No. 20A138

IN THE
Supreme Court of the United States

GATEWAY CITY CHURCH, ET AL.,
Plaintiffs-Applicants,
v.
GAVIN NEWSOM, ET AL.,
Defendants-Respondents.

APPENDIX OF RESPONDENTS' EXHIBITS

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February 24, 2021

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Exhibit 1

Santa Clara County
PUBLIC HEALTH

MANDATORY DIRECTIVE:

Gatherings

Issued July 14, 2020
sccgov.org/coronavirus

Revised and Effective: February 12, 2021

County of Santa Clara
Public Health Department

Health Officer
976 Lenzen Avenue, 2nd Floor
San José, CA 95126
408.792.5040

MANDATORY DIRECTIVE FOR GATHERINGS

Please confirm that your gathering is allowed under the State Order. Where there is a difference between the local County Order and the State Order, the more restrictive order must be followed.

Information on the State's Order and State guidance is available at covid19.ca.gov.

Issued: July 14, 2020
Revised and Effective: February 12, 2021
Effective Upon Release

Every person, business, and entity in Santa Clara County must follow *both* the County and the State Public Health Officer Orders. Below is information on: (1) the State's general gathering rules, and (2) the current rules for *indoor* gatherings in Santa Clara County.

1. General State Gatherings Rules:

As of January 25, 2021, the State's Regional Stay at Home Order is ***no longer in effect*** in Santa Clara County.

On August 28, 2020, the State issued a Statewide Public Health Officer Order ("State Order," available here and the Blueprint for a Safer Economy ("Blueprint," available here). The State Order and Blueprint establish statewide restrictions applicable to each "tier" to which counties are assigned.

The State Health Officer has generally prohibited gatherings of all kinds statewide, with limited exceptions for worship services, cultural ceremonies like weddings and funerals, protest or political activities, and any gathering that is explicitly allowed by a State COVID-19 Industry Guidance document (https://covid19.ca.gov/industry-guidance/) or by the State's "Stay home Q&A" page (https://covid19.ca.gov/stay-home-except-for-essential-needs/). The State also allows private gatherings consisting of no more than three households pursuant to the State's rules, but such gatherings must be outdoors while the County is in the Purple Tier.

All gatherings are subject to the mandatory requirements in this Directive and any other applicable County Health Officer Directive, the County Health Officer's Revised Risk Reduction Order issued on October 5, 2020, the applicable restrictions under the State Order and Blueprint, the State's COVID-19 Industry Guidance documents, and any applicable health and safety regulations.

Note: While wedding ceremonies may occur outdoors subject to the mandatory requirements of this Directive, the State has clarified that "[w]edding receptions/parties/celebrations are NOT permitted at this time" under State Public Health Officer orders.

2. Current Rules for Indoor Gatherings in Santa Clara County:

Because indoor gatherings continue to pose a severe risk of COVID-19 transmission, **all indoor gatherings are currently prohibited**.

While COVID-19 is still circulating in our community, the Health Officer strongly discourages any gathering together with people from other households. Indoor gatherings are particularly risky because COVID-19 transmission occurs more easily indoors than outdoors, and COVID-19 continues to circulate widely. The most recent scientific evidence underscores the risk of transmission indoors, and **indoor gatherings are always strongly discouraged, even when allowed**. But gatherings are not prohibited by this Directive as long as everyone attending the gathering strictly complies with all the requirements set forth below to reduce risk and keep everyone who attends as safe as possible.

A "gathering" is an event, assembly, meeting, or convening that brings together multiple people from separate households in a single space, indoors or outdoors, at the same time and in a coordinated fashion—like a wedding, banquet, conference, religious service, festival, fair, party, performance, competition, movie theater operation, fitness class, barbecue, protest, or picnic. Although the County allows all types of gatherings to occur in compliance with this Directive, at this time the State generally allows gatherings only for purposes of worship services, cultural ceremonies like funerals and weddings (but not wedding receptions, which are prohibited), and protest or political activities. The State also allows gatherings for purposes identified in the State's Industry Guidance or any other State guidance document. The State also allows small gatherings of any type with no more than three households. These gatherings must follow the County's rules (contained in this Directive) and the State's rules, including the State requirement that such gatherings must be outdoors when counties are in the Purple Tier. Because the stricter of the requirements applies, the only types of gatherings allowed in the County are those allowed by the State.

This Directive does not regulate whether a facility is open or closed. For example, facilities that are typically used for gatherings—such as places of worship, meeting halls, and event spaces—may remain open for purposes that do not involve gatherings, even when gatherings are prohibited indoors.

This Directive explains the local requirements for gatherings in Santa Clara County. **This Directive is *mandatory*, and failure to follow it is a violation of the Health Officer's Order issued October 5, 2020 ("Order").**

The Order Issued October 5, 2020

The Order imposes several restrictions on all businesses and activities to ensure that the County stays as safe as possible. All persons and businesses (including nonprofits, educational entities, and any other business entity, regardless of its corporate structure) that organize or host gatherings—such as religious institutions, wedding venues, wedding planners/coordinators, convention centers, and conference/meeting room rental facilities—must comply with the following requirements, and must ensure that participants comply with all applicable requirements:

- **Social Distancing Protocol:** All businesses and governmental entities that have not already done so must fill out and submit an updated Social Distancing Protocol under the October 5, 2020 Health Officer Order. **Social Distancing Protocols submitted prior to October 11, 2020 are no longer valid.** The Revised Social Distancing Protocol must be filled out using an updated template, which is available here. The Protocol is submitted under penalty of perjury, meaning that everything written on the form must be truthful and accurate to the best of the signer's knowledge, and submitting false information is a crime. The Protocol must be distributed to all workers, and it must be accessible to all officials who are enforcing the Order.

- **Signage:** All businesses and governmental entities must print (1) an updated COVID-19 PREPARED Sign and (2) a Social Distancing Protocol Visitor Information Sheet, and both must be posted prominently at all facility entrances. These are available for printing after submission of the Revised Social Distancing Protocol online. The Revised Social Distancing Protocol specifies additional signage requirements.

- **Face Coverings:** Everyone must wear face coverings at all times specified in the California Department of Public Health's mandatory Guidance for the Use of Face Coverings ("Face Covering Guidance") and in any specific directives issued by the County Health Officer. **Unless otherwise stated in this Directive, face coverings must be worn at all times when attending a gathering.**

- **Capacity Limitation:** All businesses must comply with the capacity limitations established in the Mandatory Directive on Capacity Limitations.

Mandatory Requirements for All Gatherings

In general, the more people a person interacts with at a gathering, the closer the physical interaction is, the more enclosed the gathering space is, and the longer the interaction lasts, the higher the risk that a person with an unknown SARS-CoV-2 infection (the infection that causes COVID-19) might spread it to others. If not everyone follows the rules to safely gather, the risk of spreading SARS-CoV-2 is even higher. Based on those principles, the Health Officer's directives for *all* gatherings are:

1. *If Gathering, the Health Officer Strongly Urges You to Gather Outdoors*

    a. Gatherings that occur outdoors are significantly safer than indoor gatherings. To qualify as an outdoor gathering, the gathering must be held entirely outdoors, except that attendees may go inside to use restrooms as long as the restrooms are frequently disinfected.

    b. The maximum number of people allowed at an outdoor gathering is specified in the Mandatory Directive on Capacity Limitations. This includes everyone present, such as hosts, workers, and guests. The space must be large enough so that everyone at a gathering can maintain at least 6-foot social distance from anyone (other than people from their own household).

        i. Example 1: A small church hosts a funeral ceremony in its churchyard. The churchyard is only big enough to allow 25 people to easily maintain 6-foot social distancing between households at all times. **No more than 25 people may be present at the funeral ceremony**.

        ii. Example 2: A couple holds their wedding ceremony outdoors at a historic hotel. The outdoor ceremony space is big enough for 1,000 people to maintain 6-foot distancing. **Even so, no more than the maximum number of people allowed by the Mandatory Directive on Capacity Limitations may be present at the wedding ceremony**.

    c. A gathering is considered an outdoor gathering only if it is held at a facility that allows the free flow of outdoor air through the entire space, as specified in the California Department of Public Health's mandatory guidance on Use of Temporary Structures for Outdoor Business Operations.

    d. Fences and screens that do not impede airflow are not considered walls or sides for purposes of determining whether an area is outdoors. Partitions around or within the facility may be used and do not qualify as sides so long as they are no more than 3 feet in height as measured from the floor.

2. *The Health Officer Strongly Discourages Indoor Gatherings, Even When They Are Allowed*

    a. Indoor gatherings may not be allowed depending on the County's current tier under the State's Blueprint for a Safer Economy and other local factors. See the "Current Rules for Indoor Gatherings in Santa Clara County" box at the top of this Directive for information on current rules.

    b. When indoor gatherings *are* allowed, the maximum number of people allowed at an indoor gathering is specified in the Mandatory Directive on Capacity Limitations. This includes everyone present, such as hosts, workers, and guests.

3. *Don't Attend Gatherings If You Feel Sick or You Are in a High-Risk Group*

    a. If you feel sick or have any COVID-19-like symptoms (fever, cough, shortness of breath, chills, night sweats, sore throat, nausea, vomiting, diarrhea, tiredness, muscle or body aches, headaches, confusion, or loss of sense of taste/smell), **you must stay home and may not attend any gatherings**.

    b. As explained on the People Who Need Extra Precautions page, people at higher risk of severe illness or death from COVID-19 are strongly urged not to attend any gatherings.

4. *All Gatherings Must Have an Identified and Designated Host Who Is Responsible for Ensuring Compliance with All Requirements*

    a. A specific person or business (including nonprofits, religious organizations, educational entities, or any other business entity) must be the designated host for a gathering and ensure compliance with all requirements in the Order and this Directive. **The host is responsible and subject to enforcement for any failure by participants to comply with the Order and this Directive.**

    b. The host also must maintain a list with names and contact information of all participants at the gathering. If a participant tests positive for COVID-19, the host is legally required to assist the County Public Health Department in any case investigation and contact tracing associated with the gathering. Public Health will ask for the list of attendees *only* if an attendee tests positive for COVID-19. The County Public Health Department will keep this information confidential and use it only for case investigation and contract tracing purposes. Hosts must maintain these records for at least 21 days. The host must provide the list to any County Enforcement Officer immediately upon request.

5. *Practice Physical Distancing and Hand Hygiene at Gatherings*

    a. At all gatherings, **everyone must stay at least 6 feet away from other people (except people in their own household) at all times**.

    b. Seating arrangements must provide at least 6 feet of distance (in all directions—front-to-back and side-to-side) between different households. This can be done by spacing chairs apart, or for fixed seating like benches or pews, by marking off rows and indicating seating areas with tape. Seating and tables must be sanitized after each use.

    c. Everyone at a gathering should frequently wash their hands with soap and water, or use hand sanitizer if soap and water are not available. The host must make handwashing facilities or hand sanitizer available for participants to use.

6. *Rules for Face Coverings, Singing, Chanting, Shouting, and Playing Wind Instruments*

Current scientific evidence shows that COVID-19 spreads primarily through respiratory droplets and fine aerosols that are released from the body when people breathe, sing, shout, or otherwise expel air from their lungs. Face coverings prevent many of these droplets and aerosols from escaping into the air, and wearing a face covering has been shown to significantly decrease the risk of COVID-19 transmission. Conversely, singing, chanting, shouting, and playing wind instruments have all been shown to significantly *increase* the risk of COVID-19 transmission, because these activities all release increased amounts of respiratory droplets and fine aerosols into the air. To reduce the risk of spreading COVID-19, the following rules apply to gatherings:

    a. For all *indoor* gatherings (when indoor gatherings are allowed):

        i. **Everyone, including performers/presenters, must wear a face covering at all times** (except for very young children, people for whom face coverings are medically inadvisable, or for communication by or with people who are hearing impaired).

            1. Food and drink may not be served at indoor gatherings—including at movie theaters—even when indoor gatherings are allowed, except as necessary to carry out a religious ceremony.
            2. Face coverings may be removed to meet urgent medical needs (for example, to use an asthma inhaler, consume items needed to manage diabetes, take medication, or if feeling light-headed).

        ii. Singing, chanting, shouting, and playing wind instruments are **strictly prohibited**.

b. For all *outdoor* gatherings:

i. **Except as described below or in other directives issued by the County Health Officer, everyone must wear a face covering at all times** (except for very young children, people for whom face coverings are medically inadvisable, or for communication by or with people who are hearing impaired).

1. Attendees may remove their face coverings to eat or drink but must put their face covering back on as soon as they are finished eating or drinking.

2. Attendees may remove their face coverings to meet urgent medical needs (for example, to use an asthma inhaler, consume items needed to manage diabetes, take medication, or if feeling light-headed).

ii. If an outdoor gathering involves a performance/presentation, performers/presenters may remove their face coverings while they are performing/presenting, but they must replace their face coverings after they finish.

1. No more than 12 performers/presenters are permitted in the performance/presentation area at a time.

2. Until their face covering is back on, any performer/presenter who removes their face covering to speak must maintain at least **12 feet** of social distance from everyone not in their household.

3. Until their face covering is back on, any performer/presenter who removes their face covering to sing, chant, shout, or play a wind instrument must maintain at least **12 feet** of social distance from all other performers/presenters who are not in their household and at least **25 feet** from all attendees who are not performing/presenting.

4. Any performer/presenter playing a wind instrument must cover the opening of the instrument (e.g., with cloth) to reduce the spread of respiratory droplets from the instrument.

5. Performers/presenters who are singing or chanting are strongly encouraged to do so at a quiet volume (at or below the volume of a normal speaking voice).

iii. All attendees who are not performing/presenting **must wear a face covering at all times** while singing, chanting, or shouting. Because these activities pose a very high risk of COVID-19 transmission, face coverings are particularly essential to reduce the spread of respiratory droplets and fine aerosols. People who cannot wear a face covering for medical or other reasons are strongly discouraged from singing, chanting, or shouting.

1. Attendees who are singing, chanting, or shouting are strongly encouraged to maintain increased social distancing greater than 6 feet to further reduce risk.

2. Attendees who are singing or chanting are strongly encouraged to do so at a quiet volume (at or below the volume of a normal speaking voice).

7. Stagger Attendance at Gatherings

a. For gatherings that have the potential to draw larger groups, like community meetings or religious services, consider offering multiple sessions, requiring reservations that cap attendance at each session, staggering arrivals and departures, and encouraging or requiring that the same group stays together (for example, Group A attends the Sunday morning worship service every week, and Group B attends the separate Tuesday evening worship service every week).

b. There is no limit on the number of gatherings that may be held at different times on a single day—for example, a mosque may hold prayer services five times a day—as long as (i) each gathering follows all the rules, and (ii) restrooms, chairs and tables, and any other high-touch surfaces are properly sanitized between groups.

c. A venue may host *multiple outdoor gatherings* at the same time (for example, multiple small barbecues in a large outdoor space like a 20-acre ranch)—as long as:

i. Each gathering follows all the rules in the Order and in this Directive. Each gathering must, for instance, have its own designated host who must maintain a list of participant names and contact information.

ii. Each gathering has its own area marked by prominent signage, barriers, or ropes, and there is a buffer zone of at least 100 feet between the boundaries of any two separate gatherings.

iii. The participants at a gathering, including hosts, workers, and guests, do not mix between or among different gatherings and stay strictly in their own area.

iv. There are sufficient restroom facilities, or a system of using the restroom facilities, such that participants from different gatherings do not have contact with one another when they use the restroom.

d. When indoor gatherings are allowed, a venue may host multiple indoor gatherings at the same time (for example, multiple gatherings in separate rooms within a building)—as long as:

i. Each gathering follows all the rules in the Order and in this Directive. Each gathering must, for instance, have its own designated host who must maintain a list of participant names and contact information.

ii. Each gathering is fully separated by solid, floor-to-ceiling walls or partitions from any other gathering.

iii. Where possible, the HVAC system for each space with a gathering should ventilate to the outdoors, rather than into a space with another gathering.

iv. The participants at a gathering, including hosts, workers, and guests, do not mix between or among different gatherings and do not enter into a common space with participants from any other gathering.

v. There are sufficient restroom facilities, or a system of using the restroom facilities, such that participants from different gatherings do not have contact with one another when they use the restroom.

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8. *Livestreaming, Broadcasting, and Recording with No Audience Present*

Businesses may livestream, broadcast, or record performances, services, and classes at indoor facilities without live audiences or members of the public present. All such livestreamed, broadcasted, or recorded events at indoor facilities **must** comply with the following rules:

a. When livestreaming under this provision, only personnel may be present at the facility. Audiences or other members of the public are strictly prohibited. The number of personnel inside the facility must be limited to the minimum necessary to conduct the event (and may never exceed 12 people or the maximum number of people allowed under the facility's current capacity limitation as dictated by the Mandatory Directive on Capacity Limitations, whichever is fewer).

b. All personnel, including performers/presenters in the performance area, must maintain at least 6 feet of physical distance from everyone outside their household at all times.

c. People performing or presenting during a livestreamed event may remove their face coverings during the performance or presentation if everyone maintains at least 12 feet of physical distance from everyone outside their household at all times. Even so, the Health Officer strongly urges people performing or presenting to wear a face covering whenever possible. All others on-site must wear a face covering in compliance with State and County Health Officer requirements.

d. When livestreaming under this provision with no audience present, singing, chanting, or playing wind instruments indoors is strongly discouraged but may occur so long as everyone maintains at least 12 feet of physical distance from everyone outside their household.

For clarity, the above rules for livestreaming, broadcasting, and recording do not apply if any member of the public is present for the event. Businesses may livestream, broadcast, or otherwise record an event at which members of the public are present (so long as current State and County Health Officer orders allow members of the public to be present for such an event), but there are no special rules that would apply to the livestream, broadcast, or recording. Instead, these events must comply with all rules currently governing the business's general operations. Note that these rules may be stricter those listed above.

9. Maximize Ventilation for Indoor Gatherings (When Indoor Gatherings Are Allowed)

a. Open doors and windows to maximize circulation of outdoor air whenever environmental conditions and building requirements allow. Consider modifications to the facility to increase outdoor air exchange, such as replacing non-opening windows with openable screened windows. Contact your local Building Department for more information on permit requirements.

b. Indoor facilities with central air handling/HVAC systems must ensure that HVAC systems are serviced and functioning properly and, to the extent feasible and appropriate to the facility:

    i. Evaluate possibilities for and implement upgrades to the system to ensure that air filters are functioning at the highest efficiency compatible with the currently installed filter rack and air handling system (ideally MERV-13 or greater).

    ii. Increase the percentage of outdoor air through the HVAC system, readjusting or overriding recirculation ("economizer") dampers.

    iii. Disable demand-control ventilation controls that reduce air supply based on temperature or occupancy.

    iv. Implement the additional measures set forth in the County's Guidance for Ventilation and Air Filtration Systems.

c. Indoor facilities that do not have central air handling/HVAC systems or that do not operate or control the system must take the following measures, to the extent feasible and appropriate to the facility:

    i. Set any ceiling fans to draw air upwards away from participants.

    ii. If using portable fans, position them near open doors/windows and use them to draw or blow inside air to the outside of the facility. Position fans to minimize blowing air between occupants, which may spread aerosols.

    iii. Consider installing portable air filters appropriate to the space.

    iv. Implement additional applicable measures set forth in the County's Guidance for Ventilation and Air Filtration Systems.

d. Upon request by a County Enforcement Officer or County Public Health Department Staff, the facility may be required to perform a comprehensive evaluation of the facility's ventilation and air filtration system by an appropriately licensed professional, and produce documentation regarding this evaluation to the County.

Stay Informed

For answers to frequently asked questions about this industry and other topics, please see the FAQs page. **Please note that this Directive may be updated.** For up-to-date information on the Health Officer Order, please visit the County Public Health Department's website at www.sccgov.org/coronavirus.

Exhibit 2

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DR. SARA H. CODY

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
(San José Division)

GATEWAY CITY CHURCH, et al., Plaintiffs, v. GAVIN NEWSOM, et al., Defendants.	No. 20-CV-08241-EJD **DECLARATION OF THE HEALTH OFFICER FOR THE COUNTY OF SANTA CLARA SARA H. CODY, M.D., IN SUPPORT OF DEFENDANTS COUNTY OF SANTA CLARA AND DR. SARA H CODY'S OPPOSITION TO PLAINTIFFS' MOTION FOR A PRELIMINARY INJUNCTION** Date: January 15, 2020 Time: 10:00 a.m. Courtroom: 4 Judge: Hon. Edward J. Davila

I, SARA H. CODY, M.D., declare as follows:

1. I have personal knowledge of the facts set forth in this declaration. If called as a witness, I could and would testify competently to the matters set forth herein.

Background and Experience

2. I graduated from Stanford University, where I received a degree in Human Biology. I received my Doctor of Medicine from Yale University School of Medicine. Following an Internship and Residency in Internal Medicine at Stanford University Hospital, I completed a two-year fellowship in Epidemiology and Public Health, as an Epidemic Intelligence Service (EIS) Officer with the Centers for Disease Control and Prevention (CDC).

3. I am currently the Director of the County of Santa Clara's Public Health Department,

as well as the Health Officer for the County and each of the 15 cities located within Santa Clara County. I have held the Health Officer position since 2013 and the Director of Public Health Department position since 2015. In these roles, I provide leadership on public health issues for all of Santa Clara County and oversee approximately 400 Public Health Department employees who provide a wide array of services to safeguard and promote the health of the community.

4. Before becoming the Health Officer for the County and each of its cities, I was employed for 15 years as a Deputy Health Officer/Communicable Disease Controller at the County's Public Health Department, where I oversaw surveillance and investigation of individual cases of communicable diseases, investigated disease outbreaks, participated in planning for public health emergencies, and responded to Severe Acute Respiratory Syndrome (SARS), influenza A virus subtype H1N1 (also known as "swine flu" or H1N1), and other public health emergencies.

5. The mission of the Public Health Department is to promote and protect the health of Santa Clara County's population of approximately 1.9 million people. None of Santa Clara County's 15 cities has a health department. All 15 cities, and all Santa Clara County residents, rely on the Public Health Department to perform essential public health functions. The work of the Public Health Department is focused on three main areas: (1) infectious disease and emergency response; (2) maternal, child, and family health; and (3) healthy communities. The Public Health Department's work is guided by core public health principles of equity, collaboration and inclusion, and harm prevention. This work—in particular, infectious disease control and emergency response—is critical to the health of the entire community countywide.

The Novel Coronavirus and COVID-19

6. The current pandemic—from a novel coronavirus that was first identified in December 2019—has spread to most countries in the world, including the United States. Worldwide, as of December 23, 2020, authorities had confirmed at least 78,320,614 cases, and 1,723,502 deaths. The United States reported its first case on January 21, 2020. The disease has since spread rapidly throughout the country. As of December 23, 2020, public health authorities had confirmed at least 18,281,597 cases in the United States, and 323,682 deaths. Starting November 4, 2020, the United States has recorded more than 100,000 new cases each day with many days

surpassing the previous single-day record and each day's total eclipsing the summer's single-day record of 77,300 new cases in mid-July. And on December 16, 2020, there were 245,000 new cases and over 3,600 deaths reported. Experts consider this epidemic to be the worst public health epidemic since the influenza outbreak of 1918, and recent case numbers, hospitalizations, and deaths confirm the epidemic is worsening.

7. Coronaviruses are a large family of viruses that can cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). A novel coronavirus is a new coronavirus that has not been previously identified in humans. SARS-CoV-2 refers to the novel coronavirus currently spreading throughout the world, and Coronavirus Disease-19 (COVID-19) is the disease caused by SARS-CoV-2. The World Health Organization has deemed COVID-19 a pandemic. One vaccine for SARS-CoV-2 received an Emergency Use Authorization on December 12, and a second vaccine received Emergency Use Authorization on December 18, 2020. A small number of vaccine doses have been distributed and vaccination of people in the highest risk categories, including healthcare personnel at acute care facilities and residents and staff of skilled nursing and other long term care facilities, began last week. There is no specific cure for COVID-19.

8. In mild cases, COVD-19 may cause fever, fatigue, and cough. In severe cases, it may cause shortness of breath and pneumonia, multi-organ system failure, and death. In some cases, COVID-19 can cause neurological symptoms such as inability to taste or smell, tingling or numbness in the hands and feet, confusion, seizures, and stroke. Evidence has shown that COVID-19 can also cause long-term chronic health conditions, such as cardiovascular, neurologic, renal, and respiratory damage and loss of limbs from blood clotting.[1] These conditions may be experienced not only by those who become seriously ill from COVID-19 but also by those who experience only mild symptoms.[2] Public health and healthcare officials are still learning about the long-term

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[1] Del Rio, C., et al., *Long-term Health Consequences of COVID-19*, JAMA, Vol. 324, No. 17, pp. 1723–24, Oct. 5, 2020, https://doi.org/10.1001/jama.2020.19719.

[2] *Id.*; Tenford, Mark W., et al., *Symptom Duration and Risk Factors for Delayed Return to Usual Health Among Outpatients with COVID-19 in a Multistate Health Care Systems Network–United*

complications associated with COVID-19, which was first identified in late 2019.

9. The SARS-CoV-2 virus is highly contagious, spreading easily between individuals. While the exact mechanisms by which SARS-CoV-2 spreads are still being studied, there is consensus among epidemiologists that SARS-CoV-2 is spread primarily via an airborne route. The novel coronavirus is spread primarily from person to person through respiratory droplets and aerosols (that is, smaller particles that travel farther than respiratory droplets) produced when an infected person coughs, sneezes, sings, shouts, or talks. SARS-CoV-2 may spread to a much lesser extent by touching objects or surfaces that have been contaminated with the novel coronavirus and then touching one's mouth, nose, or eyes.

10. People who have symptomatic SARS-CoV-2 infection are contagious and can spread the infection to others. People with SARS-CoV-2 infection can also spread the virus to others before any symptoms develop. In addition, there is broad consensus among epidemiologists that some people with SARS-CoV-2 infection never develop symptoms (i.e. asymptomatic infection) and still spread the virus. An estimated 40% of people with SARS-CoV-2 infection are asymptomatic.[3]

11. There is consensus among epidemiologists that social distancing helps reduce the risk of transmission.[4] This is in part because maintaining at least six feet of physical distance between persons substantially decreases the likelihood that sufficient respiratory droplets carrying SARS-CoV-2 will enter a person's mouth, nose, eyes, or lungs to cause a person to contract a SARS-CoV-2 infection. However, six feet of social distance is likely not adequate to prevent spread of SARS-CoV-2 via aerosols, which can travel greater distances and linger in the air for much longer. The risk of transmission is greater in indoor environments with crowding and poor ventilation. This risk

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States, March–June 2020, CDC Morbidity & Mortality Wkly. Rep., Vol. 69, No. 31, pp. 993–98, July 31, 2020, http://dx.doi.org/10.15585/mmwr.mm6930e1.

[3] Oran, Daniel P., et al., *Prevalence of Asymptomatic SARS-CoV-2 Infection: A Narrative Review*, Annals of Internal Med., Vol. 173, Issue 5, pp. 362–67, Sept. 1, 2020, https://doi.org/10.7326/M20-3012.

[4] Alagoz, Oguzhan, et al., *Effect of Timing of and Adherence to Social Distancing Measures on COVID-19 Burden in the United States*, Ann. of Internal Med., Oct. 27, 2020, https://doi.org/10.7326/M20-4096.

increases when people gather in indoor environments for long periods of time. As discussed below, the risk increases further when people are shouting, singing, or engaging in heavy breathing because these activities produce more droplets and aerosols than normal speaking. And the likelihood of transmission further increases where there is widespread community transmission as this increases the probability that a person at the gathering will be infectious.

12. There is also consensus among epidemiologists that wearing a face covering over the nose and mouth reduces the number of SARS-CoV-2 infections.[5] The CDC reports that "[e]xperimental and epidemiological data support community masking to reduce the spread of SARS-CoV-2" and recommends "[a]dopting universal masking policies."[6] The use of face coverings alone, however, is not sufficient to eliminate the risk of transmission. Face coverings are one prevention strategy and must be paired with other strategies such as social distancing, increasing ventilation, etc. For instance, as discussed below, face coverings are not perfect at preventing transmission from a person singing. Face coverings are less likely to prevent transmission if they are loosely fit, as droplets or aerosols are more likely to escape.

13. The finding that some people with SARS-CoV-2 infection are asymptomatic underscores the importance of following social distancing, always using a face covering, and limiting contact with people outside of one's household to the greatest extent possible. Because people can be infected and not have symptoms, they may be unaware they are infected and contagious, and therefore less likely to take steps or precautions to limit the spread of infection, like staying at home. The relatively high percentage of infections that are asymptomatic means that

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[5] Brooks, John T., et al., *Universal Masking to Prevent SARS-CoV-2 Transmission—The Time Is Now*, JAMA, Vol. 324, No. 7, pp. 635–37, July 14, 2020, https://doi/org/10.1001/jama.2020.13107; Wang, Xiaowen, et al., *Association Between Universal Masking in a Health Care System and SARS-CoV-2 Positivity Among Health Care Workers*, JAMA, Vol. 324, No. 7, pp. 703–04, July 14, 2020, https://doi.org/10.1001/jama.2020.12897.

[6] *Scientific Brief: Community Use of Cloth Masks to Control the Spread of SARS-CoV-2*, CDC (Nov. 10, 2020), https://www.cdc.gov/coronavirus/2019-ncov/more/masking-science-sars-cov2.html; Lyu, Wei, et al., *Community Use of Face Masks and COVID-19: Evidence from a Natural Experiment of State Mandates in the US*, HealthAffairs, Vol. 39, No. 8, June 16, 2020, https://doi.org/10.1377/hlthaff.2020.00818.

SARS-CoV-2 can spread silently, fueling community transmission, increasing community prevalence and risk for the most vulnerable members of a population.

14. Because none of these measures on their own is sufficient to eliminate the risk of transmission, the CDC promotes a multipronged application of evidence-based strategies that includes restrictions on "nonessential indoor spaces that pose the highest risk for transmission" in addition to universal mask policies and social distancing requirements."[7] The restriction of indoor gatherings is particularly important because the location, type, size, and duration of activity all impact the risk of transmission, and indoor gatherings where people from different households interact and remain in close proximity for extended periods of time create a high risk of transmission.

March 16, 2020 Shelter-in-Place Order

15. Santa Clara County recorded the first known death from COVID-19 in the entire United States (February 7, 2020) in a person who had not traveled or had contact with a known case. The County also announced two of the earliest cases of travel-associated COVID-19 in the United States on January 31 and February 2.

16. To slow community-wide virus transmission as much as possible in order to protect the most vulnerable populations, prevent deaths, and prevent the health care system from being overwhelmed, and after consideration of epidemiologic trends in countries with active COVID-19 epidemics and recognition of the potential for exponential growth in the setting of a non-immune population, on March 16, 2020, I issued a shelter-in-place order directing all individuals living in the County to shelter at their place of residence. Six other Bay Area jurisdictions issued similar shelter-in-place orders on the same day.

17. The goal of sheltering in place was to reduce the number of infections, to slow the spread of infection, to ensure that communities had enough hospital capacity to care for people who

[7] Honein MA, et al., *Summary of Guidance for Public Health Strategies to Address High Levels of Community Transmission of SARS-CoV-2 and Related Deaths*, December 2020. MMWR Morb Mortal Wkly Rep 2020;69:1860-1867. DOI: http://dx.doi.org/10.15585/mmwr.mm6949e2.

developed severe illness, and ultimately, to save lives.

18. The March 16 Order prohibited all individuals from leaving their place of residence, except for the limited purposes of performing listed essential activities. The order prohibited all travel, except essential travel, such as to carry out essential activities. All businesses with a facility in the County, except certain essential businesses, were required to cease all activities at their facilities except certain minimum basic operations. The order also prohibited all public and private gatherings of any number, except with members of individuals' own households.

19. The order was based on evidence of the exponential growth of COVID-19 within the County and then-current scientific evidence and best practices regarding the most effective approaches to slow the transmission of the virus. It was understood then, as it is now, that a proven way to decrease the probability of SARS-CoV-2 being spread from person to person is to limit interactions among people to the greatest extent practicable. At the time, allowing exceptions other than essential activities, businesses, and travel—even with social distancing and face coverings—would have resulted in more interactions among people and more opportunity for infection to spread from person to person, ultimately resulting in more infections and more illness and deaths. Limiting the number, duration, and proximity of contacts between people was critical in reducing the probability that the virus would spread from one person to another. Ensuring that every person sheltered in place to the maximum extent feasible, therefore, was expected to reduce the rate of transmission of the SARS-CoV-2 infection (i.e., "flatten the curve") more quickly than if we had not sheltered in place. This is especially true in a population—like the County's—with no immunity to the novel coronavirus.

March 31, 2020 Order to Continue Sheltering in Place

20. On March 31, 2020, I issued an updated shelter-in-place order that superseded the March 16, 2020 Order, to reinforce social distancing requirements, and to further reduce the total volume of person-to-person contact occurring in the County. The March 31 Order extended the shelter-in-place requirements through May 3, 2020. Six other Bay Area jurisdictions extended their shelter-in-place orders on the same day.

21. At that time, the public health emergency had substantially worsened since the March

16 Order, with a significant escalation in the number of positive cases, hospitalizations, and deaths, and a corresponding increasing strain on health care resources. At the same time, evidence suggested that the restrictions on mobility and social distancing requirements imposed by the prior orders were slowing the rate of increase in new cases, consistent with models of infectious disease transmission in a non-immune population.

22. The March 31 Order was more restrictive than the March 16 Order in a number of ways because it included, amongst other more restrictive provisions: (1) mandatory social distancing requirements; (2) additional restrictions on essential business; (3) a prohibition on the use of playgrounds, dog parks, public picnic areas, and similar recreational areas; and (4) a prohibition on the use of shared public recreational facilities such as golf courses, tennis and basketball courts, pools, and rock walls. As a condition to operate, all open essential businesses were required to prepare a protocol to implement various social distancing measures, such as limiting the number of persons in the facility at a time and regularly disinfecting high-touch surfaces ("Social Distancing Protocol").

23. The shelter-in-place orders slowed the spread of the virus. When the March 16 Order was put in place, the number of new cases was growing rapidly. That changed with the March 16 and March 31 shelter-in-place orders.

24. One of the most important indicators of the rate of growth of the SARS-CoV-2 virus is what is called the "doubling time," *i.e.*, how many days it takes for the number of cases to double. A shorter doubling time means that the infection is spreading rapidly; a longer doubling time means that the infection is spreading more slowly. On March 16, when the first shelter-in-place order was issued, the case count was doubling approximately every five days—indicating rapid, exponential growth. By the beginning of May 2020, however, the doubling time had slowed to around three and a half months. The shelter-in-place orders had been successful in significantly slowing the spread of the virus—that is, they had flattened the curve.

25. Model projections prepared by the County's Public Health Department in collaboration with infectious disease modeling experts at Stanford University's School of Medicine estimated that over the six-week period from March 16 through April 25, 2020, the County and State

shelter-in-place orders prevented approximately 80 percent of the infections that otherwise would have occurred.

26. Flattening the growth curve of confirmed cases not only prevented illnesses and hospitalizations and saved lives, it bought the County time to significantly increase hospital capacity and healthcare resources, to improve clinical management and treatment, to better understand routes of transmission, to provide resources for vulnerable populations at high risk of infection, to increase testing capacity across the County, and to take other critical measures to further slow the rate of spread and prevent the healthcare system from becoming overwhelmed.

April 29, 2020 Extended and Revised Shelter-in-Place Order

27. To continue these trends, on April 29, 2020, I issued a revised shelter-in-place order that superseded the March 31 Order. The April 29 Order went into effect at 11:59 p.m. on May 3, 2020 and extended most shelter-in-place restrictions through May 31, 2020. Reflecting the regional progress made under shelter-in-place orders, six other Bay Area jurisdictions also issued similar orders extending most shelter-in-place restrictions.

May 22, 2020 Order to Continue Sheltering in Place

28. To further continue these trends, and based on the available epidemiological evidence, on May 18, 2020, I issued another shelter-in-place order that superseded the April 29 Order. The order went into effect at 12:01 a.m. on May 22, 2020 and extended most shelter-in-place restrictions.

29. By this time, we had achieved progress in slowing the spread of the SARS-CoV-2 virus in Santa Clara County and the neighboring counties. Even so, because widespread SARS-CoV-2 diagnostic testing was still not available across the County or the Bay Area region, many infections still went undetected and contributed to silent spread of infection. Thus, continuation of the prior shelter-in-place order remained necessary to suppress the rate of community spread, to preserve critical and limited healthcare capacity in the County, to protect vulnerable populations, and to prevent death. However, in light of progress in slowing the spread of infection, the May 22 Order allowed a limited number of businesses and activities to resume operations, subject to specified conditions and safety precautions to reduce any associated risk of SARS-CoV-2 transmission.

30. I did not lift all the prior restrictions because accepted principles of infectious disease epidemiology, as demonstrated by the experiences of other regions in the U.S. and countries combatting the pandemic, counseled in favor of a cautious and incremental approach towards relaxing public health measures, particularly since the virus continued to circulate in the community; pre-symptomatic and asymptomatic transmission of the virus presented a significant risk of silent spread; and researchers, clinicians, and public health officials were still learning about the virus and the range of health outcomes of the disease it causes.

June 5, 2020 Update to Shelter-in-Place Order

31. On June 1, 2020, I announced amendments to the May 22 Order that went into effect at 12:01 a.m. on June 5, 2020.

32. When I announced the June 5 Order, the County and the greater Bay Area had continued to make substantial progress in slowing the spread of SARS-CoV-2. Because of that progress, and based on our developing understanding of the virus, the June 5 Order allowed certain additional businesses and activities to resume, subject to restrictions to reduce transmission risk. The order also kept key restrictions in place, requiring people to stay in their homes except when engaging in certain essential or allowed activities. Appendix C-2 to the order details the additional activities allowed and the accompanying restrictions on those activities under the update. As with the previous orders, the June 5 Order required all businesses to complete and implement a Social Distancing Protocol as a condition to operate.

33. The June 5 Order also permitted the resumption of certain outdoor activities, including non-contact recreational and athletic activities, dog parks, automobile gatherings, and some types of gatherings—again all subject to restrictions. For example, outdoor ceremonies and outdoor religious gatherings were allowed, subject to restrictions to mitigate the risk of transmission, including social distancing and face covering requirements to be enforced by a designated "host." The June 5 Order limited these outdoor ceremonies and gatherings to 25 attendees. The order also prohibited singing and shouting at ceremonies and gatherings due to the significantly increased risk of SARS-CoV-2 transmission from these specific activities, described below.

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Developing Evidence of Risk of Transmission Indoors and Through Singing and Shouting

34. Since the issuance of the June 5 Order, the evidence has grown that the risk of transmission is higher with indoor activities than outdoor activities.[8] Research has confirmed that the virus that causes COVID-19 is primarily airborne, and spreads from person to person through respiratory droplets and aerosols released into the air when singing, shouting, talking, coughing, or sneezing. It is more likely that one will inhale respiratory droplets and aerosols from an infected person in an indoor setting because aerosols disperse less easily indoors and can remain in the air for a longer period of time. When outdoors, more frequent air movement and greater air volume disperse respiratory droplets and aerosols, making SARS-CoV-2 transmission less likely.

35. A study of COVID-19 outbreaks in China reported that all of the identified outbreaks of three or more cases occurred in an indoor environment, confirming that sharing indoor space is a major infection risk.[9] Other studies have suggested that normal speaking causes airborne virus transmission in confined environments,[10] and that closed environments contribute to transmission of COVID-19 and promote superspreading events.[11]

36. The CDC advises that activities are safer when they are "held in outdoor spaces."[12] The CDC's guidance to the public regarding whether and how to engage in public activities identifies "indoor space" as a factor that can increase the risk of SARS-CoV-2 spread.[13]

37. Limiting the size of gatherings is another important public health intervention

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[8] Leclerc, Quentin J., et al., *What settings have been linked to SARS-CoV-2 transmission clusters?*, Wellcome Open Res., Vol. 5, No. 83, June 5, 2020, https://doi.org/10.12688/wellcomeopenres.15889.2.

[9] Qian, Hua, et al., *Indoor transmission of SARS-CoV-2*, Indoor Air, Accepted Author Manuscript, Oct. 31, 2020, https://doi.org/10.1111/ina.12766.

[10] Stadnytskyi, Valentyn, et al., *The airborne lifetime of small speech droplets and their potential importance in SARS-CoV-2 transmission*, Proc. of the Nat'l Acad. of Sci., Vol. 117, No. 22, pp. 11875–77, June 2, 2020, https://doi.org/10.1073/pnas.2006874117.

[11] Nishiura, Hiroshi, et al., *Closed environments facilitate secondary transmission of coronavirus disease 2019 (COVID-19)*, Apr. 16, 2020, https://doi.org/10.1101/2020.02.28.20029272.

[12] *Deciding to Go Out*, CDC, https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/deciding-to-go-out.html (last updated October 28, 2020).

[13] *Id.*

because the risk of transmission increases with the size of the gathering. The larger the gathering, the higher the likelihood that an infected person will be present. In addition, the larger the gathering, the greater the number of people at risk of becoming infected at the gathering, who may in turn infect others in the community at large. Limiting the size of gatherings in Santa Clara County is particularly important now, because, as of the date of this declaration, the prevalence of SARS-CoV-2 virus is higher than it has ever been, and the rate of new cases per 100,000 population per day is rising faster than it ever has.

38. There is also evidence of risks associated with singing and shouting, which informed the prohibition on singing and shouting in the June 5 order (and in subsequent orders). Research has shown that singing produces more and smaller droplets, as well as aerosols that can travel a longer distance, increasing the risk of infection even with social distancing.[14] Research has also indicated that wearing a mask significantly reduces but does not completely eliminate the increased risk from singing.[15] While loud singing is particularly problematic, shouting and loud talking produce more and smaller droplets as well as aerosols, increasing the risk of transmission.[16]

39. In June 2020, the available evidence regarding indoor singing included a study of a SARS-CoV-2 superspreading event—that is, an event where one infected person infects a larger number of other people—published by the CDC in May 2020.[17] As reported in the study, 61 people attended a March 10, 2020 choir practice at which one person was known to have COVID-19 symptoms. Following that choir practice, 53 cases of SARS-CoV-2 infection were subsequently identified. Three people were hospitalized, and two ultimately died. The study suggested that the act of singing might have contributed to disease transmission through emission of aerosols, which is affected by loudness of vocalization; and it concluded that "[t]he potential for superspreader events

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[14] Alsved, M., et al., *Exhaled respiratory particles during singing and talking*, Aerosol Sci. & Tech., Vol. 54, No. 11, pp. 1245–48, Sept. 17, 2020, https://doi.org/10.1080/02786826.2020.1812502.

[15] *Id.*

[16] *Id.*

[17] Hamner, Lea, et al., *High SARS-CoV-2 Attack Rate Following Exposure at a Choir Practice—Skagit County, Washington, March 2020*, CDC Morbidity & Mortality Wkly. Rep., Vol. 69, No. 19, pp. 606–10, May 15, 2020, http://dx.doi.org/10.15585/mmwr.mm6919e6external icon.

underscores the importance of physical distancing, including avoiding gathering in large groups, to control spread of COVID-19."

40. Since the issuance of the June 5 Order, additional published reports have also addressed the role of singing in disease transmission. A report published by the CDC examined multiple SARS-CoV-2 infections at an overnight camp in Georgia.[18] Five hundred ninety-seven Georgia residents attended the camp, and of the 344 attendees for whom test results were available, 260 were positive for SARS-CoV-2. According to the report, indoor cohabitation, singing, and cheering likely contributed to this outbreak: "Relatively large cohorts sleeping in the same cabin and engaging in regular singing and cheering likely contributed to transmission."

41. Public reports have detailed the role of "superspreader" events, including indoor gatherings, in community spread of the virus.[19] For example:

- In South Korea, as of March 25, at least 5,080 confirmed cases of COVID-19 were traced back to a cluster of cases at a church in Daegu, arising from one 61-year-old person who attended a religious service;[20]
- In California, 71 cases of COVID-19 were linked to a church in Sacramento;[21]

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[18] Szablewski, et al. (August 2020) *SARS-CoV-2 Transmission and Infection Among Attendees of an Overnight Camp — Georgia, June 2020*, https://www.cdc.gov/mmwr/volumes/69/wr/mm6931e1.htm.

[19] Because SARS-CoV-2 infections in humans were first identified in December 2019, research into the virus, its mechanisms of transmission, and the short, medium, and long-term consequences of infection in humans remains ongoing. The same public health departments that are responding to an unprecedented pandemic are also the ones trying to carve out time to publish outbreak investigations, but the publication process takes time. While press reports are certainly not given the same weight as peer-reviewed research, in the context of this novel pandemic and because public action to stem the pandemic cannot always wait for the peer-review process, the experience of other public health officials and the circumstances that they confront, do inform my thinking regarding how to protect all people living and working in Santa Clara County.

[20] Shin, et al., *How a South Korean church helped fuel the spread of the coronarvirus*, Washington Post, March 25, 2020, available at https://www.washingtonpost.com/graphics/2020/world/coronavirus-south-korea-church/.

[21] Chabria, et al., *Pentecostal church in Sacramento linked to dozens of coronavirus cases*, Los Angeles Times, April 2, 2020, available at https://www.latimes.com/california/story/2020-04-02/pentecostal-church-in-sacramento-linked-to-dozens-of-coronavirus-cases.

- In Kentucky, a church revival was linked to at least 28 cases and two deaths;[22]
- In Texas, about 50 people contracted the virus after a pastor told congregants they could once again hug one another;[23]
- In West Virginia, there were at least 51 confirmed cases and three deaths tied to the resumption of mask-optional services at a church in late May,[24] and as of October, 18 outbreaks in 13 counties have been traced to church services in the State;[25]
- In Pennsylvania, a dozen congregants tested positive after a church resumed in-person services;[26]
- In Ohio, one man with SARS-CoV-2 infection attending a single church service led to 91 other people becoming infected, included 53 people who had been at the same service;[27]
- In North Carolina, at least 187 cases and 8 deaths have been linked to a church revival;[28]

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[22] Loosmore, et al., *Kentucky county 'hit really, really hard' by church revival that spread deadly COVID-19*, Louisville Courier Journal, April 2, 2020, available at https://www.courier-journal.com/story/news/2020/04/01/coronavirus-kentucky-churchrevival-leads-28-cases-2-deaths/5108111002/.

[23] Conger, et al., *Churches Were Eager to Reopen. Now They Are a Major Source of Coronavirus Cases*, New York Times, July 8, 2020, available at https://www.nytimes.com/2020/07/08/us/coronavirus-churches-outbreaks.html.

[24] *Id.*

[25] Nakia McNabb, *At least 18 West Virginia COVID-19 Outbreaks Linked to Church Services, Governor Says*, CNN, October 19, 2020, available at https://www.cnn.com/2020/10/19/us/west-virginia-covid-churches-trnd/index.html.

[26] Whelan, et al., *After Philly's First Church-Linked COVID-19 Outbreak, Pastors Urge Prayers for the Sick*, Inquirer, August 21, 2020, available at https://www.inquirer.com/news/tacony-church-covid-outbreak-philadelphia-20200821.html.

[27] Peter Grieve, *Defiant Pastor Dismisses COVID-19 as Milder than the Flu Despite Superspreader Event that Led to 91 Cases*, August 18, 2020, available at https://spectrumnews1.com/oh/columbus/news/2020/08/18/after-91-cases--church-pastor-says-virus-is-milder-than-flu.

[28] Alison Kuznitz, *More COVID-19 Deaths Linked to Super-Spreader Event at Charlotte Church*, Charlotte Observer, November 4, 2020, available at https://www.charlotteobserver.com/news/coronavirus/article246965397.html.

- In Maine, at least 49 cases and three hospitalizations have been linked to a church fellowship event and in-person services in which attendees did not regularly wear masks;[29] and after 62 people attended an indoor church wedding, more than 180 people have been infected, including at a long-term healthcare facility and a jail, and 8 people have died, none of whom attended the wedding.[30]
- In Michigan, 187 infections were connected to an indoor bar and restaurant with a live DJ and an open dance floor.[31] Of the total cases traced back to the restaurant, 144 were people who had been to the venue and 43 were family members, friends, and other contacts who had not.
- In La Cross, Wisconsin, there was a substantial spike in SARS-CoV-2 cases (more than 2,000) with the return to in-person instruction at the community's three universities.[32] Researchers were able to use SARS-CoV-2 genomic sequencing to trace COVID-19 clusters at two skilled nursing facilities—and two patient deaths—back to student gatherings and parties.
- In Boston, Massachusetts, a single person infected with a strain of the virus that contained a particular mutation (which allowed for tracking of related infections), attended a 200-person conference in February 2020, leading to a local superspreading event and ultimately downstream spread across the United States and Europe, likely

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[29] Dustin Wlodkowski, *COVID-19 Outbreak Centered on Maine Church Grows Again*, NBC Boston, October 22, 2020, available at https://www.nbcboston.com/news/local/covid-19-outbreak-centered-on-maine-church-grows-again/2216323/.

[30] Barbara A. Walsh, *The Uninvited Tragedy: A wedding – then six funerals*, The Maine Monitor, September 17, 2020, available at https://www.themainemonitor.org/the-uninvited-tragedy-a-wedding-then-six-funerals/; Roz Plater, *How a Small Wedding in Maine Became a Deadly COVID-19 Superspreader*, Healthline, September 20, 2020, available at https://www.healthline.com/health-news/how-a-small-wedding-in-maine-became-a-deadly-covid-19-superspreader.

[31] Ariana E. Cha, *'Superspreading' events, triggered by people who may not even know they are infected, propel coronavirus pandemic*, The Washington Post, (July 18, 2020), https://www.washingtonpost.com/health/2020/07/18/coronavirus-superspreading-events-drive-pandemic/.

[32] Richmond, Craig S., et al., *SARS-CoV-2 sequencing reveals rapid transmission from college student clusters resulting in morbidity and deaths in vulnerable populations*, Oct. 14, 2020, https://doi.org/10.1101/2020.10.12.20210294.

causing hundreds of thousands of cases.[33]

- In Massachusetts, more than 200 cases (more than 80% of them asymptomatic) have been traced to events held at a single church on or around one specific Sunday.[34]
- In Ohio, a wedding with 83 attendees resulted in 32 of the guests becoming infected, including guests that had worn face coverings except when eating.[35]
- In Washington, an indoor wedding has been linked to one death and is suspected of leading to 23 other deaths of persons in long-term care facilities who did not attending the wedding, as well as to numerous infections.[36]
- In Texas, a funeral attended by more than 100 people, at which most guests wore face coverings but did not socially distance, has been linked to more than 40 infections in guests ranging from age 3 to age 90.[37]
- In California, at least 64 cases have been linked to outbreaks stemming from a church that held indoor services at three of its locations.[38]
- In North Carolina, at least 75 people tested positive for COVID-19 following and

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[33] Jacob E. Lemieux, et. al., *Phylogenetic analysis of SARS-CoV-2 in Boston highlights the impact of superspreading events* Science, Dec. 10, 2020, available at https://science.sciencemag.org/content/early/2020/12/09/science.abe3261.

[34] Kaitlin McKinley Becker, *More Than 200 COVID-19 Cases Linked to Fitchburg Church*, NBC, Nov. 7, 2020, available at https://www.nbcboston.com/news/local/more-than-200-covid-19-cases-linked-to-fitchburg-church/2225433/?amp.

[35] Jatara McGee, *Cincinnati couple shares story after wedding becomes a 'super spreader' event*, WLWT5, Nov. 18, 2020, available at https://www.wlwt.com/article/local-couple-shares-story-after-wedding-becomes-a-super-spreader-event/34694908.

[36] Kristin M. Kraemer, *24 COVID deaths possibly tied to Eastern WA superspreader wedding*, Tri-City Herald, Dec. 11, 2020, available at https://www.tri-cityherald.com/news/coronavirus/article247689390.html.

[37] Alexandria Hein, *Texas funeral became coronavirus superspreader event after 42 were sickened, family claims*, Fox News, Nov. 27, 2020, available at https://www.foxnews.com/health/texas-funeral-became-coronavirus-super-spreader-event-after-42-were-sickened-family-claims.

[38] Brenda Gregorio-Nieto et al., *Health Officials Alert Public Over 2 Additional Outbreaks at Awaken Church Locations*, December 3, 2020, available at https://www.nbcsandiego.com/news/local/health-officials-alert-public-over-2-additional-outbreaks-at-awaken-church-locations/2460223/.

linked to a holiday-themed indoor church event.[39]

July 2, 2020 Risk Reduction Order and Transition to Harm Reduction Model

42. On July 2, 2020, I issued a risk reduction order that superseded the May 22 Order as amended on June 5. The July 2 Order went into effect at 12:01 a.m. on July 13, 2020.

43. By this time, we had significantly increased the County's capacity to detect cases through widespread testing and to contain disease spread through both broad and focused interventions; expanded our case investigation and contact tracing program and workforce; and increased hospital resources and capacity to treat infected patients. Scientific knowledge about the relative risks of various activities and the primary modes of transmission had also grown significantly (though in many areas it was and continues to be relatively nascent). In addition, residents in the County and greater Bay Area were suffering from "pandemic fatigue." To ensure more sustained compliance, and in light of our better understanding of key routes of transmission, we transitioned from the initial shelter-in-place model to a less restrictive, longer-term "harm reduction" model—a well-established public health strategy aimed at reducing the risk associated with certain behaviors.

44. In light of these circumstances, the July 2 Order allowed most activity, travel, and business operations to resume, but subject to significant conditions and limitations to reduce the risk of SARS-CoV-2 transmission, prevent serious illness and death, and ensure that healthcare resources and capacity remained sufficient to meet the needs of the population.

45. The July 2 Order required facilities that pose a high risk of transmission to remain closed to the public, including any indoor facility used for activities where face coverings must be removed, such as indoor dining, bars, and swimming pools.

46. The July 2 Order permitted indoor and outdoor gatherings, but because gatherings of any size outside of a single household carry significant risk of exposure to SARS-CoV-2, those

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[39] Simone Jasper, *75 COVID Cases Linked to Church Event in North Carolina, Officials Say*, Charlotte Observer, December 17, 2020, available at: https://www.charlotteobserver.com/news/state/north-carolina/article247921435.html.

gatherings were subject to restrictions, including facial covering requirements and attendance limits. Indoor gatherings were limited to a maximum of 20 people, or one person per 200 square feet of indoor space, whichever was fewer. Outdoor gatherings were limited to areas large enough to allow for social distancing of all attendees, up to a maximum of 60 people.

July 8, 2020 Mandatory Directive for Gatherings

47. On July 8, 2020, prior to the effective date of the July 2 Order, I issued a Mandatory Directive for Gatherings. The July 8 Directive prohibited indoor gatherings, regardless of size, but permitted outdoor gatherings of up to 60 people, subject to social distancing, use of face coverings, and other restrictions. Under the directive, singing and shouting were not allowed at gatherings, because of the evidence that these activities increase the risk of COVID-19 transmission.

48. The directive—including the prohibition on indoor gatherings—was part of a targeted response to case counts that had abruptly started to rise again in the County, neighboring counties, and the region overall. It was also based on my judgment that restrictions on gatherings of people from different households continued to be necessary to reduce community transition of the virus. Indoor gatherings present a relatively high risk of transmission and infection, particularly gatherings that are large, conducted in a space with poor ventilation, longer in duration, and include activities like loud talking and singing.

July 13, 2020 State Public Health Order

49. Based on the trend of the number of new cases and hospitalizations per day, on July 13, 2020, the State Health Officer ordered the closure of indoor operations for particular sectors across the state, including indoor dining, wineries and tasting rooms, family entertainment centers, movie theaters, zoos, museums, and cardrooms. In addition, the State Health Officer ordered the closure of indoor operations for additional sectors in certain counties, including Santa Clara County, effective July 15, 2020. These additional closures included indoor gyms and fitness centers, worship services, protest activities, personal care services, and malls.

July 14, 2020 Mandatory Directives

50. On July 14, 2020, I issued a number of directives in order to tailor the State's general framework to local conditions. Among other directives, I issued an updated Mandatory Directive for

Gatherings clarifying that, in addition to the County's restrictions, the State also prohibited indoor worship and indoor protest activities. Outdoor worship services and outdoor protests in Santa Clara County remained subject to the mandatory requirements in the directive.[40]

The County Begins Civil Enforcement of Public Health Orders

51. On August 11, 2020, the County's elected Board of Supervisors unanimously adopted an ordinance authorizing civil administrative fines for violations of the State and County Health Officers' orders related to the COVID-19 pandemic, including the July 2 Order, the Mandatory Directive for Gatherings, the July 13 State Public Health Order and subsequent orders, and the mandatory provisions of the State's industry-specific guidance. My goal has always been to inform the public regarding the COVID-19 pandemic to achieve voluntary compliance and safeguard their health, but I understand that enforcement may nonetheless prove necessary. The long-term viability of the orders and directives I have issued depends upon robust compliance in the County.

August 28, 2020 State Public Health Order

52. On August 28, 2020, the State Public Health Officer issued a superseding order, effective August 31, 2020, referred to as the "Blueprint for a Safer Economy." That order established a procedure for assigning counties to one of four tiers based on average case rates and positivity rates of SARS-CoV-2, which in turn determined what activities would be allowed in the county. Santa Clara County was initially assigned to the most restrictive Tier 1 (Purple), classified as "widespread" transmission of the novel coronavirus. In Tier 1 counties, indoor church services are prohibited, but outdoor services are permitted.

53. On September 8, 2020, the California Department of Public Health announced that Santa Clara County had moved to Tier 2 (Red), classified as "substantial" risk of community disease transmission. Tier 2 counties can allow indoor gatherings and dining of up to 100 people or 25% of capacity (whichever is less) as well as indoor personal care services with modifications; however,

[40] On July 20, 2020, a revised Mandatory Directive for Gatherings included in the introductory box at the top of the document clarifying information regarding the State's exceptions to its prohibition of gatherings.

the State's August 28 Order permitted counties to issue and enforce more restrictive measures: "[a] local health jurisdiction may continue to implement or maintain more restrictive public health measures if the jurisdiction's Local Health Officer determines that health conditions in that jurisdiction warrant such measures."

54. Given ongoing community transmission and the continuing risk facing county residents, as well as the research establishing the significantly elevated risk associated with indoor gatherings, I decided to maintain the prohibition on indoor gatherings after the County moved to Tier 2. Both the State and the County orders continued to prohibit singing and to require face coverings and social distancing of at least six feet at all gatherings. I maintained the prohibition on indoor gatherings because evidence shows that SARS-CoV-2 is spread primarily from person to person through respiratory droplets and aerosols, and, as explained above, that the risk of transmission is higher with indoor activities than outdoor activities.

55. The evidence also suggests that indoor gatherings may pose a higher risk of transmission than other kinds of activities that remain subject to different restrictions, including because they are of a sustained duration. For example, when people from different households are together in a grocery or retail store, they typically arrive and depart at different times, and they are together for a shorter duration of time as compared to attendees at a coordinated gathering where attendees linger. Further, grocery and retail shoppers may be less likely to be in close proximity to other shoppers, as opposed to attendees at a gathering who have social connections to one another and therefore may be inclined to have extended conversations in close proximity or physically hug or touch one another. These shoppers are also less likely to engage in higher-risk activities like singing or chanting, as opposed to attendees at an indoor gathering like a church congregation or community sponsored music concert. Thus, the risk of transmission is generally lower in a setting with brief contact between individuals, particularly ones who do not personally know one another and are less likely to speak to or closely interact with one another, as compared to a setting such as a gathering that promotes sustained contact.

56. Although I decided not to remove the prohibition on indoor gatherings after the County moved to Tier 2 on September 8, 2020, I revised the Mandatory Directive for Gatherings on

September 5, 2020, to relax restrictions on outdoor gatherings consistent with developing research regarding transmission risks and the experiences in other jurisdictions easing certain restrictions.[41] Specifically, I removed the prohibition on singing, chanting, and shouting at outdoor gatherings, provided that people wore face coverings and maintained social distancing at all times when engaged in those activities. The directive also permitted playing wind instruments at outdoor gatherings, provided that people placed a cloth covering over the mouth of the instrument. Additionally, I revised the directive to allow the use of canopies, awnings, umbrellas, tents, and other structures for outdoor gatherings provided that three sides or 75% of the structure were open to the air. Finally, I eased restrictions to make it easier for entities to host simultaneous but separate outdoor gatherings of 60 or fewer people by allowing use of the same restroom facilities, provided that there was sufficient restroom capacity or a system of use in place to avoid participants in different gatherings interacting with one another while using the restrooms.

October 5, 2020 Revised Risk Reduction Order

57. On October 5, 2020, I issued a revised risk reduction order that would go into effect and supersede the July 2 Order the day after the California Department of Public Health re-assigned Santa Clara County from Tier 2 to Tier 3 (Orange), classified as "moderate" risk of community disease transmission. On October 13, 2020, the State moved Santa Clara County into Tier 3. Thus, the revised risk reduction order went into effect at 12:01 a.m. on October 14, 2020, and remains in effect as of the date of this declaration.

58. To better align the County's rules with the State's rules, the October 5 Order allowed many businesses and activities to resume to the extent allowed under the State's rules for Tier 3 counties. However, I decided to maintain stricter restrictions on activities that pose a particularly high risk of a superspreader event, including indoor gatherings.

October 13, 2020 Revised Mandatory Directives

59. On October 13, 2020, the day Santa Clara County moved into Tier 3, I revised a

[41] On September 8, 2020, I revised the Mandatory Directive for Gatherings to make clarifying changes to the introductory box at the top of the document.

number of directives. I did so based on the trends of new cases and hospitalizations in the County, growing evidence regarding the virus and how it is transmitted, and the experiences of other jurisdictions that similarly eased certain restrictions.

60. At that time, I revised the Mandatory Directive for Gatherings to further relax restrictions on outdoor gatherings and to remove the prohibition on indoor gatherings. The directive limited outdoor gatherings to 200 people (up from 60 in the prior directive) and required that such gatherings take place in an area large enough to allow for social distancing of all attendees. Although they were strongly discouraged in the directive, I also allowed indoor gatherings to resume at the level provided in the State's restrictions applicable to Tier 2 counties, which limits such gatherings to 100 people or 25% of the facility's capacity, whichever is fewer. There is growing evidence that reopening facilities at reduced capacity is an effective way to reduce the risk of transmission indoors.[42] Under the October 13 directive, face coverings were almost always required at all times at all gatherings. Although attendees at outdoor gatherings could temporarily remove their face coverings to eat or drink, food and drink could not be served at any indoor gatherings except as necessary to carry out a religious ceremony given the high risk of transmission indoors. For similar reasons, although permitted at outdoor gatherings subject to specific requirements, singing, chanting, and playing wind instruments remained strictly prohibited at indoor gatherings under this directive. However, singing was allowed indoors if it was for a livestream production, presentation, or service without an audience present, and if the singer remained physically distant from other persons present (who had to keep their face coverings on). As with outdoor gatherings, a venue could host multiple indoor gatherings at the same time subject to specific requirements. If a venue hosted multiple indoor gatherings at the same time, each gathering had to comply with the requirements of the October 5 Order and directive—which included submitting and implementing a Social Distancing Protocol, mandating the use of face coverings in all circumstances required by the State's guidance, complying with the capacity limitations described above, maximizing ventilation,

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[42] Chang, Serina, et al., *Mobility network models of COVID-19 explain inequities and inform reopening*, Nature, Nov. 10, 2020, https://doi.org/10.1038/s41586-020-2923-3.

and designating a host responsible for ensuring compliance with all applicable requirements—and be fully separated by solid floor-to-ceiling walls or other partitions from any other gathering. Participants could not mix or enter common spaces with participants from any other gatherings.

61. Subsequent studies published since the summer have continued to identify indoor singing—especially without risk mitigation measures like face coverings and social distance—as an activity with a high risk of disease transmission. For example, one study published by *Aerosol Science and Technology* in September 2020 concluded that "singing in groups is likely to be an activity at risk of transmitting infection" without appropriate measures, which include "distancing, hygiene, ventilation and shielding."[43] Even with certain risk mitigation measures, however, singing poses an elevated risk of transmission. The study found that although wearing an ordinary surgical face mask reduced the amount of aerosols and droplets a person emitted while singing, the amount was still comparable to the amount emitted by a person speaking without a mask.[44] And that measurement did not consider the number of particles that may have exited on the sides of masks with a loose fit.[45] Another recent study published by the *International Journal of Indoor Environment and Health* examined the same March 10, 2020 indoor choir rehearsal that was the subject of the CDC study discussed above and likewise concluded that group singing indoors poses a high risk of transmission.[46]

Orchard Community Church and The Home Church's Compliance with the Health Officer's Orders and Directives

62. I am aware of the lawsuit filed by Gateway City Church, The Home Church, the Spectrum Church of the San Francisco Bay Area, Orchard Community Church of Campbell, and

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[43] Alsved, et al. (September 2020) *Exhaled Respiratory Particles During Singing and Talking*, https://www.tandfonline.com/doi/full/10.1080/02786826.2020.1812502.

[44] *Id.*

[45] *Id.*

[46] Miller, et al. (September 2020) *Transmission of SARS-CoV-2 by inhalation of respiratory aerosol in the Skagit Valley Chorale superspreading event*, https://onlinelibrary.wiley.com/doi/full/10.1111/ina.12751.

Trinity Bible Church. I am informed that Orchard Community Church held worship services indoors for six Sundays in direct violation of the County's Gatherings Directive and has held worship services indoors, without masks and social distancing. I am also informed that The Home Church held indoor worship services for at least three weeks where the church did not enforce social distancing or require congregants to wear masks while seated next to one another.

63. Based on this understanding, it is my view that activities like those of the Orchard Community Church and The Home Church in violation of State and County public health orders is unsafe, detrimental to public health, and poses a significant risk of new infections, leading to potential hospitalization and death for members of the churches as well as others in the broader County community to whom they may spread the disease. It also may encourage other businesses and religious institutions to similarly violate the orders and applicable directives and guidance. Given the ongoing and now rapidly rising community transmission of SARS-CoV-2 in the County, it is only a matter of time before large, indoor gatherings without social distancing or face coverings result in disease transmission; and, unfortunately, these conditions could result in a superspreader event, if they have not done so already. Adverse outcomes from a superspreader event may include multiple infections, hospitalizations, chronic health problems, and even deaths. Consistent with well-established public health principles, this pandemic has demonstrated that community members' adherence to or disregard for public health measures, can either prevent or increase the likelihood of superspreader events, here in the County and across the globe. Even one or two superspreader events could set off multiple chains of transmission with far reaching and deleterious downstream consequences.

64. I am aware that Plaintiffs in this litigation have argued there is no evidence that indoor worship has led to COVID-19 in the County generally or at their churches specifically. Even if Plaintiffs are not aware of any COVID-19 cases connected to their churches, that does not mean there have not been any such cases or will not be any such cases. We know that people can have SARS-CoV-2 infection, never develop symptoms (asymptomatic infection), and transmit the virus. An estimated 40% of people with SARS-CoV-2 infection are asymptomatic. I am not aware that any worship services held in the County require testing of congregants for SARS-CoV-2.

Moreover, we know that persons who are asymptomatic, but infected, can spread the SARS-CoV-2 infection to others—meaning that a person could become infected by SARS-CoV-2 at a worship service held indoors, remain asymptomatic, and unknowingly transmit the infection to persons who may have never set foot into any of the place of worship's facilities. And some of those persons could become ill, hospitalized, and/or die from COVID-19. Thus, even if Plaintiffs had some type of data that could actually show that none of the persons who have attended their services in the last 6-7 months have become ill or died from SARS-CoV-2, they still cannot conclude that no person in the wider community has been infected, because virus from an asymptomatic church member could have been, or could be, transmitted to members of the wider community.

65. We need to keep the level of community transmission of SARS-CoV-2 low to protect our most vulnerable residents. By way of example, we have seen a persistent and concerning infection, hospitalization and mortality rate among residents of long term care facilities—both skilled nursing facilities and assisted living facilities—once SARS-CoV-2 is introduced into the facility. During the month of October 2020, the majority of deaths from COVID-19 occurred in residents of our County's long-term care facilities. We know from experience that once a COVID-19 outbreak starts within a facility, it is exceedingly difficult to control. One pattern that we have seen frequently at long-term care facilities is that a person who works at the facility becomes infected in the community, remains asymptomatic, and unknowingly spreads the infection to others working at or being cared for at the facility. The higher the level of transmission in the community as a whole, the higher the probability that a person who works at that facility will become infected in the community and introduce the virus into a long-term facility and cause an outbreak. Many of these outbreaks lead to death of vulnerable residents. By suppressing community transmission to the greatest extent possible, we can offer greater protection to our most vulnerable residents.

Fall Surge and Revised Mandatory Directives

66. The United States experienced an accelerating surge in COVID-19 cases beginning in early November. As noted above, starting November 4, 2020, the United States has recorded more than 100,000 new cases each day with many days surpassing the previous single-day record and each day's total eclipsing the summer's single-day record of 77,300 new cases in mid-July.

67. Unfortunately, case counts, positivity rates, and hospitalizations likewise began to accelerate rapidly in Santa Clara County. For example, as of October 24, 2020, there had been 24,014 cases confirmed in the County, the seven-day running average of new cases per day was 114, and 388 County residents had died with COVID-19. In comparison, as of November 29, 2020, there had been 33,732 cases confirmed in the County, the seven-day running average of new cases per day was 417, and 476 County residents had died with COVID-19. In other words, the seven-day running average of new cases in the County more than *tripled* during that time period. The County also saw a sharp rise in hospitalizations for COVID-19 during the month of November: The number of people hospitalized with COVID-19 went from 86 people on November 1, 2020; to 135 people on November 14, 2020; to 272 people on November 28, 2020. And those numbers have gotten dramatically worse in December: As of December 22, 2020, there had been 57,452 cases confirmed in the County; the most recent seven-day running average of new cases per day was 1,183; 607 County residents had died with COVID-19; and 621 people were hospitalized with COVID-19. The seven-day running average of new cases in the County thus almost tripled again from November to December.

68. In response to the rapid rise in case rates and increasing positivity rate and hospitalizations in Santa Clara County, the Bay Area, and California, I determined that it was necessary to impose renewed restrictions on certain high-risk activities in order to blunt the rapid rise in case rates and prevent the expected additional hospitalizations and deaths that generally follow. Other Bay Area officials made similar determinations. As one example, effective November 17, 2020, the Mandatory Directive for Dining, Bars, Wineries, and Smoking Lounges prohibits indoor dining and indoor tasting activities at wineries based on the consensus among public health experts that indoor activities, especially without face coverings, pose a higher risk of transmission than outdoor activities.

69. On November 16, 2020, the State announced that Santa Clara County would move from Tier 3 (Orange) directly into the most restrictive Tier 1 (Purple), effective November 17, 2020. Impacts of this reassignment included the closure of indoor dining, which had already been planned in the County, as well as the closure of all indoor activities associated with gyms, museums, zoos,

and aquariums. Indoor gatherings, including at places of worship and movie theaters, were also prohibited. In addition, shopping malls and retail establishments were required to reduce their indoor capacity to 25%.

70. In addition, effective November 17, 2020, the new Mandatory Directive on Capacity Limitations established capacities for various sectors and activities.[47] I issued this directive based on the growing evidence that reducing capacity is an effective way to reduce the risk of transmission indoors.[48] I also revised the Mandatory Directive on Gatherings to specify that the State's determination that the County has been assigned to the Purple Tier resulted in the prohibition of all indoor gatherings, effective November 16, 2020.

November 19, 2020 State Public Health Order

71. On November 19, 2020, the State Public Health Officer issued a temporary order referred to as the "Limited Stay at Home Order." This order, which was issued to address the unprecedented fall surge of COVID-19 cases described above, took effect on November 21, 2020, and is scheduled to remain in effect until December 21, 2020, unless extended or revised by the State Public Health Officer.

72. To reduce opportunities for transmission of COVID-19 in the community, the State's Limited Stay at Home Order placed additional restrictions on counties in Tier 1 (Purple) of the State's Blueprint for a Safer Economy. In those affected counties, the State's Limited Stay at Home Order prohibited all activities involving interaction or gathering—either indoors or outdoors—with members of other households between the hours of 10:00 p.m. and 5:00 a.m., except (a) for certain activities associated with the operation, maintenance, or use of critical infrastructure, as specified on the State's Essential Critical Infrastructure Workers list, or (b) for those activities required by law.

73. The stated intent of the State's Limited Stay at Home Order was to decrease the amount of time individuals would be mixing in the community with people outside their own households, as

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[47] Before this directive, businesses and community members had to refer to multiple directives, as well as State guidance, to determine applicable capacity limitations (if any) for particular sectors or activities.

[48] Chang, *supra*.

such interactions present opportunities for disease transmission. The Limited Stay at Home Order placed restrictions from 10:00 p.m. to 5:00 a.m. because the State Public Health Officer determined that activities and gatherings that occur during that timeframe are often non-essential, social activities during which reduced inhibitions would more likely lead to disregard of COVID-19 preventative measures, such as maintaining physical distance or using face coverings. Thus, under this Limited Stay at Home Order, individuals in Tier 1 (Purple) counties were prohibited from engaging in non-essential activities—like dining outdoors at a restaurant or going to an outdoor movie—between the hours of 10:00 p.m. and 5:00 a.m.

November 30, 2020 Revised Mandatory Directives and Travel Directive

74. By late November, the number of Santa Clara County residents contracting COVID-19 and the number of patients hospitalized with COVID-19 had continued to rise significantly. On November 28, 2020, there were 760 new cases of COVID-19 and 239 COVID-related hospitalizations, 71 of whom were in the ICU. Based on infectious disease models by colleagues at UCSF and Stanford, the rapidly rising numbers of patients needing hospitalization for COVID was projected to exceed the available staffed hospital beds by the second or third week of December if actions to dramatically decrease levels of community transmission were not taken immediately.

75. To reduce the likelihood of a surge in hospitalizations that would exceed the capacity of hospitals in the County, I made several changes to the Mandatory Directives, including requiring retail stores, limited service facilities, and most other facilities open to the public to be limited to 10% capacity indoors[49]; requiring facilities open to the public to establish a "metering system" to ensure applicable capacity limits are not exceeded; and closing cardrooms; among other changes. I also reduced the maximum number of people who could attend an outdoor gathering from 200 people to 100 people.

76. The risk of COVID-19 transmission in Santa Clara County increases as people travel in and out of the county because those travelers interact with members of other communities,

[49] Grocery stores, drug stores, and pharmacies were allowed to operate at 25% capacity indoors to ensure adequate access to food and medicine.

including communities where the prevalence of COVID-19 may be higher than in Santa Clara County. Therefore, in a further attempt to stem the significant increases in COVID-19 cases and related hospitalizations in Santa Clara County, I issued, on November 28, 2020, a Mandatory Directive on Travel discouraging all travel, especially for non-essential purposes. This Mandatory Directive on Travel requires most travelers who nevertheless travel into Santa Clara County from more than 150 miles away to quarantine, meaning they are prohibited from having contact with individuals from outside of their household or their immediate traveling party. Quarantine after travel will ensure that long-distance travelers do not introduce new COVID-19 cases (and, potentially, subsequent chains of transmission) into the Santa Clara County community from their location of origin. And requiring long-distance travelers to quarantine will lower the risk that asymptomatic or pre-symptomatic COVID-19-positive travelers will unwittingly transmit the disease to others in the county.

77. These revised and new Mandatory Directives took effect on Monday, November 30, at 12:01 a.m. and will remain in effect until at least December 21, 2020 at 5:00 a.m. unless they are extended.[50]

December 3, 2020 State Regional Stay At Home Order

78. In response to the continuing fall surge of COVID-19 cases in California, which had led to a dramatic increase in hospitalizations throughout the state, the State issued a Regional Stay at Home Order on December 3, 2020, in an attempt to keep hospitals across the state from being overwhelmed.

79. Under the Regional Stay at Home Order, the State monitors the hospital intensive care unit ("ICU") capacity in each of five geographic regions established by the State. The State placed Santa Clara County in the "Bay Area" region with Alameda, Contra Costa, Marin, Monterey, Napa, San Francisco, San Mateo, Santa Clara, Santa Cruz, Solano, Sonoma Counties. If a region's hospital ICU capacity falls below 15%, it triggers the Regional Stay at Home Order's restrictions on

[50] On December 2, 2020, I issued an amended Mandatory Directive on Travel that clarified the exemptions from the mandatory quarantine requirement for some travelers.

the types of activities permitted in the region. Once a region falls below the 15% trigger, residents are prohibited from gathering with members of other households—indoors or outdoors—at any time of day, with limited outdoor exceptions for worship services, political activities, and cultural ceremonies. Residents in the region must stay at home or at their place of residence at all times, except for (a) certain activities associated with the operation, maintenance, or use of critical infrastructure, as specified on the State's Essential Critical Infrastructure Workers list, (b) activities required by law, or (c) activities specifically permitted in the Regional Stay at Home Order.

80. When a region falls below the 15% hospital ICU capacity trigger, the Regional Stay at Home Order prohibits most activities that would otherwise be permitted in the region, even under Tier 1 (Purple), which is the most restrictive tier in the State's Blueprint for a Safer Economy. For example, the following activities would be prohibited in a region that has fallen under the 15% trigger, even though such activities would otherwise be permitted even under Tier 1: dining outdoors at a restaurant; receiving personal care services, such as a haircut, a manicure, or a tattoo; going to an outdoor zoo or museum; and gaming at an outdoor cardroom. In my opinion, restricting these types of activities is important to slow the rate of disease transmission and to keep the region's healthcare system from becoming overwhelmed in this moment when the region's healthcare system is under significant strain.

81. In addition to prohibiting certain activities in regions that have hit the 15% hospital ICU capacity trigger, the Regional Stay at Home Order also imposes further restrictions on those businesses that are allowed to continue operating in those regions. For example, the Regional Stay at Home Order imposes stricter capacity limitations on retailers. Retailers, other than stand-alone grocery stores, are required to reduce the number of people inside their indoor facility to 20% of normal capacity, down from the 25% capacity limit in Tier 1 (Purple). Stand-alone grocery stores must reduce their capacity to 35% of normal, down from the 50% capacity limit in Tier 1 (Purple).[51]

[51] The Regional Stay at Home Order issued on December 3, 2020, originally limited all retailers, including stand-along grocers, to a 20% capacity. However, the State amended the capacity limitation on stand-alone grocery store, increasing it to 35%, in its December 6, 2020, Supplement to Regional Stay at Home Order.

In my opinion, reducing the capacity of indoor retail spaces is an important tool to lower the opportunities for disease transmission, because reducing the number of people in an indoor space reduces the volume of respiratory droplets and aerosols being released into that space, and provides more room for individuals to stay physically distanced from one another. The use of occupancy or capacity limits is recommended by the CDC,[52] and its efficacy is supported by current models of mobility and disease transmission.[53]

December 4, 2020 Mandatory Directive Implementing State's Regional Stay at Home Order

82. On December 4, 2020, I, along with the Health Officers for the Counties of Alameda, Contra Costa, Marin, and San Francisco, as well as the City of Berkeley, jointly announced that our respective jurisdictions would implement the State's Regional Stay at Home Order early, rather than waiting for our Bay Area region to fall below the 15% hospital ICU capacity trigger, which at that time was expected to occur in mid- to late-December.

83. I made this decision for Santa Clara County based on the dramatically rising case rates and hospitalization rates in the county. While the Bay Area Region's hospital ICU capacity was still above the 15% trigger at the time of my decision, Santa Clara County's hospital ICU capacity had already fallen below 15%. Furthermore, because of the significant lag between when people become infected with COVID-19 and when they may need to be hospitalized, I was concerned that Santa Clara County's healthcare system was at imminent risk of being overwhelmed. Thus, I determined that immediate further action was necessary to slow the spread of COVID-19 in the county. Since the December 4, 2020 announcement, ICU capacity has continued to fall, as reflected in the data published on the County's COVID-19 Hospitalizations Dashboard as of December 23,

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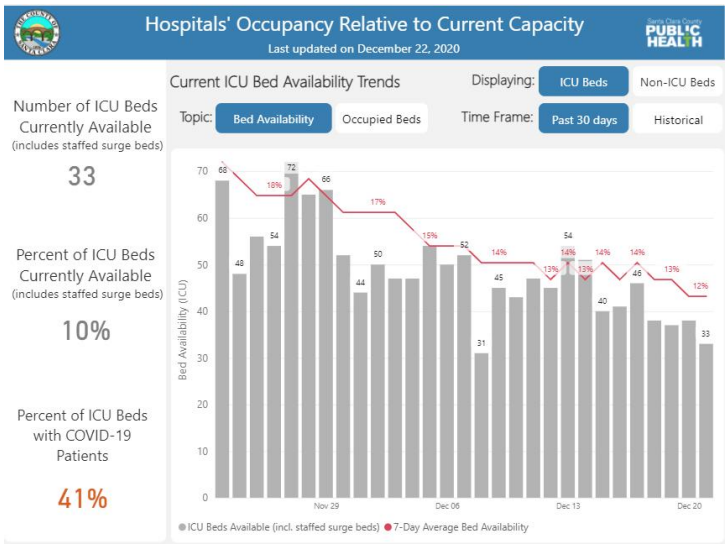
[52] Honein MA, et al., *Summary of Guidance for Public Health Strategies to Address High Levels of Community Transmission of SARS-CoV-2 and Related Deaths*, December 2020. MMWR Morb Mortal Wkly Rep 2020;69:1860-1867. DOI: http://dx.doi.org/10.15585/mmwr.mm6949e2.

[53] Chang S., et al., *Mobility network models of COVID-19 explain inequities and inform reopening*. Nature (2020). https://doi.org/10.1038/s41586-020-2923-3

2020:



84. The County's Mandatory Directive Implementing State's Regional Stay at Home Order took effect on December 6, 2020, and will remain in place until January 4, 2021, unless otherwise rescinded, modified, or extended.

85. As part of my decision to implement the State's Regional Stay at Home Order, I also amended the County's Mandatory Directive on Capacity Limitations. The December 4, 2020, amendments to the Mandatory Directive on Capacity Limitations require all retailers to reduce the number of people inside their indoor facility to 20% of normal capacity, aligning the County's capacity limitations on retailers with those of the State and the surrounding jurisdictions. Like the State's Regional Stay at Home Order, the County's revised Mandatory Directive on Capacity also prohibited or continued to prohibit restaurants, card rooms, personal care businesses, and non-essential limited services, like pet groomers, from operating indoors or outdoors.

86. On December 4, 2020, I also amended the County's Mandatory Directives on Gathering to clarify that under the Regional Stay at Home Order's, both indoor and outdoor gatherings with members of other households are prohibited, except for outdoor worship services, political events, car-based gatherings, and cultural ceremonies of up to 100 people.

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87. As the surging case rates demonstrate, there is still ongoing and accelerating community transmission of SARS-CoV-2 in the County, and a recent national seroprevalence study

estimates that the vast majority of California residents—more than 96%—have not been exposed to the virus and still have no immunity.[54] As such, our community and the greater Bay Area are still facing the risk of uncontrolled new infections, illnesses, hospitalizations, and deaths. In light of these ongoing risks, accepted public health principles counsel a cautious and incremental approach. Keeping a risk reduction order in place remains critical to our ability to protect the community and control the ongoing surge of COVID-19 cases.

88. I understand that a minority of public commentators have called for a more hands-off approach than the one I have taken. Some of these commentators urge a "herd immunity" approach, relying on the assumption that uncontrolled spread of the virus will create widespread immunity against later infection and eventually bring the pandemic to an end. I agree with the vast majority of infectious disease epidemiologists and public health professionals who reject the "herd immunity" strategy. Achieving such immunity would take a significant amount of time—some estimate as long as 18 to 24 months[55]—and would almost certainly result in a staggering number of infections and deaths.

89. Santa Clara County, the Bay Area, the State of California, the United States, and the rest of the world have not seen a public health threat like this in more than 100 years. The SARS-CoV-2 virus has infected persons of all ages and all health conditions. But this public health emergency will not last forever. Progress has been made on therapeutic treatments for COVID-19, including antivirals, monoclonal antibodies, and convalescent plasma therapy.[56] In addition, two vaccines for SARS-CoV-2 have recently received Emergency Use Authorization, initial allocations have already arrived in Santa Clara County, and vaccination of healthcare personnel and other

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[54] Shuchi, Anand, et al., *Prevalence of SARS-CoV-2 antibodies in a large nationwide sample of patients on dialysis in the USA: a cross-sectional study*, The Lancet, Vol. 396, Issue 10259, pp. 1335–44, Oct. 24, 2020, https://doi.org/10.1016/S0140-6736(20)32009-2.

[55] Moore, Kristine A., et al., *COVID-19: The CIDRAP Viewpoint*, Ctr. For Infectious Disease Res. & Pol. (Apr. 30, 2020), https://www.cidrap.umn.edu/sites/default/files/public/downloads/cidrap-covid19-viewpoint-part1_0.pdf.

[56] Shawn Radcliffe, *Here's Exactly Where We Are with Vaccines and Treatments for COVID-19*, Healthline (Dec. 8, 2020), https://www.healthline.com/health-news/heres-exactly-where-were-at-with-vaccines-and-treatments-for-covid-19.

priority groups has already begun. Numerous potential other vaccines for SARS-CoV-2 are in clinical trials.[57]

90. My staff and I continue to monitor a variety of public health indicators, including the trend of the number of new cases and hospitalizations per day; the positivity rate; the number of deaths; the location and character of outbreaks; especially those occurring in long-term care facilities; and the capacity of the healthcare system in the County and the region, to provide care during the current surge in cases and hospitalizations. We also continue to monitor our capacity to effectively respond and protect the public, including our capacity to efficiently and accurately test persons for SARS-CoV-2, especially in high-risk populations and settings; to conduct effective case investigation and contact tracing; to support persons who are isolating or quarantining; and to prevent and control outbreaks in long-term care and other settings with a concentrated population of vulnerable persons. We also continue to review the developing research regarding SARS-CoV-2 and the disease it causes. Finally, we continue to collaborate with and monitor other jurisdictions implementing various public health measures to address the pandemic.

91. The graph below demonstrates that throughout the pandemic, our shelter-in-place and risk reduction orders, as well as the related mandatory directives, have been responsive both to the state of the pandemic in the County and to the needs of residents to take part in the activities that are important to their lives. As case counts have risen and fallen, my staff and I have adjusted the County guidelines based on established public health principles. In particular, when the growth in new cases slowed, we have been able to ease restrictions on daily activities and gatherings.

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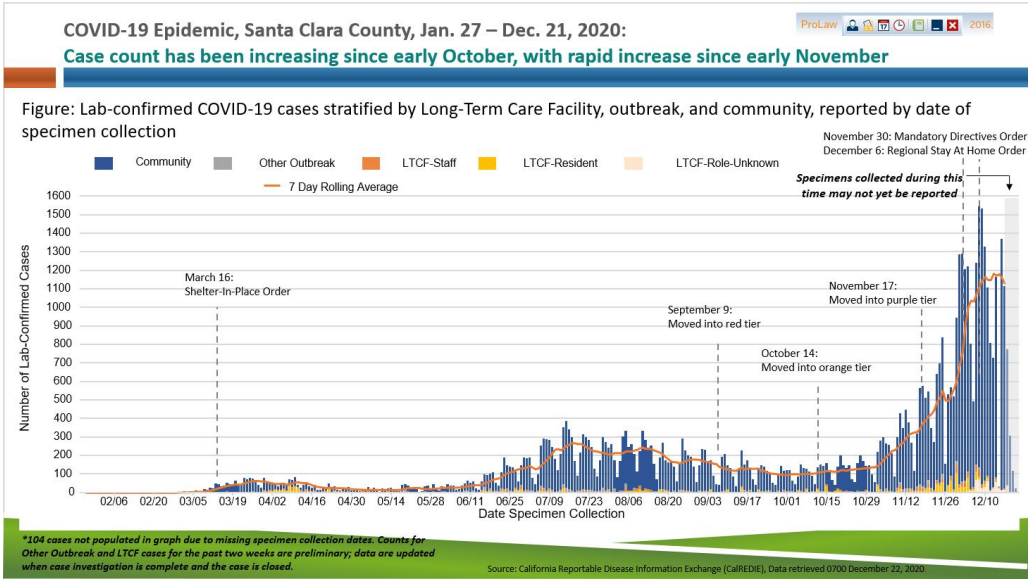
[57] *Id.*



92. The graph also reflects that when we have loosened restrictions, case counts have increased. For example, in response to a flattened curve in April and May 2020, on June 5, 2020, we updated our shelter-in-place order to allow additional commercial and other activity. This relaxation was followed by an increase in cases. As cases are again on the rise, now is not the time to ease restrictions on community transmission or lift the Risk Reduction Order and Mandatory Directives.

* * *

93. I—along with many health officials from all over the world—have concluded that the best course of action for managing the pandemic and preventing a surge in deaths from COVID-19 while scientists continue to develop treatments and while recently approved vaccines become available to a greater portion of the population, is to prevent the infection from spreading using the tools we currently have available. These tools include staying at home, maintaining social distancing when outside the home, conducting business and activities outdoors whenever possible, wearing a face covering when interacting with others outside of one's household, and limiting the number and duration of contact with others to the greatest degree possible. We do not take lightly asking people to take these steps. We understand that people are suffering from real impacts on all aspects of their lives and livelihoods. We each have a part in slowing the spread of this virus. Right now, we all urgently need to reduce the number of people with whom each of us comes in contact and the intensity of those contacts. These actions will save lives. The better we all do today, the

sooner this pandemic will end.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct. Executed in San José, California on December 23, 2020.

/s/ Sara H. Cody
SARA H. CODY, M.D.

2329525

Exhibit 3

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COUNTY OF SANTA CLARA, SARA H. CODY

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
(San José Division)

GATEWAY CITY CHURCH, et al., Plaintiffs, v. GAVIN NEWSOM, et al., Defendants.	No. 20-CV-08241-EJD **DECLARATION OF DR. MARC LIPSITCH IN SUPPORT OF DEFENDANTS COUNTY OF SANTA CLARA AND DR. SARA H CODY'S OPPOSITION TO PLAINTIFFS' MOTION FOR A PRELIMINARY INJUNCTION** Date: January 15, 2020 Time: 10:00 a.m. Courtroom: 4 Judge: Hon. Edward J. Davila

I, DR. MARC LIPSITCH, declare as follows:

1. I am a resident of Jamaica Plain, Massachusetts. I have personal knowledge of the matters set forth below and could testify competently to them if called to do so.

Professional Background

2. I am the founding Director of the Center for Communicable Disease Dynamics (CCDD) at the Harvard School of Public Health, where I am also a Professor in the Department of Epidemiology and the Department of Immunology and Infectious Diseases. I have a B.A. in Philosophy from Yale University and a DPhil (the Oxford equivalent of a PhD) in Zoology from the University of Oxford, which I attended as a Rhodes Scholar. After receiving my DPhil, I completed a postdoctoral research fellowship in Biology at Emory University working on the population biology of infectious diseases. A copy of my C.V. is attached to this declaration as Exhibit A. I

have been elected as a Fellow of the American Academy of Microbiology and a member of the National Academy of Medicine for the United States.

3. CCDD is a research center committed to advancing our understanding of infectious disease and training the next generation of scientists. It was founded as a Center of Excellence in the Models of Infectious Disease Agent Study funded by the National Institute of General Medical Sciences of the U.S. National Institutes of Health (NIH). CCDD has been at the leading edge of epidemiology, pioneering new approaches and methodologies for investigating both recurring and emerging problems. The goal of our work at CCDD is to understand why and how infectious disease persists and changes and use that knowledge to lessen its burden on people.

4. CCDD is closely monitoring the progress of COVID-19. CCDD faculty—including me—are conducting research on the novel coronavirus SARS-CoV-2 and COVID-19, the disease it causes. CCDD faculty have published over 50 peer-reviewed articles about SARS-CoV-2 and COVID-19. I am the lead or a contributing author on more than 20 of those articles. CCDD faculty regularly host and contribute to online events about COVID-19; appear in national and international media, including print and broadcast news; participate in scientific conferences, consortia, discussions, debates, and podcasts; and advise local, state, and federal officials and leaders of countries around the world.

5. My own work on COVID-19 has included epidemiology, mathematical modeling, and exploration of ethical issues related to vaccine trials and school reopenings. My research has helped identify countries with undetected cases before they were reported; modeled the effects of various social distancing and quarantine strategies; and contributed to some of the earliest estimates of case-fatality rates. My research has also addressed new methodologies on how to study immunity to COVID-19; and I am a co-lead on a large collaborative effort, led by experts at the University of Chicago and involving multiple European universities, to establish best practices for estimating the contagiousness of the virus. My work has also addressed the ethical aspects of COVID-19 vaccine trial design, including the first published proposal for human challenge studies, which received support from the World Health Organization (WHO) and the NIH, and which was implemented in the U.K.

6. I have advised the WHO, the International Monetary Fund, the Prime Minister of Israel, and senior government officials in the U.S., Canada, India, Germany, Austria, and Luxembourg on COVID-19, as well as the U.S. National Governors' Association and numerous state and local health officials. I am a member of the Massachusetts Governor's Medical Advisory Committee and the Massachusetts COVID-19 Vaccine Working Group. I am also an ad hoc expert to the COVID-19 Vaccine Working Group, which is part of the WHO Strategic Advisory Group of Experts. Health departments on several continents use software that I helped develop to update their estimates of trends in COVID-19 cases.

7. Over the course of the COVID-19 pandemic, I have been asked to provide and have provided interviews and analysis to national and international media outlets, including CNN, BBC, the *Guardian* and the *Wall Street Journal*; and I have published articles explaining aspects of the COVID-19 pandemic in national and international media outlets, including the *New York Times* and *Washington Post*. My public science communication efforts also include a Twitter account with an active following. Earlier this year, physicist Jonathan Oppenheim reported that I was the second-most-followed expert by other experts on the COVID-19 pandemic; and I was named by Forbes as one of the "most essential people on Twitter to follow during the COVID-19 outbreak."

8. More generally, my research has focused on biological and mathematical approaches to infectious disease questions—mainly understanding how our immune systems and medical interventions such as antibiotics and vaccines exert natural selection on pathogens, and how the resulting changes in pathogen populations affect human disease. My more recent work has focused on antimicrobial resistance, epidemiological methods, mathematical modeling of infectious disease transmission, pathogen population genomics, immunoepidemiology of *Streptococcus pneumonia*, transmission-dynamic simulations, and ethical questions surrounding vaccine trials for infectious disease.

9. My work has addressed a number of issues relevant to modern pandemic responses. My research provided modern evidence of the moderate contagiousness of the 1918 "Spanish flu." During the first SARS outbreak in 2003, I led a team that provided one of the first estimates of the virus' reproduction number. During the 2009 H1N1 pandemic, my research produced the first

reliable estimate of H1N1 flu severity. During the yellow fever outbreak in Angola and Democratic Republic of Congo in 2016, my modeling work helped support fractional dosing vaccination strategies, which helped extend vaccine availability in a shortage situation. I have written extensively on data-driven decision making in public health.

10. I have worked extensively with governments and intergovernmental bodies like WHO to address public health issues including pandemic response and preparedness. For example, in 2003 and 2004, I served on the Defense Science Board Task Force on the SARS Quarantine for the U.S. Department of Defense. In 2009, I was a member of the H1N1 Working Group of the U.S. President's Council of Advisors on Science and Technology; and in 2009 and 2010, I was a member of the Team B Advisory Body to the CDC on the Novel H1N1 Influenza. From 2017 through today, I have been a member of the Biological Agents Containment Working Group of the Board of Scientific Counselors to the Office of Public Health Preparedness and Response at the CDC.

11. I have also worked extensively on the design and analysis of vaccine trials during public health emergencies. In 2015, I served on a scientific advisory board for a major Ebola vaccine trial, and as I mentioned above, I am currently advising Massachusetts and WHO on COVID-19 vaccine issues.

12. I have published more than 330 peer-reviewed articles and a large number of other publications, including book chapters, non-peer-reviewed journal articles, and popular articles in the national press. I have also contributed to a number of reports, including the President's Council of Advisors on Science and Technology (PCAST) H1N1 Working Group's 2010 Report to the President on US Preparations for 2009-H1N1 Influenza; three reports from the Center for Infectious Disease Research and Policy (CIDRAP) regarding the development of a vaccine for the Ebola virus; and most recently an April 2020 CIDRAP report on COVID-19.[1] CIDRAP is based out of the University of Minnesota and is a global leader in addressing public health preparedness and

[1] Moore, K., et al., *COVID-19: The CIDRAP Viewpoint*, April 30, 2020, available at https://www.cidrap.umn.edu/sites/default/files/public/downloads/cidrap-covid19-viewpoint-part1_0.pdf.

emerging infectious disease response.

13. I continue to teach and mentor undergraduate and graduate students at Harvard, as well as supervising graduate work for doctoral candidates.

Opinions Regarding Dr. Bhattacharya's Declaration

14. The defendants in this case contacted me about responding to the opinions expressed by Dr. Jayanta Bhattacharya in his declaration submitted by the plaintiffs. I agreed to provide a declaration setting forth some of my professional opinions on the issues raised in that declaration. In reaching those opinions, I have relied on my knowledge, training, experience, and the kinds of data regularly relied on by experts in my field. I am working pro bono and not being compensated for my time.

15. I have read the declaration of Dr. Jayanta Bhattacharya submitted by the plaintiffs in this lawsuit. My opinions regarding that declaration are based on the available science regarding the novel coronavirus SARS-CoV-2 and the disease it causes, COVID-19, as well as my training and experience in infectious disease response.

16. As Dr. Bhattacharya discusses in his declaration, he has recommended an approach to COVID-19 that is commonly referred to as "herd immunity with focused protection." This approach was laid out in the so-called "Great Barrington Declaration," a document published in October at a ceremony at a libertarian think tank by three scientists, including Dr. Bhattacharya. In this approach, the virus would be allowed to spread among young, healthy people with little attempt to slow it down, while officials would try to keep older, more vulnerable Americans from contracting it. This strategy diverges sharply from the views of most infectious-disease epidemiologists and has been rejected by the National Institute of Allergy and Infectious Diseases Director Dr. Anthony Fauci,[2] WHO Director-General Tedros Adhanom Ghebreyesus,[3] and the more than 6,900 scientists,

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[2] Mandavilli A., et al., *A Viral Theory Cited by Health Officials Draws Fire From Scientists*, New York Times, Oct. 19, 2020, available at https://www.nytimes.com/2020/10/19/health/coronavirus-great-barrington.html (accessed Nov. 16, 2020).

[3] *WHO chief says herd immunity approach to pandemic 'unethical'*, The Guardian, Oct. 12, 2020, available at https://www.theguardian.com/world/2020/oct/12/who-chief-says-herd-immunity-approach-to-pandemic-unethical (accessed Nov. 16, 2020).

researchers, and healthcare professionals who have signed a formal response called the John Snow Memorandum.[4] Without a vaccine, this strategy also risks the deaths of a million or more Americans. With the FDA's recent emergency-use approval of Pfizer's and Moderna's vaccines, and given the likelihood of FDA approval of additional effective vaccines, the strategy risks significant avoidable illness and death.

COVID-19 Is Not Harmless for Younger Populations

17. The assumption underlying the herd immunity approach—that COVID-19 is harmless to most people and risky only for defined groups—is false.

18. The impact of a pandemic on health depends not only on the infection-fatality rate, but also on other measures of severity such as the risk of hospitalization or ICU admission among those infected. Crucially, it also depends on the number of people who become infected, because a small risk of death, ICU or hospitalization multiplied by a large number of people infected can result in large numbers of deaths and high burdens on health care resources. Indeed, the extraordinarily high peak demand for intensive care in Wuhan, China[5] and in Northern Italy[6] were two of the earliest warnings that uncontrolled SARS-CoV-2 spread could result in horrific burdens on the health care system. The intense stress on even very high-quality health systems is being felt across Europe and in many parts of the U.S. as of December 2020, with overloaded intensive care units in multiple locations due to COVID-19 surges. The U.S. has hit its highest number to date of hospitalizations, with more than 115,000 COVID-19 patients in hospital as of December 21, 2020:[7]

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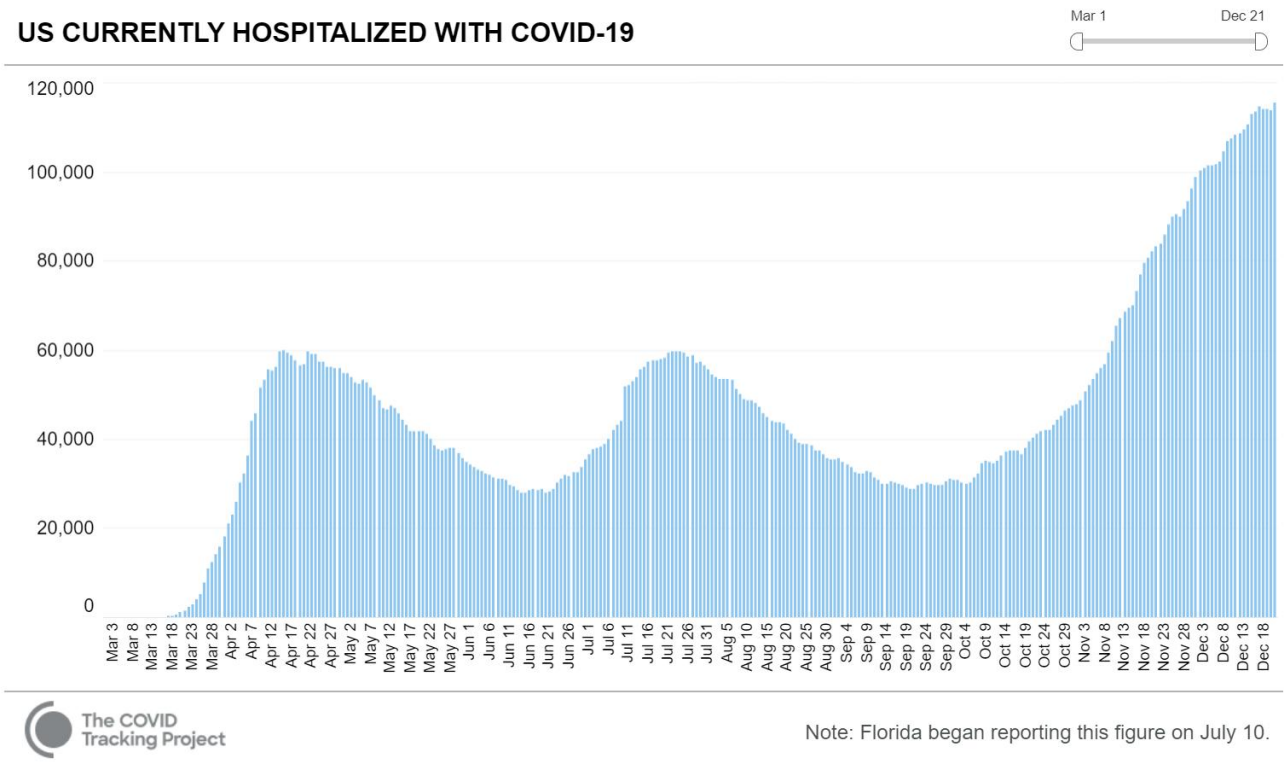
[4] Available at https://www.johnsnowmemo.com/.

[5] Li, R., et al., *Beds for Patients With COVID-19 Based on Comparisons With Wuhan and Guangzhou, China,* May 6, 2020, JAMA Netw. Open. 2020;3(5): e208297, available at https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2765575.

[6] Grasselli, G., et al., *Critical Care Utilization for the COVID-19 Outbreak in Lombardy, Italy: Early Experience and Forecast During an Emergency Response*, March 13, 2020, JAMA. 2020;323(16):1545-1546, available at https://jamanetwork.com/journals/jama/fullarticle/2763188.

[7] The COVID Tracking Project, The Atlantic, available at https://covidtracking.com/data/charts/us-currently-hospitalized (accessed Nov. 23, 2020).



19. In this context, academic debates about the risk of severe outcomes per individual, while relevant, are better understood in the context of the total burden created: individual risk times number of individuals infected.

20. COVID-19 is unquestionably worse for someone who is male, older, sicker, or lacks access to health care. Younger, healthier demographics do better than older demographics.[8] These facts do not mean, however, that COVID-19 is harmless for younger cohorts. To date, more than 52,000 Americans under 65 have died from the disease[9]—more than four times as many as typically die in that age group from seasonal flu in an entire year[10]—and we have only had about eleven

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[8] CDC, *COVID-19 Hospitalization and Death by Age*, https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-age.html (accessed Dec. 12, 2020).

[9] CDC, *Weekly Updates by Select Demographic and Geographic Characteristics*, available at https://www.cdc.gov/nchs/nvss/vsrr/covid_weekly/index.htm (accessed Dec. 12, 2020)

[10] Quandelacy, T., et al., *Age- and Sex-related Risk Factors for Influenza-associated Mortality in the United States Between 1997–2007*, Am. J. Epidemiol. 2014 Jan. 15; 179(2): 156–167, doi: 10.1093/aje/kwt235, available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3873104/.

months of intense COVID-19 activity, so that number will continue to grow.

21. Dr. Bhattacharya's declaration, by focusing only on those at lowest risk, significantly underestimates the SARS-CoV-2 infection-fatality rate. The best estimate to date of the overall infection-fatality rate for SARS-CoV-2 infection is by Dr. Gideon Meyerowitz-Katz and colleagues, and is approximately 0.7%.[11] Importantly, while the risk is age specific, and the infection-fatality rate increases sharply with age, there is no cutoff at age 70; rather, the risk of dying if infected with this virus "increases progressively to 0.4% at age 55, 1.4% at age 65, 4.6% at age 75, and 15% at age 85."[12] It is misleading to call the infection-fatality rate below age 70 "vanishingly small" given these risk estimates and given that over 83% of the U.S. population or nearly 274 million people are under 65 (2019 census estimate). Dr. Bhattacharya relies on a meta-analysis by Dr. John P.A. Ioannidis that estimates a lower infection-fatality rate (Para. 18), but Dr. Meyerowitz-Katz's meta-analysis is distinguished by more rigorous criteria for including studies than that by Dr. Ioannidis. While the former excludes studies expected to be heavily biased by a nonrepresentative sample, the latter does no such quality checks. On this basis, I judge the conclusions of Dr. Meyerowitz-Katz's meta-analysis more reliable.

22. If COVID-19 were judged on the criteria established for evaluating the severity of an influenza pandemic, it would land at the top—the most severe end—of the scale. The CDC in 2017 defined influenza pandemics along a scale of transmissibility (from 1-5) and clinical severity (from 1-7). Based on the reproduction number and approximately half of infections being symptomatic, COVID-19 would exceed the specifications for the highest transmissibility category (R0 > 1.8) (for

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[11] Meyerowitz-Katz, G., *A systematic review and meta-analysis of published research data on COVID-19 infection fatality rates*, International Journal of Infectious Diseases, Vol. 101, P138-148, December 01, 2020, available at https://www.ijidonline.com/article/S1201-9712(20)32180-9/fulltext.

[12] Levin, A., *Assessing the Age Specificity of Infection Fatality Rates for COVID-19: Systematic Review, Meta-Analysis, and Public Policy Implications* medRxiv 2020.07.23.20160895; doi: https://doi.org/10.1101/2020.07.23.2016089, available at https://www.medrxiv.org/content/10.1101/2020.07.23.20160895v7.

COVID-19 R0 is thought to be at least 2[13] and up to 6 in some places[14]). It would also likely exceed the specification for the highest clinical severity category, which is a case-fatality ratio of 1% or more.[15] (Given the underascertainment of infections relative to cases, this criterion would be satisfied by an observed infection-fatality ratio of well under 1%, consistent with even the downwardly biased estimates of Dr. Ioannidis.) In short, the COVID-19 pandemic is at the upper end, and arguably at the very top, of the severity scale for influenza pandemics. It was for those pandemics that community mitigation strategies based on nonpharmaceutical interventions have been planned at the federal[16] and state[17] levels. A decade or more of pandemic planning envisioned exactly the kinds of measures being challenged by the defendants in response to a pandemic of a similar viral infection, even with lower severity than COVID-19.

23. In every pandemic, decisions about control must be made before comprehensive evidence is available on the characteristics of the infection in affected populations.[18] Evidence-gathering and mitigation efforts must proceed in parallel.[19] Waiting for definitive evidence on severity, transmissibility, and other characteristics of the pathogen and the population before

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[13] CDC, *COVID-19 Pandemic Planning Scenarios*, available at https://www.cdc.gov/coronavirus/2019-ncov/hcp/planning-scenarios.html.

[14] Sanche, S., et al., *High Contagiousness and Rapid Spread of Severe Acute Respiratory Syndrome Coronavirus 2*, Emerg Infect Dis. 2020;26(7):1470-1477, available at https://wwwnc.cdc.gov/eid/article/26/7/20-0282_article.

[15] Qualls, N., et al., *Community Mitigation Guidelines to Prevent Pandemic Influenza — United States, 2017*, Recommendations and Reports / April 21, 2017 / 66(1);1–34 (Table 6), available at https://www.cdc.gov/mmwr/volumes/66/rr/rr6601a1.htm.

[16] Qualls (2017), *supra*.

[17] California Governor's Office of Emergency Services, *Statewide Concept of Operations for Pandemic Influenza*, available at https://www.caloes.ca.gov/PlanningPreparednessSite/Documents/StatewideConOpsforPandemicInfluenza%202009.pdf.

[18] Lipsitch, M., et al., *Managing and Reducing Uncertainty in an Emerging Influenza Pandemic*, N. Engl. J. Med. 2009; 361:112-115, doi: 10.1056/NEJMp0904380, available at https://www.nejm.org/doi/full/10.1056/nejmp0904380.

[19] Lipsitch, M., et al., for the 2009 H1N1 Surveillance Group. *Improving the Evidence Base for Decision Making During a Pandemic: The Example of 2009 Influenza A/H1N1*, 2011, Biosecurity and Bioterrorism: Biodefense Strategy, Practice, and ScienceVol. 9, No. 2, available at https://www.liebertpub.com/doi/full/10.1089/bsp.2011.0007.

adopting control measures is not a viable option, because exponential or near-exponential spread of infection in new pandemics in highly susceptible populations can rapidly transform a small public threat into a large one, and the impact of control measures is often delayed. Thus, it is rational to take action to avert possible negative outcomes before there is certainty about the likelihood and timing of these outcomes. There is room for legitimate disagreement about the strength of evidence and the justification for particular control measures. Yet in the face of a growing pandemic with clear ability to cause severe illnesses, to kill, and to cause health care disruption, it would be irresponsible public health policy to await definitive evidence before taking control measures that are expected to blunt the impact of the pandemic. This was the very clear situation in March 2020 in the United States, as we watched the impact of the pandemic in other countries that had been struck earlier.[20] Indeed, there is a compelling argument in my view that many state authorities were too slow, not too fast, to impose restrictions to slow the spread of SARS-CoV-2 during the early months of 2020. On this view, California is a model, while other states deserve criticism for slower reactions.[21]

24. The actions taken by California's public health authorities appear to have reduced transmission. Not only do seroprevalence estimates indicate that the virus has been less widespread in California than other regions of the U.S.; but a recent analysis showed that states with stricter containment measures to reduce the spread of the virus—like California—had fewer new cases and hospitalizations per capita than states that imposed few restrictions, which developed some of the worst outbreaks:[22]

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[20] Lipsitch, M., *We know enough now to act decisively against Covid-19. Social distancing is a good place to start*, March 18, 2020, STAT, available at https://www.statnews.com/2020/03/18/we-know-enough-now-to-act-decisively-against-covid-19/.

[21] Sexton, J., et al., *Two Coasts. One Virus. How New York Suffered Nearly 10 Times the Number of Deaths as California*, May 16, 2020, ProPublica, available at https://www.propublica.org/article/two-coasts-one-virus-how-new-york-suffered-nearly-10-times-the-number-of-deaths-as-california.

[22] Leatherby L., et al., *States That Imposed Few restrictions Now Have the Worst Outbreaks*, New York Times, Nov. 18, 2020, available at https://www.nytimes.com/interactive/2020/11/18/us/covid-state-restrictions.html?action=click&module=RelatedLinks&pgtype=Article.

25. The size of the vulnerable population in the United States is large. Not only are there significant numbers of American over 65—according to the U.S. Census Bureau, about 16.5% of the population was 65 or over in 2019[23]—but the CDC estimates that nearly 50 percent of Americans live with underlying conditions that predispose them to serious outcomes from COVID-19.

26. Letting the virus spread unchecked in younger populations—which include Americans with underlying conditions—will result in more serious illness and deaths, in addition to increasing the risk of transmission to older populations.

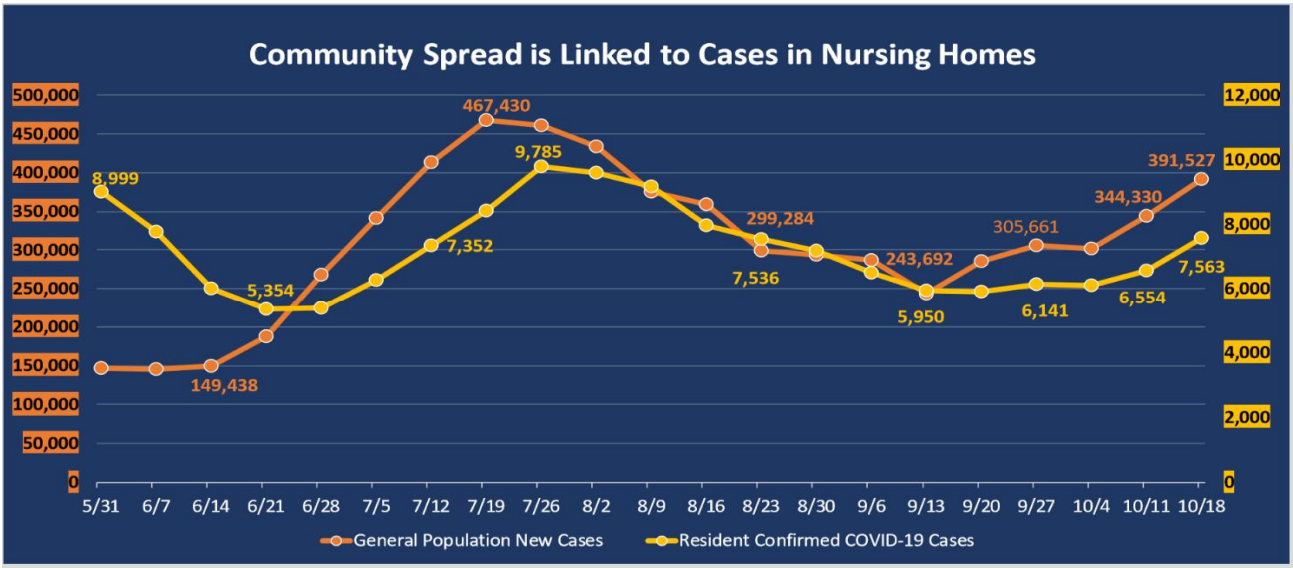
There Is No Proven Means to Protect the Vulnerable Without Restraining Transmission in The General Population

27. No one has yet devised an effective approach to protecting vulnerable populations when there is widespread community transmission. Vulnerable individuals—including older Americans and those with pre-existing conditions—live and work with, and receive care from, members of the larger community. Many of the vulnerable live in a multigenerational home, are

[23] U.S. Census Bureau, https://www.census.gov/data/tables/time-series/demo/popest/2010s-national-detail.html (accessed Nov. 9, 2020).

cared for by others in nursing and long-term care facilities, and/or are essential workers with comorbidities; and these individuals cannot be completely isolated from the larger community. Nonetheless, scientists, clinicians, and policy makers have been working hard to protect these groups, with little or modest success, for most of the year, while also attempting to minimize the threat that community transmission poses to them and to all of us. This "belt-and-suspenders" approach is the current consensus approach among infectious-disease epidemiologists.

28. Reducing or eliminating community transmission is critical to protecting vulnerable populations, including those in long-term care facilities. The American Health Care Association (AHCA) and the National Center for Assisted Living (NCAL) recently released a report stating that COVID-19 cases in U.S. nursing homes have risen with the community spread of COVID-19 since mid-September.[24] That report explicitly links cases in nursing homes to community spread of the virus:



Sources: Centers for Medicare & Medicaid Services (CMS), May 31 – October 18 on Nursing Home COVID Cases and Johns Hopkins on COVID Cases in General Population

29. Without reducing community transmission, strategies focused on protecting vulnerable populations are unlikely to succeed. Sweden, the best-known exemplar of the "age-

[24] AHCA and NCAL, *Report: COVID-19 Cases In U.S. Nursing Homes*, updated Nov. 2, 2020, available at https://www.ahcancal.org/News-and-Communications/Fact-Sheets/FactSheets/Report-Nursing-Homes-Cases-Nov2-2020.pdf (accessed Nov. 10, 2020).

targeted" approach, was unable to protect people in nursing homes. Ostensibly the goal in Sweden was to protect the elderly and other high-risk groups while slowing viral spread enough to avoid hospitals being overwhelmed; although it has been widely reported that the goal was in fact to develop herd immunity.[25] The strategy failed to meet its goal of protecting the elderly: the virus ran rampant in nursing homes, and Stockholm's nursing homes lost 7% of their residents. Sweden's polices are now falling back in line with its European neighbors.[26] Vulnerable individuals living in multigenerational households present a distinct challenge to "focused protection" in the absence of community control, particularly given that transmission of SARS-CoV-2 in households is common,[27] and households are the single greatest known source of transmission in many locales.[28]

30. The elderly, and nursing home residents in particular, are only a fraction of the truly vulnerable population. As noted above, over 52,000 deaths have occurred in those under 65 in the US, about 18% of the total death toll. Some comorbidities that predispose to severe outcomes, such as diabetes and certain cancers, may be invisible to those who are charged with protecting the vulnerable. Nonwhite race/ethnicity,[29] low socioeconomic status,[30] and other variables are also associated with high vulnerability to severe outcomes, making the logistics of "shielding the

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[25] Vogel, G., *'It's been so, so surreal.' Critics of Sweden's lax pandemic policies face fierce backlash*, Science, Oct. 6, 2020, available at https://www.sciencemag.org/news/2020/10/it-s-been-so-so-surreal-critics-sweden-s-lax-pandemic-policies-face-fierce-backlash; Bjorklund, K., *The Swedish COVID-19 Response Is a Disaster. It Shouldn't Be a Model for the Rest of the World*, Time, Oct. 14, 2020.

[26] Vogel 2020, *supra*.

[27] Grijalva, C., *Transmission of SARS-COV-2 Infections in Households — Tennessee and Wisconsin, April–September 2020*, Nov. 6, 2020, MMWR, 69(44);1631–1634.

[28] Bebinger, M., *Mass. Takes Close Look At Cluster Origins To Stop Coronavirus Spread*, WBUR, Oct. 20, 2020, https://www.wbur.org/commonhealth/2020/10/30/massachusetts-covid-cluster-data; *Infektionsumfeld von COVID-19-Ausbrüchen in Deutschland*, Epidemiologisches Bulletin, 38 2020, Sept. 17, 2020, https://www.rki.de/DE/Content/Infekt/EpidBull/Archiv/2020/Ausgaben/38_20.pdf;jsessionid=B8D1D66F6ECEC4B21EFDF40B78C8FB74.internet071?__blob=publicationFile.

[29] APM Research Lab, *The color of coronavirus: COVID-19 deaths by race and ethnicity in the U.S.*, Oct. 15, 2020, available at https://www.apmresearchlab.org/covid/deaths-by-race.

[30] Finch, W., et al., *Poverty and Covid-19: Rates of Incidence and Deaths in the United States During the First 10 Weeks of the Pandemic*, Front. Sociol., June 15, 2020, available at https://www.frontiersin.org/articles/10.3389/fsoc.2020.00047/full.

vulnerable" even more challenging.

31. Until we have a proven means to protect those most at risk and put those safeguards in place, it would be reckless to remove the protections against unmitigated community transmission and plunge ahead in pursuit of herd immunity via massive infection rates. Reducing community transmission remains one of the best ways to protect vulnerable populations.

Any Herd Immunity May Be Short-Lived and Partial

32. In the modern era, herd immunity is best achieved by vaccination—that is, when enough people acquire immunity to an infection through a shot in the arm to protect the whole community. That is our public health goal every flu season; and it is the reason we vaccinate infants against many childhood diseases.

33. The "herd immunity with focused protection" approach that Dr. Bhattacharya champions is to allow the spread of COVID-19 in younger populations in order to create immunity against later infection—the theory being that previously infected individuals will carry COVID-19 antibodies that will prevent reinfection. If carrying COVID-19 antibodies confers immunity, then half[31] or more[32] of the population must be seropositive—*i.e.*, COVID-19 antibody carriers—before we can control the virus without special measures, such as face coverings, social distancing, surveillance, and contact tracing.

34. It is possible that letting the virus spread uncontrolled in the younger population will build up some level of herd immunity and reduce further spread—for some period of time and with the significant cost of serious illness and death discussed above. However, the process of building up herd immunity could take a significant amount of time. The length of the pandemic could be 18 to 24 months or more, as herd immunity gradually develops in the human population.[33] The

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[31] Britton, T., et al., *A mathematical model reveals the influence of population heterogeneity on herd immunity to SARS-CoV-2*, Science 14 Aug 2020; 846-849.

[32] Sanche S, et al.. *High Contagiousness and Rapid Spread of Severe Acute Respiratory Syndrome Coronavirus 2*. Emerg Infect Dis. 2020;26(7):1470-1477. https://dx.doi.org/10.3201/eid2607.200282.

[33] Moore 2020, *supra*.

serosurveillance data available to date suggests that a relatively small fraction of the population has been infected and infection rates likely vary substantially by geographic area. In late September 2020, CDC Director Robert Redfield told Congress that over 90 percent of the U.S. population remains susceptible to this coronavirus,[34] citing published data.[35] Another recent seroprevalence study estimated that that the percentage of people exposed to the virus ranged from 1% to 23% depending on jurisdiction, and that overall less than 10% of people had detectable SARS-CoV-2 antibodies.[36] Given the transmissibility of SARS-CoV-2, half to two-thirds of the population may need to be immune to reach a critical threshold of herd immunity to halt the pandemic.[37]

35. Unfortunately, however, coronavirus immunity is notoriously short-lived and partial. Other coronaviruses are called "seasonal" because, like the flu, they circulate every year. Based on seasonal coronaviruses, we can anticipate that even if immunity declines after exposure, there may still be some protection against disease severity and reduced contagiousness, but this remains to be assessed for SARS-CoV-2.[38] As a result, widespread infection in the general population is unlikely to eliminate the disease but will more likely result in a persistent problem until an effective vaccine is available and widely adopted.

36. The quality of the seroprevalence studies conducted to date has varied widely, as have their results. The widely varying results of early seroprevalence studies emphasized the very local nature of the pandemic. For example, in a study that received extensive criticism for its sampling

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[34] C-SPAN, *CDC Director Redfield Says 90% U.S. Population Susceptible to Coronavirus Infection, Sept. 23, 2020*, https://www.c-span.org/video/?c4909117/cdc-director-redfield-90-us-population-susceptible-coronavirus-infection.

[35] Anand, S., et al., *Prevalence of SARS-CoV-2 antibodies in a large nationwide sample of patients on dialysis in the USA: a cross-sectional study*, The Lancet, Vol. 396, Issue 10259, pp. 1335-1344, October 24, 2020, DOI: https://doi.org/10.1016/S0140-6736(20)32009-2.

[36] Bajema K. et al., *Estimated SARS-CoV-2 Seroprevalence in the US as of September 2020*, JAMA Intern Med. (published online Nov. 24, 2020), doi:10.1001/jamainternmed.2020.7976.

[37] Britton 2020, *supra*; Sanche 2020; *supra*.

[38] Moore 2020, *supra*.

methods, statistics, and biased interpretation of the data obtained,[39] Dr. Bhattacharya and his co-authors found that 1.5 percent of Santa Clara County's population sampled tested positive for antibodies in the spring of 2020.[40] Other locales—in studies reflecting different kinds of imperfections in sampling—have shown much more widespread evidence of past infection, including 21 percent of those tested in New York City[41] and nearly a third in Chelsea, Massachusetts in April 2020.[42]

37. More recent national studies have continued to show regional variation in seroprevalence. The CDC conducted a commercial laboratory seroprevalence survey using blood samples collected from 10 U.S. sites from March to July 2020. The surveys estimated seroprevalence of 0.7% (San Francisco Bay Area) to as high as 23.2% (New York City Metro Area).[43] Another seroprevalence study of dialysis patients estimated that during the first wave of the COVID-19 pandemic, fewer than 10% of the U.S. adult population formed antibodies against SARS-CoV-2, with large regional variances.[44] In California, the study estimated seroprevalence of 3.8%.[45] The low seroprevalence estimates in California and the Bay Area suggest both that those regions have been more successful in limiting community transmission and that any measure of herd immunity is a distant prospect.

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[39] Vogel, G., *Antibody surveys suggesting vast undercount of coronavirus infections may be unreliable*. Science, Apr. 21, 2020, https://www.sciencemag.org/news/2020/04/antibody-surveys-suggesting-vast-undercount-coronavirus-infections-may-be-unreliable.

[40] Bendavid, E., et al., *COVID-19 Antibody Seroprevalence in Santa Clara County, California*, medRXiv, doi: https://doi.org/10.1101/2020.04.14.20062463.

[41] Goodman, J., et al., *1 in 5 New Yorkers May Have Had Covid-19, Antibody Tests Suggest*, https://www.nytimes.com/2020/04/23/nyregion/coronavirus-antibodies-test-ny.html.

[42] Saltzman, J., *Nearly a third of 200 blood samples taken in Chelsea show exposure*, Boston Globe, Apr. 17, 2020, https://www.bostonglobe.com/2020/04/17/business/nearly-third-200-blood-samples-taken-chelsea-show-exposure-coronavirus/.

[43] CDC, *Commercial Laboratory Seroprevalence Surveys*, https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/commercial-lab-surveys.html#surveymap

[44] Anand 2020, *supra*.

[45] *Id*.

Risks of Indoor Gatherings

38. SARS-CoV-2 spreads through contact (via larger droplets and aerosols), and longer-range transmission via aerosols, especially in conditions where ventilation is poor. This makes large, indoor gatherings particularly high-risk activities for transmission of the virus, especially where mitigation measures like the use of face coverings and social distancing are not being observed. I understand that the plaintiffs in this lawsuit want to hold church services indoors, and that some of them have done so in the past few months without requiring face coverings and social distancing, and while permitting singing. These circumstances present a relatively high risk of transmission. I disagree with Dr. Bhattacharya's assertion that that permitting high risk activities like large, indoor gatherings is consistent with good public health practice at this point in the COVID-19 pandemic.

39. A number of factors make this type of conduct particularly high risk. First, longer duration contacts increase the risk of transmission. For direct interpersonal interactions—that is, close contact without social distancing—the risk of transmission is proportional to the duration of the interaction. Longer duration contacts create a higher risk of transmission. Epidemiologists often distinguish between contacts below fifteen minutes (lower risk) and at or beyond fifteen minutes (higher risk)—hence the "fifteen-minute rule." For viruses like SARS-CoV-2 that are spread though respiratory droplets and aerosols, microbial risk assessment experts use estimates of breathing rates and duration of exposure to develop control strategies to reduce transmission.[46] Models of COVID-19 transmission using cell phone mobility data identify locations associated with longer duration indoor contacts—including full-service restaurants and religious organizations—as producing the largest predicted increases in infections when reopened.[47] In contrast, shorter duration and more transitory interpersonal interactions—such as those one would expect in grocery stores, retail stores, and while transiting at an airport—would be expected to create a lower risk of transmission. Dr.

[46] Hass C, *Action Levels for SARS-CoV-2 in Air: Preliminary* Approach, Preprint (Aug. 14, 2020).

[47] Chang S, et al., *Mobility network models of COVID-19 explain inequities and inform reopening*. Nature (2020), doi: https://doi.org/10.1038/s41586-020-2923-3.

Bhattacharya does not address the relative risks of transmission associated with different activities.

40. The aerosol component of COVID-19 transmission would also be expected to increase this risk of transmission over time. Simply stated, the longer people are in an enclosed space, the more viral particles will build up and be available to infect others. The amount of virus per liter of air will depend on a number of factors, including the size of the space, the number of people in that space, and the frequency of air changes. For these reasons, more crowded gatherings, and poor ventilation would both be expected to increase the risk of transmission in an indoor space.

41. Second, larger gatherings in indoor spaces increase the risk of transmission both for the reasons explained above, and because the larger the gathering, the more likely that infectious individuals will in fact be present, depending on the prevalence of the disease in the community.

42. Third, singing is a well-described risk factor for transmitting respiratory disease.[48] Dr. Bhattacharya previously opined in another lawsuit, on behalf of another church plaintiff, that churchgoers can "safely" hold indoor services that include "singing and chanting." Dr. Bhattacharya appears to have retreated from this prior opinion, which was not supported by the research on singing. It is understood that singing, chanting, shouting, and similar vocalizations can cause the release of a larger number of virus-bearing respiratory droplets and aerosols and may also increase the distance that droplets or aerosolized particles can travel compared to speaking at a normal volume. There are documented COVID-19 outbreaks where singing is presumed to have been a factor, including one involving a choir practice in Skagit County, Washington.[49] Because COVID-19 is spread via respiratory droplets and aerosols, singing indoors is not a safe activity at multi-household gatherings, particularly where there is widespread community transmission of the disease and the use of social distancing and face coverings are not required.

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[48] Buonanno G., et al., *Quantitative assessment of the risk of airborne transmission of SARS-CoV-2 infection: Prospective and retrospective applications*, Environ Int. (2020) Sep. 6;145:106112, doi: 10.1016/j.envint.2020.106112.

[49] Hamner, L., *High SARS-CoV-2 Attack Rate Following Exposure at a Choir Practice - Skagit County, Washington*, March 2020. Morbidity and Mortality Weekly Report 69.

43. Instead, Dr. Bhattacharya now argues that the psychological benefits of communal singing should be considered against the costs of gathering indoors (Para. 47), and that permitting in-person worship is consistent with good public health practice (Para. 49). Again, Dr. Bhattacharya does not appear to consider the research on singing or the COVID-19 outbreaks that have been traced back to gatherings where attendees sang together. He also appears to ignore the CDC guidance for people hosting holiday gatherings: "avoid singing or shouting, especially indoors" and "[k]eep music levels down so people don't have to shout or speak loudly to be heard."[50]

44. I understand that some of the plaintiffs have been permitting singing at their services. This would increase the risk of transmission, especially where mitigation measures including face coverings and social distancing are not enforced consistently. Public health measures to limit or prohibit indoor singing, chanting, shouting, and similar vocalizations, would decrease the risk of transmission of COVID-19, which is principally spread by respiratory droplets and aerosols.

45. While face coverings and social distancing would mitigate the risk of COVID-19 transmission from singing indoors, it would not eliminate that risk. Wearing a surgical mask while singing can reduce the amount of measured exhaled aerosol particles and droplets to levels comparable with normal talking,[51] but that still presents a risk of transmission indoors.

46. Dr. Bhattacharya states in his declaration that he has reviewed the CDC's May 23, 2020 guidance titled "Considerations for Communities of Faith." The current version of that guidance was updated on October 29, 2020.[52] The CDC offers this guidance to faith communities "in the course of preparing to reconvene for in-person gatherings while still working to prevent the spread of COVID-19." As this prefatory statement indicates, the CDC guidance begins with the understanding that many faith communities have not been gathering during the pandemic and

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[50] CDC, *Holiday Celebrations and Small Gatherings*, https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/holidays.html (accessed Dec. 21, 2020).

[51] Alsved, M., et al., *Exhaled respiratory particles during singing and talking*, Aerosol Sci. & Tech., Vol. 54, No. 11, pp. 1245–48, Sept. 17, 2020, https://doi.org/10.1080/02786826.2020.1812502.

[52] CDC, *Considerations for Communities of Faith*, updated Oct. 29, 2020, available at https://www.cdc.gov/coronavirus/2019-ncov/community/faith-based.html (visited Dec. 12, 2020).

provides instructions on how to begin to gather again safely. The first point in the guidance under the heading "Scaling Up Operations," advises faith communities to "[e]stablish and maintain communication with local and State authorities to determine current mitigation levels in your community." In response to the current surge in COVID-19 cases and the pressure on hospital resources and ICU capacity in California and Santa Clara County in particular, it is my understanding that the current mitigation measures prohibit indoor gatherings, including church services. I do not understand the CDC's guidance to instruct faith communities to ignore or act contrary to the current local mitigation strategy.

47. The CDC recently published a *Summary of Guidance for Public Health Strategies to Address High Levels of Community Transmission of SARS-CoV-2 and Related Deaths*.[53] That guidance lists recommended public health strategies as well as recommendations for community-level implementation. The guidance recommends the "universal use of face masks" as a public health strategy, and for that strategy recommends the following community-level implementation: "Issue policies or directives mandating universal use of face masks in indoor (nonhousehold) settings." The CDC guidance also recommends "[a]void[ing] nonessential indoor spaces and crowded outdoor settings" as a public health strategy, and for that strategy recommends the following community-level implementation: "Promoting flexible worksites (e.g., telework); apply limits to occupancy of indoor spaces and to the size of social gatherings." In my view, these are critical national and local strategies to mitigate the risk of COVID-19 transmission.

48. Any region experiencing moderate, high, or increasing levels of community transmission should do everything possible to lower transmission. The path to low transmission in other countries has included adherence to stringent community control measures—including closure of nonessential indoor work and recreational spaces.[54] Such measures along with universal mask

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[53] Honein M., et al., *Summary of Guidance for Public Health Strategies to Address High Levels of Community Transmission of SARS-CoV-2 and Related Deaths*, December 2020. MMWR Morb Mortal Wkly Rep 2020;69:1860-1867, doi: http://dx.doi.org/10.15585/mmwr.mm6949e2.

[54] Couzin-Frankel J, Vogel G, Weiland M., *School openings across globe suggest ways to keep coronavirus at bay, despite outbreaks*, American Association for the Advancement of Science.

wearing (with specific exceptions[55]) are essential to bring case numbers down to safe levels for communities to reopen.[56]

49. The United States is in the midst of a large surge in cases, recording over 200,000 new cases and more than 3,000 deaths per day. These levels of transmission threaten to overwhelm hospitals and ICU capacity in many areas. As the CDC reported last week, all age groups have reached their highest weekly hospitalization rate since the start of the pandemic, with those rates expected to increase as additional data are reported.[57] And ICU capacity is dwindling in many areas, including Santa Clara County, where ICU beds have been filling up and available capacity has dropped from around 25% to under 15% in the past month.[58] Given these circumstances, it would be reckless to lift restrictions on community transmission, for example, by permitting the large, indoor gatherings that may include singing that plaintiffs want to hold.

50. "Flatten the curve" was a good idea when the world first heard the concept in March, and it is a particularly good one right now. A flatter curve, with more infections delayed, will help the health-care system better cope with the cases it does have. Whereas an overwhelmed health-care system will mean there is little reserve to care for the seriously ill, including all the other diseases hospitals were created to treat. Finally, the first vaccine is here, and more vaccines appear to be on their way. These vaccines appear to be effective enough to protect us, if we can stay uninfected long enough to get our shots.

July 7, 2020, available at https://www.sciencemag.org/news/2020/07/school-openings-across-globe-suggest-ways-keep-coronavirus-bay-despite-outbreaks.

[55] CDC, *Coronavirus Disease 2019 (COVID-19), Frequently Asked Questions*, available at https://www.cdc.gov/coronavirus/2019-ncov/faq.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fneed-extra-precautions%2Fpeople-with-seasonal-allergies-faqs.html#People-with-Seasonal-Allergies.

[56] Levinson, M., *Reopening Primary Schools during the Pandemic* (2020) N. Engl. J. Med. 2020; 383:981-985, DOI: 10.1056/NEJMms2024920.

[57] CDC, COVIDView, *Key Updates for Week 49, ending December 5, 2020*, available at https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html.

[58] Santa Clara County Public Health Department, COVID-19 Hospitalizations Dashboard, available at https://www.sccgov.org/sites/covid19/Pages/dashboard-hospitals.aspx.

I declare under penalty of perjury under the laws of the United States that the foregoing is true and correct. Executed at Jamaica Plain, Massachusetts on December 22, 2020.

/s/ Marc Lipsitch
MARC LIPSITCH

2329409

Exhibit A

CURRICULUM VITAE

DATE: October 9, 2020

NAME: Marc Lipsitch

ADDRESS: Department of Epidemiology
Harvard T.H. Chan School of Public Health
677 Huntington Avenue
Boston, MA 02115

DATE & PLACE OF BIRTH: November 15, 1969, New Haven, CT, USA

EDUCATION:

Date	*Discipline*	*Degree*	*Institution*
1991	Philosophy	B.A. *summa cum laude*	Yale University
1995	Zoology	D.Phil.	University of Oxford

POSTDOCTORAL TRAINING:

1995-1999	Biology	Postdoc with Dr. Bruce Levin	Emory University

ACADEMIC APPOINTMENTS:

1997-1999	Visiting Scientist, Respiratory Diseases Immunology Section, Centers for Disease Control and Prevention
1999-2004	Assistant Professor, Department of Epidemiology, Harvard School of Public Health
2004-2006	Associate Professor, Department of Epidemiology and Department of Immunology and Infectious Diseases, Harvard School of Public Health
2006-present	Professor, Department of Epidemiology and Department of Immunology and Infectious Diseases, Harvard School of Public Health
2009-present	Director, Center for Communicable Disease Dynamics, Harvard School of Public Health
2009-present	Associate Member, Broad Institute, Cambridge, MA
2012-2018	External Faculty Member, Santa Fe Institute, Santa Fe, NM

HONORS AND DISTINCTIONS:

1991	Phi Beta Kappa, Yale College
1992-1995	Rhodes Scholar, University of Oxford, England
2002	Ellison Medical Foundation New Scholar in Global Infectious Disease
2002	PhRMA Foundation Research Starter Award in Health Outcomes
2002	ICAAC Young Investigator Award, American Academy of Microbiology
2006	Mentoring Award, Harvard School of Public Health
2009	Thompson Science Hall of Fame, Westminster Schools, Atlanta, GA
2011	Kenneth Rothman Award, Best Paper in *Epidemiology* in 2010
2012	Junior Faculty Mentoring Award, Harvard School of Public Health
2013	Reviewer of the Year in *Epidemiology* in 2012
2014	Member, winning team (PI Shaman), CDC Predict the Influenza Season Challenge
2015	Elected Fellow, American Academy of Microbiology
2016	Robert Austrian Lecturer, International Symposium on Pneumococci and Pneumococcal Diseases
2018	2017 Article of the Year, American Journal of Epidemiology
2019	23rd Annual Robert M. Fekety, Jr., MD Lecturer, University of Michigan
2020	Elected Member, National Academy of Medicine

PROFESSIONAL SERVICE:

1999	Temporary Advisor, WHO. Priorities for Pneumococcal and Hib Vaccine Development and Introduction. Geneva, Switzerland
2000, 2002	National Institutes of Health, National Center for Research Resources, Special Emphasis Panel, Centers of Biomedical Research Excellence
2001-2003	Consultant and invited speaker for three public meetings, FDA Center for Veterinary Medicine. Topic: regulation of antimicrobial drugs in veterinary medicine
2002	Member, WHO Pneumococcal Vaccine Trials Nasopharyngeal Carriage Study Group
2003	Member, WHO Working Group on SARS Epidemiology and Modeling
2003-2004	US Department of Defense, Defense Science Board Task Force on SARS Quarantine
2005	Consultant, Ministry of Foreign Affairs, Canada – Pandemic Influenza
2005	Consultant, Congressional Budget Office – Pandemic Influenza
2006, 2007	National Institutes of Health Study Section on Genetic Variation and Evolution
2007, 2008, 2012	National Institutes of Health Special Emphasis Panels, various
2007-2011	Report reviewer, National Research Council, NEIDL Risk Assessments
2008	Food and Drug Administration, Antiviral Advisory Committee, guest member
2008-2009	Member, World Economic Forum Global Agenda Council on Pandemics
2009	Consultant, Mexico Ministry of Health, Pneumococcal Conjugate Vaccine
2009	US President's Council of Advisors on Science and Technology (PCAST)--H1N1 Working Group
2009	Massachusetts Department of Public Health H1N1 Advisory Group
2009-2010	Team B Advisory Body to CDC on Novel H1N1 Influenza

2010-2013	Member, Informal Advisory Group on 2009 Pandemic Influenza Mortality, WHO
2010-	Member, Pneumococcal Serotype Replacement Technical Advisory Group, WHO
2011-	Member, Scientific Advisory Board, Pneumococcal Global Sequencing Project (Gates Foundation, Keith Klugman, PI)
2014-2016	Member, CIDRAP/Wellcome Trust Team B on Ebola Vaccines
2015	Member, Scientific Advisory Group, Norwegian Institute of Public Health/WHO/MSF Ebola Virus Vaccine Trial
2015	Member, Scientific Review Committee, Wellcome Trust Sanger Institute 5-Year Review (4-day evaluation visit)
2017-	Member, Biological Agents Containment Working Group, Board of Scientific Counselors, Office of Public Health Preparedness and Response, CDC
2018-	Member, Advisory Board, Vaccines and Immunotherapies, CARB-X
2018-	Member, Technical Advisory Group, Pneumococcal Serotype Replacement and Distribution Project (PSERENADE), International Vaccine Action Center
2019-	Co-chair, WHO Working Group on Vaccines and Antimicrobial Resistance (VAC-AMR)
2019	Member, Steering Committee, Scorecard on Progress on Recommendations of the Review of Antimicrobial Resistance, Chatham House
2020	Member, Massachusetts Governor's Medical Advisory Committee
2020	Member, Massachusetts COVID-19 Vaccine Working Group
2020	Ad hoc expert, WHO Strategic Advisory Group of Experts, COVID-19 Vaccine Working Group

EDITORIAL BOARDS:

2002-2012	Associate Editor, *American Journal of Epidemiology*
2004-2008	Associate Faculty Editor, *Emerging Themes in Epidemiology*
2009-2010	Member, Faculty of 1000 Biology
2006-2016	Editorial Board, *PLoS Medicine*
2008-2011	Associate Editor, *Epidemics*
2008-2011	Editorial Board, *Emerging Health Threats*
2009-2010	Board of Editorial Advisors, *Journal of Infectious Diseases*
2009-present	Editorial Board, *Epidemiology*
2015-present	Board of Reviewing Editors, *eLife*

PROFESSIONAL SOCIETIES:

Society for Epidemiologic Research
American Society for Microbiology
National Center for Science Education
Union of Concerned Scientists

PUBLIC HEALTH ORGANIZATIONS:

Founder, Cambridge Working Group, 2014
Founder, Society for Safe Science, 2014

SCIENTIFIC COMMITTEES AND CONFERENCE ORGANIZING:

Scientific Committee: 4th International Symposium on Pneumococci and Pneumococcal Diseases, Helsinki, Finland, May 2004
Scientific Committee: 5th International Symposium on Pneumococci and Pneumococcal Diseases, Alice Springs, Australia, May 2006
Scientific Committee: 6th International Symposium on Pneumococci and Pneumococcal Diseases, Reykjavik, Iceland, June 2008
Scientific Committee: 7th International Symposium on Pneumococci and Pneumococcal Diseases, Tel Aviv, Israel, March 2010
Scientific Committee: 9th International Symposium on Pneumococci and Pneumococcal Diseases, Hyderabad, India, March 2014
Conference Chair: First Annual Center for Communicable Disease Dynamics Symposium: Surveillance for Decision Making in Emerging Diseases: Lessons from the 2009 H1N1 Pandemic Influenza. Boston, June 2010
Organizing Committee: Epistemology of Modeling and Simulation. University of Pittsburgh, April 2011.
Conference Chair: Second Annual Center for Communicable Disease Dynamics Symposium: Antimicrobial Resistance: Biology, Population Dynamics and Policy Options. Boston, October 2011
Conference Chair: Epidemics[3], Boston, November 2011
Scientific Committee: Epidemics[4], Amsterdam, November 2013
Conference organizer: Workshop on Modeling and Simulation for Infectious Disease Trial Design, Seattle, August 2016 (with Betz Halloran)
Workshop organizer: Ethical Design of Vaccine Trials in Emerging Infections, ETHOX, Oxford, UK, July 2017 (with Rebecca Kahn, Nir Eyal, Annette Rid)
Scientific Committee: 12th International Symposium on Pneumococci and Pneumococcal Diseases, Toronto, 2020
Advisory group on COVID-19, Science Philanthropy Alliance, August 2020

GRANT REVIEWER SINCE 2003:

Research Fund for the Control of Infectious Disease (RFCID), Hong Kong Semi-Autonomous Region, China
UK Medical Research Council
Wellcome Trust (UK)
Department of Veterans Affairs, USA
Alliance for the Prudent Use of Antibiotics
Swiss National Science Foundation
RIVM (National Institute of Health and Environment), Netherlands
Innovational Research Incentives Scheme, Royal Netherlands Academy of Sciences
National Institutes of Health, ad hoc member, GVE study section (4x), IRAP study section (1x), several telephone special review groups
Health Research Council of New Zealand

AXA Foundation Fellowships
Canadian Institutes of Health Research
Royal Society of New Zealand
French National Research Agency (ANR)
Royal Society (UK)
NIH Special Emphasis Panels (2013/01 ZRG1 IDM-A (02) S; 2014/08 ZRG1 RPHB-W (53) R - RFA-RM-13-009: NIH Director's Early Independence Awards Review)
Dutch Research Council NOW (2011, 2017)
NIH Special Emphasis Panel (2014/10 ZRG1 IDM-S (02) M)
Chair of NIH Infectious Diseases and Microbiology Integrated Review Group, ZRG1 IDM S02 10/2014 council
NIH CRFS Study section, ad hoc member, 2015
UK Medical Research Council (2016)

INVITED TALKS (SINCE 2015):

01/2015	Otto Wolff Lecture, Institute of Child Health, University College London
01/2015	London School of Hygiene and Tropical Medicine, invited lecture
01/2015	Centre for the Study of Existential Risk, Cambridge University, UK, invited lecture
02/2015	Public Health England, Colindale, London UK, invited lecture
03/2015	London School of Hygiene and Tropical Medicine, Health Protection Research Unit Annual Conference, Invited Lecture
04/2015	University of Bristol Department of Social Medicine
04/2015	University of Pittsburgh Marcella L. Finegold Memorial Public Debate Series
05/2015	Applied Bioinformatics and Public Health Conference, Wellcome Trust Sanger Institute, Keynote Lecture
06/2015	Médecins sans Frontières Science Day, Panel Discussion, Paris, France
06/2015	Eijkman Lecture, UMC Utrecht, Netherlands
07/2015	ETH Zurich Latsis Symposium, plenary talk
07/2015	Jenner Lecture, Jenner Vaccine Institute, Oxford University, UK
09/2015	[popular presentation] HubWeek *Four Global Health Threats, Four Global Health Opportunities,* Harvard University
01/2016	National Science Advisory Board on Biosecurity
02/2016	WHO Technical Expert Consultation: Alternate Dosing Schedules of Pneumococcal Conjugate Vaccines, Geneva (by videolink)
02/2016	PATH Scientific Advisory Board, PATHwSP Vaccine Trial, Geneva (by videolink)
05/2016	Department of Microbiology and Immunology, Emory University, Atlanta
05/2016	Causal Inference in the Presence of Interference, Department of Biostatistics, Harvard T.H. Chan School of Public Health, Boston, MA
06/2016	Robert Austrian Award Lecture, International Symposium on Pneumococci and Pneumococcal Diseases-10
07/2016	Glaxo SmithKline Vaccines, Rockville, MD
07/2016	White House Pandemic Prediction and Forecasting Science and Technology Working Group (PPFST WG)

09/2016	Keynote Address, Project Prometheus Workshop on Multi-Strain Modeling, RIVM (National Institute of Public Health and the Environment), Bilthoven, Netherlands
01/2017	Postdocs in Complexity Conference, Santa Fe Institute, NM (not delivered due to travel delays)
02/2017	Department of Epidemiology of Microbial Diseases, Yale School of Public Health, New Haven, CT
03/2017	Department of Mathematics, University of Utah
03/2017	The Value of Vaccines in the Avoidance of Antimicrobial Resistance, Chatham House, London
03/2017	WHO Workshop on Vaccines and Antimicrobial Resistance, London, UK
04/2017	National Math Festival, Washington, DC (two talks)
05/2017	Memorial Symposium for Ellis McKenzie, Fogarty International Center, NIH, Bethesda, MD
06/2017	EA Global, Society for Effective Altruism, Cambridge, MA
06/2017	Panelist, Surveillance workshop, Simons Foundation, New York, NY
09/2017	Emerging Leaders in Biosecurity meeting, Johns Hopkins Center for Health Security (held Cambridge, MA)
12/2017	Risk in Complex Systems: Models, Applications, Perceptions, and Policy Implications, Centre de Recherches Mathematiques, University of Montreal
3/2018	Department of Ecology and Evolutionary Biology, Princeton University
3/2018	17th Annual Symposium, Institute for Systems Biology, Seattle
4/2018	Gates Vaccine Impact Modeling Consortium, Keynote Address, annual meeting in Cambridge, MA
5/2018	”Antibiotic resistance: Evolutionary concepts versus clinical realities,” Wenner-Gren Center, Stockholm
6/2018	London School of Hygiene and Tropical Medicine
6/2018	Institut Pasteur, Paris
6/2018	Big Data Institute, University of Oxford
8/2018	PRISM (Policy relevant infectious disease simulation and mathematical modelling) Annual Meeting, Palm Cove, Australia
8/2018	David Danks Seminar, Murdoch Children’s Research Institute, Melbourne, Australia
11/2018	Berkman-Klein Center, Harvard Law School, Data and Health Seminar
6/2019	Chan-Zuckerberg Biohub, San Francisco
6/2019	Stanford Medical School, Stanford, CA
6/2019	Proctor Foundation, UC San Francisco, CA
7/2019	Wellcome Meeting on the Global Burden of Disease from Antimicrobial Resistance, London
10/2019	23rd Annual Robert M. Fekety, MD Lecture, Department of Medicine, Division of Infectious Diseases, University of Michigan
10/2019	Microbiology and Infectious Diseases Seminar, University of Geneva, Switzerland
3/2020	National Academy of Medicine/American Public Health Association First Webinar on COVID-19, Washington DC (via Zoom)
3/2020	Harvard Kennedy School Growth Lab, Cambridge, MA (via Zoom)
3/2020	White House Modeling Consortium, Washington DC (via Zoom)
4/2020	European Central Bank (via Zoom)
4/2020	*USA Today* Editorial Board (via Zoom)
4/2020	*New York Times* Editorial Board (via Zoom)

4/2020	Harvard Medical School Department of Medicine Grand Rounds (one of many short talks, via Zoom)
5/2020	Massachusetts Coalition for Pathogen Research (one of many short talks, via Zoom)
5/2020	Covid symposium, National Institute of Statistical Science/American Statistical Association
5/2020	Private briefing, Deputy Prime Minister Chrystia Freeman, Ottawa, Canada
5/2020	Briefing, New Democrat Coalition, by Zoom
5/2020	Isaac Newton Institute, Cambridge University, UK, by Zoom
5/2020	Futureproofing Public Health, University of Stellenbosch, by Zoom
5/2020	Private briefing, Rahul Gandhi, Leader, Congress Party, India
5/2020	Harvard Club of Boston, by Zoom
5/2020	Tsinghua University / AAAS Symposium, Beijing, by Zoom
5/2020	Institute for Genome Sciences, University of Maryland, by Zoom
5/2020	National Academy of Sciences, Section 43, by Zoom
5/2020	Medical Grand Rounds, Boston Children's Hospital, by Zoom
5/2020	Vaccine Research Center, Beth Israel Deaconess Medical Center, by Zoom
5/2020	COVID-19 and the Role of Modeling, American Statistical Association and the National Institute of Statistical Sciences (via Zoom)
6/2020	International Monetary Fund, by Zoom
6/2020	Webinarium: Role of a Medical University in a Pandemic, Karolinska Institutet, Stockholm, by Zoom
7/2020	Bipartisan Commission on Biosecurity, by Zoom
7/2020	National Bureau of Economic Research, by Zoom
7/2020	SAGE Working Group on COVID-19 Vaccines, by Zoom (panelist)
7/2020	Congressional Briefing on Human Challenge Trials, organized by 1DaySooner and Rep. Bill Foster, by Zoom
7/2020	International Symposium on Novel Ideas in Science and Ethics of Vaccines against COVID-19 Pandemic, India Council of Medical Research, by Zoom
7/2020	Private and Public Science, Advisory, and Consumer Food Policy Group (PAPSAC), Harvard Kennedy School, by Zoom
8/2020	National Academies (NASEM) Committee on Equitable Allocation of Vaccine for the Novel Coronavirus (panel), by Zoom
8/2020	Mathematical Sciences Research Institute, University of California, Berkeley, by Zoom
8/2020	Coronavirus Conversations, Science and Society, Duke University (panel), by Zoom
8/2020	Giving Pledge Meeting – Q&A with Scott Dowell, Bill and Melinda Gates Foundation, by Zoom
8/2020	Janelia Farm, Howard Hughes Medical Institute, via Zoom
9/2020	COVID-19, Public Health Ethics, and Policy for Pandemics, Harvard Medical School Center for Bioethics, Cambridge MA (via Zoom)
9/2020	From testing to distribution: the importance of, and challenges to, estimating the protective effects of vaccines, National Institute of Statistical Sciences, Research Triangle, NC (via Zoom)
9/2020	Epidemiology of COVID-19: Implications for Control, American Physical Society, College Park, MD (via Zoom)

10/2020 COVID-19 and Vaccines: Clinical Trials, Immunity and Immunization, American Lung Association, Chicago, IL (via Zoom)
10/2020 Board of Directors, Blue Cross-Blue Shield of Massachusetts

RESEARCH SUPPORT:

Past Funding

1997-1999 NIH postdoctoral fellowship 1 F32 GM019182 Population Genetics of Bacterial Infection and Treatment. Role: PI

1997-1999 SmithKlineBeecham unrestricted educational grant. Effects of Antiviral Usage on Resistance in Herpes Simplex Virus, Type 1. Bruce R. Levin, PI. Role: Co-PI

2001-2005 NIH research grant R01 AI051929. Drug Resistance in Tuberculosis: Genetics and Dynamics. Eric Rubin, PI. Role: Co-PI

2001-2006 NIH research grant R01 AI48935. Vaccination and the Evolutionary Dynamics of Pneumococci. Role: PI

2001-2011 NIH research grant R01 AI048935 Mechanisms of Capsular Diversity in *Streptococcus pneumoniae*. Role: PI

2002 PhRMA Foundation Research Starter Grant. Planning and Assessing Antimicrobial Cycling and Other Interventions to Control Resistance in Hospitals. Role: PI

2002-2006 Ellison Foundation New Scientist in Global Infectious Diseases Award. Antibiotic Resistance in *Streptococcus pneumoniae*: Transmission Dynamics and Consequences for Public Health. Role: PI

2003-2006 NIH research grant 5 R21 AI055825. Epidemiologic Methods: Resistant Nosocomial Infections. Role: PI

2004-2013 NIH/NIAID R01 AI058736 (Freedberg). Optimizing HIV care in less developed countries. Role: Consortium Co-Investigator

2006 Taplin Foundation Equipment Grant, Harvard School of Public Health.

2006 NIAID/TIGR Pathogen Functional Genomics Resource Center grant of access to free microarrays. Effects of Host Immunity on Pneumococcal Gene Expression. Role: PI

2006-2009 NIH cooperative agreement U01 GM076497. Methodological Approaches to Planning and Analysis of New Infectious Diseases. Role: PI. Replaced by U54 GM088558.

2006-2016 NIH/NIAID R01 AI066304 (Finkelstein). Conjugate Vaccine Impact of Pneumococcal Carriage, Disease, and Population (SPARC2). Role: Consortium PI

2010-2014 NIH/NIMH R01 MH087328 (Seage). Modeling the Impact of HIV Prevention Interventions (CEPAC Dynamic). Role: Co-PI

2011-2016 NIH/NIGMS R01 GM100467 (Shaman). Influenza Outbreak Prediction: Applying Data Assimilation Methodologies to Make Skillful Forecasts of an Inherently Chaotic, Nonlinear System. Role: Consortium PI

2012-2018 NIH/NIAID R01 AI048935-15 NCE. Mechanisms and Population Genomics of Pneumococcal Antigenic Diversity. Role: PI

2013-2019 NIH/NIGMS R01 AI106786-05 NCE (PI: Hanage). Ecological and Genetic Contributions to the Spread of Resistance in Pnumococcus. Role: Co-PI

2014-2018 Pfizer Inc. (No number). Modeling serotype replacement with Prevnar13 using an agent-based model (Phase 2). Role: PI

2014-2018 NIH/NIGMS R01 GM116525-03 (Seage). Calibration and Simulation of the Botswana Combination Prevention Project. Role: Co-PI

2014-2018 Program for Appropriate Technology in Health. 1773-00460733-COL. Modeling pneumococcal population dynamics under serotype-nonspecific vaccination. Role: PI

2015-2018 NIH/NIAID R21 AI112991-02 NCE (Huttenhower). Staphylococcus Aureus Carriage and the Nasal Microbiome. Role: Co-PI

2015-2020 NIH/NIGMS R01 GM113233 (Wargo). The impacts of host vaccination and selective breeding for disease resistance on pathogen transmission and ecology in freshwater aquaculture. Role: Consortium PI

2017-2019 Pfizer Inc. CP147216 (Lipsitch/Lewnard). Quantifying pneumococcal conjugate vaccine impact against otitis media. Role: Co-PI

2017-2020 CDC 1 U01 CK000538-01 (Samore). Modeling and simulation to support antibiotic stewardship and epidemiological decision-making in healthcare settings. Role: Consortium PI

Current Funding

2014-2021 NIH/NIGMS U54 GM088558-10 NCE. MIDAS Center for Communicable Disease Dynamics. Role: PI

2018-2022 NIH/NIAID 5 R01 AI128344-01 (Hanage). Deep sequencing of pathogens to precisely define transmission networks using rare variants. Role: Co-PI

2018-2021 National Institute for Health Research. PR-OD-1017-20006 (PI: Cooper / University of Oxford). Leveraging Pathogen Sequence Data and Adaptive Designs to Improve Vaccine Trials in Emerging Epidemics in LMICs. Role: Consortium PI

2018-2020 Pfizer Inc. A34479 (Lewnard). Changes in antimicrobial prescribing for otitis media in the era of pneumococcal conjugate vaccination. Role: Co-PI

2019-2024 CDC U01 IP001121-02 (PI: Rosenfeld / Carnegie Mellon University). Delphi Influenza Forecasting Center of Excellence. Role: Consortium PI

2020-2022 Wellcome Trust. 219759/Z/19/Z. Vaccine-avertable antimicrobial prescribing from influenza and RSV: a mixed-methods observational study. Role: PI

2020-2022 Wellcome Trust. 219812/Z/19/Z (Grad). Reducing antibiotic prescribing through a prioritized vaccination strategy. Role: Co-PI

2020-2023 Open Philanthropy Project / Silicon Valley Community Foundation. 2020-211809. Research and Policy Activities on Biosafety and Biosecurity. Role: PI

2020-2022 NIH/NCI U01 CA261277-01. Causal, Statistical and Mathematical Modeling with Serologic Data

2020-2025 CDC U01 CK000585-01 (Samore). Modeling and Simulation to support Epidemiological decision-making in Healthcare settings. Role: Consortium PI

2020-2022 Morris-Singer Foundation. Morris-Singer Fund for the Center for Communicable Disease Dynamics. Role: PI

TEACHING EXPERIENCE:

Full Courses

Biostatistics 516: Inferential Methods for Infectious Diseases. Co-developer and co-instructor of course.
Taught 2011 (Spring 2)

Epidemiology 260: Mathematical Models of Infectious Diseases: Developed course, sole instructor.
Taught 2001, 2002, 2003, 2005, 2007, 2009, 2011, 2014, 2016, 2018, 2020 always d period (Spring 2).

Interdepartmental 267-268: Seminar in Infectious Disease Epidemiology: Developed and taught course jointly with Dr. Megan Murray in 2000; sole instructor in 2001 and 2002.
Taught 2000-2001 as full year; taught 2001 and 2002 as fall only (ID267ab).

Interdepartmental 298: Inference in Infectious Disease Epidemiology. Developed course, sole instructor.
Taught 2005, 2007 winter session.

Epidemiology 502: Biology and Epidemiology of Antibiotic Resistance. Co-developed and co-taught course with Dr. Gili Regev-Yochay.
Taught 2008, 2010, 2012, 2014, 2016, 2018, 2020 winter session.

Participation

Epidemiology 201: Introduction to Epidemiology. One week each year (2 2-hr. lectures).
Taught 2000-2007; coinstructor 2005-7.

Epidemiology 200: Principles of Epidemiology. One lecture per year.
Taught 2000-2005; coinstructor 2005-7.

Epidemiology 289: two lectures on Infectious Disease Epidemiology, 2010

Interdepartmental 229: Epidemiology of Infectious Diseases of Importance in Developing Countries (and predecessors). One lecture per year.
Taught 2000-2006.

DBS205: Biological Sciences Seminars. One presentation of research per year.
Taught 2002, 2005, 2015.

RDS281 (now 285): Decision Analysis Methods in Public Health and Medicine. One lecture on infectious diseases and dynamic modeling.
Taught 2002-2007, 2010.

IMI225 Design and Development of a vaccine. One lecture per year.
Taught 2007.

IMI227 Genetics of Infectious Disease. One lecture per year.
Taught 2007-8.

Epidemiology 205: Practice of Epidemiology. Supervised one student.
Participated 2000.

Epidemiology 294: Screening. Two lectures on introductory Infectious Disease Epidemiology
2011, (Spring 2)

ID517 Public Health Response to Mass Emergencies. One lecture.
Taught 2008.

Life Sciences 120 (Harvard College): Global Health Threats.
One to three lectures, 2011, 2012, 2016

Probabilistic Risk Analysis (HSPH Continuing Education). One lecture per year.
Taught 2002-2004.

Health Science & Technology Microbiology (HMS). One lecture per year.
Taught 2002, 2003, 2005, 2007, 2008, 2009.

Modern Medical Microbe Hunters (HMS). One lecture per year.
Taught 2000, 2001, 2002, 2004.

Epidemiology 513: Issues in the Reporting of Clinical Trials. *Guest lecture 2011.*

Epidemiology 203. Four, 2-hour lectures per year on infectious disease epidemiology
2012, 2014, 2016, 2017, 2018,2019

ID250 Ethical Basis of Public Health Practice. One lecture per year
Guest lecture 2015

GHP539 Control of Infectious Diseases in Low/Mid Income Countries: Social, Political and Economic dimensions
Guest lecture 2017

MPH100
Guest lecture 2019, 2020 (Spring and Fall)

Harvard College Gen Ed 1098 Natural Disasters
Guest lecture 2020

Short Courses Outside Harvard

Harvard-Karolinska Summer School on Modern Methods in Biostatistics and Epidemiology, Treviso, Italy. Infectious Disease Epidemiology. Developed a 1-week intensive introductory course with exercises and was sole instructor. *Taught 2005.*

Hong Kong Centre for Health Protection Short Course in Mathematical Modelling of Infectious Diseases. Participated in course development and taught three lectures. *Taught 2006.*

Infection and Immunity in Children, Department of Paediatrics, Oxford University, UK. Delivered 1 lecture by videolink. *Taught June 2010.*

Winter Forum – Pandemic 2011. Duke Global Health Institute and Office for Undergraduate Education, Durham, NC. Delivered one lecture by videolink. *Taught January 2011.*

Practical Short Course in Infectious Disease Modeling. National Center for Immunization and Respiratory Diseases, US Centers for Disease Control & Prevention (CDC). Course director (collaboratively with Hong Kong University and Imperial College London) and instructor. *Taught June 2011.*

Erasmus Summer Program, Erasmus University, Rotterdam, Netherlands. Master Class taught by videolink. *Taught August 2011.*

Short Course in Infectious Disease Modeling: Hong Kong University and HSPH CCDD:
Kuala Lumpur 2014, Bangkok 2012

Course organizer and faculty: Short Course in Infectious Disease Modeling: HSPH CCDD, Imperial College London, Hong Kong University
Centers for Disease Control and Prevention 2011, 2014

Faculty Guest Lecturer: ICARe (International course on Antibiotic Resistance), Pasteur Institute, at Fondation Merieux, Les Pensieres, France.
2018, 2019

Online Modules

Herd Immunity in: Vaccines 101, Harvard School of Public Health online course
Recorded Summer 2014

Heterogeneity in: Epidemics, University of Hong Kong HKUx EdX course
Recorded Summer 2014

Guest Teaching Outside Harvard

Georgetown University Department of Microbiology and Immunology: guest lecture in Science Diplomacy and World Health, Tomoko Steen instructor (2014, 2016)

Princeton University Woodrow Wilson School: guest lecture in Topics in Development: Global Challenges of Infection, Burden and Control, Adel Mahmoud and Bryan Grenfell instructors (2016, 2018)

Supervision

Research Scientist supervisor:

2005-2008	Krzysztof Trzcinski, D.V.M., Ph.D., Research Scientist
2008-2009	Krzysztof Trzcinski, D.V.M., Ph.D., Senior Research Scientist (now Assistant Professor, University of Utrecht, Netherlands)
2008-2010	Edward Goldstein, Ph.D., Research Scientist
2010-2018	Edward Goldstein, Ph.D., Senior Research Scientist
2019-present	Rene Niehus, Ph.D, Research Associate

Postdoctoral supervisor:

2001-2005	Krzysztof Trzcinski, D.V.M., Ph.D. Assistant Professor, University of Utrecht, Netherlands.
2001-2002	Noman Siddiqi, Ph.D. (Co-supervisor with Eric Rubin). Currently BL3 Manager, Harvard School of Public Health
2001-2002	Susan Huang, M.D., M.P.H. (Secondary advisor) (currently Professor of Infectious Disease, University of California, Irvine).

2002-2003	Ben Cooper, Ph.D. Professor, Nuffield Department of Medicine, Mahidol-Oxford Tropical Research Unit, Bangkok, Thailand
2003-2005	Michael Palmer, Ph.D. Currently working in the IT Industry
2004-2008	Gili Regev-Yochay, M.D. Currently Assistant Professor, Tel Aviv University and Head of Infectious Diseases Epidemiology Unit, Gertner Institute, Tel Aviv, Israel.
2006-2008	Debby Bogaert, M.D., Ph.D. Professor of Pediatric Infectious Diseases, University of Edinburgh
2008	Edward Goldstein, Ph.D. Senior Research Scientist, HSPH
2010	Daniel Weinberger, Ph.D. Assistant Professor, Yale School of Public Health
2009-2011	Joel Miller, Ph.D. Currently Senior Research Scientist, Institute for Disease Modeling, Seattle
2010-2013	Sarah Cobey, Ph.D. Associate Professor of Ecology and Evolution, University of Chicago
2010-2014	Yuan Li, Ph.D. Epidemiologist, CDC
2010-2014	Yonatan Grad, M.D., Ph.D. Assistant Professor, Harvard TH Chan School of Public Health
2011-2013	Nicholas Croucher, Ph.D. (co-advisor with W. Hanage). Senior Lecturer and Henry Dale Fellow, Imperial College
2013-2016	Colin Worby, Ph.D. (co-advisor with W. Hanage) Staff Scientist, Broad Institute.
2013-2019	Hsiao-Han Chang, Ph.D. (co-advisor with C. Buckee). Starting 2019: Assistant Professor, National Tsing Hua University, Taiwan
2014-2016	Nadia Abuelezam, Sc.D. (secondary advisor with George Seage). Currently Assistant Professor, Boston College School of Nursing.
2014	Ben Althouse, Ph.D. (external faculty advisor for his Santa Fe Institute Postdoc)
2015-2017	Kate Langwig, Ph.D. Assistant Professor of Ecology, Virginia Tech
2015-2018	Taj Azarian, Ph.D. Assistant Professor of Medicine, Burnett School of Biomedical Sciences, Department of Molecular Microbiology, University of Central Florida College of Medicine
2015-2018	Brian Arnold, Ph.D. Bioinformatics Scientist, Faculty of Arts and Sciences, Harvard University
2015-2018	Maria Georgieva, Ph.D. Postdoctoral Fellow, Department of Physiology, University of Lausanne
2016-present	Samantha Palace, Ph.D. (co-supervisor with Y. Grad)
2017-2018	Lucy Li, Ph.D. Bioinformatics Scientist I, Chan Zuckerberg Biohub
2017-2018	Joseph Lewnard, Ph.D. Assistant Professor, Department of Epidemiology, UC Berkeley
2017-2019	Ayesha Mahmud, Ph.D. (Co-advisor with C. Buckee). Assistant Professor, Department of Demography, UC Berkeley
2018-present	Pamela Martinez, Ph.D. (Co-advisor with C. Buckee)
2019-present	Xueting Qiu, Ph.D. (Co-advisor with W. Hanage)
2019-present	Lerato Magosi, D.Phil.
2020	Lee Kennedy-Shaffer, Ph.D., Assistant Professor, Vassar College
2020-present	Rebecca Kahn, Ph.D.

Doctoral student supervisor:

2000-2001	Ivo Foppa (Epi). Currently Epidemiologist, Influenza Division, CDC
2000-2005	Hailay Teklehaimenot (Epi). Currently at Ministry of Health, Addis Ababa, Ethiopia
2000-2001	Robert Suruki (Epi): completed doctoral studies with another advisor; currently at GlaxoSmithKline.
2001-2006	Christina Mills (Epi). Currently Attending Physician, Boston Children's Hospital Boston
2002-2005	Alethea McCormick (Epi). Currently Research Associate, Harvard School of Public Health
2002-2011	Sibel Ascioglu (Epi). Currently at Glaxo SmithKline
2003-2008	Virginia Pitzer (Epi). Currently Assistant Professor, Yale School of Public Health
2004-2012	Jessica Hartman Jacobs (Epi)
2006-2012	Justin O'Hagan (Epi). Currently Head of Outcomes Research, Dengue, Merck.
2006-2010	Daniel Weinberger (BPH). Currently Assistant Professor, Yale School of Public Health
2007-2008	Chris Ford (BPH). Currently Postdoc, Broad Institute.
2007-2008	Karell Pelle (BPH)
2014-2018	Matthew Hitchings (Epi). Currently postdoctoral fellow, Emerging Pathogens Institute, University of Florida
2016-present	Christine Tedijanto (Population Health Sciences/Epi)
2016-present	Emma Accorsi (Population Health Sciences/Epi)
2018-2020	Rebecca Kahn (Population Health Sciences/Epi)
2019-present	Keya Joshi (Population Health Sciences/Epi)

Master's student supervisor:

2000-2002	Alison Han (MPH)
2000-2008	Catherine Laine (Epi MSc). Currently Founder and Deputy Director, Appropriate Infrastructure Development Group.
2001-2002	Benjamin Ip, MD (MPH)
2001-2002	Rajneesh Hazarika, MD (MPH)
2002-2004	Hoa Nguyen, MD (MS)
2003-2005	Dereje Dengela (MS)
2004-2005	Heather Green (MS)
2004-2005	Wei-yen Lim, MD (MPH)
2004-2005	Phil James, MD (MPH)
2005-2006	Jeffrey Cloud, MD (MPH)
2005-2006	Yen-Tsung Huang, MD (MPH)
2005-2006	Minghua Chen, MD (MPH)
2006-2007	Chou-Cheng Lai, MD (MS)
2006-2007	Jennifer Shuford, MD (MPH)
2006-2007	Chih-Hao Chen, MD (MS)
2006-2007	Mark Brady (MPH)
2007-2008	Indrajit Hazarika, MD (MPH)
2007-2008	Hyun Joon Shin, MD (MPH)
2007-2008	Amit Vora (MPH)
2005-2006	Christie Jeon (MS)

2004-2007	Gili Regev-Yochay, MD (MS)
2009-2011	Weixiong Ke
2010-2012	Karen Aanensen
2011-2013	Talia Quandelacy
2011-2013	Patrick Mitchell
2013-2014	Fausto Bustos
2016-2017	Say Tat Ooi, MD (MPH)
2016-2018	Michael Martin (MS)
2016-2018	Inga Holmdahl (MS)
2016-2018	Rebecca Kahn (MS)
2017-2019	Sarah Lapidus (MS)
2018-2020	Nancy Li (MS)
2019-2020	Eva Rumpler (MS)
2019-present	Rafia Bosan (MS)

Undergraduate supervisor:

Summer 2001	Eneida Villanueva (Summer Minority Intern)
Fall 2001	Jonathan Burton-MacLeod (Bio 91r supervised reading, FAS)
2016-2018	Alan Yang (Supervised research)
Summer 2018	Tara E. Gallagher, Dartmouth College (Summer intern)

Thesis committees:

2000-2001	Megan Murray (Dr. P.H., completed 2000-1)
2004-2007	Eben Kenah (Epidemiology)
2004-2005	Y. Claire Wang (Health Policy and Management)
2005	Seema Thakore Meloni (Ph.D., Biological Sciences in Public Health)
2005-2007	Mary Farrow (Ph.D., Biological Sciences in Public Health)
2007-2010	Kevin Chan (Population & International Health)
2008-2011	Amy Bei (Ph.D., Biological Sciences in Public Health)
2010-2013	Chris Ford (Ph.D., Biological Sciences in Public Health)
2010-2013	Regina Joice (Ph.D., Biological Sciences in Public Health)
2011	Rachel Daniels (Ph.D., Biological Sciences in Public Health)
2011-2017	Freeman Suber MD (Ph.D., Biological Sciences in Public Health)
2011-2012	Tami Lieberman (Ph.D., Systems Biology)
2011-2013	Wei Wu (Epidemiology)
2013	Opponent, PhD of Rolf Ypma, University of Utrecht
2014	Clare Louise Kinnear, PhD, The University of Melbourne (external examiner)
2015-2017	Corey Peak (SD, Epidemiology)
2015-2016	Patrick Mitchell (SD, Epidemiology)
2016	Hattie Chung (PhD, Systems Biology, Harvard GSAS), examination committee
2016	Nicole Espy (PhD, BPH, defense committee)
2015-2017	Quizhi Chang (SD, Epidemiology)
2017-2019	Eric Mooring (SD, Epidemiology)
2017-present	Rebecca Mandt (PhD, BPH)

2017-2020	Sarah McGough (PhD, Population Health Sciences)
2018-2020	Lee Kennedy-Shaffer (Biostatistics)

Oral exam committees:

2001	Yemane Yihdego (IID)
2001	Chris Mores (IID)
2002	Pride Chigwedere, MD (IID)
2004	Beth Ann Griffin (Biostatistics)
2004	Eben Kenah (Epidemiology)
2004	Laura Forsberg (Biostatistics)
2007	Kevin Chan (Population & International Health)
2008	Hsien-Ho Lin (Epidemiology)
2009	Regina Joice (BPH)
2009	Celene Chang (BPH)
2009	Kathleen Wirth (Epi)
2011	Freeman Suber (BPH)
2011	Wei Wu (Epi)
2012	Nicanor Rodriguez, DVM (IID)
2016	Corey Peak (Epi)
2016	Qiuzhi Chang (Epi)

Laboratory rotations supervised:

2000	Chun Chao (MS student, Immunology & Infectious Diseases)
2004	Adam MacNeil (PhD, Biological Sciences in Public Health)
2006	Daniel Weinberger (PhD, Biological Sciences in Public Health)
2006	Amy Bei (PhD, Biological Sciences in Public Health)
2008	Chris Ford (PhD, Biological Sciences in Public Health)
2009	Richa Gawande (PhD, Biological Sciences in Public Health)
2010	Sri Kalyanamaran (PhD, Biological Sciences in Public Health)
2011	Wen Xie (PhD, Biological Sciences in Public Health)
2016	Rebecca Mandt (PhD, Biological Sciences in Public Health)

SCHOOL AND DEPARTMENTAL SERVICE

Interdisciplinary Program in the Epidemiology of Infectious Disease

- Steering committee, 2000-present
- Seminar Coordinator, 2000-present
- Associate Director, 2004-present

Biological Sciences in Public Health Program

- Admissions interviewer, 2001-present
- Curriculum Committee, 2006-2012

Department of Epidemiology

- Co-leader, department retreat, 2001

- Admissions committee, 2001-2014

HSPH Epidemiology and Biostatistics Planning Committee: member, 2003-2004

HSPH Allston Planning Committee: member, 2003-2004

HSPH Information Technology Advisory Committee: member, 2004-2005

HSPH Committee on Educational Policy: member, 2005-2008

HSPH Standing Committee on Appointments, Reappointments, and Promotions: member, 2008-present, vice-chair 2010-2012, chair 2012-2013

University Pandemic Response Planning Committee: member, 2005-present

Bioinformatics Junior Faculty Search Committee: member, 2007-2008

Epidemiology Methods Junior Faculty Search Committee: member, 2008

Epidemiology Infectious Diseases Junior Faculty Search Committee: chair, 2008

HSPH Committee on the Concerns of Women Faculty: member, 2010-2012

HMS Subcommittee on Admissions for the MD/PhD: member, 2010-2012, 2014-present

Harvard University Office of Scholarly Communication Advisory Committee, member, 2013-present

Harvard T.H. Chan School of Public Health Dean Search Advisory Committee, member, 2015

Harvard T.H. Chan School of Public Health Faculty Judge, Postdoctoral Association Travel Awards, member, 2016

Epidemiology Junior Faculty Search Committee, 2017-2018

BIBLIOGRAPHY

Peer-Reviewed Articles

1. Petrie M, Lipsitch M. Avian polygyny is most likely in populations with high variability in heritable male fitness. Proc R Soc Lond B. 1994 June 22;256(1347):275-80. doi: 10.1098/rspb.1994.0081.
2. Lipsitch M, Nowak MA. The evolution of virulence in sexually transmitted HIV/AIDS. J Theor Biol. 1995 Jun 21;174(4):427-40. doi: 10.1006/jtbi.1995.0109. PMID: 7666673.
3. Lipsitch M, Nowak MA, Ebert D, May RM. The population dynamics of vertically and horizontally transmitted parasites. Proc Biol Sci. 1995 Jun 22;260(1359):321-7. doi: 10.1098/rspb.1995.0099. PMID: 7630898.
4. Lipsitch M, Herre EA, Nowak MA. Host Population Structure and the Evolution of Virulence: A “Law Of Diminishing Returns”. Evolution. 1995 Aug;49(4):743-748. doi: 10.1111/j.1558-5646.1995.tb02310.x. PMID: 28565133.
5. Mangin KL, Lipsitch M, Ebert D. Virulence and transmission modes of two microsporidia in *Daphnia magna*. Parasitology. 1995;111(2):133-142. doi: 10.1017/S0031182000064878.
6. Lipsitch M, Siller S, Nowak MA. The Evolution of Virulence in Pathogens With Vertical and Horizontal Transmission. Evolution. 1996 Oct;50(5):1729-1741. doi: 10.1111/j.1558-5646.1996.tb03560.x. PMID: 28565576.
7. Lipsitch M, Moxon ER. Virulence and transmissibility of pathogens: what is the relationship? Trends Microbiol. 1997 Jan;5(1):31-7. doi: 10.1016/S0966-842X(97)81772-6. PMID: 9025233.
8. Antia R, Lipsitch M. Mathematical models of parasite responses to host immune defences. Parasitology. 1997;115 Suppl:S155-67. doi: 10.1017/s003118209700200x. PMID: 9571700.
9. Levin BR, Lipsitch M, Perrot V, Schrag S, Antia R, Simonsen L, Walker NM, Stewart FM. The population genetics of antibiotic resistance. Clin Infect Dis. 1997 Jan;24 Suppl 1:S9-16. doi: 10.1093/clinids/24.supplement_1.s9. PMID: 8994776.
10. Lipsitch M, Levin BR. The within-host population dynamics of antibacterial chemotherapy: conditions for the evolution of resistance. Ciba Found Symp. 1997;207:112-27; discussion 127-30. doi: 10.1002/9780470515358.ch8. PMID: 9189638.
11. Lipsitch M, Levin BR. The population dynamics of antimicrobial chemotherapy. Antimicrob Agents Chemother. 1997 Feb;41(2):363-73. doi: 10.1128/AAC.41.2.363. PMID: 9021193; PMCID: PMC163715.
12. Lipsitch M. Vaccination against colonizing bacteria with multiple serotypes. Proc Natl Acad Sci U S A. 1997 Jun 10;94(12):6571-6. doi: 10.1073/pnas.94.12.6571. PMID: 9177259; PMCID: PMC21091.
13. Lipsitch M. Evolution in health and disease. Trends Microbiol. 1997 Aug;5(8):303-5. doi: 10.1016/S0966-842X(97)01087-1. PMID: 9263405.
14. Datta A, Hendrix M, Lipsitch M, Jinks-Robertson S. Dual roles for DNA sequence identity and the mismatch repair system in the regulation of mitotic crossing-over in yeast. Proc Natl Acad Sci U S A. 1997 Sep 2;94(18):9757-62. doi: 10.1073/pnas.94.18.9757. PMID: 9275197; PMCID: PMC23263.
15. Bonhoeffer S, Lipsitch M, Levin BR. Evaluating treatment protocols to prevent antibiotic resistance. Proc Natl Acad Sci U S A. 1997 Oct 28;94(22):12106-11. doi: 10.1073/pnas.94.22.12106. PMID: 9342370; PMCID: PMC23718.

16. Lipsitch M. Transmission Rates and HIV Virulence: Comments to Massad. Evolution. 1997 Feb;51(1):319-320. doi: 10.1111/j.1558-5646.1997.tb02416.x. PMID: 28568797.
17. Levin BR, Antia R, Berliner E, Bloland P, Bonhoeffer S, Cohen M, DeRouin T, Fields PI, Jafari H, Jernigan D, Lipsitch M, McGowan JE Jr, Mead P, Nowak M, Porco T, Sykora P, Simonsen L, Spitznagel J, Tauxe R, Tenover F. Resistance to antimicrobial chemotherapy: a prescription for research and action. Am J Med Sci. 1998 Feb;315(2):87-94. doi: 10.1097/00000441-199802000-00004. PMID: 9472907.
18. Lipsitch M, Levin BR. Population dynamics of tuberculosis treatment: mathematical models of the roles of non-compliance and bacterial heterogeneity in the evolution of drug resistance. Int J Tuberc Lung Dis. 1998 Mar;2(3):187-99. PMID: 9526190.
19. Stewart FM, Antia R, Levin BR, Lipsitch M, Mittler JE. The population genetics of antibiotic resistance. II: Analytic theory for sustained populations of bacteria in a community of hosts. Theor Popul Biol. 1998 Apr;53(2):152-65. doi: 10.1006/tpbi.1997.1352. PMID: 9615474.
20. Levin BR, Lipsitch M, Bonhoeffer S. Population biology, evolution, and infectious disease: convergence and synthesis. Science. 1999 Feb 5;283(5403):806-9. doi: 10.1126/science.283.5403.806. PMID: 9933155.
21. Lipsitch M. Bacterial vaccines and serotype replacement: lessons from Haemophilus influenzae and prospects for Streptococcus pneumoniae. Emerg Infect Dis. 1999 May-Jun;5(3):336-45. doi: 10.3201/eid0503.990304. Erratum in: Emerg Infect Dis 1999 Sep-Oct;5(5):734. PMID: 10341170; PMCID: PMC2640786.
22. Lipsitch M, Bergstrom CT, Levin BR. The epidemiology of antibiotic resistance in hospitals: paradoxes and prescriptions. Proc Natl Acad Sci U S A. 2000 Feb 15;97(4):1938-43. doi: 10.1073/pnas.97.4.1938. PMID: 10677558; PMCID: PMC26540.
23. Lipsitch M, Dykes JK, Johnson SE, Ades EW, King J, Briles DE, Carlone GM. Competition among Streptococcus pneumoniae for intranasal colonization in a mouse model. Vaccine. 2000 Jun 15;18(25):2895-901. doi: 10.1016/s0264-410x(00)00046-3. Erratum in: Vaccine 2000 Oct 15;19(4-5):598. PMID: 10812233.
24. Bergstrom CT, Lipsitch M, Levin BR. Natural selection, infectious transfer and the existence conditions for bacterial plasmids. Genetics. 2000 Aug;155(4):1505-19. PMID: 10924453; PMCID: PMC1461221.
25. Negri MC, Lipsitch M, Blázquez J, Levin BR, Baquero F. Concentration-dependent selection of small phenotypic differences in TEM beta-lactamase-mediated antibiotic resistance. Antimicrob Agents Chemother. 2000 Sep;44(9):2485-91. doi: 10.1128/aac.44.9.2485-2491.2000. PMID: 10952599; PMCID: PMC90089.
26. Lipsitch M, Bacon TH, Leary JJ, Antia R, Levin BR. Effects of antiviral usage on transmission dynamics of herpes simplex virus type 1 and on antiviral resistance: predictions of mathematical models. Antimicrob Agents Chemother. 2000 Oct;44(10):2824-35. doi: 10.1128/aac.44.10.2824-2835.2000. PMID: 10991866; PMCID: PMC90157.
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Data Sets

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Exhibit 4

May 29, 2020

Federal Aviation Administration

Information for Airport Sponsors Considering COVID-19 Restrictions or Accommodations

PURPOSE

This document addresses common issues that have arisen or may arise for airport sponsors during the response to the COVID-19 public health emergency. The Federal Aviation Administration (FAA) Office of Airports will evaluate specific requests regarding restrictions or accommodations on a case-by-case basis. The FAA retains maximum flexibility to consider unique circumstances during this public health emergency.

The FAA separately has published frequently asked questions (FAQs) related to the approximately $10 billion in grants for airports under the Coronavirus Aid, Relief, and Economic Security (CARES) Act. Those FAQs are available at www.faa.gov/airports.

BACKGROUND

The FAA has been receiving inquiries from airport operators about their authority to implement a range of restrictions, changes in operations, terminal service consolidations, and other responses to the COVID-19 public health emergency. Many of these inquiries reflect interest in facilitating social distancing or adapting to a reduced level of activity at the airport.

The FAA's primary concern is that federally obligated airports remain safe and open to the traveling public and aircraft. Particularly during this public health emergency, airports play an essential role in transporting medical and emergency equipment and personnel. The FAA continues to expect all airports to operate safely and stay open.

APPLICABILITY

The guidance here is not legally binding in its own right and will not be relied upon by the FAA as a separate basis for affirmative enforcement action or other administrative penalty. Conformity with this guidance, as distinct from existing statutes, regulations, and grant assurances, is voluntary only, and nonconformity will not affect existing rights and obligations.

ISSUES

Closing airports: All proposed closing of airport access (i.e., passenger and aircraft access) must be approved in advance by the FAA. As noted in Compliance Guidance Letter, 2020-01, in general, the FAA does not permit temporary closure or restriction of federally obligated airports for non-aeronautical purposes. An airport sponsor must obtain FAA approval to allow airport closure for a non-aeronautical purpose. (Grant Assurance 19 and 49 U.S.C. § 47107(a)(8)). Grant Assurance 19

further requires that airport sponsors will not cause or permit any activity or action on the airport that would interfere with its use for airport purposes. This includes all airport structures and operational areas. If a proposed action suspends or closes an international Port of Entry, then the sponsor may also need approval from U.S. Customs and Border Protection (CBP).

Prohibiting certain flights (e.g., certain locations, types of aircraft, and types of operations): As is normally the case, actions such as these may violate Federal law and the airport's grant assurances, unless approved in advance by the FAA (and, in some cases, the Office of the Secretary of Transportation (OST) as well). To seek such approval, the airport sponsor should contact the applicable FAA Airports District Office to discuss the matter.

Requiring flights to land at certain airports for screening: All such requests would ordinarily require prior FAA approval under Grant Assurances 19 and 22 and related statutes. Usually, these restrictions would likely constitute an unreasonable restriction on access; however, FAA has discretion to consider such requests and recognizes the exceptional situation presented by this public health emergency. Depending on the circumstances, such requests might be deemed as reasonable restrictions on access. However, even where FAA is amenable to such a temporary condition, the airport will need to coordinate with OST with regard to requiring route changes, and with CBP if the action appears to suspend or close an international Port of Entry.

Closing of sections of the airfield to allow for aircraft parking: Airports should avoid overflow parking of aircraft on runways except as a last resort. If overflow parking of aircraft is needed, airports should first consider using gates, aprons, and non-movement areas. Airports should also consider suggesting that aircraft owners contact other nearby airports where there may be additional aircraft parking capacity. Based on the location(s) selected, the sponsor must be able to respond with aircraft rescue and firefighting (ARFF) capability and provide required notice. In all cases, operators of airports in the National Plan of Integrated Airport Systems should work with local air traffic facilities (if present) to develop a safe and reasonable parking plan and share that information with their servicing FAA Airports District Office, local FAA Air Traffic Manager, and FAA's Flight Standards Service. For part 139 certificated airports, see Cert Alert 20-02 – Temporary Parking of Overflow Aircraft (updated March 24, 2020).

Closing restaurants or other retail activities in the terminal: The closing of restaurants, retail stores, or other non-aeronautical functions in a terminal is not likely to violate FAA grant assurances if driven by public health measures or reduced clientele, and especially if restrictions are applicable to all business entities within the jurisdiction. However, airports should coordinate with the FAA Office of Civil Rights with regard to Airport Concession Disadvantaged Business Enterprise regulations.

Closing gates or sections of terminals: In coordination with airport sponsors, airlines, the Transportation Security Administration (TSA), and other entities, closing gates or sections of terminals is likely to be acceptable if the closure is executed in response to reduced passenger volumes and operations, is not discriminatory, and does not provide an unfair competitive advantage to one operator. For example, TSA has reduced lanes or consolidated passenger screening checkpoint operations in numerous airports in response to the reduction in originating passenger volume.

Allowing terminals to be used for sheltering of people: This is likely to be acceptable if it does not interfere with airport access or impact security for the traveling public and aircraft operations.

Screening or quarantining passengers boarding or exiting planes: State, local, or territorial public health officials may want to screen or quarantine passengers. In most cases, this is likely to be acceptable as long as passengers are not being categorically refused access to air transportation (e.g., through unapproved blanket closures). Airlines may refuse transportation to a passenger because of a communicable disease if the passenger's condition poses a direct threat to the health or safety of others. Care must also be taken in coordinating with airport sponsors, airlines, TSA, airport law enforcement, and other entities on when, where, and how your government conducts this screening and quarantining, with a goal of minimizing burden and maximizing flexibility for operations. Effort also should be made to minimize undesirable queueing or the formation of large groups of passengers.

Rent abatement / minimum annual guarantee: A decision to abate rent (including "minimum annual guarantees" and also encompassing fees) is a local decision. Rent abatement should be tied to the changed circumstances caused by the public health emergency, and done in accordance with Grant Assurances 22 and 24, as well as related statutes. Where abatement results in shifting costs between various classes of airport tenants and users, the airport sponsor is encouraged to consult with all affected parties and implement a consensus approach if possible.

If a sponsor (or airport tenant, whether aeronautical or non-aeronautical) desires to renegotiate rent, a reasonable basis for such an action might be established if the underlying basis for such rent has temporarily declined or materially altered due to COVID-19. In such circumstances, the offer of accommodation in the form of rent abatement is not barred by the grant assurances as long as it is reasonable under the circumstances and reflects the decline in fair market value, loss of services, and/or changes to volume of traffic and economy of collection.

Sponsors considering such relief are encouraged to consider the business situation of the tenant; the changed circumstances created by the public health emergency; the desirability of having solvent tenants that can resume normal operations when the emergency ends; the availability of other governmental or insurance relief that such entities have or may receive; an appropriate term for such relief; and possible subsequent conditions that, if triggered, would end the abatement. Such a condition could be the receipt of other governmental forms of relief; insurance recovery, if any; or an end to the emergency.

As noted above, where sponsors have residual lease arrangements with aeronautical users, the reduction of rent for certain non-aeronautical entities may shift costs to the aeronautical users such as airlines. Achieving the appropriate balance between these users is a local responsibility that should be managed in consultation with all affected parties. If rent abatement to non-aeronautical users results in an increase to aeronautical rates, that is not necessarily an impediment from a grant assurance perspective, but the aeronautical rates must remain reasonable. For any actions that reallocate costs, FAA encourages sponsors to carefully balance and consider the equities between all airport users. Additionally, the sponsor is encouraged to consult with all affected parties before making its decision and reach a consensus where possible.

Apart from any Federal obligations, the FAA also recommends that airport sponsors consult their lease agreements to understand their discretion to act, particularly in a residual methodology context. Airport sponsors should also examine any bond covenants to identify any potential restrictions that may exist.

Deferral of rental payments or other fees: In cases where bond restrictions or other conditions may prevent airports from offering rent abatements, the deferrals of rents and/or fees may be possible. The terms and interest rates applied should be reasonable and applied fairly to similarly situated businesses. Deferral of rental payments and or fees, if adequately justified, is not likely to violate FAA's grant assurances. A primary goal of the statutory sustainability principle is to keep the airport solvent to ensure that the airport can remain open and operate safely. If a deferral exceeds an annual reporting period, interest should be charged based on Treasury note interest rates beginning the date of the deferral and reported on FAA Form 127. The deferred rent amount should be reported in the fiscal year when the rent would have been due but for the deferral. In the event that the rent payment is deferred and not abated, the deferred rent amount should be reported as unpaid invoices (accounts receivables) which would be reflected in the amount of revenue reported on the FAA Form 127. Neither airports nor the FAA have the legal authority, however, to allow air carriers to defer the remittance of collected Passenger Facility Charge (PFC) revenues.

Sponsor's request for reducing hours of operation: If contemplated, it is important that any such proposed action be part of implementing a legitimate public health initiative related to COVID-19. At a minimum, to the extent considered, such an action would require FAA to examine whether it would result in an undue hardship on emergency response or otherwise unjustly discriminate against a specific user of the airport. Finally, FAA is unlikely to approve any such reductions that would restrict either government or emergency operations.

Sheltering-in-place impacts on airport personnel: Because airports are essential in transporting emergency and medical supplies and personnel during emergencies, a critical number of airport and Federal employees should be designated as essential to ensure the continuity, safety, and security of airport operations. Also, airport law enforcement should be informed to facilitate their access to airport and airport facilities. This is particularly true for part 139 certificated airports, which require minimum personnel to meet requirements of the regulation. In addition, the Department of Homeland Security's Cybersecurity and Infrastructure Security Agency has issued guidance that specifically identifies airport operations personnel as part of the "Essential Critical Infrastructure Workforce" who should not be impeded from their efforts to keep airports safe and operational.

Recreational aeronautical restrictions: Certain States have issued COVID-19 restrictions on activities they deem "non-essential," including certain aeronautical activities such as flight schools and sky diving. With the goal of keeping airports open to ensure access for the traveling public, emergency and medical equipment and supplies, and emergency transportation, FAA does not object to *temporarily* limiting recreational aeronautical activities that are covered by such restrictions. However, the activities limited by a sponsor should be limited to those falling within the scope of a public health measure by an authority whose jurisdiction covers the airport's geographic area (e.g., a State or local government).

Prohibiting flights from "hotspot" areas: Prohibiting flights from "hotspots" or areas of high levels of contagion generally is not acceptable. However, a jurisdiction may choose to consider its authority to impose public health screening or quarantine for passengers entering the jurisdiction. The FAA has published guidance for consideration when implementing quarantine, screening, or movement restrictions that impact air transportation.

Sponsor's Use of Airport Revenue for Public Health Activities: Federal law requires that federally obligated airports must use airport revenue for the capital or operating costs of the airport. CARES Act grants must be used in the same way as airport revenue and for costs that are directly related to the airport.

Under the extraordinary circumstances of the COVID-19 public health emergency, some activities the airport may undertake to minimize the spread of COVID-19 may be legitimate capital or operating costs of the airport. For example, in this exceptional context, the FAA considers the testing and health screening of airport employees to be a legitimate operating cost of an airport to sustain the airport's workforce, upon which the continuity of airport operations depends. Additionally, airport operating costs may also include the costs of enhanced cleaning of the terminal and other areas of airport property to minimize transmission of COVID-19. These operating costs may include the purchase of incidentals and supplies to accomplish these purposes, such as screening and testing equipment, cloth face covers, and cleaning and disinfection products. In contrast, the use of airport employees for public health screening is generally not considered a proper use of airport revenue. Airports should properly account for and document allowable costs incurred because of the COVID-19 public health emergency. Airports with specific questions regarding allowable costs related to COVID-19 should contact their Airport District Office.

Sponsor's Use of Airport Space for Public Health Activities: Under the extraordinary circumstances of the COVID-19 public health emergency, airports are permitted to allocate terminal or office space for testing and health screening activities and the related storage of medical equipment and supplies. In this exceptional context, it is also within an airport sponsor's discretion to allow tenants to have additional space, beyond what their leases include, for testing and health screening and for storage of medical equipment and supplies. Because these uses support the continuity of airport operations, such accommodations can be for no cost as long as they are temporary, necessitated by the public health emergency, and offered in a way that is not unjustly discriminatory.

CONCLUSION

Airports should be cognizant of, and assume the responsibility for, the implications of their proposed actions in response to COVID-19. Considerations include, among others: (1) coordination with the FAA, (2) coordination with other Federal, State, or local agencies as needed, including airport law enforcement or local law enforcement entities serving the airport; (3) understanding of applicable Federal obligations, (4) impacts on aeronautical use and airport infrastructure; (5) impact on the safe and efficient functioning of air traffic and the National Airspace System; (6) communications and notice requirements; (7) evolving safety and security requirements; (8) the need to document actions; (9) plans for following up on or amending actions as the situation evolves; and (10) the impact to emergency services that rely on air transportation.

Exhibit 5

Santa Clara County
PUBLIC HEALTH

MANDATORY DIRECTIVE:

Travel

Issued: November 28, 2020

sccgov.org/coronavirus

Revised and Effective: January 25, 2021

County of Santa Clara
Public Health Department

Health Officer
976 Lenzen Avenue, 2nd Floor
San José, CA 95126
408.792.5040

MANDATORY DIRECTIVE ON TRAVEL

Please confirm compliance with the State Order. Where there is a difference between the local County Order and the State Order, the more restrictive order must be followed. The State also has specific guidance for certain activities that must be followed in addition to this mandatory directive.

Information on the State's Order and State guidance is available at covid19.ca.gov.

Issued: November 28, 2020
Revised and Effective: January 25, 2021
Effective Upon Release

In light of significant increases in COVID-19 cases and associated hospitalizations across the United States, the State of California, and within Santa Clara County, this Mandatory Directive on Travel is in effect until it is rescinded or modified.

This Directive establishes the County Health Officer's rules for quarantine after travel. The risk of COVID-19 transmission increases as people travel in and out of Santa Clara County and have contact with persons from other households and other communities, especially through travel to regions with significant COVID-19 transmission. To reduce this risk, the County Health Officer has established this mandatory directive related to travel. This Directive applies to all travel into Santa Clara County, whether by residents or non-residents.

This Directive is mandatory, and failure to follow it is a violation of the Health Officer's Order issued on October 5, 2020 ("Order").

Travel Is Discouraged

1. *The County Health Officer discourages travel, especially for non-essential purposes.*

    a. Because travel involves mixing between regions and households, and because so many areas of the State and United States are also currently experiencing significant surges in COVID-19 cases, travel is discouraged and should be minimized.

b. In particular, non-essential travel (i.e., travel for leisure or for non-essential business) is strongly discouraged and should be postponed until after the current surge in COVID-19 cases and hospitalizations subsides.

Mandatory Quarantine after Long-Distance Travel into Santa Clara County

2. Quarantine Requirements

a. Except as otherwise provided in this Directive, all persons traveling into Santa Clara County, whether by air, car, train, or any other means, directly or indirectly from a point of origin greater than 150 miles from the county's borders must quarantine for at least 10 days after arrival.

b. For the purposes of this Directive, "quarantine" means staying at home or another place of temporary shelter without contact with any persons other than members of one's own immediate traveling party or one's household.

c. Information, resources, and guidance on quarantine, including recommendations on when to get tested and what to do in the case of a positive test result are available at www.sccstayhome.org.

3. Exemptions from Mandatory Quarantine.

a. Licensed healthcare professionals, as defined by the Order, and all persons working at acute care hospitals, do not need to quarantine following arrival.

b. Persons traveling solely for the purpose of performing an essential governmental function, as defined by the governmental entity responsible for that function, do not need to quarantine following that travel.

c. The following persons are required to quarantine, but may leave their home or place of quarantine solely for the activities specified in this section:

i. Persons who perform essential governmental functions, as defined by the governmental entity responsible for those functions, whose purpose for travel does not fall within section 3(b), but only to the extent that the governmental entity determines that it would otherwise lack sufficient staffing to fulfill that essential function.

ii. Persons traveling solely for the purpose of performing essential critical infrastructure work, as defined by the State Public Health Officer, but

only to the extent that the employer determines that it would otherwise lack sufficient staffing to perform such work.

iii. Persons traveling solely for the purpose of work or participation in collegiate or professional athletic activities, provided they are in compliance with all applicable directives.

d. Persons solely transiting through Santa Clara County and not staying overnight are not required to quarantine.

e. Persons traveling to Santa Clara County to obtain services from a Healthcare Facility, as defined in the Order, are required to quarantine upon arrival, but may leave their household or place of quarantine to obtain those services.

f. Persons who are otherwise required to quarantine pursuant to this Directive may leave their household or place of quarantine to the extent necessary to comply with a court order or make an appearance in a court of law or administrative proceeding.

Notification Requirement for Transit Facilities

4. Notification Requirements

a. All transit facilities, including but not limited to airports, train stations, bus stations, and other facilities where persons may be regularly traveling into Santa Clara County must ensure a copy of this Directive is provided to each passenger upon arrival from a point of origin more than 150 miles from the County borders.

b. All transit facilities must prominently post notices in such a manner that all persons transiting through such facilities will become aware of the requirements of this Directive. Notices are available to print and post here.

Stay Informed

For answers to frequently asked questions about capacity limitations and other topics, please see the FAQ page. **Please note that this Directive may be updated**. For up-to-date information on the Health Officer Order, visit the County Public Health Department's website at www.sccgov.org/coronavirus.