

The effect of social distancing on the reproduction number and number of contacts in the UK from a social contact survey  
Report for survey week 41

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Data up to 5th of January 2021*

**Summary**

- Mean contacts for adults remain low in all four nations throughout the period of October to December 2020.
- Mean contacts for adults reduced during the second lockdown in England then rose again before reducing during the Christmas period to similar levels seen during the second lockdown.
- Contacts in children reduced substantially over the Christmas holiday period due to a reduction in school related contacts, although children also reduced their contact in “other” settings (mostly social and leisure) during this period.
- The data were consistent with no meaningful change in higher risk contacts (>5 min with individuals aged 60+) during the Christmas period.

Mean contacts for adults remain low across the four nations (Figure 1). In England, reported contacts reduced during November before rising again and then reducing towards the end of December. This dip in contacts during the November lockdown is most apparent in the East of England, South East, South West, and London (Figure 2), i.e. those areas that had lower restrictions before the second lockdown. Average contact patterns reported by middle-aged adults (30-59 years) were somewhat lower over the Christmas period than during the November lockdown (Figure 3), mainly due to a larger reduction in work/education contacts (most of which are work contacts).

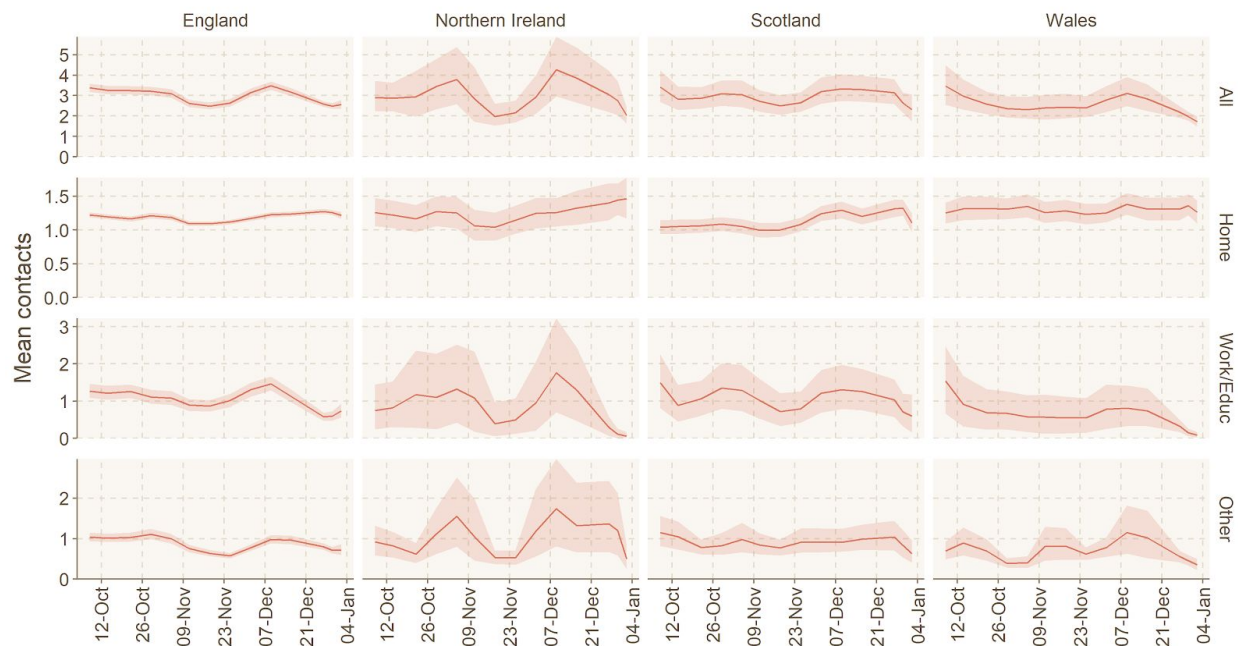
Mean contacts in under 18s have reduced substantially in the later weeks of December driven by school holidays as can be seen by the steep drop in educational contacts (Figure 4) as well as a fall in “other” contacts (which are mostly leisure and social in nature). This reduction in contacts in under 18s is the most apparent change in contacts seen across age groups during the Christmas period (Figure 5).

Contacts with the over 60s during the Christmas period (20th December to 5th January 2021) do not appear to deviate substantially from those in two weeks prior (2nd to 15th of December). As a measure of high-risk contacts, we explored the change in longer duration contacts (over 5 minutes) with individuals 60 years of age or older (Table 1). Nearly all participants (92%) reported the same number of contacts with these higher risk individuals before and during the Christmas period. Although there is some evidence of an increase in mean contacts (>5 mins duration) with the over 60s during the Christmas period, the absolute difference is very small (a difference of 0.02 mean contacts per person per day) and probably not epidemiologically meaningful.

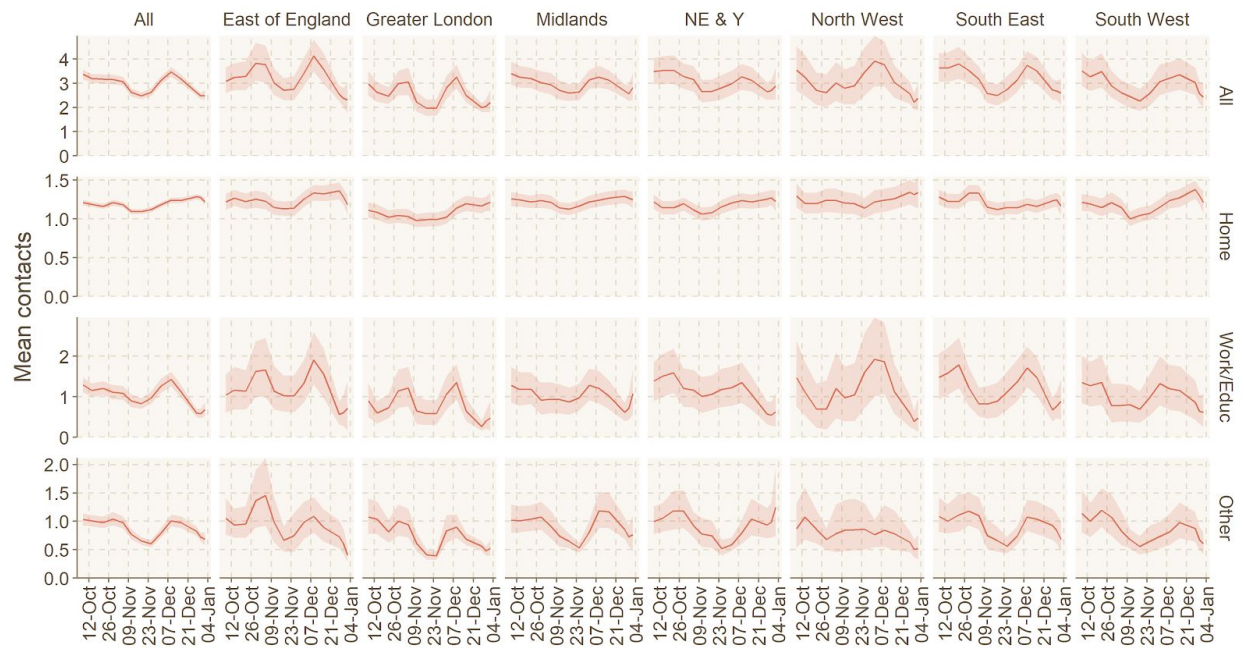
**Table 1: Change and paired mean difference in contact at home with over 60s for longer than 5 minute duration, comparing two weeks before (2nd Dec to 15th of Dec, 20th Dec to 5th of Jan)**

Age	Contacts	N	Decreased	Same	Increased	p-value
All	home	2881	103	2640	138	0.989
0-17	home	472	10	445	17	0.945
18-59	home	1514	35	1432	47	0.913
60+	home	863	56	733	74	0.962

Age	Before	After	Difference	Lower	Upper	p-value
All	0.17	0.19	0.02	0	0.03	0.015
0-17	0.07	0.08	0.01	-0.02	0.04	0.609
18-59	0.07	0.08	0.01	0	0.03	0.082
60+	0.41	0.44	0.03	0	0.06	0.057

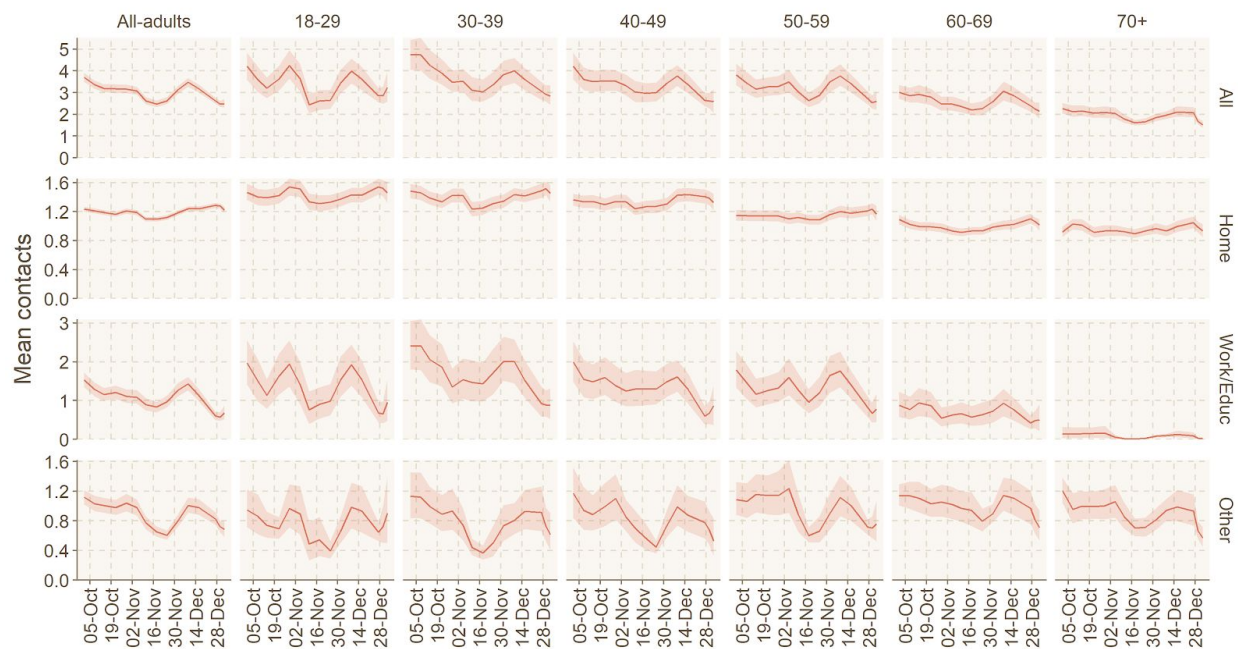


**Figure 1: Setting-specific mean contacts of Adults for UK nations over time.** Uncertainty calculated using Bootstrapped accounting. Contacts truncated to 50 contacts per participant. Observations are smoothed over two weeks to account for panel effects. Educ = education setting. Date on x axis refers to the midpoint of the survey period.

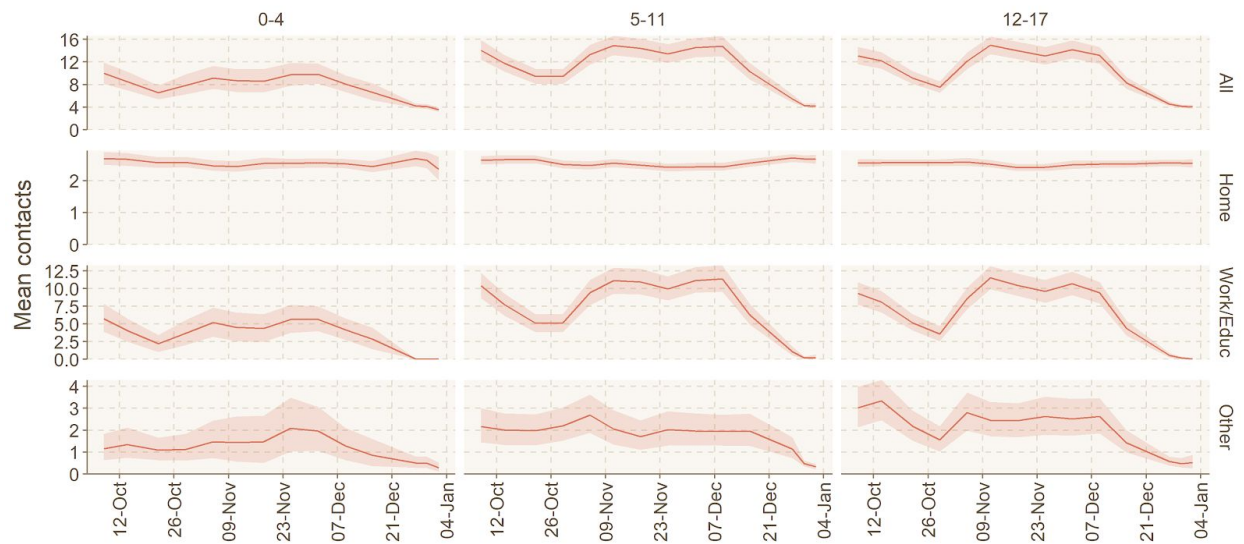


**Figure 2: Setting-specific mean contacts for adults by English region over time.**

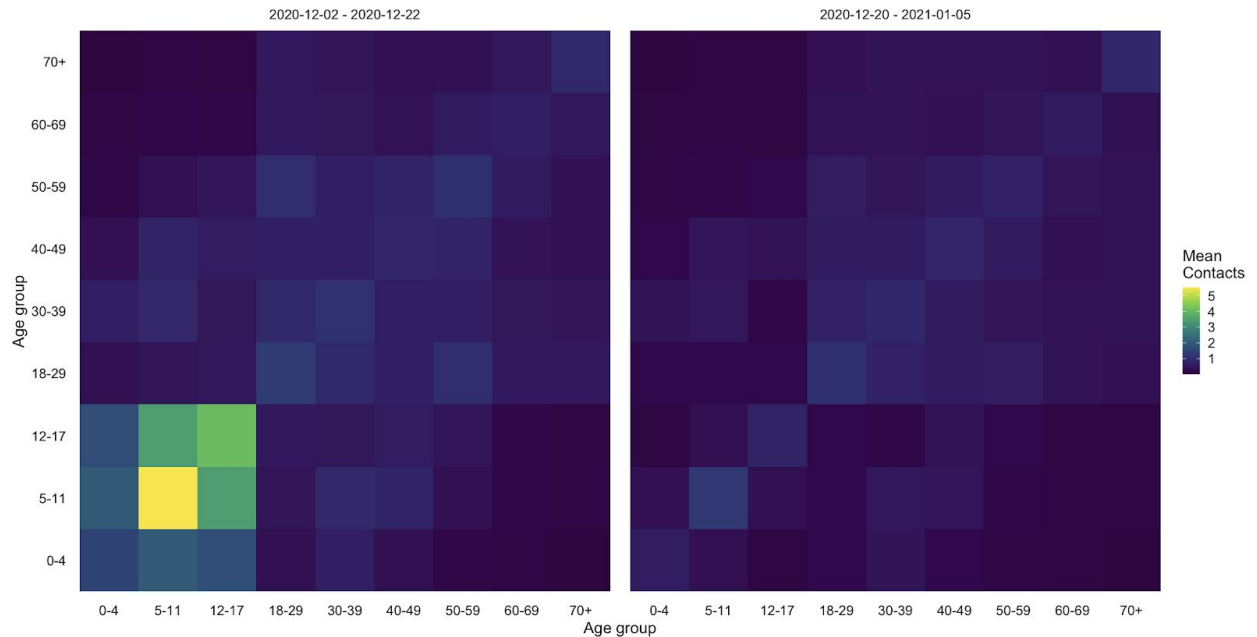
Uncertainty calculated using bootstrapping. Contacts truncated to 50 contacts per participant. Observations are smoothed over two weeks to account for panel effects. NE & Y = North East and Yorkshire. Educ = educational setting. Date on x axis refers to the midpoint of the survey period.



**Figure 3: Setting-specific mean contacts by age-group for adults over time.** Uncertainty calculated using bootstrapping. Contacts truncated to 50 contacts per participant. Observations are smoothed over two weeks to account for panel effects. Educ = educational setting. Date on x axis refers to the midpoint of the survey period.



**Figure 4: Setting-specific mean contacts by age-group for children over time.** Uncertainty calculated using bootstrapping. Contacts truncated to 50 contacts per participant. Observations are smoothed over two weeks to account for panel effects. Educ = educational setting. Date on x axis refers to the midpoint of the survey period.



**Figure 5: Contact matrix for all contacts by age comparing before and during christmas period.** Contacts truncated to 50 contacts per participant.

## Methods

CoMix is a behavioural survey, launched on 24<sup>th</sup> of March 2020. The sample is broadly representative of the UK adult population. Participants are invited to respond to the survey once every two weeks. We collect weekly data by running two alternating panels. Parents complete the survey on behalf of children (17 years old or younger). Participants record 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[2]. The contact survey is based on the POLYMOD contact survey[3].

We calculated the mean contacts using 1000 bootstrap samples. Bootstrap samples were calculated at the participant level, then all observations for those participants are included in a sample to respect the correlation structure of the data. We collect data in two panels which alternate weekly, therefore we calculated the mean smoothed over the 2 week intervals to give a larger number of participants per estimate and account for panel effects. We calculated the mean number of contacts in the settings home, work and school (including all educational establishments, including childcare, nurseries and universities and colleges), and “other” (mostly leisure and social contacts, but includes shopping). We look at the mean contacts by age, country, and region of England. The mean number of contacts is influenced by a few individuals who report very high numbers of contacts (often in a work context). The means shown here are calculated based on truncating the maximum number of contacts recorded at 50 per individual per day.

To investigate the change in contacts over the Christmas period, we compare individuals' reported contacts for two weeks prior (5<sup>th</sup> to the 15<sup>th</sup> December) to during the Christmas period (20<sup>th</sup> December to 5<sup>th</sup> of January). We restricted to highest risk contacts, those of duration longer than 5 minutes and with individuals over 60 years of age. The closest pairs of observations were identified before and after the 20<sup>th</sup> of December. Paired permutation tests were conducted on the differences. We performed two tests, first on the proportion of people who reduced contacts after the 20<sup>th</sup>, second on the paired mean difference.

We constructed age-stratified contact matrices for nine age-groups (0-4, 5-11, 12-17, 18-29, 30-39, 40-49, 50-59, 60-69, and 70+). For children participants and contacts, we did not have exact ages and therefore sampled from the reported age-group uniformly. We fitted a truncated negative binomial model to calculate the mean contacts between each participant and contact age-groups. To find the population normalised symmetrical contact matrix, we multiplied the columns of the matrix by the mean-normalised proportion of the UK population in each age-group. This was done to create one matrix prior to the 20<sup>th</sup> of December and one after to compare the mixing across age groups for these periods.

Note that graphs present data smoothed over two weeks where mean contacts are aligned to the middle time point of each survey round and therefore include data up to one week before and after date stated in graphs.

## References

1. Full list of local restriction tiers by area. [cited 21 Dec 2020]. Available: <https://www.gov.uk/guidance/full-list-of-local-restriction-tiers-by-area>
2. Jarvis CI, Van Zandvoort K, Gimma A, Prem K, CMMID COVID-19 working group, Klepac P, et al. Quantifying the impact of physical distance measures on the transmission of COVID-19 in the UK. *BMC Med.* 2020;18: 124.
3. Mossong J, Hens N, Jit M, Beutels P, Auranen K, Mikolajczyk R, et al. Social contacts and mixing patterns relevant to the spread of infectious diseases. *PLoS Med.* 2008;5: e74.