

Universal Masking to Prevent SARS-CoV-2 Transmission— The Time Is Now

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In this issue of *JAMA*, Wang et al present evidence that universal masking of health care workers (HCWs) and patients can help reduce transmission of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infections.¹

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In the largest health care system in Massachusetts with more than 75 000 employees, in tandem with routine symptom screening and diagnostic testing of symptomatic HCWs for SARS-CoV-2 infection, leadership mandated a policy of universal masking for all HCWs as well as for all patients. The authors present data that prior to implementation of universal masking in late March 2020, new infections among HCWs with direct or indirect patient contact were increasing exponentially, from 0% to 21.3% (a mean increase of 1.16% per day). However, after the universal masking policy was in place, the proportion of symptomatic HCWs with positive test results steadily declined, from 14.7% to 11.5% (a mean decrease of 0.49% per day). Although not a randomized clinical trial, this study provides critically important data to emphasize that masking helps prevent transmission of SARS-CoV-2.

This change and its association with universal masking is unlikely to be artifactual; throughout the intervention, the number of symptomatic HCWs tested per day appears to have remained steady, while at the same time the daily number of new SARS-CoV-2 infections in the greater Massachusetts community was continuing to increase or had plateaued.² An artifactual flattening or decline in the rate of newly diagnosed SARS-CoV-2 infections when the rates were actually unchanged by the intervention could have occurred if, during the intervention period, a competing etiology for the symptoms that prompted SARS-CoV-2 testing among HCWs, such as influenza, had been trending more rapidly upward; however, weekly rates of diagnosed influenza in Massachusetts were low and approaching zero during this time.³

The authors rightly note that other community-wide and hospital-specific interventions may have contributed to their observation, including the statewide declaration of emergency (March 10), new hospital policies to restrict visitors (March 12) and elective procedures (March 14), statewide school closures and hospital restrictions on business travel and on-site working (March 16), local public transportation reductions (March 17), issuance of statewide stay-at-home orders (March 24), and automation of screening and testing (March 30).⁴ Nonetheless, it was only after the universal masking policy had been in operation for approximately a week that the temporal trend in positivity

of SARS-CoV-2 testing among HCWs declined (as shown in the Figure in the report by Wang et al).

Covering mouths and noses with filtering materials serves 2 purposes: personal protection against inhalation of harmful pathogens and particulates, and source control to prevent exposing others to infectious microbes that may be expelled during respiration. When asked to wear face coverings, many people think in terms of personal protection. But face coverings are also widely and routinely used as source control. For instance, if given the choice between having surgery performed by a team not wearing some covering over their mouths and noses vs a team that does, almost all patients would reject the former. This option seems absurd because it is known that use of face coverings under these circumstances reduces the risk of surgical site infection caused by microbes generated during the surgical team's conversations or breathing. Face coverings do the same in blocking transmission of SARS-CoV-2.

Early in the pandemic, the Centers for Disease Control and Prevention (CDC) recommended that anyone symptomatic for suspected coronavirus disease 2019 (COVID-19) should wear a face covering during transport to medical care and prior to isolation to reduce the spread of respiratory droplets.⁵ After emerging data documented transmission of SARS-CoV-2 from persons without symptoms, the recommendation was expanded to the general community, with an emphasis on cloth face coverings that could be made more widely available in the community than surgical masks and to preserve personal protective equipment such as N95 respirators to the highest-risk exposures in health care settings. Now, there is ample evidence that persons without symptoms spread infection⁶ and may be the critical driver needed to maintain epidemic momentum.⁷

While community use of face coverings has increased substantially, particularly in jurisdictions with mandatory orders, resistance continues. Some have raised concerns that homemade face coverings made from household fabrics may be inferior compared with commercially manufactured products. Cloth face coverings can substantially limit forward dispersion of exhaled respirations that contain potentially infectious respiratory particles in the 1- to 10- μ m range that includes aerosol-sized particles,⁸ and recent research of household textiles' performance when used as source control suggests cloth face coverings may be able to do so with acceptable efficiency and breathability.^{9,10} Others may think it is premature to promote community masking until research has been completed that measures the effectiveness of cloth face coverings to prevent exposure specifically

to SARS-CoV-2. Laboratory studies will be difficult and costly because they require capacity to safely manage this biosafety level 3 pathogen. Any type of community-based randomized trial will be complex to deploy in the right setting (a community with active infection) at the right time (when infections are increasing) to produce actionable results quickly. In the absence of such data, it has been persuasively argued the precautionary principle be applied to promote community masking because there is little to lose and potentially much to be gained.¹¹ In this regard, the report by Wang et al provides practical, timely, and compelling evidence that community-wide face covering is another means to help control the national COVID-19 crisis.

Data from a large health care system may be generalizable to the greater community insofar as the findings represent the contribution of masking when individuals are physically close to one another and social distancing is not possible. Like herd immunity with vaccines, the more individuals wear cloth face coverings in public places where they may be close together, the more the entire community is protected. Community-level protection afforded by use of cloth face coverings can reduce the number of new infections and facilitate cautious easing of more societally disruptive community interventions such as stay-at-home orders and business closings.

Two reports published this week in *Morbidity and Mortality Weekly Report* provide additional new data about face coverings. One report indicates that use of face coverings increased following the April 3, 2020, announcement by the White House Coronavirus Task Force and the CDC that recommended their adoption in public to slow the spread of COVID-19. In an internet-based survey among 503 adults during April 7-9, 2020, and a similar survey among another sample of 502 adults during May 11-13, 2020, the self-reported prevalence of use of cloth face coverings among those who reported leaving their homes within the previous week increased from 61.9% to 76.4%.¹² Another report from investigators in Missouri found that adherence to universal masking for source control as mandated by city ordinance and company policy helped prevent transmission of SARS-CoV-2 from 2 symptomatically infected stylists at a hair salon in Springfield, Missouri. Before they were diagnosed as having COVID-19, the hair stylists had served 139 clients but had been required to wear masks at all times while working with them. After public health contact trac-

ing with the hair salon clients and after 2 weeks of follow-up, no symptoms of COVID-19 were identified among the exposed clients or their secondary contacts. Among 104 interviewed clients, 102 (98%) reported wearing face coverings for their entire appointment.¹³ In addition, another analysis published by Goldman Sachs Research suggests that expanding community masking by 15% could prevent the need to bring back stay-at-home orders that would otherwise cost an estimated 5% of gross domestic product, or a projected cost of \$1 trillion.¹⁴

For the person assessing personal exposure risk when going out in public, minimizing the number of nonhousehold contacts, maintaining a physical distance of at least 6 ft, and limiting the amount of time around others, especially while indoors and in poorly ventilated areas, are all important considerations. An additional factor in this calculus is the extent that individuals and communities will also be practicing source control by wearing masks. Several state and local governments have issued temporary mandates for face coverings in public places and some business are requiring mask wear by customers and employees. However, face covering is not needed all the time. It is probably safe for individuals and safe for others to drive alone or to walk or jog alone on an uncrowded route without a face covering. But when individuals choose to go out or must be close to others in public, a cloth face covering can help reduce the spread of COVID-19 from asymptomatic individuals or others. With cloth face coverings, personal protection is derived from their use by all members of the community.

How then can individuals make the most of this intervention? First, public health officials and leaders need to ensure that the public understands clearly when and how to wear cloth face coverings properly and continue building the evidence base for their effectiveness. Second, although cloth face coverings are generally well tolerated for short periods, with prolonged use they can be irritating or difficult for some people to breathe through, especially in hot or humid environments. Innovation is needed to extend their physical comfort and ease of use. Third, the public needs consistent, clear, and appealing messaging that normalizes community masking. At this critical juncture when COVID-19 is resurging, broad adoption of cloth face coverings is a civic duty, a small sacrifice reliant on a highly effective low-tech solution that can help turn the tide favorably in national and global efforts against COVID-19.

ARTICLE INFORMATION

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REFERENCES

1. Wang X, Ferro EG, Zhou G, Hashimoto D, Bhatt DL. Association between universal masking in a health care system and SARS-CoV-2 positivity among health care workers. *JAMA*. Published online July 14, 2020. doi:10.1001/jama.2020.12897
2. Massachusetts Department of Public Health COVID-19 dashboard—April 30, 2020. Accessed July 8, 2020. <https://www.mass.gov/doc/covid-19-dashboard-april-30-2020/download>
3. Massachusetts Department of Public Health (MDPH) weekly influenza update May 22, 2020: estimated weekly severity of influenza. Accessed

July 8, 2020. <https://www.mass.gov/doc/weekly-flu-report-may-22-2020/download>

4. Zhang H, Dimitrov D, Simpson L, et al. A web-based, mobile responsive application to screen healthcare workers for COVID symptoms: descriptive study. *medRxiv*. Preprint posted April 22, 2020. doi:10.1101/2020.04.17.20069211
5. Patel A, Jernigan DB; 2019-nCoV CDC Response Team. Initial public health response and interim clinical guidance for the 2019 novel coronavirus outbreak—United States, December 31, 2019–February 4, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69(5):140-146. doi:10.15585/mmwr.mm6905e1

6. Furukawa NW, Brooks JT, Sobel J. Evidence supporting transmission of severe acute respiratory syndrome coronavirus 2 while presymptomatic or asymptomatic. *Emerg Infect Dis*. 2020;26(7). doi:10.3201/eid2607.201595
7. Li R, Pei S, Chen B, et al. Substantial undocumented infection facilitates the rapid dissemination of novel coronavirus (SARS-CoV-2). *Science*. 2020;368(6490):489-493. doi:10.1126/science.abb3221
8. Verma S, Dhanak M, Frankenfield J. Visualizing the effectiveness of face masks in obstructing respiratory jets. *Phys Fluids (1994)*. 2020;32(6):061708. doi:10.1063/5.0016018
9. Konda A, Prakash A, Moss GA, Schmoltdt M, Grant GD, Guha S. Aerosol filtration efficiency of common fabrics used in respiratory cloth masks. *ACS Nano*. 2020;14(5):6339-6347. doi:10.1021/acsnano.0c03252
10. Ma QX, Shan H, Zhang HL, Li GM, Yang RM, Chen JM. Potential utilities of mask-wearing and instant hand hygiene for fighting SARS-CoV-2. *J Med Virol*. 2020;31:31. doi:10.1002/jmv.25805
11. Greenhalgh T. Face coverings for the public: laying straw men to rest. *J Eval Clin Pract*. 2020; e13415. doi:10.1111/jep.13415
12. Fisher KA, Barile JP, Guerin R, et al. Factors associated with cloth face covering use among adults during the COVID-19 pandemic—United States, April and May 2020. *MMWR Morb Mortal Wkly Rep*. Published online July 14, 2020. https://www.cdc.gov/mmwr/volumes/69/wr/mm6928e3.htm?s_cid=mm6928e3_w
13. Hendrix MJ, Wade C, Findley K, Trotman R. Absence of transmission of SARS-CoV-2 after exposure at a hair salon with a universal face mask policy—Springfield, Missouri, May 2020. *MMWR Morb Mortal Wkly Rep*. Published online July 14, 2020. https://www.cdc.gov/mmwr/volumes/69/wr/mm6928e2.htm?s_cid=mm6928e2_w
14. Hatzius J, Struyven D, Rosenberg I. *Face Masks and GDP*. Goldman Sachs Research. Published June 29, 2020. Accessed July 8, 2020. <https://www.goldmansachs.com/insights/pages/face-masks-and-gdp.html>