The effect of social distancing on the reproduction number and number of contacts in the UK from a social contact survey
Report 8

Authors: Amy Gimma, Christopher Jarvis, Kevin Van Zandvoort, Petra Klepac, and John Edmunds on behalf of the LSHTM COVID-19 Modelling Team

Date: 25th May 2020

Results

We estimate R_0 to be 0.66 (95% CI 0.36 to 1.06) for the UK, 0.61 (95% CI 0.34 to 1.01) for England, between the 14th May and 21st May. Prior to the 11th of May we estimated R_0 to be below one in the UK (Table 1). The interquartile range remains 1 to 3 for the number of contacts per person. The mean contacts are 2.88 in England and 3.29 in the rest of the UK, this distribution is skewed and affected by outliers, which likely shifts the central estimate of R_0. There were three participants reporting greater than 100 contacts, they worked in sales and services and reported 108, 382, and 502 contacts at work. Table 2 summarises mean contacts outside of the house by age, gender, self reported health risk group, high-contact occupations, and social group.

Table 1. Numbers of participants, reported contacts and reproduction numbers. Numbers of participants in each panel, their average number of contacts reported and the estimate of the reproduction number, R_0.

Group	Week	Panel	Dates	Observations	Contacts	Mean (IQR)	HHsize	R_0 mean (95% CI)
UK	1,2	A & B	24/03 to 10/04	3,376	8,943	2.64 (1 to 3)	2.72	0.53 (0.33 to 0.75)
UK	8	B	14/05 to 21/05	1,146	3,775	3.29 (1 to 3)	2.43	0.66 (0.36 to 1.06)
UK (< 100 contacts)	8	B	14/05 to 21/05	1,143	2,771	2.42 (1 to 3)	2.42	0.49 (0.29 to 0.72)
England	8	B	14/05 to 21/05	969	2,794	2.88 (1 to 3)	2.46	0.61 (0.34 to 1.01)
England (< 100 contacts)	8	B	14/05 to 21/05	967	2,295	2.42 (1 to 3)	2.46	0.48 (0.29 to 0.71)

Table 2. Summary of contacts outside the home by participant age group, gender, self-reported health risk level, high-contact occupation, and social group. Reported for all participants and filtered for participants reporting less than 100 contacts.

Category	Values	Subset	Observations	Mean	SD	Skew	IQR	Min to Max
Age group	18-29	All	132	0.83	1.71	3	0 to 1	0 to 11
		< 100 contacts	132	0.83	1.71	3	0 to 1	0 to 11
	30-39	All	130	1.97	10.35	8.82	0 to 0.75	0 to 108
		< 100 contacts	129	1.15	4.4	7.64	0 to 0	0 to 44
	40-49	All	214	3.49	27.09	13.33	0 to 1	0 to 387
		< 100 contacts	213	1.69	6.34	6.44	0 to 1	0 to 60
	50-59	All	249	2.97	32.09	15.38	0 to 1	0 to 505
		< 100 contacts	248	0.95	3.08	8.11	0 to 1	0 to 38
	60-69	All	204	0.97	2.14	5.03	0 to 1	0 to 20
		< 100 contacts	204	0.97	2.14	5.03	0 to 1	0 to 20
	70+	All	217	0.53	1.26	4.22	0 to 1	0 to 11
		< 100 contacts	217	0.53	1.26	4.22	0 to 1	0 to 11
Gender	Female	All	634	4.1	25.85	16.89	1 to 3	0 to 505
		< 100 contacts	631	2.53	4	8.69	1 to 3	0 to 61
	Male	All	506	2.31	3.47	7.57	1 to 3	0 to 47
		< 100 contacts	506	2.31	3.47	7.57	1 to 3	0 to 47
High Risk	No	All	759	2.59	23.73	18.27	0 to 1	0 to 505
		< 100 contacts	756	1.28	4.33	8.24	0 to 1	0 to 60
	Yes	All	357	0.54	1.51	5.5	0 to 0	0 to 17
		< 100 contacts	357	0.54	1.51	5.5	0 to 0	0 to 17
Occupation	Customer services clerks	All	52	3.48	16.21	5.54	0 to 1	0 to 108
		< 100 contacts	51	1.43	6.73	6.49	0 to 1	0 to 48
	Health professionals (except nursing)	All	26	1.85	5.71	4.12	0 to 1	0 to 29
		< 100 contacts	26	1.85	5.71	4.12	0 to 1	0 to 29
	Labourers multiple categories	All	23	3.35	8.8	2.97	0 to 1.5	0 to 38
		< 100 contacts	23	3.35	8.8	2.97	0 to 1.5	0 to 38
	Nursing and midwifery professionals	All	18	1.33	4.01	3.28	0 to 0	0 to 17
		< 100 contacts	18	1.33	4.01	3.28	0 to 0	0 to 17

	Other personal services workers	All	16	1.25	2.24	1.92	0 to 1.25	0 to 8
		< 100 contacts	16	1.25	2.24	1.92	0 to 1.25	0 to 8
	Sales and services elementary occupations	All	49	19.55	89.8	4.61	0 to 1	0 to 505
		< 100 contacts	47	1.4	4.44	4.5	0 to 1	0 to 27
	Social work associate professionals	All	17	1.53	1.84	1.12	0 to 3	0 to 6
		< 100 contacts	17	1.53	1.84	1.12	0 to 3	0 to 6
	Teaching associate professionals	All	23	3.04	12.44	4.16	0 to 1	0 to 60
		< 100 contacts	23	3.04	12.44	4.16	0 to 1	0 to 60
Social Group	A - Upper middle class	All	59	0.53	1.28	2.38	0 to 0	0 to 5
		< 100 contacts	59	0.53	1.28	2.38	0 to 0	0 to 5
	B - Middle class	All	274	2.26	23.41	16.2	0 to 1	0 to 387
		< 100 contacts	273	0.85	2	4.04	0 to 1	0 to 15
	C1 - Lower middle class	All	344	1.46	7.64	10.41	0 to 1	0 to 108
		< 100 contacts	343	1.15	5.02	9.06	0 to 1	0 to 60
	C2 - Skilled working class	All	216	1	2.97	6.18	0 to 1	0 to 29
		< 100 contacts	216	1	2.97	6.18	0 to 1	0 to 29
	D - Working class	All	167	4.5	39.21	12.46	0 to 1	0 to 505
		< 100 contacts	166	1.49	4.38	5.55	0 to 1	0 to 38
	E - Lower level of subsistence	All	86	0.55	1.58	4.53	0 to 0	0 to 11
		< 100 contacts	86	0.55	1.58	4.53	0 to 0	0 to 11

Methods

CoMix is a behavioural survey, with a study sample recruited to be broadly representative of the UK adult population. It was launched on 24th of March 2020 and this analysis includes data

collected up to the 21st of May. Data is collected weekly, using two different panels each for adults and children who are interviewed using the same questionnaire in alternate weeks. The questionnaires for children are completed by a parent within their household as a proxy. Participants recorded direct, face-to-face contacts made on the previous day, specifying certain characteristics for each contact including the age and sex of the contact, whether contact was physical (skin-to-skin contact), and where contact occurred (e.g. at home, work, while undertaking leisure activities, etc). Further details have been published elsewhere[1]. The contact survey is based on the POLYMOD contact survey, which is used as a baseline for social mixing in the UK under normal conditions[2]. The panels started with a sample size of 1,816 in Panel A, 1,560 in Panel B, 564 in Panel C, and 228 in the interim with a final target of around 500 in Panel D. Final data for Panel B Wave 4 (week 8 of the study) has 1,146 participants.

We calculated the average number of contacts in the settings home, work, school, and other. We sample uniformly between the minimum and maximum age reported for the contact, as we do not record exact ages for contacts. We use the reciprocity of contacts to impute child-adult contacts from adult-child contacts. We set the age bands for under 18s to 0-4, 5-12, 13-17 to be consistent with the BBC Pandemic study. When excluding children's survey data, we impute child-child contacts using the POLYMOD UK data, setting school-contacts to 0 and adjusting contact in other settings (e.g. home) as observed for adults, and we impute child-adult contacts by reciprocating adult-child reported contacts.[1,3] We take the mean of reciprocated contacts to form symmetric matrices.

We assume that R$_0$ prior to physical distancing measures were in place follows a normal distribution with a mean of 2.6 and sd of 0.54. We then apply a scaling factor of the ratio of dominant eigenvalues between CoMix and Polymod contact matrices to estimate R_0 under the observed contacts patterns in our study following the approach found in Wallinga et al.[4]. This assumes that all other elements of the Next Generation Matrix remain constant, such as transmissibility by age group, which may not be the case.

Uncertainty in the estimates of reduction in R_0 is obtained using 2,000 bootstrap samples of the CoMix and POLYMOD contacts matrices, and applying these ratios to 2,000 sampled values of R_0.

References

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