[2] Transmission risks by setting
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<https://www.imperial.ac.uk/news/209673/covid-19-spread-different-social-settings-imperial/>

In a global analysis of where SARS-CoV-2 transmission takes place, households show the highest transmission rates.

The report, from the Imperial College London COVID-19 Response Team in collaboration with multiple partners also revealed that:

- The chance of an asymptomatic infected person infecting a close contact was 3.5% (95% CI: 0.0%-6.4%), which was approximately a quarter of the 12.8% (95% CI: 8.9%-16.7%) chance for symptomatic infected person infecting a close contact.

- Households show the highest transmission rates among indoor settings compared to other settings such as social gatherings, travel, healthcare, workplace, and casual close contacts.

- Prolonged contact in households and in settings with familiar close contacts increases the potential for transmission of SARS-CoV-2.

- The chance of one household member infecting another is significantly higher when the duration of household exposure is more than 5 days compared to 5 days or less, according to the report.

- Chance of passing on infection in households (the secondary attack rate) estimated to be 21.1% (95% CI: 17.4%-24.8%).

- The average number of people one infected person will infect in the household (the reproduction number) estimated to be 0.96 (95% CI: 0.67-1.32)

The research team conducted a systematic review to estimate the secondary attack rate SAR (probability of onward infection from one infected individual among a defined group of close contacts such as a family group), and the observed reproduction number Robs (the observed average number of secondary cases per index case). The report identified 97 studies, 45 of which met inclusion criteria for meta-analysis.

Understanding where transmission of SARS-CoV-2 takes place is critical to effectively targeting interventions, but evidence of transmission rates in different settings remains limited.

After analysing data from a number of settings including households, social gatherings with friends and family, travel, healthcare, workplace, and casual close contacts (such as strangers during shopping at a supermarket), researchers found that households show the highest transmission rates with a 21.1% (95% CI: 17.4%-24.8%) pooled secondary attack rate and 0.96 (95% CI: 0.67-1.32) pooled observed reproduction number.

The team also find that the chance of one household member infecting

another is significantly higher when the duration of household exposure is more than 5 days compared to 5 days or less.

The researchers also point out that the majority of studies included in the pooled analysis came from China, where strict control policies were implemented which could limit the generalisability of estimates.

Infection risk from friends and family

Secondary attack rates related to familiar and prolonged close contacts were higher (such as social events with family and friends, 5.9% (95% CI: 3.8%-8.1%) than those related to low-risk casual contacts (such as strangers, 1.2%, 95% CI: 0.3%-2.1%). In addition, where the initial case was asymptomatic, the secondary attack rate was estimated to be two thirds lower (3.5%, 95% CI: 0.0%-6.4%) than when the index case had symptoms (12.8%, 95% CI: 8.9%-16.7%, p = <0.001).

The research team looked for differences in transmission by age; there was moderate evidence of less transmission occurring both from and to individuals under 20 years of age in the household context, but insufficient data to determine whether this held in other settings. Prolonged contact in households and in settings with familiar close contacts increases the potential for transmission of SARS-CoV-2. Additionally, the differences observed in transmissibility by symptom status of index cases (that is, whether someone is symptomatic or asymptomatic) and the potential for differing transmissibility by age, has important implications for outbreak control strategies -- such as contact tracing, testing, and rapid isolation of cases.

Contact tracing and testing crucial

Researchers note there were limited data reporting transmission in workplaces, schools, and care-homes, highlighting the need for further research in these settings.

5.1.2e from Imperial College London said:
"Until the widespread deployment of an efficacious SARS-CoV-2 vaccine, governments around the world are faced with the challenge of balancing the social and economic harms caused by restrictive lockdown policies against the resurgence of cases.

Our review examines differences in transmission potential by contact type, setting, and index case characteristics, to help inform how public health interventions can be better targeted in the coming months. With many countries continuing to recommend "stay-at-home" measures, the upcoming festive season and with cases isolating inside households, our results show it is likely that this location will continue to be important in sustaining transmission.

The differences we observed in transmissibility by symptom status of index cases and duration of exposure have important implications for outbreak control strategies, highlighting how contact tracing, testing, and rapid isolation of cases will be crucial. Notably the number of studies we identified from large scale contract tracing studies was limited and highlights the need for continued research into further understanding the locations and types of contact that facilitate transmission, especially in schools and workplaces."

5.1.2e from Imperial College London said: "Understanding the conditions where transmission is more likely to occur is essential in guiding policy interventions to reduce transmission whilst balancing the economic impact. In our report we systematically explore factors that affect transmission, such as age, setting and duration of contact. Our results highlight the importance of targeting interventions in settings where close and prolonged contacts occur, as well as the need for further research to inform policies for reducing transmission in workplaces, schools and care-homes."

5.1.2e 5.1.2e 5.1.2e, report author from Imperial College London added: "This analysis provides some of the 1st evidence that asymptomatic infections are substantially less infectious than symptomatic cases. It also reinforces growing evidence of the importance of household transmission, especially in the context where symptomatic cases are not isolated outside the home."

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[The full report:
5.1.2e Mousa A, Dighe A, et al. Report 38: SARS-CoV-2 setting-specific transmission rates: a systematic review and meta-analysis; Imperial College London (27 Nov 2020). Available at <https://www.imperial.ac.uk/media/imperial-college/medicine/mrc-gida/2020-11-27-COVID19-Report-38.pdf>.

Summary