JBI EVIDENCE SUMMARY

RESPIRATORY INFECTION TRANSMISSION (COMMUNITY): FACE MASKS AND RESPIRATORS

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Question

What is the best available evidence regarding the effectiveness of face masks and/or respirators in reducing the transmission of respiratory infection in community settings?

Clinical Bottom Line

One of the characteristics of pandemics is the high incidence of infections in all age groups.[1,2,3] Non-pharmacological interventions have been proposed to decrease the risk of respiratory infection, including influenza and other viruses, when vaccination or specific anti-infective treatments are unavailable.[1] There are two main types of respiratory personal protective equipment (PPE): respirators (N95 [United States], FFP2 [Europe], KN95 [China] and P2 [Australia and New Zealand]) designed to prevent the inhalation of small airborne particles; and face masks, including single-use disposable medical/surgical masks and fabric multi-layer masks made from woven and non-woven materials designed to protect the wearer from large respiratory droplets.[2] This evidence summary is focused on the use of masks and respirators to reduce transmission of respiratory infection in community settings.[1,2,3,4]

- A systematic review found limited evidence for the effectiveness of disposable medical face masks (also known as surgical masks), either worn by infected persons or by uninfected persons, for protection against influenza transmission in community settings. The review did not consider the use of respirators.[1](Level 1)
- A systematic review examined the use of medical/surgical disposable masks and respirators to prevent transmission of influenza in community and healthcare settings. Among the included randomized controlled trials (RCTs), community data showed disposable medical face mask wearing coupled with hand sanitizer use, reduced the transmission of upper respiratory infection, influenza-like illness, and/or laboratory-confirmed influenza among crowded, urban households, compared with education or hand sanitizer alone. Those in contact with an infected index case in their household who wore a P2 respirator (equivalent rating to an N95 respirator) 'all' or 'most' of the time for the first five days, were less likely to develop an influenza-like illness compared with less frequent users, or those who began hand hygiene, or hand hygiene plus a mask, within 36 hours of the confirmed index case. Observational (case-control) studies evaluated mask and respirator use following the outbreaks of severe acute respiratory syndrome (SARS) in 2003 produced unclear results.[2]
  - The authors of this systematic review concluded that limiting the transmission of influenza in community settings requires a multifaceted approach, of which masks and respirators are but one component, and continued research on their effectiveness remains an urgent priority. (Level 1)
- A systematic review examined the effectiveness of respiratory PPE measures, including hand hygiene and disposable medical/surgical face masks in preventing human-to-human influenza transmission during the 2009 A(H1N1)pdm09 pandemic. A significant protective effect was found in the one RCT where these

masks were worn, and used in conjunction with intensified hand hygiene, in households with an infected individual over the age of two years. (Level 1)[3]

- In a meta-analysis of moderately heterogeneous observational studies a non-significant protective effect in preventing influenza infection was also observed.
- Although the evidence regarding face mask use was mixed, using face masks in situations with high risk of exposure to influenza infection was effective when used in conjunction with intensified hand hygiene and the intervention was implemented within 36 hours after symptom onset of the index case. (Level 1)

- The latest interim guideline from the World Health Organization (WHO) recommends that wearing a disposable medical/surgical mask may limit the spread of certain respiratory diseases, including COVID-19, when used in conjunction with evidence-based hand hygiene; however, the wearing of any mask is not required for healthy individuals in the community. There is limited evidence that for those living in households with a sick person, or those that may come into contact with sick individuals in other ways (eg, attending a mass gathering), wearing a disposable medical/surgical mask or reusable 12–16-layer cotton mask, may be beneficial. In addition, individuals with symptoms that may suggest COVID-19 infection, should wear a medical/surgical mask, for the protection of others. If any mask is worn: (1) it must be placed to cover the mouth and nose, and tied securely to minimize any gaps; (2) it should not be touched while wearing or when removing; (3) if inadvertently touching the mask, hands must be immediately cleaned with soap and water, or alcohol-based hand rub; (4) replace a mask when it becomes damp and discard single-use masks immediately; and (5) do not re-use a single-use mask.[4] (Level 5)
- Although there is currently no direct evidence (from studies on COVID-19 and in healthy people in the community) regarding the effectiveness of universal masking of healthy people in the community to prevent infection with respiratory viruses, including COVID-19, the WHO recommends that decision makers take a risk-based approach to encouraging the general public to wear masks (both medical and non-medical), based on the following criteria:[4] (Level 5)
  - Fabric masks made from woven and non-woven fabrics, such as polypropylene, can be made from an unlimited combination of fabrics and materials, thus resulting in variable filtration and breathability. They are neither considered a medical device nor a form of PPE. If used, a minimum of three layers is required, depending on the fabric used, therefore ensuring the inner layer is not in direct contact with the outer layer.
  - If an individual is exposed to areas with known or suspected widespread transmission, limited ability to implement social distancing and/or contact tracing, or inability to isolate, fabric masks may potentially provide a benefit to the wearer.
  - Vulnerable populations (eg, those with underlying comorbidities), including people aged 60 years or over, should wear a disposable medical/surgical mask for protection in settings where social distancing cannot be achieved.
  - Any mask should be changed when becoming damp or visibly soiled and removal of the mask should involve touching the outer layer only.
  - Any person with symptoms of COVID-19 should wear a mask in any community setting. Single-use medical/surgical masks should be disposed of immediately upon removal.
  - When removing a reusable fabric mask, it should be immediately placed into a sealable bag, to be later washed at 60°C with soap or laundry detergent (woven fabrics) and 125°C (non-woven fabrics such as polypropylene).
- A systematic review evaluated the effects of using masks and respirators for the prevention of infection in

the community, and among health care workers and sick patients. Results of the studies that focused on community concluded that masks with hand hygiene were effective in high transmission settings.[5] (Level 1)

- A systematic review and meta-analysis investigated the airborne transmission of COVID-19 and the role of masks in preventing its transmission. The study concluded that the use of face masks was linked to a significantly reduced risk of SARS-CoV-2 infection.[6] (Level 3)
- A systematic review and meta-analysis evaluated the effectiveness of the use of masks to prevent SARS-CoV-2 transmission. Of the six included studies, only one focused on non-healthcare workers (others investigated transmission among healthcare workers and patients). This study found that wearing a mask significantly reduced the risk of contracting COVID-19 in non-healthcare workers.[7] (Level 3)
- A systematic review and meta-analysis investigated the effect of physical distance, face masks, and eye protection on transmission of SARS-CoV-2, SARS-CoV, and MERS-CoV in healthcare and non-healthcare (eg, community) settings. Results suggest that wearing face masks protects people (both healthcare workers and the general public) against coronavirus infections, and that eye protection could confer additional benefit. However, none of these interventions afforded complete protection from infection. In non-healthcare settings, disposable surgical masks or reusable 12–16-layer cotton masks provided protection, although much of the evidence was on mask use within households and among contacts of cases. Other basic measures like hand hygiene are still needed in addition to physical distancing and use of face mask and eye protection.[8] (Level 3)
- A systematic review investigated the effectiveness of face masks against respiratory infections, including coronavirus. The study found that the use of face masks by people in the community, in addition to other health principles can help in reducing the prevalence of COVID-19 disease.[9] (Level 1)
- A technical report from the European Center for Disease Prevention and Control identified the following recommendations for the use of face masks for the prevention of COVID-19 in the community:[10] (Level 5)
  - Wearing a medical or non-medical face mask is recommended in crowded outdoor settings and in areas with community transmission of COVID-19 (public spaces such as stores, supermarkets and public transport).
  - Medical face masks are recommended for people in households with symptoms of COVID-19 or confirmed COVID-19, especially when isolation of the person with symptoms of or confirmed COVID-19 is not possible.
  - The use of face masks can be considered in certain workplaces and for certain professions that involve physical proximity to many other people (members of the police force, cashiers- if not behind a glass partition, etc.) as a complementary measure to technical measures and organizational measures.
  - When non-medical face masks are used, it is preferred to comply with the guidelines for filtration efficacy and breathability.
  - Non-medical face masks with a small transparent window can be considered if communication is relevant, such as for interaction with people with hearing impairment.
  - The use of face masks in the community should only complement and not replace other preventive measures (physical distancing, staying home when ill, respiratory etiquette, meticulous hand hygiene and avoiding touching the face, nose, eyes, and mouth, teleworking if possible and appropriate ventilation of indoor spaces).
  - The face mask should completely cover the face from the bridge of the nose down to the chin. It should be removed from behind when taking it off; touching the front side should be avoided.
  - Hands should be cleaned with soap and water or alcohol-based hand sanitizer before putting on and taking off the mask.

- Washable reusable face masks should be washed as soon as possible after each use, following the manufacturer's instructions.
- Common cotton face masks can be washed at 60°C with a common detergent.
- No recommendations can be made on the preferred use of medical or non-medical masks in the community.

Characteristics Of The Evidence

This evidence summary is based on a structured search of the literature and selected evidence-based health care databases. The evidence in this summary comes from:

- A systematic review (part of a series of four systematic reviews) of 10 RCTs.[1]
- A systematic review of 17 studies (eight RCTs – five in community settings and three hospital-based studies, and nine observational studies – seven conducted among healthcare workers and two community-based studies).[2]
- A systematic review of 16 studies, eight measuring the effectiveness of face mask use (one cluster RCT, three case-control, two cohort, and two cross-sectional), and the remaining measuring the effectiveness of hand hygiene practices only.[3]
- A WHO interim guideline.[4]
- A rapid systematic review of 19 RCTs.[5]
- A systematic review and meta-analysis of four observational studies involving 7,688 participants.[6]
- A systematic review of meta-analysis of six case-control studies involving 1,233 participants.[7]
- A rapid systematic review and meta-analysis of 172 observational studies involving 25,697 patients.[8]
- A systematic review of five studies (study design not indicated in the review).[9]
- A technical report by the European Center for Disease prevention and Control.[10]

Best Practice Recommendations

- A multifaceted approach should be undertaken to prevent the transmission of respiratory infection in the community. (Grade A)
- The multifaceted approach to transmission prevention should include wearing either a disposable medical/surgical mask (in places of high-risk exposure, for the elderly, and where the individual has underlying comorbidities) and the practice of evidence-based hand hygiene techniques. (Grade A)
- The decision to wear a disposable medical/surgical mask or a multi-layer fabric mask by uninfected persons in the general community should be considered based on severity of risk. (Grade B)
- A medical/surgical mask should be worn by persons at high risk of exposure (eg, persons living in a household with an infected individual). (Grade B)
- All masks should be changed immediately when they become damp or soiled. (Grade B)
- Single-use masks should be discarded immediately and never re-used. (Grade B)
- All masks must be placed to cover the mouth and nose and tied securely to minimize any gaps. (Grade B)
- All masks should not be touched while wearing or when removing; if inadvertently touching the mask, hands must be immediately cleaned with soap and water, or alcohol-based hand rub. (Grade B)
- Cloth/fabric masks (eg, those made from woven or non-woven cotton, polypropylene or gauze) should be composed of at least three layers of fabric. (Grade B)

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Archived Publications

1. JBI-ES-1637-1 (Published at 12 October 2021)
2. JBI-ES-1637-2 (Published at 15 October 2021)

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For details on the method for development see Munn Z, Lockwood C, Moola S. The development and use of evidence summaries for point of care information systems: A streamlined rapid review approach. Worldviews Evid Based Nurs. 2015;12(3):131-8.

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