

# Everyone Needs a Mask in Public – COVID19

## A Call for Homemade Masks, an Industrial Hygiene Perspective



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### Disclaimer

It is not the intention of Havelick & Associates LLC (HAL) to provide safety or industrial hygiene advice in this white paper. This white paper is not intended to take the place of industrial hygiene advice or medical advice. HAL advises readers to consult with qualified medical personnel with questions about mask use.

A homemade mask will not prevent you from getting the COVID-19 virus, but it may reduce the potential for you to transmit it to others. You can be infected with the virus and not know it or be in the early stages and not be feeling any symptoms yet.

HAL does not endorse or promote any particular mask, mask design, or respiratory protection device.

Before wearing any type of mask or respiratory protection device you should consult with a medical professional.

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## I ABSTRACT

The dramatic and rapid spread of the COVID-19 pandemic has caught most communities with insufficient supplies of personal protective equipment (PPE) for medical personnel, first responders, and other front-line personnel. The U.S. Centers for Disease Control (CDC) has issued [guidelines](#) for management of shortages of respirators. To free up supplies for professionals, the CDC has recommended against the use of respirators by the general public unless they are or are caring for someone ill with COVID-19. This is in marked contrast to the response in China, Singapore, and South Korea where the use of masks was mandatory or encouraged for the public. It is notable that those nations have achieved more effective control of the virus than has been seen in the United States and Europe. Recent reports have demonstrated that significant majorities of infections are not coming to the attention of medical systems, and that those individuals are, in many cases, actively transmitting disease.

The industrial hygiene community has extensively documented the limitations of basic face masks (such as surgical style masks) as personal protective equipment. Here, the use of masks by the public is not encouraged as PPE to protect the wearer, but rather to stop some fraction of droplets from being released by the wearer. With most infections currently unreported, rapidly growing numbers of people are moving about in public and capable of spreading disease with every cough and sneeze. The widespread manufacture and use of home-made masks use by the general public could significantly reduce the transmission rate ( $R_0$ ) of COVID-19.

Due to the adoption of social isolation measures, most of our population has been encouraged or required to self-isolate at home. A great number of these isolated individuals have sewing machines, skills, fabric, and supplies and can make protective masks at home. Online patterns are available for use, both the accordion and the form fitting design. If enough people are motivated to self-manufacture protective masks, and the media would encourage people to wear them in public, an effective public health campaign could be mobilized in a matter of weeks. Such a program could supplement social isolation measures and reduce the surge in cases facing our medical system.

And if people are truly able to help, they can each make 10 more masks for distribution to relatives, friends, neighbors, to reduce the demand on N95 masks for the front line heroes.

## II SUMMARY FOR THE GENERAL PUBLIC

The COVID-19 virus is spreading rapidly around the world. Masks and respirators are in short supply for medical professionals, first responders, and caregivers, let alone everyone else. Initially, we were told to save masks and respirators for professionals and caregivers – that the general public did not need them. Now, we know eight of ten people infected never come to the attention of medical professionals – often the person infected has few or no symptoms ([Ruiyun Li](#)). There is a stealthy army of virus spreaders in your community right now – maybe even you. A few simple acts of solidarity will help to dramatically reduce this spread.

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### **YOU CAN SLOW THE SPREAD OF COVID-19**

*Make masks at home.*

<https://thevictorymask.com/>

*Make dozens of masks if you can for yourself, your friends, neighbors, and even medical facilities. Many clinics and hospitals are now asking for home-made masks to help fill the shortages.*



Figure 1: Source ABC News, <https://abcnews.go.com/Health/wireStory/hong-kong-volunteers-make-homemade-masks-combat-virus-69097862>

As of noon March 22, 2020, there are over 29,000 confirmed cases in the USA ([Johns Hopkins](#)), maybe 145,000 if the stealthy eight of ten hidden cases are counted. If the rate of increase we have seen since January continues, there may be more than three million confirmed and 15 million in total by the end of April. ([3Blue1Brown.com](#))

Use your time in social isolation to make and then use masks. Together we can slow the rate of increase and give our medical systems a chance.

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**YOU MAY BE INFECTED AND NOT KNOW IT**

**A COUGH OR SNEEZE PRODUCES THOUSANDS OF TINY DROPLETS SWIMMING WITH VIRUS PARTICLES**

**WEARING A MASK CAN CATCH DROPLETS AND SLOW THE SPREAD OF COVID-19**

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## USING YOUR HOMEMADE VICTORY MASK

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### *MASKS DO'S*

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- *Do wear a mask every time you leave your home and will be in contact with others.*
- *Do wear a mask if your job puts you in contact with the public.*
- *Do wash your hands after removing your mask.*
- *Do put on a fresh mask several times per day if you must wear it for a work shift.*
- *Do store used masks so you do not need to touch them.*
- *Do wash used masks in a washing machine. Detergent and heat will kill the virus.*
- *Do check with your medical provider before wearing a mask if you have lung or breathing problems.*

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### *MASK DON'T'S*

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- *Don't ever share a used, unwashed mask.*
  - *Don't re-use a dirty mask.*
  - *Don't ever use a mask if it restricts your breathing.*
  - *Don't violate a quarantine or isolation order, even if you are wearing a mask.*
  - *Don't have close contact with others just because you are wearing a mask.*
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Right now, each infected person is estimated to infect on average between 2.5 to 3.5 other people. Social distancing will help reduce that number. On top of that, the more people who wear masks the more we will reduce the rate of transmission. The goal is to reduce the average transmission to below one. Once we get that transmission rate ( $R_0$ ) below one, we are winning the war.

The most important function of your mask is to slow the spread of virus to others. It is not designed to stop you from catching the virus, but it may help is stopping some droplets from entering your respiratory system.

## REMEMBER

Making [Victory Masks](#) can free up supplies for the professionals who are at the highest risk of disease. If you have factory made respirators or surgical masks at home, please give them to your favorite professional to help them save lives.

Making and wearing [Victory Masks](#) is a community effort. You are doing it to protect others.

Encourage your family and communities to make masks and use them. Try different patterns and designs. A mask completely ineffective if it is not comfortable enough to be worn.

A home-made mask is not considered personal protective equipment. It will not prevent you from getting the coronavirus or any other disease. The primary function of a home-made mask is to stop droplets when you cough or sneeze, and to help avoid touching your face. Use of home-made masks is part of a community effort to slow the spread of COVID-19 and give our healthcare professionals a chance of managing the expected surge in demand for critical medical care.



Finally, shaking hands is being discouraged. Add in wearing a mask, and people may lose many social cues we use routinely. Elbow bumps are awkward. You can Flash a Victory sign instead of shaking hands. If you are wearing a mask and someone makes you smile – flash a V-sign.

By us all pulling together we can claim Victory over this most recent attack.

### III BACKGROUND AND SUMMARY

The novel coronavirus, COVID-19, was first seen in Wuhan, China approximately one hundred days ago. Since the first case was seen outside China, the number of confirmed cases has been growing at an exponential rate. The calculated time it has taken for cases to increase by an order of magnitude was 16 days. ([3Blue1Brown](#)) On March 6<sup>th</sup>, there were 21,935 cases outside China. As of March 22<sup>nd</sup>, there are now 247,878 confirmed cases outside of China ([Johns Hopkins](#)), closely tracking the growth predicted by [3Blue1Brown](#). However, in sharp contrast to the situation outside China, the number of confirmed cases in China has nearly stopped growing. To achieve this, China enforced draconian social distancing required everyone in areas impacted by the outbreak to wear masks in public. In the United States, the Centers for Disease Control (CDC) has encouraged the public to reserve use of masks and respirators for medical professionals, first responders, and caretakers.

NIOSH-approved, professionally manufactured respirators designed for use as respirators are not typically differentiated from simple dust masks by the general public. The use of simple dust masks by the general public, not NIOSH-approved respirators, if widely used, could significantly reduce the rate of transmission of the virus.

At the time of this writing personal observation shows the use of masks by the American general public during the COVID-19 pandemic is quite rare. There may be social stigma associated with wearing a mask in that the wearer could be depriving a health-care worker of a mask. Given the world-wide shortage of respirators and masks, such stigma could be appropriate. Americans and Europeans should accept a paradigm shift and accept and adopt the use of home-made masks. Individuals should be encouraged to wear masks when in public. The stigma should be shifted to appearing in public without one.

The shortage of masks can be addressed quickly by encouraging those in isolation who have sewing skills and equipment to download patterns and make large quantities.

In order to motivate the public to make, use, and promote masks, the adoption of a wartime approach should be adopted. The world is currently experiencing the greatest social and economic disruption since World War Two. I suggest the use of the term, [Victory Mask](#), to instantly indicate that the home manufacture, wearing, and social adoption of mask use is patriotic, socially necessary, and that participation can help to stop this disease.

### IV DEFINITIONS AND FUNCTIONS: RESPIRATORS V. MASKS

A variety of respiratory protection devices are in use during the COVID-19 pandemic. These include N95 respirators, full-face filtering respirators, and powered, air purifying respirators (PAPRs). Simple surgical masks are also in widespread use. Home-made masks are also in use, although rarely observed by the author in the US.

The industrial hygiene community has been central to the development, validation, fitting, and testing of respiratory protection devices. Respirators must meet strict manufacturing and testing standards and carry ratings for specific uses. No one respirator is suitable for protection against all hazards; a large number of respiratory protection products must meet [NIOSH Respirator Standards](#). Respirators are designated as

personal protective equipment (PPE). They are expected to protect the wearer against specific hazards, with assigned protection factors.

In the case of COVID-19, the medical community and first responders should use NIOSH-approved respirators when working with infected or potentially infected patients. Most commonly, N-95 respirators are used. In the vernacular, the terms “respirator” and “mask” are often used interchangeably. Here, I refer to NIOSH-approved respiratory protection equipment as “Respirators”. Dust masks, homemade masks, and other fabric-based filtering face masks are referred to here as “Masks”.

Masks are not rated by NIOSH as personal protective equipment and are not considered to offer significant protection to wearers from hazards. While a fabric mask or surgical mask is not considered protective to the wearer, such masks can stop some significant fraction of droplets from escaping when the wearer coughs or sneezes. By stopping larger droplets, they can reduce the total number of viral particles released during a cough or sneeze. This can reduce the total quantity of airborne particulates or droplets released and can reduce the deposition of droplets and virus particles on environmental surfaces (fomites).

In this application, the use of home-made masks for use by the general public is not intended for use as PPE. Instead, the wearer is reducing the spread of potentially virus-laden droplets that could infect others in the community. For this purpose, no fit factor calculation, no fit testing, no medical fitness testing is necessary. A mask is just a mask.

## V HOME MANUFACTURE OF MASKS

A simple web search for “coronavirus mask pattern” will find numerous hits and instructions for making masks. Home manufacturers should be encouraged to try several designs, sizes, and patterns to find the ones they and their friends like the best.

The use of tight-weave cotton fabric may be the best face mask material. I suspect that fabric such as is used for t-shirts may be effective for most purposes. Use of screen-printed fabric should be discouraged if the printing reduces the permeability of the mask fabric.

## VI PUBLIC WEAR OF MASKS

Everyone should be encouraged to wear a mask any time they are in public or in situations that put them in close contact with people outside their immediate family. People whose jobs put them in close contact with the public should be particularly vigilant about wearing masks. Cashiers, servers, flight attendants, ride-sharing drivers, and retail salespeople are all examples of people who are at danger of infection and have high potential to spread the virus to others. These workers should be required by their employers to wear masks.

Individuals over the age of 60, those with preexisting lung disease, diabetes, and those who are immunocompromised are already being encouraged or required to self-isolate. They and their families and caretakers should be encouraged to wear masks any time they venture out into the public. Visitors to nursing homes should be required to wear masks – assisted living staff members should wear masks.

Everyone, regardless of health status or age, should wear a mask when in public or in close contact with others.

Industries and individuals who have stockpiles of appropriate N-95 respirators should donate those to the medical system personnel who are in desperate need of them.

## VII USE AND CARE OF MASKS

- Users should attempt to find a mask size and type that is comfortable to wear.
- Masks should be laundered before the first use and after every subsequent use. Contact with laundry detergent will deactivate the virus by dissolving the lipid capsule that surrounds the coronavirus.
- Masks (not respirators) can be worn over beards and stubble.
- Avoid touching your mask or face while wearing a mask.
- Workers who wear masks for entire shifts should be encouraged to change masks several times during a shift.
- When a mask is removed, it should be placed into a laundry basket or bag so it does not need to be touched again prior to laundering.
- Everyone should wash their hands immediately after removing their mask.
- Use any standard detergent to wash masks. Masks can be dried in a regular dryer.
- After handling used masks wash your hands.

## VIII CONCLUSIONS

When Mainland China imposed severe social distancing measure and required all people in impacted areas to wear masks when in public, the rates of transmission decreased significantly. ([Johns Hopkins](#)) Today, social distancing measures are being implemented in varying degrees across the USA and Europe but the general public has not been encouraged to wear mask. The number of cases in the world has reached over 329 thousand since the first case were detected in December. ([Johns Hopkins](#)) Outside Mainland China case numbers continue to increase at an exponential rate.

If the thousands, perhaps millions, of people with sewing machines are enlisted to home manufacture masks for use by the general public the transmission rate of the COVID=19 virus will be significantly reduced.