

Community universal face mask use during the COVID 19 pandemic—from households to travellers and public spaces

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As the COVID-19 pandemic grows globally, universal face mask use (UFMU) has become a topic of discussion, with a recommendation made from the US Centers for Disease Control (CDC) for cloth mask use by community members on April 3rd.¹ However, community use of masks has been discouraged by the World Health Organization (WHO), instead encouraging other measures such as social distancing and hand hygiene.² Messaging by WHO and by many countries suggests that mask use in the community has no benefit, and should only be used by sick patients (also referred to as ‘source control’³). Such messaging may be driven more by concerns about critical shortages of personal protective equipment for health workers than by scientific evidence. In fact there are more large randomized, controlled clinical trials (RCTs) of face mask use in the community than there are of use by sick people or ‘source control’. In general, the results of community RCTs show protection for community members in settings of intense transmission of respiratory infections such as households and university dormitory settings.⁴ In trials of hand hygiene, health education and masks together, hand hygiene alone

was not effective but masks were effective when used with hand hygiene. The RCTs which measured both hand hygiene and masks measured the effect of hand hygiene alone, but not of masks alone. Therefore, the protective effect of masks and hand hygiene combined could be due to both interventions together, or the effect of masks alone.⁴ In a RCT of masks alone, surgical and P2 masks reduced infection risk in households with a sick child if parents complied with mask use.⁵ In more than one trial, interventions had to be used within 36 hours of exposure to be effective.⁴ There has been no randomized controlled trial to test effectiveness of UFMU in public spaces. However, if masks are protective in high transmission, closed settings such as households and college dormitories as proof of principle, they should also be protective in lower transmission settings such as public spaces.

There are fewer RCTs of mask use as source control, and they are much smaller in scale than the ones in well community members, but they suggest some prevention of onward transmission by mask use in sick people.^{3,6} A study in Haj pilgrims showed that UFMU including by people with symptoms reduced influenza-like illness.⁷ A study of common respiratory viruses including seasonal coronaviruses⁸ showed that viable coronaviruses was detected even in normal tidal breathing by people not wearing masks, and mask-wearing prevented virus from being exhaled. Seasonal coronaviruses were identified more in aerosols than large droplets, supporting the role of transmission by fine respiratory aerosols.⁸

The rationale for UFMU during the COVID-19 pandemic in settings with high community transmission is 2-fold. Firstly, it may protect well people from becoming infected. Secondly, it may prevent onward transmission of infection from infected people who are asymptomatic, pre-symptomatic or mildly symptomatic. There is evidence that the highest risk of transmission of SARS-CoV-2 is early in the course of infection, just prior to symptom onset and on the first day of symptoms.⁹ There is also evidence of transmission of SARS-CoV-2 from asymptotically infected cases.¹⁰ On this basis, the US CDC recommended cloth face mask use in the community 'in public settings where other social distancing measures are difficult to

maintain (e.g., grocery stores and pharmacies), especially in areas of significant community-based transmission'.¹

However, cloth masks are not as well studied as disposable masks. The only published RCT of cloth masks found that the rate of infection in hospital health care workers (HCWs) was higher than in HCWs wearing surgical masks.¹¹ The study also found that filtration of the cloth mask was very poor compared to the surgical mask. This finding may be due to poor fabric, inadequate design or washing and may not be generalizable to all home-made masks. Whilst cloth masks are not suitable for HCWs,¹² who face a higher risk of infection in the workplace, they may be suitable for community use, where a lower level of exposure to virus may be present. One study assessed respirators, surgical and home-made cloth masks by healthy volunteers during various activities and found respirators performed best, followed by surgical masks and lastly cloth masks—however, cloth masks did provide some protection.¹³ A mathematical model of face mask use by a population during an influenza pandemic showed that if masks are only 20% effective, 25% use by population will reduce infectivity by 30%.¹⁴

There is an opportunity to collect data on UFMU and specifically cloth masks during the pandemic, but meanwhile we should provide community members with well-researched, practical guidelines on suitable fabrics and designs for the most protective Do-It-Yourself masks. Basic principles around fabric filtration and water resistance, mask fit, number of layers, changing of masks and washing can inform such guidelines. The filtration of different fabrics varies widely. For example, scarves and silk filter poorly, and cotton blend T-shirt material performs better than pure cotton.¹⁵ Hydrophobic fabrics are best, and designs which have 2–3 layers and provide good fit around the face to prevent air leakage may be desirable. Daily washing of cloth masks used by community members is recommended to prevent self-contamination. It may even be wise to have two masks a day and change them during the day. Arguments that UFMU may give people a false sense of security and increase their infection risk are not supported by the evidence, which in fact shows the opposite.⁴ Arguments against the use of other population health measures such as HPV vaccine (such as vaccination will increase risk

of sexually transmitted infections by encouraging promiscuity) have similarly not been borne out by evidence.¹⁶ There is more evidence supporting face mask use in the community than hand hygiene including in RCTs which compare both interventions directly,⁴ so it is inconsistent to advocate hand hygiene as a sound principle but not masks. Greenhalgh *et al.*¹⁷ argue for the precautionary principle to be applied to UFMU during the COVID-19 pandemic, and that ‘*many people can be taught to use masks properly and will do this consistently without abandoning other important anti-contagion measures.(and) ...if political will is there, mask shortages can be quickly overcome by repurposing manufacturing capacity—something that is already happening informally.*’ Data from several community RCTs and experimental studies support UFMU in community settings where there is a high incidence of COVID-19,⁴ both inside households and closed venues, in crowded public spaces and public transport, and for travellers passing through airports and spending time on airplanes. If epidemic control is poor, until an effective vaccine is available, UFMU may contribute to reducing transmission, preventing deaths and flattening the curve.

Author contribution

C.R.M. and S.J.H. contributed equally to the manuscript writing. The idea was conceived by S.J.H.

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Conflicts of interest

C.R.M. has led a large body of clinical research on masks since 2007. She does not receive any funding from manufacturers of masks, but conducted a study in 2011 funded by an industry linkage grant from

the Australian Research Council Grant with 3 M as the industry partner. S.J.H. was an early advocate for UFMU.

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