



## Choirs and COVID-19

### Disclaimer:

This *Quick Response Report* was originally published on May 20, 2020 and updated on June 3, 2020. Given the rapidly changing nature of the coronavirus pandemic, some of the references included in this report may quickly become out-of-date. We further caution readers that researchers at the Newfoundland & Labrador Centre for Applied Health Research are not experts on infectious diseases and are relaying work produced by others. This report has been produced quickly and it is not exhaustive, nor have the included studies been critically appraised.

Readers will note that some text below has been highlighted for emphasis.

### Original Request

**What is the risk of acquiring COVID-19 associated with singing in a choir? There are 3.5 million Canadians singing in 28,000 choirs; so this is a significant issue. We need to know how to advise these singers later in the recovery process, so that they can resume an important recreational and social function in relative safety. We are not interested in “virtual” performances.**

### Summary of Findings

- Evidence suggests that the COVID-19 virus is spread through droplet transmission and possibly also through airborne transmission via aerosols.
- Transmission occurs through both normal speech and singing, in addition to the more commonly understood routes of sneezing, coughing, etc. Singing involves greater risk than normal speech, and singing loudly involves greater risk than singing softly.
- Environmental factors that influence transmission include ventilation, humidity, temperature, and duration. Close contact and large gatherings are known to contribute to spread of the virus and may lead to “super spreading”/“super emission” events.
- Personal factors that influence transmission include loudness and phonetics. Some individuals may be “super-emitters”. Examples of super-emission have been observed with choir singing groups.
- At this time, guidance from a range of authorities recommends against gathering in groups in general and against in-person choir singing in particular.

### Guidance from the Choir Community

National Association of Teachers of Singing. **A Conversation: What do science and data say about the near term future of singing?** May 5, 2020. [LINK](#) (1)

- Webinar with Dr. Lucinda Halstead, otolaryngologist, Founder and Medical Director, Evelyn Trammell Institute for Voice and Swallowing, Medical University of South Carolina; and Dr. Donald Milton, Professor of Environmental Health, University of Maryland School of Public Health, with a secondary appointment in the School of Medicine.
- There is no safe way for singers to rehearse together until there is a COVID-19 vaccine and a 95% effective treatment in place.
- Vaccine development and implementation timeline is 18-24 months at best.
- There is no spacing solution for singing groups that would eliminate risk.
- Masks do not provide safe methods for singing in groups
- Current standard testing still has 3-5% false negatives and rapid tests are not sensitive enough for large group testing.

#### Related articles:

- Barbershop Harmony Society. **Webinar Notes: Science and the Near-Term Future of Singing**. May 8, 2020 [LINK](#) (2)
- Finklestein. **NATS Panel of Experts Lays Out Sobering Future for Singers: "No Vaccine, No Safe Public Singing"**. May 7, 2020 [LINK](#) (3)
  - Halstead: criteria for group singing:
    - "Acceptance of Risk: Groups would have to accept a level of risk of someone having COVID-19 in a rehearsal or a performance; and
    - "Testing at Home and Screening at the Door: Singers would need to undergo home PCR tests and symptom screening at the door, checks of temperature as well as oxygen saturation in the blood via pulse oximetry."
- Halstead. **A Conversation: What Do Science and Data Say About the Near -Term Future of Singing**. Webinar slides, May 5, 2020 [LINK](#) (4)
- Keyes. **Choirs may have to remain silent long after society reopens**. May 9, 2020 [LINK](#) (5)
  - "There is no safe way for singers to rehearse as a group until there is a vaccine and a 95 percent-effective treatment for COVID-19, the disease caused by the coronavirus, and it could be two years before both happen, a national panel of music and medical experts told choral directors this week. That message, delivered in a webinar on Tuesday night, sent shockwaves across the global music community."
- Milton. **Transmission Perspective on COVID-19 and the Future of Singing**. Webinar Slides, May 5, 2020 [LINK](#) (6)

#### Seelig. **Choral Singing in the Time of COVID-19**. May 5, 2020. [LINK](#) (7)

- "This is not a scholarly research paper. It is a user guide to allow us to ponder a new world of choir rehearsals ahead. It is specifically written for SFGMC leadership."
- Also provides a strategy for their chorus to sing with appropriate social distancing using an online app to work out spacing ([LINK](#)).

#### Nelson. **Singing, the Church, and COVID-19: A Caution for Moving Forward in Our Current Pandemic**. April 29, 2020. [LINK](#) (8)

- Provides information on aerosol transmission, singing and disease transmission, an informal scoping review of the limits of knowledge (partially referenced).
- "There are still a lot of questions, and many things we don't know about SARS-CoV-2. However, there is a great deal of consensus among my colleagues around the country who are voice researchers, SLPs, and voice teachers. We are almost all in agreement that singing together now is not safe enough."

Gala Choruses Blog. **Staying Healthy, Connected, and Musical during Uncertain Times.** March 9, 2020. [LINK](#) (9)

- Blog post that includes rehearsal guidelines and alternatives to in-person singing

## Guidance from Health Authorities

Government of Alberta. **Restrictions on gatherings.** March 25, 2020 with update in progress. [LINK](#) (10)

- Any gatherings with fewer than 15 people must not include activities that could promote disease transmission. This includes singing, even at religious gatherings. Singing in groups is a high risk activity as it promotes the transmission of the virus through respiratory droplets. Precautions should be taken, including:
  - keeping singers completely separate from the audience and each other by live streaming individuals singing separately
  - limiting the number of people singing in the same place to the fewest possible
  - having people sing facing away from others or otherwise creating separation using a barrier such as Plexiglas
- There is no evidence to determine exactly what a safe distance would be between singers and others, but greater distances can reduce risk.

PHAC. **Risk-informed decision-making for mass gatherings during COVID-19 pandemic.** April 3, 2020 (Archived). [LINK](#) (11)

- Activities that could contribute to spread: greetings (handshakes, hugs, kisses), singing, cheering, close physical contact such as when participating in contact sports... etc.

Health Canada. **Coronavirus disease (COVID-19): Prevention and risks.** May 12, 2020. [LINK](#) (12)

- In an effort to prevent the spread of COVID-19 within communities and across the country, all Canadians are advised to "not gather in groups"
- The risk for COVID-19 may be increased for certain settings such as: gatherings (spiritual and cultural settings, theatres, sports arenas, festivals and conferences)

## Additional Sources

- CDC. **Interim Guidance for Administrators of US K-12 Schools and Child Care Programs.** March 19, 2020 [LINK](#) (13)
  - "Cancel or modify classes where students are likely to be in very close contact. For example, in physical education or choir classes, consider having teachers come to classrooms to prevent classes mixing with others in the gymnasium or music room)."
- CDC. **Get Your Mass Gatherings or Large Community Events Ready.** March 15, 2020. [LINK](#) (14)
- WHO. **Modes of transmission of virus causing COVID-19: implications for IPC precaution recommendations.** March 29, 2020. [LINK](#) (15)
  - "Droplet transmission occurs when a person is in in close contact (within 1 m) with someone who has respiratory symptoms (e.g., coughing or sneezing) ..."
  - "In the context of COVID-19, airborne transmission may be possible in specific circumstances and settings in which procedures or support treatments that generate aerosols are performed."

## Systematic Reviews

Chu et al. **Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis.** The Lancet, June 1, 2020. [LINK](#) (16)

- “From a policy and public health perspective, current policies of at least 1 m physical distancing seem to be strongly associated with a large protective effect, and distances of 2 m could be more effective.”
- “At the moment, although there is consensus that SARS-CoV-2 mainly spreads through large droplets and contact, debate continues about the role of aerosol, but our meta-analysis provides evidence (albeit of low certainty) that respirators might have a stronger protective effect than surgical masks.”

Quentin et al. **What settings have been linked to SARS-CoV-2 transmission clusters?** Wellcome Open Research, May 1, 2020. [LINK](#) (17)

- “We found that clusters of cases were reported in many, predominantly indoor, settings. Most clusters involved fewer than 100 cases, with the exceptions being in... large religious gatherings.”

## Other Reviews

Anderson et al. **Consideration of the Aerosol Transmission for COVID-19 and Public Health.** May 01, 2020. [LINK](#)

- “The weight of the available evidence warrants immediate attention to address the significance of aerosols and implications for public health protection.”
- “Infections that are known to manifest in the respiratory tract can often be expected to generate aerosols from breathing, talking, singing, coughing, and sneezing. These aerosols are likely to create longer-range transport and potential infection from the pathogens.”

Mascolini. **Studies Stoke Concern about Coronavirus Contagion through Air via Speech....correction.** May 5, 2020. [LINK](#) (18)

- “Accumulating evidence indicates that simply speaking can emit coronavirus-containing particles that waft through tens of meters of air, hover there, and possibly transmit SARS-CoV-2 to a person who inhales these virus-tainted aerosols.”

## Expert Opinion

CDC. **High SARS-CoV-2 Attack Rate Following Exposure at a Choir Practice — Skagit County, Washington, March 2020.** Released May 12, 2020 [LINK](#) (19)

- “Following a 2.5-hour choir practice attended by 61 persons, including a symptomatic index patient, 32 confirmed and 20 probable secondary COVID-19 cases occurred (attack rate = 53.3% to 86.7%); three patients were hospitalized, and two died. Transmission was likely facilitated by close proximity (within 6 feet) during practice and augmented by the act of singing.”
- “The potential for super-spreader events underscores the importance of physical distancing, including avoiding gathering in large groups, to control spread of COVID-19.”

Bromage. **The Risks - Know Them - Avoid Them.** May 6, 2020. [LINK](#) (20)

- “Singing, to a greater degree than talking, aerosolizes respiratory droplets extraordinarily well. Deep-breathing while singing facilitated those respiratory droplets getting deep into the lungs.”

Morawskaa and Cao. **Airborne transmission of SARS-CoV-2: the world should face the reality.** April 10, 2020. [LINK](#) (21)

- “Considering the many similarities between the two SARS viruses and the evidence on virus transport in general, it is highly likely that the SARS-CoV-2 virus also spreads by air.”
- “Therefore, all possible precautions against airborne transmission in indoor scenarios should be taken. Precautions include increased ventilation rate, using natural ventilation, avoiding air recirculation, avoiding staying in another person’s direct air flow, and minimizing the number of people sharing the same environment”

Asadi et al. **The coronavirus pandemic and aerosols: Does COVID-19 transmit via expiratory particles?** April 3, 2020. [LINK](#) (22)

- “A ten-minute conversation with an infected, asymptomatic super-emitter talking in a normal volume thus would yield an invisible “cloud” of approximately 6,000 aerosol particles that could potentially be inhaled by the susceptible conversational partner or others in close proximity.”

### Additional Sources

- Drossinos and Stilianakis. **What aerosol physics tells us about airborne pathogen transmission.** April 13, 2020. [LINK](#) (23)

### Primary Research

Stadnytskyi et al. **The airborne lifetime of small speech droplets and their potential importance in SARS-CoV-2 transmission.** May 13, 2020. [LINK](#) (24)

- Abstract: “Speech droplets generated by asymptomatic carriers of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) are increasingly considered to be a likely mode of disease transmission. Highly sensitive laser light scattering observations have revealed that **loud speech can emit thousands of oral fluid droplets per second.** In a closed, stagnant air environment, they disappear from the window of view with time constants in the range of 8 to 14 min, which corresponds to droplet nuclei of ca. 4 µm diameter, or 12- to 21-µm droplets prior to dehydration. **These observations confirm that there is a substantial probability that normal speaking causes airborne virus transmission in confined environments.**”

Asadi et al. **Aerosol emission and superemission during human speech increase with voice loudness.** February 20, 2019. [LINK](#) (25)

- “Here we show that **the rate of particle emission during normal human speech is positively correlated with the loudness (amplitude) of vocalization,** ranging from approximately 1 to 50 particles per second (0.06 to 3 particles per cm<sup>3</sup>) for low to high amplitudes, regardless of the language spoken (English, Spanish, Mandarin, or Arabic). Furthermore, a small fraction of individuals behaves as “speech superemitters,” consistently releasing an order of magnitude more particles than their peers.”

van Doremalen et al. **Aerosol and Surface Stability of SARS-CoV-2 as Compared with SARS-CoV-1.** April 16, 2020. [LINK](#) (26)

- “SARS-CoV-2 remained viable in aerosols throughout the duration of our experiment (3 hours)...”
- “Our results indicate that aerosol and fomite transmission of SARS-CoV-2 is plausible, since the virus can remain viable and infectious in aerosols for hours and on surfaces up to days (depending on the inoculum shed).”

## Additional Sources

- Wei et al. **Presymptomatic Transmission of SARS-CoV-2 — Singapore, January 23–March 16, 2020.** April 10, 2020. [LINK](#) (27)
- Bourouiba. **Turbulent Gas Clouds and Respiratory Pathogen Emissions: Potential Implications for Reducing Transmission of COVID-19.** March 26, 2020. [LINK](#) (28)
- Asadi et al. **Effect of voicing and articulation manner on aerosol particle emission during human speech.** January 27, 2020 [LINK](#) (29)

The following articles are preprints and have not been peer-reviewed. They report new medical research that has yet to be evaluated and so should not be used to guide clinical practice.

- Streeck et al. **Infection fatality rate of SARS-CoV-2 infection in a German community with a super-spreading event.** May 8, 2020. [LINK](#) (30)

## News Articles

Elemental. **Why Singers Might Be Covid-19 Super-Spreaders.** May 6, 2020. [LINK](#) (31)

- “Saying “aah” for 30 seconds produces twice as many particles as coughing nonstop for the same amount of time... And singing, according to research done on the spread of tuberculosis, may produce six times the rate of small airborne droplets as speaking does.”
- “In fact, almost everything about singing seems to create more (potentially virus-spreading) aerosols... The rate at which you inhale or exhale affects the number of particles you emit,” he says. Deep, slow breathing followed by a fast exhale would produce the fewest particles. The greatest number would come from quick inhalation (causing a more violent film burst) followed by slow and prolonged exhaling. ‘That’s kind of a description of singing’.”

Nature. **Is the coronavirus airborne? Experts can’t agree.** April 2, 2020 [LINK](#) (32)

- Reports on the following:
  - Liu, Y. *et al.* **Aerodynamic Characteristics and RNA Concentration of SARS-CoV-2 Aerosol in Wuhan Hospitals during COVID-19 Outbreak.** Preprint at bioRxiv <http://doi.org/dqts> (2020) (33)
  - Ong, S. W. X. *et al.* **Air, surface environmental, and personal protective equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from a symptomatic patient.** *J. Am. Med. Assoc.* <http://doi.org/ggngth> (2020). (34)
  - Santarpia, J. L. *et al.* **Transmission potential of SARS-CoV-2 in viral shedding observed at the University of Nebraska Medical Center.** Preprint at medRxiv <http://doi.org/dqtw> (2020). (35)

The Atlantic. **Everyone Thinks They’re Right About Masks: How the coronavirus travels through the air has become one of the most divisive debates in this pandemic.** April 1, 2020. [LINK](#) (36)

- “When WHO asserts that the new coronavirus is “NOT airborne,” it’s claiming that the virus instead spreads primarily through the close-splashing droplets, which either land directly on people’s faces or are carried to their faces by unwashed, contaminated hands. Such messaging is “really irresponsible,” argues Don Milton, an expert in aerosol transmission at the University of Maryland. The scientific community doesn’t even agree about whether aerosol transmission matters for the flu, so “to say that after three months we know for sure that this [new] virus is not airborne is ... expletive deleted,” he says.”

Los Angeles Times. **A choir decided to go ahead with rehearsal. Now dozens of members have COVID-19 and two are dead.** March 29, 2020. [LINK](#) (37)

- Skagit Valley Choir outbreak in which 45 of 60 attendees were diagnosed with Covid-19 after a 2.5hr choir practice.
- “One of the authors of that study... said it’s possible that the forceful breathing action of singing dispersed viral particles in the church room that were widely inhaled.”
- Related article: Skagit Breaking News. **Covid-19 Virus Devastates Skagit Valley Chorale Group.** April 30, 2020. [LINK](#) (38)

### Additional Sources

- New York Times. **Coronavirus Ravaged a Choir. But Isolation Helped Contain It.** May 12, 2020. [LINK](#) (39)
- The Guardian. **Germany to set out rules for religious services including singing ban.** Updated May 5, 2020. [LINK](#) (40)
  - “Virologists also believe singers could absorb many more particles as they tend to breathe deeper into their diaphragms than they would during normal breathing.”
- RTL. **Robert Koch Institute: We have worked together to achieve success.** April 28, 2020 [LINK](#) (41)
  - Translated: The RKI chief gave the population a warning: "Droplets fly particularly far when singing."
- Vanity Fair. **Five Surprising Facts About the Novel Coronavirus.** April 23, 2020. [LINK](#) (42)
  - “Enclosed spaces in which people raise their voices together have time and again proven to be the sites of major outbreaks.”
- Business Insider. **Speech and singing might spray the coronavirus further than 6 feet. Here's what that means for loud talkers.** April 8, 2020. [LINK](#) (43)
  - “When people give exhalations that require more energy, like singing or screaming, the droplets they emit can travel beyond to a distance of six feet.”
- Live Science. **COVID-19 may spread through breathing and talking — but we don't know how much.** April 7, 2020. [LINK](#) (44)
- Hartford Healthcare. **These Are the Ways COVID-19 is Transmitted (Or Not).** Updated March 19, 2020. [LINK](#) (45)

## Methodology

Newfoundland and Labrador Centre for Applied Health Research (NLCAHR) COVID-19 Quick Response reports are initiated by, and shared with, our partners in the provincial health system, including the four Regional Health Authorities, the Departments of Health and Community Services and Children, Seniors and Social Development, and public health officials.

NLCAHR staff work with topic submitters to clarify the research question. We then search for related systematic reviews, meta-analyses, other reviews, interim and other guidance statements, primary research, expert opinion and health and science reporting.

We use several search strategies, with a focus on the following databases:

- [Alberta Health Services](#)
- [CADTH](#)
- [Canadian Pharmacists Association](#)
- [Campbell Collaboration](#)
- [Cochrane Collaboration](#)
- [Centre for Disease Control](#)
- [Centre for Evidence Based Medicine](#)
- [Evidence for Policy and Practice Information and Co-ordinating Centre](#)
- [European Centre for Disease Prevention and Control](#)
- [Health Canada](#)
- [HIQA \(Ireland\)](#)
- [Joanna Briggs Institute](#)
- [MedRxiv](#)
- [National Collaborating Centres on Methods and Tools \(NCCMT\)](#)
- [National Institutes of Health](#)
- [National Institute of Allergy and Infectious Diseases](#)
- [National Library of Medicine](#)
- [Public Health Agency of Canada](#)
- [Trip Database](#)
- [World Health Organization](#)

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