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Medical Intelligence Report

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Topic: Update on Use of Masks for Prevention of COVID-19

Protection from SARS-CoV-2 Transmission

A number of new variants of SARS-CoV-2 have been identified throughout the world, and current evidence suggests that they have a higher transmissibility than previous variants. The increase in transmissivity means that it is easier for someone to spread the virus to another person. Because of the increase in the transmission of the virus at a time when many healthcare facilities are dealing with large numbers of people needing treatment, it is more important than ever to take precautions to keep from being exposed and to prevent infection from SARS-CoV-2 (Karan et al., 2021).

While there was a paucity of research at the start of the pandemic, studies performed since then indicate that wearing a mask or face covering can help prevent the spread of SARS-CoV-2 during high-risk scenarios.

Two of the high-risk scenarios most often encountered by the general public include:

1. Being indoors with people who are not in your household and
2. Being outside in a crowd.

The emergence of new variants is not expected to necessitate new protective measures, but rather better compliance with the already established recommendations. There have been a few national level changes in the CDC recommendations on protective equipment for SARS-CoV-2, however.

1. As of January 20, an executive order was put into place **REQUIRING** that on-duty or on-site Federal employees, on-site Federal contractors, and other individuals in Federal buildings and on Federal lands should all wear masks, maintain physical distance, and adhere to other public health measures, as provided in CDC guidelines.
2. As of January 29, the CDC announced that face masks are **REQUIRED** for all travelers while on public transportation, including passengers and operators.

These new announcements are requirements and not recommendations, meaning that they can be enforced. Enforcement for air travelers will be performed by the TSA, and TSA officers can bar people who refuse to wear a mask from entering secure areas of the airport. Additionally, those who refuse to comply could also face civil fines (Lazo et al., 2021).

Further specifications were included to define proper mask wearing and specify where masks are required. For example, people must wear masks that completely cover both the mouth and nose while awaiting, boarding, disembarking, or traveling on airplanes, ships, ferries, trains, subways, buses, taxis, and ride-shares as they are traveling into, within, or out of the United States and territories. People must also wear masks while at transportation hubs (e.g., airports, bus or ferry terminals, train and subway stations, seaports) and other locations where people board public transportation in the United States and territories (CDC_Order, 2021).

The complete CDC recommendations for reducing the risk of SARS-CoV-2 transmission include:

- Everyone 2 years and older should wear masks in public.
- Masks should be worn in addition to staying at least 6 feet apart, especially around people who don't live with you.
- Wear your mask over your nose and mouth and secure it under your chin.
- Stay 6 feet away from others.
- Avoid crowds.
- Avoid poorly ventilated spaces.
- Wash your hands often.
- Cover coughs and sneezes.
- Clean and disinfect frequently touched surfaces daily.
- Be alert for symptoms.
- Get vaccinated to protect against COVID-19.

More details about the CDC recommendations for preventing transmission of SARS-CoV-2 can be found at https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html.

What type of mask should be used?

While the CDC recommendations have not changed, experts are beginning to suggest that people use masks that have better filtration properties to prevent transmission of both the original virus and the emerging variants of SARS-CoV-2. Due to supply constraints at the start of the pandemic, officials promoted the use of non-medical grade cloth masks. These types of masks provide some protection from sick individuals dispersing infectious particles into the environment as well as some protection for healthy individuals from coming into contact with the virus, but the amount of infectious material that is stopped by cloth masks is low compared to medical grade masks.

What are the types of masks?

The two main categories of face coverings used to prevent transmission of disease are **masks** and **respirators**. The difference between them is not so much the materials they are made of, but how they fit on the face.

The technical definition of a **mask** is a loose fitting face covering that is designed to protect others from infectious particles emitted by the wearer, as during coughs or sneezes. Masks offer one-way protection for people around the mask-wearer. The person wearing the mask has limited protection themselves because the covering does not fit tightly to the face.

Respirators, on the other hand, are tight-fitting face coverings that create a seal with the face to allow the material to filter the air the wearer breathes in and breaths out. Respirators provide two-way protection so that the infectious particles from the wearer are captured and any infectious particles in the external air cannot pass through the respirator to be inhaled by the wearer.

In everyday conversation, most people refer to all face coverings as masks, which makes conversations easier, and unless there are details specific to respirators, the term “mask” will be used in this report to describe the different face coverings used to prevent transmission of disease.

The appropriateness of facemasks versus respirators is often determined based on the type of transmission observed with a respiratory virus.

> **Generally, masks are recommended for viruses that spread by droplet transmission while respirators are reserved for use with airborne pathogens, or those that spread via aerosols.**

With viruses that are mainly transmitted by **droplets** the larger particles stay suspended in the air for minutes, and infectious particles are emitted through coughs and sneezes from symptomatic people. **Airborne diseases**, on the other hand, can spread by dispersal of smaller infectious particles, called **aerosols**, simply by breathing or talking, and the smaller particles can stay suspended in the air for hours. Droplets fall to surfaces relatively quickly, which can lead to the spread of infection by contact with virus on a surface. Infectious virus located on a surface that spreads by people touching the surface are called **fomites**.

When viruses are spread by droplet transmission, the main focus of prevention is to contain the droplets so they cannot be spread on surfaces that are touched by other people. Therefore a loose-fitting mask that captures droplets can be used to prevent transmission.

> **Because droplets are not suspended in the air for long, there is no need for a tight-fitting respirator to filter the air a healthy person inhales.**

Frequent disinfection of surfaces is another important part of prevention of illness that is spread through droplets.

Respirators are necessary to prevent airborne transmission because sick individuals can emit infectious particles by breathing. Therefore a tight seal to the face is required to prevent virus from escaping. Healthy individuals can be infected simply by breathing the air where an infectious person is, and the risk of inhaling infectious particles can continue even hours after the sick individual has left the area. Therefore, avoidance of potentially infectious surfaces, through disinfection and hand washing, is no longer sufficient for prevention of disease.

To avoid transmission through aerosols, healthy individuals must also wear a mask that seals tightly to the face so that infectious particles are filtered by the material.

Does SARS-CoV-2 spread by droplets or aerosols?

The debate on the method of transmission of SARS-CoV-2 has not yet been resolved.

However, most of the evidence currently available suggests the virus is transmitted through a combination of droplet and aerosols depending on the situation.

In most cases, the transmission of SARS-CoV-2 occurs through droplets, which would suggest that the use of masks would be sufficient to capture infectious particles. However, in some specific cases, such as crowded indoor environments, SARS-CoV-2 acts more like an airborne virus that can be transmitted without emission of droplets through sneezing and coughing, requiring personal protection for healthy individuals to filter the air before it is inhaled to prevent infection.

Complicating the scenario, the infectious period of SARS-CoV-2 often occurs before individuals develop symptoms. Other people with COVID-19 may never develop symptoms, but they can still transmit the infection. Overall, a large number of cases of COVID-19 are spread from people without symptoms who are unaware that they are ill.

The combination of aerosol tendencies and transmission from people without symptoms is one of the main reasons many experts feel that better masks are necessary to control the outbreaks occurring around the world.

One published example of aerosol-like spread occurred in a pediatric ward of a hospital where the mother of a patient infected nine individuals who were all following the current WHO guidelines for personal protective equipment and were wearing surgical masks (Goldberg, 2021). The patient in the hospital was three years old and admitted to the pediatric ward for steroid treatment of Electrical Status Epilepticus in Sleep. At the time of admission, the patient's COVID-19 test was negative, and he was discharged 4 days later without incident.

However, his mother began to have symptoms two days after his discharge and eventually tested positive. After testing of other people who had been in the ward at the time, nine individuals were found to be positive for COVID-19, and six were staff in the ward. Of the healthcare workers, all worked on the same shift, but three did not have any direct contact with the child. Both the staff and the patient's mother wore a surgical mask at all times while in the

ward. The other patients that became sick had no close contact with the sick child or his mother, and all were located a distance of more than six feet away.

Based on the specifics of the outbreak, the researchers conclude that airborne transmission occurred even with recommended use of personal protective equipment and surgical masks at all times.

What is the most important part of a mask?

In order for a mask to filter out the particles in the air, the air must travel through the material.

Therefore, tight fitting masks work better than loose masks. A mask made from material that is rated to filter small particles such as viruses will be ineffective if the air inhaled by the wearer is entering through gaps around the mask. In the same vein, a well-fitted mask made from material that is more porous and lets more particles through could be more effective than an improperly fitted respirator. This type of scenario has been observed in studies of the transmission of influenza, which indicate that the use of N95 respirators compared with surgical masks was not associated with a lower risk of influenza in hospital and outpatient settings (Howard et al., 2021).

What does N95 refer to?

The **N95** designation stems from the National Institute for Occupational Safety and Health (or NIOSH) that evaluates respirators. Respirators that have been evaluated and are approved by NIOSH for use as a respirator that filters out 95% of particles are designated N95.

The Occupational Safety and Health Administration in the United States (or OSHA) has prepared a list of frequently asked questions about respirator use, which is available at https://www.osha.gov/coronavirus/faqs#respirator.

A list of respirators approved by NIOSH and their manufacturers can be found at https://www.cdc.gov/niosh/npptl/topics/respirators/disp_part/default.html. There are a large number of respirators that are being sold as “N95” that do not have NIOSH approval, and caution should be used when buying masks to ensure that they have been approved by appropriate governing bodies. The CDC has a site to help determine products with NIOSH approval compared to counterfeit products, which can be accessed at https://www.cdc.gov/niosh/npptl/usernotices/counterfeitResp.html.

What do the other designations for respirators mean?

Mask with designations other than N95, such as KN95, are approved by other governing bodies, usually outside of the United States.

For example, respirators designated as KN95 have been approved by the equivalent governing body of the Chinese government.

Due to shortages there are a number of KN95 masks that have been given Emergency Use Authorization (EUA) by the FDA, but as with N95 masks, there are a number of companies producing counterfeit products. A list of the products that have received an EUA from the FDA can be accessed at https://www.fda.gov/medical-devices/coronavirus-disease-2019-covid-19-emergency-use-authorizations-medical-devices/personal-protective-equipment-euas#nonniosh.

The European designation equivalent to N95 masks is FFP2, and this is the level of mask that Germany recently announced would be required when using public transportation or in stores.

A list of other designations around the world can be accessed at https://multimedia.3m.com/mws/media/1791500O/comparison-ffp2-kn95-n95-filtering-facepiece-respirator-classes-tb.pdf.

Why was it difficult to show that masks prevent transmission of SARS-CoV-2?

In an open letter calling for a national effort to make better masks available to the public written by 70 medical and scientific experts, the authors mention that surveys indicate one of the reasons people state for their refusal to wear masks is that they think that masks are not effective (Beier, 2021). Conflicting information at the start of the pandemic most likely contributed to this viewpoint. Information on the efficacy of masks was virtually non-existent as SARS-CoV-2 started spreading, and, therefore, scientists and officials were forced to extrapolate information from the few available studies. Officials were also accustomed to making policy decisions based on well-established research or being able to wait for more information if there were not unequivocal results available. This type of wait and see strategy about the use of masks turned out to be harmful, and may have made the pandemic worse.

It can be difficult to prepare clinical trials for the development of public health policy because there are logistical and ethical complications for organization of large, randomized and controlled trials that would be able to unequivocally answer questions about transmission of a virus. The time needed for completion and analysis of such trials may also not be available. These difficulties are further exacerbated when a world-wide pandemic is occurring from a deadly, new virus. Studies on the efficacy of masks fall into this difficult to organize category.

It would be, and has been, nearly impossible to design trials that follow an individual's precise movements during the day while correlating the amount of time wearing a mask and evaluating the COVID-19 status of individuals in the community they come into contact with. The ethical considerations for assigning some of the participants in a study to the group that does not wear masks when there is previous knowledge that masks most likely provide some amount of protection would also be ethically questionable. These types of difficulties are a large part of the reason it has been problematic to definitively investigate the efficacy of the use of face coverings to prevent transmission of a respiratory virus during a pandemic (Howard et al., 2021).

Over the last year, researchers have been able to organize and evaluate numerous, well-designed studies that have provided conclusive evidence that the use of masks of any type protect both the wearer and those in the vicinity from transmission of SARS-CoV-2.

What is known about the prevention of COVID-19 with mask use?

The most comprehensive review of available studies on the use of masks to prevent transmission of SARS-CoV-2 was published on December 5, 2020 (Howard et al., 2021). In the review, the authors looked at the ability of masks to prevent the transmission of SARS-CoV-2, and they focused on characteristics of the masks that would be expected to reduce transmission.

Included in this review is the only study available so far that directly analyzed the impact of mask use in the community on COVID-19 transmission. In the study, researchers investigated the reduction of transmission of SARS-CoV-2 in Beijing households by use of surgical masks.

The use of face masks was 79% effective in preventing transmission, if they were used by all members of the household prior to the onset of symptoms in the first person infected in the family.

The study did not determine the relative risk based on different types of masks because only surgical masks were used during the study.

What are important characteristics of masks for the reducing the transmission of SARS-CoV-2?

The review also recounts a number of laboratory-based investigations. These experiments are somewhat contrived in order to allow for measurements of the physical characteristics of the environment and to protect the investigators from inadvertent infection. For example, a study of different mask materials used a method similar to that for NIOSH certification of respirators. The material was sprayed with particles of a uniform size at a uniform air flow rate. However, in order to be able to measure the effects, the flow rates of air through the masks are much higher than the typical human respiratory rate.

The results of the investigation showed cotton masks and handkerchiefs allow for penetration of 90% of particles, and surgical masks and nonwoven non-medical masks allowed penetration of 50% to 60% of particles.

A similar study of investigating the particle penetration of different cloth masks, showed that the efficacy of filtration varied widely, from 12% to 99.9%, and the high levels of penetration of particles occurred even at flow rates lower than typically observed in a person at rest.

The best filtration, which was greater than 96% filtration efficacy for particles of larger than 0.3 micrometers, was measured for cotton with 600 threads per inch, cotton quilt, and cotton layered with chiffon, silk, or flannel.

A combination of materials was found to be more effective than a single type of material.

Another laboratory test investigated the efficacy of surgical masks adjusted to fit more tightly using a combination of rubber bands and paperclips.

With the improved adjustments, all 11 subjects in the test passed the N95 fit test with a snugly fitting surgical mask.

The authors of the review had several conclusions based on the information they collected.

The main point the authors made was that there is evidence in favor of widespread mask use as source control to reduce community transmission.

They also stressed that the available evidence, which was compiled before the emergence of the new variants, suggested that if there was nearly universal use of nonmedical masks when out in public in combination with social distancing measures, mask-use could reduce the transmission of SARS-CoV-2 from each infected person to less than one other person, thereby reducing community spread. If this scenario were enacted, economic analysis suggested that mask wearing mandates could add 1 trillion dollars to the United States gross domestic product.

The specific points that supported the widespread use of masks discussed in the review include:

- Non-medical masks use materials that obstruct particles of the necessary size to prevent transmission
- People are most infectious in the period right after infection, where it is common to have few or no symptoms
- Nonmedical masks have been effective in reducing transmission of other respiratory viruses
- Places and time periods where mask usage is required or widespread have shown substantially lower community transmission.

What has been shown about masks through epidemiological studies?

While investigation of the individual characteristics of mask-use that influence transmission is necessary, it is also possible to observe the effect of masks by monitoring transmission in large populations using epidemiological methods (Gandhi and Marr, 2021). Another review was compiled that included these types of investigations as well.

The authors report on a study that showed that transmission of SARS-CoV-2 was reduced in Arizona over the summer after statewide mask mandates were put into place. Additionally, it has been determined that counties in Kansas with mask mandates had a decrease in SARS-CoV-2 incidence compared to counties where there was no mandate. There was also evidence of a 47% reduction in new COVID-19 transmissions after the institution of regional mask

mandates in Germany. In Tennessee, counties that had mask requirements had a slower growth rate in hospitalizations for COVID-19 than those without requirements.

Smaller examples have also been reported. For example, a reduction in transmission from the use of masks was observed during the outbreak on the USS Theodore Roosevelt aircraft carrier where service members who wore face coverings had an infection rate of 55.8% compared to an infection rate of 80.8% in those who did not wear face coverings. In one well known example, use of masks by two hairdressers and their 139 customers prevented transmission from the hairdressers to anyone else who was in the salon over several days.

How well do different masks filter the particles from the air and prevent illness?

A number of studies have been reported that describe the percentage of airborne particles filtered by masks made out of different materials. Generally, typical cloth masks will capture about half of the particles in the air (Allen, 2021 and Howard et al., 2021).

More tightly woven cloth material can filter up to 60 to 70% of particles, and surgical masks that are made out of non-woven, synthetic materials can filter 70 to 80% of particles out of the air.

In a study directly measuring the ability of different materials to filter SARS-CoV-2, researchers released nebulized SARS-CoV-2 through the mouth of a mannequin that was covered by a surgical mask and measured the uptake of virus through the mouth of a second mannequin that was also covered with a surgical mask (Pan et al., 2021).

Based on the research, it was found that surgical masks were between 60% and 70% effective at protecting others from SARS-CoV-2, and 50% effective at protecting the wearer.

Masks that are designated N95 have been certified to filter out 95% of particles in the air when they are properly fitted to create a tight seal on the face. These masks are made from a synthetic material that is formed by being blown onto a support rather woven as with fabric. Production in this manner allows for very small openings that prevent even small, airborne particles from passing through.

A small study in South Korea examined the difference in the control of SARS-Cov-2 transmission between a N95 respirator, a KF94 respirator, and a surgical mask (Kim et al., 2021). Participants in the study were hospitalized for treatment of COVID-19. To determine the effect of the different masks, the researchers had the participants cough five times (once every 20 seconds) with the different masks on. The masks themselves were tested for dispersal of virus on the inside and outside of the mask, and petri dishes were spread in front of the participants to catch any emitted virus. When the participants wore a surgical mask or no mask, three of the petri dishes were found to contain SARS-CoV-2 RNA. None of the petri dishes exposed during tests of the N95 or KF94 contained SARS-CoV-2 RNA. Additionally, viral RNA was detected on both the inside and outside of the surgical mask, while no viral RNA was found on the outside of the N95 or KF94. Based on the results from the study, the authors concluded

that surgical masks were less effective in filtering viral particles from coughing patients with SARS-CoV-2 infection than N95 or KF94 respirators.

Double Layering Masks

With the continued short supply of N95-rated masks, some experts are suggesting an alternative called double masking. Surgical masks are made of the same nonwoven material as N95 masks, but differ in how well they seal to the face. In a study of the movement of influenza through eight different brands of surgical masks, the amount of virus that made its way inside the mask where it could be inhaled mask was reduced by an average of 83%. However, there was a large range in the amount of reduction measured that depended on the design of the mask, with the smallest reduction of 9% and the largest of 98% (Pan et al., 2021).

There are a number of different ways that can be used to improve the seal around a surgical mask. The effectiveness of some of them have been evaluated to determine the change in filtration of particles (Clapp et al., 2020). The ability of the masks to filter particles from room air was measured and is reported as the fitted filtration efficiency (FFE), or the percentage of particles removed.

In the study by Clapp and colleagues, the researchers tested:

1. Enhancing the seal by tying the ear loops and tucking in the side pleats (https://youtu.be/UANi8Cc71A0)
2. Fastening ear loops behind the head with ear guards or mask extender straps
3. Fastening the ear loops behind the head with a 23-mm claw-type hair clip
4. Enhancing the seal by placing a ring of 3 attached rubber bands over the mask, with the center rubber band placed over the nose and chin of the participant and the left and right side bands looped over each ear (described as the “fix-the-mask” 3–rubber band method shown at https://www.youtube.com/watch?v=CVjGCPfRwUo)
5. Enhancing the seal by covering the surgical mask with a 10-inch segment of nylon hosiery

When the surgical masks with elastic ear loops were worn normally, the researchers found that the fitted filtration efficiency (or FFE) was 38.5%, and surgical masks that had strings that tie behind the head had a FFE of 71.5%. The masks with the ear loops tied to close off the gap in the sides had a FFE of 60.3%.

Use of rubber bands on the front of the mask to make a tight seal had a FFE of 78.2%, and use of the nylon hose led to a FFE of 80.2%.

In the study by Pan and colleagues mentioned above, the researchers found that along with filtration ability, the flexibility and thickness of the material influenced the performance of masks made out of different materials because it affected how well the material could seal to the face.

Based on their results, the researchers determined that a three-layer mask consisting of two outer layers of a very flexible, tightly woven fabric and an inner layer consisting of a material designed to filter out particles would offer the most protection outside of an N95-type respirator.

The outer layers of tightly woven fabric contribute an efficiency of about 20%, and if the inner filtering material is 60% efficient over all particle sizes, the mask would have a minimum efficiency of 74%. Some of the filtering materials suggested by the authors included high efficiency particulate air (or HEPA) filters, a MERV 14 or better filter, a good surgical mask, or a vacuum bag. The size of particles that are most relevant for the transmission of SARS-CoV-2 are 1 micrometer or larger. The materials listed as possible filtering layers in this study all can have an efficacy of up to 75% at this particle range, meaning that a well-fitting three-layer mask made in this manner would have an **overall efficiency greater than 90%**.

Based on their study, Pan and colleagues had two suggestions for making layered masks with enhanced protection from infectious particles (Pan et al., 2021 and Gandhi and Marr, 2021).

There are two methods that are suggested for layering masks:

1. Wear a cloth mask tightly on top of a surgical mask, where the surgical mask acts as the filter and the cloth mask provides an additional layer of filtration while improving the seal to the face.
2. Wear a three-layer mask with the front and back layers made of a flexible, tightly woven fabric that can conform well to the face with a middle layer consisting of a nonwoven high-efficiency filter material.

The use of double layered masks can cause moisture to build up within the mask. Excessive moisture in a mask will cause it to become ineffective and promote growth of pathogens. Therefore it is important to check for moisture in a mask that is worn for an extended length of time, and a new, dry mask should be acquired if either mask becomes wet or damp.

Using double masks can also make it more difficult to breathe through the layers. People with medical issues that make breathing difficult, such as asthma or COPD, should test their masks in a controlled environment like their homes to make sure their breathing is not impeded. Silicon or plastic spacers are also available that help to keep the masks off the mouth, making it easier to breathe and talk while not compromising the seal of the mask to the face.

Why should providing better masks be prioritized?

In July, a group of 70 scientists and public health advocates in the United States published an open letter calling for a national effort to make masks that are comfortable to wear and protect the wearer and those around them through filtration of 95% or more of the viruses and other infectious particles in the air (Beier, 2021). They cite that there is now “strong scientific evidence that some face coverings are more effective in preventing the outbound dispersal of droplets

(e.g. greater than 2 microns) or aerosols (e.g. less than or equal to 2 microns)," and use of the more effective face coverings would both collect infectious particles and prevent intake of the virus by others who were not yet infected.

Following on these initial findings, researchers have also completed studies that provide good evidence that while any mask will provide more protection than nothing, the combination of droplet and aerosol transmission that can occur with SARS-CoV-2 requires a high filtration mask, or hi-fi masks.

A hi-fi mask would be a mask that has properties similar to masks with a N95 designation in the United States (Karan et al., 2021). The effectiveness of N95-rated masks to prevent the spread of SARS-CoV-2 has been shown in laboratory tests and observational studies that illustrate the ability of the equipment to protect healthcare workers caring for patients with COVID-19. Many of the lapses in protection reported at facilities in the United States have occurred due to scarcity of equipment rather than failure of the masks themselves.

Who is suggesting the use of better masks?

Numerous well-known researchers and medical professionals have been calling for better access to higher quality masks as well.

For example, **Linsey Marr**, a professor of civil and environmental engineering from Virginia Tech, has studied the movement of SARS-CoV-2 and other viruses in the air to better understand transmission. In an interview with CNN, she stated that there has been very clear data that "states that have implemented strong mask policies have a slower increase in the number of cases or even a decrease" (Gupta et al., 2021). Additionally, she points out that in countries with widespread mask use, the number of COVID-19 cases are much lower. Based on her knowledge of the current pandemic and the possibility of the increased transmission from new variants, she stated that improving the number of people wearing masks and the quality of mask worn will allow for a reduction in the rate of transmission. To achieve the goal of better masks and more widespread coverage, she proposed improving standards for masks and indicated that it may be necessary to send all residents several masks that are of good quality.

In an opinion piece published in the *Washington Post*, **Joseph G. Allen**, an associate professor at Harvard University's Chan School of Public Health, stated that it is his belief that all individuals should now be wearing masks that filter 95% of particulates from the air, or so-called N95 masks (Allen, 2021). His opinion was based on new research that shows that the relative risk of death for healthcare workers rose 20% in 2020 while the risk of death for other essential workers rose even higher and not the spread of potentially more transmissible variants. For example, the risk of death for bakers and cooks increased more than 50%, the risk for maids and truck drivers increased by 30%, and the risk for construction workers and shipping clerks increased by more than 40% (Chen et al., 2021). He also stresses the ability of N95 masks to provide two-way protection.

Ashish Jha, dean of the Brown University School of Public Health, stated in an article in *the New York Times* that the CDC needs to update their recommendations describing the best type of masks for different contexts (Klein, 2021). He no longer feels that use of cotton masks is

appropriate for all situations, and suggests that use of an N95-type mask or doubled mask should be recommended for required indoor activities, such as grocery shopping. He also mentions that even though the number of new COVID-19 cases are starting to decline, the level of transmission is still extremely high even without widespread distribution of new variants in the United States. Therefore relaxing of restrictions, such as opening restaurants, should not occur until a consistently low level of community transmission can be maintained.

Dr. **Abraar Karan**, an internal medicine physician at Brigham and Women's Hospital and Harvard Medical School, has also come out in support of the general public using N95, or their equivalents, to prevent the spread of SARS-CoV-2 (Gupta et al., 2021). Even before the emergence of the new variants, Dr. Karan and his colleagues proposed that the way to control a respiratory virus like SARS-CoV-2 that spreads through a combination of droplet and aerosol formation would be to use reusable, high-quality masks that were near to an N95 in efficacy. With the production of masks still not high enough to properly outfit even medical workers, Dr. Karan also suggests that ramping up production will need to occur using methods like those employed during World War II while using programs such as the Defense Production Act. Once masks are available, distribution could be organized through local post offices or using vending machines in the community that dispense masks in response to a personal code as is being done in Asia.

What Are Other Countries Doing?

As of January 26, it is now mandatory that individuals on public transportation and those in shops must wear single-use filtering facepiece respirators, FFP2 or the equivalent of N95 respirators, in Austria, and either surgical-type masks or FFP2 respirators in those same settings in Germany (Wamsley, 2021).

Bavaria is currently dealing with an outbreak of a more transmissible form of SARS-CoV-2. The state premier of Bavaria, Markus Söder, said that the decision to require higher quality masks there was due to the understanding that “If the virus becomes more dangerous, the mask has to get better” (Morris and Noack, 2021).

Officials in France are reportedly considering making similar requirements, and France's High Council for Public Health has already announced that they recommend using surgical masks in public as they provide more protection than fabric masks (Wamsley, 2021).

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