

Broad Public Use of Masks for COVID-19: New Evidence and Examples

A working paper for state and local health policy and research

July 7, 2020

Since early March 2020, fast-paced, unprecedented actions by state and federal public health officials have featured statewide stay-at-home orders, limits on gatherings, closure of businesses and recreation spaces, and near-universal recommendations for social distancing, sanitizing hands and surfaces, and use of face masks.

The use of universal masks and/or face coverings plays a visible and prominent role in COVID-19 responses, but had limited academic or science study or research until 2020.

This brief report ¹⁰ provides a summary and highlights of some of the best NEW EVIDENCE-BASED SOURCES specific to the broad use of masks and cloth face coverings by non-medical personnel.

Masks Stop the Transmission of COVID-19

■ Identifying airborne transmission as the dominant route for the spread of COVID-19

One of the latest peer-reviewed scientific studies. On June 12 CNN and most major news outlets brought new medical research out of the academic journals and into the headlines. They reported that “A team of researchers in Texas and California compared Covid-19 infection rate trends in Italy and New York both before and after face masks were made mandatory. Both locations started to see infection rates flatten only after mandatory face mask measures were put in place, according to the study published (June 11) Thursday in the Proceedings of the National Academy of Sciences.”

- The researchers calculated that wearing face masks prevented more than 78,000 infections in Italy between April 6 and May 9, and more than 66,000 infections in New York City between April 17 and May 9.
- “Our results show that the airborne transmission route is highly virulent and dominant for the spread of COVID-19.
- Our analysis reveals that the difference with and without mandated face covering represents the determinant in shaping the trends of the pandemic. This protective measure significantly reduces the number of infections.
- Other mitigation measures, such as social distancing implemented in the United States, are insufficient by themselves in protecting the public. Our work also highlights the necessity that sound science is essential in decision-making for the current and future public health pandemics.”

CNN’s coverage noted that “*The researchers wrote that both the World Health Organization and the US Centers for Disease Control and Prevention emphasized the prevention of contact transmission, but both organizations have largely ignored the importance of the airborne transmission route.*” ¹

- Title: Identifying airborne transmission as the dominant route for the spread of COVID-19
Authors: The team of five researchers are from the Texas A&M University, the University of Texas, the University of California, San Diego, and the California Institute of Technology.
- Source: Proceedings of the National Academy of Sciences. June 11, 2020
<https://www.pnas.org/content/early/2020/06/10/2009637117>; (PDF format = 7 pp)

■ Masks and face coverings stop the transmission. The peer-reviewed Royal Society (England) published one of the early COVID-specific articles, with a conclusion, “Masks contribute to the management of community transmission of Covid19 within the general population....”

- Their use can reduce onward transmission by asymptomatic and pre-symptomatic wearers - especially when widely used in situations where physical distancing is not possible or predictable. Face masks, including homemade cloth masks, contribute to reducing viral transmission.

- We know that respiratory droplets (mouth and nose) from infected individuals are a major mode of transmission. Droplets are generated via talking and breathing¹⁵ also from coughing or sneezing: especially in non- AND pre-symptomatic individuals.²

- Source: “Face Masks for the General Public” [published](#) by The Royal Society (England), May 4, 2020. ([PDF](#))

■ **A modelling framework assesses the likely effectiveness of facemasks in combination with ‘lock-down’**

The Royal Society (England) has published a second medical analysis (by different research teams) that scientifically models the widespread use of face masks. A University released summary makes these points:

- “The research suggests that lockdowns alone will not stop the resurgence of SARS-CoV-2, and that even homemade masks with limited effectiveness can dramatically reduce transmission rates if worn by enough people, regardless of whether they show symptoms.
- The researchers call for information campaigns across wealthy and developing nations alike that appeal to our altruistic side: “Cultural and even political issues may stop people wearing facemasks, so the message needs to be clear: “my facemask protects you, your facemask protects me”.
- Lead author Dr. Richard Stutt explains "[Our analyses support the immediate and universal adoption of facemasks by the public](#). If widespread facemask use by the public is combined with physical distancing and some lockdown, it may offer an acceptable way of managing the pandemic and re-opening economic activity long before there is a working vaccine."
- The report concludes, “Despite the potential for facemasks to reduce SARS-CoV-2 transmission, there does not appear to be any focus on investing efforts in properly designed studies on facemasks, or evaluating large populations including ‘at risk’ patients and in a variety of communities. We argue that these are required urgently. In summary, our modelling analyses provide support for the immediate, universal adoption of facemasks by the public, similar to what has been done in Taiwan.”

- Source: Published in the *Proceedings of the Royal Society A* as a peer-reviewed article, June 10, 2020 <https://royalsocietypublishing.org/doi/10.1098/rspa.2020.0376> ; University news release: <https://medicalxpress.com/news/2020-06-widespread-facemask-covid-.html>

■ **“Physical distancing, face masks, and eye protection to prevent person-to-person transmission of ... COVID-19:”**

The UK-based Lancet released another article , described as a systematic review and meta-[analysis](#) “based on 172 previous studies from around the world, found that “face mask use could result in a large reduction in risk of infection. ...For the general public, evidence shows that physical distancing of more than 1 m is highly effective and that face masks are associated with protection, even in non-health-care settings, with either disposable surgical masks or reusable 12–16-layer cotton ones.” The findings come from a systematic review of 44 studies, including seven involving the virus causing COVID-19. The remaining focused on SARS or MERS.³

This analysis to ... assess the use of face masks and eye protection to prevent transmission of viruses is the latest evidence that initial guidance from U.S. health authorities discouraging mask use was a misstep. “This puts all that information clearly in one place for policymakers to use,” said study co-author Dr. Derek Chu of McMaster University in Hamilton, Ontario.

- Sources: [The Lancet](#), funded by the World Health Organization. [Analysis](#) by the Washington Post June 1, 2020. <https://www.thelancet.com/action/showPdf?pii=S0140-6736%2820%2931142-9>

■ **“Universal Masking is Urgent”**

Joint authors (from Berkeley U, Hong Kong, UK, France and Finland) “present two models for the COVID-19 pandemic predicting the impact of universal face mask wearing...

Results show a near perfect correlation between early universal masking and successful suppression of daily case growth rates and/or reduction from peak daily case growth rates. Taken in tandem, our theoretical models and empirical results argue for urgent implementation of universal masking in regions that have not yet adopted it as policy or as a broad cultural norm.

- As governments plan how to exit societal lockdowns, universal masking is emerging as one of the key non-pharmaceutical interventions (NPIs) for containing or slowing the spread of the pandemic.”

- Combined with ... social distancing and mass contact tracing, a “mouth-and-nose lockdown” is far more sustainable than a “full body lockdown”, from economic, social, and mental health standpoints.
 - Title: “Universal Masking is Urgent in the COVID-19 Pandemic: SEIR and Agent Based Models, Empirical Validation, Policy Recommendations” – prepublication 4/21/2020 by De Kai, PHD MBA, et al; May 12
 - Text: ([PDF, 19 pages](#)). Interactive simulation available online at <http://dek.ai/masks4all>

■ [Masks4All Online](#) Information site

“How to Significantly Slow Coronavirus?” featuring Minister of Health of the Czech Republic.

- Video for public use or download: bit.ly/Masks4All-download
- Graphic comparing results in required vs recommended mask states [Graphic link](#) June 24, 2020 NYT

■ **Masks and social distancing work, new analysis finds -**

Lead author Jeremy Howard, University of San Francisco data scientist, stated,

- Roughly three-quarters of humanity has been under some kind of government masking orders in recent months.
- The research “suggests that masks — even ones that are handmade — significantly lower the likelihood of transmission of the coronavirus among people moving about their communities.”
- “Mask wearing seems to be the number one most effective tool in slowing the epidemic”
 - Source: University of San Francisco data scientist Jeremy Howard. ⁴ Washington Post, June 5, 2020. <https://www.washingtonpost.com/technology/2020/06/05/masks-benefits-study-italy/> ⁵

■ **Turbulent Gas Clouds and Respiratory Pathogen Emissions... Reducing Transmission of COVID-19.**⁶

This study from MIT, peer-reviewed in JAMA, and dramatic visual demonstration of how a cough can spread across a room, reaching up to 27 feet, was a “wake-up call” when the video was released and reproduced by the New York Times and other online media.

- Watch the lab video of a human sneeze:
- “Turbulent gas cloud dynamics should influence the design and recommended use of surgical and other masks. These masks can be used both for source control (i.e., reducing spread from an infected person) and for protection of the wearer (i.e., preventing spread to an unaffected person).”
 - [Source: JAMA](#), online March 26; 2020. Author: Lydia Bourouiba, PhD, Massachusetts Institute of Technology, (visual graphic on last page)

■ **“Fauci says the WHO's comment on asymptomatic spread is wrong.”**

In publicly refuting a confusing remark, [Dr. Anthony Fauci, the top infectious diseases expert in the US](#). Explained, “Here's the difference between asymptomatic and pre-symptomatic spread.”

- “A World Health Organization official recently said asymptomatic spread “appears to be rare,” prompting widespread confusion because doctors and scientists have been saying the opposite for months.
- But the WHO's comment “was not correct,” Evidence shows that 25% to 45% of infected people likely don't have symptoms, Fauci told ABC's “Good Morning America” on Wednesday. “And we know from epidemiological studies they can transmit to someone who is uninfected even when they're without symptoms,” said Fauci, the director of the National Institute of Allergy and Infectious Diseases. So to make a statement to say that's a rare event was not correct.”
- And while the public might use the word “asymptomatic” to describe any infected person who doesn't have symptoms, the bigger concern may be infection from “pre-symptomatic” carriers. How can I tell if someone is pre-symptomatic or asymptomatic? You can't. Both types of carriers look and feel normal, though the pre-symptomatic carriers will get symptoms later.
 - Source: CNN, June 10,2020 | Listen http://lite.cnn.com/en/article/h_cff600c488ea3e1a7a24ffd9489e16ef

■ **“It is Time to Address Airborne Transmission of COVID-19”.**

The [NY Times](#) captured the message of this communication: “**239 Experts With One Big Claim: The Coronavirus Is Airborne.**” The brief letter-format is 1) aimed primarily at WHO; 2) it does not explicitly list masks/cloth coverings as a solution. It does emphasize “microdroplets small enough to remain aloft in air and pose a risk...”

- Excerpt: “We appeal to the medical community and to the relevant national and international bodies to recognize the potential for airborne spread of COVID-19. There is significant potential for inhalation exposure to viruses in microscopic respiratory droplets (microdroplets) at short to medium distances (up to several meters, or room scale), and we are advocating for the use of preventive measures to mitigate this route of airborne transmission. Studies by the signatories and other scientists have demonstrated beyond any reasonable doubt that viruses are released during exhalation, talking, and coughing in microdroplets small enough to remain aloft in air and pose a risk of exposure at distances beyond 1 to 2 meters from an infected individual ... “
- Source: Oxford Academic: Clinical Infectious Diseases ([Full document](#)); authors: Lidia Morawska (Australia), Donald K Milton (Univ. of Maryland). Published July 6, 2020

Cloth Face Coverings Are Effective

- Non-Medical Cloth-based face masks reduce emission of particles by significant amounts, for example study #1¹⁵ showed that they are almost completely eliminated. Study #2¹⁷ showed that cloth masks filtered viral particles during coughing at 50 to 100%. Both commercially available and homemade cloth masks and surgical masks can play a role.
 - Source: “Face Masks for the General Public” [published](#) by The Royal Society (England), May 4, 2020. ([PDF](#)) (*also cited above in part 1*)
- **Seeing is Believing: Effectiveness of Facemasks**
“Visualizing the effectiveness of face masks in obstructing respiratory jets”
The latest research, from [Florida Atlantic University](#)’s College of Engineering and Computer Science, published June 30, 2020 in the journal *Physics of Fluids*, demonstrates through visualization of emulated coughs and sneezes, a method to assess the effectiveness of facemasks in obstructing droplets.
 - Their study shows “well-fitted homemade masks with multiple layers of quilting fabric, and off-the-shelf cone style masks, proved to be the most effective in reducing droplet dispersal. These masks were able to curtail the speed and range of the respiratory jets significantly, albeit with some leakage through the mask material and from small gaps along the edges.” “Our researchers have demonstrated how masks are able to significantly curtail the speed and range of the respiratory droplets and jets” said Dean Stella Batalama, PhD. (*illustration, p. 8*)
 - “Importantly, uncovered emulated coughs were able to travel noticeably farther than the currently recommended 6-foot distancing guideline. Without a mask, droplets traveled more than 8 feet.”
 - Source: [Stella Batalama](#), Ph.D., dean of FAU’s College of Engineering and Computer Science. “University News release: <https://www.fau.edu/newsdesk/articles/efficacy-facemasks-coronavirus.php> *Physics of Fluids Journal*: <https://aip.scitation.org/doi/10.1063/5.0016018>
- **Tests of 10 Cloth fabrics found that the best material is cotton t-shirt.**
 This Illinois University-based science study found that cloth-based masks were even better to breathe in than a medical mask. Most common household fabrics, such as T-shirt material, have 40% or higher droplet blocking when used as a single layer.
 - In two layers, to our surprise, T-shirt fabric had a 98% droplet blocking efficiency – exceeding that of the medical mask, while maintaining better breathability.
 - There has been ... “little information on the effectiveness of home-made face coverings in reducing droplet dissemination. Here, we ascertained the performance of ten different fabrics, ranging from cotton to silk, in blocking high velocity droplets, using a 3-layered commercial medical mask as a benchmark material. We also assessed their breathability and ability to soak water. We reason that the materials should be as breathable as possible, without compromising blocking efficiency, to reduce air flow through the sides of the mask since such flow would defeat the purpose of the mask. We found that most home fabrics substantially block droplets, even as a single layer. With two layers, blocking performance can reach that of surgical mask without significantly compromising breathability.”
 - Click to see a video the [medical mask test](#). or (<https://youtu.be/XG1Du-GOJs0>)
 - Source: medRxiv at <https://www.medrxiv.org/content/10.1101/2020.04.19.20071779v1>, April 24, 2020
 Article by: University of Illinois <https://news.illinois.edu/view/6367/808377> May 1, 2020

Masks don't just filter the air; they keep people away; yet create group solidarity.

- **How do masks change human behavior?** This engineering-oriented science study, based in Italy, “investigated if and how wearing various Personal Protection Equipment, like masks, influences social distancing
 - ...findings suggest that wearing masks has a profound effect on how we perceive others, and in particular how close we are willing to get to strangers. (Without a mask researchers) “found that fellow pedestrians actually drew closer ... as he passed them on a sidewalk, typically within a foot. Wearing a mask, people drifted back — nearly twice as far as when he wasn’t wearing a mask — suggesting the mere sight of protective gear activated the underlying knowledge among fellow pedestrians that keeping their distance helped keep them safe.” In other words, masks appeared to make an extremely social species less social — and less vulnerable
 - “It’s our humanity that is actually bringing us toward the virus,” said Marchiori, a professor at the University of Padua. “You have to take away a bit of humanity, to become a bit antisocial, to protect humanity.”
 - Source: COVID-19 and the Social Distancing Paradox: dangers and solutions Massimo Marchiori, University of Padua, Italy; full text: <https://arxiv.org/pdf/2005.12446.pdf> Published in Washington Post, June 5, 2020
 - <https://www.washingtonpost.com/technology/2020/06/05/masks-benefits-study-italy/>
- **Getting universal use of face masks accepted by the public** — The Royal Society (cited above also examined the positive result of people responding to being in groups that also are wearing masks, termed “group solidarity.”
 - behavioral science tells us people view an action as correct in a given situation to the degree they see others performing it^{57 58},
 - there is an advantage to encouraging universal application in appropriate settings (such as public transportation) with the goal of setting new norms around mask use.
 - The visibility of masks can be expected to act as a reminder of the need for physical distance, increased hand washing, reduced face touching, and Community and group solidarity.
 - “apart from population control, mask-wearing, hand-washing, and social distancing are all necessary and must be implemented early to suppress transmission.”⁷

“Shutdown orders prevented about 60 million COVID-19 infections —“Far from Over”

According to a [research study](#)⁸ published June 8 “Shutdowns” Prevented about 60 million in the United States and 285 million in China, that examined how stay-at-home orders and other restrictions limited the spread of the contagion.

- A separate [study](#) from epidemiologists at Imperial College London estimated the shutdowns saved about 3.1 million lives in 11 European countries, including 500,000 in the United Kingdom, and dropped infection rates by an average of 82 percent, sufficient to drive the contagion well below epidemic levels.
- “The two reports ...come with a clear warning that the pandemic, even if in retreat in some of the places hardest hit, is far from over. The overwhelming majority of people remain susceptible to the virus.” The two reports used completely different methods to reach similar conclusions. They suggest that the aggressive and unprecedented shutdowns, which caused massive economic disruptions and job losses, were effective at halting the exponential spread of the novel coronavirus.
 - Source: published simultaneously in the journal [Nature](#), June 8, 2020.
www.washingtonpost.com/health/2020/06/08/shutdowns-prevented-60-million-coronavirus-infections-us-study-finds/

Public Messages:

- **“All your questions about how to wear a face mask – answered”**
CNN's Dr. Sanjay Gupta explains why wearing them in addition to physical distancing is so important. "Ultimately, it's

about having some form of barrier with multiple layers," said CNN Chief Medical Correspondent Dr. Sanjay Gupta in a [CNN video](#) on why masks in addition to physical distancing are important.

○ Source: [CNN video](#) – published as [#CNNTownHall](#) <https://cnn.it/3c5PctB> April 23, 2020

■ **“If we all wear masks, we could help each other.”** Dr. Joseph Vinetz, professor in the infectious disease section at Yale School of Medicine stated “The benefit of wearing masks in public is to protect others from exposure if you are sick or if you're an [asymptomatic carrier](#). But if we all wear masks, we could help each other, "The idea about the face mask is to prevent the virus from coming out of somebody's mouth and nose, mostly out of their mouth. They prevent somebody, when they talk or sometimes when they sneeze or cough, from expelling virus and leading to infection in other people."

○ Source: Dr. Joseph Vinetz, professor in the infectious disease section at Yale School of Medicine. <https://www.cnn.com/2020/04/01/europe/iceland-testing-coronavirus-intl/index.html>

Population Impact Success Examples

Comparison of weekly new cases in states with four policy approaches, from mandatory to only recommended. Results document that broad public use of masks was associated with a drop in cases (25% and 12%), while states with requirements only for employees (e.g. Colorado,) showed a spike in cases (70%) and states with no statewide required use showed an 84% case increase. Published in NY Times, June 24, 2020.

States where mask use is ...	New cases, June 1-7	New cases, June 15-21	Change
Mandatory in public	61,064	45,950	-25%
Required by employees and patrons of certain businesses	24,860	21,796	-12%
Required by employees of certain businesses	28,321	48,062	+70%
Recommended, but not required	38,638	71,165	+84%
U.S. total	152,883	186,973	+22%

JOHN DUCHNESKIE / Staff Artist
SOURCES: National Governors Association; New York Times

International Results

The United States is different from Asia and Europe, but results of stringent mask policies are notable, as cited in three diverse published articles:

- **Japan** on May 6, 21 people died of COVID-19 in Japan. In the United States, 2,129 died. Comparing overall death rates is even starker point of comparison with total U.S. deaths at staggering 76,032 and Japan’s fatalities at 577. Japan’s population is about 38% of the U.S., but even adjusting for population, the Japanese death rate is a mere 2% of America’s. *One reason is that nearly everyone there is wearing a mask,*⁹ (a)
- **Hong Kong**, “85% of respondents reported avoiding crowded places and 99% reported wearing face masks when leaving home”⁶⁸.
- **Austria** had 90% drop in coronavirus cases after requiring people to wear face masks”- [published](#) (b)
- **Czech Republic** “63 Czechs per 100,000 has been infected and less than two per 100,000 have died from the virus.” (b)
- **Slovakia**. 21 per 100,000 people have caught it and just (0.2) (two-tenths per 100,000 have died (b)
- **Spain** residents will have to continue to wear face masks even after the country officially lifts its state of emergency on June 21, the health minister, Salvador Illa, announced June 9, as the government presented its “new normalcy” plan. Citizens must “learn to cohabit with the virus” and maintain hygiene rules “until we conclusively defeat the virus.” (c)
 - Sources: (a) Universal Masking is Urgent in the COVID-19 Pandemic: SEIR and Agent Based Models, Empirical Validation, Policy Recommendations – prepublication 4/21; posted May 12 by De Kai, et al ([PDF](#))
 - (b) “Austria Has 90% Drop in Coronavirus Cases After Requiring People to Wear Face Masks”- [published](#) in Science Times, April 21, 2020.
 - (c) New York Times, June 9, 2020 - <https://www.nytimes.com/2020/06/09/world/coronavirus-updates.html>

Is there a health risk from wearing a cloth face covering or mask?

Some opponents to masks have claimed that wearing a mask causes an unhealthy concentration of CO₂ which is damaging to health - falsely noted that wearing masks over a period can cause hypercapnia.

- AP'S Assessment: **False**. There is no evidence that wearing a mask causes hypercapnia, or that masks can trap the virus and lead to an infection in the brain. Hypercapnia occurs when there is too much carbon dioxide in the bloodstream. Mild cases can lead to issues such as headache and anxiety; severe cases can interfere with breathing.
- SEE [separate BCPH memo](#) on health risks and masks.

Baseline Advice: Federal and International

○ CDC Recommendation Regarding the Use of Cloth Face Coverings, Especially in Areas of Significant Community-Based Transmission

"... We now know from [recent studies](#) that a significant portion of individuals with coronavirus lack symptoms ("asymptomatic") and that even those who eventually develop symptoms ("pre-symptomatic") can transmit the virus to others before showing symptoms. This means that the virus can spread between people interacting in close proximity—for example, speaking, coughing, or sneezing—even if those people are not exhibiting symptoms. In light of this new evidence, CDC recommends wearing cloth face coverings 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."

Who should NOT use cloth face coverings: children under age 2, or anyone who has trouble breathing, is unconscious, incapacitated or otherwise unable to remove the mask without assistance.

[Posted April 3, 2020](#); [Reviewed May 22, 2020](#)

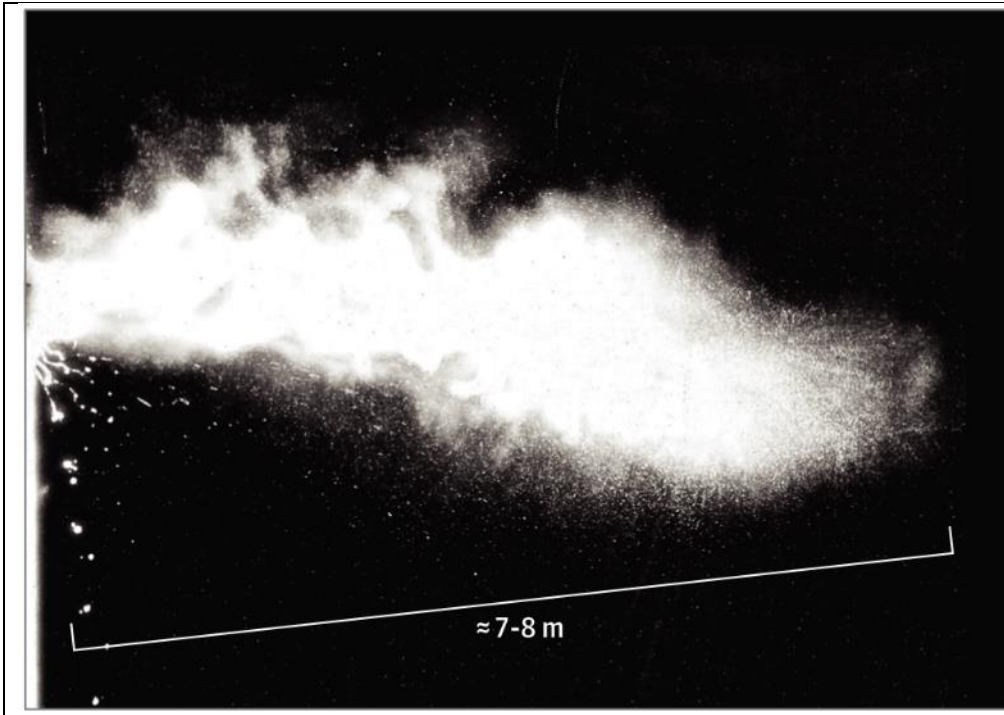
○ WHO -World Health Organization (revised guidance reversing earlier position not supportive of public use of masks)

"Wearing a medical mask is one of the prevention measures that can limit the spread of certain respiratory viral diseases, including COVID-19." (June 8, 2020)

<https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/when-and-how-to-use-masks>

Additional References and Reading (especially for readers seeking peer-review articles or breaking news)

- **The W.H.O. walked back an earlier assertion that asymptomatic transmission is 'very rare.'**
 - Scientists had sharply criticized the W.H.O. for creating confusion on the issue, given the far-ranging public policy implications. Governments around the world have recommended face masks and social distancing measures because of the risk of asymptomatic transmission. Source: New York Times, June 9, 2020.
<https://www.nytimes.com/2020/06/09/world/coronavirus-updates.html>
- **"Policies on Required Use of Masks to prevent the spread of COVID-19: An Updated Nationwide Review"** by Colorado Ideas 2.0., Richard Cauchi. Updated July 2020 ([PDF Link](#))¹⁰
- **"Face Masks Against COVID-19: An Evidence Review"** April 12, 2020 - [PDF link](#) by preprints.org
- **"To mask or not to mask: Modeling the potential for face mask use by the general public"**- April 2020 [link](#) (16 pp)
- **"Do Face Masks Create a False Sense of Security A COVID-19 Dilemma"**-MedRx , May 23, 2020.
<https://www.medrxiv.org/content/10.1101/2020.05.23.20111302v2.full.pdf>
- MedicalExpress **"News tagged with masks-online - [masks](#)**



Human Sneeze “Multiphase turbulent gas cloud”
Demonstrates the spread of
infected breath up to 27 feet.

JAMA March 26, 2020

NOTES & SOURCES

¹ CNN: “These are the states requiring people to wear masks when out in public. June 19, 2020

<https://www.cnn.com/2020/06/12/health/coronavirus-mask-wellness-trnd/index.html>

² “Face Masks for the General Public” [published](#) by The Royal Society (England), May 4, 2020. ([PDF-12 pp](#))

³ “Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis” by Derek Chu for the COVID-19 Systematic Urgent Review Group Effort (SURGE), London, UK.

<https://www.thelancet.com/action/showPdf?pii=S0140-6736%2820%2931142-9>

⁴ Howard was among a group of scientists who publicly advocated for a reversal of that position, adopting the [Twitter hashtag #Masks4All](#) and a profile picture of himself in dark mask and sunglasses. A missing element, though, has been data on how individuals react when ordered to wear masks, especially in societies not accustomed to doing so during public health emergencies.

⁵ Masks and social distancing work, new analysis finds. AP By Carla K. Johnson, June 1, 2020

⁶ “Turbulent Gas Clouds and Respiratory Pathogen Emissions: Potential Implications for Reducing Transmission of COVID-19.” [Published by JAMA](#), March 26, 2020 9 (The demonstration of how a cough spread across a room)

⁷ “Face Masks for the General Public” [published](#) by The Royal Society (England), May 4, 2020. ([PDF-12 pp](#))

⁸ “The effect of large-scale anti-contagion policies on the COVID-19 pandemic.” Nature June 8, 2020. https://www.nature.com/articles/s41586-020-2404-8_reference.pdf

⁹ “Universal Masking is Urgent in the COVID-19 Pandemic: SEIR and Agent Based Models, Empirical Validation, Policy Recommendations” – by De Kai, PHD MBA, et al; prepublication 4/21; posted May 12 by De Kai, et al ([PDF, 19 pages](#))

¹⁰ For more information: Publication research conducted and compiled by Richard Cauchi, Colorado Ideas 2.0, LLC. info@colorado2.com. All quoted and linked content is the property and the responsibility of the original authors.

Visualizing the effectiveness of face masks in obstructing respiratory jets

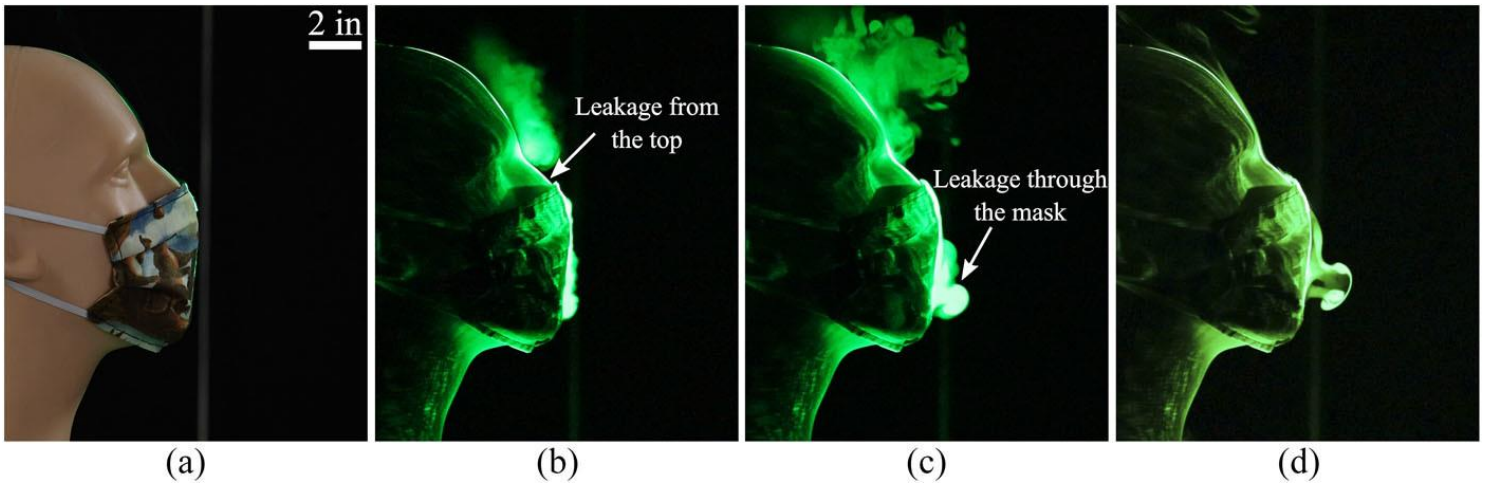


FIG. 4. (a) A homemade face mask stitched using two-layers of cotton quilting fabric. Images taken at (b) 0.2 s, (c) 0.47 s, and (d) 1.68 s after the initiation of the emulated cough (from report cited above)