Relative importance of different non household activities for COVID-19 transmission during period of intense restrictions compared to period of no restrictions. Findings from the Virus Watch Community Cohort Study.

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Methods

We undertook analyses of how the risk of COVID-19 infections in adults aged > 16 was associated with various non-household activities during the second wave of the pandemic (October 2020-April 2021) when there were intense control measures in place) and during September-November of 2021 (when no restrictions were in place).

Infections were based on self-reported lateral flow or PCR tests or positive antibody tests. Where possible we excluded infections that were thought to have been acquired in the household.

Activities were based on monthly surveys which asked about the weekly frequency of undertaking a range of activities outside the household. These were averaged across surveys for the corresponding time periods, giving an average measure of exposure.

Logistic regression analyses were used to calculate adjusted odds ratios (AOR) controlling for demographic factors and vaccination. Adjusted Population attributable fractions (APAF) were calculated for different classes of activity based on the following formula APAF = p * (1-1/Relative Risk) where p=proportion of those with COVID-19 who had the exposure of interest and AOR was taken as a proxy for relative risk.

Results

In the second wave of the pandemic when there were intense restrictions:

- Leaving home for work - AOR 1.20 (95% CI 1.02 – 1.42), APAF 7%;
- Public transport - AOR > once per week 1.82 (1.49 – 2.23), APAF 12%;
- Shopping (AOR for shopping > once per week 1.69 (1.29 – 2.21), APAF 35%
- Other non-household activities such as use of hospitality and leisure venues were rare due to restrictions and there were no significant associations with infection risk.

In September-November 2021 when there were no restrictions

- Leaving home for work AOR 1.20 (1.03-1.98)) APAF = 9%,
- Public transport more than once per week (AOR 1.28 (1.05-2.02) APAF 14%,

- Shopping AOR for weekly shopping 2.18 (1.41-3.47)
  APAF 36%
- Other activities (AOR for > weekly 1.20 (0.97-1.49)
  APAF 11%

In September-November 2021 for **public transport activities**

- there was good evidence of increased risk of transmission for using
  - a bus AOR 1.31 (95% CI 1.07-1.61),
- some evidence of increased transmission for
  - using a taxi (1.19 (0.95-1.48),
  - using an overground train or tram (1.18 (0.95-1.46)
- but no evidence for
  - using an underground train (1.02 (0.76-1.36).

In September-November 2021 for other **indoor non--household activities** other than work, public transport or shopping

- there was good evidence of increased risk of transmission for those
  - eating at a restaurant, café (AOR 1.29 (95% CI 1.05-1.61),
- there was some evidence of increased transmission for
  - going to a pub, bar or club (AOR for attending more than once per week 1.28 (0.99-1.66),
  - going to a party (1.27 (0.99-1.62),
  - going to the gym or indoor sports (1.27 (0.98-1.63).
- There was no good evidence of increased risk of transmission for
- attending theatres,cinema, concert or sports event (AOR 1.09 (0.89-1.34),
- going to a hairdresser, barber, nail salon or beauty parlor (AOR 0.81 (95% CI 0.66-0.99).

In September-November 2021 for outdoor activities there was

- Good evidence of increased risk of transmission in those
  - Playing. a sport outdoors (1.36 (1.03-1.79)
- No good evidence of increased risk from other outdoor activities including being outside at a pub, bar or club, eating outside at a restaurant or café and going to a party outside

Interpretation

Both during periods of intense restrictions and no restrictions shopping accounted for the highest proportion of infections acquired outside the home. Going to Work and Public transport use were also important predictors of infection.
Intense restrictions largely prevented transmission in hospitality, entertainment, beauty services and sports during the second wave of the pandemic.
During a period of no restrictions parties, hospitality were associated with increased risk indoors but not outdoors. Participating in sports indoors or outdoors was associated with increased risk (although this may relate to associated social activities). There was no good evidence of increased risk from attending cinemas, theatres, concerts or indoor sports events or for beauty services.

Caution. Analyses from September – October are preliminary and have not been peer reviewed. Virus Watch cohort has underrepresentation of younger adults.

Detailed results

For 2nd wave results see

Relative contribution of leaving home for work or education, transport, shopping and other activities on risk of acquiring COVID-19 infection outside the household in the second wave of the pandemic in England and Wales
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September-November 2021

Unadjusted and adjusted odds ratios for non-household SARS-CoV2 infection

Activity and frequency of occurrence			**Positive PCR lateral flow or AB**	**Univariate and analyses adjusted for age, region, vaccine status**	
Activity	**Weekly frequency**	**Total in cohort (n=10,849)**	**Number of COVID cases (n=517)**	**OR (95% CI) ,p**	**Adjusted OR (95% CI), p**
Leaving home for work or education	No Yes	6,838 (63%) 4,011 (37%)	236 (3%) 281 (7%)	1.00 2.11 (1.76 – 2.52),	1.00 1.20 (1.03 – 1.98)
Weekly frequency of using public or shared transport	0 >0 -1 >1	2,599 (24%) 3,832 (35%) 4,418 (41%)	115 (4%) 179 (5%) 223 (5%)	1.00 1.06 (0.83 – 1.34) 1.15 (0.91 – 1.45)	1.00 1.17 (1.00 – 1.63) 1.28 (1.05 – 2.02)

Weekly frequency of any retail	0 >0 -1 >1	573 (5%) 2,040 (19%) 8,236 (76%)	29 (5%) 145 (7%) 343 (4%)	1.00 1.44 (0.95 – 2.16) 0.82 (0.55 – 1.20)	1.00 2.18 (1.41 – 3.37) 1.46 (0.95 – 2.23)
Weekly frequency of other non household activities	0 - <1 1 - 3 >3	3,868 (36%) 3,733 (34%) 3,248 (29%)	170 (4%) 188 (5%) 159 (5%)	1.00 1.15 (0.93 – 1.43) 1.12 (0.89 – 1.39)	1.00 1.20 (0.97 – 1.49) 1.19 (0.94 – 1.49)

Table S1 Risk of infection according to type and frequency of public or shared transport use

			Positive PCR/Lat Flow or AB	Analysis adjusted for age, region, vaccine status		
Activity undertaken	**Weekly frequency**	**All participants (N=10,849)**	**Covid infection (N=517)**	**Adj. odds Ratio**	**95% CI**	**p**
Used a car shared with someone outside the household	No Yes	4,471 (41%) 6,378 (59%)	277 (5%) 290 (5%)	1.00 0.98	0.82 – 1.18	0.8583
Used a taxi	No Yes	8,828 (81%) 2,021 (19%)	405 (5%) 112 (6%)	1.00 1.19	0.95 – 1.48	0.1372
Used a bus	No Yes	7,867 (73%) 2,982 (27%)	357 (5%) 160 (5%)	1.00 1.31	1.07 – 1.61	0.0100
Used an over-ground train or tram	No Yes	8,357 (77%) 2,492 (23%)	384 (5%) 133 (5%)	1.00 1.18	0.95 – 1.46	0.1335
Used an underground train	No Yes	9,312 (86%) 1,537 (14%)	444 (5%) 73 (5%)	1.00 1.02	0.76 - 1.36	0.9152

Used an airplane	No Yes	9,879 (91%) 970 (9%)	467 (5%) 50 (5%)	1.00 1.06	0.78 – 1.44	0.7105

Table S2 Risk of infection according to frequency of non-work or education and non-public or shared transport activities outside the household

			Positive PCR/Lat Flow or AB	**Analyses adjusted for age, region and vaccine status**		
Activities	**Weekly frequency**	**All participants N=10,849**	**Covid infection N=517**	**Adjusted odds Ratio**	**95% CI**	**p**
Played a team sport outdoors	No Yes	9,936 (92%) 913 (8%)	441 (4%) 76 (8%)	1.00 1.36	 1.03 – 1.79	0.0363
Went to a theatre, cinema, concert or sports event	No Yes	7,909 (73%) 2,940 (27%)	368 (5%) 149 (5%)	1.00 1.09	 0.89 – 1.34	0.3926
Went to a shop for essential items	0 0-1 >1	786 (7%) 6,622 (61%) 3,441 (32%)	46 (6%) 359 (5%) 112 (3%)	1.00 1.39 0.89	 0.99 – 1.96 0.61 – 1.33	0.0002
Went to a shop for non-essential items	0 0-1 >1	3,976 (37%) 4,926 (45%) 1,947 (18%)	195 (5%) 233 (5%) 89 (5%)	1.00 1.02 1.00	 0.83 – 1.25 0.77 – 1.31	0.9757
Went to an indoor bar, pub, club	0 0-1 >1	6,028 (56%) 3,111 (29%) 1,710 (16%)	287 (5%) 140 (4%) 90 (5%)	1.00 1.07 1.28	 0.86 – 1,33 0.99 – 1.66	0.1645

Went to an outdoor bar, pub, club	No Yes	8,729 (80%) 2,120 (20%)	426 (5%) 91 (4%)	1.00 0.92	0.72 – 1.17	0.4888
Ate at an indoor restaurant, café or canteen	0 0-1 >1	3,270 (30%) 5,032 (46%) 2,547 (23%)	146 (4%) 272 (5%) 99 (4%)	1.00 1.29 0.98	 1.05 – 1.61 0.76 – 1.28	0.0134
Ate at an outdoor restaurant, café or canteen	No Yes	7,804 (72%) 3,045 (28%)	366 (5%) 151 (5%)	1.00 1.14	0.93 – 1.39	0.1963
Went to an indoor party	No Yes	9,442 (87%) 1,407 (13%)	427 (5%) 90 (6%)	1.00 1.27	0.99 – 1.62	0.0578
Went to an outdoor party	No Yes	10,397 (96%) 452 (4%)	496 (5%) 21 (5%)	1.00 0.83	0.52 – 1.33	0.4401
Went to a gym/indoor sport	0 0-1 >1	8,433 (78%) 1,317 (12%) 1,099 (10%)	374 (4%) 87 (7%) 56 (5%)	1.00 1.27 1.06	 0.98 – 1.63 0.79 – 1.42	0.2010
Went to a hairdresser, barber, nail salon, beauty parlour	No Yes	7,191 (66%) 3,658 (34%)	375 (5%) 142 (4%)	1.00 0.81	0.66 – 0.99	0.0362

Average number of contacts	0 – 5 >5 – 10 >10	5,741 (53%) 2,430 (22%) 2,678 (25%)	230 (4%) 106 (4%) 181 (7%)	1.00 1.09 1.23	 0.86 – 1.39 0.98 – 1.53	0.917