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**IN THE SUPREME COURT OF MISSOURI**

**No. SC98744**

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Missouri State Conference of the National Association
for the Advancement of Colored People, et al.,
*Appellants*,

v.

State of Missouri, et al.,
*Respondents*,

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On Appeal from the Circuit Court of Cole County
Case No. 20AC-CC00169
Honorable Jon E. Beetem

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# BRIEF OF AMICI CURIAE DOCTORS AND PROFESSORS OF EPIDEMIOLOGY

*Accompanied by a Motion for Leave to File Brief* Amici Curiae.

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## INTRODUCTION & IDENTITY OF AMICI

Amici curiae—Dr. Victoria Fraser, Dr. Elvin Geng, Dr. Megha Mehrotra, Dr. Aaloke Mody, Dr. Arthur Reingold, Dr. Sahar Saeed, and Dr. Enbal Shacham—are leading doctors and professors in the nation and in the state of Missouri specializing in epidemiology, a scientific field that studies the spread, causes, and control of infectious diseases and other factors relating to public health. Some amici, in addition to their academic studies of infectious diseases, do clinical work in patient settings. Among them, amici have published hundreds of peer-reviewed articles on topics relating to infectious diseases; have taught medical students, residents, and fellows; have conducted research on deadly infectious diseases in settings around the world; and served in full-time or advisory roles at the Centers for Disease Control and Prevention ("CDC"), the World Health Organization, and other governmental and non-governmental entities. Their biographies are attached as Appendix A.

Amici have worked on issues relating to infectious diseases throughout their entire careers, and are presently engaged in studying and combating the COVID-19 pandemic from a variety of perspectives, including research and practice settings. Based on that work, they have concluded that this pandemic poses unique risks to the public; that, in light of the high transmissibility of the virus, those risks are particularly acute for polling locations and in-person notarization; and that governments should avoid compelling voters to appear at such locations when alternatives are available. They submit this brief to provide the Court with an overview, based on their experience and expertise in

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epidemiology, of the public health issues relevant to this case and in particular how those issues implicate polling locations and ballot notarization requirements.

Appellants have consented to the filing of this brief. Respondents have not consented to the filing of this brief, objecting on the ground that it is out of time, and this brief is accompanied by a motion for leave to file out of time.[1]

## STATEMENT OF THE CASE

This litigation concerns the rights of Missourians to vote without endangering themselves and the public health by going in person to polling locations or notaries during the COVID-19 pandemic. On April 17, 2020, the Missouri State Conference of the National Association for the Advancement of Colored People, the League of Women Voters of Missouri, and three Missouri registered voters (the "appellants") filed a petition for injunctive and declaratory relief, naming as defendants the State of Missouri, Missouri Secretary of State John Ashcroft, and local officials. In relevant part, appellants argued that voters self-isolating due to the COVID-19 pandemic should be allowed to cast an absentee ballot under the statutory provision for individuals who cannot vote in person "due to ... [i]ncapacity or confinement due to illness," § 115.277.1(2), RSMo, and that preventing voters self-isolating due to COVID-19 from casting absentee ballots, or requiring notarization of such ballots, unduly burdens the fundamental right to vote recognized by the Missouri Constitution.

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[1] No party assisted in the drafting of this brief. No party made any final contribution toward the preparation of this brief, which was prepared by the undersigned counsel pro bono.

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The state defendants moved to dismiss. On May 18, 2020, the Circuit Court of Cole County granted that motion. Appellants appealed to this Court. On June 23, 2020, this Court reversed the Circuit Court's dismissal, recognizing that "petitioners seek to protect their right to vote guaranteed by the Missouri Constitution" and "present a real, substantial, and presently existing controversy regarding the interpretation of Missouri's absentee voting statute." Opinion issued June 23, 2020, at 8-9. On remand, the Circuit Court held a bench trial. On September 24, 2020, the Circuit Court ruled for defendants on both counts of the operative complaint, concluding (1) that voters expecting to confine due to COVID-19 on Election Day are not "confined due to illness" for purposes of the absentee voting statute and (2) that requiring certain voters to obtain in-person notarization in order to vote by mail did not unduly burden the Missouri constitution's fundamental right to vote. This appeal followed.

## SUMMARY OF ARGUMENT

The relief sought by appellants—an order allowing absentee voting without notarization by those self-isolating to avoid spreading or being infected with the virus that causes COVID-19—is necessary in light of the unique dangers posed by this virus and the features of polling locations and the notarization process that pose significant risks of transmission.

First, the virus has several features which collectively pose a unique threat to the public. It is highly contagious, spreading through a population with no preexisting immunity via both person-to-person interactions and surfaces. It is severe and deadly, posing serious risks to all people and in particular to certain high-risk populations. And it

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is difficult to prevent, with vaccines and testing unlikely to control spread in the near future and social distancing providing the only fully effective method for preventing spread at present. *Infra* pp. 4-17.

Second, polling locations are particularly susceptible to virus transmission. To vote in person, large numbers of people must gather, often in long and slow-moving lines and in a confined space, and touch common surfaces and objects. While mitigation measures—such as the wearing of masks and the cleaning and disinfecting of surfaces—can reduce risk, none is as effective as giving voters the option of avoiding these locations by voting absentee without notarization requirements. *Infra* pp. 17-27.

Finally, requiring absentee voters to have their ballots notarized would undermine the benefits of absentee voting by requiring voters to come into close proximity with an individual they do not know and with whom they would not otherwise have to interact. Requiring such interactions would endanger both those two parties and all others with whom they come into contact. *Infra* pp. 27-30.

## ARGUMENT

### I. COVID-19 Is a Deadly Disease Caused by a Highly Infectious Virus that Can Be Effectively Prevented Only Through Social Distancing.

In under a year, the COVID-19 pandemic has infected over seven million Americans—including over one hundred thousand Missourians—and claimed the lives of

over two hundred thousand Americans—including over two thousand Missourians.[2] These individuals have been infected with a respiratory virus known as SARS-CoV-2, which causes the disease known as COVID-19. The virus is a respiratory virus—affecting the organs and structures that allow humans to breathe—with patients typically presenting with fever, cough, and shortness of breath, which may escalate to respiratory failure and other serious, life-threatening complications. *See* CDC, *Symptoms of Coronavirus* (May 13, 2020).[3]

Drawing on decades of experience in epidemiological research and practice, and on their recent work responding to this pandemic, amici believe that three aspects of this virus may be relevant to the Court in deciding the issues before it: First, the virus is highly contagious, due to a combination of factors including that the human population has no preexisting immunity; that the virus spreads easily through tiny droplets expelled when a person speaks, coughs, or sneezes; and that individuals who may not yet know they are infected can transmit the virus. Second, the virus is severe and deadly, posing risks to all people and in particular to the elderly, to members of racial and ethnic minority populations, and individuals with preexisting conditions. Third, infection with the virus is at present difficult to prevent, with vaccines unlikely to be available in the

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[2] Ctr. for Systems Science and Engineering at Johns Hopkins University, *COVID-19 Dashboard*, https://gisanddata.maps.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6 (accessed Oct. 5, 2020); State of Missouri, *COVID-19 in Missouri*, https://showmestrong.mo.gov/data/public-health (accessed Oct. 5, 2020).

[3] Available at https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html.



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near future and social distancing and related measures offering the only method of preventing spread at present. In combination, these factors make this virus unlike any other that has circulated in the American population in the last 100 years, justifying the relief sought by appellants.

### A. The Virus Is Highly Contagious.

The virus has spread rapidly—from the first human cases in late 2019 to, as of this writing, approximately 35 million confirmed cases worldwide (a figure that likely represents only a fraction of the true number infected). *See* Ctr. for Systems Science and Engineering at Johns Hopkins University, *COVID-19 Dashboard*, *supra* n. 2. Generally, the rate at which a virus spreads may be driven by a variety of factors, including but not limited to the level of preexisting immunity in the population; the timetable on which an individual becomes infected, becomes contagious, and manifests symptoms; and the manner in which the virus is spread from person to person. In the case of this virus, each of these factors serves to explain its rapid rate of spread.

First, this is a "novel" virus, or a virus to which no human has previously been exposed and had the opportunity to become immune.[4] Accordingly, the entire population was susceptible to this virus when it emerged in late 2019. That makes this virus distinct from viruses like, for example, certain strains of seasonal influenza, in which spread is

[4] As discussed *infra* pp. 14-15, it is not yet known whether individuals previously infected with the virus become immune, or for how long any such immunity would last.

slowed by the immunity of individuals who had previously been infected with related strains of influenza virus.

Second, the virus is easily spread from one person to another—more so than influenza viruses—spreading through tiny droplets that infected individuals expel regularly when they speak, cough, sneeze, or the like. *See* CDC, *How COVID-19 Spreads* (Sept. 21, 2020).[5] These droplets may be transferred directly from one person to another, or through the touching of surfaces—for example, when an infected person touches a surface with a hand he or she has coughed into and then another person touches that same surface and then touches his or her face. *Id.* There is also evidence that the virus can be "aerosolized," with microscopic droplets remaining in the air for extended periods.[6] Transmission of the virus can occur in any location where there is close proximity between individuals, or in any location where multiple individuals touch the same surfaces. *Id.* While the degree to which an infected person spreads the virus to others depends on the precautions taken by that person, there have been numerous documented "super-spreader events," at which a single person causes widespread

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[5] Available at https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html.

[6] Fears et al., *Persistence of Severe Acute Respiratory Syndrome Coronavirus 2 in Aerosol Suspensions*, 26 Emerg Infect Dis. 2168 (Sept. 2020), https://wwwnc.cdc.gov/eid/article/26/9/20-1806_article; Lednicky et al., *Viable SARS-CoV-2 in the Air of a Hospital Room with COVID-19 Patients,* MedRxiv (Aug. 4, 2020), https://www.medrxiv.org/content/10.1101/2020.08.03.20167395v1.



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infection to a large number of people, often as a result of being in an indoor space with a large number of people for an extended period of time.[7]

Finally, individuals who have become infected with the virus can transmit the virus before showing symptoms of COVID-19. *See* CDC, *How COVID-19 Spreads*, *supra* n. 5. Many viruses can be spread by infected individuals only when those individuals have become symptomatic; for example, smallpox and the 2002 SARS virus. *See* CDC, *Frequently Asked Questions About SARS* (May 3, 2005).[8] The virus that causes COVID-19, however, can be spread by an infected individual who is not yet manifesting any symptoms—that is, people infected with the virus may spread it without knowing that they have it. *Id.* Compounding matters, this virus has a relatively long incubation period, or period between when an individual is first infected and when he or she begins to show symptoms. CDC, *Interim Clinical Guidance for Management of*

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[7] *See, e.g.*, Hamner et al., *High SARS-CoV-2 Attack Rate Following Exposure at a Choir Practice — Skagit County, Washington*, *March 2020*, 69 Morbidity & Mortality Wkly. Rep. 606 (May 15, 2020), https://www.cdc.gov/mmwr/volumes/69/wr/mm6919e6.htm (detailing incident in which between 53.3% and 86.7% of choir members were infected as result of a single infected person attending choir practice); Woodward, *Coronavirus Super-Spreader Events All Have Notable Similarities—and They Reveal the Types of Gatherings We Should Avoid for Years*, Business Insider (May 14, 2020), https://www.businessinsider.com/coronavirus-super-spreader-events-reveal-gatherings-to-avoid-2020-5 (describing super-spreader events in Daegu, South Korea; Westchester, New York; Chicago, Illinois; Westport, Connecticut; Pasadena, California; and Skagit County, Washington); *Maine 'Superspreader' Wedding Linked to 170 COVID Cases and Seven Deaths*, The Guardian (Sept. 17, 2020), https://www.theguardian.com/us-news/2020/sep/17/maine-wedding-superspreader-event.

[8] Available at https://www.cdc.gov/sars/about/faq.html.



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*Patients with Confirmed Coronavirus Disease (COVID-19)* (updated Sept. 10, 2020).[9] As a result, an individual may spread the virus for several days before having any indication that he or she has been doing so. And some individuals may be completely unaware that they have been spreading COVID-19; an estimated 40% of infections are asymptomatic, but asymptomatic individuals may also be infectious. CDC, *COVID-19 Pandemic Planning Scenarios, Table 1* (Sept. 10, 2020).[10] Presymptomatic and asymptomatic transmission, combined with the lack of widespread testing discussed *infra* pp. 12-13, means that isolating only persons known to be infected will not stop the spread of the virus.

### B. The Virus Poses Severe Risks to All People, Particularly but Not Limited to Certain High-Risk Populations.

The virus targets the human respiratory system and has presented a substantially higher fatality rate than other viruses that have circulated among the American public through similar means of transmission in recent decades. Individuals with confirmed cases have displayed a range of symptoms, and while the most severe symptoms have appeared most frequently in certain high-risk populations, all people are at risk of contracting severe cases.

The common symptoms are fever, cough, and shortness of breath; other identified symptoms include muscle aches, headaches, chest pain, diarrhea, coughing up blood,

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[9] Available at https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-guidance-management-patients.html.

[10] Available at https://www.cdc.gov/coronavirus/2019-ncov/hcp/planning-scenarios.html.

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sputum production, runny nose, nausea, vomiting, sore throat, loss of senses of taste and smell. *See* CDC, *Symptoms of Coronavirus*, *supra* n. 3. Clinical manifestations may escalate to respiratory failure and other serious, life-threatening complications. *Id.* Due to the respiratory impacts of the disease, individuals may need to be put on oxygen, and in severe cases, patients may need to be intubated and put on a ventilator. Approximately 2.9% of Americans, and 1.7% of Missourians, with confirmed cases of COVID-19 have died from it.[11]

People of every age can and have contracted COVID-19, including severe cases. *See, e.g.*, Hubler, *"Super Healthy" College Student Dies of Rare Covid-19 Complications*, N.Y. Times (Sept. 29, 2020). But certain groups are particularly at risk. Older patients are at the greatest risk of severe cases, long-term impairment, and death. *See* CDC, *Symptoms of Coronavirus*, *supra* n. 3. Likewise, those with immunologic conditions and with other pre-existing conditions, such as hypertension, certain heart conditions, lung diseases (*e.g.*, asthma), diabetes mellitus, obesity, and chronic kidney disease, are at high risk of a life-threatening COVID-19 illness. *See* CDC, *People at Increased Risk for Severe Illness*.[12] Many of these are common conditions in the population. For example, 34.8% of Missouri adults have obesity, and 30.9% of Missouri

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[11] Ctr. for Systems Science and Engineering at Johns Hopkins University, *COVID-19 Dashboard*, *supra* n. 2; State of Missouri, *COVID-19 in Missouri*, *supra* n. 2.

[12] Available at https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-at-higher-risk.html (Sept. 11, 2020).

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adults have hypertension.[13] The CDC estimates that six in ten American adults have at least one chronic medical condition. *See* CDC, *Chronic Diseases in America* (Sept. 14, 2020).[14] Information available to date shows that, if infected with the virus, racial and ethnic minority populations, especially African Americans, are at a substantially elevated risk of developing life-threatening COVID-19 illnesses and of dying of COVID-19. *See* CDC, *Health Equity Considerations in Racial and Ethnic Minority Groups* (July 24, 2020).[15]

It is not yet fully understood which populations or preexisting conditions are at the greatest risk of developing severe cases. For example, while children have generally been believed to be less susceptible to severe cases of COVID-19, there is emerging evidence that children infected with the virus that causes COVID-19 may experience severe, even deadly, inflammation of the heart, lungs, kidneys, brain, skin, eyes, or gastrointestinal organs. *See* CDC, *Multisystem Inflammatory Syndrome in Children (MIS-C) Associated with COVID-19* (May 20, 2020).[16] It is also not yet fully understood what the low-term effects of COVID-19 are or how those long-term effects may vary

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[13] *See* CDC, *Adult Obesity Prevalence Maps* (Sept. 21, 2020), https://www.cdc.gov/obesity/data/prevalence-maps.html; CDC, *BRFSS Prevalence & Trends Data, Missouri: High Blood Pressure*, https://www.cdc.gov/brfss/brfssprevalence (accessed Oct. 3, 2020).

[14] Available at https://www.cdc.gov/chronicdisease/tools/infographics.htm.

[15] Available at https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/racial-ethnic-minorities.html (accessed Sept. 30, 2020).

[16] Available at https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/children/mis-c.html.

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across different populations, but there is evidence that COVID-19 may have long-term effects including heart damage, especially among older patients with underlying illness. *See* CDC, *Long-Term Effects of COVID-19* (Sept. 16, 2020).[17]

### C. At Present, Transmission of the Virus Can Effectively Be Prevented Only Through Social Distancing and Related Measures.

Generally, transmission of viruses long-established in the population may be prevented through, *inter alia*, testing and isolation of confirmed cases, vaccinations, and the presence of widespread (or "herd") immunity in the population. As detailed below, these mechanisms are unlikely to prevent the spread of this virus in the near future. Accordingly, social distancing and related measures are the only known effective measures for preventing the spread of the virus among the general public, with those related measures including the wearing of masks, handwashing, and the cleaning and disinfecting of surfaces.

Testing for the virus is currently not available at a scale that would allow the identification and isolation of infected individuals to an extent sufficient to prevent further spread of the virus. Given the lack of widespread testing in the United States, including in Missouri, combined with the long incubation period of the virus, it is not presently possible to identify and isolate all infected individuals in a manner that would prevent further spread. Indeed, a recent study estimates that the United States is

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[17] Available at https://www.cdc.gov/coronavirus/2019-ncov/long-term-effects.html.

identifying only one in ten cases of COVID-19, because of insufficient testing rates.[18] Since the start of the outbreak and through the present, the United States generally, and Missouri in particular, has failed to conduct enough tests to allow for containment of the spread of COVID-19. Missouri's current daily testing rate of 158 tests per 100,000 people is also only 26% of the testing target that researchers recommend it administer in order to mitigate the spread of the virus.[19] Missouri presently ranks 41 out of 50 states in the number of per capita tests administered since the pandemic, and researchers have concluded that the high rate at which Missourians who are tested are found to have COVID-19 indicates that Missouri "is only testing the sickest patients who seek medical attention, and is not casting a wide enough net to know how much of the virus is spreading within its communities."[20]

In short, there is no widely available way for an individual to confirm that he or she has or has not been infected prior to engaging in activities that would entail contact with others. To prevent increasing the scope of the outbreak of COVID-19, it must be assumed that anyone could be infected and infect another person.

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[18] Havers et al., *Seroprevalence of Antibodies to SARS-COV-2 in 10 Sites in the United States*, J. Am. Med. Ass'n (July 21, 2020), available at https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2768834.

[19] *See* Collins, *Is Your State Doing Enough Coronavirus Testing?*, New York Times (Oct. 2, 2020), https://www.nytimes.com/interactive/2020/us/coronavirus-testing.html.

[20] Johns Hopkins University, *Which U.S. States Meet WHO Recommended Testing Criteria?* (Oct. 2, 2020), https://coronavirus.jhu.edu/testing/testing-positivity; Johns Hopkins University, *Cases, Deaths, and Testing in All 50 States* ( Oct. 2, 2020), https://coronavirus.jhu.edu/testing/states-comparison/testing-state-totals-bypop.



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Vaccination is unlikely to be a viable option for preventing the spread of the virus at least through November, and likely for substantially longer. There is not yet any FDA-approved vaccine that could be used to immunize the population to the virus. It is unlikely that an FDA-approved vaccine will be available for some time. Indeed, even in the extraordinarily unlikely event that a vaccine is demonstrated to be safe and effective within the next few weeks, it would take several months to produce, distribute, and administer supplies of the vaccine at a sufficient scale to provide for widespread vaccination of the general public. *See* Ercolano, *A Coronavirus Vaccine is in the Works—But It Won't Emerge Overnight*, Johns Hopkins University (April 16, 2020).[21] Even under an optimistic scenario, it is unlikely that widespread vaccination will have occurred before summer 2021, a timeline that could be delayed yet further if a substantial portion of the population declines to be vaccinated due to safety concerns.

Similarly, the presence of widespread, or "herd," immunity in the population is unlikely to prevent the spread of the virus at least through November, and likely for substantially longer. Herd immunity is present when a high percentage of the population has become immune to an infectious disease. Such herd immunity would dramatically slow the spread of the virus, as infected persons can become dead-ends for the virus, so to speak, because the people they interact with are immune to further transmission. A substantial majority of a population must be immune in order to achieve herd immunity, depending on the infectiousness of the agent. In this context, an individual's immunity

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[21] Available at https://hub.jhu.edu/2020/04/16/coronavirus-vaccine-timeline.

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can come from either a vaccine or from previous infection. Due to the virus's novelty, we do not know whether any immunity generated by previous infection lasts permanently or for a specified period, or the likelihood of reinfection, though scientists have identified a limited number of reinfection cases.[22] As a result, herd immunity is unlikely unless and until the development and widespread use of an effective vaccine or a sufficiently high proportion of the population has been infected and rendered immune. In any event, achieving herd immunity through the spread of the virus through a large share of the population would entail a level of death an order of magnitude greater than the approximately 200,000 Americans already lost to COVID-19. Aside from such a catastrophic level of spread—which, in any event, would be unlikely to occur by the November election even if the virus were left unchecked—herd immunity is unlikely unless and until the development and widespread use of an effective vaccine.

As neither testing nor vaccination nor herd immunity will be viable mechanisms for preventing the spread of the virus in the near future, the only ways to limit its spread are self-isolation, social distancing, mask wearing, frequent handwashing, and disinfecting surfaces. Self-isolation involves not physically interacting with those outside one's household. Social or physical distancing is maintaining at least six feet of distance between individuals. Both of these interventions are aimed at keeping infected

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[22] CDC, *Duration of Isolation & Precautions for Adults With COVID-19* (Sept. 10, 2020), https://www.cdc.gov/coronavirus/2019-ncov/hcp/duration-isolation.html; Saplakoglu, *Lab Confirms First Case of Coronavirus Reinfection in the U.S.*, LiveScience (Aug. 28, 2020), https://www.livescience.com/coronavirus-reinfection-case-confirmed-us.html.

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individuals far enough apart from other individuals so that they do not pass the virus along. Frequent handwashing and regular disinfecting of surfaces can help curb the spread via contaminated surfaces.

While we cannot yet definitively determine the full effects of social distancing measures, social distancing has worked to slow the spread of respiratory viruses generally and in places that are ahead of Missouri and the United States in the current pandemic. There is evidence that cities, counties, and states that implemented stay-at-home orders experienced substantially reduced transmission. *See, e.g.*, Rubin et al., *Association of Social Distancing, Population Density, and Temperature With the Instantaneous Reproduction Number of SARS-CoV-2 in Counties Across the United States*, J. Am. Med. Ass'n (July 23, 2020);[23] Matrajt & Leung, *Evaluating the Effectiveness of Social Distancing Interventions to Delay or Flatten the Epidemic Curve of Coronavirus Disease*, 26 Emerging Infectious Diseases 1740, Aug. 2020;[24] Sen et al., *Association of Stay-at-Home Orders With COVID-19 Hospitalizations in 4 States*, 323 J. Am. Med. Ass'n 2522 (May 27, 2020).[25] And there is evidence that when cities and states have "reopened," or scaled back measures that reduced person-to-person interactions, there has

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[23] Available at https://jamanetwork.com/journals/jamanetworkopen/fullarticle/2768570.

[24] Available at https://wwwnc.cdc.gov/eid/article/26/8/20-1093_article.

[25] Available at https://jamanetwork.com/journals/jama/fullarticle/2766673.

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been a significant uptick in COVID cases. After Missouri began reopening, for example, there was a 134% increase in daily cases from May 4 to July 9.[26]

* * *

Given the virus's contagiousness and severity—and given that it is unlikely that testing, vaccination, and herd immunity will prevent the spread, at least in the coming weeks—it is essential that all individuals, no matter their testing status or membership in a high-risk group, take measures to prevent the spread of the virus, including by minimizing contact with individuals outside their household and avoiding spaces in which large numbers of people gather in proximity and touch the same surfaces.

## II. Polling Locations Present Unavoidable Increased Risks of Transmission of the Virus that Causes COVID-19.

The risk of transmission is particularly acute at polling locations, where large numbers of people congregate indoors and touch common surfaces that can carry the virus. Attempts to minimize these risks are unlikely to effectively prevent spread, given limitations in widespread testing and availability of personal protective equipment. In other states that have moved forward with in-person voting during the pandemic, poll workers have subsequently tested positive for COVID-19 and public health authorities have surmised that person-to-person transmission occurred at polling locations. *Infra* pp.

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[26] Gamio, *How Coronavirus Cases Have Risen Since States Reopened*, N.Y. Times (July 9, 2020), https://www.nytimes.com/interactive/2020/07/09/us/coronavirus-cases-reopening-trends.html.

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25-26. Similar risks will be present in Missouri's upcoming election, and voters will be placed at great risk if not given the option of voting absentee.

**A. Polling Locations Pose Inherent Virus Transmission Risks.**

As discussed *supra* pp. 7-9, the virus can spread when individuals are in close proximity and when individuals touch common surfaces. Both conditions are likely to be present at polling locations.

Polling locations are often situated in crowded, poorly ventilated, indoor sites where voters are exposed to each other for extended periods of time. Identification cards and ballots need to physically exchange hands. This makes them prime vectors for virus transmission. Voters, observers, greeters, and other poll workers must all congregate in places with low ventilation, which creates conditions for airborne transmission. These settings are not unlike those that researchers believe may have contributed to transmission among medical staff and major outbreaks in nursing facilities. *See* Prather, et al., *Reducing Transmission of SARS-CoV-2*, Sci. (May 27, 2020).[27]

The virus can also be transmitted through contaminated surfaces. Polling locations contain many common surfaces that virtually all voters must touch, such as doors, poll books, pens, identification cards, and voting machines. A voter carrying the virus may spread droplets to one of these surfaces, where the virus can live for up to three days. An otherwise healthy voter might touch the contaminated surface, pick up the

[27] Available at https://science.sciencemag.org/content/early/2020/05/27/science.abc6197.full.pdf.

virus, and inadvertently complete the transmission by touching their face with the contaminated hand.

The dangers posed by polling sites may be particularly pronounced in the coming election. High turnout or a lengthy voting process can result in long wait times, furthering the risks posed by voters gathering in proximity and in indoor spaces. Missouri has a history of long lines on election day, particularly in highly anticipated contests with long ballots. *See Election Officials Say Delays at Polling Locations Attributed to Heavy Turnout, Lengthy Ballot*, 41 KSHB (Nov. 8, 2016) (reporting lines of over two hours in the November 2016 election).[28] Turnout in 2020 elections has been unusually high. Of the 34 states that held primaries in recent months, and for which data is available, 22 had higher turnout rates than in 2016.[29] Turnout for the November election is anticipated to be especially high because of high interest in this presidential election. A recent study found that 83% of registered voters say it really matters who wins the presidency, up from 63% in 2008 and 2012 and 74% in 2016.[30] The November election this year will feature not only contests for a congressional seat, statewide offices,

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[28] Available at https://www.kshb.com/news/political/missouri-and-kansas-voters-head-to-the-polls-on-election-day.

[29] Rakich, *There Have been 38 Statewide Elections During the Pandemic. Here's How They Went*, FiveThirtyEight (Aug. 3, 2020), https://fivethirtyeight.com/features/there-have-been-38-statewide-elections-during-the-pandemic-heres-how-they-went.

[30] *Election 2020: Voters Are Highly Engaged, But Nearly Half Expect to Have Difficulties Voting*, Pew Research Ctr. (Aug. 13, 2020), https://www.pewresearch.org/politics/2020/08/13/election-2020-voters-are-highly-engaged-but-nearly-half-expect-to-have-difficulties-voting.



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and the presidency, but also ballot measures on topics including redistricting and term limits, which may further extend waiting times. *See* Missouri Secretary of State's Office, *2020 Ballot Measures*[31]; U.S. Gov't Accountability Office, *Observations on Wait Times for Voters on Election Day 2012*, at 30-31 (Sept. 2014).[32] The crowds and lines resulting from higher turnout or longer ballot-completion times would further expose in-person voters to the risks of transmission inherent to polling locations.

These risks pose particular dangers to poll workers, who must spend long hours inside, in proximity to voters and other poll workers. And poll workers tend to disproportionately fall in high-risk age ranges: in the 2018 general election, 58% of poll workers were over 61, and 27% were over 70.[33] Individuals over 60 years old have tended to have the most severe complications and the highest rates of hospitalizations due to COVID-19. *See* Garg et al., *Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory-Confirmed Coronavirus Disease 2019 – COVID-NET, 14 States March 1-30, 2020*, 69 Morbidity & Mortality Wkly. Rep. 458 (April 17, 2020).[34]

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[31] Available at https://www.sos.mo.gov/elections/petitions/2020BallotMeasures (accessed Sept. 30, 2020).

[32] Available at https://www.gao.gov/assets/670/666252.pdf.

[33] *See Older People Account for Large Shares of Poll Workers and Voters in U.S. General Elections*, Pew Research Center (Apr. 6, 2020), https://www.pewresearch.org/fact-tank/2020/04/06/older-people-account-for-large-shares-of-poll-workers-and-voters-in-u-s-general-elections; *see also KCMO Election Board Loses Poll Workers Ahead of Primary*, KSHB Kansas City (Mar. 9, 2020), https://www.kshb.com/news/local-news/kcmo-election-board-loses-poll-workers-ahead-of-primary (quoting estimate that significant portion of Kansas City poll workers are older and may fear COVID-19).

[34] Available at https://www.cdc.gov/mmwr/volumes/69/wr/mm6915e3.htm.

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### B. Mitigation Measures Could Not Fully Prevent COVID-19 Spread at Polling Locations.

The CDC and several states have recognized these risks and issued guidance for reducing transmission risk. *See, e.g.*, CDC, *Considerations for Election Polling Locations and Voters* (June 22, 2020).[35] But given the inherent transmission risks posed by polling locations, it is unlikely that mitigation measures, alone or in combination, would be completely effective in preventing spread at polling locations.

As an initial matter, it is not possible to prevent spread at polling locations by providing alternatives to in-person voting only for persons confirmed to be infected. Given the limitations on testing capacity discussed *supra* pp. 12-13, voters generally will not be able to undergo testing and receive results in advance of the deadline for requesting absentee ballots or in advance of the November election. And even if testing were far more widely available, and all symptomatic voters were to be tested, there would remain a high risk that an asymptomatic (but still contagious, *supra* pp. 8-9) voter would transmit the virus to others at the polls, either through close contact or by contaminating commonly used surfaces. Moreover, given that the last day for requesting an absentee ballot by mail is the second Wednesday prior to the election,[36] it is impossible for a voter

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[35] Available at https://www.cdc.gov/coronavirus/2019-ncov/community/election-polling-locations.html.

[36] Missouri Secretary of State's Office, *How to Vote: Absentee Voting*, https://www.sos.mo.gov/elections/goVoteMissouri/howtovote#absentee (accessed Sept. 30, 2020).

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to know by that date whether he or she will receive a positive diagnosis in the *thirteen days* between that deadline and the election.

Face masks can generally help reduce the risk of spread, but the efficiency of masks in preventing person-to-person transmission varies widely based on the material with which the masks are made and based on whether they are properly worn (covering both the nose and mouth). Medical-grade N95 masks, unavailable to the general population, can, if properly fitted and worn, prevent spread with a high degree of confidence. *See* CDC, *Optimizing Personal Protective Equipment (PPE) Supplies* (July 16, 2020).[37] But N95 masks are in short supply and should be reserved for healthcare workers, and even if more widely available would be difficult for the general public to have properly fit tested and tolerated at the required level of tightness. *Id.* By comparison, cotton masks can allow in more than half the number of droplets filtered by N95 masks. Voters, therefore, may show up at polling locations with varying levels of protection.

Moreover, voters or poll workers might refuse to wear a mask at all. Missouri does not have a statewide mask order, and mask requirements and enforcement are uneven at the county level. For example, St. Charles County does not have a mask requirement and has told its poll workers that they need only wear masks upon the request of a voter; the City of St. Louis, on the other hand, requires the wearing of masks

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[37] Available at https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/index.html (accessed Sept. 30, 2020).

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in indoor facilities, and the City of St. Louis Board of Election Commissioners has "strongly encourage[d]" voters to wear masks, but even in St. Louis the Board has stated that "it is the position of the Board of Elections that we cannot refuse an eligible voter the right to vote."[38] And given reports of Missourians who refuse to wear masks, including during the most recent election,[39] voters wishing to avoid infection may be deterred from voting at all by the prospect of being in an enclosed space with individuals who will not be wearing masks.

Frequent cleaning of surfaces is an important mitigation measure, but cannot fully eliminate the risk of transmission via surfaces, especially in a highly trafficked area such as a polling location. Recognizing the risks posed by common surfaces, CDC guidance for polling places emphasizes cleaning practices. *See* CDC, *Considerations for Election Polling Locations and Voters, supra* n.35. But the effectiveness of cleaning and

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[38] Schallhorn, *Where Are Masks Required in Missouri?*, Missouri Times (July 28, 2020), https://themissouritimes.com/where-are-masks-required-in-missouri; *August 4, 2020 Primary Frequently Asked Questions*, St. Louis Board of Election Commissioners (July 17, 2020), https://www.stlouis-mo.gov/government/departments/board-election-commissioners/news/august-4-2020-primary-frequently-asked-questions.cfm; Benchaabane, *"Act Surprised that You Don't Have a Face Mask on," St. Charles County Tells Election Day Workers*, St. Louis Post-Dispatch (Sept. 16, 2020), https://www.stltoday.com/news/local/govt-and-politics/act-surprised-that-you-don-t-have-a-face-mask-on-st-charles-county-tells/article_39335fa9-369b-5053-a009-180f27da977b.html.

[39] Morris, *Missouri Woman Pepper-Sprays Workers Who Asked Her to Wear a Face Mask*, Newsweek (Aug. 4, 2020), https://www.newsweek.com/missouri-woman-pepper-sprays-workers-face-mask-1522695; Schlinkmann, *Missouri's Third Coronavirus Election Builds on the First Two*, St. Louis Post-Dispatch (Aug. 4, 2020), https://www.stltoday.com/news/local/govt-and-politics/missouri-s-third-coronavirus-election-builds-on-the-first-two/article_f9521de7-94c0-5293-a63f-b5d50f813bda.html.

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disinfecting surfaces depends on frequency, and especially in a polling location with a large number of voters passing through, it is likely that surfaces may be touched by a large number of individuals between rounds of cleaning and disinfecting. The leading voting machine vendors have also issued guidance, related to cleaning their machines, that demonstrates the difficulties and potential unintended consequences of this mitigation measure in the voting context. *See* U.S. Election Assistance Commission, *Vendor and Manufacturer Guidance on Cleaning Voting Machines and Other Election Technology*.[40] Their guidance warns against inadvertently disturbing the machines' programming while wiping the surfaces, notes the need to power down machines before wiping them down, and advises that certain cleaning products might cause the machines to malfunction. *See id*. The difficulty of taking proper cleaning precautions is likely either to lead some poll workers to forgo proper cleaning or to exacerbate crowding and group exposure at polling sites resulting from malfunctioning machines.

While these and other mitigation measures may reduce the risk of transmission at polling locations, they should be considered as complementing, rather than substituting for, providing voters the option of voting absentee. Indeed, the CDC guidance begins by urging election officials to provide voters with "a wide variety of voting options." CDC, *Considerations for Election Polling Locations and Voters*, *supra* n.35. Given the transmission risks inherent to polling locations and the limitations of possible mitigation

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[40] Available at https://www.eac.gov/election-officials/vendor-and-manufacturer-guidance-cleaning-voting-machines-and-other-election (accessed Sept. 30, 2020).

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strategies, voters have a strong basis for isolating at home on election day to avoid contracting, or unknowingly spreading, the virus.

### C. Recent Elections Illustrate the Risks of Transmission at Polling Places.

The experiences of poll workers and voters in primary elections during the COVID-19 pandemic present cautionary tales for Missouri's November election. The lack of adequate testing and contact tracing prevented some of these states from definitively establishing the extent of virus transmission at polling locations, but the number of positive cases confirmed among poll workers and voters illustrates the risks that Missourians would have to take by entering a polling location or engaging in similar interactions with a notary.

In Wisconsin, which held an election on April 7, researchers have found that in-person voting rates are correlated with higher numbers of confirmed cases of COVID-19, and that absentee voting rates are correlated with fewer confirmed cases. *See* Cotti et al., *The Relationship Between In-Person Voting and COVID-19: Evidence from the Wisconsin Primary* 10, Nat'l Bureau of Econ. Research (Aug. 17, 2020) ("[A] 10% difference in in-person voters per polling location between counties is associated with approximately a 17.7% increase in the positive test rate.").[41]

Likewise, in the days after Florida's March 17 primary, two poll workers tested positive for COVID-19, one of whom had election day responsibilities that entailed handling the ID cards of some of the 61 people who voted at that location. *See* Man, *Two*

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[41] Available at https://www.nber.org/papers/w27187.pdf.

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*Broward Poll Workers, Including One Who Handled Voters' Driver Licenses, Test Positive for Coronavirus*, South Fla. Sun Sentinel (Mar. 26, 2020).[42] Finally, in Chicago, a poll worker stationed at a voting site during the March 17 primary died from the coronavirus just two weeks—the incubation period for the coronavirus—after the election. The Chicago Board of Elections subsequently sent a letter to all poll workers and voters who visited the location, which read: "Although the Board took every precaution possible by supplying poll workers with hand sanitizers, gloves and instructions for wiping down the equipment, the fact remains that you and an individual who has now tested positive voted at the same Polling Place[.]" Brown & Sfondeles, *South Side Man Died of COVID-19 Two Weeks After Serving as Election Judge*, Chi. Sun Times (Apr. 13, 2020).[43] Similar letters were sent to residents who visited three other polling locations in Chicago. *Id*.

**D. These Risks Will Be Present for Missouri's November Election.**

The risks discussed above will be present through at least the November general election at issue in this litigation. Reliable prevention can only be expected once a safe and effective vaccine has been tested, produced, distributed, and administered at scale to the general population, which will likely take at least until well into 2021. *Supra* p. 14. Likewise, because herd immunity has not developed in the general population, and will

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[42] Available at https://www.sun-sentinel.com/coronavirus/fl-ne-broward-elections-poll-workers-coronavirus-20200326-wmgy775dvjc5jis2oagxlpmule-story.html.

[43] Available at https://chicago.suntimes.com/politics/2020/4/13/21219934/illinois-election-day-judge-poll-worker-death-covid-19-primary-coronvirus-burke-pritzker.

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not develop until a vaccine has been created or a substantial portion of the population has been infected and rendered immune, COVID-19 will likely continue to be a threat through the November election.

Accordingly, giving voters the option of voting absentee would make the upcoming elections significantly safer, both for the voters who choose to vote absentee and for the poll workers and in-person voters whose polling locations will be less crowded as a result of absentee voting.

## III. Requiring Voters to Have Absentee Ballots Notarized Poses Similar Risks.

For the reasons explained above, during the present pandemic giving voters the option of voting absentee is significantly safer than requiring in-person voting. Absentee voters can avoid being in proximity to others whom they might infect or be infected by, and the virus is unlikely to be spread by mail. *See* CDC, *Frequently Asked Questions: Prevention* (Sept. 18, 2020).[44] But this benefit is substantially undermined if voters are required to meet with others in order to vote absentee. Requirements that many voters must have their absentee (or mail-in) ballots notarized would force voters to face risks similar to those they would face if voting in person.

Legislation signed in June, Senate Bill 631, allows voters in certain narrowly defined "at-risk categor[ies]" to cast absentee ballots without notarization, but most voters are required either to have a mail-in ballot notarized or to vote in person. *See* Rev. Stat. § 115.277.1(7); Missouri Governor Michael L. Parson, Press Release (June 4,

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[44] Available at https://www.cdc.gov/coronavirus/2019-ncov/faq.html.

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2020).[45] Under the bill, "at-risk categor[ies]" are limited to voters who (1) are over the age of 65, (2) live in a long-term care facility, (3) have chronic lung disease or moderate-to-severe asthma, (4) have serious heart conditions, (5) are immunocompromised, (6) have diabetes, (7) have chronic kidney disease and are undergoing dialysis, or (8) have liver disease. Rev. Stat. § 115.277.6. As discussed *supra* pp. 9-10, all people are at risk of contracting severe cases of COVID-19. Specific medical conditions associated with higher risk—including obesity and hypertension, *supra* pp. 10-11—are not covered by this bill. And while it is not yet fully understood which populations are at the greatest risk, racial and ethnic minority populations, especially African Americans, have been found to be at substantially elevated risk of developing severe cases. *Supra* p. 11.

Notarization requirements pose risks because few voters live with a person who can notarize their ballot. These individuals will be forced to meet with others from outside their household in order to obtain notarization. As discussed above, the virus is spread primarily through close contact with other people and contaminated surfaces. Accordingly, the notarization requirement forces a voter to abstain from voting, to vote in-person, or to meet one-on-one with another individual whom they may infect or by whom they may be infected. The requirement further may require voters to interact with other individuals while en route to a notary—especially if they take public transportation—or while entering the office of the notary.

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[45] Available at https://governor.mo.gov/press-releases/archive/governor-parson-takes-security-measures-safeguard-election-process-protect.

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The requirement further places notaries—who may not have proper personal protective equipment or training in proper measures for reducing the risk of spread—in the position of meeting with numerous voters from whom they may contract the virus or to whom they may spread it. Beyond presenting risks to each other, the two parties involved can also go on to transmit the virus to others, especially if, as is likely, the same person notarizes the ballots of several absentee voters.

Governor Parson and Secretary Ashcroft have recognized these precise risks of in-person notarization. In issuing an executive order allowing remote notarization in certain circumstances, Governor Parsons explained that the state "needed to do everything we can to ensure Missourians can still safely enter into contracts, sign mortgages, and update wills and personal health care directives without placing themselves or their notary at risk."[46] Secretary Ashcroft explained that avoiding in-person notarization would "allow real estate, business, and personal transactions to continue without endangering the health of Missourians," and that the order "is vital to protecting the safety of thousands of Notaries Public."[47] That order has been extended and then codified, but unlike these other transactions, remote notarization is not available for mail-in ballots, which must physically bear the notary's seal.[48] But Secretary Ashcroft's office was correct, in light

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[46] Press Release, *Governor Parson Signs Executive Order 20-08 Regarding Notary Public in Response to COVID-19,* Missouri Secretary of State, (Apr. 6, 2020), https://www.sos.mo.gov/default.aspx?PageId=9835.

[47] *Id.*

[48] *See* Brief of Appellants at 64.

of the risks posed by the virus that causes COVID-19, that avoiding in-person notarization requirements would "protect[] the health and safety of both notaries public as well as Missourians who otherwise would have been required to have close contact with the notary."[49]

## CONCLUSION

COVID-19 and the virus that causes it pose unique risks to which voters would be exposed if they are forced to vote at polling locations or through a process that includes going to a notary. In light of these risks, voters have strong reasons to self-isolate and avoid the risks of spreading or catching the virus. Allowing voting by absentee ballot without notarization would be a much safer option for public health than forcing voters to either forego their right to vote or to risk their—and the public's—health by voting in person or going to a notary.

[49] Press Release, *supra* n.46.



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## CERTIFICATE OF COMPLIANCE

I hereby certify, pursuant to Supreme Court Rule 84.06(c), that this brief includes the information required by Rule 55.03, was served through the Court's electronic filing system in compliance with Rule 103.08, and complies with the limitations contained in Rule 84.06(b). I further certify that this brief contains 7,251 words, excluding the cover page, certificates required by Rule 84.06(c), and signature block as directed by Rule 84.06(c), as determined by the Microsoft Word 2010 word-counting system.

*Michael A. Wolff*

## CERTIFICATE OF SERVICE

I hereby certify that on October 5, 2020, I electronically filed the foregoing brief with the Clerk of the Court using the Court's electronic filing system, which will send a notice of electronic filing to all counsel of record.

*Michael A. Wolff*

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# APPENDIX A

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# AMICI CURIAE

**Dr. Victoria J. Fraser, MD**, is the Adolphus Busch Professor of Medicine, chair of the Department of Medicine at Washington University School of Medicine, and physician-in-chief for Barnes-Jewish Hospital. She is also the director of the Clinical Research Training Center at Washington University and co-principal investigator of the university's Institute of Clinical and Translational Science. Dr Fraser is an expert in infectious disease, antibiotic resistance, and epidemiology. Her research is focused on preventing and controlling hospital-acquired infections, antibiotic resistance and preventing infectious diseases in health care workers and the community. Dr. Fraser has extensive experience identifying risk factors for infections, determining infectious morbidity, mortality and costs, and applying interventions in real-world settings to successfully reduce infections in hospitals and the community. Her research is funded by the Centers for Disease Control and Prevention and the National Institutes of Health. She is the principal investigator of a CDC Prevention Epicenters Program grant. She is the past President of the Society of Healthcare Epidemiology of America (SHEA) and a board member of the Infectious Disease Society of America (IDSA). She has received numerous awards for her research in infectious disease and epidemiology, including the SHEA Lectureship, the SHEA Investigator Award, the IDSA Maxwell Finland Lecturer, the Washington University in St. Louis Distinguished Faculty Award, the University of Missouri-Columbia School of Medicine Alumni Citation of Merit Award, and the Human Rights Campaign Foundation Ally for Equality Award. She is a Fellow in the American Association for the Advancement of Science and Master of the American College of Physicians. Dr. Fraser received her doctorate in medicine from the University of Missouri and was an internal medicine resident and chief resident at the University of Colorado. She completed a fellowship in Infectious Diseases at Washington University School of Medicine and Barnes-Jewish Hospital.

**Dr. Elvin Geng, MD, MPH**, is a Professor in the Washington University School of Medicine in the Division of Infectious Diseases. Dr. Geng earned MD and MPH degrees from Columbia University and subsequently completed post-doctoral training through the Aaron Diamond AIDS Institute (posted in Kunming, China) as well as fellowship training in infectious diseases at the University of California in San Francisco. From 2009 to 2019, he was a faculty member in the Department of Medicine, Division of HIV/AIDS, Infectious Diseases and Global Medicine at University of California at San Francisco, where he was most recently an Associate Professor of Medicine. Using the lens of implementation science, he conducts research to optimize the use of evidence-based interventions in the public health response to human immunodeficiency virus (HIV) infection. His work has been sponsored by the Bill and Melinda Gates Foundation and the National Institutes of Health. He serves in an advisory capacity for the World Health Organization, non-governmental organizations, and professional organizations. He is the author of over 125 peer-reviewed papers and is an academic editor at PLOS Medicine, a member of the editorial board of the Journal of the Acquired

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Immunodeficiency Syndrome and editor for implementation science at Current HIV/AIDS Reports.

**Dr. Megha Mehrotra, PhD, MPH**, is a postdoctoral scholar in Epidemiology and Biostatistics at UC Berkeley's School of Public Health and is currently volunteering for the California Department of Public Health COVID-19 response. Her research is on developing and applying causal inference methods for improving implementation of HIV prevention strategies. Dr. Mehrotra received her PhD in Epidemiology and Translational Science from the University of California, San Francisco in 2019. Her dissertation was entitled "From Trials to Public Health Impact: Transportability of Causal Effects to Inform Implementation of HIV Pre-exposure Prophylaxis." She has over 10 years of experience working in HIV prevention research.

**Dr. Aaloke Mody, MD**, is an Instructor in the Washington University School of Medicine in the Division of Infectious Diseases. Dr. Mody completed his infectious diseases fellowship in the Division of HIV, ID, and Global Medicine at UCSF. He completed his undergraduate training at UC Berkeley and then went to Duke University for medical school where he spent his third year conducting HIV and malnutrition research in Kampala, Uganda. He then completed his internal medicine residency at the Hospital of the University of Pennsylvania in Philadelphia, PA in their Global Health Track where he spent 3 months providing clinical care at Princess Marina Hospital in Gaborone, Botswana. Dr. Mody then came to the University of California San Francisco in 2015 to complete his infectious diseases fellowship. While at UCSF, he completed research based out of Lusaka, Zambia at the Centre for Infectious Disease Research in Zambia (CIDRZ), a nongovernmental organization that supports over 300 Ministry of Health-run clinics across two provinces in Zambia. He also completed his HIV continuity clinic at the Advanced Infectious Disease Center in Lusaka, Zambia, the only clinic that provides third-line ART regimens in Zambia. Dr. Mody's overall interest is in utilizing interdisciplinary implementation science research to understand how public health systems can be optimized to deliver high-quality and patient-centered HIV care in resource-limited settings.

**Professor Arthur L. Reingold, MD**, is Division Head of Epidemiology and Biostatistics at the University of California, Berkeley, School of Public Health. Professor Reingold has worked for over forty years on the prevention and control of infectious diseases both at the national level, including eight years at the U.S. Centers for Disease Control and Prevention, as well as with numerous developing countries around the world. He has directed or co-directed the CDC-funded California Emerging Infections Program since its inception in 1994. His research interests include vaccine-preventable diseases, respiratory infections including influenza, bacterial meningitis, disease surveillance, and outbreak detection and response. He has published over 350 original research papers on these subjects and teaches a wide variety of courses on related topics at the University of California, Berkeley and at numerous other universities around the world. Among other

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honors, he was elected to the Institute of Medicine of the National Academy of Sciences in 2003. He recently helped organize a National Academics of Sciences, Engineering, and Medicine ("NASEM") workshop on aerosol transmission of SARS-CoV-2 and he has been a member of the NASEM committee on the equitable distribution of COVID-19 vaccines.

**Dr. Sahar Saeed, PhD, MSc**, is an epidemiologist and post-doctoral scholar at Washington University in St. Louis. Over the past 15 years, she has developed specialized knowledge and methodological expertise studying inequities among people living with HIV. Dr. Saeed has successfully led and collaborated in research programs in the therapeutic areas of infectious diseases (predominately HIV, viral hepatitis and most recently, COVID-19), neonatology, and hepatology. While completing her doctoral studies at the Department of Epidemiology and Biostatistics at McGill University, she uncovered barriers to accessing hepatitis C treatments among people co-infected with HIV. At Washington University, she continues to bridge the gaps in the local and global response to HIV, by employing machine-learning methods to characterize psycho-social syndemics and how they relate to disengagement from HIV care in the United States and Zambia. Concerning COVID-19, she has volunteered for the Emergency Task Force to combat COVID-19 in long-term care facilities, for the Government of Quebec. She is currently evaluating how changes in mobility impact rates of transmission in the USA. She has published a total of 34 peer-reviewed articles and received 19 competitive fellowships and prizes, including from the Canadian Institutes of Health Research (CIHR).

**Dr. Enbal Shacham, PhD,** has been intersecting epidemiological, health behaviors and outcome and geospatial research throughout her career. She is a professor of public health at the Saint Louis University College for Public Health and Social Justice. Her research focuses on infectious and chronic disease prevention and management by leveraging how location impacts health outcomes. As the Director for the Health Lab at the Geospatial Institute at Saint Louis University, she conducts research and trains professionals on how location impacts health behaviors and conditions. Her previous work has included a large focus on HIV, sexually transmitted infections, and Zika. In relation to COVID-19, her research focuses on how location and community interactions influence transmission risk. Further, she leverages data and technology from the smart watch to the satellite image to more comprehensively respond to health challenges. Dr. Shacham also has extensive research and practice experience working in community and clinic settings to improve health outcomes, particularly in vulnerable communities.