

Face Shields and Acrylic Barriers to Reduce Transmission of SARS-Cov-2: Literature Review as of February 16, 2021

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Throughout the COVID-19 pandemic, masks, hand hygiene, and social distancing have become the forefront of the personal protection trifecta for the general public. Masks can create an issue, though, for those that are deaf or hard of hearing, as visualization of the mouth is lost during conversation. Additionally, in classrooms where seeing an instructor's mouth is essential (i.e.: foreign languages), masks produce a possible hinderance to face-to-face learning. Therefore, face shields have been suggested as a possible replacement for masks. The following is a summary of the literature on the protective abilities of face shields from transmission.

Of the literature found, no studies look at the efficacy of face shields alone in the general public. Most of the studies found are done in healthcare settings or are simulations within a lab and also include some sort of mask component. In general, face shields when worn with a mask, have been shown to reduce the risk of infection within health care workers by means of reducing the amount of detectable virus on the mask worn behind it.^{1,2} A systematic review found the use of eye protection (with no distinction between face shields or goggles) also reduced the risk of infection.³ The most direct evidence of the efficacy of face shields is a simulation study by Lindsley et al. In this study, they showed that face shields could reduce viral exposure on a mask by 96% from a simulated cough 18 inches away. Additionally, after 30 minutes of exposure, face shields blocked 68% of small aerosol particles from reaching the mask behind it, of note is the small particles used may be smaller than the aerosolized version of SARS-Cov-2. Face shields are able to block the initial forward motion of the exhaled jet; however, aerosolized droplets expelled with the jet are able to move around the visor with relative ease to enter the environment.⁴

Ronen et al. conducted a study that utilizes a cough simulator to look at the efficacy of face shields against aerosol cough droplets.⁵ Findings indicated that for frontal exposures, face shield block more than 90% of fine particle droplets. Ronen et al. argue that a face shield worn by an infected person seems to be as effective as a mask in preventing transmittance to nearby, unprotected individuals. However, a recent study conducted by Lindsley et al. found that face shields only blocked 2% of the cough aerosol, indicating that face shields are not effective as source control devices for small respiratory aerosols.⁶ These findings align with the airflow visualizations showing droplet spread following a simulated sneeze/cough from the wearer of a face shield only conducted by Verma et al.⁴

Aside from simulation studies, little is known on whether wearing a face shield may help protect others.^{7,8} Additionally, many of the studies of face shields and eye protection caution the user of touching the face shield. They have been shown to be good barriers at protection from aerosols, coughs, and sneezes but build up over time on the face shield produces a second

hazard if the shield is touched and then subsequently someone touches one's own face. Transmission during this process is also viable for the viruses studied.^{9,10}

Face shields may be a possible option to protect the wearer from potential transmission of viruses, although no studies have been done without a mask also being worn. Face shields provide a unique product that won't disrupt the supply chain, like single use masks, because they can be worn, cleaned, and reused many times.¹¹⁻¹² While the evidence base of face shields is small, there does seem to be a protective effect when wearing them. When coupled with a mask, they should offer even more protection, but in a setting where a mask is not feasible, it does seem that face shields will offer at least some protection from aerosols.

Evidence related to the use of acrylic or plastic barriers (e.g. Plexiglas) has not been identified in the scientific literature despite being part of CDC recommendations for reopening businesses. While these structures would act as a physical block of acutely expelled droplets, there is no data available about their effectiveness in preventing infection. As another way to identify any evidence related to blocking droplets or acute aerosols, an effort was made to find literature about sneeze guards. Though widely seen and required at salad bars and food buffets, evidence indicating sneeze guards prevent any type of infections has not been identified despite comprehensive attempts in multiple biomedical, engineering, and general databases.

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