

COVID-19 in Missouri

2020-2021

A Perspective on Origins, Spread & Controversies Part II

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AS THE FIRST CASES OF COVID-19

streamed into Missouri's hospitals in March 2020, the state's health care professionals faced a host of critically important and yet unanswered questions:

What specific risk factors could be identified and how should this knowledge be used to protect the most vulnerable? Who would be struck hardest: persons aged 20-40, as was the case with 1918 influenza, or children, older adults, or the immunocompromised?¹ Which measures would prove most effective in mitigating disease spread in the community?

The medical profession's painstaking process of answering these questions by conducting research studies and then implementing evidence-based actions based on the findings was much more time-consuming than expected by the public.

Therein lay the seeds of another conundrum. Frighted and impatient citizens encountered a myriad of conflicting sources of incomplete information.

Who could be trusted, and whose advice should be followed?

Which fork in the road should be taken: acceptance of public health best practices known to be effective, or maximization of "personal freedoms" by shifting responsibility to individuals to do as they chose while the pandemic ran its unpredictable course? Missourians' decisions would prove both highly consequential, as evidenced by the state's performance metrics two years after the pandemic's onset, and bitterly divisive.

During the first two years that we navigated COVID-19's uncharted waters much was learned regarding risk factors and the effective mitigation strategies of mask use and vaccination, subjects that will be addressed in this manuscript.

However, extreme differences of opinion soon emerged regarding the optimum approach to pandemic control and major barriers arose to the implementation of best-practice prevention strategies.

The long-forgotten lesson from the deadly 1918 influenza pandemic, that politics and public health don't mix, would be retaught to Missourians.

Risk Factors

Defining specific risk factors for COVID-19 was an early priority. Analyses of outbreaks provided valuable information about the medical conditions and societal factors that were associated with severe illness and death.

In the Seattle metropolitan area, the first epicenter of COVID-19 in the U.S., skilled nursing

facilities (SNF) were overwhelmed by COVID-19 outbreaks in February 2020. Multiple clusters in senior living facilities drew attention to the association between older age and worse prognosis. Subsequent analyses revealed a striking increase in risk of death per decade of advancing age beginning at age seventeen years.² Compared to a reference group of teenagers, death rate among persons

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aged forty years or older was 130-fold higher and octogenarians’ mortality was increased by a remarkable 8,700-fold.² In 2020 and 2021 almost three fourths of COVID-19 deaths occurred in persons aged sixty-five years or older, a group that accounted for just 13% of the U. S. population; only 4.2% of fatal cases were in individuals under age 45 years.³

Early outbreaks in Missouri shed light on the association between crowded living or working conditions and increased disease incidence. Clusters were identified at SNFs, meatpacking plants, and prisons in the state. As of October 2021, more than 43,000 COVID-19 cases were reported at Missouri SNFs and long-term care facilities. Two centers reported >300 cases among residents and staff, 12 sites documented 200-300 COVID-19 infections, and 161 facilities identified between 100-200 illnesses.⁴

Employment in meatpacking plants in the first few months of the pandemic also was associated with high risk for infection. In Missouri, eighteen packinghouse outbreaks were identified by the end of 2021, the two largest of which were in Buchanan and McDonald Counties, with 622 and 371 confirmed cases, respectively.⁵ Among the incarcerated population nationwide, case rates were more than five-fold higher than in the general population; disease incidence in the Missouri prison system was increased by 1.8-fold. COVID-19 outbreaks were reported at prisons in Howard, Greene, and Jackson counties.^{6,7}

Many other risk factors were identified. Although most chronic medical illnesses increase

the risk of severe COVID-19, obesity, anxiety, diabetes mellitus with complications, and chronic kidney disease have been most strongly associated with mortality. Prognosis is negatively correlated with a rising count of chronic conditions.⁸

Targeting attention to members of the community with modifiable risk factors is a potential high-impact strategy. Of particular interest in Missouri is the intersection of the ongoing tobacco and obesity epidemics with COVID-19. A review of published papers suggested that smoking is an independent risk factor for COVID-19 disease progression and mortality.⁹ Missouri ranks tenth in the U. S. for tobacco use; 17.8% of adults and 24.8% of high school students smoke or use chewing tobacco or snuff.^{10,11} Further, a linear correlation has been identified between increasing body mass index (BMI) and higher rates of COVID-19 related hospitalization.¹² Among Missouri’s adult population, 34% have a BMI 30 or higher; the state is the eighteenth most obese in the U. S.¹³ These data suggest that public health efforts to reduce tobacco use and obesity in Missouri may hold promise as strategies to mitigate severe COVID-19 in the state.

Public Health

Empowerment of public health authorities was one of the most notable historical inflection points in the United States’ path to economic prosperity. Directives to reduce the incidence of infectious diseases, by improving sanitation and minimizing the spread of contagious infections, became highly effective components of the time-honored public

health armamentarium. Multiple tools have been shown to reduce disease spread including case identification and reporting; contact tracing; quarantine (requiring exposed persons to stay home during the potential incubation periods of their illnesses); isolation (following the same practice for individuals with known infections); stay at home orders; closures of public places during pandemics; travel limitations; and vaccination requirements.¹⁴ Mask mandates, widespread but controversial during the 1918 influenza pandemic, were another potential strategy albeit one rarely utilized prior to COVID-19.¹⁴ The effectiveness of these public health measures, in combination with other factors including availability of antimicrobials, has been stunning. Over the course of the 20th century the lifespan for U. S. men increased from 46 to 76 years; for women, life expectancy jumped from 48 to 81 years.

Given the long-known benefits of mask use, physical distancing, and closures of public places in controlling respiratory viral pandemics, persons in authority were faced with major and controversial decisions about which mitigation strategies to pursue when COVID-19 struck. Missouri implemented fewer pandemic control measures than most other states. In 2020 the governor ordered bars and restaurants to close from March 23 to May 4. By comparison, the nationwide average closure period was from March 18 to November 24. A stay-at-home order was issued from April 6 to May 4; this 28-day closure contrasted sharply with the national average of 155 days.¹⁵ In total the Missouri governor issued seven public health orders and restrictions in 2020 and early 2021, leaving it to local governments to determine the best courses of action in their venues and to absorb more of the “heat” from their disgruntled constituents. In contrast St. Louis County issued thirty-four restrictions as of mid-2021, Boone County nineteen, and Kansas City eighteen.¹⁵

Masking Madates

Mask mandates emerged as an early and effective intervention for COVID-19 case reduction but soon became a lightning rod in the court of public opinion. The prevention benefit

of masking is derived from the combination of uninfected wearer protection and, especially, source control in infected individuals. Asymptomatic or presymptomatic infected individuals are estimated to account for over half of SARS-CoV-2 transmissions.¹⁶ Multiple laboratory, epidemiologic and population-level studies have demonstrated the benefit of community masking in preventing spread of COVID-19. One analysis determined that case rates were at least 50% lower in states with greater than 75% mask adherence.¹⁷ In Kansas, counties that “opted in” for mask mandates had almost a three-fold case reduction compared to those that did not.¹⁸ Missouri is one of only eleven states that never issued a state-wide mask mandate during 2020 and 2021. One analysis estimated that approximately 1,900 lives would have been saved in Missouri in the first year and a half of the pandemic had a mask mandate been implemented.¹⁹

An evaluation by the Missouri Department of Health and Senior Services revealed that disease incidence and mortality in the two cities (St. Louis and Kansas City) and the two counties (St. Louis and Jackson) that had mask mandates during the Delta variant surge in 2021 were lower than in the state’s 112 counties that did not require mask use. Daily case rate per 100,000 population in St. Louis and Kansas City was 15.8 as compared to 21.1 in counties without mandates.²⁰ We utilized this publicly available data to compare differences in daily incidence and mortality in the two groups of counties and cities from July 7, 2021 to October 31, 2021 (Figures 1 and 2.) Both disease incidence and mortality were significantly lower in the locations with mask mandates when assessed by paired t-tests ($p < 0.001$ for each analysis).

Despite ease of use and compelling supporting data for masking as a life-saving practice, anti-masking sentiment became a cause celebre in Missouri and nationwide and was characterized

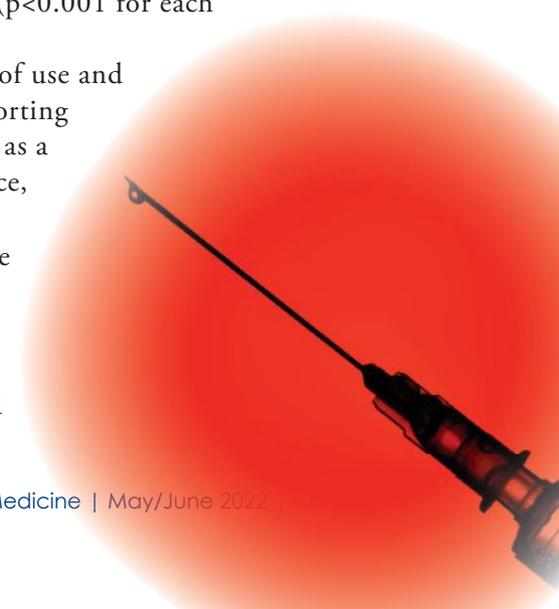
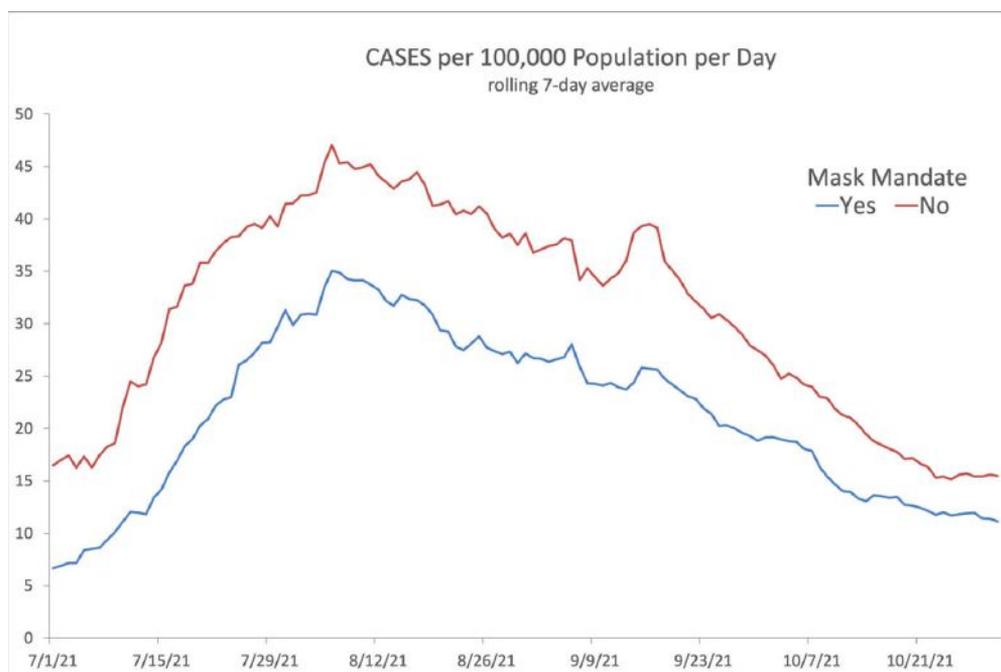


Figure 1. Cases of COVID-19 during Delta variant surge in Missouri cities and counties with mask mandates compared to counties without mandates, 2021.

Source: Documenting COVID-19 Project at the Brown Institute for Media Innovation



by many as an unacceptable violation of their personal liberty. As tensions mounted, increasing vitriol was directed at public health officials who found themselves in the exceedingly challenging, and nearly untenable, position of attempting to implement mitigation measures among an angry, unbelieving population who were being actively dissuaded from complying by prominent public figures. A dismaying, if unsurprising, finding during the pandemic was that 23.4% of all public health workers nationwide were “bullied, threatened, or harassed.”²¹

For more than 200 years health officials have been granted the authority under the Tenth Amendment to the U. S. Constitution to “control the spread of dangerous disease.”²² However, Missouri gained negative national attention when the Cole County Circuit Court ruled that the state’s Department of Health and Senior Services and its local health departments’ orders to help control the pandemic were “null and void”. After the judge’s ruling, twelve county health departments, sensing that their legal authorities to implement pandemic control measures were in jeopardy, ceased contact tracing, issuing quarantines, and publicizing their counties’ COVID statistics.²³ Further, the state’s attorney

general filed more than forty lawsuits against school districts, St. Louis County, and Kansas City to prohibit enforcement of mask mandates. Most of these lawsuits subsequently were dismissed.

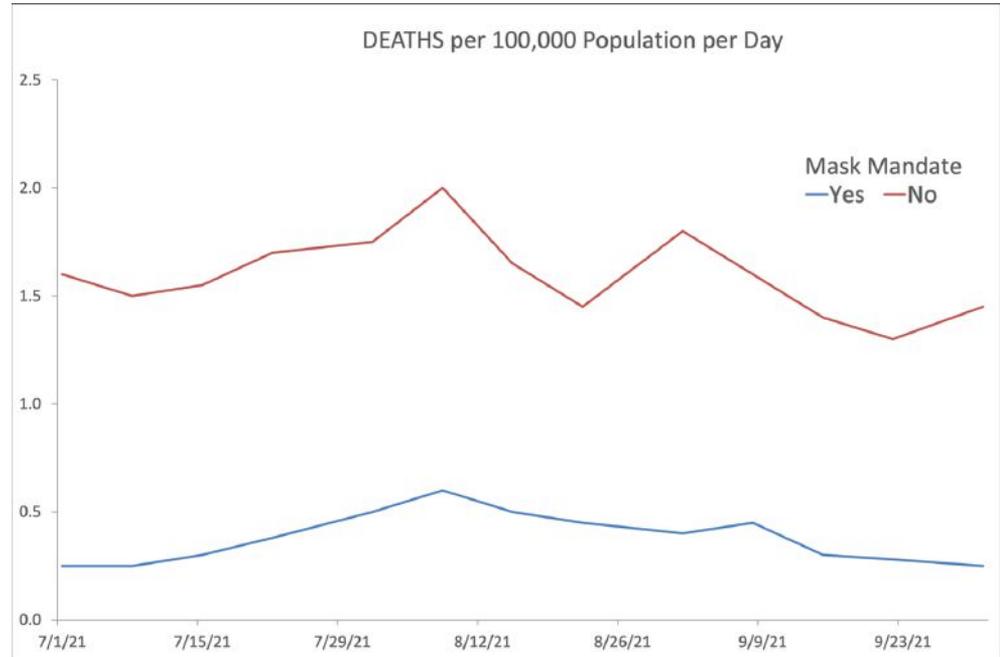
Vaccination

Prompt and prescient action by Dr. Barney Graham, then Deputy Director of the Vaccine Research Center of the National Institutes of Health (NIH), was critical in spearheading the early efforts to develop a vaccine even before COVID-19 had been declared a pandemic. Collaboration among thousands of scientists around the globe contributed to the development and availability of safe and highly effective vaccines less than a year after SARS-CoV-2 was first identified, a remarkable achievement.

The rapid approval of COVID-19 vaccines raised concerns among some about their safety. However, the basic science groundwork enabling the production of these vaccines was decades in the making. Researchers established a framework for a speedy response to new viral threats, utilizing multiple technologies developed in the past two decades. The characterization of specific antigen targets and immunogenic antibody lineages at

Figure 2. Mortality rates from COVID-19 during Delta variant surge in Missouri cities and counties with mask mandates compared to counties without mandates, 2021

Source: Documenting COVID-19 Project at the Brown Institute for Media Innovation



the molecular level enabled rapid development of vaccine candidates.^{24, 25}

Three COVID-19 vaccines are available in the United States: mRNA vaccines manufactured by Moderna[®] and Pfizer[®] (mRNA-1273 and BNY162b2 respectively), and a replication-incompetent adenovirus vector vaccine made by Johnson & Johnson[®] (JNJ-78436735). The rapid and widespread vaccination of Missourians is an urgent priority, as mRNA vaccines are more than 90% effective in reducing both the need for mechanical ventilation and the risk for mortality.²⁶ However, as of April 2022 the state ranked 39th in the country in vaccine uptake; only 54% of eligible Missourians had been fully vaccinated and more than one million of the state's residents remained vaccine-hesitant.²⁷

Many factors have been associated with refusal to receive a COVID-19 vaccine, perhaps the most striking of which is political affiliation.²⁸ Missourians historically have preferred limited government intervention in their lives. Past is prologue: a recent survey of vaccine-hesitant Missourians found that 34% cited lack of trust in the government as a leading influence in their thought processes.²⁹

Once COVID-19 vaccines became available,

there was marked variation in vaccine uptake among Missouri's counties, with full vaccination rates ranging from 20.4% to 65.2% by January 2022. Counties in Southeastern Missouri tended to demonstrate lower vaccination rates.³⁰ Individuals who chose not to be vaccinated arguably were engaging in risky behavior. To determine whether vaccine hesitancy correlated with increased acceptance of risk-taking behavior in general, we reviewed numbers of COVID cases, hospitalizations, deaths, and vaccination rates during the pandemic at the city, county, and state levels and assessed rates of adult cigarette smoking, another adverse health-related activity, in those counties (Figure 3).³¹ The association was significant, with smokers more likely to forgo vaccination ($y = -1.716x + 88.5$; $R^2 = 0.345$; $p < 0.0001$).

To determine if this association was a nonspecific assumption of risk and not the influence of another factor, we compared vaccination rates to a different risk-taking behavior, failure to wear automotive seat belts. Data on seat belt use is collected in a representative selection of counties annually by the Highway Safety and Traffic Division of the Missouri Department of Transportation.³² In contrast to smoking there was

MISSOURIANS SHOULD TAKE NOTE

of two important lessons learned from the 1918 influenza pandemic which held true in 2020 and 2021:

- 1. During pandemics, sound public health measures should trump political considerations.**
- 2. Saving lives should be prioritized above maximizing perceived personal freedoms.**

no significant correlation between seat belt use and vaccination status. Of note, smoking is an addictive behavior whereas seat belt use is not. These analyses suggest that the reasons for failure to receive vaccination are multi-factorial in nature and cannot be explained solely by willingness to accept risk to health.

Information sources and Messaging

Prior to the pandemic many Missourians had only a glancing familiarity, if any, with national and state public health agencies and experts. The National Institute of Allergy and Infectious Diseases (NIAID), a division of the NIH, is primarily a basic science research organization whose director has been thrust into the COVID-19 spotlight as the federal government’s leading public health spokesman. The Food and Drug Administration (FDA) is charged with regulating vaccines, drugs, and other products; its Vaccine and Related Biological Products Advisory Panel (VRBPAC) is an independent group of experts which advises FDA regarding vaccine efficacy and safety. The Centers for Disease Control and Prevention (CDC) assesses disease trends and provides guidance to health care facilities and public health programs. The Advisory Committee on Immunization Practices (ACIP), a panel of authorities from universities nationwide, offers specific recommendations to CDC for vaccine

use. At the state level, public health messaging is provided by the Missouri Department of Health and Senior Services (DHHS) and by county and city health departments.

Much has been learned much during the COVID-19 pandemic. First, the sheer number of federal and state agencies, with their complicated acronyms, is confusing to the public. Second, whereas these organizations and their consulting committees are comprised of some of the most brilliant and accomplished academic physicians, scientists, and public health experts in the world, to the general public their recommendations often are met with disdain as “government interference,” and with scorn for “authority”. Third, the public is caught in a maelstrom of conflicting opinions,

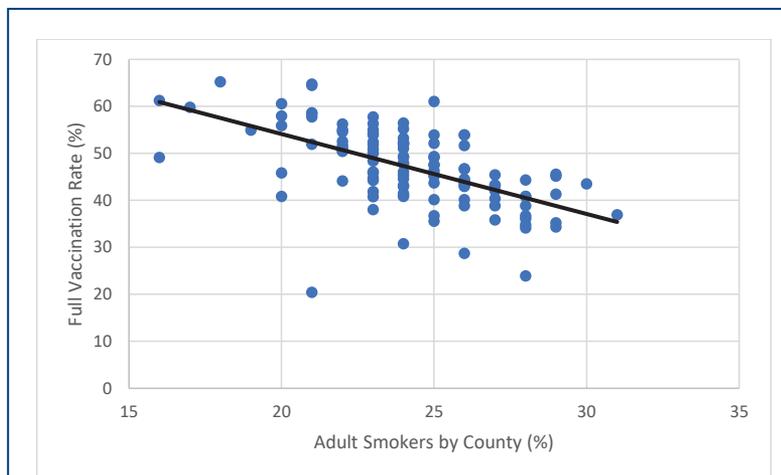


Figure 3. Rate of full coronavirus vaccination by Missouri county compared to rate of adult smoking in the same counties.

Metric	Missouri	United States	Rank
Mask mandate	No	39 other states had mandates	
Stay-at-home orders (mean duration)	28 days	155 days	
Closures of public places (mean duration)	42 days	215 days	
Fully vaccinated (%)	54	66.4	39 th
Mortality rate/year/100,000	329	301.19	31 st

Figure 4. Pandemic Mitigation Measures in Missouri, 2020-21.

many of which are based on widely prevalent and potentially harmful misinformation. Fourth, certain politicians, podcasters, and cable news personalities have deemed it advantageous to impugn the reputations of dedicated public officials whose knowledge bases and expertise vastly outpace their own. The net result is that during a once-in-a-lifetime crisis in which unity would have saved many lives, a massive chasm developed in the public’s opinions regarding the value of public health measures. This lack of widespread buy-in to effective but unpopular strategies for disease control had lethal consequences in many cases. With due respect to Abraham Lincoln, his aphorism that you can please all of the people some of the time has not held true during the COVID-19 pandemic.

It is notable that despite the pivotal role the CDC has played in the U. S. pandemic response, the previously fastidiously apolitical organization’s occasionally uneven and confusing messaging has muddied the waters periodically. Although the authors agree with Dr. Tim Lahey that “we should cut the CDC some slack for not being clairvoyant”, the agency’s evolving mask guidance sometimes has been hard to follow.³³ Another potentially concerning development is that the directors of CDC and FDA have each chosen to break with tradition by not following the guidance of their expert advisory committees (ACIP and VRBPAC respectively) regarding COVID-19 vaccine booster recommendations. These actions could have the unintended consequence of further eroding trust in federal health agencies.

Future Directions

The ultimate measure of the effectiveness of the United States’ response to COVID-19 has been the population’s survival during the pandemic. By this metric the country’s performance has been deeply concerning. In 2020, life expectancy declined by 1.9 years compared to the prior year, the most substantial reduction since the throes of World War II.³⁴ A further drop in lifespan of 0.4 years was documented in 2021. In comparison to 21 peer countries, the U.S. fared the worst in this regard, despite many of our citizens having access to state-of-the-art medical care.³⁵ As summarized in Figure 3, Missouri has been a laggard in the implementation of effective pandemic mitigation strategies. The state’s mortality rate ranks in the bottom 40% in the nation.

The end of COVID-19 is not yet in sight. Much of the public has long since ceased masking and physical distancing. However, the emergence of new variants and their eventual spread to Missouri remains a real threat. To help put the pandemic in the rear-view mirror, the medical profession should focus on overcoming the daunting obstacle of vaccine hesitancy, as widespread vaccination is our country’s most promising exit strategy. Physicians and nurses, who are in the unique position of being highly trusted advocates, have a golden opportunity to counsel our patients to make the potentially life-saving choice to receive COVID-19 vaccines and to allow their children to be vaccinated.

Missourians should take note of two important lessons learned from the 1918 influenza pandemic which held true in 2020 and 2021:

1. During pandemics, sound public health measures should trump political considerations.
2. Saving lives should be prioritized above maximizing perceived personal freedoms.

Restoration of the authorities of federal, state and local public health departments to take necessary steps during the pandemic without political interference is an urgent priority. Judicial actions and lawsuits filed by government officials to overturn mask mandates place our state and our nation on an anti-science slippery slope, at our peril. Missourians should trust the public health system and its dedicated and underappreciated personnel who are battling not only the many challenges of the evolving pandemic but also the headwinds of rampant misinformation which has driven a lethal wedge into our society.

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Disclosure

None reported.

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