

How common are high-risk COVID-19 contacts?

A video-observational analysis of public place behavior in the first year of the pandemic (pre-print, version 1)

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Version 1

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Note that these are preliminary (preprint) results from a not yet peer-reviewed study in progress. The final results will be available at osf.io/7ek9d. The study was financed by the NSCR and ZonMw (projectnumber 10430022010017) and conducted independently by the authors.

Summary

Drawing on video footage from three municipal surveillance cameras in Amsterdam, the Netherlands, this study provides observational insights into the frequency and nature of high-risk COVID-19 encounters in public places. As the literature on transmission of COVID-19 and definitions by the WHO indicate, close contact becomes risky whenever it involves interpersonal touching and long-lasting face-to-face contact. We found that such high-risk contacts were relatively uncommon: across the average observation time of 27 seconds, 0.7% of 7,814 individuals observed were involved in such contact. By contrast, the majority (78%) of persons were observed moving with a 1.5 meters radius of another member of the public. Given the relatively low incident rate of high-risk contacts, the current results indicate that public health agencies should be less concerned about such risk behaviors in public places.

Background

Not every violation of social distancing directives is equally risky for transmission of the COVID-19 virus. Research indicates that the longer a person is in close proximity to an infected person, the higher the risk of transmission is (Duong-Ngern et al. 2020; Ying & O'Clery 2021). In line with this, the World Health Organization defined risky close contact as face-to-face contact with a probable or confirmed COVID-19 case within one meter and for at least 15 minutes, or direct physical contact with a probable or confirmed COVID-19 case (WHO 2020). However, most studies focussing on the effects of and compliance with social distancing measures do not adhere to this definition. Most often, they study self-reported social distancing compliance without attention to the nature of the contact (Bielecki et al. 2021)—or they use mobility data to infer social distancing behaviors (e.g., McCrail et al. 2020; Nouvellet et al. 2021; Yilmazkuday 2021) without attention to whether people stay on distance from strangers when being on the move. With the reopening of society, including decisions about whether to open both indoor and outdoor leisure activities, it is valuable for policymakers to know the frequency and nature of high-risk contacts in outdoor settings.

Earlier studies proved that behavior in outdoor settings is less risky for transmissions of the COVID-19 virus than behavior in indoor settings (Bulfone et al. 2021; Weed & Foad 2020). Although these studies did not take the 15-minute rule into account for their definition of high-risk contact, several do find that risks for transmissions coincide with the duration of the contact. To gain more insight into the frequency and nature of high-risk contacts in outdoor settings, and therefore whether and what type of outdoor behaviors should be considered risky by policymakers, we studied

the nature and frequency of contacts between people on the streets of Amsterdam, drawing on video observations of footage from municipal surveillance cameras.

Method

A high-risk contact was defined as an encounter between two or more people who did not enter the scene together, and (a) are in less than one-meter proximity for longer than ten seconds, or (b) touch each other. Using footage of three municipal surveillance cameras in Amsterdam, the Netherlands, we observed high-risk contact encounters on the streets. The three cameras were distributed across different parts of Amsterdam (i.e., Buikslotermeerplein, Leidssestraat, and Bijlmerplein). The Amsterdam Police Department stored recordings of every Thursday and Saturday between 9 AM and 9 PM in the period March 2020 to March 2021. Note that the study has been approved by the Ministry of Internal Affairs (PaG/BJZ/49986). In the available data, the behavior of every third person crossing an imaginary selection line on the screen between 1 and 1.30 PM was sampled. During the coding process, we noted down whether or not a person was involved in a high-risk contact. When they were, we gave a qualitative description of this contact and coded the gender and age of the people involved, whether or not there was hand- or body contact involved, and whether or not the persons involved were evaluated to be acquainted.

Further, we recorded what type of situation the person was involved in, distinguishing between seven categories: 1) touching without prolonged contact, indicating that people did not stay in close proximity for longer than ten seconds but did touch each other; 2) queueing, indicating two or more people standing in line for a shop; 3) asking questions, indicating two or more people involved in an informative encounter; 4) subconscious proximity, indicating two or more people walking or standing close to each other without noticing; 5) catching-up, indicating two or more people who meet on the street, talk with each other and leave the scene separately; 6) meeting, indicating two or more people who meet on the street, talk with each other and leave the scene together; and 7) returned in-group, indicating two people meeting on the street who seem to have been waiting on each other and leave the scene together. The observed high-risk encounters did not involve people evaluated to belong to the same household, as they did not enter the scene together. All encounters observed should have therefore involved social distancing according to the directives of the government.

Results

In total, we observed the behavior of 7,814 persons. Within the average observation time of 27 seconds, 78% (CI 95% [77%, 79%]) moved within a 1.5-meter proximity from another person at least one time during the observation, and 59% (CI 95% [57%, 60%]) of the people moved within a 1-meter proximity from another person at least one time. By comparison, only 0.7% (CI 95% [0.5%, 0.9%]) of the people moved within 1-meter proximity from another person for longer than ten seconds or touched another member of the public. Following the literature and WHO's definition of high-risk COVID-19 behavior, only these 0.7 percent of the people were involved in close contact that poses a risk for transmission of the COVID-19 virus during the observation time. Our results thus suggest that high-risk behavior was relatively uncommon in public places. However, it should be noted that the risk accumulates as the person moves thoughout the city, but high-risk contacts are disproportionally much less common than incidents where people move shortly within a 1.5-meter radius of each other.

Furthermore, our analysis shows that it is not in specific situations that high-risk contacts occur—we present these results below.

High-risk contacts with acquaintances

In 54% of the high-risk contacts, we evaluated that people knew each other beforehand. These contacts involve touching without prolonged contact, catching up, meeting, and returned in-group. In 90% of these cases, the contact became risky due to the fact that it lasted longer than ten seconds. Almost half of these encounters, specifically 42%, involved touching aside from the prolonged contact. For example, two people bump into each other on the street and catch up for a moment:

A man walks down a shopping street, which consists of one wide walking area with shops on either side and benches here and there on the side of the street. This street is situated in the North of Amsterdam. The camera is located at a high angle at the end of the street, so that you can see people walking through the street toward as well as away from the camera. In the middle of the street, the man passes another man and turns his head. The two men walk toward each other, shake hands and bump fists. They talk for a short moment, then they bump fists again, and each continue their walk down the street in separate directions.

In the remaining 10% of the cases, the contact turned risky because it involved touching, although it did not last longer than ten seconds. For example, a boy who approaches a girl on the street and hugs her:

A boy is walking down the same shopping street that was described in the previous example. As he nearly approaches the end of the street, which is in the front of the screen, he laughs and spreads his arms. A girl comes walking in the screen from the opposite direction. She walks toward the boy with open arms, and they hug. The boy places his hand on the girl's back, and together they enter the shopping mall on their right.

High-risk contacts with strangers

In 46% of the high-risk contacts, we evaluated that people did not know each other beforehand. These contacts involve touching without prolonged contact, queueing, asking questions, and subconscious proximity. In 88% of these cases, the contact became risky because it lasted longer than 10 seconds and, in 14% of these cases also involved touching. An example of this prolonged contact involves two women queueing in front of the butcher shop without keeping a 1-meter distance between them:

A woman comes walking down a shopping street which consists of two wide walking areas, separated by trees with benches around them in the middle. Shops are located on the left as well as the right side of the street, and far in the back you can see the Bijlmer train station. The street is situated in the South-East of Amsterdam. The woman walks in the direction of the butcher shop. Another woman comes from the opposite direction and stops in front of the butcher shop. The two woman both enter the queue before the shop, but do not keep 1-meter distance in between them. The first woman does a step forward, the second woman follows. Then, the first woman enters the shop.

In the other 12% of the cases, the contact became risky because it involved touching, although it did not last longer than ten seconds. For example, a lady who brushes her shoulder against the shoulder of someone passing her:

Several people are walking up and down the shopping street that was already described in the first two examples. A lady walks towards the camera in quite a rush. She passes a group of people walking in opposite direction right through the middle, and thereby brushes her shoulder against the shoulder of a woman that is part of the group that is passing her. They both walk on and share no look.

Discussion

In public places, people frequently move within a 1.5-meter radius of other people, but they rarely remain within close distance for any prolonged time period. According to the prior literature, only prolonged contact poses a high risk for transmission of the COVID-19 virus. Furthermore, when following the definition of a close contact by the WHO, stating that encounters that last more than 15 minutes or involve touching are a risk for transmission, only 0.3% of the people observed are involved in such high-risk contacts. None of the observed encounters lasted 15 minutes or longer. Our results indicate that the majority of outdoor behavior poses a limited risk of COVID-19 transmission. Furthermore, only one third of the people involved in high-risk contacts touch each others. The rareltively rare occurrence of this phenomenon might indicate that the usual greeting styles of handshakes, hand-touching-gestures, and face kissing are rare, and might have changed into different forms during the pandemic. This needs further investigation. Further, we note that the observed risk encounters do not occur in specific types of situations and, therefore, would be difficult to intervene towards with policy measures.

Our study adds a behavioral component to existing studies of COVID-19 transmission risks in outdoor settings by establishing that people often violate the 1.5-meter rule but rarely engage in high-risk contacts in outdoor settings. Therefore, policymakers should consider focusing their efforts on social distancing directives in indoor settings and perhaps even change the message of the 1.5-meter society to an 'indoor 1.5-meter society.'

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