

Why Should People Use Face Masks in the Time of COVID? The *JRI* Position

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Recommended Citation: Bordon J, Glynn A, Arnold FW. Why should people use face masks in the time of COVID? The *JRI* position. *Univ Louisville J Respir Infect* 2021; 5(1):Article 27.

The COVID-19 pandemic is likely an epic reshaping of human behavior across the globe. Beyond our knowledge of previous pandemics and infections, COVID-19 demanded extraordinary changes in our lifestyle. The virus spread rapidly across the globe due to its high transmissibility, and the extraordinary death toll was unprecedented. In the early stages of this pandemic, there was a sense of powerlessness leading us to isolation from public gathering. Under the leadership of the World Health Organization (WHO), the Centers for Disease Control and Prevention (CDC), and other organizations, the predominant response was to use preventive measures, including social distancing, hand washing and face masks. These measures have been very effective in preventing infection and containing the spread of infection in previous epidemics and pandemics. Ongoing protective measures are critical to mitigate the pandemic; however, controversies persist concerning the use of face masks as a protection measure against COVID.

One of the greatest privileges of today's world is the right to have our own opinion on any finding and to share it through digital media. Diversity of opinion makes our world rich with ideas; however, some opinions—well-intentioned or otherwise—can result in suffering and loss of lives.

Constructive scientists recognize the limitations of our knowledge and develop hypotheses in efforts to expand it. Unfortunately, in the time of the infodemic, not all medical research—particularly articles posted as preprints—undergo rigorous scientific scrutiny. Our journal previously published our position on preprints as potentially unreliable sources of knowledge.[1] Furthermore, traditional and social media are being used to spread misinformation and disinformation despite the efforts of infodemic surveillance organizations. In this note, we would like to address the controversy re-

garding whether the use of face masks by people in the community prevents infection and the spread of infection to others.

The CDC recommends the use of a face mask consisting of two or more layers of fabric for those not fully vaccinated or who have a weak immune system; masks are universally recommended (regardless of vaccination or immune status) in indoor public places and in public transportation to mitigate the spread of the Delta variant of SARS-CoV-2. For these purposes, the U.S. Food & Drug Administration defines a face mask as “a mask, with or without a face shield, that covers the user's nose and mouth and may or may not meet fluid barrier or filtration efficiency levels”.[2] In the case of non-medical face masks, filtration efficacy is variable. An important point for clarification is the mask filtration efficiency for particles including the SARS-CoV-2 virus. Typically, the virus is transmitted through the air by droplets—particles greater than 5 μm in diameter—however, it can also be transmitted in smaller particles (<1 μm). Filtration efficiency is the percentage of particles blocked by the mask. As a reference, medical masks are certified by the American Society for Testing and Material (ASTM) International with an efficiency $\geq 95\%$ (Level 1) or $\geq 98\%$ (Levels 2 and 3) for particles 0.1 μm in diameter.[3]

What does the current literature tell us?

Filtration efficiency

Van der Sande *et al.* reported the inward filtration efficiency for a 1-layer tea towel at 55–77% and outward at 17% for 0.02–1 μm particles.[4] The low outward efficiency could be explained by the 1-layer composition and the fact that particles are expelled from the upper respiratory tract and mouth, which are high pres-

sure spaces. Dato *et al.* reported an efficiency >90% for multilayer homemade masks. Overall, if we follow the CDC recommendation to use a ≥ 2 -layer fabric face mask, substantial protection is expected for the user, as well as substantial mitigation of viral spread.[5]

Effectiveness of mask use

The effectiveness of face mask use against past and present pandemics is well-attested in the literature. The following is a summary of the findings of five systematic reviews and meta-analyses on the subject.

In 2020, few studies of mask use against COVID-19 had been published; evidence primarily consisted of studies concerning other coronaviruses and other respiratory pathogens. In June 2020, Chu *et al.* found that across six studies, persons wearing face masks were at one-third the risk of infection from SARS-CoV and MERS-CoV, Betacoronaviruses similar to SARS-CoV-2, compared to those with uncovered faces (adjusted odds ratio [OR] 0.33, 95% confidence interval [CI] 0.17–0.61, $I^2=76\%$).[6] Liang *et al.* (July 2020) similarly found that across 21 studies, including one on SARS-CoV-2, face mask users were at 35% the risk of infection from respiratory viruses compared to those with uncovered faces (pooled OR 0.35, 95% CI 0.24–0.51, $I^2=60\%$).[7] In subgroup analyses, the OR [95% CI] for healthcare workers across 12 studies was 0.20 [0.11–0.37] and for non-healthcare workers across eight studies was 0.53 [0.36–0.79].

By 2021, richer literature on mask use against SARS-CoV-2 specifically was available for meta-analysis. In January 2021, Tabatabaeizadeh *et al.* demonstrated a significant reduction in SARS-CoV-2 infection risk with face mask use across four studies (pooled relative risk [RR] 0.12, 95% CI: 0.06–0.27, $P<0.001$).[8] In a meta-analysis by Hemmer *et al.* (February 2021) of 29 studies on SARS-CoV, MERS-CoV, and SARS-CoV-2, mask use was associated with one-third odds of infection (adjusted OR 0.04, 95% CI: 0.004–0.3 [N95 respirators] and 0.33, 95% CI 0.17–0.61 [other masks]).[9] Li *et al.* (July 2021) similarly found that across six studies, wearing a mask was associated with significantly reduced odds of COVID-19 infection (OR 0.38, 95% CI: 0.21–0.69, $I^2=54.1\%$).[10]

Effectiveness of government-mandated mask use

A 2021 cross-sectional study found that a 10% increase in self-reported mask use was associated with a more than three-fold increase in odds of transmission control (multivariate logistic regression model with 10-point

extrapolation, adjusting for confounders, physical distancing, and a time trend).[11] However, the study also found no statistically significant change in average mask usage as a result of government mandate. By contrast, MacIntyre *et al.* observed a statistically significant association between mask mandates and mask use in univariate regression analysis ($P<0.001$).[12]

In a 2020 ecological study, Fang *et al.* found that counties in states with face mask mandates were at significantly less risk of COVID-19 incidence, with an adjusted risk ratio of 0.8462 (95% CI: 0.7592–0.9433).[13] This association was observed during the second surge (May 28–September 12, 2020), but not during the first surge (up to May 28, 2020).

A study of SARS-CoV-2 spread prior to the start of vaccination found that the rapid implementation of mask mandates was associated with lower rates of infection.[14] States that implemented mask mandates 3–6 months after the start of their respective SARS-CoV-2 epidemic (defined as ≥ 50 cases present in the state) had an infection rate 1.61 times higher than states that implemented a mask mandate within one month (adjusted rate ratio 1.61 (95% CI: 1.23–2.10), $P<0.001$). States that implemented mask mandates after six months or did not implement mask mandates had an infection rate 2.16 times higher than states that implemented a mask mandate within one month (adjusted rate ratio 2.16 (95% CI: 1.64–2.88, $P<0.0001$).

Conclusion

Despite the many medical resources at our disposal, the landscape of the COVID-19 epidemic looks like a disastrous battlefield in the US. As of August 25, 2021, there have been 38,077,814 confirmed cases of COVID-19 and 630,840 deaths, while only 51.6% of the US population is fully vaccinated.[15, 16] The most recent complete epidemiological week (August 15–21, 2021) saw nearly a million new cases of COVID-19 reported to the CDC, the greatest surge since 1.7 million were reported at the beginning of 2021 (**Figure 1**). The surge is largely among the unvaccinated and demands extraordinary measures to contain it. Regardless of the relatively limited data and lack of optimal randomized controlled trials to confirm the benefit of face masks against COVID-19, the available data indicate a moderate protection that is crucial to protect our communities. We strongly recommend the use of face masks to the public in line with the recommendations of the CDC and the Infectious Diseases Society of America.

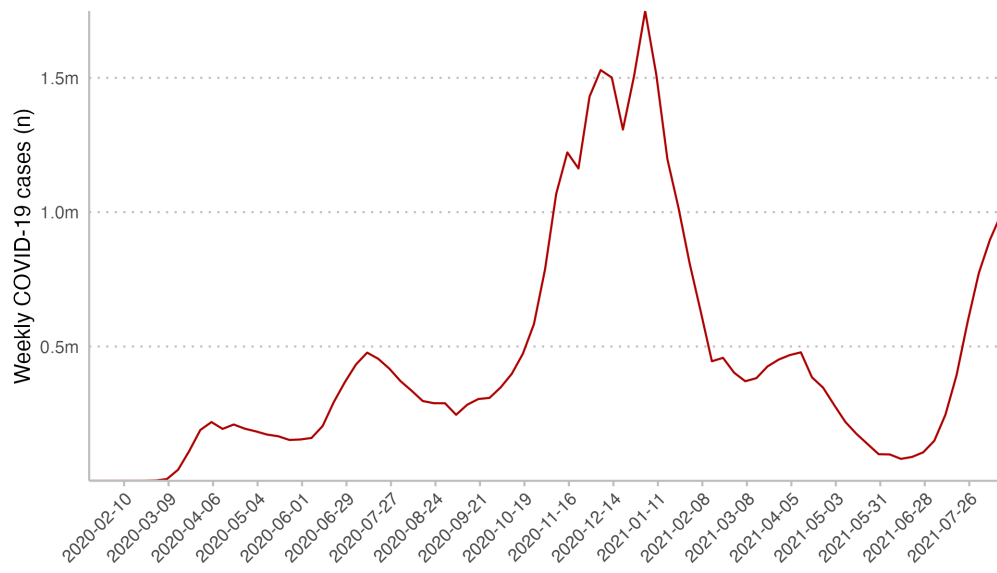


Figure 1. Cases of COVID-19 reported to the Centers for Disease Control and Prevention (CDC) per week.

Acknowledgements: The authors would like to thank Jessica Petrey, MSLS, for conducting the literature search.

Published: August 25, 2021

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Funding Source: The author(s) received no specific funding for this work

Conflict of Interest: All authors declared no conflict of interest in relation to the main objective of this work.

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