Supplementary tables

Supplementary Table 1. Characteristics of study population.

		Eligible	Participating	Not-participating	*P* value
N		15,561	12,781	2,780	
Sex	Male	8,060 (51.8%)	6,504 (50.9%)	1,556 (56.0%)	<0.001
	Female	7,213 (46.4%)	6,125 (47.9%)	1,088 (39.1%)	
	Other/unknown	288 (1.9%)	152 (1.2%)	136 (4.9%)	
Age, years, median (IQR, range)		20.6 (19.4-22.6, 16.4-71.7)	20.5 (19.3-22.3, 16.4-58.1)	21.3 (19.8-24.3, 17.4-71.7)	<0.001
Ethnicity	White	9,453 (60.7%)	8,168 (63.9%)	1,285 (46.2%)	<0.001
	Black, Asian and minority ethnic	5,302 (34.1%)	4,097 (32.1%)	1,205 (43.3%)	
	Refused/unknown	806 (5.2%)	516 (4.0%)	290 (10.4%)	
Residency	UK	9,870 (63.4%)	8,504 (66.5%)	1,366 (49.1%)	<0.001
	International	5,496 (35.3%)	4,205 (32.9%)	1,291 (46.4%)	
	Unknown	195 (1.3%)	72 (0.6%)	123 (4.4%)	
Year of study	1st	3,788 (24.3%)	3,336 (26.1%)	452 (5.5%)	<0.001
	2nd	3,239 (20.8%)	2,673 (20.9%)	566 (20.4%)	
	3rd	2,832 (18.2%)	2,434 (19.0%)	398 (14.3%)	
	4th (or above)	997 (6.4%)	844 (6.6%)	153 (5.5%)	
	Postgraduate	4,369 (28.1%)	3,366 (26.3%)	1,003 (36.0%)	
	Missing	336 (2.2%)	126 (1.0%)	210 (7.5%)	
Stage	Undergraduate	10,857 (69.8%)	9,288 (72.7%)	1,569 (56.4%)	<0.001
	Postgraduate	4,369 (28.1%)	3,368 (26.3%)	1,001 (36.0%)	
	Missing	335 (2.2%)	125 (1.0%)	210 (7.5%)	
Course*	Undergraduate arts and humanities	5,490 (35.3%)	4,553 (35.6%)	937 (33.7%)	<0.001
	Undergraduate science and technology	5,454 (35.1%)	4,806 (37.6%)	648 (23.3%)	
	Postgraduate vocational	466 (3.0%)	343 (2.7%)	123 (4.4%)	
	Postgraduate (other)	3,815 (24.5%)	2,953 (23.1%)	862 (31.0%)	
	Unknown	336 (2.2%)	126 (1.0%)	210 (7.6%)	
Household size	1 person	472 (3.0%)	299 (2.3%)	173 (6.2%)	<0.001
	2 to 5 people	4,535 (29.1%)	3,703 (29.0%)	832 (29.9%)	
	6 to 10 people	9,228 (59.3%)	7,688 (60.2%)	1,540 (55.4%)	
	>10 people	1,326 (8.5%)	1,091 (8.5%)	235 (8.5%)	

Student characteristics associated with programme participation were assessed by comparing participating and non-participating students using unpaired 2 sample 2 tailed *t*-tests (continuous variables) or chi-square tests (categorical variables).

*Courses are grouped as: undergraduate arts and humanities (undergraduate students in the School of Arts and Humanities and the School of Humanities and Social Sciences); undergraduate science and technology (undergraduate students in the School of Biological Sciences, the School of Physical Sciences and the School of Technology); postgraduate vocational courses (students in clinical medicine, clinical veterinary medicine and postgraduate certificates in education); and other postgraduate courses (all other postgraduate students, including those in doctoral and masters programmes).

Supplementary Table 2. Tests conducted.

Week	Dates	Eligible students	Participating students	Asymptomatic screening programme								University symptomatic testing	
				Screening tests	Valid results	Scale*	Mean swab count per pool	Students screened (estimated)	Individual confirmatory tests	Valid results	Students screened per total tests	Individual tests	Valid results
1	5 Oct – 11 Oct	15,479	11,638	1,867	1,837	2 students per pool	1.87	3,435	36	34	1.81	102	96
2	12 Oct – 18 Oct	15,511	12,100	1,890	1,866	2 students per pool	1.92	3,583	56	56	1.84	221	219
3	19 Oct – 25 Oct	15,488	12,195	1,913	1,886	Half-pool	2.47	4,658	105	104	2.31	195	194
4	26 Oct – 1 Nov	15,440	12,383	1,923	1,900	Half-pool	2.92	5,548	109	109	2.73	109	109
5	2 Nov – 8 Nov	15,385	12,372	1,873	1,865	Half-pool	2.49	4,644	79	77	2.38	112	110
6	9 Nov – 15 Nov	15,323	12,350	1,864	1,851	Half-pool	2.89	5,349	228	226	2.56	265	263
7	16 Nov – 22 Nov	15,307	12,424	1,743	1,727	Half-pool	2.42	4,179	102	102	2.27	87	87
8	23 Nov – 29 Nov	15,309	12,498	1,919	1,889	Whole pool	5.02	9,483	45	44	4.83	28	28
9	30 Nov – 6 Dec	15,310	12,544	1,953	1,938	Whole pool	4.90	9,496	52	52	4.74	27	27
Weeks 1-2	5 Oct – 18 Oct			3,757	3,703	2 students per pool		7,018	92	90	1.82	323	315
Weeks 3-7	19 Oct – 22 Nov			9,316	9,229	Half-pool		24,379	623	618	2.45	768	763
Weeks 8-9	23 Nov – 6 Dec			3,872	3,827	Whole pool		18,979	97	96	4.78	55	55
All weeks	**5 Oct – 6 Dec**	**15,561**	**12,979**	**16,945**	**16,759**			**50,376**	**812**	**804**	**2.84**	**1,146**	**1,133**

*Phase 1 (weeks 1-2): two students per testing pool screened each week; phase 2 (weeks 3-7): half of each testing pool screened on alternating week; phase 3 (weeks 8-9): whole testing pool screened each week.

Supplementary Table 3. Case ascertainment.

Week	Dates	Asymptomatic screening programme							University symptomatic testing	Other*	Total positive individual tests	% ascertained through screening
		Positive pooled screening tests	Confirmed positive pools (at least one positive individual test)	Positive individual tests	Positive individual tests per positive pool (mean, range)		Positive individual tests per positive household (mean, range)		Positive tests			
1	5 Oct – 11 Oct	19	11	12	1.1	1 to 2	1.1	1 to 2	6	2	20	60.0%
2	12 Oct – 18 Oct	28	27	35	1.3	1 to 2	1.2	1 to 2	79	8	122	28.7%
3	19 Oct – 25 Oct	38	36	38	1.1	1 to 2	1.2	1 to 3	50	12	100	38.0%
4	26 Oct – 1 Nov	35	30	38	1.3	1 to 3	1.3	1 to 3	21	7	66	57.6%
5	2 Nov – 8 Nov	26	22	23	1.1	1 to 2	1.1	1 to 2	37	17	76	28.9%
6	9 Nov – 15 Nov	67	59	80	1.4	1 to 4	1.4	1 to 4	122	26	228	35.1%
7	16 Nov – 22 Nov	22	17	27	1.6	1 to 4	1.6	1 to 4	15	6	48	56.3%
8	23 Nov – 29 Nov	7	3	3	1.0	1	1.0	1	1	0	4	75.0%
9	30 Nov – 6 Dec	10	0	0	-	-	-	-	4	2	6	0.0%
Weeks 1-2	5 Oct – 18 Oct	47	38	47	1.2	1 to 2	1.2	1 to 2	85	10	142	33.1%
Weeks 3-7	19 Oct – 22 Nov	188	164	206	1.3	1 to 4	1.3	1 to 4	245	68	519	39.7%
Weeks 8-9	23 Nov – 6 Dec	17	3	3	1.0	1	1.0	1	5	2	10	30.0%
All weeks	**5 Oct – 6 Dec**	**252**	**205**	**256**	**1.3**	**1 to 4**	**1.3**	**1 to 4**	**335**	**80**	**671**	**38.2%**

*Other includes: positive results obtained through other testing pathways, such as NHS testing facilities, and reported to the university by Public Health England; and 7 asymptomatic positive cases identified through a distinct programme of screening undertaken by the university in conjunction with local public health teams during an outbreak investigation in a single accommodation block during term week 3. An additional 2 cases reported to the university by Public Health England during the study period were excluded, because their test dates could not be confirmed.

Supplementary Table 4. Technical validation: number of replicates detected for each target concentration of SARS-CoV-2 virus.

Target concentration of SARS CoV-2 (dC/mL)	Calculated SARS Cov-2 copies per RT-PCR reaction	Number of swabs	Replicates detected	Number of swabs	Replicates detected
250,000	4,444	1	3/3	5-6	3/3
100,000	1,778	1	3/3	5-7	3/3
25,000	444	1	2/2	5-6	3/3
10,000	178	1	3/3	5-6	3/3
2,500	44	1	3/3	5-6	3/3
1,000	18	1	3/3	5-7	3/3
500	9	1	3/3	5-6	3/3
250	4	1	3/3	5-8	3/3
125	2	1	3/3	5-7	3/3

Supplementary Table 5. Distribution of CT values for individual confirmatory tests.

	CT value					
	<20	**20-25**	**25-30**	**30-35**	**≥35**	**All**
Symptomatic testing	60 (18%)	137 (41%)	83 (25%)	41 (12%)	14 (4%)	335 (100%)
Asymptomatic screening programme	23 (9%)	85 (33%)	68 (27%)	43 (17%)	37 (14%)	256 (100%)
Presymptomatic with cardinal symptoms	6 (9%)	30 (44%)	21 (31%)	7 (10%)	6 (9%)	68 (100%)
Minor symptoms	4 (9%)	14 (33%)	17 (40%)	3 (7%)	5 (12%)	43 (100%)
Asymptomatic	2 (7%)	6 (21%)	4 (14%)	7 (24%)	10 (34%)	29 (100%)

Supplementary Table 6. Single variable logistic regression analysis of student characteristics associated with a positive SARS-CoV-2 result, n=12,781.

Variable	Category	Positive	Not positive	OR	(95% CI)	*P* value
Sex	Female	325	5,800			
	Male	346	6,158	1.00	0.86-1.17	0.97
	Other/unknown	5	147	0.61	0.21-1.34	0.28
Ethnicity	White	509	7,659			
	Other	153	3,944	0.58	0.48-0.70	<0.001
	Unknown	14	502	0.42	0.23-0.69	0.002
Residency	UK	570	7,934			
	International	103	4,102	0.35	0.28-0.43	<0.001
	Unknown	3	69	0.61	0.15-1.63	0.40
Year of study	1st	367	5,195			
	2nd	166	2,999	0.78	0.65-0.95	0.01
	3rd or higher	142	3,786	0.53	0.43-0.65	<0.001
	Unknown	1	125	0.11	0.006-0.51	0.03
Course	Undergraduate arts and humanities	348	4,205			
	Undergraduate science and technology	246	4,560	0.65	0.55-0.77	<0.001
	Postgraduate vocational	22	321	0.83	0.52-1.26	0.41
	Postgraduate (other)	59	2,894	0.25	0.18-0.32	<0.001
	Unknown	1	125	0.10	0.0055-0.43	0.02
Household size	Minimum	1	1	1.08	1.05-1.11	<0.001
	25th centile	6	5			
	Median	7	7			
	75th centile	8	8			
	Maximum	20	20			

Supplementary Table 7. Multivariable logistic regression analysis of student characteristics associated with a positive SARS-CoV-2 result, n=12,781.

Variable	Category	OR	95% CI	*P* value
Sex	Female			
	Male	1.21	1.03-1.42	0.02
	Other/unknown	0.44	0.07-1.42	0.26
Ethnicity	White			
	Other	0.69	0.57-0.84	<0.001
	Unknown	0.46	0.23-0.81	0.01
Residency	UK			
	International	0.53	0.42-0.67	<0.01
	Unknown	12.4	1.63-113	0.01
Year of study	1st			
	2nd	0.63	0.52-0.76	<0.001
	3rd or higher	0.44	0.36-0.54	<0.001
	Unknown	0.04	0.002-0.24	0.004
Course	Undergraduate arts and humanities			
	Undergraduate science and technology	0.74	0.62-0.88	0.001
	Postgraduate vocational	0.73	0.45-1.11	0.16
	Postgraduate (other)	0.28	0.21-0.38	<0.001
	Unknown	NA	-	-
Household size		1.06	1.03-1.09	<0.001

Supplementary Table 8: Model settings, parameters, and assumptions.

Parameter or setting	Value or assumption	Source	Change from HE-INI model[1]
Network settings			
Number of individuals	12,781	From data: number of study participants	Yes – generic 15,000 used in preprint
Household structure	Full specification: {1: 0.151, 2:0.105, 3:0.074, 4:0.114, 5:0.115, 6:0.130, 7:0.094, 8:0.117, 9:0.036, 10:0.029, 11:0.014, 12:0.012, 13:0.003, 14:0.003, 15:0.001, 16: 0.001, 18:0.001} This notation means: Size_of_household:fraction_of_households_that_size	From data: household structure of eligible students	Yes – {10: 0.5, 5: 0.5} used in preprint, arbitrary choice
Sizes of other activity groups	Full specification: {50:0.01, 10:0.5, 5:0.49} Notation as above	By assumption: to model a majority of small groups, with a small number of larger events	Yes - {40: 0.05, 10:0.3, 5:0.5, 3: 0.15} used in preprint, arbitrary choice
Number of other activity groups	4,000	By assumption: note relationship to probability of transmission for a non-household contact below	Yes – 3,000 used in preprint, arbitrary choice
Disease progression and transmission			
Probability of transmission for a household contact per day	0.017	From data: calibrated to produce the observed within-household attack rate, accounting for symptomatic and asymptomatic infections	Yes – 0.025 used in preprint, chosen for plausibility
Ratio of probability of transmission for a non-household contact per day to probability of transmission for a household contact per day	1.0	From data: calibrated to produce a between-household attack rate roughly consistent with the observed rate to week 7 (before the UK national lockdown) Note that this parameter has a relationship to the sizes and number of other activity groups: an increase in the number of other activity groups or their sizes gives similar results to an increase in this parameter For computational reasons it is more efficient to increase this parameter than the total number of non-household contacts	Yes – 0.2 used in preprint, chosen for plausibility
Mean non-infectious latent period	2.9 days	Alene *et al.* (2021)[2]	Yes (small change) – 3 days in preprint, chosen for plausibility

Mean presymptomatic infectious period	3.6 days	From data: observed presymptomatic infectious period	Yes – 2 days in preprint, chosen for plausibility
Proportion asymptomatic	19.7%	From data: observed proportion of asymptomatic students	Yes – 50%, chosen for plausibility
Infectiousness of presymptomatics relative to symptomatics	Equal	By assumption	No change
Infectiousness of asymptomatics relative to symptomatics	18%	From data: observed ratio of secondary household attack rates for asymptomatic and symptomatic index cases	Yes – equal infectiousness used in preprint, chosen for plausibility
Mean infectious period after symptoms develop	4 days	Singanayagam, A. *et al.* (2020)[3]	Yes – 10 days used in preprint, chosen for plausibility
Total mean period of infectiousness of an asymptomatic individual	Equal to symptomatic individual (mean 7.6 days)	By assumption	No change
Testing and isolation			
Probability and speed of symptomatic tests	Symptomatic individuals immediately seek tests with no false positives or false negatives. Positive tests result in household isolation from the following day	By assumption	No change
Participation in asymptomatic screening	100%	By assumption	No change
Performance of asymptomatic tests	Asymptomatic testing is perfect with no false negatives or false positives. Positive tests result in household isolation from the following day	By assumption	No change
Isolation	Entire household isolates upon any positive test within the household	By assumption	No change
Expected isolation period	14 days	By assumption	No change
Isolation implications for contact	When a household isolates, all contacts between members of the household and non-members cease, but all contacts within the household continue as before including with the index case.	By assumption	No change
Tracing	50% probability of each non-household contact of a test-positive being contacted and isolating from the day after the positive test.	By assumption	No change

1. Enright, J. *et al.* SARS-CoV-2 infection in UK university students: Lessons from September-December 2020 and modelling insights for future student return. *INI Preprint Series* (2021). Available in preprint at: https://www.newton.ac.uk/files/preprints/ni20004.pdf.
2. Alene, M. *et al.* Serial interval and incubation period of COVID-19: a systematic review and meta-analysis. *BMC Infect Dis* **21**, 257, doi:10.1186/s12879-021-05950-x (2021).
3. Singanayagam, A. *et al.* Duration of infectiousness and correlation with RT-PCR cycle threshold values in cases of COVID-19, England, January to May 2020. *Euro Surveill* **25**, doi:10.2807/1560-7917.ES.2020.25.32.2001483 (2020).

Supplementary notes

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