In The

Court of Appeals of Maryland

Misc. No. 1
September Term, 2022
COA-MISC-0001-2022

TAPESTRY, INC.,

Appellant,

vs.

FACTORY MUTUAL INSURANCE COMPANY,

Appellee.

Certified Question from the United States District Court for the District of Maryland (Honorable George L. Russell, III, Judge)

AMICUS BRIEF OF MEDCHI, THE MARYLAND STATE MEDICAL SOCIETY

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INTEREST OF AMICUS CURIAE AND REASONS WHY BRIEF IS DESIRABLE

MedChi, The Maryland State Medical Society ("MedChi"), is the professional association of Maryland's physicians. It was chartered by the General Assembly in 1799 and presently consists of over 9,200 physician members, making it the largest physician membership organization in the State of Maryland. MedChi is a non-profit organization dedicated and committed to advocating for patients, physicians, the medical profession and health-related rights, responsibilities and issues for the betterment of public health in Maryland. Uniting together as physicians and healthcare advocates with one voice, MedChi plays an important role in helping to shape the future of medicine.

MedChi represents the concerns of all medical specialties and regions across the state as well as patient interests through advocacy and education. MedChi's mission is and always has been to bring together physicians to advocate for the well-being of their patients, for their profession and, most importantly, for the betterment of the public health.

On behalf of its members, MedChi is also substantially concerned with matters affecting the practice of physicians and matters affecting the relationship between physicians and their patients. One of MedChi's core missions is the fostering of trust and confidence between its thousands of physician members and their patients because such trust fosters the public health of all the people of this state.

MedChi takes no position on the merits of the specific insurance dispute between the parties that has given rise to this appeal. However, MedChi believes it can provide this Court with a perspective distinct from either of the parties and grounded in science, which may assist the Court in determining the issues before it in this case.

This case concerns the COVID-19 pandemic, one of the greatest threats to the public health of the people of this state in the past one hundred years.

Specifically, the issue before this Court centers on whether the presence inside a property of the SARS-CoV-2 virus that causes the deadly communicable disease COVID-19 and its consequent effects can cause "physical loss or damage" to that property.

The insurance coverage issue is beyond MedChi's mission but the statements by the insurer-appellant (the "involved Insurer") that effectively minimize the seriousness of COVID-19 – strike at the heart of MedChi's mission.

Simply put, these statements are not grounded in science and ignore the actual scientific understanding of SARS-CoV-2 and COVID-19, the virus's presence in the air surrounding infected persons, the transmission of the disease and the inability to completely remove SARS-CoV-2 from a property with routine surface cleaning.

MedChi has an interest in this case because one of the greatest threats to physician-patient trust and to the public health of the people of Maryland is the propagation of false information, or junk science, minimizing the grave seriousness of COVID-19 and its causative virus, SARS-CoV-2 (hereinafter "COVID Denial"). The brief of Insurer on its motion to dismiss,[1] unfortunately, reinforces the kind of scientifically inaccurate information that cause our physician members' patients to deny the seriousness of COVID-19, ignore the medical advice of our members, and fail to protect themselves against this deadly virus.

A finding by this Court embracing the ideas that buildings were safe with SARS-CoV-2 circulating at levels that could (and did) kill people, or that the cleaning of surfaces in buildings meaningfully affected that risk (i.e., made the building safe), or that building owners should have ignored the recommendations of medical authorities because hindsight showed those recommendations to be not efficacious, would threaten the public health in Maryland. Accordingly, MedChi has a strong interest in this case.

[1] Apx1486 (hereinafter, "Insurer Br.").

COVID Denial has cost, and continues to cost, many lives. Given the inaccuracy of the statements in the Insurer's brief for dismissal concerning the science of COVID-19 and SARS-CoV-2, MedChi submits this brief[2] to provide a scientific perspective on these important issues to assist this Court in deciding this case.

CONSENT

The parties have consented to the filing of the amicus curiae brief.

SUMMARY OF ARGUMENT

The brief for dismissal by the involved Insurer is rife with either its own assertions or its adoption of the rulings of other courts making scientifically unsupported statements minimizing the severity of COVID-19 and falsely proclaiming SARS-CoV-2 can be easily removed by surface cleaning or dissipation. These statements are, at best, scientifically inaccurate, and frankly, are more accurately described as "junk science."

The involved Insurer argues that the presence of the SARS-CoV-2 does not render a structure uninhabitable. That was not true in 2020 during the initial period of the emergence of COVID-19 before the advent of widely available vaccines and treatments when COVID-19 was often a death sentence. During that time, the only way to avoid it was to shut down public property.

Nor, notwithstanding government designation, were "essential" businesses habitable or their property fully useful when they remained open as the virus raged. In fact, essential workers staffing those businesses were infected with, and died from, COVID-19 at rates much greater than the general public. In short, just because the government allowed a business to remain open did not mean it was

[2] The Court may note certain similarities, even identical passages, as between this brief and the Complaint (Apx8) filed in this matter. MedChi makes no apologies for this: Tapestry got the science right. Recognition of the science – regardless of who puts it forth – and a decision consistent with that science will best protect the public health.

habitable. Rather, the government decided that the political or economic reasons for the business staying open outweighed the often grave risk to life and health.

Finally, SARS-CoV-2 cannot be effectively removed from surfaces by routine or even extraordinary disinfection and such methods do not remove it whatsoever from the air – its number one transmission vector. Moreover, cleaning, disinfection and dissipation are ineffective at removing SARS-CoV-2 from any business premises remaining open during the pandemic because the virus is continuously and repeatedly reintroduced into the premises.

In sum, MedChi seeks to provide this Court with the accurate science on COVID-19 and SARS-CoV-2 to assist the Court in making its decision.

IDENTITIES OF CONTRIBUTORS

No persons other than MedChi and its attorneys made monetary or other contribution to the preparation or submission of the brief.

ARGUMENT

I. COVID-19'S PRIMARY TRANSMISSION VECTOR IS THE PRESENCE OF SARS-COV-2 IN INDOOR AIR.

It is undisputed that airborne – not surface – transmission is the primary transmission vector for SARS-CoV-2. This is not conjecture. This is the learned opinion of the World Health Organization ("WHO"),[3] the Centers for Disease Control ("CDC") and the scientific community. For example, on April 5, 2021, the CDC concluded that:

- "[t]he principal mode by which people are infected with SARS-CoV-2 … is through exposure to respiratory droplets carrying infectious virus";

[3] *See Coronavirus disease (COVID-19): How is it transmitted?* World Health Organization (Dec. 23, 2021), https://www.who.int/news-room/questions-and-answers/item/coronavirus-disease-covid-19-how-is-it-transmitted#:~:text=Current%20evidence%20suggests%20that%20the,%2C%20speak%2C%20sing%20or%20breathe (last visited, July 12, 2022) (explaining airborne transmission pathways) (Exhibit 1).

- "[i]t is possible for people to be infected through contact with contaminated surfaces or objects (fomites), but the risk is generally considered to be low"; and

- "when a person with suspected or confirmed COVID-19 has been indoors, virus can remain suspended in the air for minutes to hours."[4]

Scientific study after study eviscerates any emphasis on surface cleaning as a solution to the risk of COVID-19 and makes clear that the danger from COVID-19 transmission is and always has been from the presence of SARS-CoV-2 in the indoor air of buildings. Indeed, an investigation of over 7,000 COVID-19 cases found that ***all*** outbreaks involving three or more people occurred indoors.[5] Every single one.

Airborne coronavirus viral RNA has also been detected inside hospitals at distances over 50 meters from COVID-19 patients' rooms.[6] Moreover, the CDC published a research letter concluding that a restaurant's air conditioning system triggered the transmission of SARS-CoV-2, spreading it to people who sat at separate tables downstream of the airflow from an infected diner.[7] Moreover, one

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[4] *Science Brief: SARS-CoV-2 and Surface (Fomite) Transmission for Indoor Community Environments*, CDC (updated Apr. 5, 2021), https://www.cdc.gov/coronavirus/2019-ncov/more/science-and-research/surface-transmission.html (last visited June 20, 2022) (Apx999).

[5] Hua Qian et al., *Indoor transmission of SARS-CoV-2*, 31 INDOOR AIR 3, 639-45 (May 2021), https://pubmed.ncbi.nlm.nih.gov/33131151/ (last visited June 20, 2022) (Apx1005).

[6] Yuan Liu et al., *Aerodynamic analysis of SARS-CoV-2 in two Wuhan hospitals*, 582 NATURE 7813, 557-60 (June 2020), https://pubmed.ncbi.nlm.nih.gov/32340022/ (last visited July 12, 2022) (Exhibit 2).

[7] Jianyun Lu et al., *COVID-19 outbreak associated with air conditioning in restaurant*, *Guangzhou, China, 2020*, 26 EMERGING INFECTIOUS DISEASES 7 (July 2020), https://wwwnc.cdc.gov/eid/article/26/7/20-0764_article (last visited June 20, 2022) (Apx1013); *see also* Keun-Sang Kwon et al., *Evidence of Long-Distance Droplet Transmission of SARS-CoV-2 by Direct Air Flow in a Restaurant in Korea*, 35 J. KOREAN MED. SCI. 46, e415 (Nov. 30, 2020),

study detected SARS-CoV-2 inside HVAC systems transmitted over 180 feet from its source.[8]

Additionally, on May 7, 2021, the CDC issued a scientific warning of the risks of indoor airborne transmission of coronavirus from aerosols at distances greater than six feet from the source, stating that "transmission of SARS-CoV-2 [i.e., coronavirus] from inhalation of virus in the air farther than six feet from an infectious source can occur" and that:

> With increasing distance from the source, the role of inhalation likewise increases. Although infections through inhalation at distances greater than six feet from an infectious source are less likely than at closer distances, the phenomenon has been repeatedly documented under certain preventable circumstances. These transmission events have involved the presence of an infectious person exhaling virus indoors for an extended time (more than 15 minutes and in some cases hours) leading to virus concentrations in the air space sufficient to transmit infections to people more than 6 feet away, and in some cases to people who have passed through that space soon after the infectious person left. Per published reports, factors that increase the risk of SARS-CoV-2 infection under these circumstances include:
>
> - **Enclosed spaces with inadequate ventilation or air handling** within which the concentration of exhaled respiratory fluids, especially very fine droplets and aerosol particles, can build-up in the air space.
> - **Increased exhalation** of respiratory fluids if the infectious person is engaged in physical exertion or raises their voice (e.g., exercising, shouting, singing).
> - **Prolonged exposure** to these conditions, typically more than 15 minutes.[9]

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https://jkms.org/DOIx.php?id=10.3346/jkms.2020.35.e415 (last visited June 20, 2022) (Apx1021).

[8] Karolina Nissen et al., *Long-distance airborne dispersal of SARS-CoV-2 in COVID-19 wards*, SCI. REPS. 10, 19589 (Nov. 11, 2020), https://www.nature.com/articles/s41598-020-76442-2 (last visited June 20, 2022) (Apx1030).

[9] *Scientific Brief: SARS-CoV-2 Transmission*, CDC (updated May 7, 2021), https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/sars-cov-2-

In sum, the air utilized by infected visitors to a business (as they must if they wish to breathe), is in turn infected with the SARS-CoV-2 virus, and in turn results in infection of other uninfected visitors to the business.

II. THE PRESENCE OF SARS-COV-2 CONTINUALLY INTRUDES ON THE PROPERTIES BECAUSE ITS CONTINUOUS REINTRODUCTION INTO BUSINESS PREMISES REMAINING OPEN TO THE PUBLIC RENDERS CLEANING, DISINFECTION OR DISSIPATION INEFFECTIVE AT REMOVING IT.

The involved Insurer argues that the presence of SARS-CoV-2 is not "intrusion on the property itself." (Insurer Br. at 17 (citation omitted)). Citing legal decisions, but ***not one*** scientific study (in stark contrast to Tapestry's Complaint), the involved Insurer asserts that the presence of SARS-CoV-2 in the indoor air of a property is not "a distinct, demonstrable, physical alteration of the property." (*Id.* at 12 (citation omitted)). That is wrong; the "intrusion" (i.e., presence) of SARS-CoV-2 at a business premises physically alters that premises, distinctly, and demonstrably. In deciding matters before it, the court therefore needs be informed by the science so the results it reaches are consistent with it.

SARS-CoV-2 is persistent. Given the ubiquity and pervasiveness of SARS-CoV-2, no amount of cleaning, disinfection or even the dissipation of SARS-CoV-2 with the passage of time, will protect an indoor space from reintroduction of the virus if the space is open to persons infected with COVID-19. Any one infected person who enters an indoor space and exhales millions of additional SARS-CoV-2 droplets and infectious aerosols into the air, fills the room air with aerosolized and hazardous SARS-CoV-2 that can be inhaled by others.

The continuous reintroduction of SARS-CoV-2 by infectious persons into a publicly open indoor space renders cleaning, disinfection and even dissipation over time ineffective and futile. None of these things, while they may mitigate the

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transmission.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fscience%2Fscience-briefs%2Fscientific-brief-sars-cov-2.html (last visited June 20, 2022) (Apx1047).

situation temporarily, eliminates the presence of SARS-CoV-2. As such, none of these things makes indoor property safe, habitable or fit for its intended use, especially with respect to the time period before the emergence of widely available vaccinations for COVID-19 and effective and available treatments for COVID-19.

The scientific facts and reality of SARS-CoV-2 in Maryland could not be clearer: the physical invasion by deadly SARS-CoV-2 particles that spread COVID-19 is not a single discharge event, such as a pipe bursting and spilling a toxic substance into a room where, once the valve is shut off, the substance can be cleaned and dissipated from the room.

On the contrary, due to its continuous reintroduction into businesses that remain open to the public, the physical invasion by deadly SARS-CoV-2 virions that spread COVID-19 into such a business is a continuous discharge event that does not stop. As such, even if cleaning and dissipation of a one-time SARS-CoV-2 invasion into the business were effective in removing the virus, SARS-CoV-2's continuous reintroduction into a business open to the public prevents a business owner from permanently removing the virus from the premises so that the building could be made safe for its intended use. It is akin to placing a pipe pumping fumes into a business premises with the valve stuck in the open position indefinitely – depriving the business owner of the opportunity to clean or dissipate the fumes. Or to a flood held back by water-tight doors after the initial inundation, with the business owner unable to re-open the doors because to do so would re-initiate flooding.

Thus, business owners are not able to remove or eliminate SARS-CoV-2 from their property with routine or even extraordinary cleaning, disinfection, or dissipation. Rather, the only way to eliminate the presence of coronavirus from property and prevent its continuous reintroduction is to close the property and bar the public from entering.

The COVID-19 pandemic presents the worst health crisis to strike this nation and our state in 100 years. Any attempt to trivialize it by asserting there is

no intrusion and no physical alteration does not comport with either scientific facts or the reality of this pandemic.

III. THE PRESENCE OF SARS-COV-2 RENDERED PROPERTY UNINHABITABLE OR LESS FUNCTIONALLY USEFUL IN 2020 AS DEMONSTRATED BY THE ELEVATED COVID-19 INFECTION AND DEATH RATES OF ESSENTIAL WORKERS

The involved Insurer asserts that physical loss or damage requires "permanent dispossession of the property rendered unfit or uninhabitable by physical forces." (Insurer Br. at 13 (citation omitted)). It further asserts that this did not occur.

While that may very well be true in today's world of July 2022 with the medical advancements of COVID-19 vaccines, monoclonal antibodies, anti-viral medications and other FDA-approved treatments for COVID-19, that was not true in 2020 during the initial and early period of the COVID-19 pandemic. The Court cannot apply today's medical breakthroughs to the desperate, dark early days of the pandemic when none of those medical advancements existed and people were spraying bleach on their groceries in an attempt to combat SARS-CoV-2. Back then, COVID-19 was often a death sentence for high-risk groups, and sadly, even for individuals not members of high-risk groups. The only way to avoid COVID-19 was to prevent the public from inhaling the air inside one's business which was infected with SARS-CoV-2, air that had been physically altered from the wholesome pre-pandemic air.

To appropriately understand whether a place was habitable, it is useful to consider the sacrifices made by "essential" workers in the early days of the pandemic in 2020. While the government did allow certain "essential" businesses to remain open during the early days, that did not mean those businesses were habitable. It meant only that the government determined there were economic or political reasons that outweighed the risk of contracting COVID-19 that justified those businesses to be open.

If one looks at the dramatically elevated COVID-19 infection and death rates of essential workers in 2020, as compared to the general public, one can see the life-and-death costs of keeping essential businesses open, which provides the proof that staying open for business does not mean habitable or fully useable.

The CDC defines essential workers to be those who conduct "operations and services in industries that are essential to ensure the continuity of critical functions in the United States."[10]

After the first wave of mass business closures in March and April of 2020, employees of so-called "essential businesses" that were eventually allowed to re-open or operate at reduced capacities (i.e., essential workers) were faced with elevated rates of infection and death when compared to the general public, demonstrating the presence of SARS-CoV-2 in their workplaces, and that such workplaces were unfit and unsafe for normal use (i.e., for people to be present).[11] For example:

- One study found that 20% of essential grocery store workers tested positive for COVID-19, a much higher rate of infections than others in their surrounding communities[12] and that those grocery store workers with interactions with the public tested positive for COVID-19 at a rate five times greater than the general population.[13]

- Essential workers (e.g., liquor store employees) accounted for 87%

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[10] *See Interim List of Categories of Essential Workers Mapped to Standardized Industry Codes and Titles*, CDC (updated Mar. 29, 2021), https://www.cdc.gov/vaccines/covid-19/categories-essential-workers.html (last visited July 12, 2022) (Exhibit 3).

[11] Joanna Gaitens et al., *COVID-19 and Essential Workers: A Narrative Review of Health Outcomes and Moral Injury*, 18 INT'L J. ENV'T RSCH. & PUB. HEALTH 4, 1446 (Feb. 4, 2021), https://www.mdpi.com/1660-4601/18/4/1446 (last visited June 20, 2022) (Apx1064).

[12] *Id.*

[13] Fan-Yun Lan et al., *Association between SARS-CoV-2 infection, exposure risk and mental health among a cohort of essential retail workers in the USA*, 78 OCCUPATIONAL ENV'T MED. 237-43 (Oct. 30, 2020), https://oem.bmj.com/content/oemed/78/4/237.full.pdf (last visited June 20, 2022) (Apx1083).

of excess deaths in California[14] and over 60% in New York City.[15]

Similar findings have been reported across various sectors of essential workers, including elevated rates of infection for emergency services personnel (e.g., firefighters, police), prison correctional officers, and transportation and factory workers, among others.[16] These findings disprove any argument that SARS-CoV-2 does not affect the habitability, safety, usability, or the functional use of property merely because the government allowed businesses it determined were "essential" to remain open.

IV. SARS-COV-2 CANNOT BE REMOVED OR ELIMINATED WITH ROUTINE SURFACE CLEANING.

The involved Insurer argues that the presence of SARS-CoV-2 inside a property can never cause "physical loss of or damage" to that property. As discussed above, it is plain that in the early days of the pandemic its presence in the air of a building rendered the air unfit for use, thus rendering the building unfit for use. But we also have to remember that in the early days the presence of SARS-CoV-2 on surfaces was also believed to be a significant source of infection. That too resulted in damage to those surfaces.

The involved Insurer appears to pooh-pooh the knowledge of that period, asserting that the theory of infection from surfaces "has been largely debunked." (Insurer Br. at 17 n.4). How a change in scientific knowledge affects insurance coverage is a coverage question on which MedChi takes no position. But from a public health perspective, there can only be one answer: if medical authorities are

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[14] Yea-Hung Chen et al., *Excess mortality associated with the COVID-19 pandemic among Californians 18-65 years of age, by occupational sector and occupation: March through November 2020*, 16 PLOS ONE 6, e0252454 (June 4, 2021), https://pubmed.ncbi.nlm.nih.gov/34086762/ (last visited June 20, 2022) (Apx1091).

[15] *The plight of essential workers during the COVID-19 pandemic*, 395 LANCET 1587 (May 23, 2020), https://www.thelancet.com/action/showPdf?pii=S0140-6736%2820%2931200-9 (last visited June 20, 2022) (Apx1102).

[16] *Id.*

advising that certain circumstances are dangerous and should be addressed, the public should not be faulted or penalized for following that medical advice. Applied here, if the medical authorities are advising that SARS-CoV-2 should be cleaned from hard surfaces and soft surfaces that cannot be cleaned removed, that is a reasonable basis for a business to take action.

This leads to another misconception in the involved Insurer's paper. It faults Tapestry for what it calls a "conclusory statement" that surfaces cannot be cleaned of SARS-CoV-2. (Insurer Br. at 17). Not so, Tapestry's position is the correct scientific one.

As an initial matter, surface cleaning of SARS-CoV-2 is no panacea against COVID-19 transmission. In fact, the CDC released guidance stating that there is little evidence to suggest that routine use of disinfectants can prevent the transmission of coronavirus from fomites (surfaces containing SARS-CoV-2) in community settings.[17] The CDC concluded that according to a more quantitative microbial risk assessment study, "surface disinfection once- or twice-per-day had little impact on reducing estimated risks" of coronavirus transmission.[18]

Moreover, SARS-CoV-2 cannot be removed by *routine* surface cleaning. A number of studies have similarly demonstrated that coronavirus is "much more resilient to cleaning than other respiratory viruses so tested."[19]

Studies have demonstrated that even *extraordinary* cleaning measures do not remove coronavirus from surfaces. For example, a 2021 study by the largest

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[17] *Science Brief: SARS-CoV-2 and Surface (Fomite) Transmission for Indoor Community Environments*, CDC (updated Apr. 5, 2021), https://www.cdc.gov/coronavirus/2019-ncov/more/science-and-research/surface-transmission.html (last visited June 20, 2022) (Apx999).

[18] *Id.* (citing A. K. Pitol & T. R. Julian, *Community transmission of SARS-CoV-2 by fomites: Risks and risk reduction strategies*, ENV'T SCI. & TECH. LETTERS 8, 263-69 (2021)).

[19] Nevio Cimolai, *Environmental and decontamination issues for human coronaviruses and their potential surrogates*, 92 J. MED. VIROLOGY 11, 2498-510 (June 12, 2020), https://onlinelibrary.wiley.com/doi/10.1002/jmv.26170 (last visited June 20, 2022) (Apx1200).

hospital network in New York State demonstrated that even *after* trained hospital personnel used disinfection procedures in coronavirus patient treatment areas, much of the virus *survived* in those areas – proving even intense, non-routine surface cleaning does not remove it from surfaces – let alone from the air.[20] Stated simply, if even trained hospital workers using hospital-grade disinfectants could not remove all SARS-CoV-2, Lysol® and a rag will not. As such, the involved Insurer's rejection of Tapestry's scientifically supported statements that routine cleaning does not remove SARS-CoV-2 from property has no basis in science and should not guide this Court's decision.

CONCLUSION

It is often said that someone is entitled to their own opinion but they are not entitled to their own facts. This is just such a case. The involved Insurer devotes large portions of its brief to COVID Denial – expressly or by reliance on court decisions where the science was either not presented or was ignored. While those positions may be the involved Insurer's opinion, they are simply unmoored from any scientific facts. The science refutes each and every one of those positions. Their adoption by this Court would shatter public trust and confidence in medicine and in the physicians who compose MedChi's members, imperiling the public health in this state.

MedChi requests this Court to rely on the real science advanced by MedChi in this brief in rendering a decision in this case.

[20] Zarina Brune et al., *Effectiveness of SARS-CoV-2 Decontamination and Containment in a COVID-19 ICU*, 18 INT'L J. ENV'T RSCH. & PUB. HEALTH 5, 2479 (Mar. 3, 2021), https://www.mdpi.com/1660-4601/18/5/2479 (last visited June 20, 2022) (Apx1263).

CERTIFICATION PURSUANT TO SUPREME COURT RULE 8-112

1. This brief contains 3887 words, excluding the parts of the brief exempted from the word count by Rule 8-503.

2. This brief complies with the font, spacing, and type size requirements stated in Rule 8-112. The brief is written in size 13, double-spaced, Times New Roman font.

Respectfully submitted,

MEDCHI, THE MARYLAND STATE MEDICAL SOCIETY

By its attorneys,

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EXHIBIT 1

Maintaining infection prevention and control measures for COVID-19 in health care facilities

Policy brief

7 June 2022

World Health Organization

Introduction

Between late March and May 2022, the number of COVID-19 cases declined in countries worldwide, except in the World Health Organization (WHO) Region of the Americas and African Region *(1)*. With increases in population level immunity from past infection and/or vaccination, there is a decline and decreasing impact on health systems. Many countries have been lifting public health and social measures (PHSM) and considering what infection prevention and control (IPC) measures implemented in the context of COVID-19 could be relaxed in health care facilities *(2)*. Since January 2020 and throughout the course of the pandemic, WHO has recommended that countries implement a comprehensive package of measures adapted to local contexts and epidemiological scenarios to prevent COVID-19 transmission during the pandemic, including PHSM and IPC measures in health care facilities. These measures are aimed at limiting person-to-person transmission of SARS-CoV-2, thereby protecting individuals and their contacts from getting infected.

In the context of circulation of known SARS-CoV-2 variants of concern and potential emergence of future variants of concern, based on available evidence and expert consensus, WHO continues to advise that the current recommended IPC measures be reinforced and continue to be stringently implemented in health care facilities *(3)*. Current key infection prevention and control (IPC) strategies and measures for management of COVID-19 in healthcare facilities include[1]: 1) an IPC programme or at least a dedicated and trained IPC focal point, 2) screening and triage for early recognition of community- and health care facility-acquired cases and rapid implementation of source control measures, 3) applying standard and transmission-based precautions, 4) patient isolation and cohorting, 5) universal masking using well-fitting medical masks, 6) administrative controls, 7) implementation of engineering and environmental controls, with emphasis on ventilation, 8) COVID-19 vaccination of health workers and 9) prevention, identification and management of COVID-19 among health workers *(4-5)*.

Purpose of this document

This document aims to encourage countries to develop and implement policies to maintain and strengthen IPC programmes and measures in health care facilities in the context of the current ongoing transmission of the SARS-CoV-2, with recognition that epidemiological trends may vary; this should be done also considering the risk of transmission of other pathogens. These policies should achieve the following:

- maintain IPC achievements and prioritize critical gaps in IPC programmes;
- maintain IPC operational readiness for a resurgence of COVID-19 case and other emerging and re-emerging pathogens;

[1] For additional resources on infection prevention and control in the context of COVID-19 issued by WHO, refer to the Country & Technical Guidance - Coronavirus disease (COVID-19) home page: https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance-publications?publicationtypes=d198f134-5eed-400d-922e-1ac06462e676.

- scale up IPC capacity with strong investments in the implementation of IPC minimum requirements and the ultimate goal of achieving the implementation of all IPC core components and ensuring resilience and sustainability.

As stated in the WHO framework and toolkit for IPC preparedness, readiness and response to outbreaks in the context of COVID-19, countries should implement and adapt IPC measures to the local context *(6)*.

Target audience

This document is intended for national, subnational and facility-level authorities (including IPC focal points and teams), policy makers, developers of normative guidance, donors, health care facility managers, implementing partners and those involved in the management of IPC in the context of COVID-19 (e.g., IPC COVID-19 Taskforce and individuals in charge of clinical management).

Process and methodology

On 23 March 2022 the members of the WHO Health Emergencies Programme COVID-19 IPC Guideline Development Group[2] met virtually to 1) review the current global epidemiological situation and data on IPC programmes during the pandemic according to recent surveys, 2) discuss potential changes required in WHO's IPC guidance for health care facilities in the current epidemiological context, 3) discuss the importance of highlighting the need for continued to prevention of SARS-CoV-2 transmission in health care settings by sustaining IPC measures and 4) strengthening IPC programmes to allow safe access to health care facilities and services and to prevent transmission of any pathogen. Their conclusions were critical to the development of this brief. GDG members signed a declaration of interest and the secretariat concluded that none of the members had a conflict of interest.

Implementation of IPC measures in the context of the COVID-19 pandemic

Many countries have made impressive improvements in IPC with the focused prioritization of measures to mitigate SARS-CoV-2 transmission within health care facilities; but sustaining this progress and further improvement are urgently required. A detailed global survey on the minimum requirements for national IPC programmes was conducted by WHO between July 2021 and January 2022, with participation by 106 countries. Significant increases compared to a previous WHO survey conducted in 2017-2018 were reported in the percentage of countries with a trained IPC focal point, a dedicated budget for IPC and an in-service IPC curriculum. By contrast, the 2021-2022 survey found that 54.7% (58/106) of countries had an active IPC programme and only four out of 106 participating countries (3.8%) met all minimum requirements for IPC (none of these was a lower-middle-income country) *(7, 8)*. The survey also documented specific gaps: lack of functioning IPC programmes with annual work plans and supported by a dedicated budget, inadequate support at the national level for IPC training roll-out and monitoring of its effectiveness and limited expertise in conducting IPC monitoring *(8)*.

It is likely that financial resources for IPC have been dedicated mainly to procurement of commodities including personal protective equipment (PPE) and hand hygiene and cleaning supplies. Other critical needs may have not been adequately addressed. These include the establishment or strengthening of IPC programmes and expertise; investment in sustainable production, stockpiling, and access to PPE and other IPC supplies; improving governance; infrastructural improvements; and implementing interventions to change practices. Environmental and engineering control interventions in health care facilities were often limited to interventions for the COVID-19 emergency response, such as implementation of portable high-efficiency particulate absorbing (HEPA) filtration devices and installation of exhaust fans *(9)* and provision of temporary hand hygiene stations in isolation wards; rather than longer-term, sustainable improvements such as natural or mechanical ventilation and sustainable water, sanitation and hygiene (WASH) services in health facilities.

[2] For the list of contributors, refer to the "Acknowledgment" section.

WHO pulse surveys[3] on continuity of essential health services during the COVID-19 pandemic *(10-13)* found that in quarter 4 2021, bottlenecks in procurement of PPE for all staff in many low- and middle-income countries, health workforce challenges, a lack of IPC supplies and best practices were major contributors to ongoing essential health services disruption. The results also showed that IPC focal points were more likely to be found in healthcare facilities than in primary care facilities (89% vs 65%). Essential IPC supplies[4] were available, although almost half of healthcare facilities did not have all items.

There continued to be a shortage of PPE required to provide care to COVID-19 patients (medical masks, respirators, gloves, face shields, goggles and gowns), with only 20% of primary care facilities and 27% of healthcare facilities having all items available for staff. Additionally, a COVID-19-safe environment (i.e., dedicated entrance for screening, separated room for a patient suspected of having COVID-19) was being implemented in about one-quarter of primary care facilities and about one-third of healthcare facilities. Furthermore, a lack or limited availability of PPE was also confirmed in two WHO pulse surveys on continuity of essential health services during the COVID-19 pandemic *(13, 14)*. These surveys demonstrated that the lack of IPC supplies and poor application of best practices were a major reported reason for the disruption of essential health services in 44% of countries in 2020 and 26% of countries in 2021.

Finally, the increased use of PPE has intensified the pre-existing problem of health care waste – with 2 in 3 healthcare facilities in the least developed countries lacking means for segregating or safely treating waste.

Maintaining IPC achievements and prioritizing critical gaps in healthcare settings

SARS-CoV-2 transmission in healthcare settings has been a matter of concern during the COVID-19 pandemic, especially early in the pandemic in 2020. Among hospitalized confirmed COVID-19 patients, it has been estimated that up to 41% were infected in healthcare settings. The incidence of infection among health workers has varied from 0.4% to 49.6% depending on the study *(15)*.

As SARS-CoV-2 continues to circulate widely, healthcare facilities remain a high-risk transmission setting where patients at risk of severe COVID-19 are admitted *(16-19)*. Hence, it is critical to maintain IPC measures, including appropriate mask wearing and physical distancing *(20)*.

There is a risk that as COVID-19 incidence and mortality reduces globally, key IPC measures (for example, screening at facility entrance, triage and use of use of masks) will be scaled down. While it is not possible to identify all cases nor stop SARS-CoV-2 transmission in the community, given the wide circulation of the virus, by contrast, all possible efforts to avoid transmission within healthcare facilities – where fragile patients are present – should continue, and improvements in IPC gained during the pandemic be sustained. These include, for example, appointed focal points/teams at the national and facility level; adequate provision of hand hygiene supplies at the point of care, in toilets and other critical sites; appropriate environmental cleaning; patient placement/cohorting and flow; increase in isolation rooms; improved use of PPE; and safe management of waste *(7)*. This means that assessments of the local situation of IPC and WASH – in particular concerning measures for COVID-19 and the International Health Regulations (IHR 2005 requirements – should continue to be regularly undertaken at both national and facility levels; and gaps should be addressed promptly *(7, 10, 21, 22)*.

IPC operational readiness for resurgence of cases

Healthcare facilities can become amplifiers of infectious disease outbreaks. Maintaining IPC operational readiness to rapidly respond to resurgence of COVID-19 cases is therefore paramount *(23-25)*. Readiness activities are designed to mitigate the impact of an outbreak on the health system and reduce morbidity and mortality. By flattening the

[3] For more information on the global pulse survey on continuity of essential health services during the COVID-19 pandemic, refer to https://www.who.int/teams/integrated-health-services/monitoring-health-services/global-pulse-survey-on-continuity-of-essential-health-services-during-the-covid-19-pandemic/dashboard.

[4] IPC supplies considered in the question: liquid soap, hand sanitizer, biohazard bags, safety boxes and body bags. For more information on the indicator, refer to footnote 3.

epidemic curve of new SARS-CoV-2 and avoiding a sharp peak of COVID-19 cases, the impact on the population and healthcare system capacity can be better controlled. Hence, if a resurgence of SARS-CoV-2 variants of concern cases is detected or imminently anticipated, key immediate actions at national and healthcare facility levels are required.

In the context of the COVID-19 pandemic, if there is a local resurgence of cases, national and sub-national level authorities should take the following immediate actions *(6)*:

1. Reconvene the national COVID-19 outbreak IPC taskforce to revise, adapt and disseminate policies, national guidelines, training and other IPC-related activities across all levels of the health system.
2. Re-evaluate the national COVID-19 Strategic Preparedness and Response Plan (SPRP)[5] IPC/PHSM pillar priority areas to strengthen in preparation for potential widespread community transmission.
3. Assess surge capacity, identify required resources for a resurgence of cases (financial, logistical, human resources) and provide contingency plans where needed for alternative service delivery modes, human resources incentives and IPC/PPE supplies (based on PPE burn rate).
4. Update and undertake refresher COVID-19 IPC training.[6]
5. Maintain a surveillance system and management policies for health worker infection detection and policies for management of exposed and confirmed health worker infection (quarantine and isolation).
6. Update and reinforce existing risk communication messaging and dissemination strategy related to IPC and PHSM considering contextual issues (e.g., pandemic fatigue).

Immediate steps at healthcare facility level include the reactivation of incident management for coordination of IPC stakeholders and resource mobilization; ensuring safe flow of patients, staff and safe care environments; PPE availability and optimal use; vaccinating health workers as per latest protocols; increasing infrastructural capacity as required (e.g., screening, triage and isolation capacity) and refresher IPC training *(6)*.

Actions recommended for immediate implementation with planned sustainability include the recruitment and training of IPC focal persons to direct and monitor facility response actions, investments in assessing and improving health infrastructure to ensure the ventilation in healthcare facilities meets or exceeds recommended air-exchange rates for the expected volume of occupants and implementing surveillance approaches to identify and investigate SARS-CoV-2 transmission events in healthcare settings. This will ensure these events serve as opportunities for continuous improvement to mitigate the possibility of amplifying outbreaks within healthcare facilities.

Such actions will need to be contextualized for fragile, conflict or vulnerable settings where mobile health teams may be required to identify risks in congregate care settings and IPC and WASH resources and develop an outbreak response action plan that includes interventions specific to COVID-19 testing, isolation and quarantine.

It is assumed that when SARS-CoV-2 becomes endemic there will be low-level circulation of virus, and many people infected with the virus may be asymptomatic. In that context, having a separate entrance for patients with suspected infection will be less likely to prevent acquisition within a health system. Instead, there should be enhanced vigilance and IPC measures in place akin to universal precautions, which were introduced in the 1980s to protect health workers from HIV and other bloodborne pathogens in human blood and certain other body fluids, regardless of a patients' infection status *(26)*.

Scaling up IPC capacity and ensuring resilience and sustainability

COVID-19 has awakened countries to the critical need to enhance and sustain IPC policies. The importance of such policies goes beyond protection against SARS-CoV-2 infection. Enhanced IPC policies will also reduce the burden of other healthcare associated infections (HAI) that occur every day in all countries, caused mainly by pathogens resistant to antimicrobials but also by viruses such as other respiratory or hepatitis viruses. Every year this burden affects millions of people across the health system, including in primary care and long-term care facilities, and across all

[5] For more information on the WHO Strategic preparedness, readiness and response plan to end the global COVID-19 emergency in 2022, refer to https://apps.who.int/iris/handle/10665/352861.

[6] For more information on the OpenWHO courses, refer to the Infection Prevention and Control channel at https://openwho.org/channels/ipc.

country income levels. The impact of HAI and antimicrobial resistance (AMR) on people's lives is incalculable, in terms of human suffering, premature mortality, disabilities, and financial loss. The risk of acquiring an infection during health care delivery and of suffering from its deadly consequences, doubles and can be up to 20 times higher in low- and middle-income countries, where IPC programmes and measures are least implemented. Evidence emerging from surveillance networks shows significant increases in the incidence of HAI and AMR in different countries during the COVID-19 pandemic *(8)*. This could be in part due to a narrow focus on IPC measures that are specific for COVID-19 and less attention and efforts in implementing antimicrobial stewardship and wider IPC measures, in particular those preventing infections due to invasive devices.

Scale-up of IPC capacity should be undertaken according to WHO-recommended IPC core components *(27)* and the framework for IPC preparedness, readiness, and response to outbreaks *(6)*. To achieve these goals, it is recommended that countries:

- conduct an in-depth situational analysis regarding the implementation status of IPC programmes and practices using standardized tools;[7]
- develop action plans based on this analysis for further improvements with consideration of wider IPC priorities;
- put in place at least the IPC minimum requirements at the national and health care facility levels as soon as possible *(7);*
- strengthen or establish functional IPC programmes at the national level and in all health care facilities, including primary care and long-term care, supported by dedicated budget and trained IPC team and not by a temporary programme or focal point;
- ensure implementation of IPC standards at the point of care, including within specific clinical care practices (such as surgical, neonatal and maternal care) and monitor key performance indicators[8];
- simulate scenarios to assess whether current strategies and plans can cope with a rapid upsurge of cases, absenteeism of staff, shortage of IPC supplies or other challenges;
- ensure that procurement, distribution, and use of essential IPC supplies be secured at the point of care and WASH infrastructure be further improved and maintained and its funding sustained;
- support IPC capacity by increasing knowledge and expertise;
- strengthen coordination among all partners operating at the country level and work in support of ministerial action plans for IPC in the long term;
- update national IPC policies as well as national and local action plans for the next phase towards ending the pandemic to consolidate previous efforts and clearly identify the above-mentioned priorities and adapt them to the local context.

Conclusions

IPC is a clinical and public health specialty that provides practical solutions grounded in scientific evidence on infectious diseases, epidemiology, social and implementation science and health systems strengthening. Ultimately, the goal of IPC is to prevent harm from infections to patients, health workers, caregivers and visitors in health care settings.

The COVID-19 pandemic has demonstrated the importance of IPC implementation at national, subnational and facility levels to contain the emergence and re-emergence of infectious threats and for the delivery of safe care. IPC, together with other core capacities required by the International Health Regulations (2005), plays a critical role in detecting, assessing, notifying and reporting events and responding to public health risks and emergencies of national and

[7] For more information on standardized tools to assess the implementation of infection prevention and control practices, refer to *World Health Organization. (2017). Instructions for the national infection prevention and control assessment tool 2 (IPCAT2). https://apps.who.int/iris/handle/10665/330078, World Health Organization. (2018). Infection prevention and control assessment framework at the facility level. World Health Organization. https://apps.who.int/iris/handle/10665/330072* and *World Health O. Minimum requirements for infection prevention and control programmes. Geneva: World Health Organization; 2019 (https://apps.who.int/iris/handle/10665/330080.*

[8] See footnote 7.

international concern. The pandemic has also demonstrated the critical role of health system resiliency in providing essential health services and maintaining health systems functioning.

During the Seventy-fifth World Health Assembly, held on May 2022, Member States requested the Director-General to develop in consultation with Member States and regional economic integration organizations, a global strategy on infection prevention and control in both health and long term care settings (Agenda item 14.6, A75/A/CONF./5) *(28)* for consideration by the Seventy-six World Health Assembly, elevating IPC in the global health and political agendas. There is an urgent need to bridge the existing gaps in IPC implementation, maintain IPC operational readiness to ensure surge capacity and ensure scale up and sustainability of IPC programmes in the long-term to end the pandemic, prevent and control future outbreaks, reduce the endemic burden of HAI and AMR *(29, 30)* and build resilient health systems *(31)*.

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Declaration of conflicts of interest

Roger Chou is an author on some of the evidence used to inform some recommendations. However, as a methodologist, he provided guidance to the GDG on methodologic issues and is not a voting member of the GDG. Fernanda Lessa is an employee of the United States CDC which has provided funding towards the development of this policy brief. After consulting with the WHO Ethics Committee, it was determined Dr Lessa would contribute to discussions as she brings significant technical and field expertise to the discussions; however, be recused from voting on recommendations. Declarations of interest of external reviewers were collected and assessed, and no conflict of interest was identified.

References

1. World Health Organization. COVID-19 weekly epidemiological update, edition 91, 11 may 2022. Geneva: World Health Organization; 2022 (https://apps.who.int/iris/handle/10665/354259).
2. Stokel-Walker C. Covid restrictions are lifting - what scientists think. Nature. 2022;603:563. doi: 10.1038/d41586-022-00620-7.
3. World Health Organization. Enhancing response to omicron SARS-CoV-2 variant. Geneva: World Health Organization; 2022 (https://www.who.int/publications/m/item/enhancing-readiness-for-omicron-(b.1.1.529)-technical-brief-and-priority-actions-for-member-states).
4. World Health Organization. Infection prevention and control during health care when coronavirus disease (COVID-19) is suspected or confirmed: Interim guidance, 12 july 2021. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/342620).

5. World Health Organization. Annex to infection prevention and control during health care when coronavirus disease (COVID-19) is suspected or confirmed: Interim guidance, 1 october 2021. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/345682).
6. World Health Organization. Framework and toolkit for infection prevention and control in outbreak preparedness, readiness and response at the national level. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/345251).
7. World Health Organization. Minimum requirements for infection prevention and control programmes. Geneva: World Health Organization; 2019 (https://apps.who.int/iris/handle/10665/330080).
8. World Health Organization. Global report on infection prevention and control. Geneva: World Health Organization; 2022 (https://apps.who.int/iris/handle/10665/354489).
9. World Health Organization. Roadmap to improve and ensure good indoor ventilation in the context of COVID-19. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/339857).
10. World Health Organization. Continuity of essential health services: Facility assessment tool: A module from the suite of health service capacity assessments in the context of the COVID-19 pandemic: Interim guidance, 12 may 2021. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/341306).
11. World Health Organization. Covid-19 case management capacities: Diagnostics, therapeutics, vaccine readiness, and other health products – facility assessment tool: A module from the suite of health service capacity assessments in the context of the covid-19 pandemic, 7 july 2021. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/342473).
12. World Health Organization. Community needs, perceptions and demand: Community assessment tool: A module from the suite of health service capacity assessments in the context of the COVID-19 pandemic: Interim guidance, 5 february 2021. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/339388).
13. World Health Organization. Second round of the national pulse survey on continuity of essential health services during the covid-19 pandemic: January-march 2021: Interim report, 22 april 2021. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/340937).
14. World Health Organization. Pulse survey on continuity of essential health services during the COVID-19 pandemic: Interim report, 27 august 2020. Geneva: World Health Organization; 2020 (https://apps.who.int/iris/handle/10665/334048).
15. Chou R, Dana T, Buckley DI, Selph S, Fu R, Totten AM. Epidemiology of and risk factors for coronavirus infection in health care workers: A living rapid review. Annals of internal medicine. 2020;173:120-36. doi: 10.7326/M20-1632.
16. Zhu N, Rawson TM, Mookerjee S, Price JR, Davies F, Otter J et al. Changing patterns of bloodstream infections in the community and acute care across two COVID-19 epidemic waves: A retrospective analysis using data linkage. Clin Infect Dis. 2021. doi: 10.1093/cid/ciab869.
17. Buetti N, Ruckly S, de Montmollin E, Reignier J, Terzi N, Cohen Y et al. COVID-19 increased the risk of icu-acquired bloodstream infections: A case-cohort study from the multicentric outcomerea network. Intensive Care Med. 2021;47:180-7. doi: 10.1007/s00134-021-06346-w.
18. Grasselli G, Scaravilli V, Mangioni D, Scudeller L, Alagna L, Bartoletti M et al. Hospital-acquired infections in critically ill patients with COVID-19. Chest. 2021;160:454-65. doi: 10.1016/j.chest.2021.04.002.
19. Kariyawasam RM, Julien DA, Jelinski DC, Larose SL, Rennert-May E, Conly JM et al. Antimicrobial resistance (AMR) in COVID-19 patients: A systematic review and meta-analysis (november 2019–june 2021). Antimicrobial Resistance & Infection Control. 2022;11:45. doi: 10.1186/s13756-022-01085-z.
20. World Health Organization. Infection prevention and control in the context of coronavirus disease (COVID-19): A living guideline, 25 april 2022: Updated chapter: Mask use, part 1: Health care settings. Geneva: World Health Organization; 2022 (https://apps.who.int/iris/handle/10665/353565).
21. World Health Organization. Instructions for the national infection prevention and control assessment tool 2 (ipcat2). Geneva: World Health Organization; 2017 (https://apps.who.int/iris/handle/10665/330078).
22. World Health Organization. International health regulations (2005): State party self-assessment annual reporting tool. 2nd ed ed. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/350218).
23. Ong CCH, Farhanah S, Linn KZ, Tang YW, Poon CY, Lim AY et al. Nosocomial infections among COVID-19 patients: An analysis of intensive care unit surveillance data. Antimicrobial Resistance & Infection Control. 2021;10:119. doi: 10.1186/s13756-021-00988-7.
24. Read JM, Green CA, Harrison EM, Docherty AB, Funk S, Harrison J et al. Hospital-acquired sars-cov-2 infection in the uk's first COVID-19 pandemic wave. Lancet. 2021;398:1037-8. doi: 10.1016/s0140-6736(21)01786-4.
25. World Health Organization. Managing epidemics: Key facts about major deadly diseases. Geneva: World Health Organization; 2018 (https://apps.who.int/iris/handle/10665/272442).
26. Broussard IM, Kahwaji CI. Universal precautions. In: Statpearls. Treasure Island (FL): StatPearls Publishing; 2021: http://www.ncbi.nlm.nih.gov/books/NBK470223/).

27. World Health Organization. Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization; 2016 (https://apps.who.int/iris/handle/10665/251730).
28. World Health Assembly, 75. (2022). Agenda item 14.6. Global Strategy on Infection Prevention and Control. World Health Organization. https://apps.who.int/gb/ebwha/pdf_files/WHA75/A75_ACONF5-en.pdf
29. Vehreschild M, Tacconelli E, Giske CG, Peschel A. Beyond COVID-19-a paradigm shift in infection management? Lancet Infect Dis. 2021;21:e117. doi: 10.1016/s1473-3099(20)30789-1.
30. Patel A, Emerick M, Cabunoc MK, Williams MH, Preas MA, Schrank G et al. Rapid spread and control of multidrug-resistant gram-negative bacteria in COVID-19 patient care units. Emerg Infect Dis. 2021;27:1234-7. doi: 10.3201/eid2704.204036.
31. World Health Organization. Building health systems resilience for universal health coverage and health security during the COVID-19 pandemic and beyond: Who position paper. Geneva: World Health Organization; 2021 (https://apps.who.int/iris/handle/10665/346515).

WHO continues to monitor the situation closely for any changes that may affect this scientific brief. Should any factors change, WHO will issue a further update. Otherwise, this scientific brief document will expire 2 years after the date of publication.

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EXHIBIT 2

Article

Aerodynamic analysis of SARS-CoV-2 in two Wuhan hospitals

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The ongoing outbreak of coronavirus disease 2019 (COVID-19) has spread rapidly on a global scale. Although it is clear that severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is transmitted through human respiratory droplets and direct contact, the potential for aerosol transmission is poorly understood[1–3]. Here we investigated the aerodynamic nature of SARS-CoV-2 by measuring viral RNA in aerosols in different areas of two Wuhan hospitals during the outbreak of COVID-19 in February and March 2020. The concentration of SARS-CoV-2 RNA in aerosols that was detected in isolation wards and ventilated patient rooms was very low, but it was higher in the toilet areas used by the patients. Levels of airborne SARS-CoV-2 RNA in the most public areas was undetectable, except in two areas that were prone to crowding; this increase was possibly due to individuals infected with SARS-CoV-2 in the crowd. We found that some medical staff areas initially had high concentrations of viral RNA with aerosol size distributions that showed peaks in the submicrometre and/or supermicrometre regions; however, these levels were reduced to undetectable levels after implementation of rigorous sanitization procedures. Although we have not established the infectivity of the virus detected in these hospital areas, we propose that SARS-CoV-2 may have the potential to be transmitted through aerosols. Our results indicate that room ventilation, open space, sanitization of protective apparel, and proper use and disinfection of toilet areas can effectively limit the concentration of SARS-CoV-2 RNA in aerosols. Future work should explore the infectivity of aerosolized virus.

The ongoing outbreak of COVID-19, which has been reported in 206 countries and areas, has resulted in 857,641 confirmed cases and 42,006 deaths globally as of 2 April 2020. Owing to the increasing threat caused by COVID-19 to global health, the World Health Organization (WHO) has declared the COVID-19 outbreak a pandemic and global public health emergency. The causative pathogen of the COVID-19 outbreak has been identified as a highly infectious novel coronavirus that is referred to as SARS-CoV-2[4–6]. Reported transmission pathways of SARS-CoV-2 in humans include the inhalation of virus-laden liquid droplets, close contact with infected individuals and contact with surfaces that are contaminated with SARS-CoV-2[1]. Moreover, aerosol transmission has been suggested to be an additional, yet important pathway, on the basis of clinical observations in confined spaces[2,3]. There are many respiratory diseases that are spread through airborne routes, such as tuberculosis, measles and chickenpox[7,8]. A retrospective cohort study conducted after the SARS epidemic—which was caused by SARS-CoV—in Hong Kong in 2003 suggested that airborne spread may have had an important role in the transmission of SARS[9]. At present, little is known about the aerodynamic characteristics and transmission pathways of SARS-CoV-2 in aerosols; in part because of the difficulties in sampling virus-containing aerosols in real-world settings and challenges in their quantification at low concentrations.

We analysed the occurrence of airborne SARS-CoV-2 and its aerosol deposition at 30 sites in two designated hospitals and public areas in Wuhan, China, and then quantified the copy counts of SARS-CoV-2 in aerosol samples using a robust droplet-digital-PCR-based detection method (ddPCR)[10]. The two hospitals are exclusively used for the treatments of patients with COVID-19 during the outbreak; however, each hospital has unique characteristics that serve different purposes. Renmin Hospital of Wuhan University (hereafter, Renmin Hospital) is representative of grade-A tertiary hospitals that have been designated for the treatment of patients with severe symptoms of COVID-19. By contrast, Wuchang Fangcang Field Hospital (hereafter, Fangcang Hospital) is representative of the makeshift field hospitals that were converted from indoor sports facilities or exhibition centres to quarantine and treat patients with mild symptoms. The sampling locations

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Table 1 | RNA concentration of airborne SARS-CoV-2 at different locations in Wuhan

Category	Sites	Sample type	Concentration (copies m^{-3})
Patient areas			
Fangcang Hospital	Zone A workstation[a]	TSP[b]	1
		TSP[c]	9
	Zone B workstation	TSP	1
	Zone C workstation[a]	TSP[b]	5
		TSP[c]	0
	Patient mobile toilet room	TSP	19
Renmin Hospital	Intensive care unit	TSP	0
	Intensive care unit	Deposition	31[d]
	Intensive care unit	Deposition	113[d]
	Coronary care unit	TSP	0
	Ward zone 16	TSP	0
Medical staff areas			
Fangcang Hospital	PPAR of zone A[a]	TSP[b]	16
		TSP[c]	0
	PPAR of zone B	Size-segregated	42
	PPAR of zone C[a]	Size-segregated[b]	20
		TSP[c]	0
	Male staff change room	TSP	20
	Female staff change room	TSP	11
	Medical staff's office	Size-segregated	20
	Meeting room	TSP	18
	Warehouse[a]	TSP[b]	21
		TSP[c]	0
Renmin Hospital	Passageway for medical staff	TSP	6
	Dining room for medical staff	TSP	6
Public areas			
	Fangcang Hospital pharmacy	TSP	3
	Renmin Hospital doctor office	TSP	0
	Renmin Hospital outpatient hall	TSP	0
	Renmin Hospital outdoor	TSP	7
	University office doorside	TSP	0
	University hospital outpatient hall	TSP	0
	Community checkpoint	TSP	0
	Residential building	TSP	0
	Supermarket	TSP	0
	Department store 1	TSP	11
	Department store 2	TSP	3
	Blank control[a]	Field blank[b]	0
		Field blank[c]	0

TSP, total suspended particles. The samples were distinct by design owing to the unique conditions inside the hospitals during COVID-19 outbreak. We collected 35 samples (not including two blanks) at different sites, therefore $n = 35$. The replicability is limited by very restricted experimental conditions to conduct sampling in the highly infectious zones.

[a]Two rounds of sampling were conducted for the sites. A blank control was included for each of round of sampling. Detailed information is shown in Supplementary Table 1.

[b]The samples were taken during the first round of sampling from 17 February to 24 February 2020.

[c]The samples were taken during the second round of sampling on 2 March 2020.

[d]The reported values are virus aerosol deposition rates in copies m^{-2} h^{-1}.

were classified into three categories according to their accessibility by different groups: (1) patient areas, where the patients with COVID-19 have a physical presence—these include the intensive care units, coronary care units and ward rooms inside Renmin Hospital, a toilet and staff workstations inside Fangcang Hospital; (2) medical staff areas, the workplaces in the two hospitals that are exclusively accessed by medical staff who had direct contact with the patients; and (3) public areas, venues that are open to the general public (Supplementary Table 1). Three types of aerosol samples were collected: (1) aerosol samples of total suspended particles with no upper size limit to quantify RNA concentrations of SARS-CoV-2 in aerosols; (2) aerodynamic size-segregated aerosol samples to determine the size distribution of airborne SARS-CoV-2 droplets; and (3) aerosol deposition samples to determine the deposition rate of airborne SARS-CoV-2.

The existence of SARS-CoV-2 in aerosol samples was determined through the quantification of its genetic material (RNA).

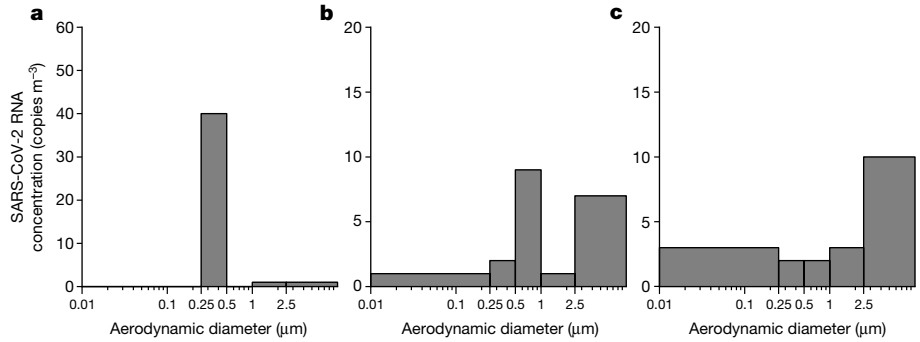

Fig. 1 | Concentration of airborne SARS-CoV-2 RNA in different aerosol size bins. a, Concentration of SARS-CoV-2 in a protective-apparel removal room in zone B of Fangcang Hospital. **b**, Concentration of SARS-CoV-2 in a protective-apparel removal room in zone C of Fangcang Hospital. **c**, Concentration of SARS-CoV-2 in the medical staff's office of Fangcang Hospital. The *x* axis represents the aerodynamic diameter on a logarithmic scale to cover the multiple magnitudes of measured aerosol diameters.

The concentrations of airborne SARS-CoV-2 at the different sites are shown in Table 1. In general, very low or undetectable concentrations of airborne SARS-CoV-2 were found in most of the patient areas of Renmin Hospital, suggesting that the negatively pressurized isolation and high air exchange rate inside the intensive care units, coronary care units and ward room of Renmin Hospital are very effective in limiting the airborne transmission of SARS-CoV-2. The highest concentration in patient areas was observed inside a patient mobile toilet room at Fangcang Hospital (19 copies m^{-3}), which is a temporary single toilet room of approximate 1 m^2 in area without ventilation. Airborne SARS-CoV-2 may come from either the patient's breath or the aerosolization of the virus-laden aerosol from the faeces or urine of a patient during use[11,12]. Although the infectivity of the virus is not known in this study, the results also relate to the findings of another study[13], which found positive test results of wipe samples from room surfaces of toilets used by patients infected with SARS-CoV-2. In medical staff areas, the two sampling sites in Renmin Hospital had low concentrations of 6 copies m^{-3}, whereas the sites in Fangcang Hospital generally had higher concentrations. In particular, the protective-apparel removal rooms (PPARs) in three different zones inside Fangcang Hospital are among the upper range of the concentrations of airborne SARS-CoV-2, ranging from 16 to 42 copies m^{-3} in the first round of sampling. In public areas outside the hospitals, we found that most of the sites had undetectable or very low concentrations of SARS-CoV-2 aerosols (below 3 copies m^{-3}), except for one crowd-gathering site about 1 m from the entrance of a department store that customers frequently passed through and a site next to Renmin Hospital, through which the public including outpatients walked. Although both sites were outside buildings, it is possible that individuals infected with SARS-CoV-2 in the crowd may have been the source of virus-laden aerosols during the sampling period. The results suggest that, overall, the risks of infection are low in well-ventilated or open public venues, but do reinforce the importance of avoiding crowded gatherings and implementing the early identification and diagnosis of individuals infected with SARS-CoV-2 for quarantine or treatment.

Inside a room of the intensive care unit of Renmin Hospital, the two aerosol deposition samples tested positive with an estimated deposition rate of 31 and 113 copies m^{-2} h^{-1}, although the concentration of the total suspended particles in the aerosol sample inside this room of the intensive care unit was below the detection limit (Table 1). The sample with the higher deposition rate was placed in the hindrance-free corner of the room, approximately 3 m from the bed of a patient. The other sample, for which a lower number of virus copies was recorded, was placed in another corner, approximately 2 m from the bed of the patient and below medical equipment, which may have blocked the path of virus aerosols during sedimentation. Our findings, although based on a small sample size, indicate that virus-laden aerosol deposition may have a role in surface contamination and subsequent contact by susceptible people, which results in the infection of individuals with SARS-CoV-2.

In general, medical staff areas had higher concentrations of SARS-CoV-2 aerosols compared with patient areas in both hospitals during the first round of sampling (17–24 February 2020) at the peak of the COVID-19 outbreak (Table 1). For sampling sites at Renmin Hospital, the air circulation in medical staff areas is isolated by design from the air circulation in the patient rooms. By contrast, in Fangcang Hospital, the non-ventilated temporary PPAR was isolated from the patient hall, in which the aerosol concentration of SARS-CoV-2 was generally low. The second round of sampling of total suspended particles in medical staff areas of Fangcang Hospital was conducted after the number of patients reduced from more than 200 to less than 100 per zone and the implementation of more rigorous and thorough sanitization measures, including more frequent spraying of chlorinated disinfectant on the floor of patient areas, additional disinfection using 3% hydrogen peroxide in the PPAR at least once a week, thoroughly spraying alcohol disinfectant on the protective apparel before taking it off and an increased operation time of indoor air purifiers. The samples from this second round showed all undetectable results (Table 1), confirming the importance of sanitization in reducing the amount of airborne SARS-CoV-2 in high-risk areas.

SARS-CoV-2 aerosols were mainly found to include two size ranges, one in the submicrometre region (d_p between 0.25 and 1.0 μm) and the other in supermicrometre region (d_p > 2.5 μm). Aerosols in the submicrometre region were predominantly found in PPARs in zones B and C of Fangcang Hospital (Fig. 1a, b) with peak concentrations of 40 and 9 copies m^{-3} in the 0.25–0.5 μm and 0.5–1.0 μm range, respectively. By contrast, aerosols in the supermicrometre region were mainly observed in the PPAR of zone C of Fangcang Hospital (Fig. 1b) with concentrations of 7 copies m^{-3}. The medical staff's office (Fig. 1c) had more virus-laden aerosols in the supermicrometre size range, but the size distribution is flatter compared with the range in other areas. Reports on the resuspension of microorganisms from the floor, clothing and furniture have previously been noted to contribute to the generation of microbial aerosols in the built environment[14]. Therefore, we hypothesize that the source of the submicrometre peak is the resuspension of virus-laden aerosols from the surface of the protective apparel worn by medical staff while they are removing the equipment. The submicrometre virus-laden aerosols may originally come from the direct deposition of respiratory droplets or airborne SARS-CoV-2 from a patient onto the protective apparel as evidenced by the deposition samples (Table 1). The higher mobility owing to their smaller aerodynamic diameter facilitates the resuspension from the surface of protective

apparel after gaining the initial velocity while the equipment is being removed. On the other hand, floor-deposited SARS-CoV-2 is possibly the source of supermicrometre virus-laden aerosols and was carried across different areas by medical staff. Furthermore, a recent study has experimentally demonstrated that SARS-CoV-2 could maintain its biological stability in aerosols and on different surfaces for hours to days[15]. The submicrometre SARS-CoV-2 aerosols found in this study had a relatively longer residence time, indicating that the virus was probably still infectious during transmission.

This study has its inherent limitations because of the small sample size and the description of sample viral RNA instead of virus infectivity, which was imposed by restricted access to the patient and medical staff areas at the epicentre of the COVID-19 outbreak. Nonetheless, the findings of this study provide a real-world investigation of the aerodynamic characteristics of airborne SARS-CoV-2 in Wuhan, where a strict quarantine and travel restrictions were implemented during the peak of the COVID-19 outbreak. The findings suggest that toilet use by patients with COVID-19 and crowd gatherings that included individuals infected by SARS-CoV-2 are non-negligible sources of airborne SARS-CoV-2, although the infectivity of the virus is not known. We also describe a transmission pathway for SARS-CoV-2 aerosols that is mediated by the surface deposition of the virus on and resuspension from protective apparel of medical staff and the floor surface. The results of this study have important implications for the prevention of infection of the public and protection of medical staff. We call for particular attention to (1) the ventilation and sterilization of toilets as a potential source for the spreading of the virus; (2) personal protection measures for the general public, such as the wearing of masks and avoidance of busy crowds to reduce the risk of exposure to airborne virus; (3) the effective sanitization of high-risk areas in the hospital to limit the transmission of airborne SARS-CoV-2 and to protect the medical staff; (4) the effectiveness of a naturally ventilated large stadium to limit the aerosol transmission of SARS-CoV-2 when converted to a field hospital for the quarantine and treatment of patients with SARS-CoV-2; and (5) surface sanitization of the apparel before the equipment is taken off to help to reduce the potential risk of infection for medical staff.

Online content

Any methods, additional references, Nature Research reporting summaries, source data, extended data, supplementary information, acknowledgements, peer review information; details of author contributions and competing interests; and statements of data and code availability are available at https://doi.org/10.1038/s41586-020-2271-3.

1. National Center for Immunization and Respiratory Diseases (NCIRD). *How COVID-19 spreads* https://www.cdc.gov/coronavirus/2019-ncov/about/transmission.html (2020).
2. Offord, C. How COVID-19 is spread. *The Scientist* https://www.the-scientist.com/news-opinion/how-covid-19-is-spread-67143 (21 February 2020).
3. WHO *Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19)* https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf (2020).
4. Coronaviridae Study Group of the International Committee on Taxonomy of Viruses. The species *Severe acute respiratory syndrome-related coronavirus*: classifying 2019-nCoV and naming it SARS-CoV-2. *Nat. Microbiol.* **5**, 536–544 (2020).
5. Chen, L. et al. RNA based mNGS approach identifies a novel human coronavirus from two individual pneumonia cases in 2019 Wuhan outbreak. *Emerg. Microbes Infect.* **9**, 313–319 (2020).
6. Zhou, P. et al. A pneumonia outbreak associated with a new coronavirus of probable bat origin. *Nature* **579**, 270–273 (2020).
7. Leclair, J. M., Zaia, J. A., Levin, M. J., Congdon, R. G. & Goldmann, D. A. Airborne transmission of chickenpox in a hospital. *N. Engl. J. Med.* **302**, 450–453 (1980).
8. Escombe, A. R. et al. The detection of airborne transmission of tuberculosis from HIV-infected patients, using an in vivo air sampling model. *Clin. Infect. Dis.* **44**, 1349–1357 (2007).
9. Yu, I. T., Qiu, H., Tse, L. A. & Wong, T. W. Severe acute respiratory syndrome beyond Amoy Gardens: completing the incomplete legacy. *Clin. Infect. Dis.* **58**, 683–686 (2014).
10. Suo, T. et al. ddPCR: a more accurate tool for SARS-CoV-2 detection in low viral load specimens. *Emerg. Microbes Infect.* https://doi.org/10.1080/22221751.2020.1772678 (2020).
11. Peng, L. et al. SARS-CoV-2 can be detected in urine, blood, anal swabs, and oropharyngeal swabs specimens. *J. Med. Virol.* https://doi.org/10.1002/jmv.25936 (2020).
12. Wang, W. et al. Detection of SARS-CoV-2 in different types of clinical specimens. *J. Am. Med. Assoc.* **323**, 1843–1844 (2020).
13. Ong, S. W. X. et al. Air, surface environmental, and personal protective equipment contamination by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) from a symptomatic patient. *J. Am. Med. Assoc.* **323**, 1610–1612 (2020).
14. Prussin, A. J. II & Marr, L. C. Sources of airborne microorganisms in the built environment. *Microbiome* **3**, 78 (2015).
15. van Doremalen, N. et al. Aerosol and surface stability of SARS-CoV-2 as compared with SARS-CoV-1. *N. Engl. J. Med.* **382**, 1564–1567 (2020).

Methods

Data reporting

No statistical methods were used to predetermine sample size. The experiments were not randomized and the investigators were not blinded to allocation during experiments and outcome assessment.

Sample collection

The sampling was conducted between 17 February and 2 March 2020 in the locations in two rounds as shown in Table 1. All aerosol samples were collected on presterilized gelatin filters (Sartorius). A total of 30 aerosol samples of total suspended particles were collected on 25-mm-diameter filters loaded into styrene filter cassettes (SKC) by sampling air at a fixed flow rate of 5.0 l min^{-1} using a portable pump (APEX2, Casella). A total of three size-segregated aerosol samples was collected using a miniature cascade impactor (Sioutas Impactor, SKC) that separated aerosols into five ranges (>2.5 μm, 1.0–2.5 μm, 0.50–1.0 μm and 0.25–0.50 μm on 25-mm filter substrates, and 0–0.25 μm on 37-mm filters) at a flow rate of 9.0 l min^{-1}. A total of two aerosol deposition samples was collected using 80-mm-diameter filters packed into a holder with an effective deposition area of 43.0 cm^2 and the filters were placed intact on the floor in two corners of the intensive care unit room of Renmin Hospital for 7 days. Sampling durations and operation periods are described in Supplementary Table 1. All sampling instruments were located in the centre of the respective sampling area, where the sampling inlet was at a height of 1.5 m from the floor. Considering the limited experimental conditions and the small sample size, the integrity and robustness of the experiment protocol was examined extensively in the laboratory before field sampling and these results are described in Supplementary Table 2.

Analytical method and data analysis

After the collection of aerosol samples, all samples were processed immediately in the BSL-2 laboratory of Wuhan University. The 25-, 37-mm and 80-mm filter samples were dissolved in deionized water, after which TRIzol LS reagent (Invitrogen) was added to inactivate SARS-CoV-2 viruses and extract RNA according to the manufacturer's instructions. First-strand cDNA was synthesized using the PrimeScript RT kit (TakaRa). Optimized ddPCR was used to detect the presence of SARS-CoV-2 viruses according to a previous study[10]. Analysis of the ddPCR data was performed using QuantaSoft software (Bio-Rad). The concentration reported by the procedure equals the number of copies of template per microlitre of the final 1× ddPCR reaction, which was normalized to copies m^{-3} in all of the results; therefore, the virus or viral RNA concentration in aerosol is expressed in copies m^{-3} throughout. A detailed protocol is provided in the Supplementary Information.

Reporting summary

Further information on research design is available in the Nature Research Reporting Summary linked to this paper.

Data availability

All data generated and analysed during this study are included in the Article and its Supplementary Information. Source Data for Fig. 1 are provided with the paper.

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Author contributions K.L., Y.C., Z.N., Q.F., H.K. and K.-f.H. conceptualized the study design; Yuan Liu, Y.C., M.G., Yingle Liu and K.L. collected samples; Yuan Liu, M.G. and X.L. carried out the laboratory tests; Yuan Liu, Z.N., Y.C., N.K.G., M.G., X.L. and K.L. analysed the data; Y.C., Z.N., Yuan Liu, Q.F., H.K., J.C., K.-f.H. and K.L. interpreted the results; Yuan Liu and Z.N. wrote the initial drafts of the manuscript; Yuan Liu, Z.N., Y.C. and K.L. revised the manuscript; M.G., Yingle Liu, N.K.G., L.S., Y.D., J.C., D.W., K.X., H.K. and Q.F. commented on the manuscript. All authors read and approved the final manuscript.

Competing interests The authors declare no competing interests.

Additional information
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Correspondence and requests for materials should be addressed to Z.N., Y.C., K.-f.H., H.K., Q.F. or K.L.
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Our web collection on statistics for biologists contains articles on many of the points above.

Software and code

Policy information about availability of computer code

Data collection	NONE
Data analysis	QuantaSoft analysis software v.1.7.4.0917 (Bio-Rad) was used for analysis of the ddPCR data.

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors/reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Research guidelines for submitting code & software for further information.

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- Accession codes, unique identifiers, or web links for publicly available datasets
- A list of figures that have associated raw data
- A description of any restrictions on data availability

All data generated and analysed during this study are included in the Article and its Supplementary Information files, which include an additional Excel file containing Source Data for Fig. 1 and all raw data.

Field-specific reporting

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☐ Life sciences ☐ Behavioural & social sciences ☒ Ecological, evolutionary & environmental sciences

Ecological, evolutionary & environmental sciences study design

All studies must disclose on these points even when the disclosure is negative.

Study description	This study investigated the aerodynamic nature and aerosol transmission of SARS-CoV-2 aerosol in Wuhan under strict quarantine and travel restriction during the peak of COVID-19 outbreak.
Research sample	Total of 35 distinct samples of three types, total suspended particle, size segregated and aerosol deposition were collected.
Sampling strategy	We sampled three types of virus aerosol samples at 30 sites covering patient and medical staff areas inside hospitals and in public areas in Wuhan. The sampling was designed to identify the hotspots of airborne SARS-CoV-2 and investigate their sources, and seek for evidences of their aerosol transmission across different isolation zones and air-surface transfer mechanisms.
Data collection	We collected two batches of samples from Feb 17 to Feb 24, 2020 and on Mar 2, 2020 respectively.
Timing and spatial scale	Sampling durations range from 5 to 20 hours for total suspended particle and size segregated samples and 7 days for aerosol deposition samples. Sampling air volumes range from 1.5 m3 to 8.9 m3.
Data exclusions	No data were excluded in this work.
Reproducibility	The samples were distinct by design in this study due to the unique conditions inside the hospitals during COVID-19 outbreak.
Randomization	This study categorized sampling locations by functions and user groups. Each sample has served different purposes so no randomization was attempted.
Blinding	The sampling process itself has no impact on the study subject and data integrity by the nature of study, so no blinding was attempted.

Did the study involve field work? ☒ Yes ☐ No

Field work, collection and transport

Field conditions	The sampling sites include indoor of hospital function areas and outdoor in public areas in Wuhan under strict quarantine and travel restriction.
Location	We sampled SARS-CoV-2 aerosol samples at 30 sites in two designated hospitals and public areas in Wuhan.
Access and import/export	This field study didn't involve any study objects that require permission so no approval is needed.
Disturbance	The sampling process has no disturbance of the subjects.

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology
☒	☐ Animals and other organisms
☒	☐ Human research participants
☒	☐ Clinical data

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

EXHIBIT 3

Interim List of Categories of Essential Workers Mapped to Standardized Industry Codes and Titles

This interim list identifies "**essential workers**" as those who conduct a range of operations and services in industries that are essential to ensure the continuity of critical functions in the United States (U.S.). Essential workers were originally described by the U.S. Department of Homeland Security's Cybersecurity and Infrastructure Security Agency's (CISA):"Guidance on the Essential Critical Infrastructure Workforce: Ensuring Community and National Resilience in COVID-19 Response, (Version 4.0; August 18, 2020) ." This list maps the CISA guidance to standardized industry codes and titles for ease of use.

The Advisory Committee on Immunization Practices (ACIP) comprises medical and public health experts who develop recommendations on the use of vaccines in the civilian population of the United States. The recommendations stand as public health guidance for safe use of vaccines and related biological products. ACIP recommended phased allocation of COVID-19 vaccines while vaccine supply is limited, with expansion of populations recommended for vaccination as COVID-19 vaccine supply allows. Phase 1a includes healthcare personnel and long-term care facility residents. Phase 1b includes persons ≥75 years of age and frontline essential workers. Phase 1c includes persons 65-74 years of age, persons 16-64 years of age with high-risk medical conditions, and essential workers not recommended in Phase 1a or 1b.

ACIP Categories of Essential Workers (Phase)

- Essential Healthcare Workers (1a):
  All paid and unpaid persons serving in healthcare settings who have the potential for direct or indirect exposure to patients or infectious materials. This includes persons not directly involved in patient care, but potentially exposed to infectious agents while working in a healthcare setting
- Essential Non-Healthcare Workers:
  Workers who are essential to maintain critical infrastructure and continue critical services and functions
  - Frontline essential workers (1b): The subset of essential workers likely at highest risk for work-related exposure to SARS-CoV-2, the virus that causes COVID-19, because their work-related duties must be performed on-site and involve being in close proximity (<6 feet) to the public or to coworkers
  - Other essential workers (1c): Essential workers not included in Phase 1a or 1b

The interim CDC list that follows is intended to help state, local, tribal, and territorial officials and organizations prepare for the allocation of initially limited COVID-19 vaccine supply by mapping essential industries to corresponding COVID-19 vaccination phases and workforce categories, as recommended by ACIP. Standardized codes and titles may not perfectly align with the populations of workers described by CISA and ACIP. Other mapping approaches may produce slight variations of this list.

While this list may aid in classification of worker populations, other considerations may also factor into COVID-19 vaccine prioritization decisions. For example, racial and ethnic minority groups are disproportionately represented in many essential industries, which may be contributing to COVID-19 racial and ethnic health disparities. Jurisdictions may want to consider the distribution of the workforce in these industries as they prioritize vaccine allocation.

For more information on industry and occupation codes, please see the web page: Collecting and Using Industry and Occupation Data. Additional information and resources will be shared by CDC as they become available.

Essential Industry Classification Based on CISA Guidance

In this list, industries are identified using the 2017 North American Industry Classification System (NAICS) . NAICS codes are hierarchical; the first two digits represent general categories of economic activities, and each subsequent digit provides

single CISA essential industry designation. Some essential critical infrastructure industries described in the CISA guidance do not directly align with a worker category identified by ACIP as Essential Non-Healthcare Workers and are thus noted as "Not explicitly included" by ACIP in this list.

Sub-categories of essential workers may be prioritized differently in different jurisdictions, in accordance with local needs. Some jurisdictions may also face local factors that require the addition of industries not included on the CISA ECIW list. Jurisdictions have flexibility in weighing local economic and infrastructure needs, ethical considerations, and other equity factors in order to prioritize those working in industries in the CISA ECIW list for COVID-19 vaccine allocation.

Note about Industry vs. Occupation

The list provided below categorizes workers based on the industry (type of business) in which they work, not based on their occupation (a person's specific job). Although workers' status as essential under the CISA guidance is most readily determined by the industry in which they work, their exposure risk may be largely determined by their occupation. Because the most efficient vaccination allocation strategy will take both essentiality and risk into account, jurisdictions should, where feasible, make efforts to prioritize workers in occupations characterized by the inability to work remotely and the need to work in close proximity to others within the below industries, as implied by the ACIP definition of Essential Non-Healthcare Workers.

Note about Multi-employer Workplaces

The list provided below categorizes workers based on the primary industry of their workplace. Some workplaces include workers employed by a mix of employers that fall under different industry categories (NAICS codes). For workers employed by contract firms or temporary help agencies, the staffing agency and the host employer are joint employers and, therefore, both are responsible for providing and maintaining a safe work environment. Workers should be considered for vaccination prioritization according to the primary industry activities at the site(s) where they work, even if the industry category of their actual employer does not fall within these lists. If offering on-site vaccination to employees, host employers should consider offering vaccination to temporary and/or contracted employees.

Table 1. Detailed Industries mapped to ACIP Recommended Vaccination Phase 1a

2017 NAICS Code*	2017 NAICS Title	CISA v4.0 Sector	ACIP Recommended Vaccination Phase†	ACIP Workforce Category
446110	Pharmacies and Drug Stores	Healthcare/Public Health	1a	Health Care Personnel
621111	Offices of Physicians (except Mental Health Specialists)	Healthcare/Public Health	1a	Health Care Personnel
621112	Offices of Physicians, Mental Health Specialists	Healthcare/Public Health	1a	Health Care Personnel
621210	Offices of Dentists	Healthcare/Public Health	1a	Health Care Personnel
621310	Offices of Chiropractors	Healthcare/Public Health	1a	Health Care Personnel
621320	Offices of Optometrists	Healthcare/Public Health	1a	Health Care Personnel
621330	Offices of Mental Health Practitioners (except Physicians)	Healthcare/Public Health	1a	Health Care Personnel
621340	Offices of Physical, Occupational, and Speech Therapists, and Audiologists	Healthcare/Public Health	1a	Health Care Personnel
621391	Offices of Podiatrists	Healthcare/Public Health	1a	Health Care Personnel

621420	Outpatient Mental Health and Substance Abuse Centers	Healthcare/Public Health	1a	Health Care Personnel
621491	HMO Medical Centers	Healthcare/Public Health	1a	Health Care Personnel
621492	Kidney Dialysis Centers	Healthcare/Public Health	1a	Health Care Personnel
621493	Freestanding Ambulatory Surgical and Emergency Centers	Healthcare/Public Health	1a	Health Care Personnel
621498	All Other Outpatient Care Centers	Healthcare/Public Health	1a	Health Care Personnel
621511	Medical Laboratories	Healthcare/Public Health	1a	Health Care Personnel
621512	Diagnostic Imaging Centers	Healthcare/Public Health	1a	Health Care Personnel
621610	Home Health Care Services	Healthcare/Public Health	1a	Health Care Personnel
621910	Ambulance Services	Healthcare/Public Health	1a	Health Care Personnel
621991	Blood and Organ Banks	Healthcare/Public Health	1a	Health Care Personnel
621999	All Other Miscellaneous Ambulatory Health Care Services[a]	Healthcare/Public Health	1a	Health Care Personnel
622110	General Medical and Surgical Hospitals	Healthcare/Public Health	1a	Health Care Personnel
622210	Psychiatric and Substance Abuse Hospitals	Healthcare/Public Health	1a	Health Care Personnel
622310	Specialty (except Psychiatric and Substance Abuse) Hospitals	Healthcare/Public Health	1a	Health Care Personnel
623110	Nursing Care Facilities (Skilled Nursing Facilities)	Healthcare/Public Health	1a	Health Care Personnel
623210	Residential Intellectual and Developmental Disability Facilities	Healthcare/Public Health	1a	Health Care Personnel
623220	Residential Mental Health and Substance Abuse Facilities	Healthcare/Public Health	1a	Health Care Personnel
623311	Continuing Care Retirement Communities	Healthcare/Public Health	1a	Health Care Personnel
623312	Assisted Living Facilities for the Elderly	Healthcare/Public Health	1a	Health Care Personnel
623990	Other Residential Care Facilities	Healthcare/Public Health	1a	Health Care Personnel
624110	Child and Youth Services[a]	Healthcare/Public Health	1a	Health Care Personnel
624120	Services for the Elderly and Persons with Disabilities[a]	Healthcare/Public Health	1a	Health Care Personnel
624190	Other Individual and Family Services[a]	Healthcare/Public Health	1a	Health Care Personnel
812210	Funeral Homes and Funeral Services	Healthcare/Public Health	1a	Health Care Personnel
812220	Cemeteries and Crematories	Healthcare/Public Health	1a	Health Care Personnel

2017 NAICS Code*	2017 NAICS Title	CISA v4.0 Sector	ACIP Recommended Vaccination Phase†	ACIP Workforce Category
62423x	Emergency and Other Relief Services	Law Enforcement, Public Safety, and Other First Responders	1b	First Responders
92212x	Police Protection	Law Enforcement, Public Safety, and Other First Responders	1b	First Responders
92216x	Fire Protection	Law Enforcement, Public Safety, and Other First Responders	1b	First Responders
92219x	Other Justice, Public Order, and Safety Activities	Other Community- or Government-based Operations and Essential Functions	1b	First Responders
92214x	Correctional Institutions	Law Enforcement, Public Safety, and Other First Responders	1b	Corrections Workers
11xxxx	Agriculture, Forestry, Fishing and Hunting	Food and Agriculture	1b	Food and Agriculture
311xxx	Food Manufacturing	Food and Agriculture	1b	Food and Agriculture
3121xx	Beverage Manufacturing	Food and Agriculture	1b	Food and Agriculture
44422x	Nursery, Garden Center, and Farm Supply Stores	Food and Agriculture	1b	Food and Agriculture
54194x	Veterinary Services	Other Community- or Government-based Operations and Essential Functions	1b	Food and Agriculture
445xxx	Food and Beverage Stores[b]	Food and Agriculture	1b	Grocery Store Workers
4523xx	General Merchandise Stores, including Warehouse Clubs and Supercenters	Food and Agriculture	1b	Grocery Store Workers
6111xx	Elementary and Secondary Schools	Education	1b	Education
6112xx	Junior Colleges	Education	1b	Education
6113xx	Colleges, Universities, and Professional Schools	Education	1b	Education
6114xx	Business Schools and Computer and Management Training	Education	1b	Education
6115xx	Technical and Trade Schools	Education	1b	Education
61171x	Educational Support Services	Education	1b	Education
62431x	Vocational Rehabilitation Services	Other Community- or Government-based Operations and Essential Functions	1b	Education
62441x	Child Day Care Services[c]	Other Community- or Government-based Operations and Essential Functions	1b	Education
92311x	Administration of Education Programs	Education	1b	Education
491xxx	Postal Service	Transportation and Logistics	1b	U.S. Postal Service Workers
4851xx	Urban Transit Systems	Transportation and Logistics	1b	Public Transit Workers
4852xx	Interurban and Rural Bus Transportation	Transportation and Logistics	1b	Public Transit Workers
4854xx	School and Employee Bus Transportation	Transportation and Logistics	1b	Public Transit Workers
485991	Special Needs Transportation	Transportation and Logistics	1b	Public Transit Workers

32412x	Asphalt Paving, Roofing, and Saturated Materials Manufacturing	Energy	1b	Manufacturing
32419x	Other Petroleum and Coal Products Manufacturing	Energy	1b	Manufacturing
325xxx[§]	Chemical Manufacturing	Chemical	1b	Manufacturing[d]
326xxx	Plastics and Rubber Product Manufacturing	Transportation and Logistics; Critical Manufacturing	1b	Manufacturing
327xxx	Nonmetallic Mineral Product Manufacturing	Critical Manufacturing	1b	Manufacturing
331xxx	Primary Metal Manufacturing	Critical Manufacturing	1b	Manufacturing
332xxx	Fabricated Metal Product Manufacturing	Critical Manufacturing; Law Enforcement, Public Safety, and Other First Responders	1b	Manufacturing
333xxx[§]	Industrial Machinery Manufacturing	Critical Manufacturing; Food and Agriculture; Transportation and Logistics	1b	Manufacturing[d]
334xxx[§]	Computer and Electronic Product Manufacturing	Critical Manufacturing	1b	Manufacturing
335xxx	Electrical Equipment, Appliance, and Component Manufacturing	Commercial Facilities; Energy; Critical Manufacturing; Communications and Information Technology	1b	Manufacturing
336xxx	Transportation Equipment Manufacturing	Transportation and Logistics; Residential/Shelter Facilities, Housing and Real Estate, and Related Services; Critical Manufacturing; Defense Industrial Base	1b	Manufacturing
33711x	Wood Kitchen Cabinet and Countertop Manufacturing[e]	Commercial Facilities	1b	Manufacturing
3391xx	Medical Equipment and Supplies Manufacturing	Healthcare/Public Health	1b	Manufacturing
3399xx[§]	Other Miscellaneous Manufacturing	Other Community- or Government-based Operations and Essential Functions; Critical Manufacturing; Transportation and Logistics; Hygiene Products and Services; Healthcare/Public Health	1b	Manufacturing
54142x	Industrial Design Services	Critical Manufacturing	1b	Manufacturing
811219	Other Electronic and Precision Equipment Repair and Maintenance	Commercial Facilities	1b	Manufacturing
81131x	Commercial and Industrial Machinery and Equipment (except Automotive and Electronic) Repair and Maintenance	Commercial Facilities	1b	Manufacturing

Table 3. Broad Industries mapped to ACIP Recommended Vaccination Phase 1c

2017 NAICS Code*	2017 NAICS Title	CISA v4.0 Sector	ACIP Recommended Vaccination Phase†	ACIP Workforce Category
3231xx	Printing and Related Support Activities	Transportation and Logistics; Other Community- or Government-based Operations and Essential Functions	1c	Transportation and Logistics
423xxx[§]	Merchant Wholesalers, Durable Goods	Critical Manufacturing; Commercial Facilities; Transportation and Logistics; Healthcare/Public Health	1c	Transportation and Logistics[d]
424xxx[§]	Merchant Wholesalers, Nondurable Goods	Commercial Facilities; Healthcare/Public Health; Food and Agriculture; Critical Manufacturing; Energy; Other Community- or Government-based Operations and Essential Functions	1c	Transportation and Logistics[d]

481xxx	Air Transportation	Transportation and Logistics	1c	Transportation and Logistics
482xxx	Rail Transportation	Transportation and Logistics	1c	Transportation and Logistics
483xxx	Water Transportation	Transportation and Logistics	1c	Transportation and Logistics
484xxx	Truck Transportation	Transportation and Logistics	1c	Transportation and Logistics
4853xx	Taxi and Limousine Service[f]	Transportation and Logistics	1c	Transportation and Logistics
4855xx	Charter Bus Industry	Transportation and Logistics	1c	Transportation and Logistics
485999	All Other Transit and Ground Passenger Transportation[f]	Transportation and Logistics	1c	Transportation and Logistics
488xxx	Support Activities for Transportation	Transportation and Logistics	1c	Transportation and Logistics
492xxx	Couriers and Messengers	Transportation and Logistics	1c	Transportation and Logistics
493xxx	Warehousing and Storage	Transportation and Logistics	1c	Transportation and Logistics
5321xx	Automotive Equipment Rental and Leasing	Transportation and Logistics	1c	Transportation and Logistics
532411	Commercial Air, Rail, and Water Transportation Equipment Rental and Leasing	Transportation and Logistics	1c	Transportation and Logistics
54143x	Graphic Design Services	Transportation and Logistics	1c	Transportation and Logistics
541614	Process, Physical Distribution, and Logistics Consulting Services	Transportation and Logistics	1c	Transportation and Logistics
561431	Private Mail Centers	Transportation and Logistics	1c	Transportation and Logistics
56191x	Packaging and Labeling Services	Transportation and Logistics	1c	Transportation and Logistics
611692	Automobile Driving Schools	Transportation and Logistics	1c	Transportation and Logistics
8111xx[§]	Automotive Repair and Maintenance	Transportation and Logistics	1c	Transportation and Logistics
62421x	Community Food Services[g]	Food and Agriculture	1c	Food Service
7223xx	Special Food Services	Food and Agriculture	1c	Food Service
7225xx	Restaurants and Other Eating Places	Food and Agriculture	1c	Food Service
211xxx	Oil and Gas Extraction	Energy	1c	Energy
212xxx[¶]	Mining (except Oil and Gas)	Energy; Critical Manufacturing	1c	Energy
213xxx	Support Activities for Mining	Energy	1c	Energy
447xxx	Gasoline Stations	Energy	1c	Energy
45431x	Fuel Dealers	Energy	1c	Energy
486xxx	Pipeline Transportation	Energy	1c	Energy
54162x	Environmental Consulting Services	Energy	1c	Energy

92411x	Administration of Air and Water Resource and Solid Waste Management Programs	Water and Wastewater	1c	Water and Wastewater
236xxx	Construction of Buildings	Residential/Shelter Facilities, Housing and Real Estate, and Related Services	1c	Shelter and Housing
238xxx	Specialty Trade Contractors	Residential/Shelter Facilities, Housing and Real Estate, and Related Services	1c	Shelter and Housing
453xxx[§¶]	Miscellaneous Store Retailers	Food and Agriculture; Commercial Facilities Residential/Shelter Facilities, Housing and Real Estate, and Related Services	1c	Shelter and Housing
531xxx[§¶]	Real Estate	Residential/Shelter Facilities, Housing and Real Estate, and Related Services; Commercial Facilities	1c	Shelter and Housing
54141x	Interior Design Services	Residential/Shelter Facilities, Housing and Real Estate, and Related Services	1c	Shelter and Housing
62422x	Community Housing Services	Residential/Shelter Facilities, Housing and Real Estate, and Related Services	1c	Shelter and Housing
721xxx[§¶]	Traveler Accommodation	Commercial Facilities; Public Works and Infrastructure Support Services; Residential/Shelter Facilities, Housing and Real Estate, and Related Services	1c	Shelter and Housing
92511x	Administration of Housing Programs	Other Community- or Government-based Operations and Essential Functions	1c	Shelter and Housing
5413xx[§]	Architectural, Engineering, and Related Services	Residential/Shelter Facilities, Housing and Real Estate, and Related Services, Public Works and Infrastructure Support Services, Energy	1c	Shelter and Housing; Public Safety; Energy
51121x	Software Publishers	Communications and Information Technology	1c	IT and Communication
517xxx	Telecommunications	Other Community- or Government-based Operations and Essential Functions	1c	IT and Communication
518xxx	Data Processing, Hosting, and Related Services	Other Community- or Government-based Operations and Essential Functions	1c	IT and Communication
51913x	Internet Publishing and Broadcasting and Web Search Portals	Other Community- or Government-based Operations and Essential Functions	1c	IT and Communication
5415xx	Computer Systems Design and Related Services	Communications and Information Technology	1c	IT and Communication
811211	Consumer Electronics Repair and Maintenance	Commercial Facilities	1c	IT and Communication
811212	Computer and Office Machine Repair and Maintenance	Commercial Facilities	1c	IT and Communication
811213	Communication Equipment Repair and Maintenance	Communications and Information Technology	1c	IT and Communication
451212	News Dealers and Newsstands	Other Community- or Government-based Operations and Essential Functions	1c	News Media
51111x	Newspaper Publishers	Other Community- or Government-based Operations and Essential Functions	1c	News Media
51112x	Periodical Publishers	Other Community- or Government-based Operations and Essential Functions	1c	News Media
515xxx	Broadcasting (except Internet)	Other Community- or Government-based Operations and Essential Functions	1c	News Media
51911x	News Syndicates	Other Community- or Government-based Operations and Essential Functions	1c	News Media

532412	Construction, Mining, and Forestry Machinery and Equipment Rental and Leasing	Public Works and Infrastructure Support Services	1c	Public Safety
562xxx	Waste Management and Remediation Services	Public Works and Infrastructure Support Services; Hazardous Materials	1c	Public Safety
54169x	Other Scientific and Technical Consulting Services	Healthcare/Public Health	1c	Public Health Workers
54171x	Research and Development in the Physical, Engineering, and Life Sciences	Healthcare/Public Health	1c	Public Health Workers
561422	Telemarketing Bureaus and Other Contact Centers[h]	Healthcare/Public Health	1c	Public Health Workers; IT and Communication
92312x	Administration of Public Health Programs[i]	Healthcare/Public Health	1c	Public Health Workers
521xxx	Monetary Authorities-Central Bank	Financial Services	1c	Finance
522xxx	Credit Intermediation and Related Activities	Financial Services	1c	Finance
523xxx	Securities, Commodity Contracts, and Other Financial Investments and Related Activities	Financial Services	1c	Finance
524xxx	Insurance Carriers and Related Activities	Financial Services; Healthcare/Public Health	1c	Finance
525xxx	Funds, Trusts, and Other Financial Vehicles	Financial Services	1c	Finance
5412xx	Accounting, Tax Preparation, Bookkeeping, and Payroll Services	Financial Services	1c	Finance
551xxx	Management of Companies and Enterprises[j]	Financial Services	1c	Finance
56145x	Credit Bureaus	Financial Services	1c	Finance
5411xx	Legal Services	Other Community- or Government-based Operations and Essential Functions	1c	Legal
561492	Court Reporting and Stenotype Services	Other Community- or Government-based Operations and Essential Functions	1c	Legal
92211x	Courts	Other Community- or Government-based Operations and Essential Functions	1c	Legal
92213x	Legal Counsel and Prosecution	Other Community- or Government-based Operations and Essential Functions	1c	Legal
92215x	Parole Offices and Probation Offices	Law Enforcement, Public Safety, and Other First Responders	1c	Legal
443xxx	Electronics and Appliance Stores[k]	Commercial Facilities	1c	Not explicitly included
4441xx	Building Material and Supplies Dealers[k]	Commercial Facilities	1c	Not explicitly included
44421x	Outdoor Power Equipment Stores[k]	Commercial Facilities	1c	Not explicitly included
44613x	Optical Goods Stores	Healthcare/Public Health	1c	Not explicitly included
44619x	Other Health and Personal Care Stores	Food and Agriculture; Healthcare/Public Health	1c	Not explicitly included
45111x	Sporting Goods Stores[k]	Commercial Facilities	1c	Not explicitly included

51912x	Libraries and Archives[k]	Commercial Facilities	1c	Not explicitly included
54199x	All Other Professional, Scientific, and Technical Services	Other Community- or Government-based Operations and Essential Functions	1c	Not explicitly included
56121x	Facilities Support Services	Commercial Facilities	1c	Not explicitly included
561311	Employment Placement Agencies	Other Community- or Government-based Operations and Essential Functions	1c	Not explicitly included
5616xx	Investigation and Security Services	Commercial Facilities	1c	Not explicitly included
5617xx	Services to Buildings and Dwellings	Commercial Facilities	1c	Not explicitly included
71213x	Zoos and Botanical Gardens[l]	Other Community- or Government-based Operations and Essential Functions	1c	Not explicitly included
71219x	Nature Parks and Other Similar Institutions[m]	Public Works and Infrastructure Support Services	1c	Not explicitly included
7139xx[§]	Other Amusement and Recreation Industries[m]	Public Works and Infrastructure Support Services	1c	Not explicitly included
811412	Appliance Repair and Maintenance[k]	Commercial Facilities	1c	Not explicitly included
81149x	Other Personal and Household Goods Repair and Maintenance[k]	Commercial Facilities	1c	Not explicitly included
81291x	Pet Care (except Veterinary) Services[l]	Other Community- or Government-based Operations and Essential Functions	1c	Not explicitly included
8123xx	Drycleaning and Laundry Services	Hygiene Products and Services	1c	Not explicitly included
8131xx	Religious Organizations	Other Community- or Government-based Operations and Essential Functions	1c	Not explicitly included
814xxx	Private Households[n]	Other Community- or Government-based Operations and Essential Functions	1c	Not explicitly included
921xxx	Executive, Legislative, and Other General Government Support	Other Community- or Government-based Operations and Essential Functions	1c	Not explicitly included
92313x	Administration of Human Resources Programs (except Education, Public Health, and Veterans' Affairs Programs)	Other Community- or Government-based Operations and Essential Functions	1c	Not explicitly included
92314x	Administration of Veterans' Affairs[o]	Other Community- or Government-based Operations and Essential Functions	1c	Not explicitly included
92412x	Administration of Conservation Programs	Other Community- or Government-based Operations and Essential Functions	1c	Not explicitly included
92512x	Administration of Urban Planning and Community and Rural Development	Other Community- or Government-based Operations and Essential Functions	1c	Not explicitly included
926xxx	Administration of Economic Programs	Other Community- or Government-based Operations and Essential Functions	1c	Not explicitly included
927xxx	Space Research and Technology	Defense Industrial Base	1c	Not explicitly included
928xxx	National Security and International Affairs	Defense Industrial Base; Other Community- or Government-based Operations and Essential Functions	1c	Not explicitly included

*NAICS codes are condensed into the lowest level at which most components are contained within a single ACIP workforce

ACIP-recommended vaccination phase and workforce category assignments are coded with respect to CISA essential industry designations and sector assignments according to coder judgement. These assignments are not produced by ACIP.

[§]Some small subcategories within these NAICS groupings are not designated as essential under CISA v4.0:

- 325991 Custom Compounding of Purchased Resins
- 325992 Photographic Film, Paper, Plate, and Chemical Manufacturing
- 333112 Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing
- 3346 Manufacturing and Reproducing Magnetic and Optical Media
- 33991 Jewelry and Silverware Manufacturing
- 33993 Doll, Toy, and Game Manufacturing
- 339991 Gasket, Packing, and Sealing Device Manufacturing
- 339992 Musical Instrument Manufacturing
- 339993 Fastener, Button, Needle, and Pin Manufacturing
- 339999 All Other Miscellaneous Manufacturing
- 4232 Furniture and Home Furnishing Merchant Wholesalers
- 42341 Photographic Equipment and Supplies Merchant Wholesalers
- 42344 Other Commercial Equipment Merchant Wholesalers
- 42392 Toy and Hobby Goods and Supplies Merchant Wholesalers
- 42393 Recyclable Material Merchant Wholesalers
- 42394 Jewelry, Watch, Precious Stone, and Precious Metal Merchant Wholesalers
- 4243 Apparel, Piece Goods, and Notions Merchant Wholesalers
- 42494 Tobacco and Tobacco Product Merchant Wholesalers
- 42499 Other Miscellaneous Nondurable Goods Merchant Wholesalers
- 441210 Recreational Vehicle Dealers
- 441222 Boat Dealers
- 45322 Gift, Novelty, and Souvenir Stores
- 4533 Used Merchandise Stores
- 45392 Art Dealers
- 45399 All Other Miscellaneous Store Retailers
- 53112 Lessors of Nonresidential Buildings (except Miniwarehouses)
- 53113 Lessors of Miniwarehouses and Self-Storage Units
- 53119 Lessors of Other Real Estate Property
- 54132 Landscape Architectural Services
- 71394 Fitness and Recreational Sports Centers
- 71395 Bowling Centers
- 811192 Car Washes

[¶]Some subcategories within these NAICS groupings industries are designated as essential critical infrastructure by CISA but are not contained within any of the large workforce categories explicitly included by ACIP:

- 2122 Metal Ore Mining
- 2123 Nonmetallic Mineral Mining and Quarrying
- 213114 Support Activities for Metal Mining

- 531312 Nonresidential Property Managers
- 7211 Traveler Accommodation
- 7212 RV (Recreational Vehicle) Parks and Recreational Camps

Additional Notes about specific industries:

[a]This includes workers who are providing these services outside of a fixed workplace (e.g., street outreach workers).

[b]This includes convenience stores that sell food and beverages.

[c]Workers in other industries whose duties involve child day care (e.g., day camps, after-school activities) may also be considered for 1b prioritization.

[d]Some subindustries mapped to manufacturing or transportation and logistics may also be identified within the "Food and Agriculture" ACIP workforce category as appropriate.

[e]This specific industry is designated as essential critical infrastructure by CISA because it includes "Workers who support the supply chain of building materials from production through application and installation, including cabinetry…"

[f]Taxi, for-hire-vehicle, and rideshare drivers who often transport healthcare workers to/from work, sick passengers to/from medical appointments, and perform other non-emergent medical transportation duties may be considered for higher prioritization.

[g]This industry comprises establishments primarily engaged in the collection, preparation, and delivery of food for individuals who are hungry or who have food insecurity. These establishments include community meal programs, social services, food banks, food pantries, mobile and non-mobile soup kitchens, and meal delivery programs. Note that people who work for establishments that provide individual and family services related to healthcare/public health, such as WIC clinics, SNAP clinics, mutual aid programs, and benefits access projects, may also be considered for higher prioritization under Phase 1a (e.g., NAICS 624190 Other Individual and Family Services).

[h]This specific industry is designated as essential critical infrastructure by CISA because it includes "Public health/community health workers (including call center workers) who conduct community- based public health functions, conducting epidemiologic surveillance and compiling, analyzing, and communicating public health information, who cannot work remotely."

[i]This industry comprises government establishments primarily engaged in the planning, administration, and coordination of public health programs and services, including state and local health departments and Federal agencies. Note that staff within these establishments who are providing in-person services to known or suspected COVID-19 case patients should be considered Health Care Personnel (Phase 1a).

[j]This does not include all persons employed as managers in any industry. Industries in the Management of Companies and Enterprises subsector include three main types of establishments: (1) those that hold the securities of (or other equity interests in) companies and enterprises; (2) those (except government establishments) that administer, oversee, and manage other establishments of the company or enterprise but do not hold the securities of these establishments; and (3) those that both administer, oversee, and manage other establishments of the company or enterprise and hold the securities of (or other equity interests in) these establishments. Those establishments that administer, oversee, and manage normally undertake the strategic or organizational planning and decision-making role of the company or enterprise.

[k]These specific industries are designated as essential critical infrastructure by CISA because they include "Workers in retail and non-retail businesses – and necessary merchant wholesalers and distributors necessary to provide access to hardware and building materials, consumer electronics, technology products, appliances, emergency preparedness supplies, home exercise and fitness supplies, and home school instructional supplies."

"These specific industries are designated as essential critical infrastructure by CISA because it includes "Workers who support the operations and maintenance of parks and outdoor recreational facilities."

[n]This specific industry is designated as essential critical infrastructure by CISA because it includes workers employed in private households "providing dependent care services, including childcare, eldercare, and other service providers necessary to maintain a comprehensive, supportive environment for individuals and caregivers needing these services."

[o]This industry comprises government establishments primarily engaged in the administration of programs of assistance, training, counseling, and other services to veterans and their dependents, heirs, or survivors. Workers providing healthcare to veterans in a hospital setting are classified in Subsector 622, Hospitals (Phase 1a); Workers providing health care to veterans in an ambulatory care setting are classified in Subsector 621, Ambulatory Health Care Services (Phase 1a).

Page last reviewed: March 29, 2021 (archived document)

CERTIFICATE OF SERVICE

Court of Special Appeals of Maryland
No. COA-MISC-0001-2022
----------)
TAPESTRY, INC,
Appellant,
v.

FACTORY MUTUAL INSURANCE COMPANY,
Appellee.
----------)

I, Elissa Diaz, being duly sworn according to law and being over the age of 18, upon my oath depose and say that:

Counsel Press was retained by McCarter & English, LLP, counsel for Amicus Curiae MedChi, The Maryland State Medical Society to print this document. I am an employee of Counsel Press.

On the **13th Day of July, 2022**, the within **Amicus Curiae Brief MedChi, The Maryland State Medical Society** have been filed and served electronically via the Court's MDEC system. Additionally, I will serve paper copies upon:

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via Express Mail, by causing 2 true copies of each to be deposited, enclosed in a properly addressed wrapper, in an official depository of the United States Postal Service.

Unless otherwise noted, 8 copies of the documents have been sent to the Court on this day via overnight delivery.

July 13, 2022

/s/ Elissa Diaz
Elissa Diaz
Counsel Press