Where have all the singers gone, and when will they return? Prospects for Choral Singing after the SARS-CoV-2 Pandemic

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Status of this paper

This paper was prepared during the 2020 Covid-19 lockdown. It has been reviewed by two members of the editorial board of *Choral Directions Research* and by an academic virologist, a public health registrar and an anthropologist specialising in religion. These reviews have not been anonymous but more of a collaborative process with the author. The review process differs, therefore from that which is normal for the journal – two anonymous blind peer reviews. It is not, strictly, a "pre-print", but neither should it be treated as an authoritative source for professional practice. It has been produced to contribute to a research-informed response to the challenges choirs face as a result of the 2020 SARS-CoV-2 pandemic. Some aspects of it are likely to date quickly as the situation is changing rapidly.

Abstract

Since the outbreak of the 2020 coronavirus pandemic, generally referred to as "COVID-19" governments including that of the UK have imposed lockdown on all social gatherings. As governments move towards relaxing restrictions it has emerged that choral singing may need to be one of the last restrictions to be relaxed. The paper reviews the scientific evidence that underpins this perception and considers the position of choral directors. Evidence that choral singing is a high-risk activity is strong, but ultimate decisions on the future of choirs will need to be taken by choir directors and managers through an informed risk analysis. The paper considers the situation in Norway, the first European country to resume choral singing under strict regulation. A boys' choir in Sweden that did not cease singing is also considered. The paper then reviews similar prospects for England, drawing on a survey of members of the Cathedral Organists Association. Conditions under which English cathedral choirs as a specific category might resume singing are considered on the grounds that professional choirs with children may be amongst the first to restart. The conclusion is that a limited resumption may be possible, but this must still be treated as a high-risk activity and does not apply generally across all sectors of choral singing.

Introduction

The 2020 global pandemic commonly known as "COVID-19" has silenced choirs in many countries. Plenty of choirs have valiantly displayed varying degrees of ingenuity and creativity to continue through remote technology ("virtual choirs" or on-line singing lessons), but for conventional performances, the shut-down is total and absolute. The prominence of this event in the history of choral singing becomes apparent when comparison with other significant cataclysms is attempted. Neither the First nor Second

World Wars silenced choirs. The history of King's College Cambridge records that the annual nine lessons was broadcast "even during the Second World War, when the ancient glass (and also all heat) had been removed from the Chapel and the name of King's could not be broadcast for security reasons". Alan Mould records that during the First World War, the boys singing matins at St.Paul's were "disturbed by the sound of anti-aircraft fire until with volleying and thundering a bomb fell 150 yards from the cathedral". They continued singing regardless and were presented with a cricket catching cradle in recognition of "their calmness under fire" (Mould, 2007: 250).

One has to go back as far as the English civil war to find a time when choirs were silenced totally. After an initial period during which choir numbers dwindled due to a ban on recruitment, the total ban on sung services lasted eight years, from 1652 until 1660. The history of King's records that it took six subsequent years to return the choir to normal strength. Times were hard, very hard, as doubtless they were for the recusant communities of Byrd's day. Singers and conductors at the present time have been coming to terms with the shock and reality that they are living through what will be reported in future histories as a period every bit as significant. Naturally, they have many questions and anxieties. This paper is written in order to address them – as much as is possible under the circumstances.

Questions

The welfare of choir members forms part of the role of choral conductors, sometimes explicitly stated in job descriptions and especially in youth, church and cathedral settings. Providing conductors with adequate, accurate information to make risks assessments and other important decisions is therefore an essential task. Conductors are only too aware of the links and stories circulating through the press and social media and many will have concluded from these that there can be no choral singing for the immediately foreseeable future. Amongst the more specific anxieties widely aired in social media and other such fora are likely to be:

- Are we being alarmist and over-cautious or is it really that bad?
- Is there actually a scientific consensus? How reliable and balanced are the representations of scientific material in the media?
- Is there a trade-off between psycho-spiritual health and physical health, or does the latter trump the former at every turn?
- Who will tell us it is safe to begin a return to normality and on what authority?
- How can we justify any decisions we may take and how will we feel confident in those decisions?
- What will we face when we go back? What will have become of our choirs?

The first step is to translate these anxieties into answerable research questions. Such answers as might be obtainable will not absolve anyone of the responsibility of making decisions prone to human error, where wisdom and judgement must step in at the limit of knowledge. In most cases, the choir director is a leader. There will be many, many

singers, young and old, who are facing emotions ranging from disappointment to distress. Their leaders will need to be strong and though they may be feeling similar emotions, the need to combat psycho-spiritual distress begins at the top. To be knowledgeable is to be armed.

Research questions

1. What is known about the transmission of the SARS-CoV-2 virus through the actions of the respiratory system?

2. How are choir conductors responding to their inability to meet and rehearse singers and what plans are they making for the future?

3. When choirs begin to resume levels of physical meeting, what lessons might be learned that can be passed on to other choirs?

Literature review

Transmission of the virus

Different types of literature can be consulted:

- Peer-reviewed studies of air-borne transmission published before the pandemic was known about;
- The work of authors knowledgeable in the field made available after the pandemic outbreak, but before peer review could be completed;
- Popular reporting of what has happened when choirs are said to have ignored or flouted advice;
- Empirical investigation of mitigation strategies is currently not possible because choirs are not currently singing. Eventually, when some choirs begin to resume, usual protocols such as ethical approval for study will be needed and these are conventionally time consuming.

The term "COVID-19" is the one in popular usage to refer to the pandemic, although the correct medical name for the virus responsible is SARS-CoV-2, which is more indicative of the relationship with previous forms of coronavirus for which no immunity existed. SARS-CoV-2 differs from previous coronaviruses in that, whilst less lethal to individuals than, for example MERS, the SARS-CoV-2 appears unusually contagious and, for reasons not yet fully understood, both highly variable and unpredictable in how it affects individuals. Effects range between asymptomatic infection through mild flu-like symptoms to respiratory or multi-organ failure and death. It is also difficult to control the spread because it is carried by asymptomatic individuals – people who feel and appear perfectly healthy.

Peer-reviewed pre-pandemic studies

This category of literature represents by far the greatest resource of reliable information. King et al (2020) have identified more than 4000 peer-reviewed journals since January. In spite of that, they regard themselves as remaining "pretty much in the dark regarding the nature of immunity". No individual worker can hope to assimilate or communicate the vast amount of information that exists. In mitigation, it can be stated that a properly executed study will itself contain a significant bibliography or relevant literature, so citation of that study to some extent takes account of multiple other studies. This is why it is so important to read peer-reviewed studies rather than polemics or blogs which may be quite flimsy and lacking breadth. Unsurprisingly, very many studies on the spread of disease were conducted in years and decades before anybody knew about the present pandemic. The advantage of this body of literature is that it has been systematically and thoroughly peer-reviewed and represents work that was not undertaken with undue haste during a global crisis.

Although many people will be familiar with slogans such as "coughs and sneezes spread diseases" it has long been established that ordinary breathing and speech both emit particles that can carry viable viruses (Duguid, 1946; Volkwein et al, 2011). In a now classic study, Louden and Roberts (1968) reported that in several instances, singing had been engaged in at the time the transmission of an infection appeared to have been occurred. The concern at the time was the transmission of tuberculosis, a bacterial rather than viral infection, but one well known to be spread by droplets expelled during respiratory events. These authors set up a controlled clinical experiment to investigate the hypothesis that singing might be classed alongside coughing and sneezing as a means of transmission. Since that time (1968) it has been understood in the field of public health that singing is a means of transmission.

Concern was expressed by public health officials when the loud playing of the vuvuzela (a plastic blowing horn) became endemic amongst sports fans during the 2009 FIFA Confederations Cup in anticipation of South Africa hosting the World Cup. Lai et al (2011) investigated the extent to which this activity expelled disease-carrying particles or droplets into the air. They concluded that people with respiratory infections should be advised not to blow their vuvuzela in enclosed spaces and where there is a risk of infecting others. The issue that has to some extent divided scientific opinion during the present pandemic concerns the size of particles. Critically, Lai and colleagues established that over 97% of particles emitted during vuvuzela playing or shouting were between 0.5 and 5 µm in diameter. This would class them as *aerosols.* An aerosol particle is defined as invisible to the eye, typically 1 µm in diameter (Papineni and Rosenthal, 1997). Aerosols tend to remain suspended in the atmosphere for some time as opposed to particles larger than 5 µm which fall to the ground over distances that can be mapped and predicted by testing. Lindsley et al (2009) undertook significant work on the size of the expelled particles that carry the virus, identifying particles with a mean diameter 13.5 µm for coughing and 16.0 µm for speaking. This appears to disagree with Lai et al's stress on smaller particles and is where worrying uncertainty begins.

It is well established that the virus can remain viable for variable periods on surfaces. Studies have identified how long viruses can survive on different surfaces, up to 72 hours on some (van Doremalen, 2020). As with many viral infections, frequent and rigorous handwashing with soap and water, and cough hygiene, are important primary approaches to limit transmission (Nicolaides, 2019; Wong, 2014). It is possible to implement strategies to limit transmission through public education about hand-washing and the cleansing of surfaces (fomite transmission). Some studies that have yet to be peer-reviewed (see below) have been apparently content to declare choral singing safe through investigation only of the particles in the 5 to 16 μm range which fall on surfaces, thereby largely ignoring the possible effects of aerosols.

This is significant for choirs because it is likely that aerosol particles will circulate for some time throughout the enclosed spaces in which choirs rehearse and perform. There is not yet clear agreement on the extent to which each small particle can transport viable viruses, nor on the behaviour of aerosols in the kinds of space used by choirs. The sheer volume of articles now needing to be carefully read in the *Journal of Aerosol Science* alone is daunting. It cannot possibly be the case that individuals in a rush to produce information on how choirs should respond to the pandemic can have thoroughly assimilated all of these. In these circumstances, the precautionary principle is essential, as is a healthy scepticism towards any information that does not include clear reports of methodology referring to particle size, the means by which this was measured and the statistical treatments applied.

Aerosols are believed to come from the mucosal layers of the respiratory tract through a process referred to as "fluid-film burst". The actions of the vocal folds are particularly potent causes of fluid-film burst. The role of aerosol particles in other viral transmission such as measles has been established and shown to be more potent than at first thought (Laksono et al, 2016). The historic role of schools in the spread of aerosol-borne diseases such as measles, whooping cough, and scarlet fever has been well established (Steckel, 1995) a factor it might be unwise to ignore. Van Doremalen et al. (2020) demonstrated that aerosolized SARS-COV-2 remains viable in the air with a half-life on the order of 1 hour. Once emitted by the first singer, the virus may remain active in the rehearsal room for at least an hour – effectively the rest of the rehearsal/performance, multiplying rapidly as other singers exhale.

Choir rehearsal and performance venues share key attributes of school classrooms as well as additional factors relating to the behaviour of air in enclosed spaces. The most relevant literature is therefore that concerned with the behaviour of aerosol particles in enclosed spaces. This was modelled by Wells (1934) but the classic understanding of transport in a puff or plume has been revised by more recent studies. Aerosol behaviour has been shown to be more complex and less predictable (Wei and Li 2016). Currents of air circulate in random directions between singers. It is necessary, therefore, to examine closely the way singers are spread out and mere physical distancing may not be sufficient. Wei and Li's study would seem to suggest that it could be wrong, for example, to imagine that singers in a front row are at risk from singers in a back row, but not the back row from the singers in the front. More investigation is needed here

Significant recent work has been undertaken by Asadi et al. A study published in 2019 before the current pandemic investigated the effects of "non-dramatic" events upon airborne infectious disease transmission. "Dramatic events" were considered to be coughing and sneezing. Normal speech as an additional carrier of respiratory pathogens was found to be positively correlated with amplitude (the volume at which people were speaking or shouting). Contamination ranged from 1 to 50 particles per second according to the extent the voice was projected. In other words, as the vocal folds are excited more vigorously, aerosol transmission increases rapidly by as much as fifty-fold. Singing would appear to be at least as harmful in this respect as loud speech or shouting, possibly more so. Morawska et al (2008) identified an enhanced effect of sustained vocalisation, into which category singing would fall. They found different modes of particle size to be associated with different physiological states. Particles between 3.5 and 5 μm were most pronounced during sustained vocalization. In their most recent publication, Asadi et al identified an enhanced transmission effect associated with the articulation of plosive consonants[1] in 59 healthy volunteers (Asadi et al, 2020). Requests by choir directors to stress consonants are likely, therefore, to increase the rate of transmission. It is possible that sustained vowels or melismatic passages in singing may also result in aerosol emission at a greater rate than in loud speech. This requires further investigation by researchers looking particularly at the choir context.

In keeping with the apparent variability in the potency of the virus across individuals Asadi et al also found that wide variations in the potency of individuals as transmitters. Some individuals were found to be "superspreaders". This is an unfortunate term that is taking on a folk meaning and generating alarm. It was defined by Lloyd-Smith et al (2005) in their statistical work on the "R number", another term that has become part of popular discourse. Popularly understood, the "R number" is the number of people who will become infected by any one individual carrier. If it is less than 1, it is thought that the pandemic will decline. The superspreader phenomenon is revealed when individual values for the R number are used rather than a single R value for the aggregate population. Individuals who appear to have an unusually high R value are found in the tail of possibilities within a normal distribution. This phenomenon has not yet been linked to demographic or known physiological data. A child, an adult or an elderly person could equally be an unidentified superspreader in a choir. Asadi et al have updated their conclusions in a more recent paper published in 2020. They remain the same, though the authors are keen to emphasise the limits of certainty, stressing the word "might" (Asadi et al 2020).

Questions have been asked as to why it is more common to see people in Asian countries wearing face masks than in Europe or America. To some extent this may be cultural, and it certainly predates the present pandemic. Etiquette or social norms may be more significant than responses to scientific evidence. The potential of face masks in planning for an epidemic (in this case, influenza) was reviewed in 2008 by van der Sande et al. Their research question was whether face masks worn by the general population could be an accessible and affordable intervention when worn under routine circumstances.

[1] The basic plosives in English are t, k, and p (voiceless) and d, g, and b (voiced). They are produced by stopping the airflow using the lips, teeth, or palate, followed by a sudden release of air

Home-made masks might not meet the US standard of N95, i.e. a barrier to 95% of airborne particles but not to noxious gases or vapours. The paper considered the practical difficulties of supplying sufficient masks for a whole population and compared home-made masks with properly manufactured ones. All types of mask reduced aerosol exposure, though manufactured surgical masks (unsurprisingly) were more efficient. Only personal respirators provided full protection and children were the least well protected category regardless of the type of mask (van der Sande et al, 2020). No peer-reviewed papers addressing the wearing of face masks for SARS-COV-2 have yet been identified. Unreviewed or "pre-print" papers are considered below.

Work published after the outbreak, not necessarily peer-reviewed

The above review represents only a tiny fraction of the available literature and was undertaken by a principal author who is not himself medically qualified. However, it has been reviewed by co-authors who are so qualified and careful attention has been paid to their comments and suggestions. In moving to the next stage of this review, the views of academics currently active in the field are reported. It must be considered that these persons will be knowledgeable in the above fields. There is neither the time nor the space for these authors to list the full literature that informs their understanding, but the presumption might be made that when they express their opinions, these will be informed by appropriate bodies of literature.

No peer-reviewed studies detailing aerosol circulation in choir rehearsal and performance venues have yet been identified. Some studies that have appeared as pre-prints appear to offer hope to those who desire a rapid return to normality. Yu guo et al (2020) investigated aerosol transmission in a poorly-ventilated restaurant in Guangzhou, China. They found that three families who ate at adjacent tables became infected, whereas waiters and other families at more distant tables did not. Some license was therefore given to distancing as a mitigation strategy. However, this study was significantly critiqued by Milton (2020) who considered that their treatment of particle size had been inadequate. He cited disagreement between aerosol scientists concerning what is to constitute an aerosol particle, pointing out that a "cow in a tornado" would satisfy the scientific definition of a contaminant that circulates in the air. There is some evidence that this study has now been retracted, possibly on the instruction of the Chinese government (https://retractionwatch.com/)

Two other hastily produced study have been undertaken at the University of the Bundeswehr (Kähler and Hain, 2020a; 2020b). Working in their discipline of fluid mechanics and aerodynamics, these authors first conducted controlled laboratory experiments on the effectiveness of different mask materials in relation to a wide range of particle sizes, including aerosols. Their conclusions erred firmly on the side of caution, stressing that only professionally made masks accurately fitted would be effective in bringing about the safe flow conditions they had described. They also expressed reservations about the trustworthiness that could be placed in populations to adhere to government guidance.

It is their second paper that has been the source of media reports that "scientists have declared singing safe." Some, such as that in *Slipped Disc* (Lebrecht, 2020) seem to have added some imagination at the same time as omitting inconvenient details about the size, scope and limits of the experiment. One result has been a harsh critique by Hui (2020) who pointed out that no data had been shared nor statistical treatment offered. It is hard to see what statistical treatment might be useful under present circumstances for an experiment with one professional and two amateur singers. An issue here would appear to be the dangers of scientists venturing a little beyond their normal sphere of work and hasty and superficial reading of papers by journalists.

It remains the case, at the time of writing, that most authors with relevant knowledge but whose work in the field has not yet been peer-reviewed have declared choral singing to be unsafe. Few have been able to suggest a time limit for the period of risk but there is a suggestion that choral singing will remain a high risk activity until such time as a vaccine has been developed, demonstrated to be effective and administered to most of the population. David Young, an otolaryngologist and singer participating in a NATS seminar, pointed out that there is still no HIV vaccine after 30 years. An effective COVID vaccine could appear within 12 to 24 months – or never (NATS, 2020). This comment has been criticised by virologists and public health officials and is probably an example of the kind of unhelpful information that might spread through webinars. The HIV virus is a totally different kind. It "hides" inside cells where the immune system is unable to attack it. Thus, an effective vaccine must be 100% neutralising of the initial infection. This is unlikely to be the case for the class of coronavirus to which SAR-CoV-2 belongs. Although vaccine production for coronavirus is not straightforward, vaccines for other forms of coronavirus exists and current projections are more optimistic than for HIV vaccines.

Other mitigation strategies have been discussed, particularly the use of face masks. A recent pre-print systematic review and meta-analysis provides an update to the Cochrane Review on the use of masks to interrupt or reduce the spread of respiratory virus. It concludes that there is insufficient evidence to make a recommendation on use of masks (Jefferson, 2020). The earlier version of this Cochrane Review, published in 2011, found poor quality evidence from observational studies to support the use of masks in preventing the spread of SARS (Jefferson, 2011). Recently, due to the lack of clear evidence on the issue, the use of masks has been promoted due to applying the 'precautionary principle' (Greenhalgh, 2020).

Some commentators have expressed the view that masks would be at best uncomfortable in the choir context. The masks would likely become hot and breath contaminated by the end of a long rehearsal, to say nothing of their possible effect on the actual sound where performance quality is desired. The policing of children's use of face masks would be an additional burden for school and youth choirs. A literature review by bin-Reza et al (2012) revealed evidence that the retention properties of masks used during deep breathing in vigorous exercise can lead to infections that would not happen without the masks. A new study of the actual efficacy of face masks was carried out by Leung et al (2020). These authors compared the efficacy of seasonal coronaviruses, influenzaviruses and rhinoviruses within aerosol particles with mixed results. They claimed that surgical masks could efficaciously reduce the emission of influenza virus particles into the

environment in respiratory droplets, but not in aerosols, concluding that correctly fitted surgical facemasks could prevent transmission of coronavirus and influenza virus from individuals showing symptoms. However, the study was a small-scale trial (n=246) with few confirmed cases of viral infection in the sample. There is consequently a high risk of bias in the data collection.

A substantial literature review of available papers on all aspects of coronavirus and respiratory transmission was undertaken by Heather Nelson, a Missouri vocologist (Nelson, 2020). Whist stressing the importance of peer-review and the limitations of studies published in advance of this process, Nelson concluded that there is not yet a full consensus on whether the SARS-CoV-2 can be transmitted as a live virus in aerosol. She did, however, concede that aerosols could be "very, very efficient carriers of the virus" and that any choir might have amongst its members an unknown, random "super spreader". She was against the use of face masks on the grounds already suggested above as well as difficulties with breathing, particularly for older people. Legal issues as to whether churches could compel the wearing of masks would appear to have been raised in the United States. The position in the UK on this issue is as yet unclear. Nelson was also against mitigation through physical distancing, stating that there "does not seem to be any amount of physical distancing in an indoor space that can mitigate against aerosol spread". No literature in support of this particular opinion, however, was offered. Her overall conclusion was that "For now, it is not safe to sing together".

Nelson's summing up here is very generalised. At some stage refinement that recognises differential levels of risk according to such variables as age category and geographical region will need to be considered. King et all (2020) draw attention to the fact that the COVID-19 pandemic is not just one large homogenous epidemic. It is made up of hundreds, if not thousands, of outbreaks, each at a different stage, in progress throughout the country. Progress in understanding the pandemic will need to include progress in understanding how it is to be controlled and managed in different contexts. Members of elder choirs, for example, may need to accept the implications of their being a different risk category to young music students.

Erin Bromage researches infectious diseases and the host immune responses of animals at the University of Massachusetts Dartmouth, where he is an associate professor of biology. He cites expert reaction to questions about SARS-COV-2 and viral load at the Science Media Centre which exists to facilitate expert researchers communicating clearly to journalists. It is a substantial, authoritative and regularly-updated source of information. Bromage's own summary concludes that "any environment that is enclosed, with poor air circulation and high density of people, spells trouble." Religious ceremonies were said currently to fare worse on this criterion than cruise ships which have come to be regarded as hotbeds of Covid transmission and lockdown. The closure of churches by the Archbishops would seem to be supported if this remains demonstrably the case. Bromage is in agreement with Nelson that physical distancing is not an appropriate measure in indoor spaces, stating "social distancing guidelines don't hold in indoor spaces."

The National Association of Teachers of Singing (NATS) has published its own multi-disciplinary compilation of literature (McBroom, 2020). This does not state any position, but NATS convened an expert panel for a webinar in collaboration with ACDA, Chorus America, Barbershop Harmony Society, and Performing Arts Medical Association [PAMA] (NATS, 2020). Key participants with medical expertise were Lucinda Halstead from the Medical University of South Carolina and Donald Milton from the Institute of Applied Environmental Health. Halstead's conclusions were that any return to group singing must be considered at present to be *high risk* on grounds such as uncertainty surrounding aerosols and the efficacy of masks. Were any public singing events to be offered screening at the door would be necessary and this would raise various practical and legal difficulties. She did not commit in her slides to a firm conclusion on physical distancing in indoor spaces but employed a 3D simulation produced by the New York Times (Parshina-Kottas et al, 2020). She expressed considerable scepticism during her talk for physical distancing in choir performance areas, stating that a football stadium would be needed to space apart the Westminster choir (i.e Westminster Choir College in the US, not Westminster Abbey in the UK). She was clear, however, that barriers such as face masks would not be appropriate. In her summing up she emphasised the need for a vaccine leading to 95% effective treatment. She estimated that this might take 18-24 months to achieve and that in the meantime, there is no safe way for singers to rehearse together (Halstead, 2020)

Milton gave a comprehensive presentation on all aspects of airborne transmission. This was well-referenced with sources that were mainly teaching resources on the subject. Two recently published (though not yet peer-reviewed) papers were cited. The first (Rothe et al, 2020) stressed the significance of asymptomatic transmission. The danger for choirs would be that an undetected carrier of the virus might attend rehearsal fit and well yet be responsible for an outbreak across the whole choir. Milton and Halstead were in full agreement that there are at present no conditions under which choirs could safely resume rehearsal.

Hui (2020) has carried out a literature review and draws from it the following conclusions. First, singing indeed presents a high-risk of spreading or contracting the virus. He places it on a par with coughing that can lead to mass infection events. Second, he recommends a 6' or 2m distance between all individuals and states that this recommendation is upheld as a minimum "by all researchers". This might be overstating the case since a limited number of examples can be found where researchers propose shorter distances may still be safe (e.g. Kähler and Hain). Surgical masks, he regards as a "must for all", but home-made masks, little more than a "fashion statement". This may be Hui's personal opinion, though in support, he cites Kähler. He also raises new questions about the management of air in indoor spaces, suggesting that ultra-violet light assisted by ceiling fans might help sterilise air, and he states that the technology is still under research and expensive. His source is the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE). An influx of orders for air sterilisation equipment would clearly benefit members of that organisation, but to say so is not to dismiss the usefulness of a detailed briefing paper it has produced (ASHRAE, 2020). However, UV

sterilisers and ceiling fans seem an unlikely possibility in buildings such as churches or impoverished civic halls where many choral concerts take place.

Similar to NATS and ACDA in the United States, the European Choral Association (ECA) has produced a comprehensive list of resources as well as sponsoring surveys and webinars. These are all available under the umbrella title *Covid-19 How does the choral world deal with it*? (ECA, 2020). The document recognises that the situation is not the same across the whole of Europe as government responses have varied widely. What may be the case in one country may not apply in the same way to another for this reason and because population densities and demographic structures vary widely. Associated "exit strategies" are beginning to differ considerably between countries much as initial responses did. So, there is an ongoing potential for one country to learn from another. The question "When and how can our choirs go back to regular, live rehearsals?" has been regularly discussed at a weekly Zoom café meeting. The ECA notes as its position that they are "not scientists" but have done their best to collate the scientific information available. They conclude from this that there are "a number" of studies dealing with the probable transmission through droplets and aerosols but "few studies" saying the opposite. This would appear to reflect the findings of the present paper. A small number of studies play down the risk, a larger number say it is high.

The current position of ECA, then, is that "any activity where you speak loudly, shout, sing, breathe heavily / breathe in more deeply is considered more dangerous, especially when this happens in a closed room full of people." Importantly, ECA also deal with the management of risk, stating that those who decide when and how choirs will perform "carry a heavy responsibility in case something goes wrong." They note that the decision-making process will differ according to the status of the choir, large or small, professional or amateur. This seems hitherto to have been relatively neglected in the literature but may be an important observation. A universal or "one size fits all" response would not seem to be appropriate and should perhaps not be expected.

The ECA response, therefore, takes account of the need for risk management by persons who are not scientific experts but who have ultimate responsibility for choirs and the welfare of their singers and associates. They also acknowledge the importance of managing the behaviour of choir members and controlling perceptions that may be influenced by fears – real or imagined. To this end, they cite Solathe and Case (2020) who have developed an on-line predictive simulator of the way the virus will spread. This is perhaps a useful complement to the New York Times simulator of social distancing cited earlier. The authors observe that their simulation is meant to give both hope *and* fear. "To beat COVID-19 *in a way that also protects our mental & financial health*, we need optimism to create plans, and pessimism to create backup plans." (Solathe and Case, 2020, their emphasis).

ECA's recognition of the importance of understanding and managing risk is echoed in a commentary or summary article by Anderson et al in the journal *Risk Analysis*. The authors observe that risk assessment and risk management approaches were first adopted in 1976 to address the need to make public health protective policy decisions in the face of uncertainty. That would certainly describe the present predicament, there is

much scientific evidence available, but in sum it does not alleviate uncertainty. They stress that most of the public health advice currently in circulation is based upon the study of larger droplets that do not travel far because of gravity. Understanding of aerosol transmission, clearly vital in the discussion of choral singing, is less comprehensively researched or understood by the public. Accounts of transmission by asymptomatic individuals are presented, a key point being that such individuals were not coughing or sneezing, this apparent state of health enhancing the misperception that no transmission was occurring.

They conclude that aerosol transmission is both under-researched and a potentially very significant means of transmission, particularly in large buildings where particles in the 1 - 3 μm range can remain suspended almost indefinitely. This does not mean that the SARS-CoV-2 virus within those particles remains viable indefinitely, but these authors consider that the weight of current evidence warrants immediate attention to address the significance of aerosols. Air circulation in and between large buildings is considered in their paper and choral singing is singled out as an activity that presents enhanced risk.

Finally, there is the question of choirs with children. This is obviously linked to the question of schools and when and how schools will return. At the time of writing, the UK government has announced plans for an imminent, limited reopening of schools in England. It is not immediately known, therefore, how those plans will materialise and what might be the consequences. The issue at the present juncture is that it is generally believed children may be asymptomatic carriers of the disease but less susceptible to its effects than groups such as people over 70. There is, however, uncertainty about this and a small number of cases have been reported of serious consequences for children, including a hitherto little publicised Kawasaki-like disease. An on-line presentation by Reussner, (2020) notes that, in spite of large spaces such as churches and cathedrals being significant primary sources of contamination, the highest actual transmissions occur in domestic houses. Moreover, should a child choir member infect his/her household there is currently no reliable means of tracing whether the infection was picked up at choir or elsewhere in the community. On the issue of children infecting households, the literature currently presents only an uncertain picture.

The larger risk, if it exists, may be that children attending choir will spread the virus to their families where it may spread further through vulnerable family members, particularly grandparents. The position stated in the *Lancet* editorial comment of 13th May is that it is unclear whether the disparity in reported infection rates between children and adults is due to lower susceptibility in children or a much higher proportion of children being asymptomatic carriers. Jones et al (2020), reporting work at Berlin's Charité hospital, concluded that they should caution against an unlimited re-opening of schools at the present time. They noted the possible danger of a rebound or second surge in cases resulting from the reopening of schools. Their study was based upon an analysis of variance in viral loads across age cohorts divided by ten-year categorisations. They found no significant difference in viral load between their age categories, including the youngest of children and infants.

They pointed out that their results should not be taken as an indicator of age-specific prevalence in Germany. It is rather the case that symptoms are not a good predictor of infection. Children in hospital or attending GP surgery were not found to have higher viral loads[2] than children in the general population thought to be healthy, which will obviously include children attending school. Zhu et al (2020) employed a retrospective deidentified data methodology to investigate the dynamics of infected family clusters. They looked at 166 articles globally sourced and selected from this number 40 that satisfied their criteria. Their hypothesis was that asymptomatic or mild paediatric cases could result in children driving the intra-household transmission of SARS-CoV-2.8. They were not confident that this hypothesis was supported, citing confounding factors such as greater travel by adult members of households in the weeks preceding the pandemic or that children were not present on cruise ships where high infection rates had been attributed to asymptomatic individuals. They suggested that whilst children may not be correctly identified as source of a household cluster due to their asymptomatic status it was possible to be confident that from the 40 studies they examined that 21% of household outbreaks could be reliably attributed to the children. The interpretation presented in their abstract was that SARS-CoV-2 can cause mild disease in children but the data available to date suggests that children have not played a substantive role in the intrahousehold transmission of SARS-CoV-2.

Shortly after these studies appeared, a review and critique was published by Munro and Roland (2020). These authors reviewed a total of twelve studies. Five of these addressed the question of how easily children can catch the diseases, three of how many children actually have the disease, one of how infectious a child actually is when the have it and two looked at schools. None of these studies emerged from this review as robust. Possibly tongue in cheek or with Occam's razor in mind, Munro and Roland produced the following "parsimonious" conclusion: children are less susceptible to becoming infected, therefore fewer of them have become infected, there are subsequently fewer infected individuals in the community, and children have therefore infrequently brought the infection into their homes (Munro and Roland, 2020). They did, however, single out for especial critique the Jones et al study at the Charité hospital, cited above. Objections included sparse reporting of the methodology, unbalanced and unrepresentative sampling (too few children and proportionately too many adults) and statistical treatments inappropriate for the study's objectives.

The corresponding author of the Charité study was a virologist, Christian Drosten. Drosten was asked to comment on German radio on the relaxation of lockdown in Germany. Speaking on 25th May, he was against a model based upon personal responsibility, noting that such a model has led to a very high excess mortality rate in Sweden. On this issue he may well be right. The mortality rate in Sweden had been 376 per million on 22nd May, which certainly compares unfavourably with 44 per million in Norway or 55 per million in Finland. In Spain at the same time it was 597 per million and in the UK, 538 per million. Since then, the mortality rate in Sweden has continued to

[2] Viral load refers to the actual number of viral particles that can be measured within an organism or the surrounding environment. The term came to prominence during the HIV epidemic and is also used in assessment of conditions such as hepatitis where quantities defining high and low are established.

climb, whilst declining in both Spain and the UK. By the 26th May, the daily rate in Sweden of 4.68 per million had overtaken that in the UK at 4.49 per million (statistics from Our World in Data[3]). Responding specifically to a question on church services and singing in church, which had been banned in Germany on 5th May, Drosten argued that people "should concentrate on airing rooms in everyday life and less on constantly washing their hands, wiping and disinfecting." The justification for this is presumably that much of the risk in singing is due to aerosol transmission, but to downplay the significance of fomite transmission in this way seems somewhat unwarranted, particularly as there is not yet a strong consensus concerning the relative significance of the two.

Some reporting in the weekend quality newspapers tended to contrast the studies of Zhu et al and Jones et al as evidence of disagreement in science, but this is an oversimplification. Perhaps journalists should take more account of the haste with which all these studies are appearing – far more rapidly than is the normal custom in academia. Any temptation to grab headlines from abstracts without studying the paper in depth needs also to be resisted – or appreciated by the general public for what it is.

Reports of choirs flouting regulations or ignoring the risk

Several reports of serious infection amongst choir members who have not followed what has become the advice are in circulation. Some of these make particularly alarming reading, although in most cases, breaching of current lockdowns was done in good faith shortly before those lockdowns were imposed. They are not, therefore, representative of choirs functioning under lockdown conditions. The number of such reports has declined since the firm imposition of lockdown and the point has been made by some commentators that it has not been possible to separate the social behaviour of choir members from the actual act of singing. If choirs begin to sing again, it is likely that members will observe the strict precautions they have observed during lockdown. Carefully-designed studies will then be needed that control for the effects of social contact (e.g. talking, greeting, moving about). It will be necessary to have clearer data on the extent to which infection is resulting from aerosol transmission specifically associated with vocalisation requests made by the conductor as opposed to fomite transmission through individual behaviours of singers. The very feasibility of such an enterprise might need to be tested since choirs, particularly amateur ones, are gatherings in which social contacts are intricately entwined with the actual function of singing. The conditions under which the functions might be separated would need to be clearly defined and constantly monitored.

Amongst the most serious was the performance of the St John Passion by the Amsterdam Mixed Choir. Part of the English translation of the report in *Slipped Disc* reads thus:

> So on Sunday evening, March 8, there was the successful performance of Bach's smaller passion with about a thousand audience members in the hall. But that one performance, five days before Covid-19 had to close the concert halls, had disastrous consequences. Of the 130 choir members, 102 fell ill around and after this performance, some seriously. Choirs are of course familiar with cold and flu waves, and with the phenomenon that you can infect someone with such a flu while

[3] https://ourworldindata.org/

> singing. But this was something completely different. A 78-year-old choir member did not survive, three partners of the choir members also died. Singers ended up in intensive care, conductor Valk had serious symptoms, many of the accompanying musicians of the Holland Orchestra Combination as well. Even among the evangelist, Christ and the other four soloists, the virus spread around. How could it happen that one event had such major consequences, while for the time being no direct connection can be made between the well-known virus fireplaces in Northern Italy or at the carnival parties in the southern Netherlands? (Lebrecht, 2020)

Subsequent reports of the same incident later appeared in the English quality newspapers. Though the language was moderated, the message was essentially the same. A similar incidence has been cited by Milton (2020). The Skagit Valley Chorale in Washington State suffered two deaths and forty hospitalisations. Milton points out that this represents a 70% infection rate. Given that raw figures of total deaths and infections in various countries run into tens of thousands and sound alarming, as a percentage of total populations they are still small. 70% in such a context then becomes an exceedingly high figure orders of magnitude above normal. The equivalent figure for Amsterdam would be 78%. The Skagit outbreak occurred two weeks before lockdown was imposed in Washington State and Milton records that choir members had been in receipt of the following instruction: "Anyone showing any symptoms of illness, no matter the cause, should not attend rehearsals." According to the report published by Skagit County Public Health, one individual at the rehearsal felt and spread the infection on that night to 52 others. The report concluded that "the act of singing itself may have spread the virus in the air and onto surfaces" (Hamner, 2020).

Similar instances provide pointers for research if not categoric results from properly controlled studies. An outbreak in Mount Vernon Church, Washington amongst singers with an average age of 69 was at first linked to social contact such as stacking chairs or "snacking on cookies", in other words, fomite transmission. More detailed investigation by the Centers for Disease Control and Prevention (a US federal agency) subsequently raised the prospect of aerosol transmission. The singers had been spaced 6 to 10 inches apart during a two and a half-hour rehearsal. With spacing such as this, it seems unlikely that investigators would be able to distinguish between large particles and aerosols. Perhaps somewhat intriguingly and pertinently, an investigation of the *Voices of Yorkshire* choir revealed that symptoms had been detected in January before widespread recognition of a pandemic had occurred. Members of this choir reported amongst other symptoms a loss of smell and taste, but it is only recently that a UK government announcement has added such symptoms to the recognised list.

Clearly, the temptation to sensationalise reports such as these is strong, whilst fresh ones have stopped appearing as choirs have altogether ceased meeting once lockdowns have got under way. The only solid conclusion that might be drawn is that the reports set an agenda (a) for due caution and diligence in alertness to all factors from those venturing to restart their choirs and (b) for anticipatory research based on possible hypotheses derived from these reports. There is also an issue of public relations and reputation. Whilst there may be initial sympathy for unwitting victims, in the UK, both choral singing and church attendance are classified as the same priority level as restaurants, cafés and pubs – the least essential activities in the resumption of normality. Reporting that

inflames public opinion against an activity seen as non-essential when health services are under pressure will not help the cause of choral singing.

Choristers and Covid

Conductors of English cathedral choirs face an unenviable task. They are guardians of an ancient and precious tradition and they are significantly responsible for the welfare of children – the boy and girl choristers who sing in their choirs. They operate in the context of religious worship, which has been identified as a primary concentration site for the disease, particularly since the much-publicised German ban on singing in church.[4] They also operate in spacious ancient buildings, environments that have been identified as challenging in the context of aerosol transmission. The author has long been an enthusiast for English cathedral music and has published several studies of boy choristers undertaken in cathedrals. He, as much as anybody, wishes to see these choirs restart, so does not urge caution lightly.

The literature review above undoubtedly suggests the need for considerable caution. It is hard to dispute a general conclusion that choral singing is a high-risk activity. It is likely that more and more papers will be published in the coming months and that these will confirm the high-risk posed by choral singing. A point of saturation will be reached and if there is not to be an indefinite impasse and paralysis, carefully managed risks will eventually need to be taken. The taking of such risks will itself generate new data. It is only in this way that the scientific understanding can eventually advance. A limited resumption of choral singing in environments such as cathedrals would potentially begin to generate data to answer the third research question posed in this paper:

> When choirs begin to resume levels of physical meeting, what lessons might be learned that can be passed on to other choirs?

Answering this question requires the public-spirited co-operation of choirs that will return data on their management of risk and any suspected infections that may have occurred amongst their singers and their contacts (hopefully, none). No ethics committee would sanction explicitly the use of boy or girl choristers as human experimental subjects in the investigation of a potentially fatal disease. Nevertheless, in resuming choir under conditions of uncertainty, it could be argued that this is in effect what is happening. If this sobering thought is born in mind as a guiding principle, then the full implications of what is being countenanced will be appreciated.

With the best interests of children and their families as a guiding principle, it is possible to identify from the above literature review, and others like it, modified conditions of rehearsal and performance for which science informed justification can be presented, albeit within limits of certainty. A limited return to choral singing has at the time of writing been sanctioned in Norway under exactly such conditions. Moreover, a study

[4] See, for example https://www.foxnews.com/world/germany-resumes-church-no-singing-coronavirus-lockdown

akin to that suggested has already begun at the Inland Norway University of Applied Sciences (Caplin, work in progress). It must at once be stated that conditions in Norway are very different to those in the UK. The population is only 5.3m and population density is seventeen times less than in the UK. The lockdown has been managed such that only 236 deaths out of 8383 confirmed cases had occurred by 27th May[5]. Nevertheless, as will be shown shortly, the conditions under which choirs might resume in Norway are strict and might form a model for how choirs might resume in the UK, once control of the pandemic in the UK becomes more comparable with that in Norway.

Before considering the case of Norway, a case in Sweden might be examined. The author is in regular contact with the director of the Stockolm Gosskor, a 130-strong boys' choir, said to have its "origin in the classical English choral tradition" and to be "an important nursery for the regeneration of Swedish music". Lockdown conditions in Sweden have been very different to those in Norway, possibly more liberal even than in the UK. This may be associated with the most recently published data for Sweden where 4029 deaths out of 33843 confirmed cases have been recorded in a population of 10.3m.[6] (Compare these data with those for Norway, above). The conductor of the Stockholm Gosschor reports that whilst most choirs in Stockholm have shut down, the primary and secondary schools have remained open and the Gosschor has continued to rehearse as usual across all divisions. Performance opportunities, however, have been severely curtailed and the choir is responding by a greater focus on pedagogical work and the preparation of performances to be transmitted through live streaming. All regulations required by the Swedish authorities have been complied with and the measures taken by the choir have included

- Additional spacing between individuals during rehearsal
- Smaller groups
- Immediate suspension of any boy with any suspected illness
- Supply of hand alcohol
- More frequent cleaning or rooms.

She reports no suspected cases of Covid-19 amongst the boys and that their biggest problem in Stockholm has been the "elderly and demented people." "Children's activities are not the biggest concern for the authorities" (Skogberg, 2020). One possible significance of this is that it would appear to lend support to the developing consensus that children are significantly less vulnerable than older age groups and that it might be safer to restart children's choirs before adult choirs. The situation is under constant review and the author hopes to be able to report any updates.

The situation in Norway has been clearly documented. General guidelines have been published by the Norwegian Directorate of Health. They are for music rehearsals generally, not choral singing specifically where the risk may be greater. The guide has been prepared in collaboration with representatives from choirs, bands, and orchestras

[5] data from Centers for Disease Control and Prevention the European Centre for Disease Prevention and Control and the World Health Organisation compiled by Bing.
[6] data from Agence-France Presse

and assessed and approved by the Norwegian Institute of Public Health and Directorate of Health. It is regularly updated. It states the following:

In order to limit infection during a controlled resumption of rehearsals, there are a number of measures that can be put in place to reduce infection risk.

The five pillars for slowing the spread of infection during music exercises are:

(1) Sick people should not attend music exercises
(2) Good hygiene
(3) No physical contact between persons
(4) No use of instruments and equipment
(5) The rehearsal room must be suitable: Enough space for athletes (sic) and equipment
(6) Do not conduct music activity unless you are completely confident that the activity does not contribute to an increased risk of infection and that it can be exercised in accordance with the recommendations. Otherwise, the activity should be immediately interrupted.

Table 1 below reproduces the information that has been used in Norway to guide how singers should be spaced out in the available area.

Table 1

Group size	**Minimum area (m^2)**	**Safer area ($3m^2$ per person)**
<5	**10**	**25**
<15	**20**	**65**
<30	**30**	**120**
>50	**30**	**180**

The following report was received by the present author on 27th May from the president of the Norwegian Choral Conductors' Association (FONOKO):

> The pandemic situation in Norway has not been as bad as in other European countries. This may be because the Norwegian government took firm, decisive action promptly. All choirs were immediately locked down from March 12th and conductors were ordered to organise no rehearsals before April 4th. The choral organisations encouraged the choirs to continue to pay their conductors and a number set about finding alternatives to live rehearsals, making new arrangements and experimenting with different programmes to create on-line rehearsals.
>
> From the middle of April onwards, singers were allowed to meet in groups of 4, plus conductor. It was required to maintain a 2m space between each person. One person in the choir was required to be responsible for the distribution of hand cleansing gel. Windows in the rehearsal room must be opened regularly for a fifteen-minute break during rehearsal.
>
> From the beginning of May, the number permitted to attend was raised to 30 and a minimum 1m space between each person was required. Handwashing and disinfectant was still required. Nobody feeling unwell should attend a rehearsal.

> The main challenge for choirs implementing these regulations has been with the size of rehearsal rooms. This has resulted in some churches and schools being unable to reopen as of yet. Other choirs constrained by space are turning to alternative venues such as barns or sports arenas.
>
> The latest rules require still a minimum of 1m between singers in all directions (sideways and back/forwards). Singers in a second row must be placed so that they are in between rows in front of or behind them. Air circulation must still be promoted during breaks and singers must bring their own drinks. No sharing of meals is allowed. One singer for each rehearsal must still be appointed to be in charge of disinfectant.
>
> The singers are really happy to meet again and to hear other voices than their own. The restrictions are gladly accepted so that this is possible.
>
> (Persson, 2020)

The Nidarosdomens Guttekor claims a lineage similar to many English cathedral choirs of over 1000 years and is one of six choirs that sing regularly at the cathedral. It differs from English practice, however, in being more closely aligned to the norms of mainland Europe as epitomised in Germany. Boys do not leave when their voices change but are coached to continue when they are ready to sing lower parts. There is also a strong complement of adult men. Currently, the choir numbers about 65 boys aged 9-15 and 30 men in total. As with the German choirs, proportionately more time is spent on rehearsal and preparation for major concerts and tours than daily cathedral offices as in England. Normally there are two or three international tours each year. In governance, the choir is independent of the cathedral, though the cathedral remains its home base and principal venue.

In recommencing after lockdown, the choir has carefully followed the instructions of the Norwegian Institute of Public Health and Directorate of Health as outlined above. This has resulted in an immediate reduction in the numbers singing. Immediately prior to the pandemic, the choir had 85 singers, but it is not possible for all of these to be together without flouting the regulations. Unlike most English choirs, the choir has no regular dedicated practice room or "song school" in the cathedral. There is a small warm up room used by all the choirs and a 100 m^2 space available for the boys' choir. This can accommodate a maximum of 24 singers plus conductor with the current spacing constraints.

However, the choir is also able to rent a 300 m^2 space in an office building for its exclusive use. The administrator reports that they have been particularly fortunate with this as many other choirs in potentially similar situations have been unable to rent the desired spaces. Schools and other landlords have ceased to allow their spaces to be used in order to maintain their own hygiene requirements. Many choirs in Norway have been apparently unable to restart because of this space problem. Were he in a position of being unable to rent space, the administrator wonders whether an approach to universities might be fruitful, or whether real-estate companies might be swayed by a PR argument "helping the cathedral choir survive – keeping culture alive during COVID".

The choir has adopted the following procedures to regulate the behaviour of the boys

- The conductor must always be present in the room before the boys arrive
- Antibacterial sprays are provided as the boys arrive

- The boys must stay on their seats and may only move if required to stand to sing or visit the toilet
- All music stands have been removed and the boys must not touch surfaces
- Doors remain wide open during rehearsal

Normal rehearsal time has been reduced from 2.5 hours to a maximum of 90 minutes. This seems short to the Norwegians but might be less of an issue for English choirs where boys or girls might rehearse for an hour or less before morning school several days a week. The choir has been "creative" in rearranging its normal pattern of rehearsal so that regulations can be adhered to. The normal practice is sectional rehearsals on Mondays and Tuesdays with full rehearsals on Thursdays and Saturdays. The adapted regime utilises a two-week pattern as follows:

- Week A: sectional rehearsals with every group fewer than 20 singers
- Week B: the full choir is split into four eight part (SSAATTBB) groups, each with no more than 20-22 singers. Each of these groups is structured so that there is an approximately equal mix of experienced, less experienced and new choristers, all a minimum of one metre apart from each other.

The choir reports that this has been an interesting and instructive experience where boys have been unable to rely upon "that one sturdy soprano, who always sings correctly".

In spite of its virtual performances and its recording of a publicity video in the cathedral[7], the choir's programme has of course been greatly curtailed. Planned concerts in Cologne, Aachen, Münster, Paderborn and Hildesheim cathedrals have all been cancelled. The only actual performances planned at the time of writing are one Sunday service on June 14th and a private concert for chorister families on June 17th. The summer break then commences on June 18th.

How might similar arrangements be made in English cathedrals?

An immediate interpretation of Table 1 from Norway would rule out conventional arrangements of monastic style stalls ("Can and Dec") – in the cathedral itself, but perhaps more challengingly in the practice room or song school where layouts often mimic the stalls arrangement of the cathedral church itself. This is certainly confirmed by the report of how the Norwegian regulations have been put into practice. Nidarosdomens Guttekor seem to have been relatively fortunate in being able to use the large space of their whole cathedral and to have access to a large rehearsal space. Other Norwegian choirs have been unable to resume because of the space problem. This consideration informed the central question in a survey designed by the author and put to members of the Cathedral Organists Association (COA). 53 members of the association had returned responses at

7 https://www.youtube.com/watch?v=eC7EBXTVBiM&fbclid=IwAR1dW2MWR4m1c5vi21fEmVOGtWmOUO57toNe4-d75HFY_Fp9N3EvYzZWiC0
See also the choir under normal conditions https://www.youtube.com/watch?v=INKy_V60abE

the time of writing. The options they were given, and responses are shown in Table 2 overleaf as percentages agreeing with each statement. For ease of interpretation the responses have been arranged in rank order. Figures in the right-hand column are the percentages agreeing with the statement.

All but a small minority recognise that normal arrangements are not going to be possible. A rearrangement of the singers, perhaps guided by spacing recommendations similar to those in column 3 of Table 1, will be the way forwards. 60% of the sample (n=44) recognise that they may need to do this, whilst 55% recognise that it may need to be done with fewer singers.

Table 2

Have the choir spaced out, e.g. in the crossing rather than normal stalls position	60
Fewer singers, maintaining suitable spacing (in stalls and rehearsal room)	55
The choir could sing, but in an empty building with the service relayed	45
Men's voices might resume before any boys or girls return	32.5
The choir could sing but the congregation must be in the nave	22.5
Men's voices/boys or girls voices alternatively but not together	12.5
Have one side of the choir only (e.g. just Dec or Can on alternate days)	7.5
It isn't really practical to deviate from our normal arrangements	2.5

Almost half the sample (45%) see this as happening in an empty building to which the public, at least in the earlier stages, are not admitted. These expectations cohere well with what has happened in practice in Stockholm and choirs more generally in Norway. They may present, in one set of details or another, a feasible template for choirs planning to restart. At the very least, conductors and managers will be able to demonstrate diligence in the observation of conditions that are suggested by science and associated with success in another country. The other number of significance was the 32.5% who saw the men returning before the boys or girls as a possibility.

Respondents were given the opportunity to state their own ideas in an "other" box, and, as always, the resultant qualitative data are useful. Additional issues raised were that, as already anticipated, the rehearsal arrangements might be more problematic than the performance arrangements. This will clearly be easier for some than others. A cramped song school and/or a small cathedral with obstructive furnishings may present a bigger challenge than a more spacious building where singers are used to in-stalls rehearsals and might manage without the song school. Positioning of the congregation (if any) was

a similar, though less frequently mentioned variable. In some cathedrals, the congregation is always well distant and spaced out, whereas in others, it might normally be close to the choir. Perhaps collegiate choirs are the more affected, but three respondents raised the issue of relationships with universities. Choral scholars may not be available if universities reduce or eliminate face to face teaching and boys, under those circumstances, might sing before men. Some were concerned with the practical issue of reducing the number of singers. This was more a question of person management and equity than musical consequence. How would the singers to be excluded be chosen? Would this be on a rota? What happens if a chosen singer is then unavailable? How are excluded singers to feel that they are still valued and remain in touch?

Returning to normality

One respondent was bold enough to state he or she would try anything to get some resumption of live music, a sentiment that may well be shared if not stated. Another felt that any "normal" would be a "new" one. The importance of any scientific evidence that might be conclusive as well as health and safety and personal liability was raised by one. On the topic of when these things might be worked through, all were asked when they envisaged a return to normality. None imagined having to wait as long as two years and all feel that they will get back to normal eventually. The sample was almost equally divided between those who see later this year (43%) and those who see the earlier part of next year (45%). The remainder felt late 2021 the most likely. Over half (57%) felt that they would not be able to be specific about when a return to normality might be contemplated until they know how long the lockdown is going to be. Few (7%) however believed that when things did begin to resume it would be no different to the end of the long summer break. Almost half (48%) felt that they were going to have to simplify their repertoire in the initial stages at least. Amalgamation of boys and girls was not a popular choice. Only 8% felt they might need to consider this.

Influences on restarting choirs

The largest single influence on when choirs restart was parents and parents' concerns. 68% thought these were important and 15% entirely obligatory. This indicates a desire to work with parents as partners, which presumably means keeping them well informed, dealing with issues that may impact their confidence and, of course, listening to their legitimate concerns or even taking their advice where justified. This was closely linked to concern for chorister welfare which was also high. 60% felt it obligatory to take act upon this whilst 35% thought it important. Government advice was recognised as significant, with 47% thinking it important and 47% feeling it obligatory. Guidance or instruction from bishops, clergy or school managements were all recognised as of some degree of importance, with exactly half feeling that it would be obligatory to follow the decisions of their chapter whereas 12.5% would just take note of this.

Expressed as rankings through weighted averages of all responses on a scale of 1 - 5, the most significant aggregate influences were:

(1) Chorister welfare 4.5
(2) Government advice 4.4

(3) Policy decisions by clergy/chapters 4.2
(4) Associated school managements 4.13
(5) Parents and parents' concerns 3.92
(6) Advice from specialist bodies 3.82
(7) Guidance from bishops/archbishops 3.77
(8) Own views as music director 3.35

Although 60% thought their own views as music director were important, none thought that these could be obligatory. 37% gave lower prominence to their own views, 20% thinking they would note them and 17% that they were of some concern. Only one thought them to be of no significance at all.

Weighted averages are given for the significance of various sources in the formation of personal views and approaches.

(1) Local advice and instruction (school, LEA, cathedral chapter etc.) 4.2
(2) National advice and instruction (government) 4.1
(3) Discussion with colleagues 4
(4) Professional organisations 3.9
(5) Expert webinars and similarly convened events 3.8
(6) Personal understanding of "the science" 3.4
(7) Mainstream media 2.3
(8) Social media 1.7

Categories at the extremes are worthy of further exploration. 45% felt social media to be insignificant whilst 43% felt it to be only of marginal significance. This might encourage those who stress the unreliability of social media, its tendency to spread "fake news" or waste time on pontification by those with little real knowledge. That the mainstream media did not that much better, however, is a matter of interest and doubtless concern for such as the BBC. In this case, 42% thought it fairly significant whilst 45% thought it marginal. Presumably, this is influenced by perceptions of bias or distrust of particular reporting chains, since the mainstream media must surely have some role in propagating local and national advice which were the strongest influencers of opinion. 68% felt local advice to be very significant as compared with 55% for national advice. The respective figures for indispensable were 28% for national and 25% for local.

Chorister welfare and impact upon choirs

The concern for chorister welfare is notable. Asked specifically about boys, 67% appeared resigned to the need for a certain amount of rebuilding with younger boys and simplified repertoire during the earlier stages. This is obviously a practical performance issue, but there was also concern for the boys themselves. Just over half acknowledged that some of their oldest boys may never sing again and the same number (51%) felt that those boys would be affected badly at a personal level, missing out their final summer in choir. Only 5% thought that their boys would "bounce back" as they perhaps do from other difficult situations. When the question was extended to include girls, three

responses were in the not applicable category as the choirs did not have girls. Of the remainder just over half (53%) saw no real difference between boys and girls. 13% might consider extending the final year for their girls to compensate for a possible loss of older boys. Only one agreed that girls might be more resilient than boys although 13% agreed that girls might learn more quickly and recover faster than boys. One respondent suggested the opposite, that the girls would be nervous about restarting.

Other potentially significant differences emerged in analysis of the qualitative responses. Choirs with an 11-18 age range for girls might be less damaged than choirs where the girls' and boys' age ranges were similar. Three respondents suggested that in varying ways, they found girls easier to recruit than boys. One, from a choir which had no choir school, was finding it harder to keep boys engaged than girls and felt that the camaraderie they were missing could lead to losses of boys if the lockdown were extended longer. Boys could be vulnerable to disruption of transition routes. One choir already had no Y8 boys (presumably prior to the pandemic) whilst another was concerned about the loss of role modelling by older boys which could have a knock-on effect. There was a very slight tendency to see issues being greater for the younger children, both boys and girls. Older children were mentioned as gaining more from on-line substitutes. In one case, senior girls (aged over 13) responded better to on-line tuition than girls in the Y5-Y8 range. In another, the youngest boy was not engaging on-line and was feared potentially lost. These are not strong trends, but ones perhaps worthy of monitoring.

Contact during lockdown

One quarter of those surveyed had had no contact with their choristers during lockdown. Over half, however, had been engaging in on-line activities with "virtual choir or similar projects" mentioned most frequently (52%). Second to virtual choirs came on-line singing lessons (40%). These active forms of engagement may be the best way of helping choristers through. 20% mentioned a web/social media site with updates and news that choristers could look at, though none offered any further comments indicative of whether these had been successful with choristers were regularly engaging with them. Only one stated updates with parents/families that by-passed the choristers. Several mentioned in the qualitative comments that they were unable to engage because they were on furlough. Other staff, perhaps singing teachers or the staff in associated schools who were not on furlough had been helpful in maintaining levels of activity. The inability of the choir directors themselves to engage must be unfortunate though, given the nature of the relationship between conductor and singers.

The concern with welfare mentioned earlier was again evident in this question. Mental health issues were mentioned specifically once, and a twice-weekly wellbeing singalong. A diverse and imaginative range of activities was evidence of the recognised need to maintain interest and morale. One choir might emerge academically stronger for having increased the level of musical appreciation and analysis, whilst others mentioned enhanced theory lessons or "making the psalms properly known".

Feedback from choristers or parents

25% reported no feedback at all. Whether this is the same 25% that also reported no engagement, it is not possible to tell. The strongest response here came from the qualitative comments which were overwhelmingly positive. These indicated high levels of parental support and appreciation of the considerable efforts that had been made to keep in touch and provide things for choristers to do. In one case, a parent was a consultant virologist and therefore able to add professional knowledge to the dialogue. Although certain sections of the press have promoted a poor image of teachers, this does not seem to have impacted upon chorister parents who are aware of the considerable efforts that many are making. This might be something for choirs that have had less engagement to reflect upon. One respondent reported being unable to engage with parents because of furlough, so the matter may not be entirely in the gift of individuals. Of the quantitative responses 48% felt they had had received helpful suggestions and 40% messages of sympathy. Less helpful responses were limited to 13% whilst 15% reported having to deal with anxious enquiries.

Personal support.

Finally, a question was asked about the levels of personal support conductors felt they had received as individuals. This was considered an important question since no one can be expected to lead or maintain the morale of others if their own needs are not met.

The weighted responses (on a scale of 1 – 5) are listed in rank order:

(1) From my own family 4.2
(2) From colleagues 4
(3) From professional organisations 3.8
(4) From parents and well-wishers 3.7
(5) From clergy 3.6
(6) Through social media 3
(7) From senior staff at associated schools 2.7
(8) From government official sources 2.1

Discussion

It is clear from the literature review that a considerable body of scientific literature dating back as far as the 1940s confirms that choral singing is likely to be associated with a high transmission rate of infection during a coronavirus event. Some studies indicate less risk than others, but the emerging consensus is that the risk is high. More studies confirming this position are likely to appear over coming months. One of the tasks for these studies is to drive a more sophisticated and nuanced interpretation of context, moving away from a "one size fits all" prohibition on choral singing. This aside, it is reasonable to conjecture that a point of saturation will be reached when further studies add little to the existing knowledge that the risk is high. The critical point concerns the nature of public understanding of "high risk" in the given context. Much refinement of scientific understanding will occur without a shifting of the overall judgement "high risk".

Ultimately, the quality or usefulness of information may begin to deteriorate, since if no choirs are singing no research can be undertaken on the effects of singing. This has been seen in cases such as Skagit and Amsterdam. Until a choir has sung under very carefully controlled scientific conditions such that confounding factors like "stacking chairs" or "eating cookies" have been eliminated, valid and reliable results will be hard to achieve, scientific consensus still harder. The necessary process has begun to happen in Norway. It is abundantly clear that choirs such as Nidarosdomens Guttekor are singing under much reduced circumstances and following closely guidance and instruction which is quite restrictive. They do this in a country where the infection rate is unusually low and action by relevant authorities taken promptly and decisively. Many Norwegian choirs have been unable to resume because the space available to them has been insufficient to accommodate their singers according to the distancing requirements. Progression of the pandemic and the way it will affect choirs is currently hard to predict, although certain plausible scenarios can be constructed as a basis of testable hypotheses.

- The "R number" (the rate at which one person affects others) will continue its currently declining trajectory until the pandemic can be declared to be safely under control;
- The R number might quite quickly and unpredictably rise again for reasons either unanticipated or associated with premature easing of lockdown regulations;
- The R number will decline during the warm summer months, but then rise again during the winter as weather conditions change;
- Seasonal variations in the R number may be come a relatively permanent phenomenon;
- The variance in R number from one country or region to another will increase as some administrations prove more effective than others at controlling it.

What happens may be a combination of more than one of these scenarios. It seems at the very least expedient to the present author to plan for data gathering so that the best possible information on what happens as choirs begin to restart is available. The study begun by Caplin has already identified the questions that need to be asked and the data that need to be gathered. For example, it is tracking, the demographic profiles of the singers, the spaces in which they are singing, ventilation conditions in those spaces, conduct of the rehearsals (e.g. length, frequency of breaks), any reports of infections associated with choir attendance, reported transmissions to other family members and other pertinent data. Twenty-four choirs have participated to date. This study represents a significant departure from most studies reviewed in this paper in that it is anticipatory and proactive. It has been designed to investigate from the outset a new set of circumstances as they develop. Professor Caplin has been generous enough to share his data with the present author and it is proposed that the study be extended to other countries including the UK as their choirs restart.

A significant consideration will be the extent to which guidance for choirs similar to that already provided in Norway is provided elsewhere. Although this sounds simple in practice, many organisations represent choral singing in the UK and the author's experience from a previous funded project on youth participation in choral singing

suggests that getting them to agree and work together will be difficult. This in turn will be affected by the level of priority afforded to choral singing by government and the quality of national co-ordination. Again, a prognosis based upon experience does not promise well. The stakes, however, might this time be just high enough to overcome the practical difficulties.

Conclusions

The weight of scientific evidence warrants no conclusion other than that at the present time choral singing in enclosed spaces must be considered a high-risk activity. Nevertheless, there are variations in the level of risk across the wide range of circumstances and contexts in which choral singing is undertaken. These variations will become more apparent as a more subtle and nuanced picture emerges. Conditions associated with higher success rates in strategies for managing both the pandemic itself and the risk assessment process for choirs wishing to restart will become better documented and clearer. The course of the pandemic – whether it declines gradually or is subjected to renewed peaks or seasonal resurgences as conditions change will be known with a relatively short timescale.

Given that risk can never be eliminated, decisions will need to be made as to when choirs can resume activity that has been assessed by suitably comprehensive risk management protocols. The evidence that children both present less risk and are themselves at a significantly lower level of risk than other age groups is not yet fully conclusive. Nor are its potential consequences yet tested. Nevertheless, it does point towards the possibility that the first choirs to resume might be either children's choirs, or choirs in which children play a prominent role. All choirs will need guidance as to the nature of the risk assessments they should undertake, and a view needs to emerge on who will provide this guidance. Professional organisations or choral associations are one possible answer and should perhaps already have begun to collaborate on the provision of suitable guidance. In Norway, the process has been clear, but fewer organisations have been involved and the Norwegian government appears to have taken a decisive and proactive role.

It is an unlikely scenario that choirs will remain locked down for ever. The case for proactive, anticipatory research that traces, documents and analyses the consequences of choirs restarting is strong and one of the main recommendations the author wishes to make. The term "new normal" has gained some currency. It remains to be seen whether the "old normal" returns or whether discoveries and innovations made during the lockdown become more permanent features of the life of choirs. On-line part learning or singing lessons may well become part of a "new normal". The phenomenon of the "virtual choir" will almost certainly receive attention and choral directors, newly upskilled in activities perhaps previous considered "geeky", may feel motivated to perpetuate aspects of the virtual choir. It seems probably that physical spacing or "social distancing" may be part of everyday life for some time to come. The use of public spaces from supermarkets to trains may reflect this and choirs, when they return, may look anew at work undertaken on such matters as choir spacing by Daugherty (1999), or self to other ratio by Ternström (1999).

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See also:

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https://www.sciencemediacentre.org/expert-reaction-to-questions-about-covid-19-and-viral-load/
The Lancet COVID Access centre
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