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Usher Network for COVID-19 Evidence Reviews

Summary: Are homemade facemasks effective at reducing transmission of covid-19 in community settings?

Date: 27 May 2020 Version: 004-02

THE UNIVERSITY of EDINBURGH | usher institute

Title: Are homemade facemasks effective at reducing transmission of covid-19 in community settings?

Summary answer:

Our original review, published on 19 April 2020 (004-01) screened 549 records and found 11 articles that were relevant to this question. The most informative study we found was by Davies et al (2013). Overall, the quality of the evidence available was **very low**. We updated the review on 27 May 2020 to add in additional evidence on fluid dynamics. Key findings:

- Homemade masks are **not effective at filtering respiratory aerosols**. Van der Sande et al (2008) compared the effectiveness of different masks at filtering respiratory aerosols from the outside to the inside of the mask. FFP respirators, which provide a minimum of 94% filtration, were found to be 25 times more effective than surgical masks, which were in turn about twice as protective as homemade masks.

- Although they are not effective at filtering respiratory aerosols, homemade masks worn by sick people can **reduce virus transmission by mitigating aerosol dispersal** (Tang et al, 2009; Viola et al, 2020). Homemade masks worn by sick people can also **reduce transmission through droplets**. By reducing the number of droplets reaching surfaces, homemade masks can **reduce the risk of transmitting or acquiring COVID-19 through reducing environmental (surface) contamination**.

- Suitable household materials for making homemade masks must combine filtration properties with breathability. There is a trade-off between filtration and breathability. T-shirt or jersey material combined with a non-woven filter, such as kitchen paper, have been proposed as the optimum materials; however evidence is limited. Much of the evidence about suitable materials focuses only on filtration properties tested in laboratories and not on comfort and breathability tested in human subjects.

- Although there is a proliferation of mask designs available online, no studies have systematically evaluated or compared different designs for filtration, closeness of fit and comfort.

- If a mask does not fit well around the nose and mouth it will be of reduced effectiveness. Suggestions for improving the fit of homemade masks include the use of pipe-cleaners to ensure a close fit across the bridge of the nose and cheeks.

- Evidence on the effect of repeatedly washing and drying homemade masks suggests that this may reduce mask filtration effectiveness by distorting porousness. This is important because people may be more likely to cut up a less effective old T-shirt than a brand new T-shirt when fashioning a mask at home.

Policy implications:

- Although at the individual level, homemade facemasks may only have a marginal protective effect, when multiplied up to the population level, they may contribute to reducing transmission. However, we found no research evidence quantifying this.

- On the other hand, encouraging the use of facemasks in the general population may have negative consequences such as putting pressure on already fragile supply

chains of surgical masks required by healthcare and other frontline health care workers. Again, we found no evidence quantifying the likely impacts.

- Another potentially serious consequence is that facemasks may give people a false sense of security and encourage behaviour that puts people at increased risk of infection. The lower protective capabilities of a homemade mask should be emphasized to the public so that unnecessary risks are not taken and the importance of regular hand hygiene and good respiratory etiquette should be stressed.
- Masks should be changed regularly: a mask that has become damp from use will be less effective than a fresh mask.

Extended abstract:

This study searched 4 bibliographic data bases (PubMed, CINAHL, Web of Science and MedRxiv) and conducted reference screening and forward citation tracking of key articles to identify relevant literature. Articles were included if they provided data on the design or effectiveness of homemade facemasks at preventing the transmission of respiratory viruses in community settings or on the effectiveness of commonly available household materials. Articles were excluded if they focused exclusively on clinical settings or on manufactured masks, unless they provided information about the effectiveness of fabrics or materials. Titles and abstracts were each screened by one reviewer (RM, AN, MD). A second reviewer then screened all excluded abstracts. Conflicts were included in full text screening. Each full text was screened by one reviewer (RM, MD). A second reviewer then screened all excluded full texts (RM, MD). Conflicts were resolved by discussion. Data extraction and quality assessment was conducted by a single reviewer (RM). CASP and Joanna Briggs Institute checklists were used to assess study quality for epidemiological studies. For non-epidemiological studies, articles were assessed for rigour but without using a standardised tool. Data were synthesized narratively. Evidence heterogeneity meant that meta-analysis was not appropriate.

This review was updated on 27 May 2020 to incorporate additional evidence on fluid mechanics. Two new citations were added (Tang et al, 2009; Viola et al, 2020).

Link to full review: https://edin.ac/facemasks

Date completed: 19 April 2020

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The UNCOVER network is committed to responding quickly and impartially to requests from policymakers for evidence reviews. This document has therefore been produced in a short timescale and has not been externally peer-reviewed.

Key references:

Dato V.M. et al (2006) Simple respiratory mask. Emerging Infectious Diseases.12(6):1033-4

Davies A. et al (2013) Testing the efficacy of homemade masks: would they protect in an influenza pandemic? Disaster Medicine & Public Health Preparedness7(4):413-8

Ma Q.X. et al (2020) Potential utilities of mask-wearing and instant hand hygiene for fighting SARS-CoV-2 Journal of Medical Virology31():31

Rengasamy S. et al. (2010) Simple respiratory protection--evaluation of the filtration performance of cloth masks and common fabric materials against 20-1000 nm size particles. Annals of Occupational Hygiene54(7):789-98

Rodriguez-Palacios A. et al. (2020) Textile Masks and Surface Covers - A 'Universal Droplet Reduction Model' Against Respiratory Pandemics medRxiv 2020.04.07.20045617; doi: https://doi.org/10.1101/2020.04.07.20045617

Tang JW, Liebner TJ, Craven BA and Settles GS (2009) A schlieren optical study of the human cough with and without wearing masks for aerosol infection control. J. R. Soc. Interface (2009) 6, S727–S736. Available at: https://royalsocietypublishing.org/doi/full/10.1098/rsif.2009.0295.focus

van der Sande M. et al (2008) Professional and home-made face masks reduce exposure to respiratory infections among the general population PLoS ONE [Electronic Resource]3(7):e2618

Viola IM, Peterson B, Pisetta G, Pavar G, Akhtar H, Menoloascina F, Mangano E, Dunn KE,

Gabl R, Nila A, Molinari E, Cummins C, Thompson G, Lo TYM, Denison FC, Digard P, Malik O, Dunn MJG, McDougall CM and Mehendale FV (2020). Face Coverings, Aerosol Dispersion and Mitigation of Virus Transmission Risk. arXiv Prepr. arXiv2005.10720.