RESEARCH NOTE

Reported exposure to SARS-CoV-2 and relative perceived importance of different settings for SARS-CoV-2 acquisition in England and Wales: Analysis of the Virus Watch Community Cohort [version 1; peer review: 2 approved with reservations]

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Abstract

We aimed to assess the relative importance of different settings for SARS-CoV-2 transmission in a large community cohort based on perceived location of infection for self-reported confirmed SARS-CoV-2 cases. We demonstrate the importance of home, work and education as perceived venues for transmission. In children, education was most important and in older adults essential shopping was of high importance. Our findings support public health messaging about infection control at home, advice on working from home and restrictions in different venues.

Keywords

SARS-CoV-2; COVID-19; transmission; pandemic

Open Peer Review

Approval Status ? ?

	1	2
version 1
21 Sep 2021	view	view
1. Qifa Song , Ningbo City First Hospital,, Ningbo,, China		
2. Joël Mossong , Health Directorate, Findel, Luxembourg		
Any reports and responses or comments on the article can be found at the end of the article.		

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Author roles: **Beale S:** Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Visualization, Writing – Original Draft Preparation; **Byrne T:** Data Curation, Investigation, Project Administration, Validation, Writing – Original Draft Preparation, Writing – Review & Editing; **Fragaszy E:** Conceptualization, Methodology, Project Administration, Supervision, Writing – Review & Editing; **Kovar J:** Project Administration, Resources, Writing – Review & Editing; **Nguyen V:** Data Curation, Project Administration, Software, Writing – Review & Editing; **Aryee A:** Methodology, Writing – Review & Editing; **Fong WLE:** Data Curation, Writing – Review & Editing; **Geismar C:** Data Curation, Writing – Review & Editing; **Patel P:** Conceptualization, Writing – Review & Editing; **Shrotri M:** Conceptualization, Methodology, Writing – Review & Editing; **Patni N:** Project Administration, Writing – Review & Editing; **Braithwaite I:** Conceptualization, Writing – Review & Editing; **Navaratnam AMD:** Conceptualization, Writing – Review & Editing; **Johnson AM:** Conceptualization, Methodology, Supervision, Writing – Review & Editing; **Aldridge RW:** Conceptualization, Funding Acquisition, Methodology, Supervision, Writing – Review & Editing; **Hayward AC:** Conceptualization, Funding Acquisition, Methodology, Supervision, Writing – Review & Editing;

Competing interests: ACH serves on the UK New and Emerging Respiratory Virus Threats Advisory Group.

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The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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Background

Risk of SARS-CoV-2 transmission is understood to be driven by the complex interplay of many factors that can be broadly classified into four main areas¹ viral load and infectiousness², contact patterns^{3,4}, environmental factors⁵ and socioeconomic inequalities^{6–8}. However, the relative contribution of different settings to overall transmission has proven difficult to quantify at a population level¹. A lack of evidence on the fraction of infections occurring in different settings at different epidemic stages and intensities limits our ability to make evidence-based decisions about which settings should be the focus of control measures at different stages of the pandemic, as different public health and policy actions are required. In this analysis, we aimed to assess the perceived relative importance of different settings for SARS-CoV-2 transmission in a large community cohort (Virus Watch).

Methods

Virus Watch is a household community cohort study which began recruitment in June 2020 and has recruited circa 50,000 individuals across England and Wales with weekly online follow up and self-reporting of any positive SARS-CoV-2 virological tests⁹. On the 17th of March 2021, participants were asked, “If you have had a positive COVID-19 swab test at any point in the pandemic, did you test positive after...?”. Possible responses were “Contact with confirmed COVID-19 case(s)”, “Contact with suspected COVID-19 case(s)”, “No known contact with confirmed or suspected COVID-19 case(s)”, or “I have not had a positive COVID-19 swab test during the pandemic”. Participants who responded anything other than “I have not had a positive COVID-19 swab test during the pandemic” were then asked: “Where do you think you may have caught COVID-19?”. Participants were allowed to select multiple setting categories and we classified these settings into the following groups: home, someone else’s home, work, place of education, public transport, essential shop, healthcare setting, leisure (comprising ‘bar, pub, or club’, ‘eating out in a restaurant, cafe, or canteen’, ‘gym/indoor sports facility’, ‘hairdresser, barber, nail salon, or similar location’, and ‘shop for non-essential items’), and other. Survey responses were linked to a previously reported date of laboratory-confirmed infection, where available. Virus Watch was approved by the Hampstead NHS Health Research Authority Ethics Committee: 20/HRA/2320.

Using these data, we described the perceived setting of SARS-CoV-2 acquisition by contact status and stratified these descriptive analyses by age of the case and by time period of infection (Jan-May 2020, Jun-Aug 2020, Sep 2020-Dec 2020, Jan-March 2021). The survey was sent to 21,444 households comprising 45,654 study participants on 17/03/2021, and 18,096 (40%) individual participants had completed the survey in full when data were extracted on 28/03/2021. Of these, 1142 participants had self-reported a positive SARS-CoV-2 test previously during follow-up and responded to the main question of interest.

Results

Of the 1142 survey respondents, 499 (44%) reported known contact with a confirmed case, 120 (10%) contact with a suspected case and 523 (46%) reported no known contact. Amongst all cases, the perceived setting of acquisition was, in descending order of frequency, within the home (n=317, 33%), at work (n=259, 23%), in an essential shop (n=201, 18%), other venues (n=129, 11%), in a leisure venue (n=112, 10%), in a place of education (n=96, 8%), in healthcare settings (n=90, 8%), on public transport (n=75, 7%), and in someone else’s home (n=64, 6%; [Table 1](#)). This varied considerably depending whether or not the person was a contact of a known case ([Figure 1](#)).

For those with known contact with a confirmed case, the perceived venues for transmission in descending order of frequency were: home (n=234, 47%), work (n=116, 23%), education (n=44, 9%), someone else’s home (n=39, 8%), healthcare setting (n=35, 7%), essential shop (n=28, 6%), other venues (n=25, 5%), and leisure venue (n=17, 3%). For those with no recognized contact, the perceived venues for acquisition were: an essential shop (n=167, 32%), work (n=101, 19%), other venues (n=99, 19%), home (n=98, 19%), a leisure venue (n=86, 16%), transport (n=58, 11%), healthcare (n=48, 9%), education (n=42, 8%), and someone else’s home (n=13, 3%) ([Table 1](#) and [Figure 1](#)).

The most important perceived venue for transmission varied by age group: place of education was more important than home for children aged 0–17, home and workplace were of similar importance for working age adults, and home and essential shops were the most important settings for those aged over 65 years ([Table 1](#) and [Figure 1](#)). Young adults aged 18–34 were more likely than other age groups to perceive leisure venues and public transport as the venue of acquisition.

Home settings had a relatively stable level of perceived importance between Jan-May 2020 (n=21, 34%) and Jan-March 2021 (n=106, 30%; [Table 1](#)). The proportions who perceived that they were infected in someone else’s home increased over time (n=0, 0% Jan-May 2020 vs. n=27, 9% Jan-March 2021), as did place of education (n=0, 0% vs. n=12, 4%). The proportion who perceived that they were infected in a healthcare setting decreased over time (n=18, 26% vs. n=25, 8%). Caution should be used interpreting these time period changes because of small numbers for some groups, particularly in the Jun-Aug time period when levels of infection were low.

Discussion

Our findings illustrate the central perceived importance of home, work and place of education as venues for transmission, although the relative importance of different settings is likely to change over time and with variation in restrictions. In children, place of education is most important, and in older adults essential shopping is of high importance. Home was

Table 1. Perceived Setting of SARS-CoV-2 Acquisition by Contact Status, Age, and Time Period.

	Contact Status			Age*						Time Period			
	Confirmed ¹ , N=499	Suspected ¹ , N=120	None ¹ , N=1142	0 to 17 ¹ , N = 120 ¹	18 to 34 ¹ , N = 191 ¹	35 to 49 ¹ , N = 262 ¹	50 to 64 ¹ , N = 361 ¹	65+ ¹ , N = 206 ¹	Mar-May 2020, N = 70 ¹	Jun-Aug 2020, N = 18 ¹	Sep-Dec 2020, N = 377 ¹	Jan-Mar 2021, N = 311 ¹	
Home	234 (46.9%)	41 (34.2%)	98 (18.7%)	53 (44.2%)	64 (33.5%)	94 (35.9%)	100 (27.7%)	61 (29.6%)	21 (30.0%)	6 (33.3%)	113 (30.0%)	106 (34.1%)	
Someone else's home	39 (7.8%)	12 (10.0%)	13 (2.5%)	2 (1.7%)	9 (4.7%)	9 (3.4%)	21 (5.8%)	23 (11.2%)	0 (0.0%)	0 (0.0%)	22 (5.8%)	27 (8.7%)	
Work	116 (23%)	42 (35.0%)	101 (19.3%)	2 (1.7%)	61 (31.9%)	87 (33.2%)	98 (27.1%)	11 (5.3%)	22 (31.4%)	4 (22.2%)	97 (25.7%)	69 (22.2%)	
Place of education	44 (8.8%)	10 (8.3%)	42 (8.0%)	63 (52.5%)	15 (7.9%)	8 (3.1%)	8 (2.2%)	1 (0.5%)	0 (0.0%)	0 (0.0%)	54 (14.3%)	12 (3.9%)	
Public transport	10 (2.0%)	7 (5.8%)	58 (11.1%)	4 (3.3%)	22 (11.5%)	15 (5.7%)	22 (6.1%)	12 (5.8%)	5 (7.1%)	2 (11.1%)	30 (8.0%)	16 (5.1%)	
Essential shop	28 (5.6%)	6 (5.0%)	167 (31.9%)	6 (5.0%)	28 (14.7%)	51 (19.5%)	70 (19.4%)	46 (22.3%)	7 (10.0%)	4 (22.2%)	62 (16.4%)	71 (22.8%)	
Healthcare setting	35 (7.0%)	7 (5.8%)	48 (9.2%)	0 (0.0%)	14 (7.3%)	20 (7.6%)	32 (8.9%)	24 (11.7%)	18 (25.7%)	3 (16.7%)	17 (4.5%)	25 (8.0%)	
Leisure	17 (3.4%)	9 (7.5%)	86 (16.4%)	5 (4.2%)	28 (14.7%)	19 (7.3%)	36 (10.0%)	24 (11.7%)	4 (5.7%)	3 (16.7%)	53 (14.1%)	4 (1.3%)	
Other	25 (5.0%)	5 (4.2%)	99 (18.9%)	4 (3.3%)	15 (7.9%)	19 (7.3%)	43 (11.9%)	48 (23.3%)	7 (10.0%)	3 (16.7%)	34 (9.0%)	37 (11.9%)	

¹n (%); * Two cases excluded due to missing age; **Note:** Participants could select multiple locations so proportions are calculated from group n and may sum to >100.0%

Figure 1. Perceived Setting of SARS-CoV-2 Acquisition by (a) Time Period, (b) Contact Status, (c) Age and (d) Age – Contacts of Confirmed or Suspected Cases.

perceived as an important location across time periods and age groups – particularly for contacts of confirmed or suspected cases – and further research (particularly intervention research) and public health advice to reduce household transmission is recommended. Our estimates cover several periods of intense restrictions. As restrictions loosen, the relative importance of out-of-household transmission, including of workplaces and a wider range of leisure settings, is likely to increase.

Our study was reliant on community testing for case ascertainment so is most likely to represent infections acquired after the first UK lockdown following initiation of the Test, Trace and Isolate programme. Perceived venues of acquisition in those with known contact are likely biased toward venues such as home, work and education where contact tracing can readily lead to identification of known contact. Conversely those with no known contact may be more likely to conclude they acquired SARS-CoV-2 infection in settings where they are in contact with strangers (such as in shops). Judgments may also be affected by perceptions of the importance of factors such as proximity and ventilation in influencing transmission risk.

Considering these possible biases in reporting of the importance of these perceived settings by known or unknown contact status, our estimates provide useful upper and lower

ranges for the likely relative importance of acquisition of SARS-CoV-2 in England and Wales over our study period. In future waves of transmission, these findings can support public health efforts on guidance to prevent household transmission, advice on working from home, restrictions in different venues, and advice to vulnerable elderly to reduce exposure to shops, for example through online shopping.

Data availability

Underlying data

We aim to share aggregate data from this project on our website and via a “Findings so far” section on our website - <https://ucl-virus-watch.net/>. We will also be sharing individual record level data on a research data sharing service such as the Office of National Statistics Secure Research Service. In sharing the data we will work within the principles set out in the UKRI Guidance on best practice in the management of research data. Access to use of the data whilst research is being conducted will be managed by the Chief Investigators (AH and RWA) in accordance with the principles set out in the UKRI guidance on best practice in the management of research data. We will put analysis code on publicly available repositories to enable their reuse. Given the content of our dataset (information on exposure and activities in participants with SARS-CoV-2 infection) for this study, we currently cannot release the data at the individual level.

Data access requests to data can be made to the Virus Watch chief investigators (AH or RWA) at the following email address: viruswatch@ucl.ac.uk.

Extended data:

Zenodo. UCL-Public-Health-Data-Science/VirusWatch_Caught_Covid: VirusWatch_Caught_Covid. DOI: <https://doi.org/10.5281/zenodo.5123386>¹⁰

This project contains the following extended data:

- <exposure_code_deposit.R> (<source code>)
- <Contact with COVID survey question.pdf> (<original survey questions used for current analyses>)

Data are available under the terms of the [Creative Commons Attribution 4.0 International license](#) (CC-BY 4.0).

References

1. Scientific Advisory Group for Emergencies: **PHE: Factors contributing to risk of SARS-CoV-2 transmission in various settings, 26 November 2020**. GOV.UK; 2020; [cited 9 Jun 2021]. [Reference Source](#)
2. Cevik M, Tate M, Lloyd O, *et al.*: **SARS-CoV-2, SARS-CoV, and MERS-CoV viral load dynamics, duration of viral shedding, and infectiousness: a systematic review and meta-analysis**. *Lancet Microbe*. 2021; 2(1): e13–e22. [PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
3. Sun K, Wang W, Gao L, *et al.*: **Transmission heterogeneities, kinetics, and controllability of SARS-CoV-2**. *Science*. 2021; 371(6526): eabe2424. [PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
4. Government Office for Science: **SARS-COV-2: Transmission Routes and Environments, 22 October 2020**. GOV.UK; 2020; [cited 10 Jun 2021]. [Reference Source](#)
5. Bulfone TC, Malekinejad M, Rutherford GW, *et al.*: **Outdoor Transmission of SARS-CoV-2 and Other Respiratory Viruses: A Systematic Review**. *J Infect Dis*. 2021; 223(4): 550–561. [PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
6. Public Health England: **COVID-19: review of disparities in risks and outcomes**. GOV.UK; 2020; [cited 10 Jun 2021]. [Reference Source](#)
7. Aldridge RW, Pineo H, Fragaszy E, *et al.*: **Household overcrowding and risk of SARS-CoV-2: analysis of the Virus Watch prospective community cohort study in England and Wales**. *medRxiv*. 2021. [Publisher Full Text](#)
8. Beale S, Braithwaite I, Navaratnam AMD, *et al.*: **Deprivation and exposure to public activities during the COVID-19 pandemic in England and Wales**. *medRxiv*. 2021. [Publisher Full Text](#)
9. Hayward A, Fragaszy E, Kovar J, *et al.*: **Risk factors, symptom reporting, healthcare-seeking behaviour and adherence to public health guidance: protocol for Virus Watch, a prospective community cohort study**. *bioRxiv*. 2021. [Publisher Full Text](#)
10. sarahbealeuc: **UCL-Public-Health-Data-Science/VirusWatch_Caught_Covid: VirusWatch_Caught_Covid (v1.0.0)**. Zenodo. 2021. <http://www.doi.org/10.5281/zenodo.5123386>

Open Peer Review

Current Peer Review Status: ? ?

Version 1

Reviewer Report 15 June 2022

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Joël Mossong

Health Directorate, Findel, Luxembourg

This is an interesting article on perceived settings for SARS-CoV-2 transmission, an important epidemiological topic for which few studies have published.

Major comments:

- 1) The description of the sample population needs to be expanded for the reader to understand the context where the data is coming from and what the possible sources of bias could be.
 - State how were study participants recruited for VirusWatch? Was this an online survey? How often were participants followed up? What was the retention over time?
 - What are the characteristics of Viruswatch participants?
 - How representative are participants of the general population?
 - What are characteristics of persons testing positive and not testing positive.
- 2) The authors should conduct some form of statistical analysis to assess whether differences in Location vs Time Period, Contact Status, Age Group, Sex/Gender (seems to be missing, why?) are actually statistically significant and relevant. Options for modelling here include basic chi² contingency tables, factor analysis or multinomial regression. Ideally seek assistance by a statistician with expertise in epidemiology. The categorisation of the time period probably needs to be changed to have enough statistical power to detect differences between periods. There are too few positive cases (N = 18) during Jun-Aug to draw comparisons. I suggest to create a new category to Mar-Aug 2020 or possibly even Mar-Sep 2020.
- 3) The author's findings need to be discussed in reference to the existing literature on
 - a) Risk of acquiring infection in different settings. For example: Leite *et al.* (2021)¹, Galmiche *et al.* (2021)², Speaker *et al.* (2021)³, Grant *et al.* (2022)⁴, Fisher *et al.* (2020)⁵, Munch *et al.* (2022)⁶, Munch *et al.* (2021)⁷.

- b) General contact patterns, e.g. Mossong *et al.* (2008)⁸.

4) Data availability. Sharing findings on a project website is not the same as sharing raw data. The authors should consider making their data available to wider research community, e.g. an excel or csv file of anonymised individual positive cases with characteristics presented in Table 1 either as a supplement to the paper or in Zenodo. The Zenodo entry currently does not contain any raw data.

Minor comments:

Table 1.

- Contact status (N=) is missing for None.
- The column "Overall" should be labeled "Total" and moved to the right hand side of the table, not within Contact Status.

References

1. Leite A, Leão T, Soares P, Severo M, et al.: A Case-Control Study of Contextual Factors for SARS-CoV-2 Transmission. *Front Public Health*. 2021; **9**: 772782 [PubMed Abstract](#) | [Publisher Full Text](#)
2. Galmiche S, Charmet T, Schaeffer L, Paireau J, et al.: Exposures associated with SARS-CoV-2 infection in France: A nationwide online case-control study. *Lancet Reg Health Eur*. 2021; **7**: 100148 [PubMed Abstract](#) | [Publisher Full Text](#)
3. Speaker SL, Doherty CM, Pfoh E, Dunn A, et al.: Social Behaviors Associated With a Positive COVID-19 Test Result. *Cureus*. 2021; **13** (2): e13064 [PubMed Abstract](#) | [Publisher Full Text](#)
4. Grant R, Charmet T, Schaeffer L, Galmiche S, et al.: Impact of SARS-CoV-2 Delta variant on incubation, transmission settings and vaccine effectiveness: Results from a nationwide case-control study in France. *Lancet Reg Health Eur*. 2022; **13**: 100278 [PubMed Abstract](#) | [Publisher Full Text](#)
5. Fisher KA, Tenforde MW, Feldstein LR, Lindsell CJ, et al.: Community and Close Contact Exposures Associated with COVID-19 Among Symptomatic Adults ≥18 Years in 11 Outpatient Health Care Facilities - United States, July 2020. *MMWR Morb Mortal Wkly Rep*. 2020; **69** (36): 1258-1264 [PubMed Abstract](#) | [Publisher Full Text](#)
6. Munch P, Espenhain L, Hansen C, Krause T, et al.: Societal COVID-19 epidemic counter measures and activities associated with SARS-CoV-2 infection in an adult unvaccinated population – a case-control study in Denmark, June 2021. *medRxiv*. 2022. [Publisher Full Text](#)
7. Munch P, Espenhain L, Hansen C, Müller L, et al.: Societal activities associated with SARS-CoV-2 infection: a case-control study in Denmark, November 2020. *Epidemiology and Infection*. 2022; **150**. [Publisher Full Text](#)
8. Mossong J, Hens N, Jit M, Beutels P, et al.: Social contacts and mixing patterns relevant to the spread of infectious diseases. *PLoS Med*. 2008; **5** (3): e74 [PubMed Abstract](#) | [Publisher Full Text](#)

Is the work clearly and accurately presented and does it cite the current literature?

Partly

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

No

Are all the source data underlying the results available to ensure full reproducibility?

No

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Infectious disease epidemiology, modelling and genomics.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Reviewer Report 03 March 2022

<https://doi.org/10.21956/wellcomeopenres.18853.r48342>

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Qifa Song

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The authors use data from a household community cohort to prove that home, work and place of education are the central contributing factor of COVID-19 transmission. The manuscript is clearly written. However, this work has very limited new information. The conclusions are well known and easy to be derived according to the length of exposure time. Moreover, the existing knowledge about similar studies is not well-reviewed. Statistical p values should be provided when there is a comparison.

Is the work clearly and accurately presented and does it cite the current literature?

No

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Clinical epidemiology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.