PRISM SOLUTIONS

RESEARCH BRIEF

Research Request:

COVID-19: Mask Effectiveness and Recommended Procedures for Passengers and Crew

Research Response:

Mask Types and Effectiveness

Since the beginning of the global coronavirus pandemic, Americans have been told by the Centers for Disease Control and Prevention not to wear masks unless they are sick, caring for a sick person who is unable to wear one or working in health care.

Numerous reasons have been given: that they don't offer significant protection from germs, that the most effective models need special fitting in order to work, that regular people don't typically wear them correctly, that they'll give people a false sense of security and cause them to be lax about hand-washing and social distancing.

And most of all: that there aren't enough masks and respirators for the health-care workers who desperately need them so leave the masks to them.

Now there are big changes to that policy.

The Trump administration announced on 03 APR 2020 that the CDC is now recommending people consider wearing cloth face coverings in public settings where other social distancing measures are difficult to maintain.

There's one big reason for the change: There is increasing evidence that the virus can be spread by presymptomatic and asymptomatic carriers.

These new policies come with the vital plea that people don't use the medical-grade masks that are in short supply in hospitals right now. That means one thing: The era of the homemade masks and face coverings is upon us.

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With this new attitude come many questions — which we'll attempt to answer here.

Can face coverings prevent the spread of the virus?

The primary benefit of covering your nose and mouth is that you protect others. While there is still much to be learned about the novel coronavirus, it appears that many people who are infected are shedding the virus – through coughs, sneezes and other respiratory droplets – for 48 hours before they start feeling sick. And others who have the virus – up to 25%, according to Centers for Disease Control and Prevention Director Dr. Robert Redfield — may never feel symptoms but may still play a role in transmitting it.

That's why wearing a mask even if you don't feel sick can be a good idea.

If you cough or sneeze, the mask can catch those respiratory droplets so they don't land on other people or surfaces. "So it's not going to protect you, but it is going to protect your neighbor," says Dr. Daniel Griffin at Columbia University, an expert on infectious diseases. "If your neighbor is wearing a mask and the same thing happens, they're going to protect you. So masks worn properly have the potential to benefit people."

The best masks are N95 respirators, but the general public is urged not to use them because they are fiercely needed by health care workers right now. If you have those, consider donating them immediately to a local hospital. Same goes for surgical masks — those thin blue models-- which offer less protection but are helpful and are also in short supply.

If I'm wearing a mask and someone sneezes on me, would the mask offer some protection?

Yes. But only if you use the mask properly and don't touch it with your hands afterward.

Those droplets from a cough or sneeze would hit your mask instead of your mouth and nose — good news. But the next step is to take the mask off by the ear bands and either wash or discard it — without touching the front of it.

"That's what I see all the time," says Griffin. "That's why in the studies, masks fail — people don't use them [correctly]. They touch the front of it. They adjust it. They push it down somehow to get their nose stuck out."

If you touch the front of the mask, whatever that person coughed or sneezed on it is now on your hands.

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As this video from the World Health Organization shows, you should take off your mask by removing the elastics or straps from behind your ears. Don't touch the front, and keep the mask away from your face.

One other thing: Ideally you would have eye protection, too, to keep that stranger's sneeze from getting in. Glasses and sunglasses aren't perfect but can help.

Types of Masks

Face-protection options range from hospital-grade surgical masks and respirators to makeshift face coverings like bandannas.

Surgical masks and N95 respirators, often simply called respirators, are regulated by the Food and Drug Administration (with some collaboration with the National Institute for Occupational Health and Safety on respirators). Both types of masks are tested (to be cleared for marketing) for fluid resistance, filtration efficiency, flammability and biocompatibility. N95 respirators offer more protection for health care workers performing medical procedures that expose them to patients' respiratory secretions, such as placing a tube to open a patient's airway.

Respirators

Respirators are made from cloth-like filter material that protects wearers from inhaling infectious organisms. Firmer and more substantial than a surgical mask, the rounded respirator is shaped more like a small bowl. Its edges form a seal around your nose, and mouth and the filtering action removes tiny particles from the air when you breathe in.

Respirators come in several sizes and models. For an N95 respirator to be fully effective, it must be properly fitted to the individual user. Fitting entails an established process including aerosol spray tests – it's not like trying on a hat. Health care professionals are individually custom-fitted for these masks.

Health care providers now face challenges with N95 respirator availability. In addition the general public doesn't have access to respirator fitting procedures or training on how to use them, which could reduce their effectiveness.

N95 respirators have other limitations. Respirators can make it more difficult for the wearer to breathe, so people with chronic respiratory, cardiac or other medical conditions should check with their health care providers before using one, the FDA cautions. N95 respirators are not designed for people with facial hair, or for children, and a respirator may not provide them with full protection.

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Surgical Masks

Flat, rectangular surgical face masks are made of thin, paper-like material. The mask fits loosely around your nose, mouth and chin. Surgical masks are disposable and not designed to be used more than once.

If properly worn, surgical masks block large-particle droplets, splashes, sprays or splatters that may contain germs like viruses and prevent them from reaching your mouth and nose, according to the FDA. In addition, surgical masks may reduce exposure to saliva and respiratory secretions.

Some surgical masks include a clear, wraparound shield that provides an added barrier for the eyes, cheeks and forehead. If you need drive-thru COVID-19 testing, for instance, you might see test providers wearing those kinds of masks. They're also worn in hospital settings where respiratory procedures are performed.

Because surgical masks fit loosely rather than having a tight seal, they don't provide an absolute barrier or complete protection against tiny particles in the air that may be released by coughs or sneezes.

The World Health Organization offers advice for the public on how to use masks to protect against coronavirus infection:

- Inspect the mask for any holes or tears to make sure that it's intact.
- Wash your hands with soap and water or use an alcohol-based hand sanitizer that contains at least 60% alcohol before putting on the mask.
- Cover your nose and mouth with the mask and make sure no gaps exist between it and your face.
- Avoid touching the mask while using it. Touching the front of your mask, which is exposed to the environment, can defeat the purpose of using it.
- If you do touch your mask, wash or sanitize your hands immediately.
- When your mask gets damp, replace it.
- Do not reuse these single-use masks.
- Remove your mask from behind rather than touching the front of the mask.
- Discard the used mask immediately in a closed trash bin and clean your hands again.

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What about homemade masks?

Some research has shown that cotton T-shirt material and tea towels might help block respiratory droplets emitting from sick people — though it's not clear how much protection they provide.

We don't yet know exactly how effective homemade masks are, but Griffin thinks they're a good idea — he has even taken to wearing one over his N95 respirator.

How often do I need to wash it?

Griffin says to think of a mask as like underwear: It needs to be washed after each use.

"You don't take this dirty mask off, put it in your purse and then stick it back on your face," he says. "It's something that once you put on, is potentially either touching your coughs, sneezes or the spray of your speech, or protecting you from the coughs, spray, speech of other people. And now it's dirty. It needs to basically be either discarded or washed."

So if you're wearing a cloth mask, put it into the laundry basket immediately. If it's disposable, throw it away.

It's a big no-no to pull the mask down to eat a snack, then pull it back up: You've just gotten whatever dirty stuff is on the mask on your hands and into your mouth.

Is there one best mask design?

There is little data so far on cloth or homemade masks in general — let alone data that dictates how many pleats to put on your home-sewn version.

Griffin says the best material to use is a tight-weave cotton. "Don't use a synthetic or a polyester because they've looked at the virus's ability to survive on surfaces, and spandex is the worst," he says.

Johns Hopkins Medicine has one design you might try. Kaiser Permanente has another design, as well as a video showing how to make a mask using a sewing machine. Both recommend 100% woven cotton fabric. Kaiser recommends washing and drying the fabric two or three times before cutting it, so it doesn't shrink later.

You can make a mask out of a T-shirt, no sewing machine required. You could also try making one out of (unused) shop towels. But no matter what you make it out of, try to make it fit closely to your face and

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don't touch the front of it once you've started wearing it.

If you use cloth masks, make a number of them so you can wear a fresh one each time you go out.

Would a scarf work?

Probably not as well as a mask that fits closely to your face.

"You can imagine if you put a loosely knit scarf with lots of holes in it ... that would not be very effective," says Dr. Michael Klompas, an infectious disease physician at Brigham and Women's Hospital.

The goal is to create a barrier that catches droplets and keeps others from coming in, so you want coverage that is tightly woven and close-fitting.

Should Aviation Crew Wear Personal Protective Equipment (PPE) & Face Masks?

The CDC recommends wearing cloth face coverings in public settings where other social distancing measures are difficult to maintain.

Therefore some aviation authorities, including EASA, have recently recommended that face masks should be worn by crew members having direct contact with passengers, at all times and replaced regularly (at intervals not exceeding 4 hours). Correct disposal of the PPE and of other items that may be contaminated should be ensured. Provide detailed instructions and dedicated disposal bags as to where such items should be placed; and how they should be sprayed or doused with disinfecting solutions.

Once on the ground, the contents should be appropriately disposed following the guidelines for the disposal of biohazardous materials.

The EASA guidance does not mention pilots in the flight deck. However, as it is possible for pre-symptomatic transmission of the virus, and as the flight deck is a confined space (distancing is less than the recommended 6 feet); a pilot may want to wear a mask.

What Masks Should We Have On Board?

A facemask should be used by people who have been exposed to Covid-19 and are showing symptoms.

⇒ Surgical masks are usually protective enough for the affected person(s) onboard.

⇒ Surgical masks should also be worn by anyone attending to the ill person and anyone in close proximity (within 2 meters/ 6 feet).

⇒ N95 Masks are meant for the trained medical professional. They must be fitted properly for maximum protection.

⇒ For crew and guests on board, cloth face coverings are encouraged

Additional Considerations

- Wearing face coverings helps people who may have COVID-19 and not know it from transmitting the virus to others. When considering this guidance, air carriers and crewmembers should be mindful of the regulations regarding the use of oxygen masks where the operation requires an oxygen mask to be rapidly placed on the face, properly secured, sealed, and supplying oxygen upon demand. Air carriers should complete a safety risk assessment and provide guidance to their crewmembers on procedures for the use of face coverings as they may affect the donning of oxygen masks.

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Because air travel remains essential, it is critical to protect the health and safety of crews while ensuring that essential flight operations can continue. The FAA and CDC recommend that air carriers and crewmembers take precautions to avoid exposure of crewmembers to SARS-CoV-2 and to ensure crewmembers do not work while symptomatic with fever, cough, or shortness of breath, or after having tested positive for SARS-CoV-2. They may return to work only after they are no longer considered infectious according to CDC's criteria for Discontinuation of Isolation for Persons with COVID-19 Not in Healthcare Settings.

The FAA and CDC also recommend that crewmembers with known exposure to SARS-CoV-2, or persons with COVID-19, not work until 14 days after the last potential exposure. The CDC has issued guidance for exposed workers in critical infrastructure who might need to return to work before 14 days have passed: Implementing Safety Practices for Critical Infrastructure Workers Who May Have Had Exposure to a Person with Suspected or Confirmed COVID-19. While air travel is a vital economic activity, CDC does not recommend allowing crewmembers with known exposures to continue to work, even if asymptomatic, because of the inability of crewmembers to remove themselves from the workplace if they develop symptoms during a flight and the challenges involved in effectively isolating a symptomatic person on board an aircraft.

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Further, to slow the spread of the virus, the CDC recommends the use of cloth face coverings while in public places and when social distancing is not practicable. Wearing face coverings helps people, who may have COVID-19 and not know it, avoid transmitting the virus to others.

The FAA and CDC recommend and expect that all U.S.-based air carriers and crewmembers, all non-U.S.-based air carriers operating flights with a U.S. nexus, and all non-U.S.-based crewmembers on flights with a U.S. nexus implement and use their company-developed COVID-19 preparedness plans and procedures in conjunction with the FAA and CDC occupational health and safety guidance in the attached appendix regarding practices for limiting the spread of COVID-19. The FAA and CDC will update or supplement this SAFO as more information becomes available. Air carriers and crewmembers should also review and incorporate into their COVID-19 preparedness plans and procedures, the CDC guidance, "Updated Interim Guidance for Airlines and Airline Crew: Coronavirus Disease 2019 (COVID-19)" on the CDC website at: https://www.cdc.gov/quarantine/air/managing-sick-travelers/ncov-airlines.html

CDC has additionally provided fact sheets for the transportation industry, available at: https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/businesses-employers.html

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COVID-19: Updated Interim Occupational Health and Safety Guidance for Air Carriers and Crews from the Federal Aviation Administration and the Centers for Disease Control and Prevention

Guidance for U.S.-based Air Crews and Air Crews Based in Other Countries while Located in the United States

Health Monitoring

- Crewmembers should monitor themselves for fever (feeling feverish or a measured temperature of 100.4oF [38oC] or higher), cough, or shortness of breath.
  - Crewmembers should take their temperature twice a day during duty periods, and any time they feel sick.
- Crewmembers should stay home or in their hotel room, notify their employer's occupational health program, and not report to work if they meet any of the following conditions:
  - Develop fever, cough, or shortness of breath, even if mild;
  - Test positive for SARS-CoV-2, even if no symptoms are present; or
  - Are exposed, as defined below, to a sick person with fever, cough or shortness of breath, even if the person has not been tested for SARS-CoV-2.
- Exposures of concern include:
  - A sick household member or intimate partner;
  - Taking care of a sick person without using personal protective equipment (PPE); or
  - Being within 6 feet (2 meters) of a sick person (including co-workers and passengers) for a prolonged period of time (i.e., 10 minutes or longer).
    - NOTE: Data are insufficient to precisely define the duration of time that constitutes a prolonged exposure. Brief interactions are less likely to result in transmission; however, it is important to consider the person's symptoms and the type of interaction (e.g., whether the sick person coughed or sneezed directly into the face of the exposed person).
- Crewmembers who are symptomatic or have been exposed to a person with COVID-19, should not return to work until cleared to do so by their employer's occupational health program and public health officials.
- If a crewmember develops symptoms during a flight, the crewmember should stop working as soon

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as practicable, put on a surgical mask or a cloth face covering, notify the Lead Flight Attendant or Purser, and maintain a distance of (6 feet [2 meters]) from others to the extent possible.

Health Protection

To protect their health and the health of others, including co-workers and passengers, crewmembers should:

- Maintain a distance of 6 feet (2 meters) from others to the extent possible, including:
  - ◊ While working on aircraft, e.g., while seated in jump seats during take-off or landing or working in galley areas, etc. Certain FAA regulations may be implicated in implementing this guidance (e.g., 14 C.F.R. § 121.391(d)); crewmembers may wish to verify that the air carrier has sought relief.
  - ◊ During ground transport.
  - ◊ While in public places.
- Stay at home or in their hotel rooms (as applicable) to the extent possible.
  - ◊ Eat in hotel room during layovers with either room service or delivery service. If in-room food delivery options are not available, get take-out from hotel restaurant or another restaurant nearby.
  - ◊ Limit activities in public to essential errands, such as getting food.
- Wash their hands frequently with soap and water, for at least 20 seconds, or use an alcohol-based hand sanitizer with at least 60% alcohol, particularly after assisting sick travelers or touching body fluids or surfaces likely to be contaminated with body fluids; after coughing, sneezing, or blowing their nose; after using the restroom; before eating; and before preparing or serving food or beverages; and after removing any PPE, including gloves.
- Avoid touching their eyes, nose, or mouth with unwashed hands.
- Consider wearing a cloth face covering while around other people, especially in situations where they cannot maintain the recommended physical distance from others.
  - ◊ Cloth face coverings should not replace the use of surgical masks or other PPE provided in the Universal Precaution Kit (UPK) when interacting with a sick traveler on board an aircraft.
- Avoid contact with people having cough, fever or shortness of breath or otherwise suspected of having COVID-19.
- Before each flight, inspect and confirm the condition and contents of the UPK(s). Follow existing air

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carrier policy and procedures regarding use of the PPE available in the kits if needed to provide care to a sick traveler on board.

- Follow guidance for COVID-19 precautions of the State and local health authorities in the area where they are located.

Crewmembers should be aware that their employer's occupational health and safety program may include policy and procedures that exceed these recommendations. Air crews based in other countries should also follow guidance from the relevant foreign public health and civil aviation authorities.

Guidance for U.S. Air Carriers and Foreign Air Carriers Operating in the United States

Health Monitoring

Air carriers' occupational health and safety programs and COVID-19 preparedness plans should include provisions for:

- How to remain in contact with all crewmembers to ensure they continue to monitor their health, avoid risk factors that could increase risks for exposures to SARS-CoV-2, and do not report to work while symptomatic.
- Educating crewmembers on what to do if they or their close contacts become sick with symptoms of COVID-19.
- To the extent feasible, screening air crews for symptoms of COVID-19 at the start of their duty day using a combination of visual observation for signs of illness; temperature checks; and asking about fever, cough, or shortness of breath in the previous 48 hours.
- Consultation with CDC and State or local health officials before allowing symptomatic, infected, or exposed crewmembers to return to work.

Crewmembers should be excluded from work if they:

- Have fever (defined as feeling feverish or a measured temperature of 100.4oF [38oC] or higher), cough, or shortness of breath, or test positive for SARS-CoV-2 regardless of symptoms.
    - ◊ Crewmembers should remain excluded until they meet CDC's criteria for discontinuing isolation, available at https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-in- home-patients.html.
    - ◊ For **asymptomatic persons with laboratory-confirmed COVID-19**, CDC recommends continued

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precautions for an additional 3 days after discontinuing isolation. Air carriers may consider continued exclusion from work of asymptomatic infected crewmembers during these additional 3 days.

- Were exposed to a person likely to have or confirmed to have COVID-19 (see exposures of concern in Guidance for Air Crews above).
    - ◊ Exposed crewmembers should remain excluded from work until 14 days have passed after the last potential exposure.

Minimize Crewmember Exposures

To minimize crewmember exposures, air carriers should:

- Arrange for private ground transport to move crews to hotels, or to the parking lot at their home base, that allows crews to maintain the recommended 6-foot (2-meter) distance from others.
- Arrange to house flight crews in hotels that are in close proximity to the airport. Ensure that the hotel rooms are sanitized in advance of the crews' arrival.
- Provide sufficient quantities of alcohol-based hand sanitizer containing at least 60% alcohol to crewmembers for their personal use.
- Provide sufficient quantities of cleaning and disinfectant products (e.g., disinfectant wipes) that are effective against COVID-19, compatible with aircraft for crewmembers to use on surfaces they touch frequently in the galley, in the passenger cabin, and on the flight deck.
- Increase the frequency of routine cleaning of the aircraft to focus on the most frequently touched surfaces per CDC's Interim Guidance for Airline and Aircrew.
- After each flight, clean and disinfect surfaces in the galley, passenger cabin, and areas that are frequently touched by crewmembers, such as buttons and dials that control cabin lighting and temperature, safety demonstration equipment, phone handsets, and touchscreens. Use products that are effective against COVID-19, compatible with aircraft, and approved by the aircraft manufacturer for use on board the aircraft.
- After each cockpit crew change, clean and disinfect surfaces in the flight deck that are frequently touched and utilized by cockpit crew members, such as yoke, throttles, auto pilots, radios, etc. Use products that are effective against COVID-19, compatible with aircraft, and approved by the aircraft manufacturer for use on board the aircraft.
- Increase the frequency of routine cleaning of flight simulators and training devices, training aids, and other training equipment that crew are likely to use or touch during training. Use products that are

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effective against COVID-19, compatible with the simulator, training devices, training aids and other equipment and approved by the appropriate manufacturer.

- Provide sufficient personal protective equipment (PPE), (e.g., gloves, face shield, surgical masks, etc.) on board aircraft for crewmember use when interacting with an ill traveler and ensure availability of face masks to place on symptomatic travelers. Before each flight, ensure the UPK(s) are inspected for proper condition and contents, have adequate supplies, and are properly stored.
- Ensure crewmembers are trained in the correct use of PPE, including correct procedures for donning (putting on) and doffing (taking off).
- Consider providing cloth face coverings to crewmembers for routine use when on duty if it does not interfere with required PPE or job tasks and when it is difficult to maintain a distance of at least 6 feet (2 meters) from co-workers and passengers at all times.
    - ◊ Isolate sick crewmembers from other co-workers and passengers by a distance of at least 6 feet (2 meters) as much as possible during flight and have the sick crewmember don a surgical mask or cloth face covering if tolerable.
- Consistent with 14 CFR § 382.23, airlines may refuse transportation to a passenger because of a communicable disease if the passenger's condition poses a direct threat to the health or safety of others.

Notifications

Air carriers should notify:

- Local health authorities (for the crewmember's place of residence) if they are aware of a crewmember with COVID-19 and the information came from a source other than the State or local health authority (e.g., a foreign health authority).
- CDC if:
    - ◊ A COVID-19-positive crewmember worked on a flight to or within the United States during the period from 2 days before symptoms developed until CDC's criteria for discontinuing isolation are met;
    - ◊ An asymptomatic crewmember with confirmed SARS-CoV-2 worked on a flight to or within the United States during the 7 days after a specimen testing positive for SARS- CoV-2 was collected;
    - ◊ A crewmember with COVID-19 needs to be repatriated to the United States or relocated from one U.S. State or territory to another before CDC's criteria for discontinuing isolation are met; or

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- ◊ A crewmember with known exposure to COVID-19 needs to be repatriated to the United States or relocated from one U.S. State or territory to another before 14 days have passed since the last potential exposure.

- Crewmembers who may have been exposed to an infected co-worker or passenger.
  - ◊ NOTE: A person with COVID-19 is considered potentially infectious during the period from 48 hours before symptom onset until CDC's criteria for discontinuing isolation are met.

Response Plans

Air carriers should have plans for:

- Managing a crewmember who is identified as symptomatic or positive for COVID-19 while on duty.
  - ◊ Whenever possible, air carriers should avoid having crewmembers working on flights while a test for SARS-CoV-2 is pending.
- How to house crewmembers or move them safely to their residence if they are discovered to be positive for SARS-CoV-2 or exposed to COVID-19 while on duty.
  - ◊ Housing an infected or exposed crewmember (other than at crewmember's residence) should be coordinated with the State and local health department of jurisdiction for where crewmember is located.
  - ◊ Relocating a SARS-CoV-2-positive or exposed crewmember to or within the United States should occur by approved private charter, medical transport, or private vehicle, and should be coordinated with CDC and the State and local health departments at origin (if within the United States) and destination.
  - ◊ Transporting a SARS-CoV-2-positive or exposed crewmember based in another country back to their home country should occur by approved private charter, medical transport, or private vehicle (if transport occurs via land border), and should be coordinated with CDC and relevant public health authorities at origin and destination.

Air carrier occupational health and safety programs may choose to exceed these recommendations based on their own policies. Air carriers based in other countries should also follow guidance from the relevant foreign public health and civil aviation authorities.