

SYNOPSIS

04/08/2021

Review of “Epidemiologic evidence for airborne transmission of SARS-CoV-2 during church singing, Australia, 2020”

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One-Minute Summary

- Twelve secondary cases of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) were linked to an index case, an 18 year old chorister with symptom-onset of July 16 and positive test July 17, who sang at four one-hour services, one each on July 15 and 16, and two on July 17.
- Five secondary cases were linked to exposures on July 15, seven were linked to exposures on July 16. There were no secondary cases in contacts who only attended a service on July 17 (1 case attended on July 16 and 17).
 - The overall secondary attack rate was 2.4% (12/508, 434 were tested). Secondary attack rates were 2.3% (5/215, 169 were tested) and 5.8% (7/120, 108 were tested) on July 15 and 16, respectively.
 - Five secondary cases were from the same household and transmission within the household could not be excluded.
 - No other exposures to SARS-CoV-2 were reported by secondary cases outside the services. Sequencing of the index and 10 of 12 secondary case samples indicated a single genomic cluster.
 - No secondary cases were detected from either one-hour services on July 17 despite 91% (157/173) of contacts tested.
 - No other choristers developed symptoms or tested positive.
- The index case was seated at a piano raised approximately three metres from the ground floor and facing away from the secondary cases. The index case, confirmed by video recordings, did not have close contact with any of the secondary cases who were sitting between 1-15 metres from the index case, suggesting transmission via inhalation of aerosols at distances up to at least 15 metres.
- Masks were not required and there was minimal ventilation during the service (ventilation system was off, fans were off, and doors and windows were largely closed).
- High viral load and singing, which creates more respiratory aerosol particles and droplets than talking, combined with a lack of ventilation were noted as important factors for spread.

Additional Information

- Cycle threshold values were 14.5 and 16.8 for envelope and nucleocapsid genes, respectively, in the index case on July 17.
- Time from exposure to symptom-onset of secondary cases ranged from two to 12 days for exposures on July 15, and two to 10 days for exposures on July 16.
- Seating locations of churchgoers within the circular seating layout that surrounds a stage were verified by video recording, except for two who described their location. All secondary cases were seated in four out of 16 sections of seats, which were located below the choir loft where the index case was situated (above the main entry) and the three adjacent sections clockwise.
 - Relatively more attendees sat at the front of the church (furthest away from the index case), compared to the sides or back of the church.
- Contacts were tested within 17 days (14-day incubation period plus 3 days) of the last exposure date.
 - Some cases may have been missed due to testing too early during asymptomatic infection.
 - Whole genome sequencing was performed for the index case and the 10 secondary cases that had sufficient virus volume for sequencing, and there was a maximum of two nucleotide changes from the index case, supporting the sequences as clonal.

PHO Reviewer's Comments

- The observed attack rate was lower compared to household secondary attack rates consistent with close contact as an important transmission risk factor.¹ This outbreak report highlights important risk factors for transmission including singing while infectious, lack of source control masking (index case unmasked), exposure during the presymptomatic period, and a poorly ventilated indoor space.
- There is insufficient information to hypothesize why a limited section of the whole church was the location of all detected secondary cases compared to a more homogenous location of secondary cases, particularly when the index case was facing away from the affected area. No data were provided on the position of the other choristers who were closer to the index case.
- There was no explanation provided by the authors for why there were no cases on the date when the chorister became symptomatic with respiratory tract symptoms.
- There was no comment to confirm lack of potential fomite exposures (e.g. hymnals, leaflets), and no comment to rule out movement of secondary cases during the service (e.g. processing up the aisle for communion, etc.).
- While the church was inspected to assess ventilation, there were no airflow studies or hypotheses included in the investigation. Thus, airborne transmission as proposed by the authors was possible in this situation; however, additional data would be helpful and direct evidence of airborne transmission is not provided.
- Three of the 4 secondary cases seated in the furthest section (cases 7, 8, and 12) were household contacts of case 13 who sat at a 1 metre horizontal distance from the index case. However, even if these household cases are excluded, several secondary cases sat well beyond a 2 metre distance.
- This outbreak report highlights singing, inadequate ventilation, and a lack of masking for source control as risk factors for COVID-19 transmission in indoor environments. Additional epidemiological and environmental data would be helpful to augment the study findings.

Additional References

1. Madewell ZJ, Yang Y, Longini IM Jr, Halloran ME, Dean NE. Household transmission of SARS-CoV-2: a systematic review and meta-analysis. *JAMA Netw Open*. 2020;3(12):e2031756. Available from: <https://doi.org/10.1001/jamanetworkopen.2020.31756>

Citation

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