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# To "Mask" or "Not-To-Mask" for COVID-19 Protection?

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## ABSTRACT

Since the beginning of the SARS-CoV-2 pandemic in 2020, many have opined conflicting recommendations related to use of facial masks for COVID-19 protection for public use at large. This is due to several reasons including knowledge gap in the proper use of facemask in different strata of populations studied including studies at the community versus hospital/health care study settings. Additionally, most of the studies suffered from confounding variables such as social distancing, hand hygiene. Potential risks associated with mask use in public emerged as an important barrier to mask use. In this communication, we provide an update to our article from April 2020 on use of facial masks in public settings.

**Keywords:** Facemask, COVID-19 protection, Public health

**Abbreviations:** SARS-Cov-2: Severe acute respiratory syndrome Coronavirus: 2; COVID-19: Corona Virus Disease of 2019; RCT: Randomized Controlled Trial; CDC: Center for Disease Control; WHO: World Health Organization; nm: Nanometer; um: Micrometer; N95: 'N' stands for: Not resistant to oil '95' stands for: Filters at least 95 % of airborne particles

## SARS-COV-2 TRANSMISSION

According to the CDC, the principal mode of transmission for SARS-CoV-2 is primarily through exposure to respiratory droplets carrying infectious virus. A less important route of transmission is contact transmission through contaminated surfaces or objects (fomites) [1,2]. Emerging evidence during the pandemic supports aerosol transmission especially by super-spreaders, suggesting that airborne transmission is highly relevant for the spread SARS-CoV-2 [3].

## MASK EFFECTIVENESS

Wearing face masks may reduce transmissibility but requires at least two other factors: limiting contacts of infected individuals via physical distancing to reduce the transmission of infected respiratory particles and reducing the probability of transmission per contact [4]. Because respiratory particles become smaller due to evaporation; hence, they can remain suspended in air. Proponents of mask usage encourage mask wearing by infected individuals (acting as a source) with benefits at a population level. However, most of the time you do not know that is infectious as almost 60% of infections are reportedly transmitted from asymptomatic individuals [5].

Numerous published studies support the use of surgical masks in medical settings. During the preintervention period, the SARS-CoV-2 positivity rate increased exponentially from 0% to 21%, with a weighted mean increase of 1% per day and a case doubling time of 3.6 days (95% CI, 3.0-4.5 days). During the intervention period, the positivity rate decreased linearly from 14% to 11%, with a weighted mean decline of 0.49% per day and a net slope change of 1.65% (95% CI, 1.13%-2.15%; $P < .001$) [6]. Typically, in medical settings, healthcare personnel wear masks once and then discard them. In contrast, in community settings surgical mask use by the public is usually a voluntary event guided by mask availability, price and personal convenience. Furthermore, in community settings, individuals may wear their masks for extended periods and keep them in a convenient location for reuse.

In one observational study in China, the use of face masks in the community led to 79% reduction of secondary transmission of SARS-Cov-2 in households if the masks were used by all members of a household prior to symptoms developing [7]. Findings from one of the few available

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randomized open-label controlled trials on mask use in community settings show that masks do not appear to confer a benefit for community users with wide confidence intervals for their odds ratios (may provide protection as well as may increase risk of infection). This study is a good demonstration why a randomized control study (RCT) of mask use in the community is difficult to undertake because of the many uncontrolled variables (for example: distancing, proper use of masks, proper maintenance of masks) that may contribute to the outcomes of the study (COVID-19 infection [8].

## DIVERGENT CONFLICTING RECOMMENDATIONS

Here, we provide a brief review of conflicting recommendations. In general, studies were of low quality. For example, a Cochrane review on physical interventions to interrupt or reduce the spread of respiratory viruses, included 67 RCT and observational studies which showed that "overall masks were the best performing intervention across populations, settings and threats." Interestingly, in another study, from the same Cochrane review on studies with mask alone intervention without hand hygiene or social distancing and excluding observational studies concluded "there was insufficient evidence to provide a recommendation on the use of facial barriers without other measures" [9].

The Usher institute has laboratory as well as epidemiological evidence for benefit of homemade masks stating: "face masks in the general population offered significant benefit in preventing the spread of respiratory viruses especially in a pandemic situation; however, the benefit is limited by inconsistent adherence to mask usage [10,11]. Conducted an ecological study to assess the range of policy interventions by country and population characteristics to infer the relationship between mask use and SARS-CoV-2 transmission. In this study the authors found that SARS-CoV-2 transmission was 7.5 times higher in countries that did not have a mask mandate or universal mask use. Another study looked at the difference between US states with mask mandates and those without and found out that daily growth rate of COVID-19 is 2.0 percentage points lower in states with mask mandates [12]. Both studies support association but not necessarily causation.

## RISKS OF MASK USE

Some proponents against use of face masks argue that masks are not ideal for several reasons including effect on breathing physiology, lack of efficacy, psychological effects, psychological effect and economics. For example, chronic mask wearing may lead to measurable chronic hypoxemia and hypercapnia which leads to health deterioration and exacerbation of existing condition increasing morbidity and mortality [13].

Physical properties of masks affect performance properties of the mask. For example, SARS-Cov-2 virus has a diameter of 60 nm to 140 nm while medical and non-medical facemasks' thread diameter ranges from 55 um to 440 um which is 1000 times larger than viral particles. Hence, viruses can easily pass-through masks [14].

Proponents against mask wearing also support their views based on published studies. For example, one meta-analysis among health care workers found that compared to no masks, surgical masks and N95 respirators were not effective against transmission of viral infections or influenza like illness based on six RTCs [15]. A recent systematic review of 39 studies including 33,867 participants in the community with self-report illness found no difference between N95 respirators versus surgical masks and surgical masks versus no masks in the risk of developing influenza or influenza like illness [16].

Moreover, regulatory bodies such as WHO and CDC among many others have promoted conflicting recommendations during the pandemic exacerbating the problem. For example, early in the pandemic, WHO recommended: "facemasks are not required, as no evidence is available on its usefulness to protect non-sick persons." WHO, in the same publication, also declared that "cloth (for example, cotton or gauze) masks are not recommended under any circumstance [7]. A later publication by WHO contradicted this view stating fabric-made masks is a general community practice for "preventing the infected wearer transmitting the virus to others and/or to offer protection to the healthy wearer against infection".

## CONCLUSION

Although there are numerous studies in support of mask use for the public, the studies are generally of low quality and are generally confounded which markedly affects their validity. On the other hand, mask use in medical settings has a good evidence base to support use of masks in the healthcare setting. So, what are we to do in the face of all the conflicting data?

In summary, we continue to advocate for COVID-19 vaccination, social distancing, avoiding indoor crowding and hand sanitizing as the primary measures to prevent SAR-CoV-2 transmission. Further, we believe that there is a role for mask use indoors especially when crowding is anticipated. Our definition of crowding is the presence of 2 or more people. We believe that the new CDC recommendations limiting outdoor use of masks particularly for vaccinated individuals are relevant and timely [17]. However, for non-vaccinated adults (a substantial number in the population given that children are not vaccinated) we still recommend mask use indoors and outdoors especially in the presence of others. We expect that guidelines and recommendations will continue to be in-flux due to the emergent SARS-CoV-2 variants.

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