New study identifies most effective face-mask practices to reduce spread of infection

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Findings from a new study published today provide guidance for increasing the effectiveness of face masks to reduce the spread of respiratory infectious pathogens including SARS-CoV-2. The findings,

which appear in the *American Journal of Infection Control* (*AJIC*), the journal of the Association for Professionals in Infection Control and Epidemiology (APIC), identify specific face mask combinations and fit modifications that can be implemented by healthcare workers, patients and the public to improve mask fit and performance.

Face masks are used to reduce the spread of infectious viruses such as SARS-CoV-2 that are transmitted by respiratory aerosols and droplets produced during activities such as talking, breathing and coughing. The U.S. Centers for Disease Control and Prevention (CDC) recommends a mask that is multi-layered, covers the nose and mouth, and forms a tight seal against the face.

"The performance of face masks as devices that control infection spread depends upon both the ability of the mask material to filter aerosols and on how well the mask fits the wearer," said Francoise M. Blachere, MSc., Research Biologist, of the National Institute for Occupational Safety and Health (NIOSH), and the paper's lead author.

Blachere and colleagues used both human subjects and simulator manikins to evaluate the performance of multiple mask types, combinations, and modifications. The researchers conducted a variety of experiments that simulated coughs and exhalations, and then measured the efficiency of the masks at blocking respiratory aerosols.

Results show that layering a three-ply cloth mask over a medical mask (double masking) or securing a medical mask with an elastic brace provided the best protection against respiratory aerosols. Medical masks without modification blocked >56% of cough aerosols and >42% of exhaled aerosols; comparatively, placing a cloth mask over a medical mask blocked ≥85% of cough aerosols and ≥91% of exhaled aerosols, and adding a brace over a medical mask blocked ≥95% of cough aerosols and ≥99% of exhaled aerosols.

Using earloop toggles or an earloop strap, or knotting and tucking the mask, also increased performance as compared to medical masks without modification. Two other mask-fit modifications, crossing the earloops or placing a bracket under the mask, did not increase performance.

"Since the start of the COVID-19 pandemic, there has been considerable confusion about the most effective use of face masks, especially among the general public, to reduce the spread of infection," said Ann Marie Pettis, BSN, RN, CIC, FAPIC, and APIC 2021 president. "The NIOSH study findings are important and timely because they identify specific, practical combinations of face masks and mask modifications that may improve mask seal and thereby measurably reduce the expulsion of infectious aerosols into the environment."

  More information: Francoise M. Blachere et al, Face mask fit modifications that improve source control performance, *American Journal of Infection Control* (2021). DOI: 10.1016/j.ajic.2021.10.041

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