

Boundaries of solidarity: a meta-ethnography of mask use during past epidemics to inform SARS-CoV-2 suppression

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To cite: Tsang PM, Prost A. Boundaries of solidarity: a meta-ethnography of mask use during past epidemics to inform SARS-CoV-2 suppression. *BMJ Global Health* 2021;**6**:e004068. doi:10.1136/bmjgh-2020-004068

Handling editor Seye Abimbola

Received 28 September 2020
Revised 4 December 2020
Accepted 9 December 2020

ABSTRACT

Background Many countries aiming to suppress SARS-CoV-2 recommend the use of face masks by the general public. The social meanings attached to masks may influence their use, but remain underinvestigated.

Methods We systematically searched eight databases for studies containing qualitative data on public mask use during past epidemics, and used meta-ethnography to explore their social meanings. We compared key concepts within and across studies, then jointly wrote a critical synthesis.

Results We found nine studies from China (n=5), Japan (n=1), Mexico (n=1), South Africa (n=1) and the USA (n=1). All studies describing routine mask use during epidemics were from East Asia. Participants identified masks as symbols of solidarity, civic responsibility and an allegiance to science. This effect was amplified by heightened risk perception (eg, during SARS in 2003), and by seeing masks on political leaders and in outdoor public spaces. Masks also acted as containment devices to manage threats to identity at personal and collective levels. In China and Japan, public and corporate campaigns framed routine mask use as individual responsibility for disease prevention in return for state- or corporate-sponsored healthcare access. In most studies, mask use waned as risk perception fell. In contexts where masks were mostly worn by patients with specific diseases (eg, for patients with tuberculosis in South Africa), or when trust in government was low (eg, during H1N1 in Mexico), participants described masks as stigmatising, uncomfortable or oppressive.

Conclusion Face masks can take on positive social meanings linked to solidarity and altruism during epidemics. Unfortunately, these positive meanings can fail to take hold when risk perception falls, rules are seen as complex or unfair, and trust in government is low. At such times, ensuring continued use is likely to require additional efforts to promote locally appropriate positive social meanings, simplifying rules for use and ensuring fair enforcement.

INTRODUCTION

The global spread of SARS-CoV-2 continues to cause illness, loss of life and social suffering.¹ Observational studies suggest that the use of face masks by the public can help reduce SARS-CoV-2 transmission by containing

Key questions

What is already known?

- ▶ As part of a comprehensive strategy to suppress SARS-CoV-2, a large number of countries mandate face masks or coverings in public, especially where social distancing is challenging.
- ▶ The social meanings that masks create are likely to influence adoption and long-term use, but have received little attention to date.

What are the new findings?

- ▶ Using a meta-ethnography of nine primary studies, we found that in East Asian countries where masks were routinely used in the context of epidemics, they created positive social identities linked to solidarity, civic responsibility and scientific modernity; these positive meanings were salient when risk perception was high, but faded as it fell.
- ▶ In contexts where masks interfered more with social lives than their perceived protective properties were worth, they were viewed as stigmatising, uncomfortable or even oppressive.

What do the new findings imply?

- ▶ Public health campaigns should seek to positively harness the meaning-making properties of masks.
- ▶ Ensuring continued mask use as risk perception fluctuates will require efforts to promote locally appropriate positive meanings, simplifying rules for use and ensuring rules are enforced fairly.

droplets and aerosols.^{2 3} WHO currently recommends medical masks (eg, respirators or surgical masks) for health workers, people with symptoms of COVID-19, those caring for possible or confirmed cases at home or in the community, people aged 60 years or over and people with underlying conditions.⁴ WHO also recommends non-medical fabric masks for the general public where transmission is widespread and social distancing is challenging.⁴

Mask use has been increasing globally, but remains uneven.^{5 6} Online surveys conducted



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in October 2020 found that 70% or more of people interviewed in Canada, Spain, France, Italy, Japan, South Korea, Singapore and the UK said they always wore a mask outside their home in the past 7 days. In contrast, <25% of interviewees in Scandinavian countries wore a mask.⁷ Such surveys are prone to sampling, recall and social desirability bias and do not characterise mask use with great precision; nevertheless, they highlight that use remains unequal and could be improved.

Scientists have recently recommended moving beyond viewing masks purely as a medical intervention, and towards understanding their use as a social practice.⁸ Mask use, they argue, can carry a range of meanings in different settings. Anthropologists Margaret Lock and Vinh-Kim Nguyen have shown that biomedical technologies are rarely history- and value-free, but rather emerge out of entangled social, political and scientific histories, creating both new ways of seeing the world and intervening in it.⁹

What social meanings do face masks reflect and create, and what implications do these have for SARS-CoV-2 suppression? A recent synthesis of sociobehavioural studies conducted during past outbreaks suggested that six inter-related factors affect mask use: public understanding of virus transmission; risk perception; the perceived benefits of masks; individual characteristics (eg, gender, age and occupation); previous national epidemic experience and perceived or actual barriers to sourcing masks.^{10 11} While important, this synthesis does not explore the social meanings of masks or how these might be harnessed to support public health efforts. In addition, social science research on the meanings of masks is likely to be found in ethnographic and sociological studies, not just in biomedical or historical ones.¹¹⁻¹³

We used meta-ethnography, an approach to generate new interpretations from existing qualitative studies across social science disciplines, to examine the social meanings that masks have reflected and created in past epidemics, in the hope of informing SARS-CoV-2 suppression efforts.

METHODS

Study selection and synthesis

We systematically searched eight databases (ASSIA, EBSCO, which included EconLit and CINAHL Plus, Embase, which included PsycINFO and Medline, IBSS, PubMed, Sociological Abstracts and Web of Science, and AnthroSource, a database of anthropological journals), for studies that included qualitative interviews, participant or non-participant observation, narratives and documents about mask use in the community during epidemics published till 7 March 2020. The phrase 'face covering' was not widely used prior to SARS-CoV-2, so the main search string combined terms related to masks and epidemics, with the names of methodological approaches likely to capture qualitative studies: focus group* OR interview* OR deliberative OR survey OR ethnograph*

AND mask* OR respirator OR face-mask OR face-mask AND illness OR resp* OR diseases* OR pandemic OR epidem*. We included articles in English, French, Spanish, Italian, Portuguese and Chinese languages, with no date restrictions. We excluded studies conducted in hospital settings, or unrelated to infectious diseases. PMT and AP did the search and screened articles in English. PMT screened articles in Chinese languages, and AP screened articles in other languages.

Meta-ethnography is a seven-phase interpretive method for qualitative evidence synthesis developed by sociologists Noblit and Hare.¹⁴ It aims to produce new interpretations from primary studies. We chose meta-ethnography over other approaches to qualitative synthesis because it involves the comparison and translation of concepts between studies. We felt this might offer more cross-cultural insights.¹⁵ Both authors independently coded individual studies for key concepts using NVivo V.12, and compared concepts and their interpretations manually, leading to a joint final synthesis. We used both 'reciprocal' and 'line of argument' translation as some studies had accounts that were directly comparable (reciprocal translation) while others explored different but related social meanings (line of argument translation).^{14 16}

Our approach was different to that originally proposed by Noblit and Hare in two ways. First, we included mixed-methods studies if they were relevant to our research question. Second, we used a set of concepts drawn from the extensive ethnographic literature on masks cited in our primary studies to inform the translation stages of meta-ethnography. We provide a focused summary of this literature below.

Masks and social theory

Past social science studies of masks have made two fundamental, inter-related propositions. The first is that mask use can transform individual and group identities. Masks 'work' on the face by concealing or transforming it, and through this act as 'indexes' of identity.¹⁷⁻¹⁹ Because masks can reveal, conceal or obscure identities, their relationship to power is often ambivalent. Frantz Fanon's 'Black Skin, White Masks' is a compelling example of this. Fanon's work offered a blistering description of how racism compelled colonised people to adopt the 'white masks' afforded by foreign education and mastery of the coloniser's language, causing intersubjective and intrasubjective violence.²⁰ The second theoretical proposition relevant to a study of masks is that human and material life are mutually constituted: an object exists through, and creates social relations. As Daniel Miller advocates, we ought to be concerned 'at least as much with how things make people as the other way around'.²¹ (p.42) For this reason, sociological studies of masks have often framed them as 'boundary objects', that is, a set of arrangements, both material and processual, that resides between social worlds (or communities of practice) and helps facilitate communication between them.²² Fox, for example, viewed surgical masks as boundary objects

because their infection control function was enhanced by their social function, which was to visually label surgeons as healers both in their professional circle and the wider community.²³ This partial account of the social scientific literature on masks would therefore lead us to think that, at minimum, masks are a means to create and transform identities, and are created by people and social contexts as much as they create them.

Why we wrote about masks

This article was initiated through conversations between the two authors about differences in mask use between the UK and East Asian countries in March 2020. PMT is a medical practitioner from Hong Kong who was studying global health in London at the start of the COVID-19 pandemic. She had experienced the 2003 SARS outbreak in Hong Kong, and witnessed the striking contrast between the devastating shock of lives lost and the rise of a strong collective spirit to fight the virus. AP is a Franco-British researcher with training in social anthropology and epidemiology. She began wearing masks after reading about asymptomatic transmission of SARS-CoV-2 in studies from China in February 2020 and after reading the work by Greenhalgh *et al.*²⁴ Both authors felt that masks were a potentially important tool for COVID-19 suppression, and were motivated to investigate how the social meanings given to them in different settings might influence their use.

Patient and public involvement

It was not appropriate or possible to involve patients or the public in the design, or conduct, or reporting, or dissemination plans of our research.

RESULTS

Overview of studies

Figure 1 describes the study selection process. Our initial searches retrieved 7933 studies, of which 9 studies were retained. Studies were from China and Hong Kong (n=5), Japan (n=1), Mexico (n=1), South Africa (n=1) and the USA (n=1) discussed mask use by the public in the context of previous pandemics.

In Mexico City, Condon and Sinha observed mask use in around 1400 bus drivers and 2800 taxi drivers, 5200 passengers and 100 passers-by in two metro stations during the 2009 H1N1 pandemic.²⁵ In Khayelitsha, a partially informal township in the City of Cape Town, Abney did participant observation in tuberculosis patient support groups linked to the state treatment programme to understand people's experiences with N95 respirator masks.²⁶ In Tokyo, Burgess and Horii analysed 120 street interviews on behaviours and attitudes related to surgical mask use in a convenience sample of 120 adult men and women after the 2011 H1N1 outbreak.²⁷ In China, Sin used qualitative content analysis of media publications to document public perceptions of mask use during and after the 2003 SARS epidemic.²⁸ Siu conducted 40 semi-structured individual interviews with Hong Kong residents attending a private primary care clinic and asked about mask use during the 2015 Influenza A (H3N2) season.²⁹ Zhang *et al* did 137 semi-structured interviews with Hong Kong residents aged 65–80 years about their views on mask use during the Influenza A/H1N1 pandemic.³⁰ In Hong Kong again, Baehr analysed media sources to understand reasons for the widespread use of masks during and after SARS.³¹ Lynteris used historical analysis to understand the origins of the modern face mask during the Manchurian plague epidemic in 1910–11.³² Finally, in New York, Ferng *et al* did interviews,

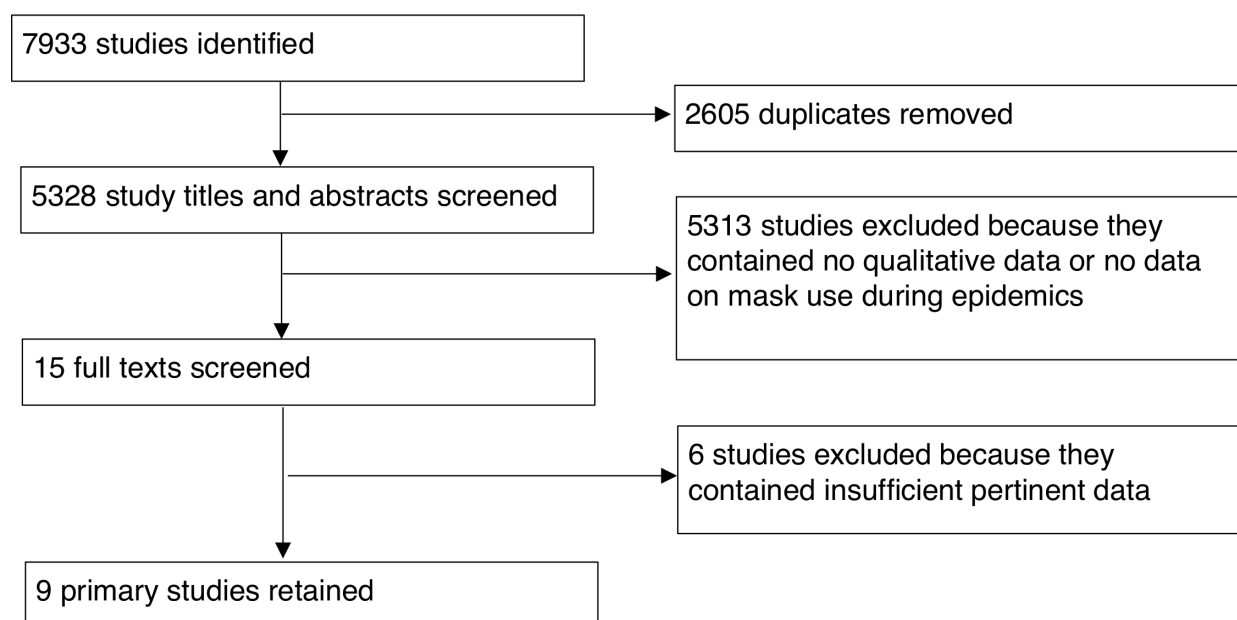


Figure 1 Study selection.

think-aloud exercises and group discussions with Hispanic women living in northern Manhattan who participated in a trial of non-pharmaceutical indoor interventions against influenza, including masks. Household members with influenza-like illness were asked to wear a mask indoor and outdoor whenever they were within 3 feet of another person (including a household member) for a period of 7 days or until symptoms disappeared.³³

Creating social identities

All studies describing routine mask use during epidemics were from East Asia. Their participants and authors argued that masks reflected and created powerful social identities that emphasised solidarity, civic responsibility and scientific modernity. The salience of these identities increased at times of heightened risk perception, when deviance from the norm also became challenging. During the 2003 SARS outbreak in Hong Kong, for example, mask use became a symbol of collective solidarity with fellow residents and health workers. A participant in the study by Siu described these events:

‘SARS has changed the culture of facemask use in Hong Kong. Before [the] SARS [outbreak], no one would use a facemask. I did not even know where I could buy a facemask before [the] SARS [outbreak]. However, when SARS hit, using a facemask was just like wearing clothes in public, and it was a norm in society. Everyone in Hong Kong wore a facemask during [the] SARS [outbreak]. If you did not wear a facemask, you would be given a dirty look and be

discriminated against. No one dared not to wear a facemask at that time.’²⁹ (p.6) Male participant, aged 52 years

Baehr confirmed that mask use became established as a social norm and expression of civic responsibility during SARS: ‘the mask symbolized a rule of conduct—namely, an obligation to protect the wider community—and an expectation regarding how one was to be treated by others.’³¹ (p.150)

Several studies described how the visual properties of masks played a key role in their ability to generate solidarity. The uniformity of mask shapes and designs commonly used by the public made them a powerful visual tool to materialise ‘sameness’ and unity. Anthropologist and historian Lynteris described this property while examining the early uses of face masks as a technology of containment during the 1910–1 plague outbreak in Manchuria.³² Dr Wu Liande, credited as the inventor of the 20th century face mask, created a photographic album of his efforts during the plague. It contained 47 photographs of humans, 32 of them masked men. The photographs created a powerful ‘spectacle of masked unity’ that reverberated across the scientific world (figure 2). Baehr also observed the visual properties of photographs with large numbers of masked persons as a means to communicate social ‘sameness’ and solidarity in the context of the 2003 SARS epidemic in Hong Kong: ‘By blurring social distinctions, it (the mask) produced social resemblance. Mask-wearing activated and reactivated



Figure 2 A disinfection squad wearing masks at Changchun plague hospital during the first pneumonic plague epidemic in Changchun, Manchuria in 1911 (source: Special Collections, The University of Hong Kong Libraries 香港大學圖書館特藏部).

a sense of a common fate; it was a mode of reciprocity under conditions that supremely tested it'.³¹ (p.150) This effect was also reinforced by politicians and newscasters wearing masks in the media and by seeing masks in all outdoor public spaces, not just indoor public venues or transport.^{29–31}

The mask's power as a unifying symbol of solidarity was not static however, but context- and time-sensitive. As epidemics waned, social norms established during a state of emergency were sometimes insufficient to overcome the physical discomfort that masks created and the fear of stigmatisation brought about by the association between masks and disease. Interviews by Siu suggest that Hong Kong residents became more reluctant to use masks after SARS because of physical discomfort, especially people with respiratory illnesses:

'Even for a healthy person, wearing a facemask can make you feel difficulties and discomfort in breathing; so asking a sick person to wear a facemask is quite inhumane to me, since this will make him or her feel even sicker.'²⁹ (p.9)
Male participant, aged 22 years

Together, these studies suggest that while mask use can rapidly become a social norm if it is seen and presented as an expression of solidarity and altruism, this can change as risk perception wanes and other concerns, including physical discomfort and stigma, take hold.

Containing risks

The metaphor of masks as technologies of 'containment' featured in several of the studies reviewed. Masks acted as containment devices to manage threats to identity at both personal and collective levels. The Japanese media described face masks as people's 'safety blankets'.²⁷ In Hong Kong, participants felt that masks gave them some sense of control over risk, wherever it might be located:

'I could never know who a virus carrier was when I was on the streets. I could never know if the air contained the SARS virus as well. There was so much that was unknown about SARS, and there was so little that we could do and control. However, I still had to do something, and wearing a facemask was the only thing that I could do at the time. It gave me a sense that I could at least have some control over my life.'²⁹ (p.8) Female participant, aged 51 years

In most studies, uncertainty about the exact mode of virus transmission and perceived or actual barriers to sourcing masks were not cited as strong barriers to mask use. Instead, in a context of uncertainty, people engaged in context- and person-specific risk appraisal, weighing up their own perceived individual susceptibility, the health and social benefits of wearing masks, physical and social discomforts and occasionally financial penalties. Three studies found that gender shaped individual risk appraisals. Condon and Sinha found higher compliance in mask use among women than men during the H1N1 epidemic in Mexico City, and hypothesised that gender norms led men to take more risks, although reasons for non-use were also clearly occupational.²⁴ Similarly, in

Hong Kong, gender norms related to appearing 'strong' and 'brave' prompted men to take risks by not wearing face masks after SARS.^{28 29}

Foucault and subsequent scholars have linked biomedical and government regulatory practices to the exercise of biopower, defined as the modern state's use of technologies—including ways of regulating and counting bodies—to control populations without the use of physical force.³⁴ In all studies reviewed, masks operated as containment devices at an individual and at a collective level. Burgess and Horii described the rise of masks in Japan as a collective, science-based response to the 1918 influenza pandemic that was also compatible with older, lay beliefs about pathology, but endured for socio-political reasons. After the SARS and Avian flu outbreaks in 2003 and 2004, the Japanese mask manufacturing industry launched advertisements that linked individual health protection with masks to national defence.²⁷ Burgess and Horii also highlighted the influence of corporations on mask use in Japan. The 'social bargain' culture of postwar Japan encouraged employees to be loyal to companies in exchange for secure life support, and corporations could enforce mask use:

'My company is forcing everyone to wear them all day from the moment one leaves the house to when one gets back home. It feels like I'm suffocating, all the while keeping a microbe-culture adhered to my face and feeding it warmth and moisture with my own breath, so naturally, I hate it. A lot. But when my pay's on the line, I have no choice but to comply... at least while the bosses are looking.' (Japan Probe 2009)²⁷ (p.1188)

In this context, mask promotion was also embedded within a historical neoliberal trend to individualise responsibility for disease prevention.²⁷ Additional reinforcement was provided by the fact that masks were seen as useful to prevent the transmission of a range of influenza-like illnesses and protect against the air pollution of densely populated cities.²⁸

In three of our nine studies, mask use did not become routinised after public health crises triggering widespread use associated with solidarity against infection. In these three studies, study participants described masks as stigmatising, uncomfortable or even oppressive for different reasons. Where few people wore masks in public and their use was limited to those with known illness, they rapidly became stigmatising.^{23 31} A patient wearing a N95 respirator while recovering from tuberculosis in Cape Town's Kayelitsha explained:

'This mask [N95]... you can't see the face. You can see the eyes... not the nose, the mouth. Can you see me smile? Or can you see if I am not happy? How can you trust someone like that? The face is closed. You cannot see it (laughs)... That's what I can say is (that) no one can see you! But they can see you, because of this damn thing. You are like a ghost standing up. You can be a ghost and no one will notice. But when you stand, everyone will.'²³ (p.8)

In the USA, the advice to wear masks indoors and outdoors when experiencing influenza-like illness led to mixed responses. While many participants described getting used to masks over time, these interfered with daily activities indoors, causing stresses and discomfort:

'I feel OK now. The mask does not feel as humid/damp or itchy after I changed to a new mask. I feel like I cannot show as much affection to my baby with the mask on. I would have kissed my baby more if I was not wearing a mask.'³² (p.19)

In Mexico City, mask use was rapidly abandoned as the perceived risk of H1N1 infection decreased and as the discomfort of wearing a mask outweighed its perceived protective qualities.²⁴ Lack of trust in government compounded the effects of decreased risk perception. The police threatened to seize vehicles of taxi drivers who failed to wear masks and applied fines nearly 40 times the daily minimum wage, leading to compliance with resentment followed by rapid abandonment as the epidemic waned.²⁵ Bus drivers were also subjected to the fines but could not have their vehicles seized. They staged a protest against the policy of mandatory mask use and rapidly reducing their own use.^{24 25}

Masks also helped control or exacerbate symbolic threats to identity at a transnational level. Twentieth and twenty-first century epidemics have occurred in the context of a global circulation of images, including images of people in masks. In Dr Wu's 1910–1 plague album, masks conjured modern scientific rationality and leadership.³¹ But images of masked people and masked crowds have also been politicised in more nefarious ways. Sin, who studied the effect of the global dissemination of images of masked crowds in Asian cities, argued that these have been racialised and construed by the Western media as a distinctly 'Asian' phenomenon linked to 'folk' cultural beliefs and obedience to government.²⁸ Racist interpretations singled out people from Asia as potential disease carriers, with masks 'indexing' their identity as contaminated. Such politicisation of masks to contain perceived threats makes them easy tools to foster othering and discrimination.

DISCUSSION

Our study has explored the meanings of face masks along two main axes: as technologies creating social identities that can support by triggering solidarity and altruism, and as technologies containing threats to individual, national and transnational identities and health. Masks create new forms of biosociality: they are medical technologies that both reflect and create social relationships.³⁵

Our findings broadly concur with the synthesis of sociobehavioural studies recently conducted by DELVE, and suggests that risk perception, in the form of perceived severity of disease and individual susceptibility (including through pre-existing health conditions, age and occupation) may play an even greater role than understanding of virus transmission and perceived or actual barriers to

sourcing masks.^{10 11} While the latter are important, mask use can take hold rapidly even when there is uncertainty about transmission, conflicting beliefs about whether masks protect oneself, others or both, little previous experience with previous outbreaks and barriers to sourcing masks. This was the case for H1N1 in Mexico, and is also being verified in the very rapid increase in mask use across continental Europe and Asia in the context of SARS-CoV-2.⁷

Maintaining long-term mask use after epidemic peak is likely to be more challenging. The studies we reviewed suggested that reduced risk perception is the biggest threat to mask use. Countering this requires consistent appeals to shared social forms of solidarity, easily intelligible ground-rules about mask use and consistently fair enforcement.

The concept of 'boundary object' is useful to illustrate how masks 'work' on different scales.²² Historians and anthropologists have often found that the objects and actions that materialise intimate care for patients, such as masks or cloths used to wash loved ones, often offer a bridge between local norms of care and the norms of public health. In her study of burials in Madagascar, Poleykett found that, at the level of materiality and intentionality, traditional ritual care and hygiene become mutually intelligible.³⁶ In a study of local responses to Ebola in Sierra Leone, Parker *et al* found that community members implemented local quarantine systems and had made their own protective gear for funerals prior to external interventions; these technologies served as boundary objects that linked local norms of care to the emerging norms of Ebola control programmes started by WHO and its partners.³⁷

Masks are boundary objects within global health too: they are positioned as an essential tool for SARS-CoV-2 suppression by some, and questioned for their global transferability and effectiveness by others, with new evidence constantly negotiated as part of the necessary 'boundary work' of science.³⁸ They have even taken up a new form of 'boundary work' in the current SARS-CoV-2 pandemic, as a tool to display political affiliation.^{39–41} In the USA, mask use is viewed by some as an expression of collective solidarity, but cause protests among others.^{41 42} Echoing concerns about ostracisation raised by our primary studies, we see that politicisation can dichotomise social identities and hinder mask use.

To our knowledge, our study is the first meta-ethnography of mask use by the public in the context of epidemics. Nevertheless, our review reflects gaps in the literature and had its own methodological limitations. Our findings reflect the prominence of East Asian studies on mask use; we found considerable gaps in evidence from African, South Asian, Latin American and European settings. Few studies actually described public health campaigns for mask promotion or social and structural factors that enabled 'safe use', for example, handwashing before placing and after touching masks, which limits our ability to inform discussions about these. Similarly,

we found no studies on the social impacts of widespread mask use among people for whom mask-wearing is highly distressing, and those who rely on lip-reading for communication. It is possible that our screening missed studies where masks were mentioned in small portions of text rather than as a main focus. Some of the studies we identified showed substantive conceptual thinking that greatly enabled translation across studies, while others focused on description, and we had to rely on our own interpretations to make links with findings in other studies. In addition, our use of secondary anthropological literature is necessarily partial and might have led us to overemphasise or underemphasise some dimensions of mask use. Finally, we did not search for literature on ‘face coverings’ as this term has only emerged recently.

More and better quality, social science-informed studies on mask use are needed. Global, national or local behavioural surveys could be improved by using behavioural theory and measuring capability (eg, knowledge about virus transmission and the benefits of mask use), opportunity (including social and material constraints) and motivation (eg, protecting oneself, protecting others and other motivations linked to the social meanings explored in this meta-ethnography).^{7 43}

The historic, political and social influences that shape to the long-term use of masks during and after efforts to suppress SARS-CoV-2 transmission also need ethnographic attention in diverse contexts. Some of this is already emerging through ‘real-time’ reporting and analysis in blogs. In India, blogs described women’s self-help groups producing an estimated 19 million masks while also disseminating prevention information and running community kitchens, leading to praise and concerns about the social fairness of extracting essential work from women for low pay.⁴⁴ Ethnography from the Czech Republic has described how women spearheaded a brisk, largely non-monetary trade in masks, supported by values that stressed collective care and reciprocal responsibility.⁴⁵ Similarly, contemporary stories from Afghanistan, Ghana and the USA show that women’s roles in mask production can be empowering yet at the same time entrench gendered stereotypes about caregiving.^{46–48} We need more research on the social lives of masks, their role as ‘boundary objects’ where norms of public health and everyday realities intersect, and investigations of how everyday responses to health and social vulnerabilities shape mask production and use.^{49 50}

CONCLUSION

Our study suggests that face masks can take on positive social meanings linked to solidarity and altruism during epidemics. Unfortunately, these positive meanings can subside if risk perception falls, masks interfere too much with daily activities and trust in government is low. In such contexts, ensuring continued use is likely to require additional efforts to promote locally appropriate positive

meanings, simplifying rules for use and ensuring rules are enforced fairly.

Contributors PMT and AP are co-contributors to planning, conduct and reporting of the work.

Funding The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

Competing interests None declared.

Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

Patient consent for publication Not required.

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are from the published peer-reviewed literature.

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