

Respiratory Protection for TB and Other Airborne Infectious Diseases (including COVID-19)

Paul Arthur Jensen, PhD, PE, CIH



16 June 2020

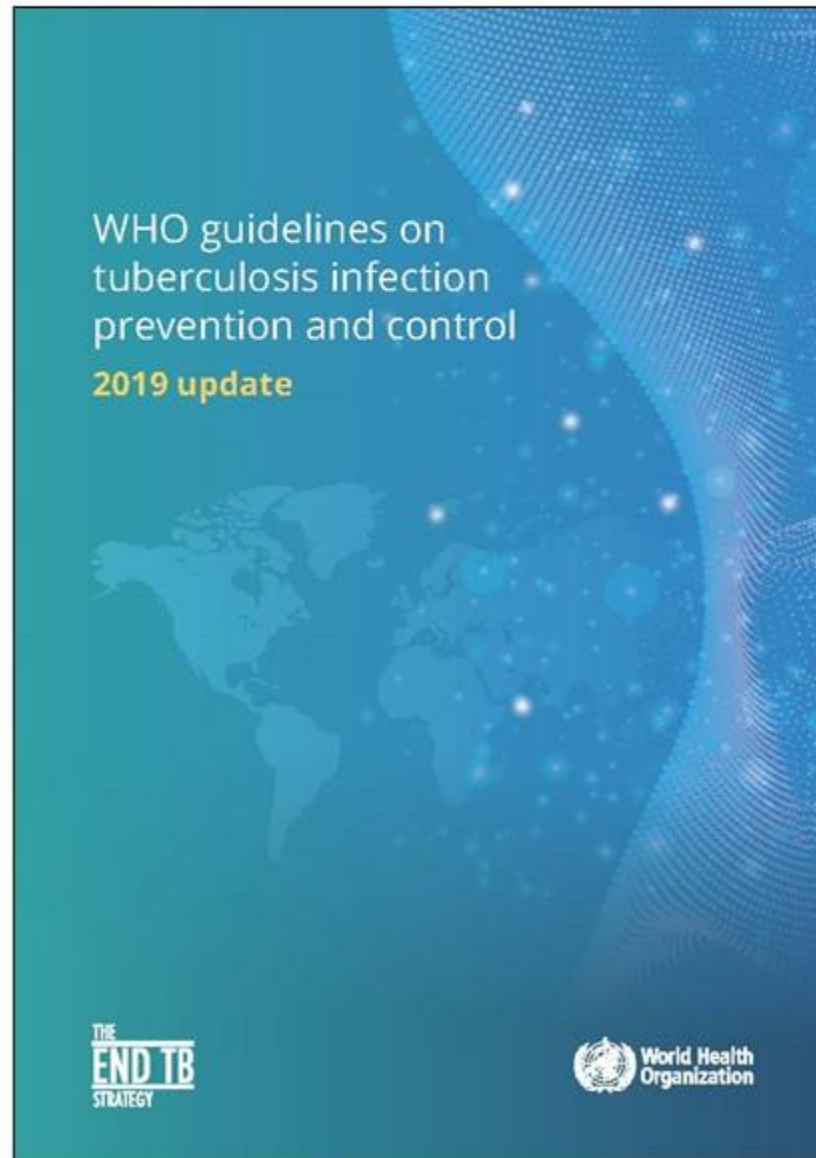
www.StopTB.org/wg/ett



Outline

- Basics of Airborne IPC . . . Next webinar
- Hierarchy of Airborne IPC
- Introduction to PPE
- Surgical / Procedure Masks
- N95 / FFP2 Respirators

Reference #1



Reference #2

Please note: This report has been corrected and replaces the electronic PDF version that was published on December 30, 2005.



MMWR™

Morbidity and Mortality Weekly Report

Recommendations and Reports

December 30, 2005 / Vol. 54 / No. RR-17

Guidelines for Preventing the Transmission of *Mycobacterium tuberculosis* in Health-Care Settings, 2005

INSIDE: Continuing Education Examination

DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION

Reference #3

Global

Regions ▾

العربية

中文

English

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Español



World Health
Organization



Health Topics ▾

Countries ▾

Newsroom ▾

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Coronavirus disease (COVID-19) Pandemic

[Public Advice](#)

[Country &
technical guidance](#)

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[Your questions](#)

www.who.int

Reference #4



Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People™

[All A-Z Topics](#)

Coronavirus ▾



[Advanced Search](#)

Coronavirus Disease 2019 (COVID-19)

CDC > Coronavirus Disease 2019 (COVID-19) > Healthcare Professionals > Infection Control



Coronavirus Disease 2019 (COVID-19)

Symptoms

Testing +

Prevent Getting Sick +

If You Are Sick +

Daily Life & Coping +

People Who Need Extra
Precautions +

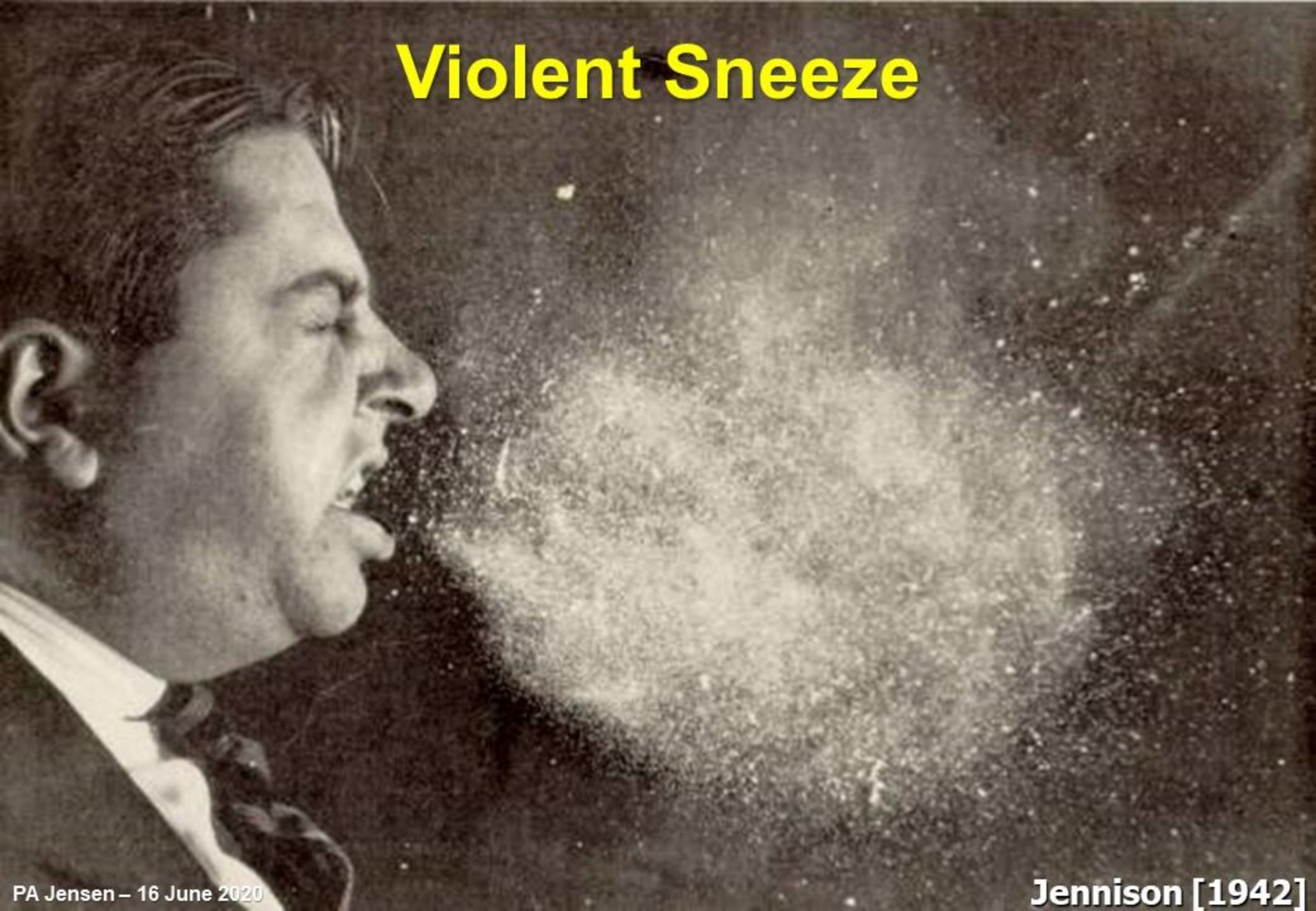
Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings

[Print Page](#)

Update May 18, 2020

www.cdc.gov

Violent Sneeze



Droplets (1)

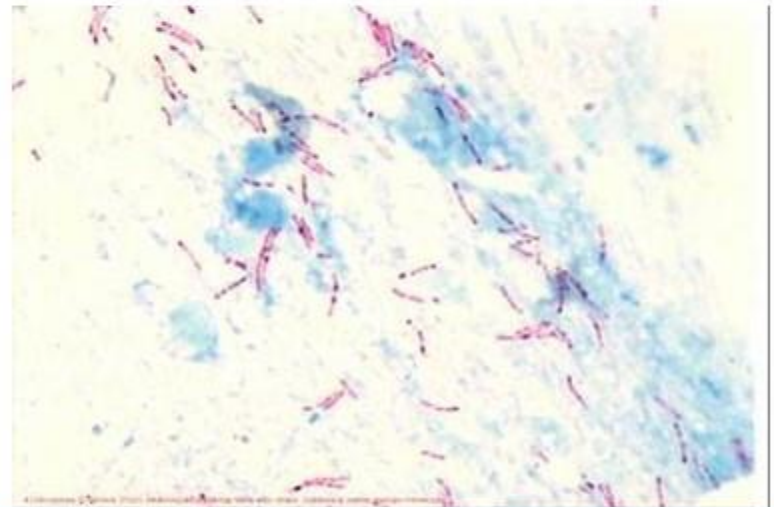
- **Large droplets - larger than $100\ \mu\text{m}$**
 - Settling velocities $\gg 0.5\ \text{m/s}$
 - Fall out of air quickly
- **Medium-size particles - $10\ \text{to}\ 100\ \mu\text{m}$**
 - Settling velocities $> 0.2\ \text{m/s}$
 - Settles out slowly

Droplets (2)

- **Small particles – 1 to 10 μm**
 - Falls very slowly, take days to years to settle out of a quiet atmosphere. In a turbulent atmosphere they may never settle out

Droplets (3)

- A $1.0\ \mu\text{m}$ ***Droplet Nucleus*** or ***Micro-Droplet*** will settle at a rate of $0.0035\ \text{cm/s}$ or 3 m in 24 hours!



Tuberculosis

- Globally, 1.5 million people died from TB in 2018 (including 251 000 people with HIV).
- Worldwide, TB is one of the top 10 causes of death and the leading cause from a single infectious agent (above HIV/AIDS).
- In 2018, an estimated 10 million people fell ill with TB worldwide. 5.7 million men, 3.2 million women and 1.1 million children.

Modes of TB Transmission (1)

- Person-to-Person through Airborne Route!
- When a person breathes TB bacteria deep into the lungs, it can begin to grow.
- From there, they can move through the blood to other parts of the body, such as the kidney, spine, and brain.

Modes of TB Transmission (2)

- TB is NOT spread by:
 - Shaking someone's hand
 - Sharing food or drink
 - Touching bed linens or toilet seats
 - Sharing toothbrushes
 - Kissing

COVID-19

- 11 February, WHO announced official name – COVID-19
 - CO = corona,
 - VI = virus,
 - D = disease, and
 - 19 = 2019 (year theorized it “jumped” to humans)

Coronavirus that causes COVID-19

- **SARS-CoV-2**
- Novel or new coronavirus
- Coronaviruses have been around for a long, long, time
- Most recent coronaviruses:
 - SARS
 - MERS

COVID-19



Search by Country, Territory, or Area



Covid-19 Response Fund

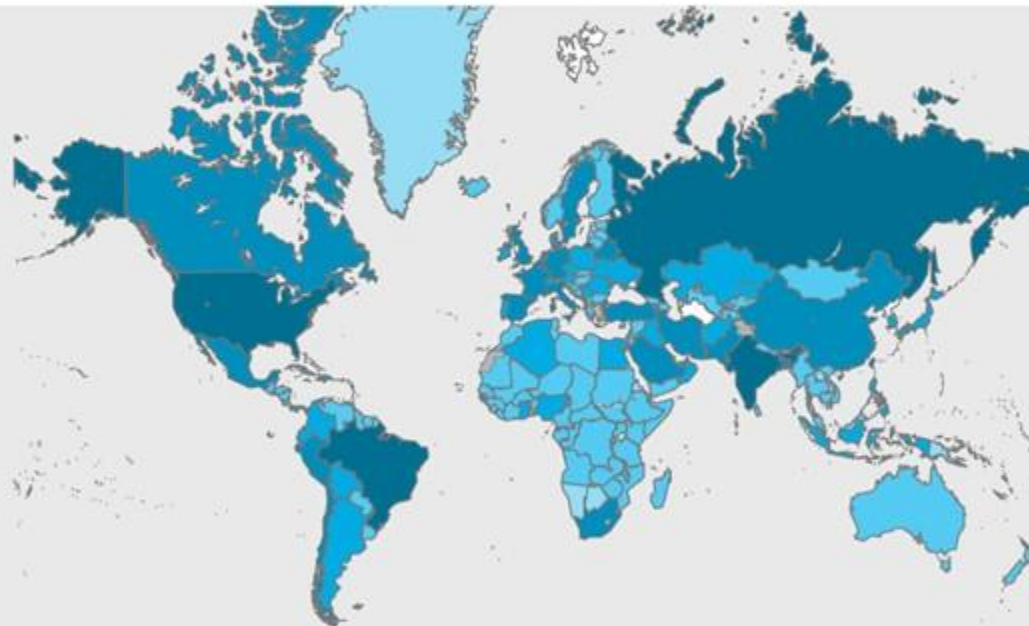
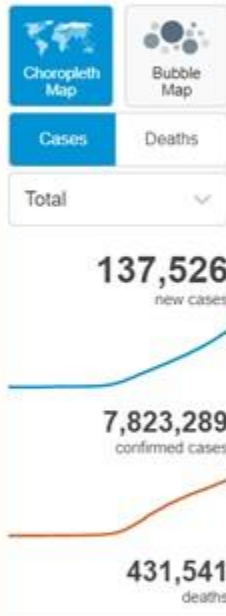
Donate

WHO Coronavirus Disease (COVID-19) Dashboard

Data last updated: 2020/6/15, 7:35pm CEST

Overview

Explorer



Download Map Data
Source: World Health Organization

Globally, as of 7:35pm CEST, 15 June 2020, there have been 7,823,289 confirmed cases of COVID-19, including 431,541 deaths, reported to WHO.



COVID-19

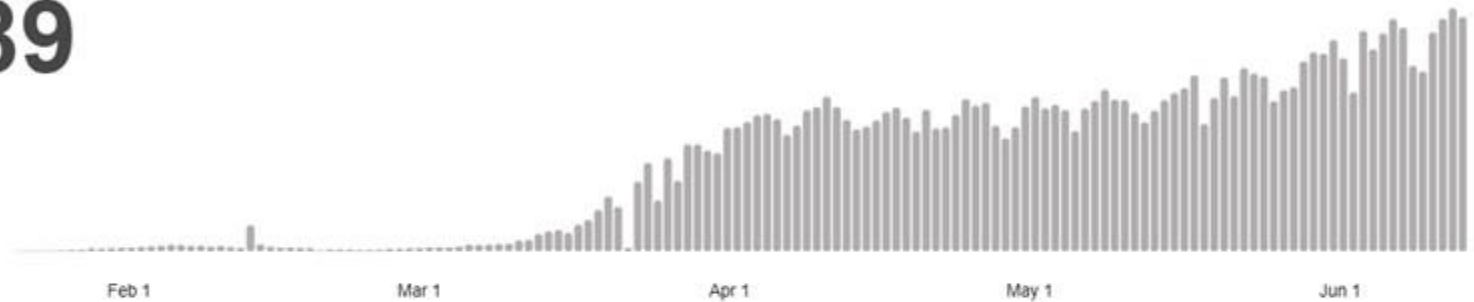
Confirmed Cases Over Time

Daily

7,823,289

confirmed cases

Source: World Health Organization



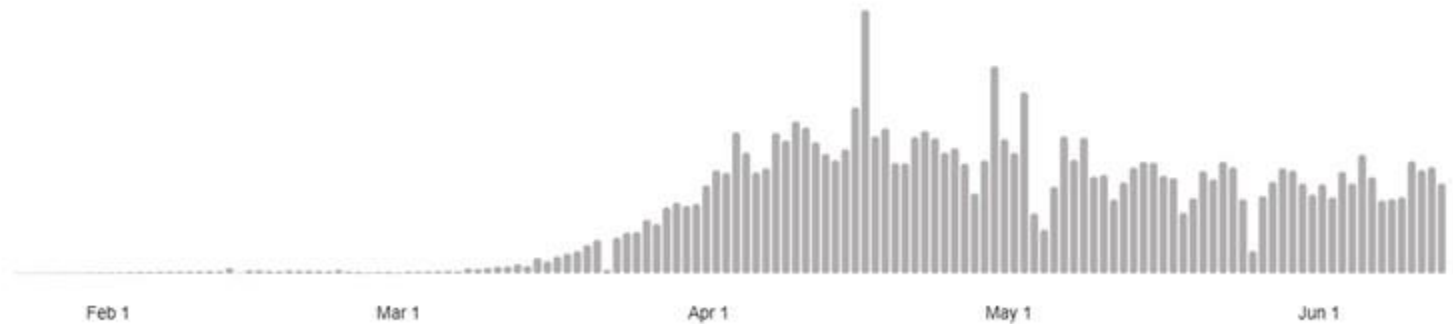
Deaths Over Time

Daily

431,541

deaths

Source: World Health Organization



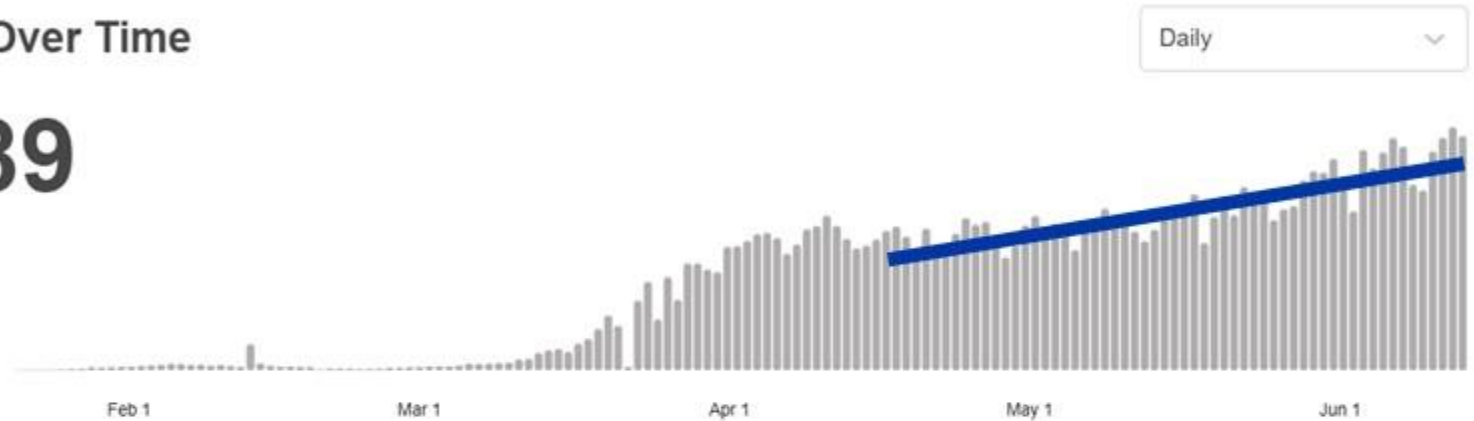
COVID-19

Confirmed Cases Over Time

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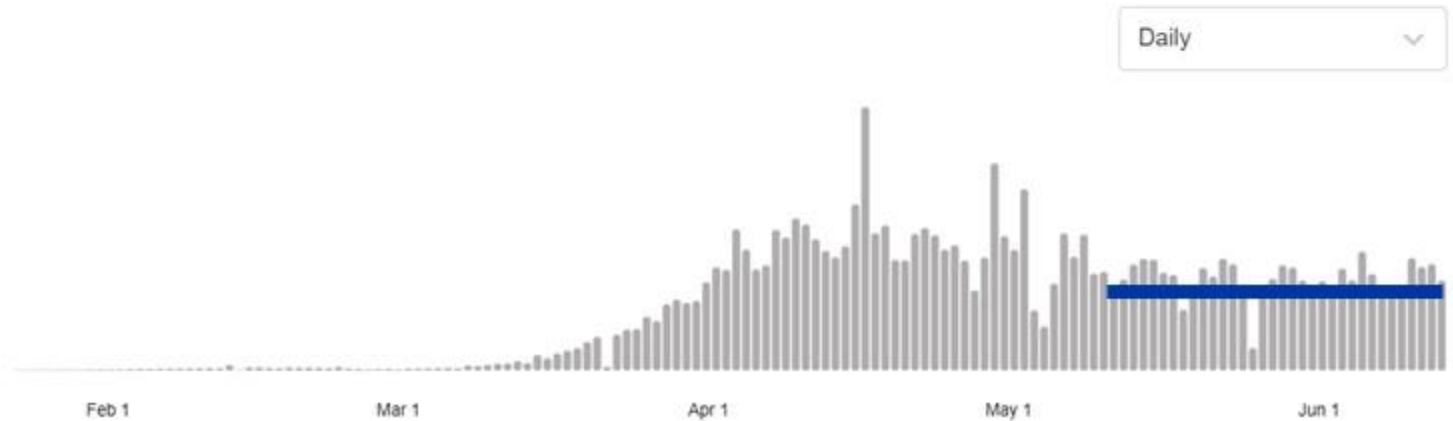


Deaths Over Time

431,541

deaths

Source: World Health Organization



Person-to-Person Spread of CoV

- Mainly from person-to-person.
- Mainly between people who are in close contact with one another (3/6? feet / 1/2? meters)
- Through respiratory droplets produced when an infected person coughs, sneezes, talks, sings, shouts . . .
- Droplets can land in the mouths or noses of people who are nearby or possibly be inhaled into the lungs.
- May be spread by people who are not showing symptoms.

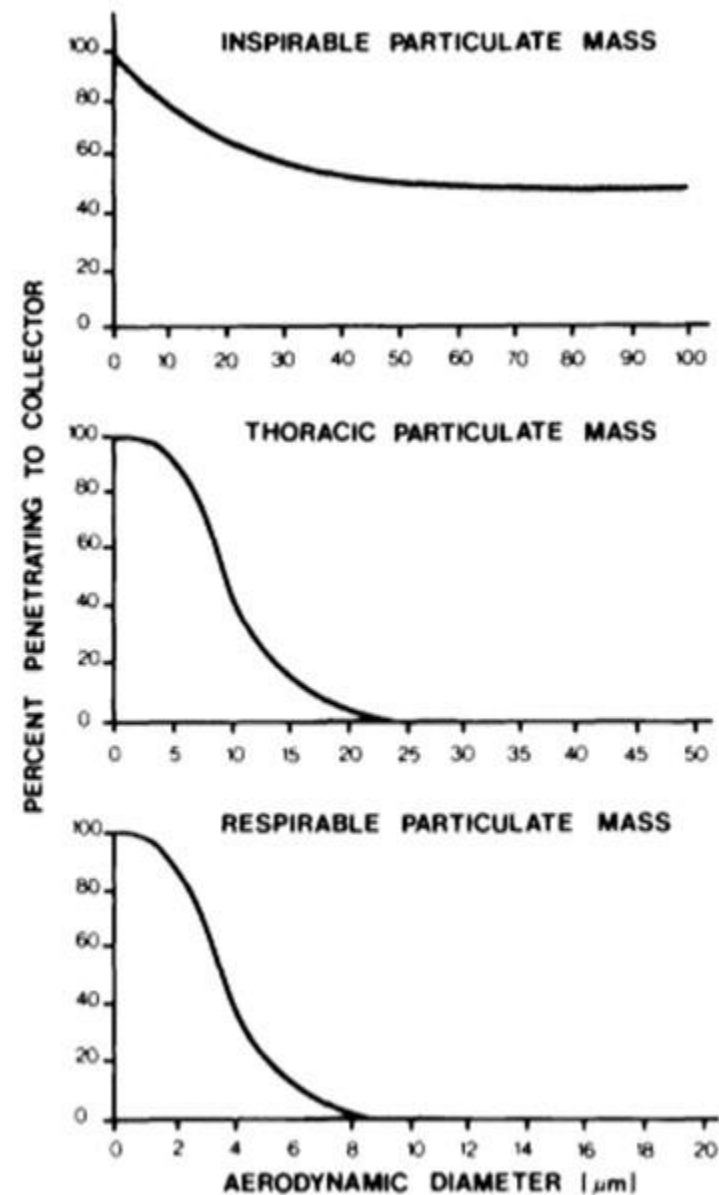
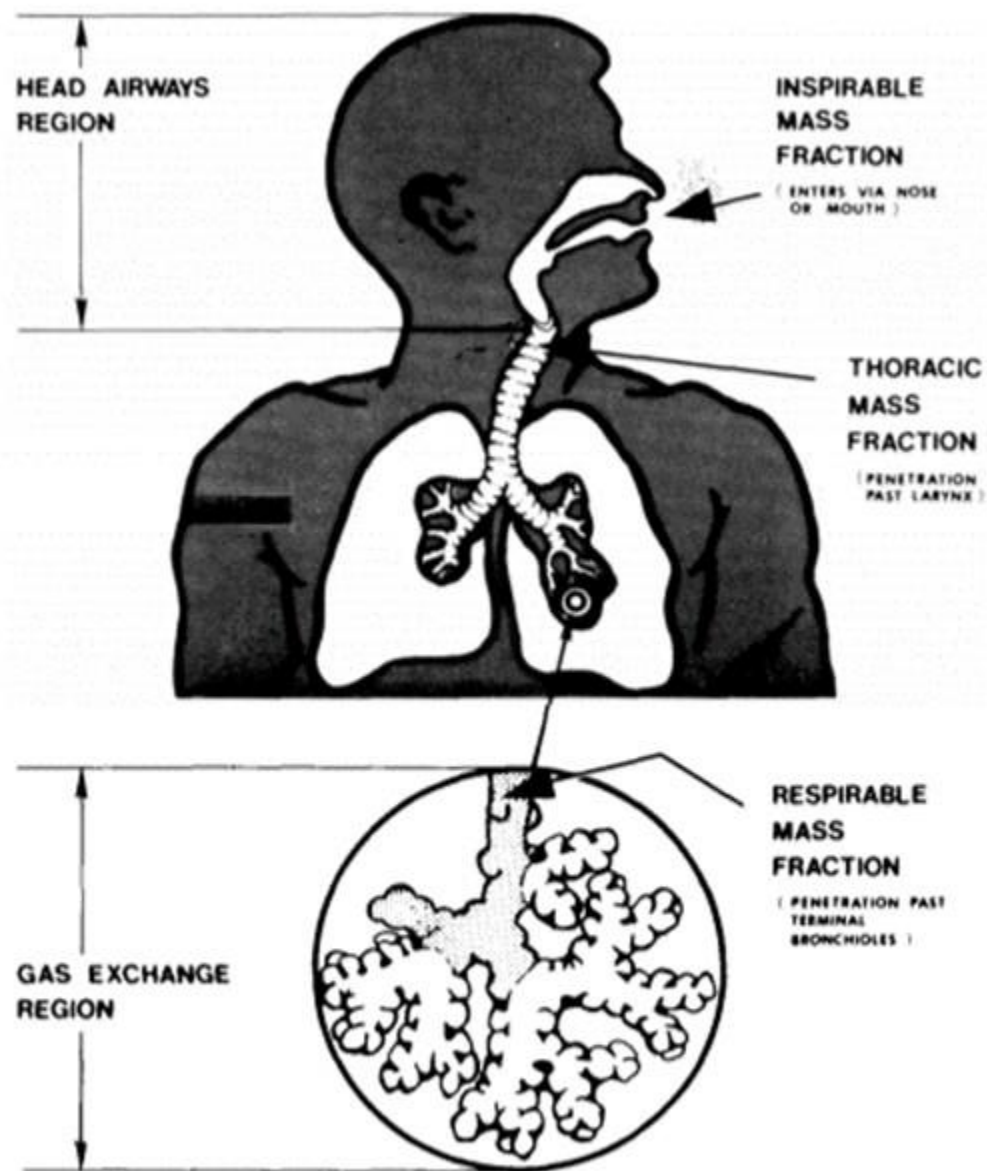


Figure 8—The three aerosol mass fractions recommended for particle size-se-

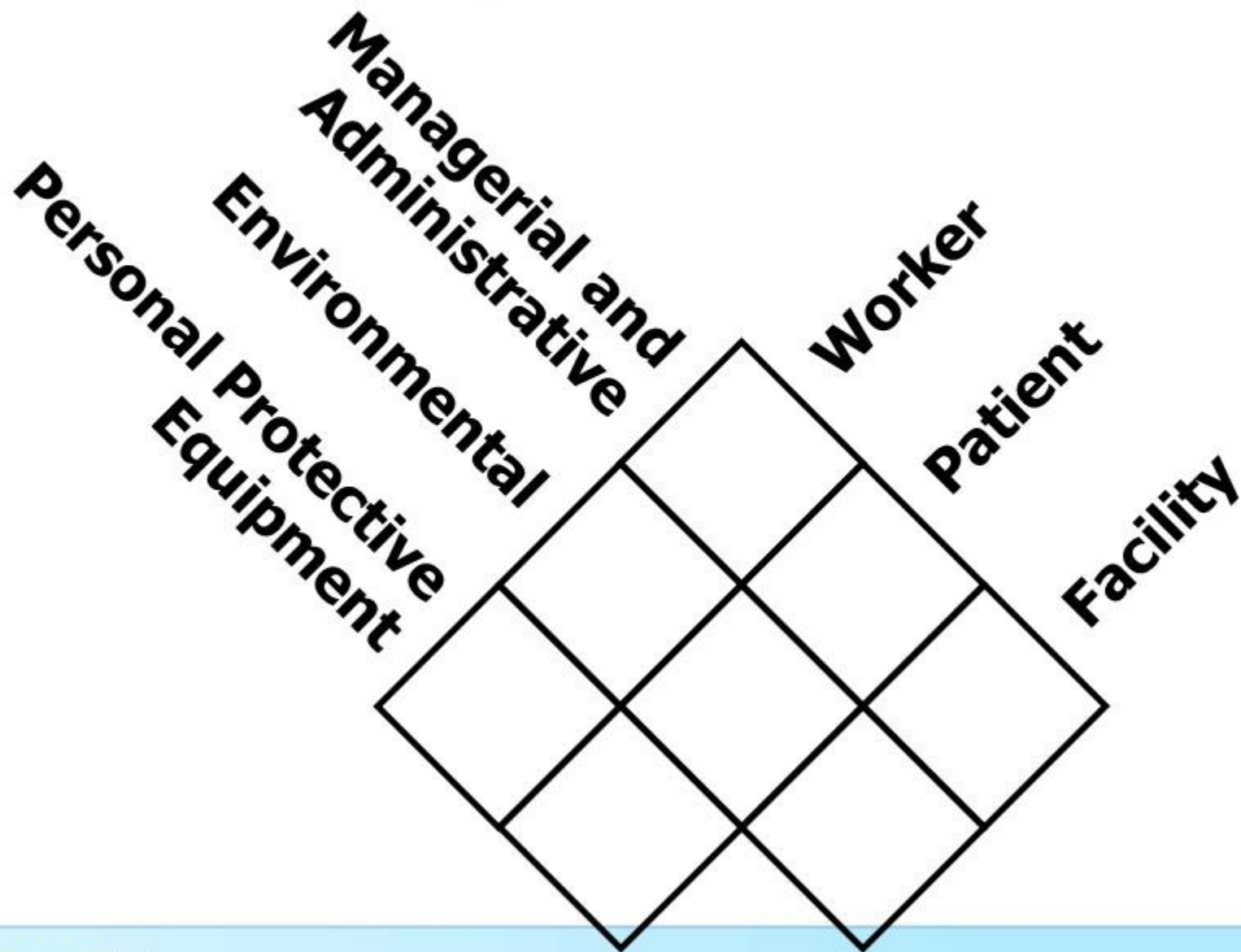
Phalen, R. F.; Hinds, W. C.; John, W.; Liou, P. J.; Lippmann, M.; McCawley, M. A.; Rabbe, O. G.; Soderholm, S. C.; Stuart, B. O. Rationale and recommendations for particle-size selective sampling in the workplace. *Appl. Ind. Hyg.* 7:3-14; 1986.

How easily does the CoV spread?

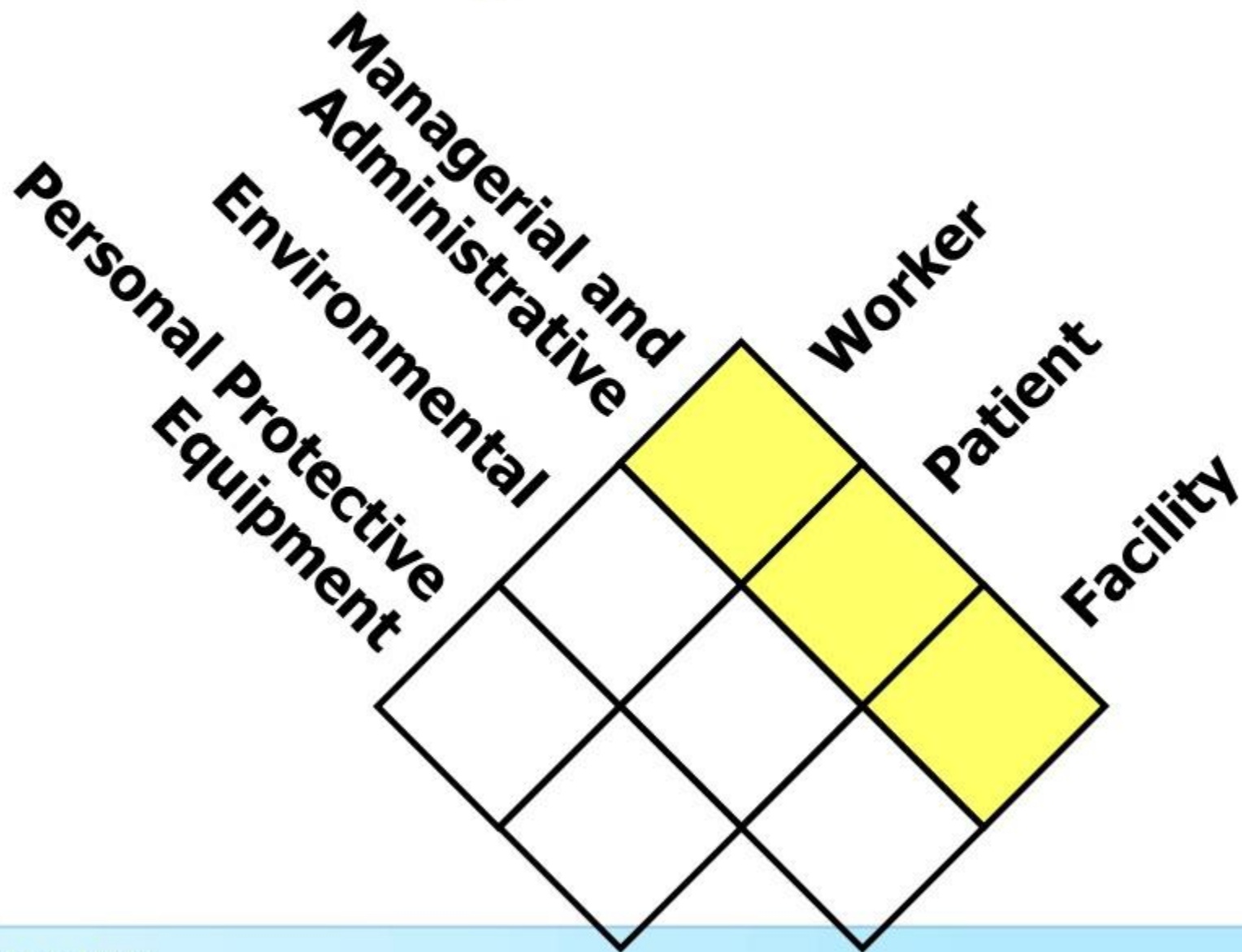
- Very easily and sustainably between people.
- Information from the ongoing COVID-19 pandemic suggest that this virus is spreading more efficiently than influenza, but not as efficiently as measles, which is highly contagious.
- Need “cleaning” of surfaces and air!

Hierarchy of Airborne Infection Prevention and Control (IPC)

Hierarchy of Airborne IPC



Hierarchy of Airborne IPC



Cough Etiquette / Respiratory Hygiene Demonstration (1)



Coughing, Sneezing and You



Stop the spread of germs that make you and others sick!

Cover your Cough



Cover your mouth
and nose with a
tissue when you
cough or sneeze
or

cough or sneeze into
your upper sleeve,
not your hands.



Put your used tissue in
the waste basket.



You may be asked to
put on a surgical mask
to protect others.

Clean your Hands

after coughing or sneezing.



Wash with
soap and water
or
clean with
alcohol-based
hand cleaner.



Stop the spread of germs that make you and others sick!

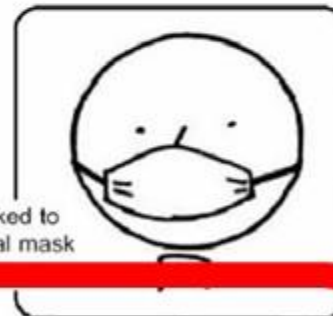
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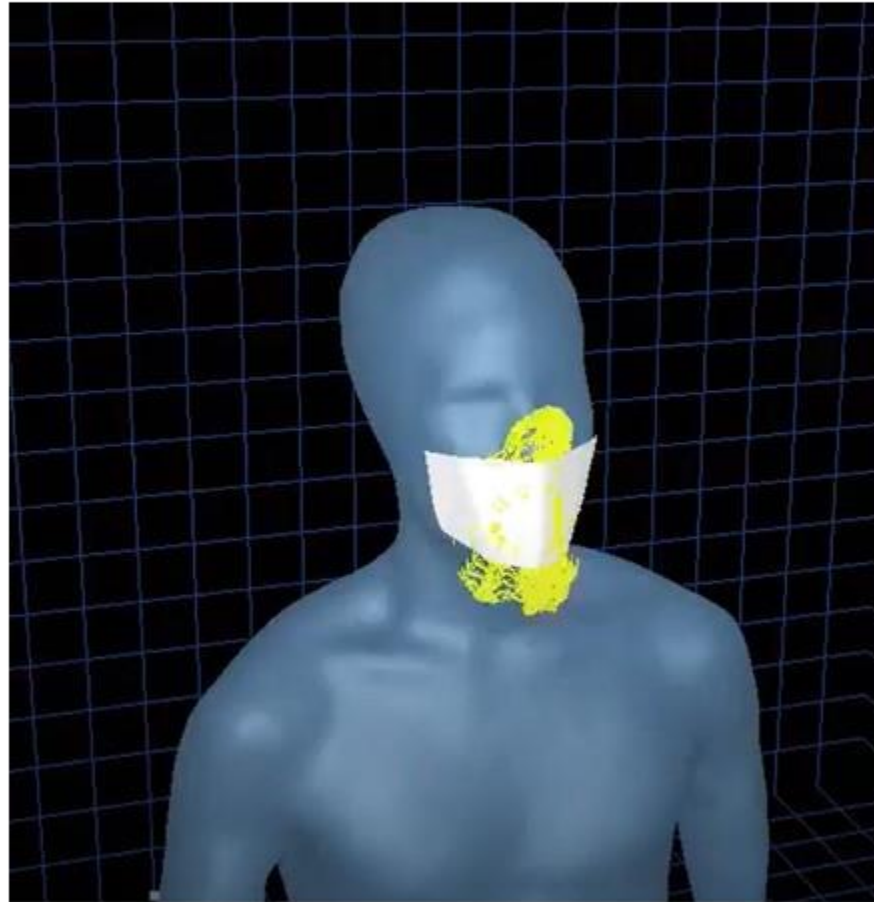
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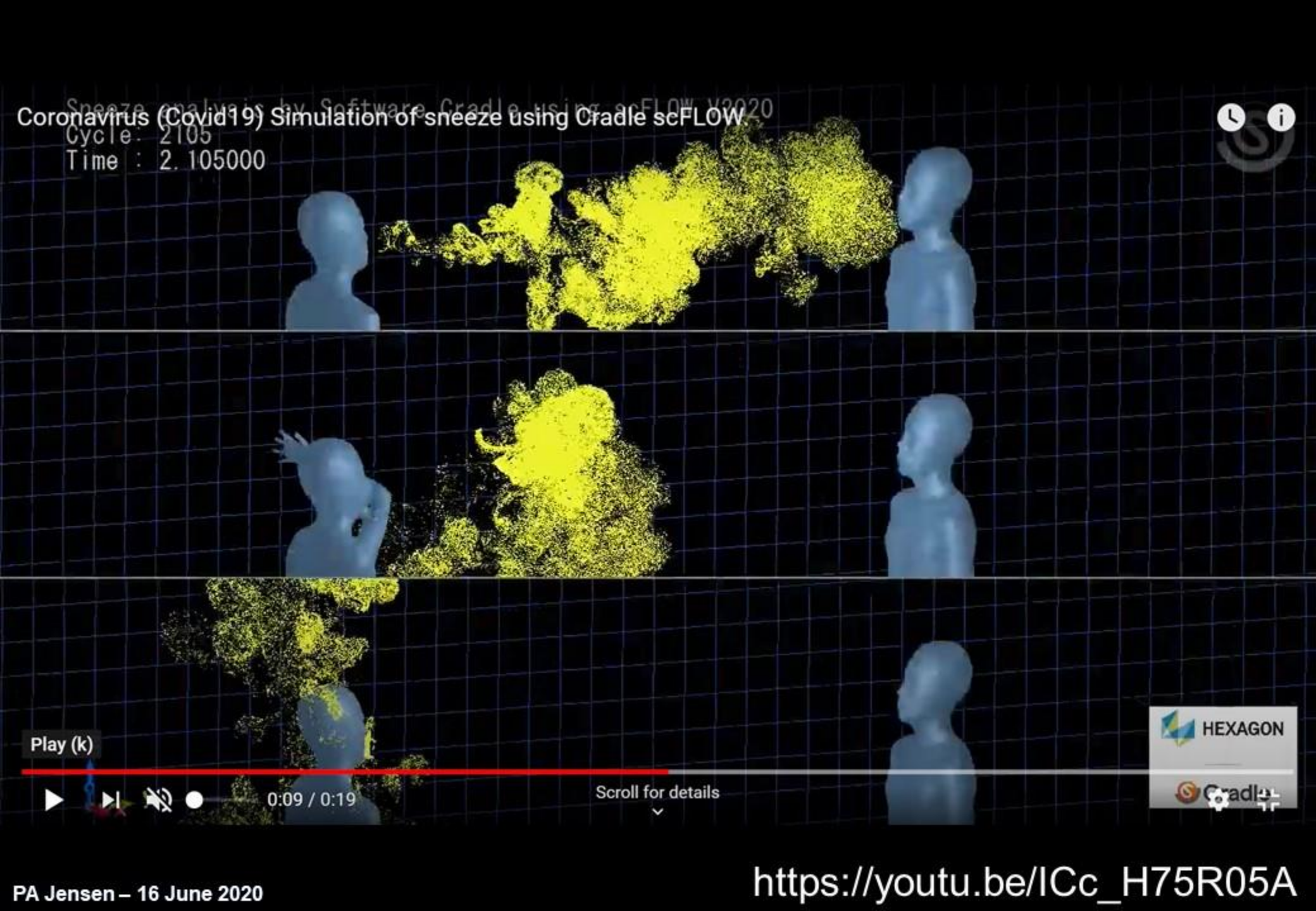


How effective are surgical/procedure masks?



Coronavirus (Covid19) Simulation of sneeze using Cradle scFLOW

Cycle: 2105
Time : 2.105000

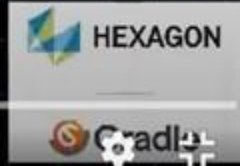


Play (k)



0:09 / 0:19

Scroll for details



How effective are surgical/procedure masks at reducing risk of TB transmission when patients used masks.?

- 10%
- 30%
- 50%
- 70%
- 90%

How effective are surgical/procedure masks at reducing risk of TB transmission when patients used masks?

- 10%
- 30%
- 50%
- 70%
- 90%

56%

(95% CI, 33-70.5%)

Dharmadhikari AS, Mphahlele M, Stoltz A, Venter K, Mathebula R, Masotla T, Lubbe W, Pagano M, First M, **Jensen PA**, van der Walt M, Nardell EA. Surgical face masks worn by patients with multidrug-resistant tuberculosis: impact on infectivity of air on a hospital ward. American Journal Respiratory and Critical Care Medicine. 185(10):1104-1109, 2012.

WHEN TO USE A MASK

For healthy people wear a mask **only if you are taking care of a person with suspected 2019-nCoV infection**

Wear a mask, **if you are coughing or sneezing**

Masks are effective only when used **in combination with frequent hand-cleaning with alcohol-based hand rub or soap and water**

If you wear a mask then you **must know how to use it and dispose of it properly**



World Health
Organization

PA Jensen – 16 June 2020



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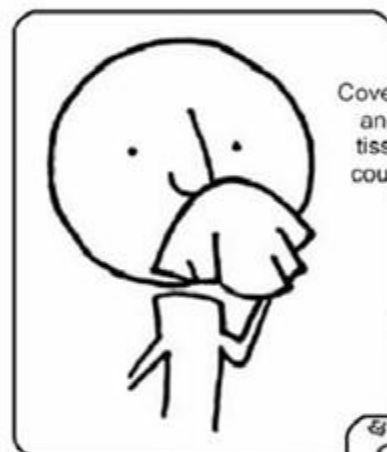
Surgical Mask Instructions?



citynoticias@citytv.com.co

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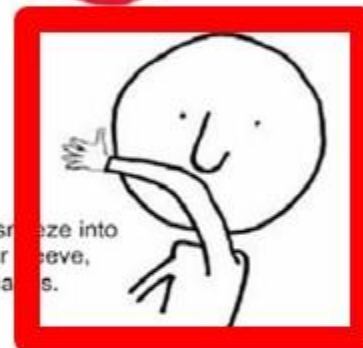
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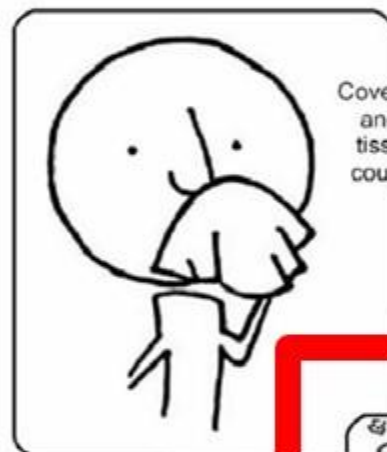


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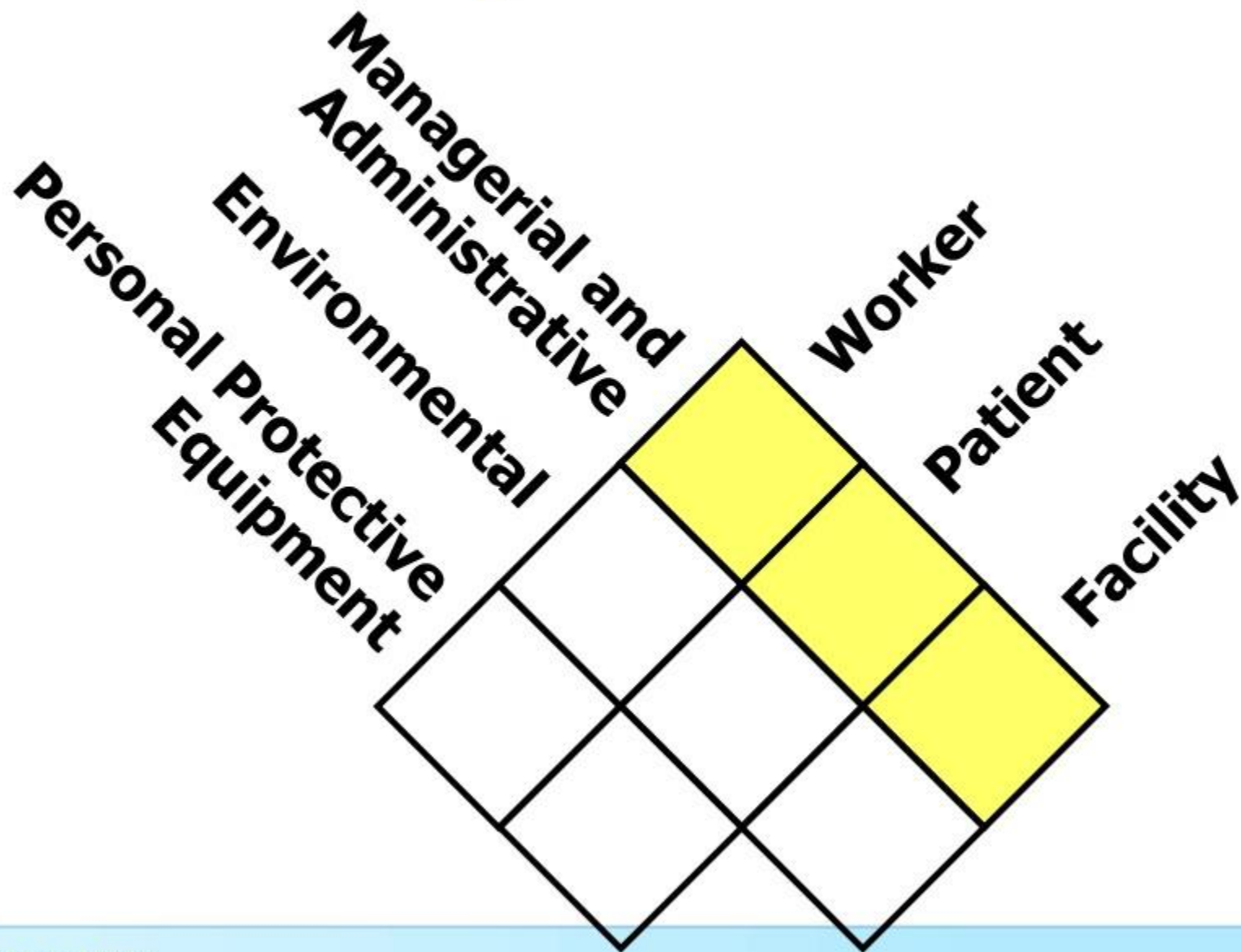
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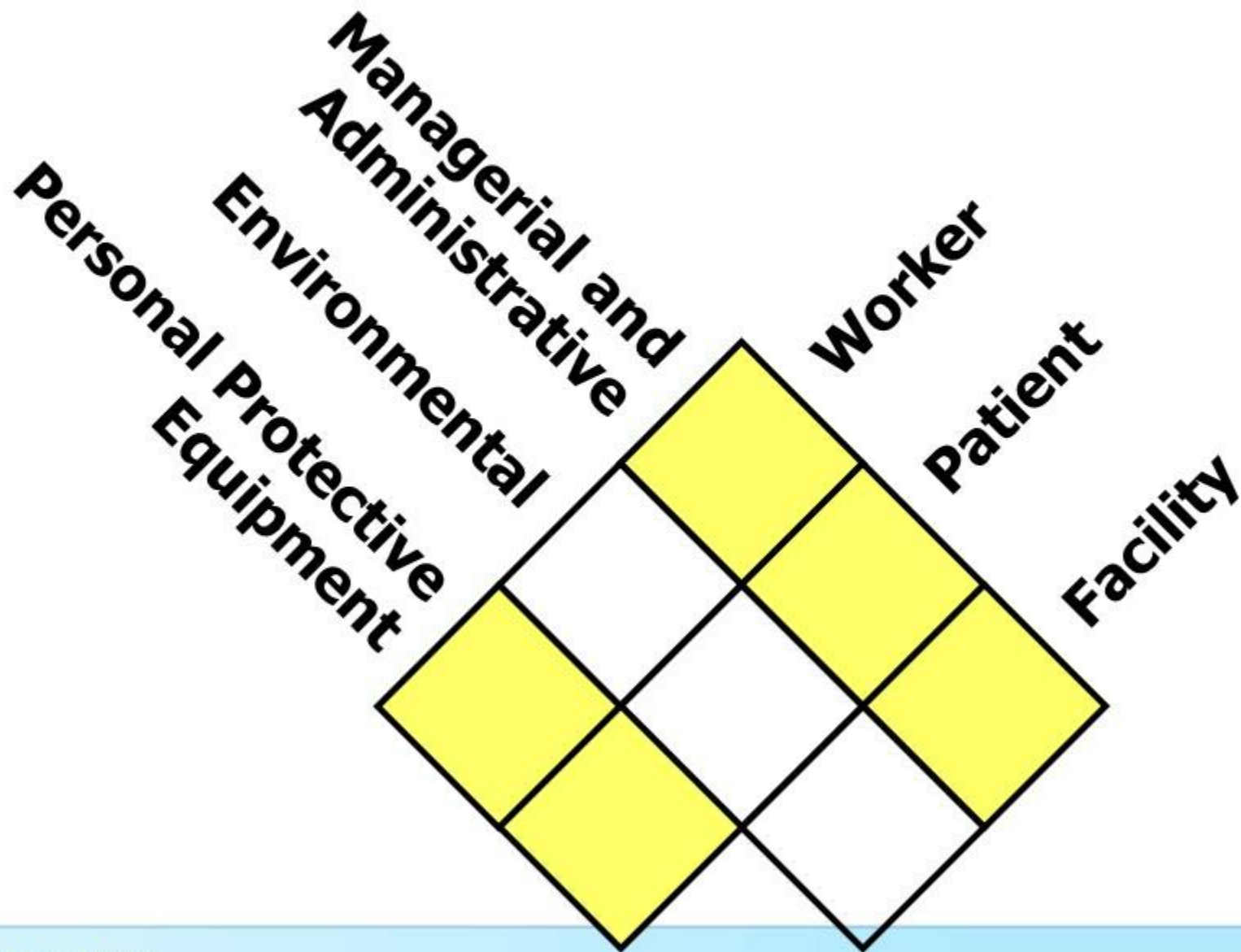


The Biggest Virus On Earth Is Still
Human Behavior.

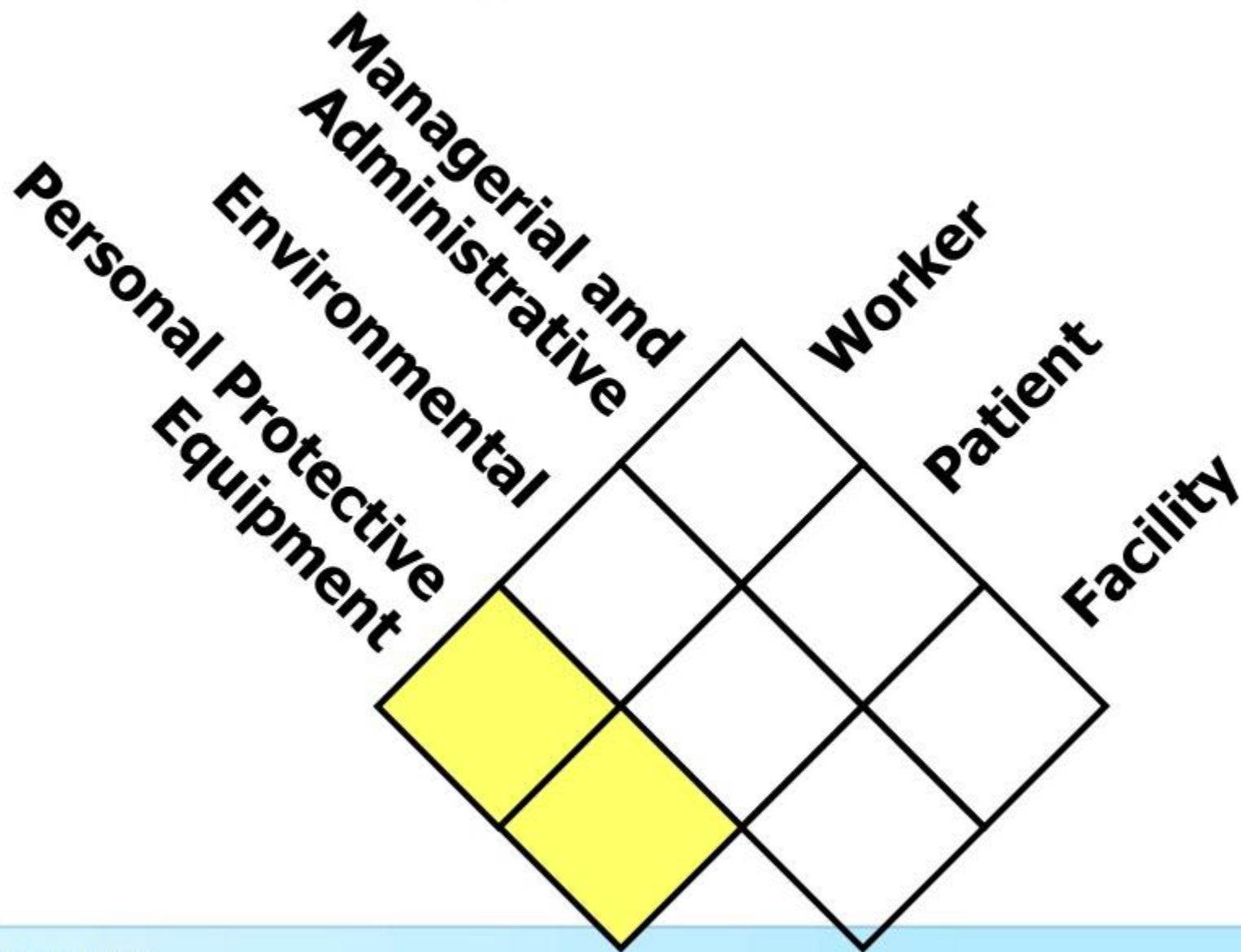
Hierarchy of Airborne IPC



Hierarchy of Airborne IPC

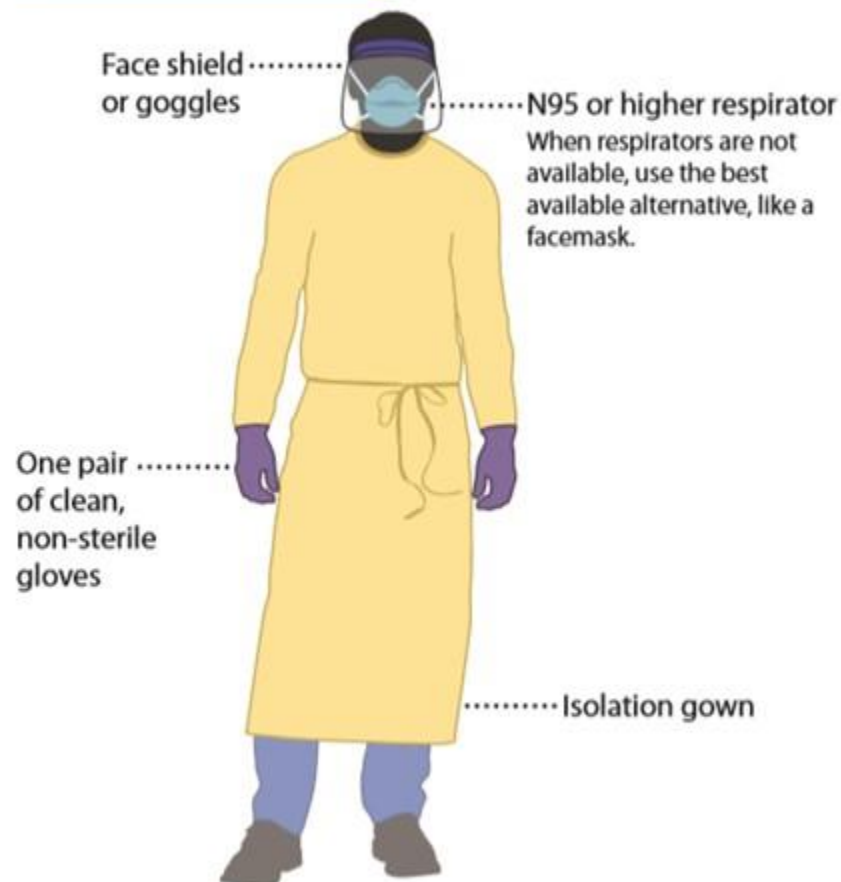


Hierarchy of Airborne IPC

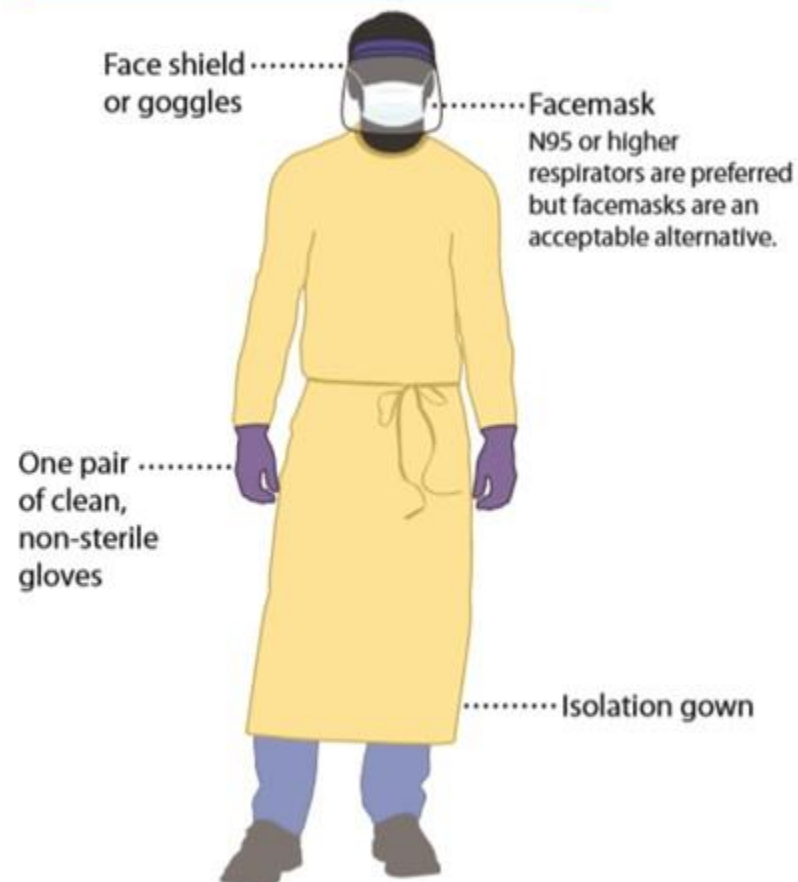


COVID-19 Personal Protective Equipment (PPE) for Healthcare Personnel

Preferred PPE – Use N95 or Higher Respirator



Acceptable Alternative PPE – Use Facemask



CS-11500-C 01/23/2020

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cdc.gov/COVID19

Personal Protective Equipment

Masks vs. Respirators



Selected PPE

Masks . . . Large & Medium droplets

Protect environment from wearer

People (patients, HCWs, etc.)

Surfaces

Protect wearer from environment

Respirators . . . Micro-Droplets / Droplet Nuclei

Protect wearer from environment

Protect environment from wearer

(if no valve)

Surgical or Procedure Masks



Surgical or Procedure Masks



Surgical or Procedure Masks



publix
FOOD & PHARMACY



How to Make a Mask



Tutorial: How to Sew a Face Mask for Hospitals | Coronavirus COV19



Watch later



Share



20:02 / 20:02



YouTube



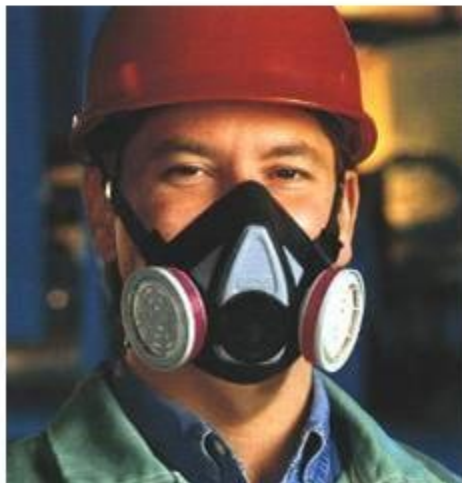
Negative Pressure Respirator

A respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator



Air-Purifying Respirator (APR)

A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element



CDC-NIOSH Standards

TABLE 4. Nonpowered air-purifying respirator filter classes certified in 42 CFR* 84

Resistance to efficiency filter degradation	Filter efficiencies†		
	95 (95%)	99 (99%)	100 (99.97%)
N (Not resistant to oil)	N95	N99	N100
R (Resistant to oil)	R95	R99	R100
P (Oil proof)	P95	P99	P100

* Code of Federal Regulations.

† The percentages in parenthesis indicate the minimum allowable laboratory filter efficiency value when challenged with 0.3 μm particles.

Selection of N-, R-, and P-Series Filters

- If no oil particles are present in the work environment, use a filter of any series.
- If oil particles are present, use an R- or P- series filter
- Selection of filter efficiency depends on size of particulate and how much filter leakage is acceptable

N95 Respirators

- N95 or higher disposable respirators are generally acceptable for most Coronavirus & TB situations
- Higher level of protection may be prudent during high risk procedures
 - Sputum induction
 - Bronchoscopy
 - Autopsy



CEN Standards

- Initial filter penetration (NaCl & paraffin oil)
- Total inward leakage
- Maximum breathing resistance
- Loading test

CEN Standards

(Initial Filter Penetration)

NaCl

< 20% = P1

< 6% = P2

< 3% = P3

Paraffin Oil

NA = P1

< 2% = P2

< 1% = P3

CEN Standards



Total inward leakage

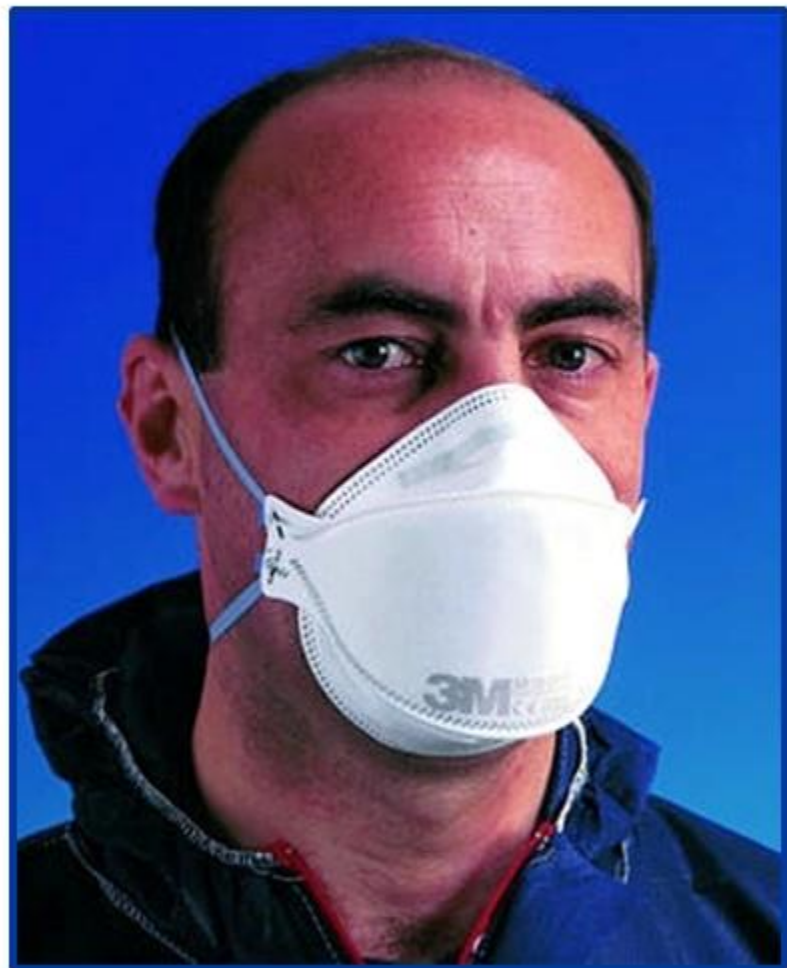
$< 25\% = \text{FFP1}$

$< 11\% = \text{FFP2}$

$< 5\% = \text{FFP3}$

CEN Respirators

- FFP2 or higher disposable respirators are generally acceptable for most Coronavirus & TB situations
- Higher level of protection may be prudent during high risk procedures
 - Sputum induction
 - Bronchoscopy
 - Autopsy



“Real” vs “Counterfeit” Respirators



JFY®

4150 N95 NIOSH
RESPIRATOR
LOT NO. 0709

2010/09/04



JFY[®]

4150 N95 NIOSH
RESPIRATOR
LOT NO. 0709

2010/09/04



JFY®

4150 N95 NIOSH
RESPIRATOR
LOT NO. 0709

2016/09/04

“Real” vs “Counterfeit” Respirators



“Real” vs “Counterfeit” Respirators



“Real” vs “Counterfeit” Respirators





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3M
Aura™ 1862+
EN149:2001 FFP2 NR D
CE 0086

Нишонаҳои бемории сип

Ҳангоми дар худ ва ё наздиконатон
пайдо шудани чунин нишонаҳо:



Сипҳои аз 2 нафас зиёд



Беморӣҳои қорғари
қабза



Аранҷи
қабза



Ҳарорати
қабза



Қабза



Дароз
қабза

Минтақавии

Минтақавии

2013





**HI-TECH
SH9550
NIOSH N95
PARTICULATE
RESPIRATOR**



HI-TECH
SH9550
NIOSH N95
PARTICULATE
RESPIRATOR



HI-TECH

SH9550

NIOSH N95

PARTICULATE

RESPIRATOR

TC-84A-3713

CDC/NIOSH-Approved Respirators

Insid...
EAA Air...
multim...
Citrix A...
FAA Te...
CDC -...
How To...
https://...
Google...
Citrix A...
Atlanta...
Trade...
teledyn...
>> +

Bookmarks
Reading List

Favorites Bar

FAA: Home

Free Audio Books - Downlo...

Historic American Newspap...

Samsung Solstice Cell Phon...

On-Line Duct Friction Loss

CUSHIONED CABLE CLAMP...

The Daytona Beach News-J...

N T S B - Aviation Accidents...

NASA - Station Spacewalk...

5 Foods To NEVER Eat | Bey...

BLM-1300 Biohazard Safety...

iPhone 4S Voice and Data Pl...

Air Density Calculator

eNature: Birds & Birding: Sp...

Straight Talk

Google

InvisibleHand: Home

Lear Capital - The End of th...

OSH Answers: Ultraviolet Ra...


Ekahau HeatMapper - The F...

Thermal ex

BLM-1300 Biosafety Cabine...


AOPA Live

Free Classic AudioBooks.

CDC Home
 Centers for Disease Control and Prevention
CDC 24/7: Saving Lives. Protecting People.™




☒ NIOSH
☐ All CDC Topics
SEARCH

A-Z Index for All CDC Topics

The National Personal Protective Technology Laboratory (NPPTL)


NIOSH > NPPTL

NIOSH-Approved Particulate Filtering Facepiece Respirators

   For Questions about this page Contact Us

NIOSH-Approved N95 Particulate Filtering Facepiece Respirators

Manufacturers Listed Alphabetically - H









The N95 respirator is the most common of the seven types of particulate filtering facepiece respirators. This product filters at least 95% of airborne particles but is not resistant to oil.

This web page provides a table of NIOSH-approved N95 respirators, listed alphabetically by manufacturer. You can select a particular manufacturer by clicking on the first letter of their name on the index below.

There are some products that are approved by NIOSH as an N95 respirator and also cleared by the Food and Drug Administration (FDA) as a surgical mask. These products are referred to as **Surgical N95 Respirators**. [View a definition of Surgical N95 Respirators](#). For your convenience the Surgical N95 Respirators are indicated with the **Model Number/Product Line in bold text followed by (FDA)**. If you have a product you believe is NIOSH-approved and FDA-cleared that does not appear on this list, you will need to check with the FDA Center for Devices and Radiological Health at 1-800-638-2041 for validation of clearance. [View a comprehensive table of Surgical N95 Respirators](#).


Disclaimer: The links in this section go to websites outside of CDC/NIOSH and should not be considered as an endorsement of their content, or as a statement of NIOSH policy. The donning procedure and/or user instruction, either on the websites or the PDF version, should not be considered an official endorsement of their content, or as a statement of NIOSH policy.

Index for N95 Manufacturers:
[3M](#) [A](#) [B](#) [C](#) [D](#) [E](#) [F](#) [G](#) [H](#) [I](#) [J](#) [K](#) [L](#) [M](#) [N](#) [O](#) [P](#) [Q](#) [R](#) [S](#) [T](#) [U](#) [V](#) [W](#) [Y](#) [Z](#) [Notes](#)

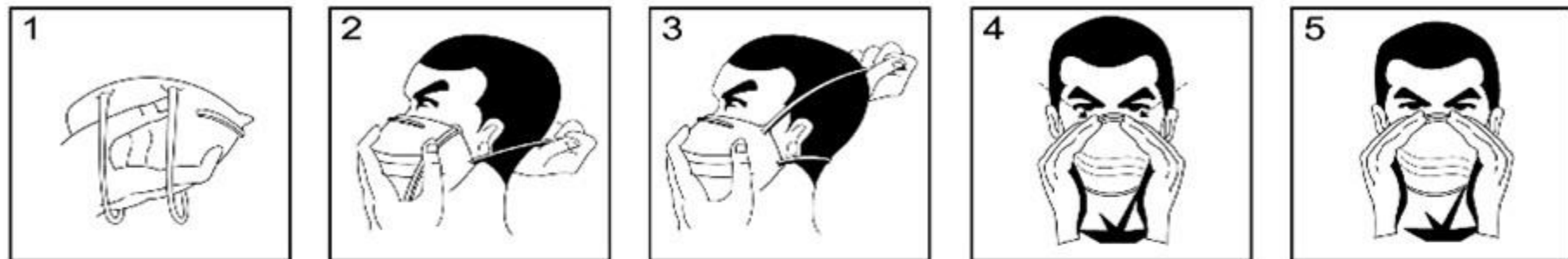
Supplier/Manufacturer and Contact Information	Model Number/ Product Line	Approval Number	Valve Yes/No	Manufacturer's Donning Procedure User Instructions
Hakugen Company, Ltd. [*I] 886-2-2683-0356	SGPR-N95	84A-4635	No	SGPR-N95  [PDF - 133 KB] 
Harbor Freight Tools [*E] 800-379-9929	94785A 61438	84A-5411	No	All Models  [PDF - 538 KB] 
Harbor Freight Tools [*E] 800-379-9929	47518A 61434	84A-5460	Yes	All Models  [PDF - 538 KB] 
Henox Marketing SDN. [*E] 888.279.9929	109015	84A-3323	No	109015  [PDF - 5.6 MB] 

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www.cdc.gov/niosh/npptl/topics/respirators

Supplier/Manufacturer and Contact Information	Model Number/ Product Line	Approval Number	Valve Yes/No	Manufacturer's Donning Procedure User Instructions
Hakugen Company, Ltd. [*I] 886-2-2683-0356	SGPR-N95	84A-4635	No	SGPR-N95 [PDF - 133 KB]
Harbor Freight Tools [*E] 800-379-9929	94785A 61438	84A-5411	No	All Models [PDF - 538 KB]
Harbor Freight Tools [*E] 800-379-9929	47518A 61434	84A-5460	Yes	All Models [PDF - 538 KB]
Henox Marketing SDN. [*E] 800-379-9929	109015	84A-3323	No	109015 [PDF - 5.6 MB]
Hi-Tech Equipment, Inc. [*I] 886-2-2683-0356	SH9550	84A-3713	No	SH9550 [PDF - 214 KB]
Hi-Tech Equipment, Inc. [*I] 886-2-2683-0356	SH9550V	84A-3714	Yes	SH9550V [PDF - 214 KB]
Hi-Tech Equipment, Inc. [*I] 886-2-2683-0356			No	SH2550 [PDF - 264 KB]
Hi-Tech Equipment, Inc. [*I] 886-2-2683-0356			Yes	SH2550V [PDF - 247 KB]
Ho Cheng Enterprise Company, Ltd. [*E] 800-379-9929 (Distribution availability for all products listed for Ho Cheng Enterprise Company, Ltd.)			No	910-N95 [PDF - 842 KB]
Hogy Medical Company, Ltd. [*D] 81-547-45-4125			No	All Models [PDF - 61 KB]
The Home Depot [*E] 800-379-9929			No	H950 [PDF - 586 KB]
The Home Depot [*E] 800-379-9929			Yes	H950V [PDF - 586 KB]
The Home Depot [*E] 800-379-9929			No	H950S [PDF - 586 KB]
The Home Depot [*E] 800-379-9929			No	H910F [PDF - 178 KB]
The Home Depot [*E] 800-379-9929			Yes	H910FV [PDF - 178 KB]
Homeland Safety International [*I] 886-2-2683-0356			No	FFN95-OV/AG [PDF - 221 KB]

User's Instructions



FITTING INSTRUCTIONS :

1. Hold the respirator in hand with the nosepiece at your fingertips. Allow headbands to hang freely below hand.
2. Cup the respirator firmly against your face with the nosepiece on the bridge of your nose.
3. Stretch and pull the lower headband over the head and position below your ears. Stretch and pull the top headband on the back of your head above your ears.
4. Press soft metal nosepiece to conform snugly around the nose.
5. (a) To test fit for respirator without exhalation valve : Cup both hands over the respirator and exhale sharply. If air flows around your nose, tighten the nosepiece. If air leaks around the edges, reposition the headband for better fit. (b) To test fit for respirator with exhalation valve : Cup both hands over the respirators and inhale sharply. A negative pressure should be felt inside respirator. If air flows around your nose, tighten the nosepiece. If air leaks around the edges, reposition the headband for better fit.
6. Change respirator immediately if breathing becomes difficult or respirator becomes damaged or distorted, or a proper face fit can not be maintained. Careful observance of these instructions is an important step in safe respirator use.

Other Classes of Respirators

- Powered air-purifying respirator
- Atmosphere-supplying respirators
 - Supplied air respirator
 - Self-contained breathing apparatus
 - Emergency escape

Respiratory Protection Program Elements

- Training
- Medical evaluation
- Fit testing
- Respirator Selection
- Respirator Use
- Maintenance and care of respirators
- Program evaluation



Masque antipoussières 9320

Ce masque est conforme à la norme européenne EN149:2001 classe FFP2. Il protège contre les aérosols solides et liquides non-volatils uniquement. Il peut être utilisé pour des concentrations allant jusqu'à 10 fois la Valeur Moyenne d'Exposition (VME) (Valeur Limite de Jauge (VLE)).

Notices de précautions d'emploi à l'intérieur.

Respiratore per polveri 9320

Questo respiratore a facciale filtrante è conforme ai requisiti previsti per la classe FFP2 dalla norma europea EN149:2001 e protegge l'utilizzatore da particelle solide e liquide non volatili. Il respiratore può essere utilizzato per concentrazioni di contaminanti fino a 10 volte il loro valore limite ponderale (TLV); il fattore di protezione operativa (FPO) è 10 a TLV. Vedere le istruzioni per l'uso all'interno.

Atmehutmaska 9320

Diese filternende Halbmaske erfüllt die Anforderungen der EN149:2001 für die Partikelfilterklasse FFP2 und sollte ausschließlich zum Schutz vor Partikeln und nichtflüchtigen, flüssigen Aerosolen eingesetzt werden. Die Maske kann gegen Gefährstoffkonzentrationen bis zum 10-fachen des Grenzwertes verwendet werden.

Siehe Gebrauchsanleitung.

Zerrecik Filtres 9320

Bu filterli Arayış Standartı EN149:2001, kategorisi FFP2'ni gerektiren kısıtlı ve katı ya da sıvı olmayan sıvı zerreciklere karşı kullanılmaktadır. Bu maskeler kısıtlı olarak en çok değeri (ESD) 10 katına kadar olan (10 x ESD) konsantrasyonlarına karşı etkili koruma sağlar. Kullanım için talimatları okuyunuz.

Mascarilla para Partículas 9320

Esta mascarilla autofiltrante cumple con los requisitos de la Norma Europea EN149:2001 en la categoría FFP2. Debe ser utilizada exclusivamente como protección frente a partículas sólidas y líquidas no volátiles. Esta mascarilla puede usarse en concentraciones hasta 10 veces el límite de exposición ocupacional (TLV, VLA, ...).

Las instrucciones de ajuste y uso en el interior.

Máscara para Partículas 9320

Esta máscara cumpre com os requisitos da Norma Europeia EN149:2001, na categoria FFP2. Deve ser utilizada exclusivamente como proteção contra partículas sólidas e líquidas não voláteis. Esta máscara pode ser utilizada em concentrações até 10 vezes o limite de exposição ocupacional (ex: TLV).

Ver instruções de ajuste e de utilização no interior.

(F)
(CH)
(B)

(I)

(D)

(TR)

(E)

(P)

Made in UK

EXP DATE
30 / 04 / 06
Time 18:26



3M

NIOSH APPROVED N95 RESPIRATOR

Health Care N95 Particulate Respirator and Surgical Mask

Donning instructions (to be followed each time product is worn):



1 Cop the respirator in your hand with the nosepiece at fingertips, allowing the headbands to hang freely below hands.



2 Position the respirator under your chin with the nosepiece up.



3 Pull the top strap over your head so it rests high on the back of head.



4 Pull the bottom strap over your head and position it around neck below ears.



5 Using two hands, mold the nosepiece to the shape of your nose by pushing inward while moving fingertips down both sides of the nosepiece. Pinching the nosepiece using one hand may result in less effective respirator performance.



6 **FACE FIT CHECK.** The respirator should be checked before each use to check for proper fit. Place both hands completely over the nosepiece and cheeks. If air leaks around your nose, adjust the nosepiece as described in step 5. If air leaks at respirator edges, adjust the straps back along the sides of your head. Recheck.

NOTE: If you cannot achieve proper fit, do not enter the isolation or treatment area. See your supervisor.

Removal instructions:



1 Cop the respirator in your hand to maximize position on face. Pull bottom strap over head.




2 Still holding respirator in position, pull top strap over head.



3 Remove respirator from face and discard or store according to your facility's policy.

Sources of Facepiece Leakage

- Through air-purifying filter
- Through exhalation valve
- Around facepiece/skin interface



Mom, why are humans
wearing muzzles?

Honey, they are too
dumb to learn "sit" and
"stay".





3M 1860



3M 1860S



















3M

8822
EN143:2001 FFP2
CE 0085

Selection of Respirators



3M 1860 Use Instructions

- Before use for respiratory protection, a written respiratory protection program must be implemented . . .
- Respirator may be used until damaged, breathing becomes difficult, or contaminated with blood or body fluids
- Filtering facepieces are to be inspected prior to each use . . .



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APIC Position Paper: Extending the Use and/or Reusing Respiratory Protection in Healthcare Settings During Disasters

**Co-Authored by APIC Emergency Preparedness Committee, Public Policy Committee and
Regulatory Review Panel**

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04 December 2009

Recommendations

II. Recommendations for extending the use and/or reusing respirators

Disposable N-95 respirators, when used solely to prevent occupational exposure to *Mycobacterium tuberculosis*, can be safely reused until contaminated, damaged, or no longer form a good seal.² Unlike *Mycobacterium tuberculosis*, which is transmitted exclusively via airborne droplet nuclei, most other respiratory pathogens are transmitted primarily via direct and indirect (droplet) contact with respiratory secretions. Therefore the exterior of respiratory protection used in caring for patients with respiratory pathogens other than tuberculosis can become contaminated and serve as a reservoir for infectious agents. Special precautions must be taken when extending the use or reusing disposable respiratory protection to prevent healthcare personnel exposure.

Extended use of respiratory protection is defined as the wearing of a disposable respirator during serial patient encounters without the removal or re-donning of the device between encounters.³ Reuse of respiratory protection consists of removing and re-donning the device between encounters.³ Both of these actions pose a transmission risk to healthcare personnel due to potential respirator contamination. This transmission risk can be minimized if healthcare personnel adhere stringently to hand hygiene before and after handling the respiratory protection device.

Disinfection of N95/FFP2 Respirators

- Vaporized Hydrogen Peroxide (VHP)
- Ultraviolet Germicidal Irradiation (UVGI) / Germicidal Ultraviolet (GUV)
- Dry heat
- Autoclave (wet heat)
- Ethylene Oxide (EtO)
- Formalin or Formaldehyde
- Bleach (Sodium hypochlorite)
- Soap & Water
- Alcohol (Ethanol or Isopropanol)

Disinfection of N95/FFP2 Respirators

- Vaporized Hydrogen Peroxide (VHP)
- ~~Ultraviolet Germicidal Irradiation (UVGI) /
Germicidal Ultraviolet (GUV)~~
- ~~Dry heat~~
- ~~Autoclave (wet heat)~~
- ~~Ethylene Oxide (EtO)~~
- ~~Formalin or Formaldehyde~~
- ~~Bleach (Sodium hypochlorite)~~
- ~~Soap & Water~~
- ~~Alcohol (Ethanol or Isopropanol)~~

What Can You Do?

- Be proactive
- Research and select well-designed respirators
- Take care of your respirator
 - Decontamination
 - Cleaning
 - Keep your respirator clean!
 - Storage
- Take care when reusing respirator – closely monitor hygiene and service life
- Dispose of respirator if you question its cleanliness or performance

What Can You Do?

- Be proactive
- Research and select well-designed respirators
- Take care of your respirator

~~• Decontamination~~

Not easily!

~~• Cleaning~~

Not FFP respirators!

- Keep your respirator clean!

Cover with a mask

- Storage

Clean & dry place!

- Take care when reusing respirator – closely monitor hygiene and service life
- Dispose of respirator if you question its cleanliness or performance

RP Summary (1)

- Need lots and lots of SOPs!
And FOLLOW THEM!!!
- HCWs
 - Use valveless, certified respirators when in close proximity to patients
 - Protect yourself from micro-droplets
 - Protect others from you
- General Public
 - Use surgical or procedure masks
 - Protect yourself from large droplets
 - Protect others from you

Support Each Other ! ! !



RP Summary (2)

- Work hard!
- Play hard!
- Promote good public health!
- Be safe!
- Enjoy life!





Personal respiratory protection

What are respirators and why do we need to wear them?

Respirators or filtering facepiece equipment are disposable, negative-pressure, air-purifying respirators made of a filtering material to filter out airborne microorganisms such as Mycobacterium tuberculosis (MTB). Respirators are used to protect health workers involved in care involving TB and other airborne microorganisms. Respirators that don't specifically mention chemical and/or used with a combination of other infection prevention and control measures can provide reasonable protection for health workers.

Does WHO recommend respiratory protection?

Yes, the updated WHO TB infection prevention and control guidelines (second Health Organization TB infection prevention and control guidelines for health workers, second edition) state, "Respiratory protection, within the framework of a respiratory protection programme, are recommended to protect MTB exposures in health workers, persons attending health facilities or other persons in settings with a high risk of transmission."

ETT Stop TB Partnership



Respirator fit testing

Why is fit testing important?

It's testing is important to ensure the respirator fits tightly to the face of the wearer (seal) and prevents leaks that could allow infectious aerosol containing Mycobacterium tuberculosis and other airborne pathogens (airborne) of sufficient size to pass the filtering area through any gap between the face and the respirator. This reduces the risk of TB exposure in individuals working in high TB transmission risk settings. This testing can be achieved by performing a respirator fit test. The test, shape and configuration of every face is different and can potentially change over time. Therefore, it is important that several different respirator models and sizes are available, and every health worker should be fit tested with respirators before they are used in high-risk settings. This is only single factor fit testing is an essential component of an effective personal respiratory protection program.

What is fit testing?

A "respirator fit test" (RFT) (1) (2) (3) (4) (5) (6) (7) (8) (9) (10) (11) (12) (13) (14) (15) (16) (17) (18) (19) (20) (21) (22) (23) (24) (25) (26) (27) (28) (29) (30) (31) (32) (33) (34) (35) (36) (37) (38) (39) (40) (41) (42) (43) (44) (45) (46) (47) (48) (49) (50) (51) (52) (53) (54) (55) (56) (57) (58) (59) (60) (61) (62) (63) (64) (65) (66) (67) (68) (69) (70) (71) (72) (73) (74) (75) (76) (77) (78) (79) (80) (81) (82) (83) (84) (85) (86) (87) (88) (89) (90) (91) (92) (93) (94) (95) (96) (97) (98) (99) (100) (101) (102) (103) (104) (105) (106) (107) (108) (109) (110) (111) (112) (113) (114) (115) (116) (117) (118) (119) (120) (121) (122) (123) (124) (125) (126) (127) (128) (129) (130) (131) (132) (133) (134) (135) (136) (137) (138) (139) (140) (141) (142) (143) (144) (145) (146) (147) (148) (149) (150) (151) (152) (153) (154) (155) (156) (157) (158) (159) (160) (161) (162) (163) (164) (165) (166) (167) (168) (169) (170) (171) (172) (173) (174) (175) (176) (177) (178) (179) 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Thank you!

Рақмет сізге!

Рахмат сага!

Sag boluñ!

Muito obrigado

Rahmat!

Спасибо!

Сипос!

Tashakor!

Muchas gracias!