Face masks for the public during the covid-19 crisis

Trisha Greenhalgh and colleagues argue that it is time to apply the precautionary principle

The precautionary principle is, according to Wikipedia, “a strategy for approaching issues of potential harm when extensive scientific knowledge on the matter is lacking.” The evidence base on the efficacy and acceptability of the different types of face mask in preventing respiratory infections during epidemics is sparse and contested. But covid-19 is a serious illness that currently has no known treatment or vaccine and is spreading in an immune naive population. Deaths are rising steeply, and health systems are under strain.

This raises an ethical question: should policy makers apply the precautionary principle now and encourage people to wear face masks on the grounds that we have little to lose and potentially something to gain from this measure? We believe they should.

Evidence and guidelines

Evidence based medicine tends to focus predominantly on internal validity—whether primary research studies were “done right”—using tools to assess risk of bias and adequacy of statistical analysis. External validity relates to a different question: whether findings of primary studies done in a different population with a different disease or risk state are relevant to the current policy question. We argue that there should be a greater focus on external validity in evaluation of masks.

A rapid search of the literature on the wearing of masks by the general public during epidemics or pandemics by a team at the University of Galway (E Toomey, personal communication, 29 March 2020) found five peer reviewed systematic reviews:

• An “empty review” published on 27 March 2020—that is, a review showing no randomised trials of masks so far during the covid-19 pandemic

• A 2020 systematic review comparing standard surgical masks and respirator masks, which included a single small trial from 2009 of respirator masks, standard masks, and no masks among the general public during an influenza epidemic in Australia. That trial, which was considered robust, showed a benefit of masks over no masks, but no benefit of respirator masks over standard ones, and also showed that masks were worn less than 50% of the time

• A 2011 Cochrane review covering physical interventions and including 67 studies (many of poor quality), in which the main relevant study was the 2009 trial described above

• A 2010 systematic review of face masks in influenza epidemics, which included standard surgical masks and respirator masks and found some efficacy of masks if worn by those with respiratory symptoms but not if worn by asymptomatic individuals.

• A 2007 systematic review and expert panel deliberation, which acknowledged the difficulties in interpreting evidence and stated: “With the exception of some evidence from SARS, we did not find any published data that directly support the use of masks . . . by the public.” The evidence from SARS was not set out in the paper (so we assume it was expert opinion on the panel).

Two further systematic reviews have since been released as preprints. Xiao and colleagues reviewed non-pharmaceutical measures for prevention of influenza. They identified 10 randomised controlled trials published between 1946 and 2018 that tested the efficacy of face masks (including standard surgical masks and commercially produced paper face masks designed for the public) for preventing laboratory confirmed influenza. A pooled meta-analysis found no significant reduction in influenza transmission (relative risk 0.78, 95% confidence interval 0.51 to 1.20; I²=30%, P=0.25). They also identified seven studies conducted in households; four provided masks for all household members, one for the sick member only, and two for household contacts only. None showed a significant reduction in laboratory confirmed influenza in the face mask arm. The authors concluded: “randomized controlled trials of [face masks] did not support a substantial effect on transmission of laboratory-confirmed influenza.”

A preprint of a systematic review published on 6 April 2020 examined whether wearing a face mask or other barrier (goggles,
shield, veil) prevents transmission of respiratory illness such as coronavirus, rhinovirus, tuberculosis, or influenza. It identified 31 eligible studies, including 12 randomised controlled trials. The authors found that overall, mask wearing both in general and by infected members within households seemed to produce small but statistically non-significant reductions in infection rates. The authors concluded that “The evidence is not sufficiently strong to support the widespread use of facemasks as a protective measure against covid-19” and recommended further high quality randomised controlled trials.

Contested interpretations

The heterogeneous and somewhat sparse primary literature described above has been inconsistently interpreted by policy makers. The World Health Organization, for example, recommends masks only for those with symptoms suggestive of covid-19, stating that masks should otherwise be reserved for healthcare workers. However, elsewhere WHO acknowledges that the wearing of masks by the general public has a place in severe pandemics, since even a partial protective effect could have a major influence on transmission. The US Centres for Disease Control and Prevention originally advised the public against wearing masks during the covid-19 pandemic, but this advice was updated on 4 April 2020 (box 1).

None of the studies mentioned above tested the makeshift cloth masks that CDC has recommended. To our knowledge, there are no trials of cloth masks in the general public. A three arm trial of cloth masks versus surgical masks versus no masks. The World Health Organization, for example, describes above has been inconsistently interpreted by policy makers. The World Health Organization, for example, recommends masks only for those with symptoms suggestive of covid-19, stating that masks should otherwise be reserved for healthcare workers. However, elsewhere WHO acknowledges that the wearing of masks by the general public has a place in severe pandemics, since even a partial protective effect could have a major influence on transmission. The US Centres for Disease Control and Prevention originally advised the public against wearing masks during the covid-19 pandemic, but this advice was updated on 4 April 2020 (box 1).

Box 1: CDC advice on use of face masks by the general public

Cover your mouth and nose with a cloth face cover when around others

You could spread covid-19 to others even if you do not feel sick.

Everyone should wear a cloth face cover when they have to go out in public—for example, to the grocery store or to pick up other necessities.

Cloth face coverings should not be placed on children under age 2 or on anyone who has trouble breathing or is unconscious, incapacitated, or otherwise unable to remove the mask without assistance.

The cloth face cover is meant to protect other people in case you are infected.

Do not use a face mask meant for a healthcare worker.

Continue to keep about 6 feet (2 m) between yourself and others. The cloth face cover is not a substitute for social distancing.

Precautionary principle

Anecdotal evidence is rightly viewed as methodologically suspect, but as we contemplate using the precautionary principle, we should not ignore such evidence entirely. We should, for example, take account of the high rates of infection (and substantial mortality) among healthcare and other frontline staff in settings where there are shortages of masks compared with settings where these staff were better and more consistently protected. We might come to regret dismissing as anecdote the story of a choir practice with 60 people, of whom 45 are known to have developed covid-19 and two so far have died. Some indirect evidence for the benefits of masks is emerging. For example, a longitudinal ecological study from Hong Kong, conducted before and after the introduction of a range of non-pharmaceutical measures including masks for the public, suggested that these seemed to help to contain the pandemic (changes were statistically significant for masks and social distancing measures combined, though the effect of masks alone cannot be isolated out). There is also analogical evidence from the behaviour of viruses with a similar chemical make-up. Given these indirect and circumstantial findings and the seriousness of this outbreak, there is a moral argument that the...
public should be given the opportunity to change their behaviour in line with the precautionary principle, even when direct, experimental evidence for benefit is not clear cut. Unlike in Australia and the US, where most trials were done, mask wearing has become normalised in some Asian countries, partly as a protection against polluted air and perhaps also as a response to the SARS and MERS outbreaks. In Japan, Hong Kong, South Korea, and China, for example, mask wearing is now the norm.

Another argument for using the precautionary principle is that the world may pay a high price for covid-19 and the “collateral damage” risks becoming higher than the direct damage from the virus. The dangers include increased suicide rates because of isolation and economic hopelessness among poorer people losing their income or in small companies, civil unrest in some countries when they consider lockdown, as was seen with Ebola, people losing their access to their regular medication, thwarting automatic systems under the pretence of controlling covid-19, and domestic violence and family disputes—the list is long. There are, of course, important counterarguments, including the possibility of a false sense of security and reduction in compliance with other infection control measures.

We propose two hypotheses that we believe should be urgently tested in natural experiments. The first is that in the context of covid-19, many people can be taught to use masks properly and effectively, for randomised controlled trial evidence. The second is that if political will is there, mask shortages can be quickly overcome by repurposing manufacturing capacity—something that is already happening informally.

In conclusion, in the face of a pandemic the search for perfect evidence may be the enemy of good policy. As with parachutes for jumping out of aeroplanes, it is time to act without waiting for randomised controlled trial evidence. A recently posted preprint of a systematic review came to the same conclusion. Masks are simple, cheap, and potentially effective. We believe that, worn both in the home (particularly by the person showing symptoms) and also outside the home in situations where meeting others is likely (for example, shopping, public transport), they could have a substantial impact on transmission with a relatively small impact on social and economic life.

Key messages
The precautionary principle states we should sometimes act without definitive evidence, just in case
Whether masks will reduce transmission of covid-19 in the general public is contested
Even limited protection could prevent some transmission of covid-19 and save lives
Because covid-19 is such a serious threat, wearing masks in public should be advised

We thank the members of the covid-19 researchers Google group for a discussion which inspired this paper, though the views expressed in this paper do not reflect those of all group members. We also thank Elaine Toomey of Cochrane Ireland for sharing unpublished data from an ongoing review of face masks for the general public, and Sebastian Straube from University of Alberta, Canada, as well as two reviewers, Ben Cowling and Ka Hung Chan, for helpful advice on an earlier draft. We also thank three members of the public, John Taylor, Jenni Bowley, and Anica Alvarez Nishio, for useful feedback which helped us improve the paper.

Contributors and sources: The article was conceived on a professional discussion network. MBS wrote the first draft. TG added conceptual insights and coordinated shaping of the paper for BMJ. All authors contributed to the development of ideas and writing of the paper, and approved the final manuscript. TG and MBS are joint first authors and guarantors.

Competing interests: We have read and understood BMJ policy on declaration of interests and have no relevant interests to declare.

Provenance and peer review: Commissioned; not externally peer reviewed.


34 For autocratic regimes, COVID-19 is a window to consolidate power. *Newsday* 2020 https://www.newsday.co.zw/2020/04/for-autocratic-regimes-covid-19-is-a-window-to-consolidate-power/


