

Masks

A Reminder to be Afraid

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Yesterday in Costco, a woman didn't see me in line and stood within 3 feet of me. When she noticed, she quickly stood back, apologized profusely, and had the look of shame in her eyes. I smiled and said I didn't care and that all the executive orders made no difference anyway. She then said she wears her mask as a "sign of respect." I found that to be an odd phrase. Then I heard it again later in the day on television and realized that it was another catch phrase programmed into current culture by the news media and politicians.

Also at Costco, a woman around 80 sneezed in front of me with her mask on. She looked at me so embarrassed with shame in her eyes and apologized. I laughed and said, "That's excellent. Normal human happenstance. Don't worry about it." She smiled with her eyes and walked off.

The events cited above caused me to update this paper from a couple weeks ago.

Shame on us for allowing shame upon us. Masks protect neither others nor ourselves; and may even raise the likelihood of spread.

Many governors have issued executive orders requiring face coverings be worn at certain venues. Some people take it a step further and wear masks outdoors on a daily walk alone in the neighborhood or while driving alone in their cars.

But what do the experts tell us about masks? What is the science? What is the data?

This paper explores the efficacy of masks, the science and data behind them, and provides opinions from experts.

HISTORY

The face mask worn in surgery was first described in 1897 at its inception and consisted of a layer of gauze to cover the mouth. The primary purpose was to protect the patient from bacterial infection potentially in droplets expressed from surgeons and staff present during surgery. (Zhou, 2015)

SCIENTIFIC STUDIES

As recently as 2015, there seems to be little information on this subject. "... overall there is a lack of substantial evidence to support claims that face masks protect either patient or surgeon from infectious contamination. More rigorous contemporary research is needed to make a definitive comment on the effectiveness of surgical face masks." (Zhou, 2015)

One study showed that face masks "prevented blood/bodily fluid splashes that would have otherwise contaminated the surgeon's face in 24% of procedures." (Zhou, 2015) This benefit has nothing to do with viruses or bacteria carried in aerosols, which are tiny droplets expressed from someone's nose or mouth.

A 1993 study published in the American Journal of Infection Control included the potential of air leaks between the skin and mask, known as "venting." "... the more protective dust-mist-fume respirator showed a fourfold increase in aerosol penetration into the mask with an artificial leak 4 mm in diameter." It further stated that one of the surgical masks tested had "penetration of approximately 100% for the particle sizes of 0.2 μ m to 1 μ m." The overall conclusion of the study of aerosol penetration and leakage characteristics of masks used in the health care industry is, "We conclude that the protection

provided by surgical masks may be insufficient in environments containing potentially hazardous submicrometer-sized aerosols.” (Weber, 1993)

In addition to venting, masks accumulate moisture when worn for extended periods; and that moisture facilitates the movement of contaminants through the mask by capillary action. Bacteria and virus concentrations can become dislodged by movement of the mask. (Zhou, 2015) By “dislodged” the study means that any movement of a mask on a face can release a plume of virus or bacteria in concentrations likely to be far greater than someone breathing without a mask.

One study had to do with the “laser plume” from CO₂ laser surgery. The plume would carry aerosols and the concern was that these aerosols from HIV patients might infect medical staff present during laser procedures. The laser plume aerosols were much smaller (~0.31µm) than droplets expelled by medical staff. (Chen, 1992)

The most pertinent and recent study, conducted by Dr. Don Milton at the University of Maryland, used a breath-capturing machine called “Gesundheit II machine.” (G-II) Dr. Milton conferred with federal and White House health officials on his findings in April 2020. Thus, this is a good study to dwell upon. (University of Maryland, 2020)

Milton runs the Public Health Aerobiology, Virology, and Exhaled Biomarker Laboratory in the School of Public Health. In 2013, he concluded that surgical masks could limit flu transmission, but cautioned that results such as those in his experiment may not be as good outside of the experiment’s controlled settings.

"In normal times we'd say that if it wasn't shown statistically significant or be effective in real-world studies, we don't recommend it," he said. "But in the middle of a pandemic, we're desperate. The thinking is that even if it cuts down transmission a little bit, it's worth trying." This statement alone disqualifies his prior conclusions. However, the study will be further examined.

Dr. Nancy Leung of Hong Kong University, under the supervision of Drs. Cowling and Milton, recruited 246 people suspected to have a

respiratory ailment. The Gesundheit II machine was used. "In 111 people infected by either coronavirus, influenza virus, or rhinovirus, masks reduced detectable virus in respiratory droplets and aerosols for seasonal coronaviruses, and in respiratory droplets for influenza virus," Leung said. "In contrast, masks did not reduce the emission of rhinoviruses."

Although this experiment took place before Covid-19, the coronaviruses used were similar in size to Covid-19.

Milton did say that other non-mask measures he studied were more effective. Improved ventilation in buildings and UV-C lights near ceiling fans that pull air upward and destroy viruses and bacteria are two more effective mitigation methods cited by Milton.

The data in the Leung study cited in *Nature Medicine* (2020) did show that masks provide a considerable reduction of coronavirus aerosols under 5µm in diameter, moderate to little reduction of influenza sub-5µm virus aerosols, and very little reduction of sub-5µm rhinovirus aerosols.

It’s important to note that in the Leung experiment, participants’ breathing was captured by the G-II machine for 30 minutes each. In order for the reader to understand the physical situation of the experiment, a picture of the G-II machine from 2018 is included here.



Picture from University of Maryland. School of Public Health. 2020-01-18

This being the most recent and most acclaimed study for the efficacy of masks raises serious

questions regarding the science behind mask wearing. While the machine is ingenious in design and application, it hardly meets any real world application standards.

First, participants are not inclined to touch their masks or faces once their head is situated in the “cone of breath.” There are numerous articles that state that a person is more inclined to touch their face while wearing a mask. This idea is not included in this study.

Secondly, who sits 18 inches from a person and funnels the entirety of their breath into another person’s mouth for 30 minutes? I’m sorry to depart from serious prose in this article, but come on. Look at that thing. How can anyone take this study seriously as it may be applied to Covid-19 spread? This study is being used to justify mask usage. And this is the gold standard used to confer with the White House and federal departments who make public policy recommendations, which are then used by governors of states to make executive orders under civil defense act law depriving citizens of rights.

No wonder Milton wrote that the conditions of the experiment might be difficult to duplicate in the real world. This is a fantasy world. I can think of a hundred issues with this experiment that have to do with fluid dynamics, thermodynamics, turbulence, and other physics problems.

This should not be a medical-only study. This is a combined, multi-discipline issue incorporating mostly mechanical engineering with some added knowledge of microbiology or virology in order to ascertain the decay rate of an aerosol virus under certain physical conditions of ambient light frequency and intensity, temperature, humidity and fluid dynamics (air flow around and through physical structures such as a mask).

REAL EXPERIMENT?

A real study, as the CDC should have done decades ago, would include a time-based simulation in something like Ansys or MatLab/SimuLink. A real study should take in equations from virologists and chemical engineers regarding the aforementioned decay rate (including evaporation of the aerosol containing the virus) of

aerosols containing viruses and from mechanical engineers who would model the fluid dynamics of an expression of aerosol virus concentration.

The study should include varied mask types and face coverings and varied expressions of breath such as sneezing, coughing, elevated breathing, normal breathing, shallow breathing, mouth breathing, nose breathing, singing, yelling, and others.

In the absence of any real study or data, this simple 10-second video demonstrates the fluid dynamics of mask usage.

<https://youtu.be/okIEE3wifJE>

In the video, a woman takes in aerosols from an electronic cigarette (e-cig). It is clear that the size of aerosol particles does not matter as an aerosol is simply a particle suspended in air or in another gas. Droplets such as those in the millimeter (mm) range are not suspended and are affected by gravity and fall through the air to a solid or liquid surface. In general, aerosol droplets are in the micrometer (μm), or micron (μ), range.

e-cig aerosols are sub-micron approximately $0.01\mu\text{m}$ to $0.90\mu\text{m}$ in diameter. (Sosnowski, 2018)

Bio aerosols range from $0.3\mu\text{m}$ to $100\mu\text{m}$. However, sub-micron particles have a high rate of surgical mask penetration, while larger droplets from coughing or sneezing (mm range) quickly fall to a surface through gravity. Thus, the range of concern is particles sizes around $1\mu\text{m}$ to $10\mu\text{m}$. (Wang, 2020)

For this “real experiment,” refer to the Weber (1993) study and the Wang (2020) paper regarding masks and aerosol sizes. For quicker understanding, simply look at the 10-second video.

Respirators make a seal to the skin. Masks do not. The government recommends any face covering made of cloth. The CDC website, devoid of any papers on studies of the efficacy of masks, explains how to sew a homemade mask. Massachusetts Governor Baker’s COVID-19 Order No. 31 states, “All persons are strongly discouraged from using medical-grade masks to meet the requirements of this Order, as medical-grade masks should be reserved for healthcare

workers and first responders.” This is the order that requires the use of face coverings while in public and within 6 feet of any other persons.

The CDC web page (CDC, 2020) recommending the use of face masks lists seven recent studies, which contain no links, and none of which have “masks” or “efficacy” in their titles. Another page entitled “About Cloth Face Coverings” on the [cdc.gov](https://www.cdc.gov) site has a hyperlink “Studies and evidence” that takes you to a page entitled, “Isolation Precautions,” and has neither studies nor evidence anywhere on the page.

CANDID THOUGHTS

After watching interviews with doctors who’ve treated thousands of patients and had hundreds die around them in New York City in March, April, and May of 2020, the overwhelming anecdotal evidence is that, according to one frontline ER doctor in NYC, 99% of transmission is “hands to face.” You touch something or someone and then you touch your face. He said the most important thing that anyone can do is wash your hands and don’t touch your face.

Understanding fluid dynamics, researching aerosols, watching the 10-second video, and knowing Order No. 31 led to the following thoughts.

- 1) Masks do not stop COVID-19 aerosols from exiting en masse in plumes from regular breathing.
- 2) Masks do not stop COVID-19 aerosols from coughs or sneezes exiting en masse. They merely direct the aerosol plume in every direction except forward. The plume of 1 μ m to 10 μ m virus aerosols remains suspended in air at a height of around 4 to 7 feet for several minutes. When not wearing a mask, the non-aerosols around 1mm size go in the direction of the cough or sneeze for a second or two before plummeting to the ground. Simply looking downward while sneezing or coughing will send them to the floor. Using your hand or even your sleeve will make your hand or sleeve highly infectious.
- 3) We live in a dynamic environment, not static. People don’t walk into a store and stand there for 20 minutes. Six foot distancing means

nothing in these situations as we all walk through each other’s breath within seconds of passing a location where someone just was. There could be 50 feet separation and one will still walk through a plume of aerosol virus from someone’s breath within 20 seconds.

- 4) If you are sitting at a show or a restaurant or sitting on a bus or subway for several minutes and no one is moving, then a mask may give a slight percentage reduction in giving or receiving virus laden aerosols. Conditions have to be quite still for a prolonged period for a mask to make any difference.
- 5) Distancing only matters in the aforementioned static environments.
- 6) Wearing a mask and social distancing do nothing for you while hiking, walking in your neighborhood, or driving alone in your car.
- 7) Masks collect a massive amount of virus concentration. Whether you wear gloves or not, touching your mask simply puts a large amount of virus on your hands or gloves that then touch things like door handles and shopping carts. If you wash your hands and then touch your mask, your hands are now a far greater spreader than your breath would be if you were not wearing a mask.
- 8) After 30 minutes or less, your mask becomes moist and is then capable of spreading virus aerosols due to capillary action that carries the virus from the inside of your mask to the outside of the mask. Thus, even your N95 becomes contaminated and not much better than being mask-less.

These candid thoughts are based on science and data. Order No. 31 is based on CDC recommendations. CDC recommendations run contrary to science and data and are rejected by many nurses and doctors, though their voices have been silenced and deleted from YouTube and other social media and news media outlets.

Masks do not prevent you from infecting others and likely create a higher probability of spread through hands to mask, then to a common physical item, then onto someone else’s hands and to their face.

PSYCHOLOGY

CONCLUSION

Some people feel safer wearing a mask. Of course they do. They've been scared to death by the news media and Dr. Fauci that Covid-19 is a massive killer, when, in fact, from CDC data, it is less deadly for those under-60 than the common flu. Yet people don't leave their houses to take a walk in the sunshine without their face masks.

The mask is a psychological reminder to be afraid of the outside world. Prolonged fear leads to lasting traumatic stress, which causes depression, anger, and other maladies of the mind.

These useless mitigation methods are stressors that lead to homicide, suicide, overdose, physical and emotional spousal and child abuse, civil unrest, and other negative externalities.

It is said that wearing a mask protects others from the wearer who may be infectious and asymptomatic. It delivers a feeling of moral virtue and conformity. How would the wearer feel knowing that he or she is accumulating several minutes worth of virus concentration in a mask only to have a gust of wind, cough, sneeze, or quick turn of the head release a massive plume of virus into the air affecting someone 50 feet downwind?

Some feel safer with a mask; and yet are no safer. Some only wear a mask because it is either required by executive order or they are shamed into wearing one.

People have been programmed to shame and yell at each other in public regarding a mask that does not do anything to prevent spread. Homicide has now occurred over wearing of a mask and two families will never be the same having lost the society and companionship of fathers, brothers, and husbands. For what?

The psychology of face coverings and extreme social distancing is another failure of the CDC and NIAID. They know full well that masks do not work. They have remained silent regarding the science and data and have instead posted instructions on how to make homemade face coverings.

There is no proof that masks will stop Covid-19 from being shed into or received from the world around us.

There have been no experiments applicable to real world conditions. There could swiftly and easily be very good simulations performed by engineers. Engineers have not been asked or funded to do so. Research grants are given to virologists and epidemiologists who build nearly useless machines like the G-II and end up with data that has no practical real world application.

Conventional paranoia (wisdom?) seems to have won this battle temporarily until a real study can be done in software simulation such as Ansys or MatLab/SimuLink rather than a G-II. It should then be fed into a multiple discipline quantitative analysis (MDQA) in order to choose the best mitigation measures from the optimal solution space.

Dr. Fauci, a virologist and physician, admittedly knowledgeable only in his purview, is making recommendations without consideration for negative externalities derived from other disciplines such as sociology, psychology, engineering, physics, chemistry, and economics.

Current COVID-19 Orders are given by politicians who are blind to the consequences of the very Orders.

The CDC and NIAID have spent most of their budget fighting HIV for the last 30 years, which is why they were not ready with any real plans for COVID-19 and made mistake after mistake. A few years ago HIV killed 17,000 Americans and infected 38,000 Americans. During that same time period, influenza A(H1N1) killed 55,000 to 80,000 and millions were infected. Yet, the CDC and NIAID continue to spend money disproportionately to the data.

Videos of interviews of Dr. Fauci in late February and early March posted on the NIAID web site are historical records of error after error misinforming the American people regarding COVID-19. And it continues with the recommendation to now wear masks. I know of no other profession where someone can be wrong

100% of the time and people will call him an expert and listen to his every recommendation.

Most importantly, the method of spread in 99% of COVID-19 cases according the NYC ER physicians is hands to face and yet that is lost in the weeds of mask wearing and social distancing, which are not proven to do anything. People touch their masks and then touch a door knob or a coffee pot handle. Why isn't Dr. Fauci stressing the 99% most important measures? Wash your hands and don't touch your face.

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