some but not all students, indicates that COVID-19 positivity rates were highest for students aged 16/17 (school year 12) – 24 years, compared to employed people of the same age, during October 2020, at a time following the start of Autumn 2020 term. Importantly, these data do not capture those living in halls of residence or mature students, and rely on individuals listing 'student' as occupation, so may miss some groups and/or not reflect the entire student population (medium confidence).

ONS analysis of people aged 16-24 testing positive for COVID-19, by employment status.

[3] DfE data; see also 3rd Sept SAGE paper on HE
[4] COVID-19 and Students Survey Report, https://www.nusconnect.org.uk/resources/covid-19-and-students-survey-report.
[5] https://www.hesa.ac.uk/data-and-analysis/students/chart-4
[6] https://www.suttontrust.com/wp-content/uploads/2019/12/Home_and_away_FINAL.pdf
[7] Data provided by the Russell Group 17/02/21
[8] ONS COVID-19 Infection Survey

- During September 2020 to January 2021, COVID-19 positivity was highest for people that are employed (Figure 1). However, this has varied over time and rates were highest for students aged school year 12 to 24 years during October 2020.
- In recent weeks however, positivity has been increasing among both employed individuals and students in this age group.
- The 'Other' occupation category includes people who are furloughed or not working (such as unemployed, long-term sick etc.). Caution should be taken in over-interpreting the trend in the 'Other' category due to wide credible intervals.

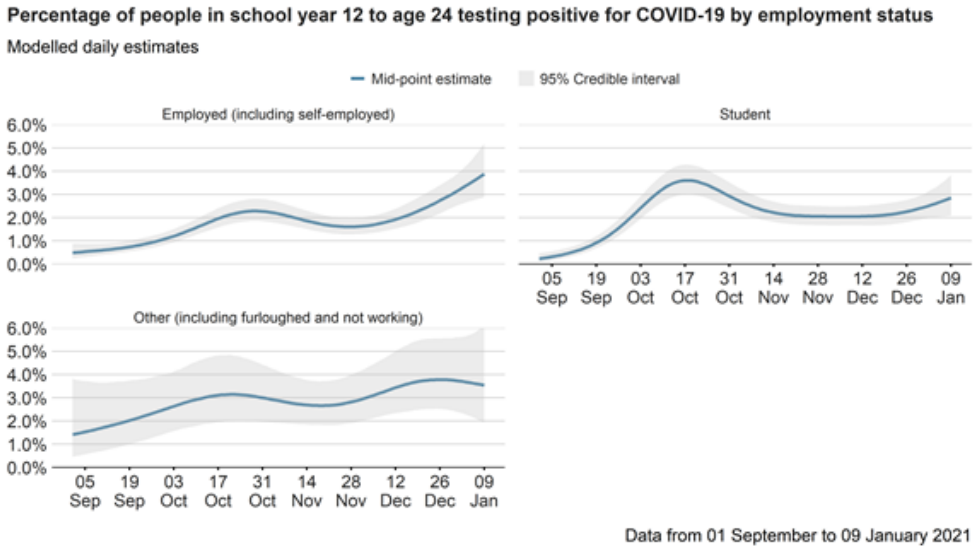


Figure 1 ONS analysis of CIS showing proportion of students aged school year 12 to age 24 testing positive for COVID-19 by employment status

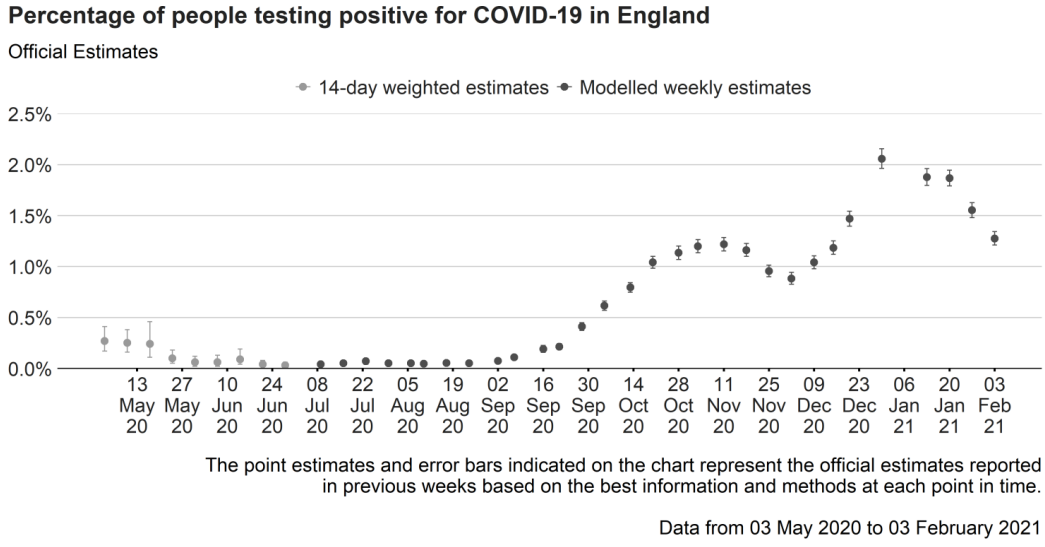


Figure 2 – ONS official estimates of people testing positive for COVID-19 in England[9]

[9] ONS COVID-19 Infection Survey, 12 February 2021.
https://www.ons.gov.uk/peoplepopulationandcommunity/healthandsocialcare/conditionsanddiseases/bulletins/coronaviruscovid19infectionsurveypilot/12february2021

Caveats:

- Sample sizes are smaller in age groups 16-24 and modelling is therefore more challenging, and may lead to a higher level of uncertainty around the modelled trends.
- These data do not reflect those living in halls of residence accommodation, and do not capture those who are part-time student/part time employed (only those who put student as occupation), and do not capture mature students – DfE estimate that 70% of university students are under 25 years of age[10]. As noted above DfE report 62% of students in HE having a job alongside study, though many of these have been affected by the pandemic, for example resulting in furlough or reduced hours.
- These trends are at an aggregate level, and may mask substantial heterogeneity between regions.

1.2 Incidence of infection using Pillar 1 (NHS and PHE) and Pillar 2 (community testing) lab-based data for England, by 'educational-aged cohorts' - PHE analyses.

Summary

In PHE testing data, which may not capture all potential exposures and is likely to underestimate e.g. asymptomatic infections, reported incidence of infection by educational age cohort (corresponding to year groups) rose exponentially from mid-September to early October 2020 in the college / university age cohort. Following a decline in incidence in November, a further exponential rise in reported incidence was seen to early January 2021 when the third national lockdown was implemented (Figure 1). Note that these data are more reflective of the general increase in cases among young people, as **educational age cohorts are determined by age rather than by their educational status,** and therefore many of those defined as college/university age cohort will not be attending or enrolled in HE.

Cases were reported regardless of attendance at educational settings or if educational settings were open. Whilst the first reported rise was around the time of the start of Autumn term, it is not possible from these data to identify where transmission was occurring, and reported incidence in 18–22-year-olds was high prior to the start of the Autumn term (low-medium confidence) (Figure 3). A similar pattern was seen in positivity rates (peaking at 20% for university cohorts in October), however in January reported positivity rates were higher for primary and secondary aged children.

- Educational age cohorts were calculated from national Pillar 1 and Pillar 2 test data, using individual's dates of birth, which corresponded to a particular educational year group.
- Cases are included regardless of whether they attended an educational setting or whether the educational setting was open during the reporting period.
- Weekly COVID-19 incidence shows that college and university aged cohorts (18-22-year-olds) started the academic term in September 2020 with an incidence rate of 159 per 100,000 population which at the time was already four times the incidence rate in secondary school aged children and seven times the incidence rate in primary school aged children.
- The incidence in this university aged cohort rose exponentially from mid-September (week 38, 2020), peaking in early October (week 41, 2020) at 1,111 cases per 100,000 population. The incidence declined thereafter and following the second national lockdown in England, which started on Thursday 5 November (week 45, 2020), fell to a low of 219 per 100,000 population in late November (week 48, 2020) when incidence matched that in secondary school aged cohorts

[10] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/914978/S0728_Principles_for_Managing_SARS-CoV-2_Transmission_Associated_with_Higher_Education_.pdf

for the first time. Incidence then started to climb again as the more infectious B.1.1.7 variant increased in prevalence and became dominant, resulting in another exponential escalation of cases peaking at 960 cases per 100,000 population in January (week 1, 2021) when the third national lockdown was implemented. The recent late December/early January 2021 peak in the university cohort was double the incidence compared to secondary school aged cohorts and four times that in the primary school aged cohorts. Incidence among 18–22-year-olds had come down to 317 per 100,000 in late January (week 4, 2021) (data for week 4 are still provisional) (Figure 3).

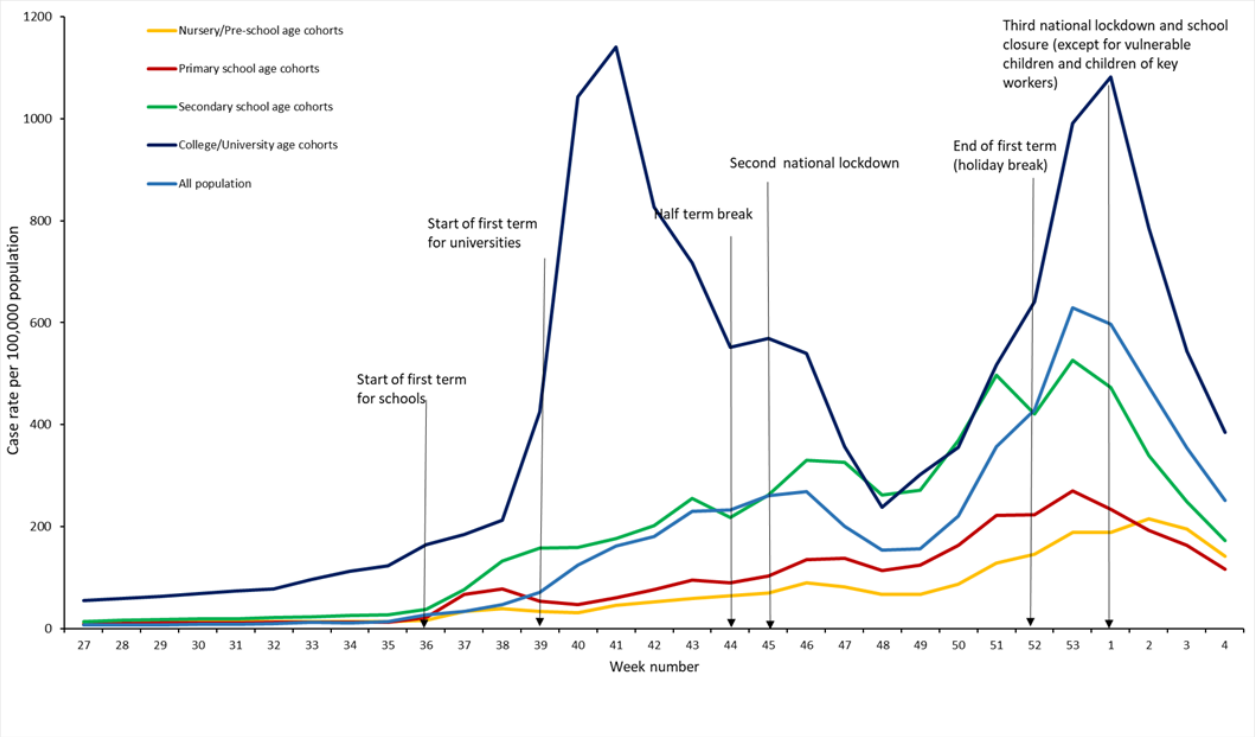


Figure 3 PHE data showing weekly incidence of laboratory confirmed COVID-19 cases per 100,000 population in nursery/preschool, primary school, secondary school and college/university age cohorts in England

- PHE data (4) also showed that positivity in college and university aged cohorts peaked in early October (week 41, 2020) at 20%, with a steady decline until early December (week 49, 2020) after which it rose again to a peak of 17% in late December to early January (week 53, 2020-2021). Peaks in positivity mirrored peaks in incidence in this age group. Interestingly positivity in secondary and primary school aged cohorts started out much lower than that in college and university aged cohorts in early September (week 36, 2020) and remained lower up until late October (week 44, 2020) when positivity in secondary school aged students overtook it. Positivity in secondary school aged cohorts and to a certain extent primary school aged cohorts have remined high since then and have not been overtaken by the college and university aged cohorts despite incidence being higher in the latter group since mid-December (week 51, 2020).

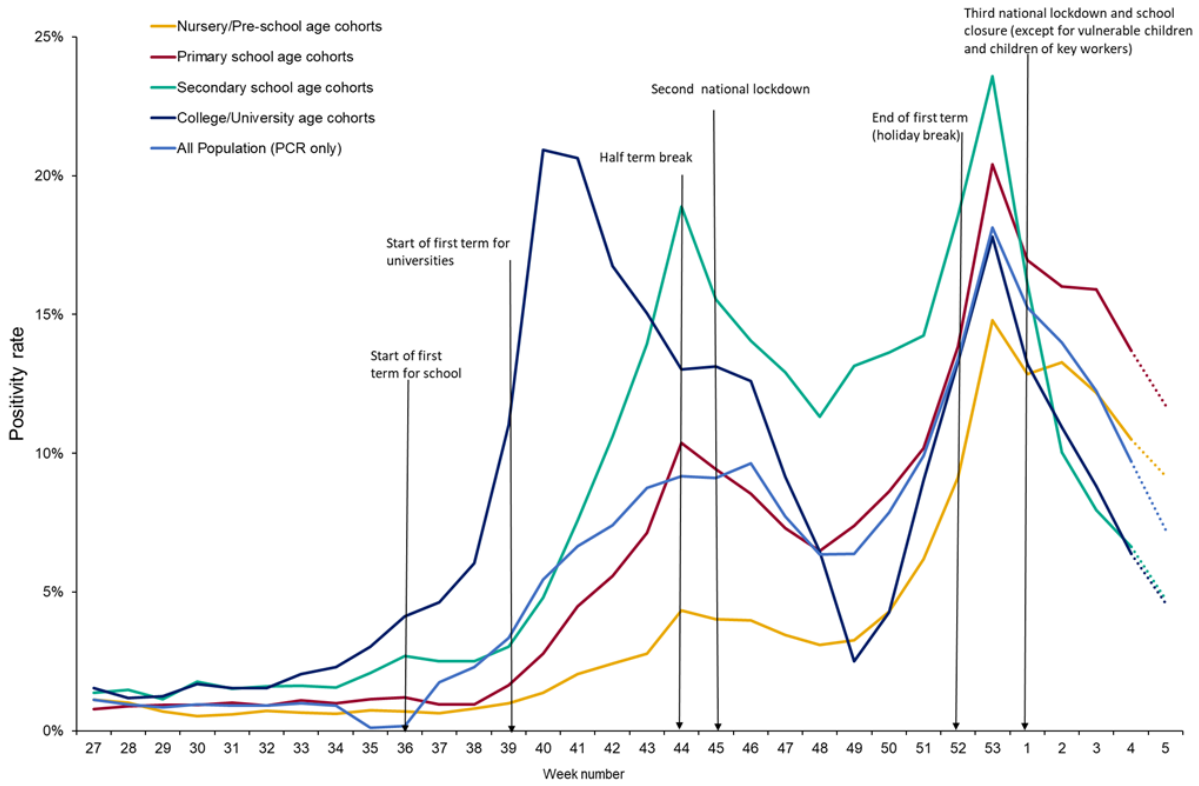


Figure 4 PHE data showing weekly positivity rates of confirmed COVID-19 cases, in nursery/preschool, primary school, secondary school and college/University age cohorts in England. N.B. positivity rates for school cohorts include PCR and LFD tests, whereas all population positivity includes PCR tests only.

1.3 Incidence reported from NHS Test & Trace data, by PHE

Summary

NHS Test and Trace data, which may not capture all potential exposures or transmission events in education settings and are likely to underestimate asymptomatic cases/transmission compared to e.g. ONS CIS data, indicates that of cases that reported attending an educational setting, university settings were the most common in late October. Whilst an increase in cases reporting attendance at a university setting was seen in late Dec 2020 / early Jan 20201, this represented a lower proportion of overall reported cases than in October. It is not possible to tell specifically where transmission was occurring from these data (low-medium confidence).

- According to the NHS Test & Trace educational settings report, there have been 271,013 cases that reported attending an educational setting from 23 October (week 43, 2020) to 31 January (week 4, 2021). This ranged from 6.2%-15.9% of all cases reported each week, the largest proportion during early to mid-December (week 50, 2020) just prior to the end of school term for the Christmas break (Figure 5).
- Note that cases are presented by the day when they were reported to Test and Trace, and this does not represent when they attended an educational setting. Further work is needed to define if exposure was related to attendance, and transmission cannot be inferred by this data.

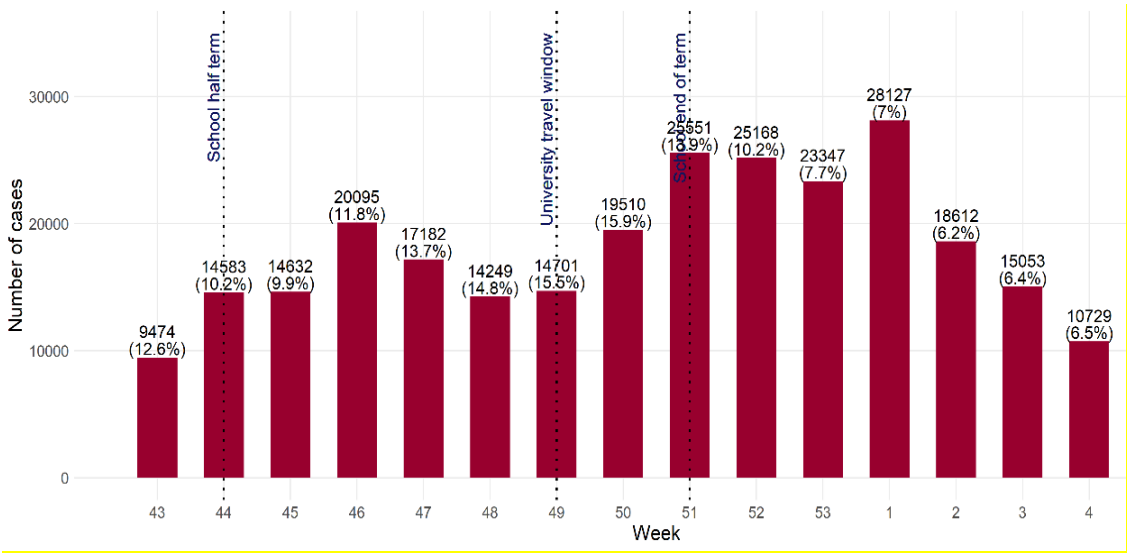


Figure 5 : NHS T&T data showing the number of cases, and percentage of the total number of cases each week, that reported attending an educational setting by week, England, October 23 - 03 February; PHE. NOTE that graph is presented in terms of number of cases with the percentage in brackets, with high numbers in late Dec/Jan reflecting national prevalence

- According to NHS T&T data, **secondary schools** were the most commonly reported educational setting attended by students who tested positive between week 45 2020 (when students returned to school after half-term) and week 1 2021 (the end of the Christmas holidays). Earlier, among cases reported in late October (weeks 43-44, 2020), university settings were the most common. From mid-January (week 2, 2021) onwards, primary schools were most frequently reported (Figure 6).

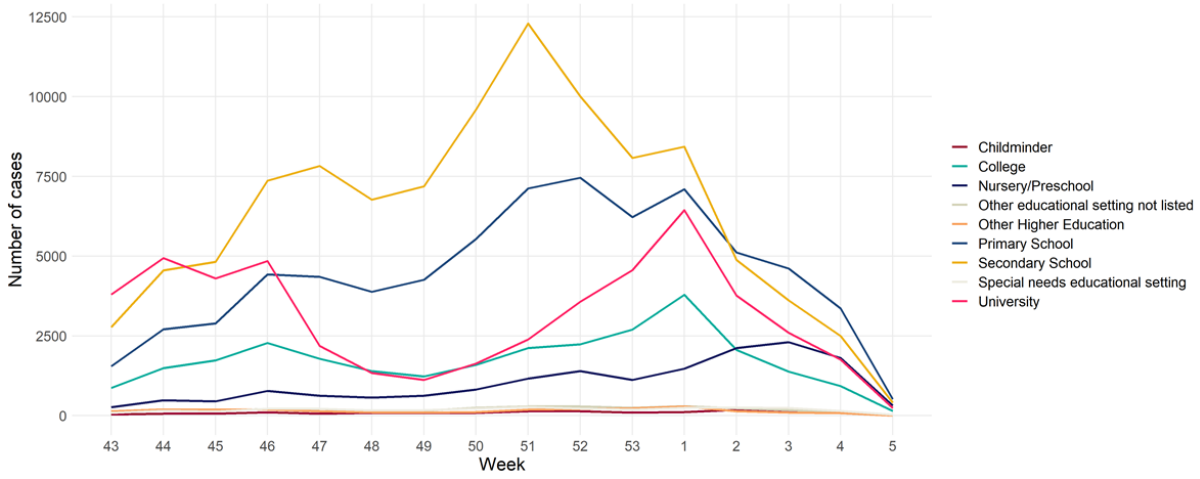


Figure 6 Number of cases attending an educational setting by week stratified by education setting type, England, October 23-03 February. N.B. Week 5 data incomplete at time of report

- NHS Test & Trace recorded 49,236 cases that reported attending university from 23 October (week 43, 2020) to 31 January (week 4, 2021). This ranged from 1.1% to 5% of all cases reported each week. The largest proportion was reported in late October (week 43, 2020) and the smallest in mid-late January (weeks 3 and 4, 2021) (Figure 7). It is important to note that mid-late January reflects a period of significant national restrictions, where the vast majority of other settings, including many workplaces, are closed.

- Note that **cases are presented by the day when they were reported to Test and Trace, and this does not represent when they attended a university setting, or if they attended during the time when they may have been exposed.** Further work is needed to define if exposure was related to attendance, and transmission cannot be inferred by this data.

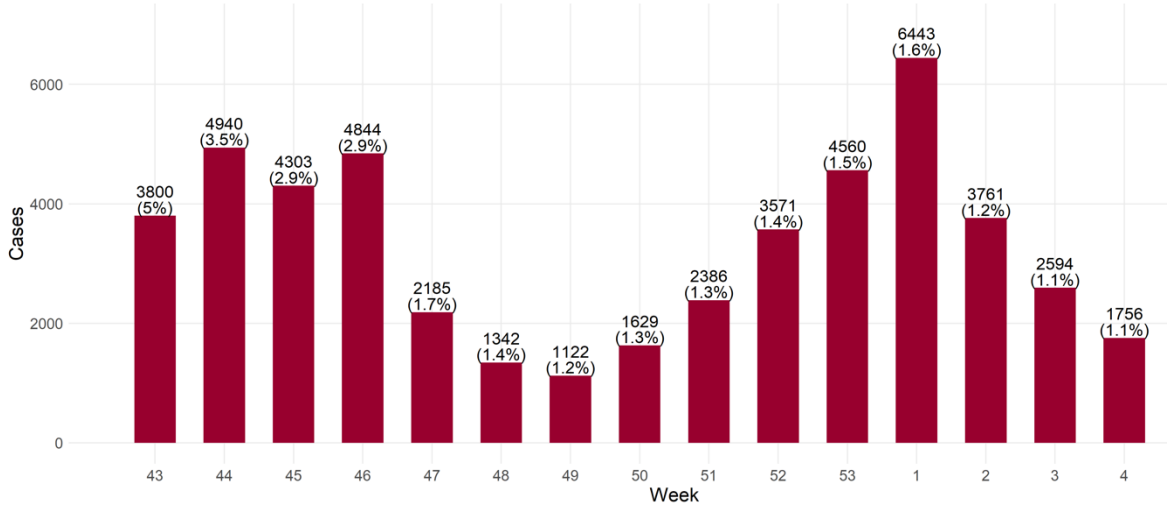
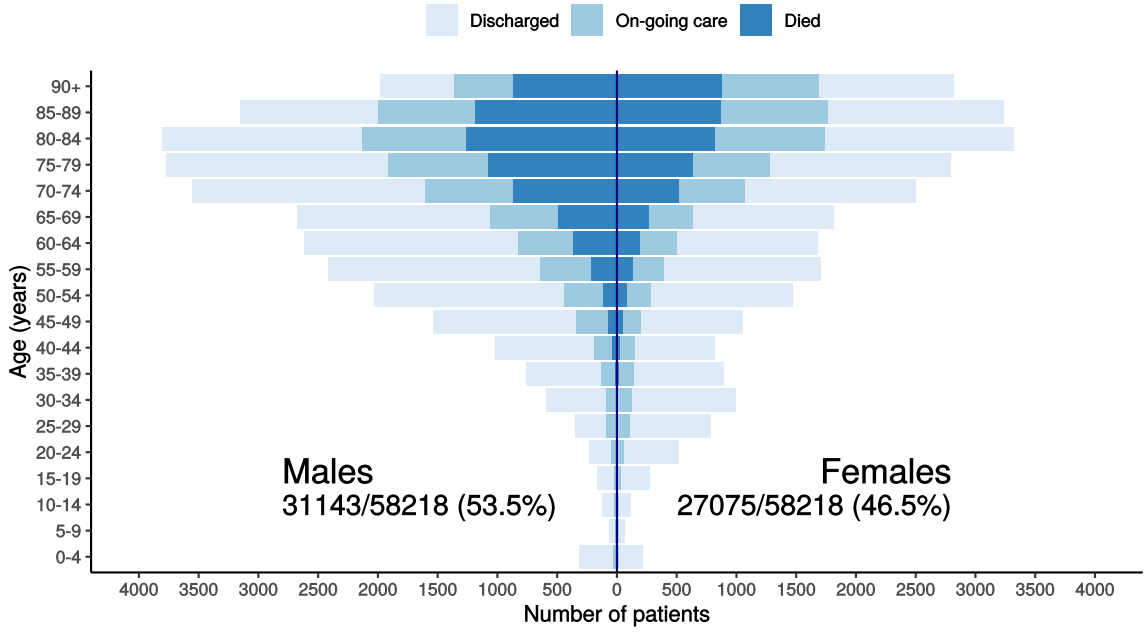


Figure 7 NHS T&T data showing the number of cases that reported attending an education setting - "University" only, England, October 23 - 03 February; PHE. NOTE that graph is presented in terms of number of cases who self-report as students with the percentage in brackets, with high numbers in late Dec/Jan reflecting national prevalence

1.4 Severity of disease among HE student populations

There is strong evidence that the majority of HE students (those aged 18-24) are less susceptible to severe clinical disease than older people (high confidence). For example, in recent CO-CIN data[11] hospital case fatality rates were 0.2% or below for all 5-year age bands reported between 15-29 years, and 0.5% or below for all under 44 years (male or female). In this dataset, around 30% of SARS-CoV-2 positive cases admitted to hospital were under 60, with around 6% under 30 (Figure 8).



[11] https://isaric4c.net/reports/ accessed 10th Feb 2021

Figure 8 Age, sex and status at 28 days for hospital in-patients with proven SARS-CoV-2 infection from Co-CIN

However, as noted in previous advice[12], some HE students are older (DfE estimate 70% of HE students are aged 18-24 years; 11% are aged 25-29, and 19% are aged 30 and over) or may have underlying conditions that make them vulnerable to COVID-19.

1.4 Student behaviour

Student intention to engage with university testing programmes appear high. A December ONS survey exploring student intentions and views on COVID-19 testing found that 2/3 of students downloaded the NHS COVID-19 or Protect Scotland apps; between 85-89% said that they would request a test if they had COVID-19 symptoms; 82-86% said that they would stay at home; and 85% reported that they were likely or extremely likely to share contact details with NHS test and trace[13].

This adds additional evidence to the previous SPI-B work on HE return to campus for Spring term. As such, maximising uptake of testing and protective health behaviours must be underpinned by greater understanding of the costs, feasibility and acceptability of approaches to testing. Communication and tailored support packages are needed to enable self-isolation[14,15].

Impacts of COVID-19 restrictions on HE student populations

Summary
Survey evidence indicates disruption to research and learning, lower wellbeing and increased mental distress in HE students; however, these findings are heavily caveated due to low response rates and potential for bias (low confidence). Recent data from the ONS Student COVID Insights Survey (8 January-18 January 2021) (Annex 1), with responses from 2,698 students, found that:

- Of those students who travelled to stay with family or friends over the winter break, 40% have since returned and 60% have not yet returned to their term-time address.
- Of those students who provided complete travel information, 33% travelled to stay with family or friends over the winter break and 37% stayed in their accommodation; the remaining 30% were already living at their usual non-term address or family home, or in 'other' accommodation.
- The majority of students (over 94%) reported performing the following most or all of the time: reducing the number of people they meet, trying to keep a 2-metre distance from people outside their household, and washing hands thoroughly and regularly. This was a similar proportion to the general population.
- Almost two-thirds (63%) of students indicated that their well-being and mental health had worsened since the start of the autumn 2020 term.
- A statistically significantly higher number (63%) of students reported a worsening in their well-being and mental health, compared with 57% reporting the same in the previous student survey (20 to 25 November 2020).

[12] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/914978/S0728_Principles_for_Managing_SARS-CoV-2_Transmission_Associated_with_Higher_Education_.pdf
[13] ONS, "Coronavirus and the impact on students in higher education in England: September to December 2020," 2020
[14] J. R. P. Philip T Gressman, "Simulating COVID-19 in a university environment," *Math BioSci,* vol. 328, 2020.
[15] T. Berger-Gillam, J. Cole, K. Gharbi and ". al", "Norwich COVID-19 testing initiative pilot: evaluating the feasibility of asymptomatic testing on a university campus," *Journal of Public Health,* no. https://doi.org/10.1093/pubmed/fdaa194, 2020.

- Average life satisfaction scores of students decreased by 9% from 5.3 to 4.8 out of 10, between 20 to 25 November 2020 and 8 to 18 January 2021.
- A greater proportion of students reported being dissatisfied or very dissatisfied with their academic experience since the start of the autumn term (37%), compared with 29% reporting the same at the end of November 2020 (20 to 25 November 2020). The main reasons for dissatisfaction related to limited opportunities for social or recreational activity (86%), limited opportunities to meet others (84%), and limited access to sports and fitness facilities (52%).
- These findings are heavily caveated, the statistics provided are experimental, so care needs to be taken when interpreting them. This wave of the survey had a low response rate of just 2.7%, little understanding of response bias and error in the sample and reflecting the views of only a small proportion of students (not representative) (low confidence). For more detailed evidence on student behaviour, risk to students and those of their age groups, including the mental health impacts and mitigation measures, see recent SPI-B paper on return to campus for spring term[16]

[16] SPI-B: Return to campus for Spring term: risk of increased transmission from student migration (13 January 2021) [currently unpublished]

2 Evidence from case studies of outbreaks and transmission in HE settings

Summary

Multiple case studies of individual outbreaks and/or transmission in HE settings are consistent in reporting a higher number of outbreaks associated with students or HE settings in late September - October 2020. More detailed case studies involving genomic and/or antibody studies in an even smaller number of specific HE settings suggest that there may be a higher risk of transmission in residential settings. There is some evidence that face-to-face learning was taking place during Autumn term 2020, and limited evidence from 10 universities presented by ONS suggests minimal cases of transmission were attributed to face-to-face learning environments. However, further research is required to assess the contribution of various HE settings to transmission risk. It is unclear how generalisable the results from these studies are to different HE settings or the wider population. Evidence for the risk related to halls of residence vs. other residential settings is more mixed (low-medium confidence). Links between university students and the wider community are diverse. It is important to gain a better understanding of these links and interactions as, 'reduction of infectious disease transmission in this demographic will reduce overall community transmission, lower demands on health services and reduce risk of harm to clinically vulnerable individuals while allowing vital education activity to continue'[17].

2.1 Office for National Statistics (ONS) data

- The ONS article "How has coronavirus (COVID-19) spread among students in England?" examined trends in transmission using research and volunteered information from 10 higher education institutions in total, including case studies from Exeter and Loughborough universities.
- This analysis showed that COVID-19 cases in the student population rose steeply during the start of term in September and October 2020 but fell during November.
- Outbreak investigation data from Loughborough and Exeter Universities, analysed by ONS, showed cases were rising steeply in September and October 2020 but falling during November. Data from these two universities showed that **transmission spikes were greater in halls of residence compared to private accommodation**. The peak in cases among students was not seen in the wider population of Exeter, although their cases also increased later in 2020. There is not sufficient evidence in the data to be certain whether infections spread from the wider population into the student population, or whether the arrival of students in Exeter had an impact on the rising levels in the wider community. These data include students who tested through HE PCR testing and through NHS Test and Trace. Bringing together this with information from a number of other English universities, **ONS found a higher risk of transmission in residential settings (halls and student houses)** and limited evidence in face-to-face teaching settings[18].
- Qualitative and quantitative evidence from 10 universities were analysed by ONS, with minimal evidence of transmission in face-to-face learning environments, such as lecture theatres. Instances where transmission did occur were associated with guidance not being followed, for example, the removal of a face mask, rather than systemic failures. N.B. all data above reflect transmission in late 2020 and therefore do not reflect transmission of the new variant of concern (B.1.1.7).

[17] SPI-B: Return to campus for Spring term: risk of increased transmission from student migration (13 January 2021) [currently unpublished]

[18] https://www.ons.gov.uk/peoplepopulationandcommunity/educationandchildcare/articles/howhascoronaviruscovid19spreadamongstudentsinengland/2020-12-21

2.2 PHE national routine surveillance of COVID-19 outbreaks in educational settings

- PHE publish weekly national surveillance data of COVID-19 outbreaks in educational settings[19]. Data from these reports for the period 31 August 2020 to 31 January 2021 show that from early September (week 36, 2020) to late January (week 4, 2021) there have been 202 outbreaks linked to colleges or universities reported to PHE (Figure 9)

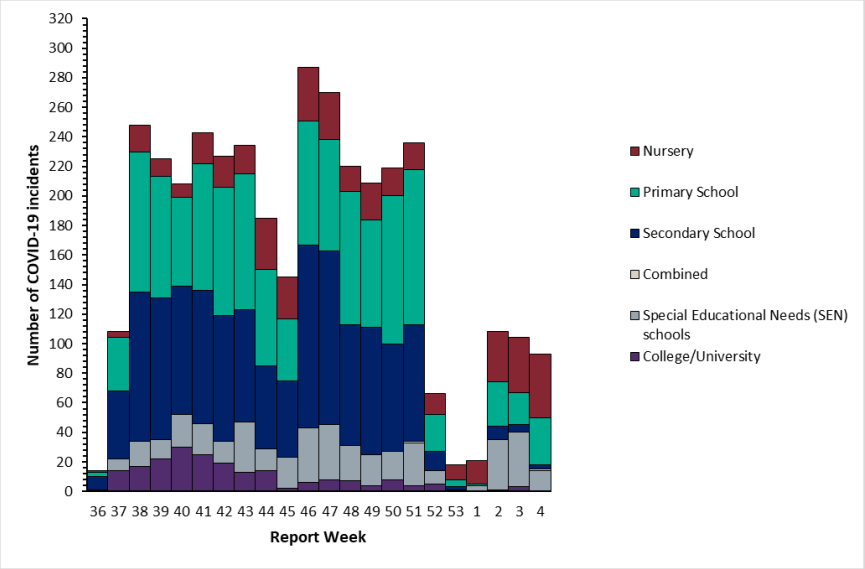


Figure 9 PHE outbreak surveillance data showing the number of confirmed COVID-19 clusters or outbreaks by type of educational setting per EPI Week, 2020/21 academic year, starting from week 36 (31/08/2020 – 06/09/2020) to week 4 2021 (25/01/2021 to 31/01/2021)

- Additionally, PHE surveillance data on outbreaks in educational settings show that during the period 31/08/20 to 31/01/2021 there have been 131 outbreaks in halls of residence, with a peak in late September to early October (week 40, 2020) (Figure 10)

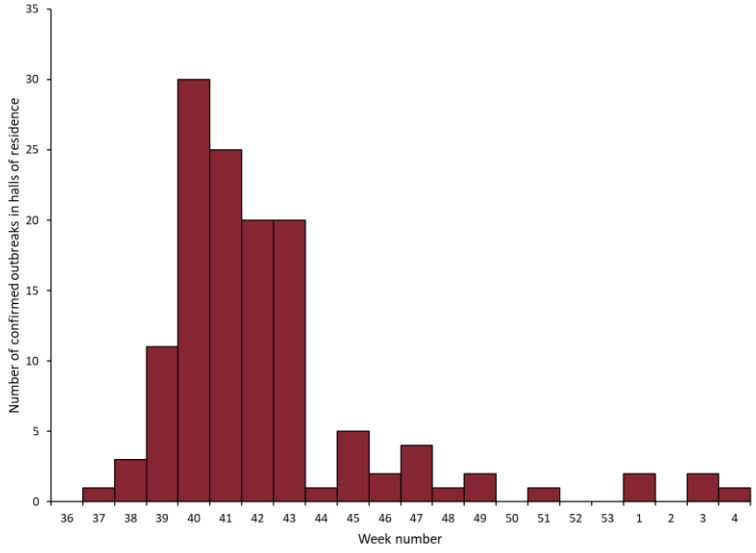


Figure 10 PHE Surveillance data showing the number of confirmed COVID-19 clusters or outbreaks in Halls of Residence per EPI Week, 2020/21 academic year, starting from week 36 (31/08/2020 – 06/09/2020) to week 4 (25/01/2021 to 31/01/2021), HPZone

[19] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/958478/Weekly_COVID-19_and_Influenza_Surveillance_Graphs_W5.pdf

PHE Cross-Sectional Study Examining the Seroprevalence of SARS-CoV-2 Antibodies in University Students in England, December 2020 (UNICOVID)

- A cross-sectional serosurvey was conducted by PHE between 02 to 11 December 2020 of students aged ≤ 25 years across 5 universities in England - Reading university, Newcastle University, Leeds Beckett University, Oxford Brookes University and the University of Manchester.
- Seroprevalence of SARS-CoV-2 in university students (n=2,905) was estimated at 17.8% (95%CI, 16.5-19.3), ranging from 7.6%-29.7% across the 5 participating universities.
- Seropositivity was associated with younger students likely to represent first year undergraduates (OR 4.1, 95% CI 2.7 to 6.4; aOR 3.2, 95% CI 2.0 to 4.9), those living in halls of residence (OR 2.9, 95% CI 2.4 to 3.5; aOR 2.1, 95% CI 1.7-2.7) and those who shared a kitchen with a greater number of students (shared with 4-7 individuals OR 1.92, 95%CI 1.53 to 2.42; shared with 8 or more individuals OR 2.99, 95% CI 2.09 to 4.27). Seropositivity was estimated at 49% for students who lived in halls of residence with high reported case rates (>8%) during the autumn term.
- Overall, less than one in five university students have antibodies to SARS-CoV-2 suggesting that despite large outbreaks during September – November 2020, a substantial proportion remain susceptible to infection. However, in some halls with reported outbreaks there was evidence of extensive transmission with seropositivity approaching 50%.

2.3 COVID-19 Genomics UK (COG UK) consortium preliminary analysis of data from Universities of Cambridge (UoC), Portsmouth (UoP) and Glasgow (UoG) (Annex 2).

- At UoC and UoP, a similar pattern of positive cases among students could be discerned in the testing data, with prevalence increasing in the early weeks of term during October, followed by a decline towards the end of November. Occasional spikes in cases can be observed.
- Based on testing data from UoP and the surrounding area, there was an initial surge of cases among younger people in early October, and subsequent control of cases amongst students. Overall, infection rates among students were lower than among young people in the surrounding community (Figure 11). Similarly, cases associated with UoG initially rose in late September, involving off-campus student residential halls, in the week immediately following Freshers' week but the outbreak was rapidly curtailed following intervention measures.
- Overall, the pattern suggests that infection control measures, increased testing, use of remote learning, and self-isolation by students were successful in reducing prevalence in student communities.

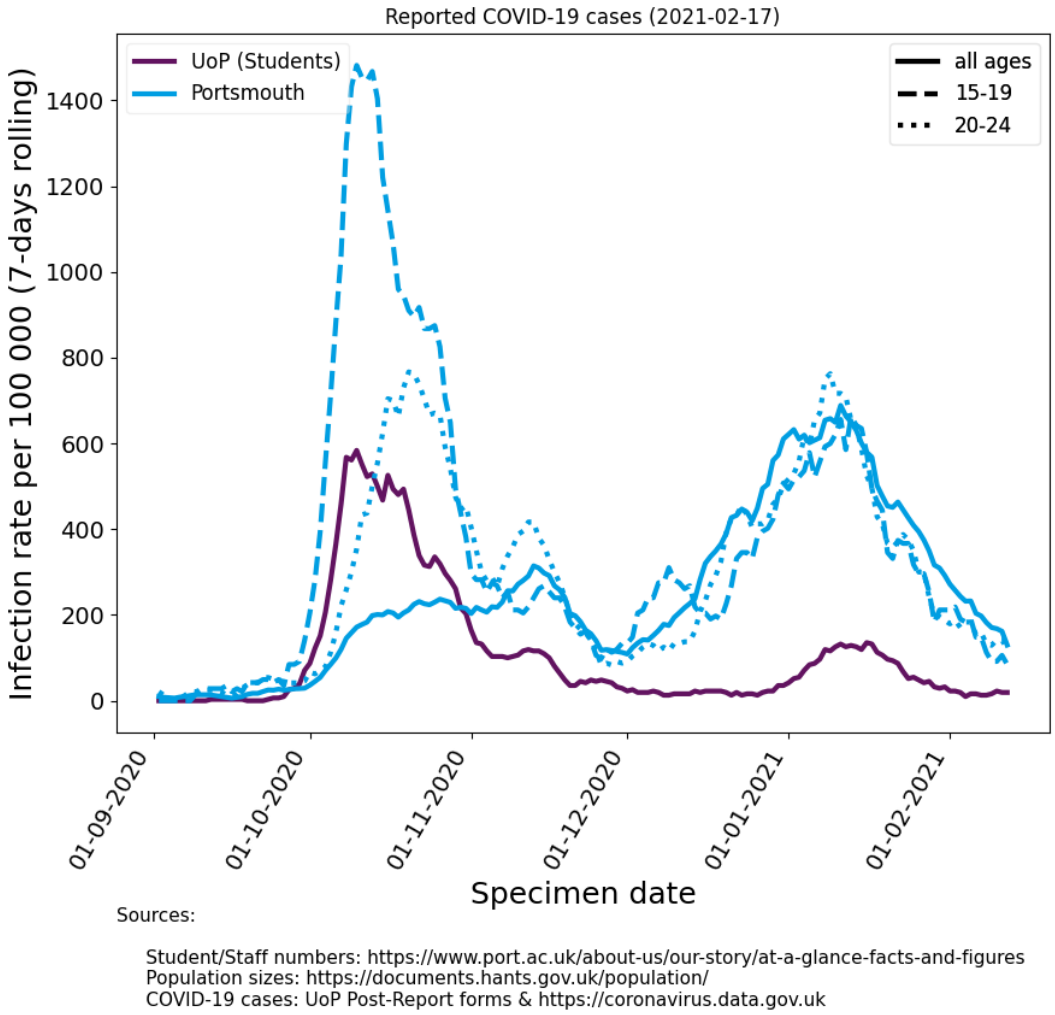


Figure 11 COG-UK analysis of cases with COVID-19 from the University of Portsmouth compared to community cases in Portsmouth

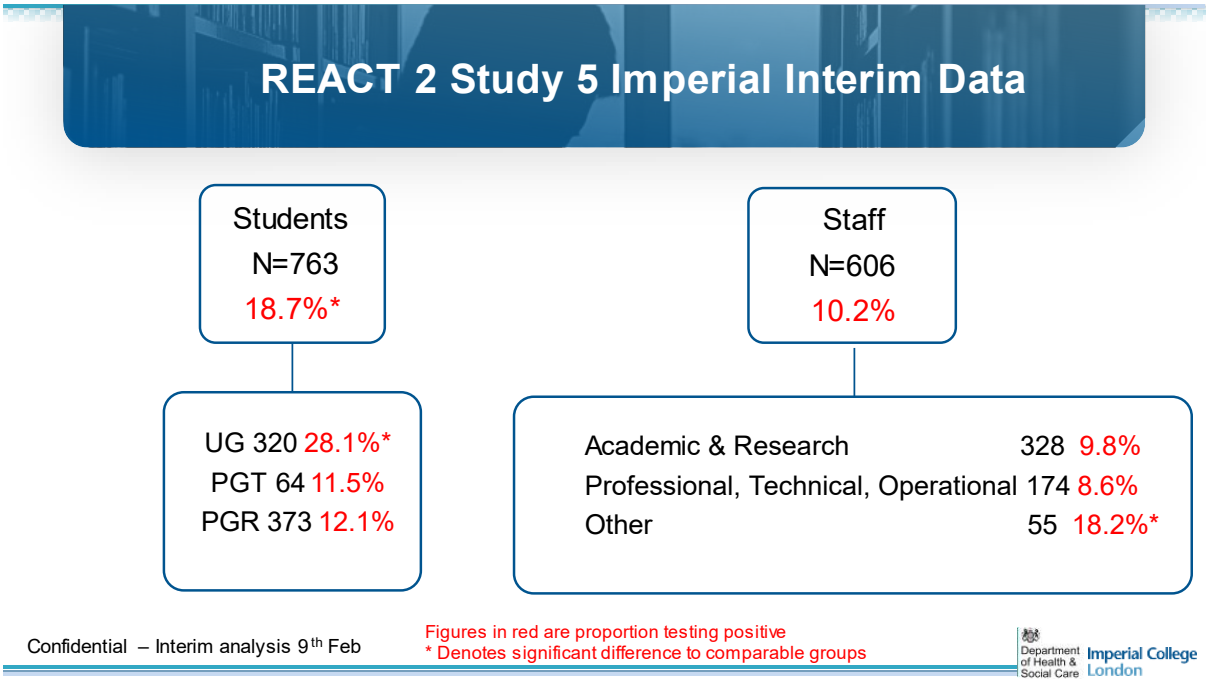
- Genome sequence data indicates that there were multiple SARS-CoV-2 variants introduced in mid-late September into UoG, and early October into UoC and UoP. While some formed clusters with a limited number of cases (which generally were not detected again after early weeks of the term), others seeded larger clusters consisting of cases from multiple halls of residence/colleges. The association of multiple distinct virus variants with one outbreak suggests multiple introductions into the residential halls, likely through shared common source(s) linked to social activity, and/or sporadic introductions with origins from the local community and/or non-term-time domicile locations.
- However, the relatively low number of distinct viruses, compared to overall sequenced case numbers, suggests significant subsequent student-student transmission occurred. Residential halls and colleges present similar scenarios for shared households and facilities that may enable transmission of SARS-CoV-2. Potential asymptomatic transmission among students within halls of residence was observed. However, the likelihood of transmission events to and/or from the local community is likely to differ depending on the accommodation and social context of the student

population and incidence in the local community. There was some evidence of potential acquisition of infection from, and onward transmission to, the local community in the case of off-campus residential halls, although further epidemiological and phylogenetic study is needed to understand these putative links.

- There was no clear evidence for a difference in transmission among students living in halls of residence versus private accommodation, although the outbreak at UoG was centred around off-campus university residential halls. For full limitations and caveats relating to these data see Annex 2.

2.5 REACT-2 Antibody prevalence Data

- An interim analysis of REACT-2 antibody prevalence data in Imperial College London between 15-30 Jan 2021 using lateral flow immune-assay self-tests, suggests higher prevalence of past infection in students (18.7% [95% CI 15.9, 21.7], 136 of 763) than staff (10.2% [7.9, 13.0], 59 of 577). Prevalence was **particularly high among those living in University halls of residence**, where 61 of 198 (30.8% [95% CI 24.5, 37.7]) tested positive for antibodies compared to 75 of 530 (14.2% [11.3, 17.4]) students living elsewhere. Recruitment was opportunistic or linked to booking PCR tests as part of asymptomatic testing on campus, so the sample (1,369 returned questionnaires) may not be representative or generalisable to other scenarios



*UG = Undergraduate; PGT = Postgraduate teaching; PGR = Postgraduate research

2.6 Investigation of cumulative confirmed cases and seroprevalence in students at a single university (Annex 4)

In the period September 2020 to 31 January there were 2,700 reports of positive test results among students from a Research-Intensive Provincial University, the majority of which were from students reporting testing due to having symptoms of COVID-19 (n=2,193). Some students reported testing

due to other reasons, including due to receiving a positive asymptomatic test result n=167. The estimated proportion of students reporting symptomatic PCR-confirmed infection since the beginning of term in university halls and outside of university halls (Figure 12) shows that a higher proportion of students in university halls reported confirmed symptomatic infection. The denominators for these proportions were based on estimates of current academic year enrolments and known university hall capacity. These are caveated, as there is uncertainty linked to student self-report of accommodation type when reporting test results, and some halls may be considered privately run which could lead to discrepancies in how accommodation is reported. Additionally, positive test results are self-reported by students through a web form, and are not verified e.g. through test and trace, which may introduce bias.

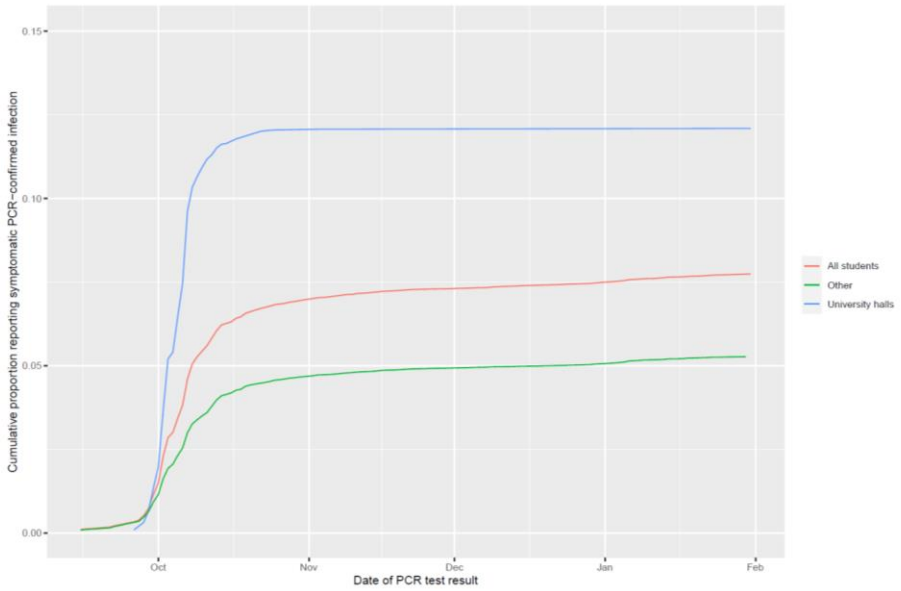


Figure 12: Proportion of students at a single university reporting symptomatic infection by accommodation type.

Antibody tests have been conducted among students and staff since October 2020 using an in-house assay validated against PHE standards[20]. Of 3,521 tests taken to 14 December 2020, seroprevalence within halls of residence was 36.6% (95% CI: 32.4-41.2%), and outside of residential halls (including some staff data) was 15% (95% CI: 13.5-16.6%). This confirms **enhanced risk amongst students living in residential halls compared to the wider university**, with the caveat that sampling has not been designed to be representative of the student population (Annex 4)

[20] Potent anti-SARS-CoV-2 Antibody Responses are Associated with Better Prognosis in Hospital Inpatient COVID-19 Disease. Patrick J. Tighe, Richard A. Urbanowicz, C. Lucy Fairclough, C. Patrick McClure, Brian J. Thomson, Nancy Gomez, Joseph G. Chappell, Theocharis Tsoleridis, Matthew Loose, Matthew Carlile, Christopher Moore, Nadine Holmes, Fei Sang, Divyateja Hrushikesh, Gemma Clark, Nigel Temperton, Tim Brooks, Jonathan K. Ball, William L. Irving, Alexander W. Tarr: https://doi.org/10.1101/2020.08.22.20176834

Annex 1: ONS data

COVID-19 Infection Survey

Context

In the last 14 days the **Coronavirus (COVID-19) Infection Survey (CIS)** had 168,900 individuals from 85,778 households in a long-term surveillance study involving repeat swab sampling, blood sampling and survey data collection, including details of vaccination status. CIS operations and analysis are delivered by ONS in collaboration with partners at the University of Oxford, the University of Manchester, Public Health England (PHE), Wellcome Trust and IQVIA. CIS aims to estimate the number of current positive cases in the community, including cases where people do not report having any symptoms, and estimates the number of new cases and change over time in positive cases. The data collected can also be used to identify the differences in numbers of positive cases between different regions. The CIS is a household survey and does not cover halls of residence.

Student COVID Insights Survey

Context

The Student COVID-19 Insights Survey (SCIS) aims to understand the behaviours of the student population, how and when they will travel between home and university, and to understand the impact on students' mental health and wellbeing. The SCIS presents experimental statistics and has been designed to produce estimates quickly, providing timely information for policy makers. As with all survey data based on a sample, there is an element of uncertainty as they are susceptible to respondent error and bias.

Method

Four waves of the SCIS have taken place between October 2020 and January 2021. The first two waves surveyed a small number of universities directly, whereas the most recent two have used email addresses held by the National Union of Students (NUS), which provides greater coverage of the student population in England. The survey was conducted using an online survey tool and all answers were self-reported. In the latest wave, conducted between 8 January and 18 January 2021, a total of 100,000 students were invited to take part via their email address held by National Union of Students (NUS). The response rate was 2.7% (2,698 students).

Key findings (Wave 4 - 8 January and 18 January 2021):

Student migration

- Of those students who travelled to stay with family or friends over the winter break, 40% have since returned and 60% have not yet returned to their term-time address.
- Of those students who provided complete travel information, 33% travelled to stay with family or friends over the winter break and 37% stayed in their accommodation; the remaining 30% were already living at their usual non-term address or family home, or in 'other' accommodation.
- Of those who travelled to stay with family or friends and haven't returned to their term time accommodation, almost a third (32%) didn't know when they would return and 14% were not planning on returning this term.

Mitigations to avoid infection

- The majority of students (over 94%) reported performing the following most or all of the time; reducing the number of people they meet, trying to keep a 2-metre distance from people outside their household, and washing hands thoroughly and regularly. This was a similar proportion to the general population.
- A significantly lower proportion of those living in university halls of residence or privately managed student accommodation reported 'reducing the number of people they meet' always or most of the time (89%), compared to students in all other living arrangements (96%).
- Of all students, 10% said that they were aware of a large social gathering (more than 10 people) happening in the last 7 days.

Self-reported infection

- 8% of students said they had already had coronavirus (COVID-19), which had been confirmed by a test. A further 17% thought they had already had coronavirus (COVID-19), although this hadn't been confirmed.
- Two thirds (66%) of students have downloaded the NHS COVID-19 app. 89% of students said that they were likely or extremely likely to share the details of those they have been in contact with if asked by their country's contact tracing service.

Testing

- 9 out of 10 (91%) students said that they would request a test if they developed symptoms of COVID-19.
- The reasons for not requesting a test included "I wouldn't want to use a test that could go to someone else who needs it more" (28%), "I only need to self-isolate" (28%) and "If my symptoms were only mild or have improved" (25%) among others.
- 74% of students who have not yet returned to university after the winter break are either likely or extremely likely to take a COVID-19 test when returning to their studies, even if they do not have symptoms.

Interactions with general public

- Two thirds (66%) of all students reported leaving home for any reason in the past 7 days. This is lower than the general population, which appears to be 90% according to OPN data. Students most commonly left home to go to the shops for groceries or to the pharmacy (90%), or to spend time outdoors for recreational purposes or exercise (69%).
- Of those students who left home in the last 7 days, 35% did so to go to work and 14% had used public transport

<u>Caveats:</u>

- As with all survey data based on a sample, there is an element of uncertainty as they are susceptible to respondent error and bias.
- These are experimental statistics, so care needs to be taken when interpreting them. While this has been weighted and is comparable with previous findings, this has an impact on the level of certainty of this research.
- It is worth noting this survey has a relatively small sample size of 2,698 respondents, which represents a 2.7% response rate. We have little understanding of response bias and error given the low response rate. Further validation across surveys is required to improve the confidence in the estimates.

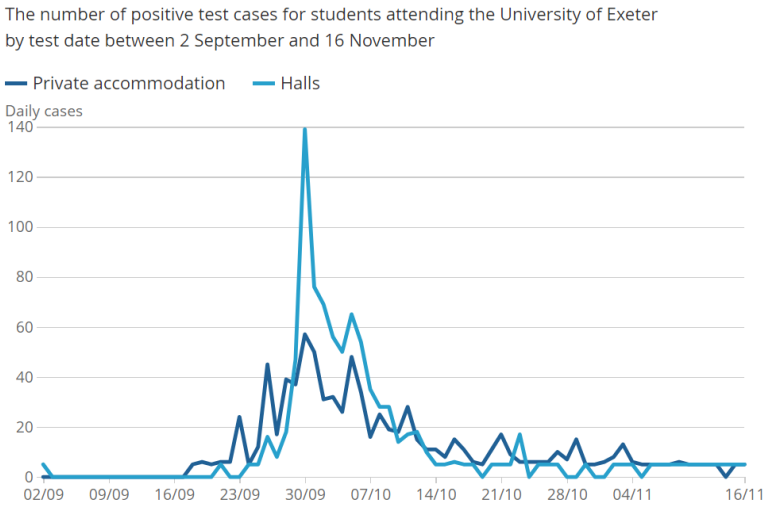
- The NUS sample frame covers around 500,000 students in English universities. While this provides the better coverage than other sample frames available it still only represents around 20% of higher education students in the UK.

Outbreak investigations – deep dive

The article "How has coronavirus (COVID-19) spread among students in England?" examined trends in transmission using research from six higher education institutions, including case studies from Exeter and Loughborough universities.

The data from Exeter and Loughborough University showed that COVID-19 cases in the student population rose following the start of the autumn term. Cases were rising steeply in September and October 2020 but falling during November. Data from these two universities showed that transmission was greater in halls of residences compared to private accommodation. The peak in cases among students was not seen in the wider population of Exeter, although their cases also increased later in 2020. There is not sufficient evidence in the data to be certain whether infections spread from the wider population into the student population, or whether the arrival of students in Exeter had an impact on the rising levels in the wider community.

Figure: Cases of COVID-19 among Exeter students rose fastest the week following the start of term, particularly in halls of residence.



Source: Office for National Statistics – Research into how the Coronavirus pandemic is affecting students in Higher Education

Notes

1. This includes data from students tested via the University's commercially provided PCR testing and from students tested via NHS Test and Trace.
2. Students attending the University of Exeter had wider access to COVID-19 tests than at universities without access to their own testing. This could affect the volume of cases seen on campus.
3. A smaller number of students are typically housed in university halls, meaning the numbers of cases in this accommodation type likely represent a larger proportion of the residents.

Face-to-Face Teaching

Bringing together qualitative and quantitative information gathered from 10 universities, we found minimal evidence of transmission happening in face-to-face learning environments, such as lecture theatres. All of these universities reported face-to-face learning taking place during the autumn term. In instances when transmission was traced back to a face-to-face learning environment, further investigation showed specific reasons for it happening, usually through appropriate guidance not being followed, such as the removal of a face mask. One university described the results of their investigations of non-domestic transmission as "human compliance failures rather than systemic failures".

Assessments into transmission of positive COVID-19 cases at the University of Reading and York St John University concluded that the majority of transmission was through domestic or social interactions (82% and 76% respectively). Neither university had evidence of direct transmission through a face-to-face learning environment. A high proportion of transmission sources were 'undetermined', suggesting that for many cases, the source of infection was unknown (21%). These universities conducted internal contact tracing investigations, prompted by self-report data.

Caveats:

- The data reflects transmission in late 2020 and therefore does not reflect transmission of the new variant.
- The evidence presented here does not yet provide a comprehensive national picture about the nature and level of transmission among HE students but provides some insights into where and how COVID-19 transmission happens for ongoing research.

Annex 2: COG-UK data

COG-UK summary for SAGE report to DfE on SARS-CoV-2 in educational settings

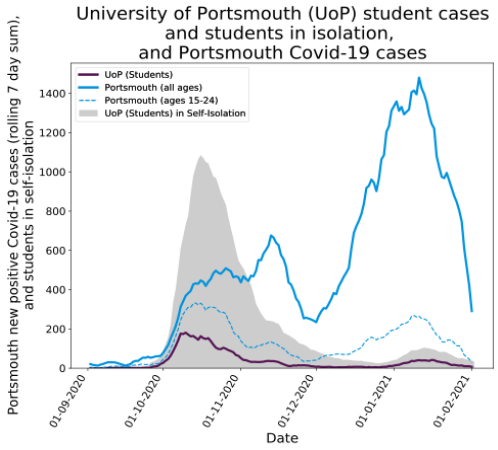
8th January 2020

Multiple academic and public health partners within the COVID-19 Genomics UK (COG-UK) consortium are sequencing SARS-CoV-2 positive samples from university testing programmes (asymptomatic and symptomatic), and as part of the public health outbreak response, to generate genomic insights into transmission among students and staff at their institution. As part of this effort, an interim report on the genomic epidemiology of SARS-CoV-2 at the University of Cambridge was submitted to SAGE on the 10th of December.

This summary briefly describes some of the broad level insights that can be taken from studies undertaken by COG-UK members at the University of Cambridge (UoC), the University of Portsmouth (UoP), and Public Health Scotland in collaboration with MRC-University of Glasgow (UoG) Centre for Virus Research who provided the sequencing. These broad level insights should be viewed as preliminary; detailed reports will be prepared in due course.

- *Rates of infection among student populations, how these have changed over time and what may have influenced changes (including closures and restrictions).*

At UoC and UoP, a similar pattern of positive cases among students could be discerned in the testing data, with prevalence increasing in the early weeks of term during October, followed by a decline towards the end of November. Occasional spikes in cases can be observed, which may be associated with gatherings of students. Based on testing data from UoP and the surrounding area, infection rates among students were lower than in the surrounding community (See figure). Similarly, cases associated with UoG initially rose in late September, involving off-campus student residential halls, in the week immediately following Freshers' week but the outbreak was rapidly curtailed following intervention measures. Overall, the pattern suggests that infection control measures, increased testing, use of remote learning, and self-isolation by students were successful in reducing prevalence in student communities.



*includes both symptomatic and asymptomatic cases.

- *Evidence of transmission between communities and students, students and staff and among students.*

Genome sequence data indicates that there were multiple SARS-CoV-2 variants introduced in mid-late September into UoG, and early October into UoC and UoP. While some formed clusters with a limited number of cases (which generally were not detected again after early weeks of the term),

others seeded larger clusters consisting of cases from multiple halls of residence/colleges. The association of multiple distinct virus variants with one outbreak suggests multiple introductions into the residential halls, likely through shared common source(s) linked to social activity, and/or sporadic introductions with origins from the local community and/or non-term-time domicile locations. However, the relatively low number of distinct viruses, compared to overall sequenced case numbers, suggests significant subsequent student-student transmission occurred. Residential halls and colleges present similar scenarios for shared households and facilities that may enable transmission of SARS-CoV-2. Potential asymptomatic transmission among students within halls of residence was observed. However, the likelihood of transmission events to and/or from the local community is likely to differ depending on the accommodation and social context of the student population and incidence in the local community. There was some evidence of potential acquisition of infection from, and onward transmission to, the local community in the case of off-campus residential halls, although further epidemiological and phylogenetic study is needed to understand these putative links.

- *Settings and factors associated with risk of transmission e.g., halls of residence compared to private accommodation, student migration and how this influences transmission/risk.*

There was no clear evidence for a difference in transmission among students living in halls of residence versus private accommodation, although the outbreak at UoG was centred around off-campus university residential halls.

Several important limitations should be considered when interpreting these findings:

- Infection risks associated with student social activities, or involving residential halls, cannot be directly quantified as the total numbers of infected and uninfected students were not known and some cases were probably asymptomatic and not tested.
- Interpretation of direct student-to-student transmission events is limited by lack of information on how cases are linked to individual households/flats within residential halls, lack of additional contact tracing information to further define contacts, chains of transmission and links to social events, and the low levels of variation in SARS-CoV-2 genomes making it difficult to conclusively define direct transmission events.
- The interpretation of the relative frequency and importance of separate introductions into halls, versus subsequent student-student transmission, is limited by the partial coverage of cases for sequencing and assumes that the sequenced cases represent a random selection of the overall cases.
- Interpretation of transmission events between students and the local community is limited by lack of knowledge of the non-term-time locations of students, their recent travel histories, and the likelihood that genomic surveillance will miss variants circulating in the community at a low level. The background context of circulating viruses is also complicated by the presence and numbers of SARS-CoV-2 lineage detections over time and across locations being biased by the targeted sampling of outbreaks and varying surveillance coverage.
- Further epidemiological and phylogenetic work is needed to further investigate the likely source of introductions from across the UK and abroad.

Annex 3: NHS Test &Trace Data

Limitations:

Ascertainment of cases and contacts by the National Test and Trace system may not provide a representative population of Covid prevalence in the UK. Common reasons for this may include:

- Variation in testing procedures for different segments of the population, for instance students, health workers and asymptomatic cases, or by region.
- Not all contacts can be captured by contact tracing, for instance the case may not name some due to recall bias or stigma, and interpretations/definitions of contacts can vary by educational setting. NHS Test and Trace may not capture all education based contacts that were potentially exposed.
- Data on risks in specific exposure settings can only be captured when those activities occur, and so is limited by regional restrictions and lockdowns. Such restrictions can also mean that activity events expose one to different risks in different regions, depending on activities permitted at any given time.
- A setting reported by a case does not mean that transmission occurred there.

Case-control study data and analysis

- The data for the cases was collected through NHS T&T, where cases provided the information either through a digital route (self-completed) or through being interviewed over the phone. Information was collected on workplace, education and leisure activities in the 7-2 day period before symptom onset (or date of test if onset date was not provided). Each activity is categorised in three different categories, each category providing further details on the setting where the activity took place. Controls completed an online survey with same activity questions. However, they were not asked to provide details about their contacts for each activity. Crude odds ratios (cORs) were obtained for each main exposure. Adjusted odds ratios (aORs) were obtained through multivariable analyses using penalised regression methods (see Firth, 1993). All multivariable analyses were adjusted for age, sex, ethnicity, socioeconomic deprivation (using index for multiple deprivation (IMD)), geographical region, and non-work community and leisure activities. Finally, a random-effects meta-analysis was conducted across the three studies to investigate how the association between exposure settings and the odds of infection differed in the three studies and to obtain pooled odds ratios (pORs).

Caveats

- It is not possible to determine how much of the transmission of SARS-CoV-2 took place within the education setting, and how much was associated with social, household or transport exposures. Furthermore, selection bias is affecting both cases and controls. Asymptomatic cases will not be likely to seek a test, and will be missed by NHS T&T. The controls are recruited from Market Research Panels and therefore unlikely to fully representative sample of the general population of England. There is also differential misclassification of exposure. It is for example plausible that cases are under-reporting their activities potentially due to issues with questionnaire fatigue or being more likely to adhere to socially desirable reporting. Controls are less likely to be affected by questionnaire fatigue, and also are paid to complete the survey. However, it is difficult to determine whether the biases causing the misclassification led to under- or overestimation of the effect measures. While multivariable models were adjusted for confounding of all the available demographic variables, some residual confounding is likely to persist.

NHS Test & Trace common exposure data

- The data for the cases was collected through NHS T&T, where cases provided the information either through a digital route (self-completed) or through being interviewed over the phone. Information was collected on workplace, education and leisure activities in the 7-2 day period before

- The common exposures report uses enhanced contact tracing data from the period 2 to 7 days prior to onset of symptoms. If 2 or more cases report the same event postcode and category within a 7-day rolling period this is classed as a common exposure. As above, a common exposure may not reflect a true epidemiological linkage and does not infer transmission occurred. Further local investigation is required to determine this. Settings with more visitors/attendees will be more likely to be included.

References:

1. NHS Test and Trace Education Report (03/02/2021): unpublished
2. (Preprint article) Hiironen et al. (2020) Occupational exposures associated with being a COVID-19 case; evidence from three case-control studies. doi: https://doi.org/10.1101/2020.12.21.20248161
3. Weekly Influenza and COVID-19 Surveillance graphs (https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/958478/Weekly_COVID-19_and_Influenza_Surveillance_Graphs_W5.pdf)

Number of cases that reported attending an education setting, by week, October 23 - 03 February, from Table 7 of NHS Test and Trace Education Report (1)

Week number:	43	44	45	46	47	48	49	50	51	52	53	1	2	3	4	5
Childminder	39	58	60	106	66	84	77	86	134	138	92	114	178	155	115	24
College	864	1487	1732	2278	1783	1400	1226	1593	2121	2238	2699	3789	2063	1377	929	142
Nursery/Preschool	263	484	449	775	625	565	627	815	1162	1396	1119	1476	2117	2307	1812	314
Other educational setting not listed	117	174	171	208	209	141	154	244	290	291	248	294	226	171	119	22
Other Higher Education	139	193	191	192	139	106	94	116	184	205	226	289	134	98	81	7
Primary School	1552	2709	2895	4425	4356	3882	4259	5537	7119	7458	6222	7097	5112	4611	3358	519
Secondary School	2774	4556	4824	7364	7831	6771	7192	9590	12290	10012	8077	8429	4885	3614	2494	410
Special needs educational setting	84	156	126	217	215	159	170	220	269	221	190	247	258	240	146	30
University	3800	4940	4303	4844	2185	1342	1122	1629	2386	3571	4560	6443	3761	2594	1756	238
Total	9632	14757	14751	20409	17409	14450	14921	19830	25955	25530	23433	28178	18734	15167	10810	1706

Number of contacts who were exposed in an education setting by week, October 23 - 03 February, from Table 16 of NHS Test and Trace Education Report (1)

Week number:	43	44	45	46	47	48	49	50	51	52	53	1	2	3	4	5
Childminder	18	29	28	31	19	16	17	24	37	76	98	112	72	67	48	6
Nursery/Preschool	216	451	500	614	452	358	358	481	680	1013	1133	1321	1550	1303	955	189
Other educational setting not listed	308	627	613	622	401	309	274	436	694	987	986	1158	756	539	384	68
Other Higher Education	99	188	164	215	143	112	102	110	198	245	312	353	214	165	101	23
Primary School	980	2158	1675	2386	2014	1584	1723	2385	3143	4255	3784	3422	2830	2327	1744	348
Secondary School	806	1557	1163	1601	1513	1171	1302	1767	2609	2978	2381	2080	1309	964	657	125
Sixth Form Centre	47	101	79	113	62	66	61	79	119	175	152	202	92	74	38	8
Special needs educational setting	195	361	284	389	342	257	306	387	535	594	621	612	526	450	339	74
University	436	630	567	607	318	231	229	321	500	781	931	1197	747	532	428	83
Total	3105	6102	5073	6578	5264	4104	4372	5990	8515	11104	10398	10457	8096	6421	4694	924

Annex 4: SARS-CoV-2 infection in students: confirmed symptomatic infections and seroprevalence at a single university

SARS-CoV-2 infection in students: confirmed symptomatic infections and seroprevalence at a single university

February 2021

Cumulative confirmed cases and seroprevalence in students

Since September 2020 students were encouraged to centrally report confirmed SARS-CoV-2 infection via a web form, including their accommodation type and test result date. We consider this data up to 31st January 2021. In this period there were 2700 reports of positive test results. The majority of reported test results were associated with students undertaking testing due to having symptoms of COVID-19 (2193), however a minority noted other reasons, including 167 noting they were undertaking testing due to receiving a positive result in the University Asymptomatic PCR Testing Service.

We use estimated enrolment numbers for 2020/2021, and known capacity of university halls, to estimate numbers of students living within university halls and in all other accommodation types. These baseline numbers of students implicitly assume students are present at their term-time residence. Note that students self-report accommodation type when reporting test results, and it is possible there is uncertainty over whether some halls are considered privately run. With these caveats we plot the estimated proportion of students reporting symptomatic PCR-confirmed infection since the beginning of term in all students, students in university halls, and students in other accommodation in Fig. 1.

Detection of SARS-CoV-2 antibodies in students

Large numbers of antibody tests have been taken by students, and some staff, since October 2020. Here we focus on the 3521 tests undertaken up until 14th December 2020 with temporal distribution of sample dates in Fig. 2. In this data set, seroprevalence in university halls is in the October-December data was 36.6% (95% CI: 32.4–41.2%) and outside of residential halls (including some staff data) was 15.0% (13.5–16.6%). This confirms enhanced risk amongst students living in residential halls compared to the wider university community, with the caveat that antibody sampling has not been explicitly designed to be

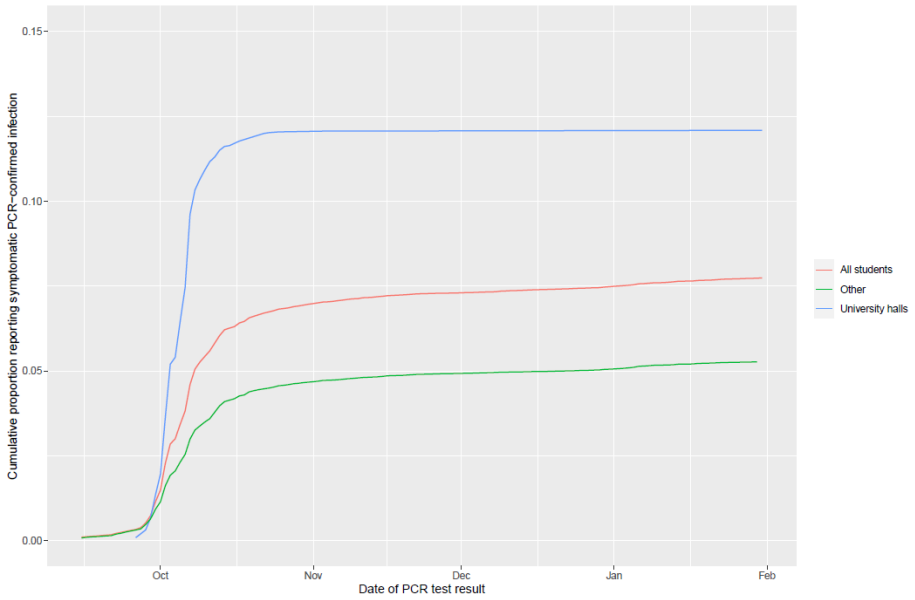


Figure 1: Cumulative proportion reporting symptomatic infection amongst all students, students in university halls, and students in other accommodation.

representative. Comparison with the proportion of students in halls or other accommodation each suggest that roughly a third cases were tested and reported in this setting, depending on assumptions about the pre-term seroprevalence and the time-scales for seroconversion and seroreversion.

While we do not have linked symptom reporting and antibody testing data for students, we can see from Fig. 1 that the majority of students in university halls reported test results in the first half of October 2020. Given the distribution of antibody sampling dates for students in halls (Fig. 2), suggesting many samples were collected late October, it is plausible that some of the antibody testing was undertaken too early to detect seroconversion [1]. Comparison with data collected in January may enable interrogation of this, although interpretation of cross-sectional serological data is complicated by uncertainty around individual antibody dynamics. More rigorous estimates of the reporting rates using this data set are ongoing.

References

[1] B. Lou, T.-D. Li, S.-F. Zheng, Y.-Y. Su, Z.-Y. Li, W. Liu, F. Yu, S.-X. Ge, Q.-D. Zou, Q. Yuan, S. Lin, C.-M. Hong, X.-Y. Yao, X.-J. Zhang, D.-H. Wu, G.-L. Zhou, W.-H. Hou, T.-T. Li, Y.-L. Zhang, S.-Y. Zhang, J. Fan, J. Zhang, N.-S. Xia, and Y. Chen. Serology characteristics of SARS-CoV-

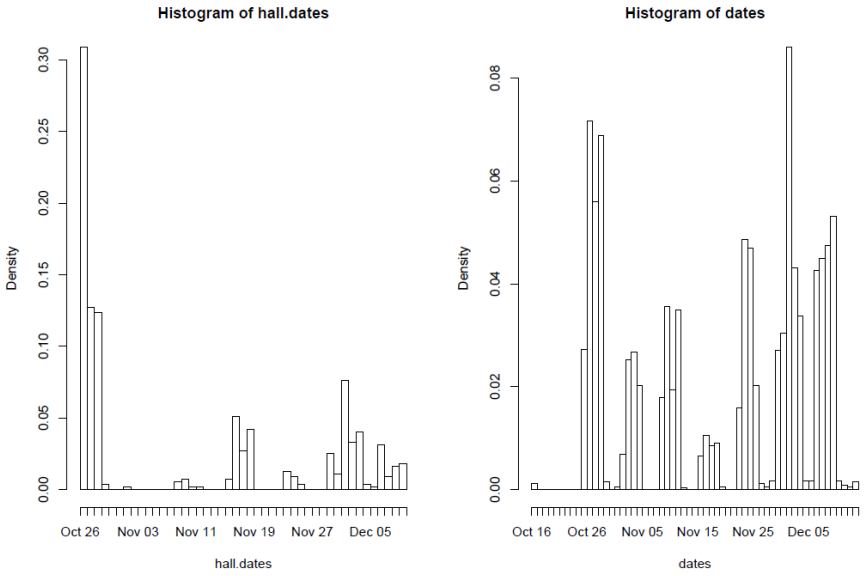


Figure 2: Histogram of antibody tests dates for students in university-run halls (left) and all other participants (right) for antibody tests collected up to 14th December 2020.

2 infection since exposure and post symptom onset. *European Respiratory Journal*, 2020.