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PERSPECTIVES

The Time for Universal Masking of the Public for Coronavirus Disease 2019 Is Now

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In this perspective, we recommend universal masking of the US public during coronavirus disease 2019 due to the high contagiousness of severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2), viral shedding of viable SARS-CoV-2 from asymptomatic individuals, and the likely contribution of masking to core distancing public health strategies for curbing transmission.

Keywords. COVID-19; public; SARS-CoV-2; surgical masks; viral shedding.

Healthcare workers (HCWs) should wear isolation masks in all clinical settings to reduce their risk of acquiring coronavirus disease 2019 (COVID-19). However, should the US public wear isolation masks when in crowded indoor or public areas to prevent the spread of the virus? The Centers for Disease Control and Prevention (CDC) recommended the use of cloth face coverings for the public on April 3, 2020, especially in areas of high community transmission [1]. The World Health Organization (WHO)'s updated interim guidance on April 6, 2020 does not make this recommendation [2]. In this perspective, we briefly review the current scientific evidence behind universal public masking based on 4 considerations: (1) the highly contagious nature of severe acute respiratory syndrome-coronavirus 2 (SARS-CoV-2), the virus that causes COVID-19; (2) increasing evidence of viral shedding of SARS-CoV-2 from asymptomatic and presymptomatic individuals; (3) experience from Asian countries with receding epidemics that incorporated universal masking as a part of stringent public health measures; and (4) the potential contribution of masking to facilitate selective return-to-work policies

CONTAGIOUSNESS OF SEVERE ACUTE RESPIRATORY SYNDROME CORONAVIRUS 2

Although the debate on whether SARS-CoV-2 is airborne versus droplet is still raging [2–7], SARS-CoV-2 is highly contagious compared with the following: SARS-CoV-1, the coronavirus that led to the SARS epidemic in 2002 [8]; Middle East respiratory syndrome (MERS), the coronavirus that led to MERS in 2012 [9]; and seasonal viral influenza. Coronavirus disease 2019 has spread exponentially worldwide since the cluster of infections in Wuhan Province was first reported to the WHO on December 31, 2019 [10]. As of this writing, worldwide estimates of COVID-19 cases exceed 1.8 million, a number that is likely grossly underestimated due to inadequate testing capability in many settings. Although the airborne versus droplet question is relevant to healthcare settings (which involve close contact) and has guided infection control recommendations and type of masks required accordingly [7, 10], the most compelling reason for public masking is due to the data on spread from asymptomatic individuals [11]. For the general public, surgical isolation masks (as part of an overall public health strategy) should be able to curb dissemination of both droplet-spread and airborne viruses to the breathing zones of nearby individuals [12–17].

VIRAL SHEDDING FROM PRESYMPTOMATIC AND ASYMPTOMATIC INDIVIDUALS

There is considerable evidence that presymptomatic persons (those without current symptoms who eventually go on to develop symptoms) or asymptomatic persons (defined as individuals who never go on to develop symptoms) with SARS-CoV-2 can infect others. Asymptomatic or presymptomatic (heretofore combined into the single term of "paucisymptomatic") transmission of a respiratory virus requires shedding of viable virus in the oropharynx, nasopharynx, or other body fluids. Mounting evidence that SARS-CoV-2 displays high rates of viral shedding in the upper respiratory tract (eg, nasopharynx, oropharynx), even among paucisymptomatic individuals, distinguishes it from SARS-CoV-1, in which replication occurs mainly in the lower respiratory tract [18–20], and viral influenza, in which individuals with asymptomatic disease have

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lower viral loads in the upper respiratory tract versus those without symptoms [21, 22].

Data from the Diamond Princess cruise ship suggest that up to 18% of cases were asymptomatic, despite detectable SARS-CoV-2 ribonucleic acid in the nasopharynx or oropharynx [23]. A similar report in the Morbidity and Mortality Weekly Report (*MMWR*) [24] detailed clusters of cases in Singapore from January 23 to March 16, 2020 and estimated that more than 6% of transmissions occur from paucisymptomatic individuals. Finally, after identification of a case of COVID-19 in a HCW in a skilled nursing facility (SNF) in Washington State, 76 residents of the SNF were tested for SARS-CoV-2 and 48 (63%) had positive swabs, with 27 (56%) being paucisymptomatic. Moreover, SARS-CoV-2 viral loads were quantitatively similar in those with symptoms and those who were asymptomatic [11], with viral culture demonstrating viability even before symptoms.

Two other studies besides the one from the Washington State SNF [11] have demonstrated similar quantitative nasopharynx and oropharynx SARS-CoV-2 viral loads among paucisymptomatic and symptomatic individuals with COVID-19 [25, 26]. Analysis of presymptomatic and symptomatic patients demonstrates high viral loads and viable virus readily isolated in culture shortly before and after the onset of symptoms [27]. A study detailing the clinical and virological characteristics of 5 patients in France showed that 2 patients had high viral loads of SARS-CoV-2 in nasopharyngeal secretions soon after symptom onset [28]. Lower respiratory tract specimens may have higher viral loads than those in upper respiratory samples during the phase of active pneumonia and acute respiratory distress syndrome with SARS-CoV-2 [29]. However, high viral loads of SARS-CoV-2 in upper respiratory tract samples among patients "without symptoms" suggest a high risk of transmissibility [30]. Modeling studies have also demonstrated that paucisymptomatic infections with SARS-CoV-2 could be responsible for a large proportion of transmissions [31, 32], with early case reports and familial clusters also indicating asymptomatic transmission [33–40]. In sum, the degree of transmissibility from asymptomatic individuals in SARS-CoV-2 is the most compelling argument for universal public masking.

EXAMPLES FROM OTHER COUNTRIES

The literally breathtaking pace of the COVID-19 pandemic is reflected in the lack of a unified public health responses to curb transmission. However, recommendations have coalesced on the use of isolation facemasks (eg, "surgical masks") for HCWs in the clinical workspace. After an article in *The New Yorker* on March 21, 2020 by Dr. Atul Gawande [41] encouraging this protective measure for HCWs in the United States based on experiences from Singapore and Hong Kong, the Boston hospitals mandated this measure for HCWs on March 22, 2020 [42], followed by hospitals around the country in quick succession. Universal cloth face masking for the public was recommended by the CDC on April 3, 2020, but it has been actively debated in the White House [43].

A systematic review of physical interventions to reduce the spread of respiratory viruses for the public showed that surgical masks are the most consistent and comprehensive measure to interrupt transmission, because N95 masks can irritate the skin and thereby reduce compliance [16, 44]. Universal public masking was adopted in Singapore, South Korea, Hong Kong, mainland China, Thailand, and Taiwan [45, 46] after their respective COVID-19 outbreaks and may have contributed to their initial success rates to curbing transmission, along with widespread testing, isolation and quarantining, contact tracing, and border control measures. Asian countries were heavily impacted by SARS-CoV-1 [8], which may have led to a more rapid institution of universal masking for SARS-CoV-2 [47]. In the early stages of the epidemic, Taiwan immediately increased its capacity to mass produce surgical isolation masks for HCWs and the public [28], and they announced plans on April 1, 2020 to donate 10 million masks to countries most severely impacted by the coronavirus.

A major argument against universal public masking in addition to other public health measures has been limited supplies of personal protective equipment, including surgical masks, in the face of a sudden pandemic for which HCWs must be prioritized. We cannot conflate what we think should be done and what can be done. Industries in the United States can repurpose to produce surgical masks in vast quantities for the public [48] (as in Taiwan) [45], and such production will allow equal access to mask supplies across all strata of society. The CDC has provided guidance on which cloth materials are the most effective for preventing the spread of respiratory droplets [12, 49], although ensuring that equality to access is imperative and recommendations on how to prolong the life of disposable masks and reuse masks are widespread [50]. Another major concern is that the public will let their "guard down" with masking [2]. This can be addressed with strong public health messaging performed in tandem with new policy.

UNIVERSAL PUBLIC MASKING AND A RETURN TO WORK

The effects of the "lockdown" and shelter-in-place guidelines for most of the United States on the economy have been devastating. Taiwan, with the most consistent supply of surgical isolation masks for its people (including medical, public and industrial sectors), and with stringent social distancing guidelines and other public health measures, has maintained control of its epidemic without mandating work and school closure. When social distancing is not possible, the Taiwanese Centers for Disease Control has mandated that members of the public wear face masks, including on public transportation where fines may be incurred for noncompliance. The country of Taiwan remains one of the most controlled in

terms of the COVID-19 epidemic to date, with 388 cases and 6 deaths as of April 12, 2020 [51]. An eventual and cautious recommendation for a return to work in the United States, with public masks for crowded indoor or outdoor spaces as one component of the updated guidelines, could provide much-needed relief for the economy. Tips for how children can be encouraged to wear face masks are already emerging [52].

CONCLUSIONS

In conclusion, we strongly endorse universal public masking in the United States for crowded indoor or public spaces, including supermarkets, public gatherings, and in close workplaces. This recommendation does not replace our population-level, public health approaches, including social distancing in the short term, but it does serve as an adjunct, with the hope that we will be able to relax such measures as transmission slows.

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