

## Summary of COVID-19 Pandemic Characteristics Pertaining to Resumption of Congregational Singing

The goal of this document is to summarize some of the key observations and research related to COVID-19 as it relates to the discussion of when and how to resume congregational singing at Redeemer. It is not exhaustive, but is an attempt to summarize what has been gleaned over the last year to put the discussion of singing in the context of what we know and what we do not know. The issues are complex, often filled with uncertainties and thus open to variable interpretation. Much of the scientific research that has been done has produced only preliminary results given the relatively short time span of the pandemic. Many of the observations reported in the media and elsewhere may often be incomplete in detail and/or biased, making it difficult to draw realistic conclusions. We have attempted to provide as accurate and unbiased summary and interpretation of these findings as we could.

### Determinants of risk of contracting COVID

- A. **Mechanism of transmission:** Large droplets and small aerosolized particles from the lungs and mouth carrying the virus are spread through the air when an infected person breathes, talks, sings, coughs or sneezes. These particles, with the attached virus, are then inhaled into the lungs or become attached to the mucus membranes of the nose, mouth and eyes of susceptible individuals when they come in close contact with the infected person. This can lead to infection in susceptible individuals. Less frequently, the susceptible person may acquire the virus by touching objects that are contaminated with the secretions of an infected person, and then transferred to mucous membranes by touching the face, mouth, and eyes.
- B. **How much virus is transmitted by an individual** is variable and is dependent on several issues: Individuals appear to be most infectious in the 2-3 days prior to onset of symptoms and the first 2-3 days after symptoms start, with likelihood of contagiousness decreasing as time goes on. Some people have been identified as “super spreaders”, emitting larger amounts of virus than others. The activity the infected person is engaged in at the time also determines how much virus may be produced in the droplets and aerosols: Singing and loud talking produce significantly more aerosols and droplets than talking quietly or just breathing.
- C. **The number of people in the community that are infected with the virus** (prevalence of disease). The more people that are infected, the greater the likelihood one will come in contact with an infected person and thus the greater likelihood of transmission. This also applies to the size of a gathering of individuals: the more people in a group, the greater the likelihood there will be at least one individual who is infected and may transmit to other individuals in the group. The more prevalent the virus is in the community, the riskier gathering in groups becomes.
- D. **The activities an individual engages in within the community.** The more an individual has contact with other individuals in a community, the greater the risk of coming in contact with an infected person, and acquiring the virus. Healthcare workers, police, people working in grocery or other retail businesses, hospitality industry, food processing, etc. are greatest risk, especially in urban communities. Rural communities, farmers, other businesses and activities that usually have less contact with other individuals outside of their household,

and people working from home may be at lower risk unless the prevalence of the virus is high in those communities. Elderly and the retired living in the community who can voluntarily restrict contact with others are also at lower risk. Attending events with large numbers of people, for example, sporting events, bars and restaurants, and concerts have an elevated risk of contracting the disease.

- E. **Other factors** influencing the risk of contracting COVID-19:
- a. **The distance one is from the infected individual.** Most of the large droplets produced with coughing and sneezing quickly fall from the air within a distance of 1-2 feet. Aerosols have been generally limited to a dispersion of less than six feet; however, forceful expulsion of aerosols with loud talking and singing, coughing and sneezing, has been documented to be able to travel several feet beyond that when unmasked.
  - b. **How much time is spent near the infected individual.** Aerosols have been documented to remain suspended in the air for several minutes to several hours depending on amount of fresh air that is moving in that space.
  - c. **What was the type of environment in which contact with the infected person occurred.** Outdoor spaces carry the least risk, and also larger indoor spaces with frequent fresh air exchanges. Small confined spaces indoors with little or no air circulation are high risk environments.

#### **Actions that can be done to reduce risk of infection**

- A. **Avoid large gatherings, especially if indoors**
- B. **Avoid activities that result in frequent prolonged contact with others in the community**
- C. **Avoid people who are ill, or who are engaged in activities that put them at higher risk of becoming infected**
- D. **Wash hands frequently**
- E. **Avoid touching the face or eyes**
- F. **Maintain adequate social distance.** Recommendations are to maintain a distance of at least six feet from others not in the same household.
- G. **Minimize the amount of time spent with others.**
- H. **Wear a mask.** Research studies have consistently demonstrated a reduction in large droplets and much of the aerosols with use of face coverings. How well they block release of these respiratory secretions does vary significantly: medical grade, well fitted N-95 masks are the very best, well-fitted medical grade (Level 3) surgical masks are next followed by cloth masks that are made with at least 2 layers (preferably 3) of woven material and fit snugly against the face; gaiters and handkerchiefs are least effective. Epidemiological observations conclude that countries requiring masks have been able to slow the spread of the virus significantly. Wearing of masks by patients and healthcare workers in the hospital setting has substantially reduced the risk of healthcare workers being infected in the workplace.
- I. **Provide adequate Ventilation.** Almost all studies of mitigation strategies stress the importance of providing adequate ventilation in combination with the other strategies in reducing risk of transmission of the virus. Activities that occur outdoors are the safest. Indoor ventilation with frequent exchanges of fresh air and circulation of the air are

important. In addition, mechanisms to remove the viral particles from the air are also recommended. This includes filters with high MERV ratings and use of HEPA filters. Portable air purifiers with HEPA filters and designed to the room size are also recommended to improve air quality. New technologies such as UV Light, which kills bacteria and viruses, and Bipolar Ionization which removes potentially infectious particles from the air are also being used, although there is still limited research on how effective they may be. **(For additional details, see the separate document on Ventilation by Michael Harvey)**

### **Evidence Related to Singing**

- A. Singing produces increased amounts of droplets and aerosols compared to simple breathing.** Some research suggests the amounts are similar to loud talking, although others suggest the amounts are greater with singing. Another study noted whispered and breathy phonation produced significantly greater airflow (and therefore probably increased aerosol production) than normal speaking at all levels of loudness.
- B. The amount of aerosol produced is related to the volume of singing, the consonants, the vowels, and the pitch.** Louder volumes and more forceful singing produce more aerosols, as does singing of certain vowels and consonants and singing higher notes.
- C. Well-fitting medical grade surgical masks can block over 90% of aerosols produced when singing.** However, a portion of aerosol particles can be emitted upwards and to the sides as even these masks do not totally seal the sides or over the nose. One study reported aerosol levels in singers wearing masks was comparable with that produced from ordinary speech without masks.
- D. Wind instruments have similar aerosol production as singers, and varies by intensity.** Aerosols can be reduced with the player wearing a mask and the bell of the instrument covering consisting of a MERV 13 filter or surgical mask material.
- E. Caveats to these studies:**
  - a. Small numbers of participants under strict laboratory conditions.**
  - b. Participants were typically professional singers who are trained to breathe and sing differently, potentially releasing lesser amounts of aerosols than the average congregation member singing.**
  - c. It is often difficult to translate the results of these studies into real life situations.** For example, it may be unrealistic for the majority of a congregation to wear well-fitted surgical masks, or even well-fitted cloth masks, thus reducing the effectiveness of particle capture by masks demonstrated in the research setting. Another example: congregational worship is typically characterized by brief periods of singing with longer intervals between chanting or hymns but with much larger numbers of participants than in the research studies.
  - d. Many of the results come from single studies, reporting only preliminary results, and not verified by others.**

### **Choirs and Congregational Singing**

- A. There are multiple examples of churches and choirs associated with COVID-19 outbreaks.** The first notable choir was in Washington State. Other choirs in Amsterdam, Berlin, Spain,

the United States, and elsewhere have been reported. There are many examples of churches identified as sources of outbreaks both in the United States and abroad.

**B. Caveats to the above events:**

- a. **Most of these outbreaks occurred early in the pandemic.** Thus, few mitigation strategies were in place such as social distancing, masks, and appropriate hygiene.
- b. **Details of many of these outbreaks are scant, making it difficult to identify specific causation.**
- c. **Multiple other factors, including singing, were likely involved with these early cases.** Many occurred in the large crowds, close together, in inadequately ventilated venues.
- d. **However, four Christmas Eve worship services in a Massachusetts' church have been associated with a large cluster of cases recently.** This is despite described precautions including: occupancy of only 35%, mask-wearing, social distancing and hand sanitizer access. The speakers and singers were not wearing masks, but were on a stage 16 feet from the first row. Each service was one hour long. It is not clear if there was congregational singing. The type and condition of ventilation system in the church has not been reported. The prevalence of the virus in the community at the time was not noted.
- e. **Many congregations are singing without reports of COVID outbreaks.** This could be related to the extent of virus spread in those communities, mitigation efforts that have been put in place by the churches, characteristics of the congregations as cited above, or other yet to be identified factors. But lack of reports could also be related to inconsistent reporting and contact tracing with failure to identify attendance at a worship service as the source.

**C. Recommendations for Choirs** as informed by the International Performing Arts Aerosol Study:

- a. Outdoor rehearsals are best
- b. Indoor rehearsals with increased outdoor air exchange rate to HVAC maximum
- c. Masks worn at all times. Multi-layered bell covers by all wind instruments
- d. Social distance of 6 feet for singers and instrumentalists
- e. Indoors limited to 30 minutes followed by at least 3 exchanges of indoor air by outdoor air before another group attends
- f. Add HEPA Filtration designed for the size of the room
- g. Practice good hand hygiene

**D. Minnesota Department of Health Directive (1/10/2021)**

- a. Spectators must be separated at all times from performers by at least 12 feet
- b. All people present—spectators and performers—are to wear masks
- c. Maintain social distance of at least 6 feet between performers, and encourage more distance if possible
- d. Reduce rehearsal and performance times
- e. Maintain choral groups of 25 or less; groups of 10 or less should be considered
- f. Congregational singing, group singing, or chanting by attendees is not recommended in indoor ceremonies or services. However, if congregational singing is allowed: household groups must be separated from other household groups by

more than 6 feet, whenever possible; and, must wear masks during the entire service, even when singing or chanting.

- g. Increase ventilation and air exchange rates

## **Conclusions and Recommendations**

**We are ready to cautiously reintroduce congregational singing into our worship services. Although the risk of becoming infected by attendance at a worship service will never be zero and therefore never completely safe, we feel that the risk has been reduced low enough for us to move forward.**

### **A. Our church is prepared for the following reasons:**

- a. **Our members have shown excellent compliance with mask use when in the facility**
- b. **Social distancing practices have been followed**
  - i. Reduced the number of people able to meet in the sanctuary and chapel
  - ii. Seating arrangement maintains at least 6 feet of distance between households
  - iii. Socializing has been limited within the facility before and after services
- c. **Hygienic practices are in place**
  - i. Pews and common areas are cleaned and sanitized after each service
  - ii. Hand sanitizer dispensers are readily accessible throughout the facility and their use has been strongly encouraged
- d. **Length of worship services has been reduced to minimize group contact time**
- e. **Substantial improvement in the ventilation system has been completed** (see the separate document by Michael Harvey for details)
  - i. Installation of a damper system to bring fresh air into the sanctuary and chapel when the outside temperature allows its use
  - ii. Upgraded many of the filters in the HVAC system for better capture of small particles, including virus
  - iii. Addition of bipolar ionization technology to the current HVAC system to remove potentially infectious particles from the air
  - iv. Purchase of multiple portable air purifiers with HEPA filters, placed around the sanctuary and chapel to further enhance air quality

### **B. There have been significant changes occurring in the community which are reducing risk of infection (while aware of potential increase in spread with variants of the virus emerging elsewhere)**

- a. **Decline in the number of cases in the community**
- b. **More people are being vaccinated**

### **C. THEREFORE, the Transition Team is recommending to the Elders:**

- a. **Formalize and approve the current practice of limited congregational singing at funerals and special days of the Church year**
- b. **Approve a subgroup of Transition Team members and staff to develop a plan for increased congregational singing beginning with Holy Week and Easter, and then ongoing as conditions allow**