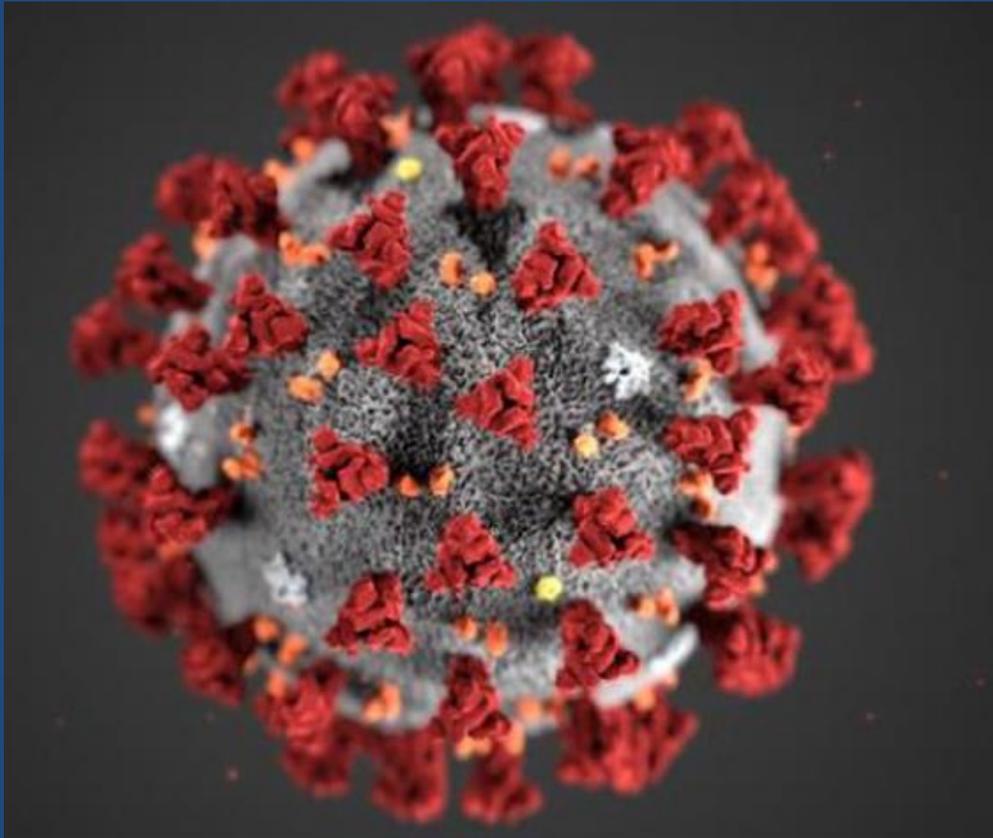


COVID-19 and the Workplace

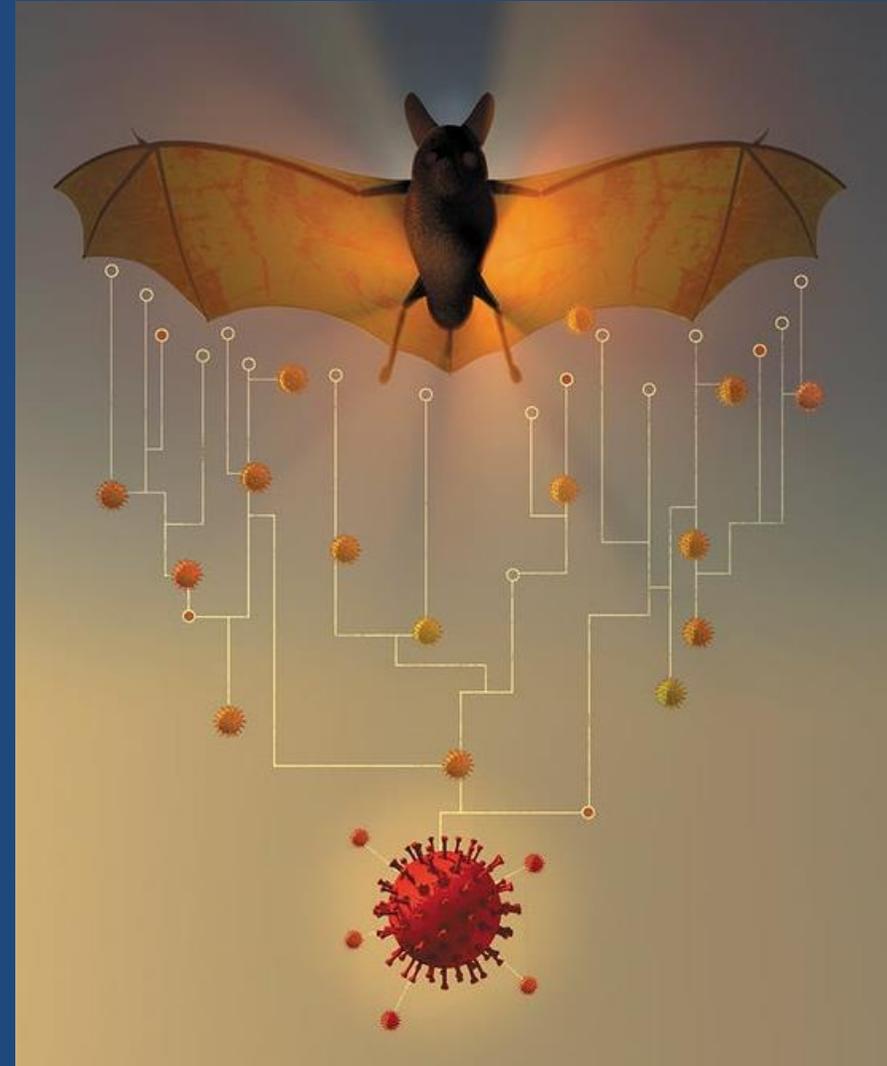


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Centers for Disease Control and Prevention
U.S. Department of Health and Human Services

National Safety Council Webinar
30 April 2020

Nomenclature

- **COVID-19** is an abbreviation. ‘CO’ stands for “corona,” ‘VI’ stands for ‘virus,’ ‘D’ stands for ‘disease,’ and 19’ refers to 2019 when the viral disease was first identified in December.
- The virus that causes COVID-19 is referred to as **SARS-CoV-2** which stands for “severe acute respiratory syndrome—coronavirus—two.”
 - Genetic sequence identity
 - 79.6% SARS-CoV
 - 96.2% Bat coronavirus (BATCoV RaTG13)



Coronavirus Family

Coronaviruses	Disease
SARS-CoV-2	COVID-19
SARS-CoV	Severe Acute Respiratory Syndrome (SARS)
MERS-CoV	Middle East Respiratory Syndrome (MERS)
HCoV – 229E	Usually mild respiratory disease (10-15% of common colds caused by HCoVs) but can cause severe disease in vulnerable groups
HCoV – OC43	
HCoV – NL63	
HCoV - HKU1	

What is a Pandemic?

- World Health Organization declared COVID-19 to be a pandemic on March 11, 2020.
- There are **three elements** that must exist for a pandemic to be declared:
 - **Novel virus**
 - Virus that has not previously circulated in the population—no one in the population has any immunity to the virus.
 - **Sustained community spread**
 - Virus spreads from person to person
 - Not associated with travelers entering from a source country
 - **Worldwide distribution**

COVID-19 Basics

- COVID-19 is *primarily* a respiratory disease.
 - Most cases are mild
 - Some cases involve a viral pneumonia
 - Severe cases affect the liver, kidneys, brain, heart and the blood clotting system
- Symptoms
 - Fever, cough & trouble breathing.
 - Sore throat, headache, loss of taste/smell, muscle pain & shaking chills.
- Average incubation period = is 5.2 days
 - 99% of individuals exhibiting symptoms within 12.5 days to 14 days.

COVID-19 Basics

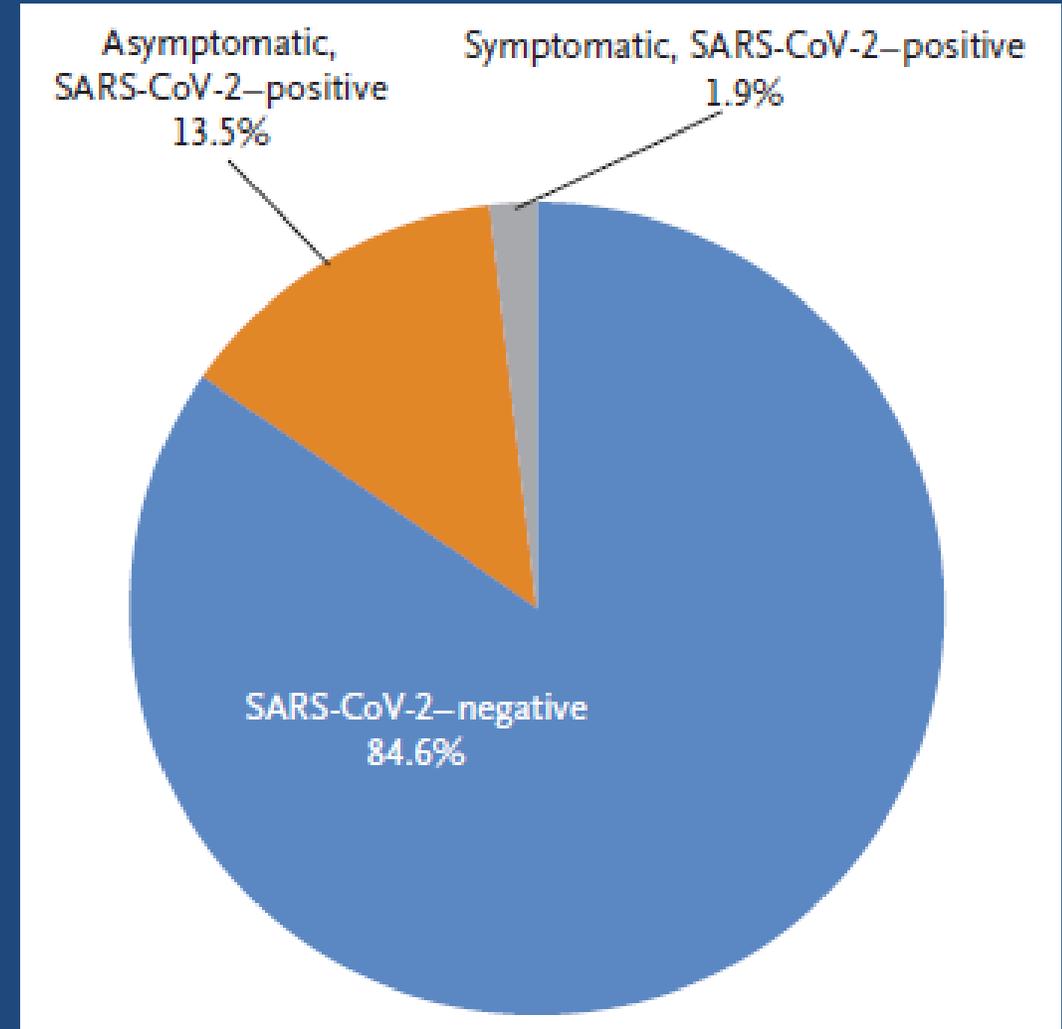
- Asymptomatic
 - Pre-symptomatic (infectious)
 - Persistently asymptomatic (?)
- Symptomatic
 - Mild—Can be treated at home
 - Moderate—Hospitalization needed, but without mechanical ventilation
 - Severe—Hospitalization needed, but with mechanical ventilation

What Makes SARS-CoV-2 So Contagious?

- High level of shedding in the upper respiratory tract through coughs and sneezes
- Pre-symptomatic people are infectious 1 to 3 days *before* symptom onset
 - 40 to 50% of cases may be attributable to transmission from asymptomatic or pre-symptomatic people
- Asymptomatic transmission is the Achilles' heel of COVID-19 control
 - Various population surveys indicate wide range of viral test positives

Asymptomatic

- *Symptom Status and SARS-CoV-2 Test Results among 215 Obstetrical Patients Presenting for Delivery*
 - Sutton D et al. *NEJM*, 16 April 2020
- Asymptomatic, but SARS-CoV-2 (+)
 - 13.5%



Transmission

Droplet Transmission

- Transmission from person to person occurs primarily between people in close contact with each other (at least 6 feet).
- Respiratory droplets carrying the virus transmit infection when they travel directly *from* the respiratory tract of the infected individual *to* the mucosal surfaces—the eyes, nose and mouth of the uninfected person.
- Droplets are produced when infected person coughs, sneezes, sings, or speaks forcibly.

Aerosol Transmission

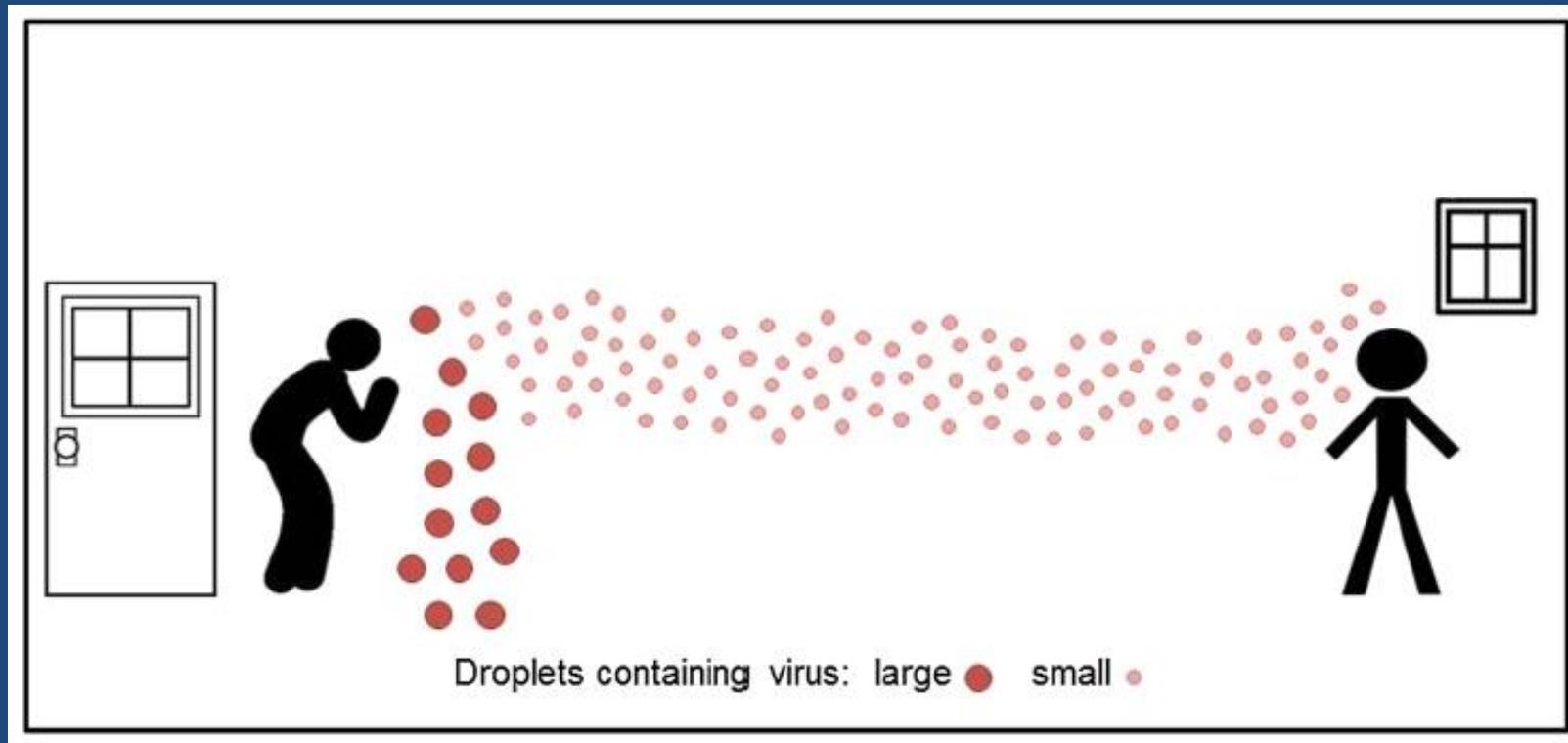
- Transmission by small particles—called aerosols—which remain airborne for a longer time and over a longer distance than droplets—*may* occur.



Aerosol Transmission

<https://doi.org/10.1016/j.envint.2020.105730>

- Evidence for aerosol transmission
 - Similarities between the two SARS viruses
 - Evidence on virus transport in general



Aerosol Transmission

- **Close Contact Aerosols**

- Airborne spread can occur especially in a relatively closed environment, involving high concentrations of aerosols over a prolonged period, and where the uninfected person is close to the source.
- This is especially true in **healthcare settings**.

- Precautions:

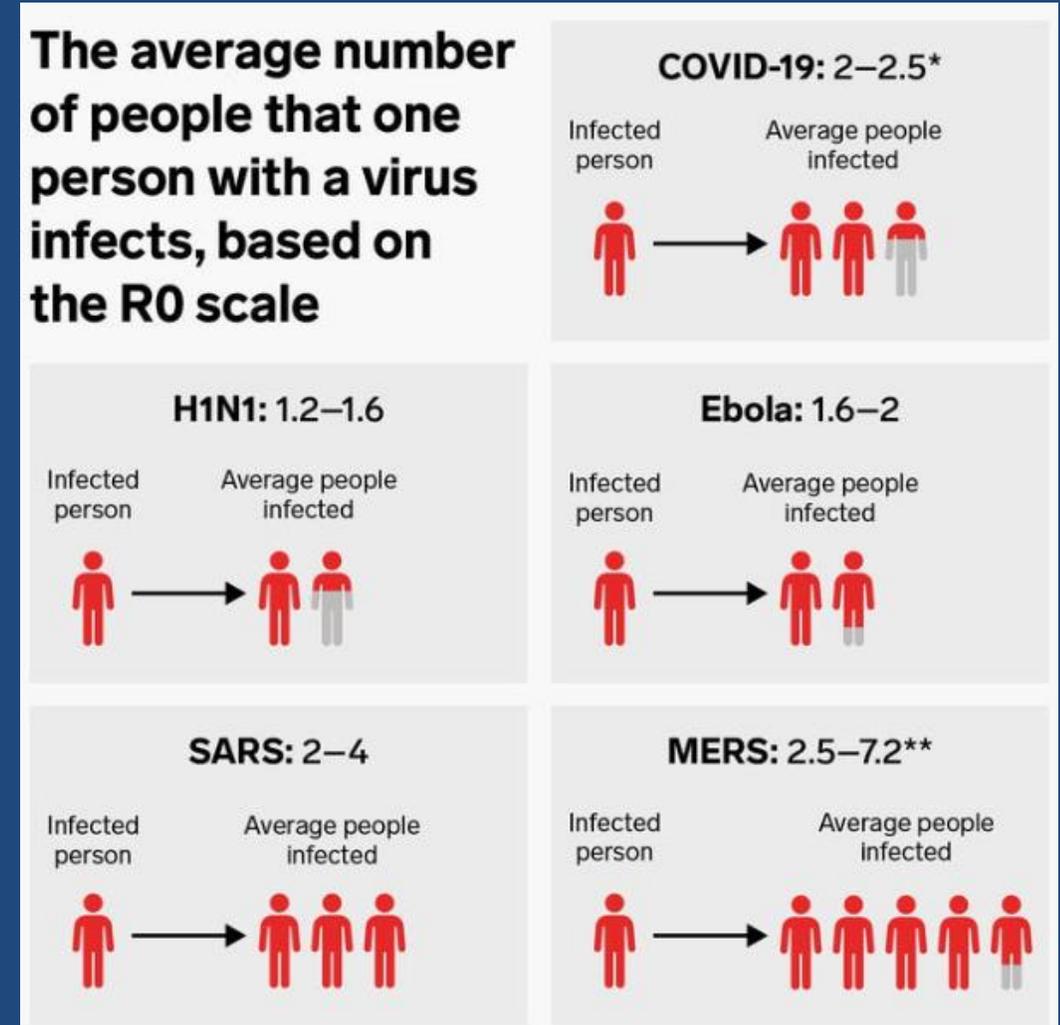
- ↑ ventilation, using natural ventilation
- Avoid air recirculation
- Avoid staying in another person's direct air flow
- Minimize the number of people sharing same environment

Contact Transmission

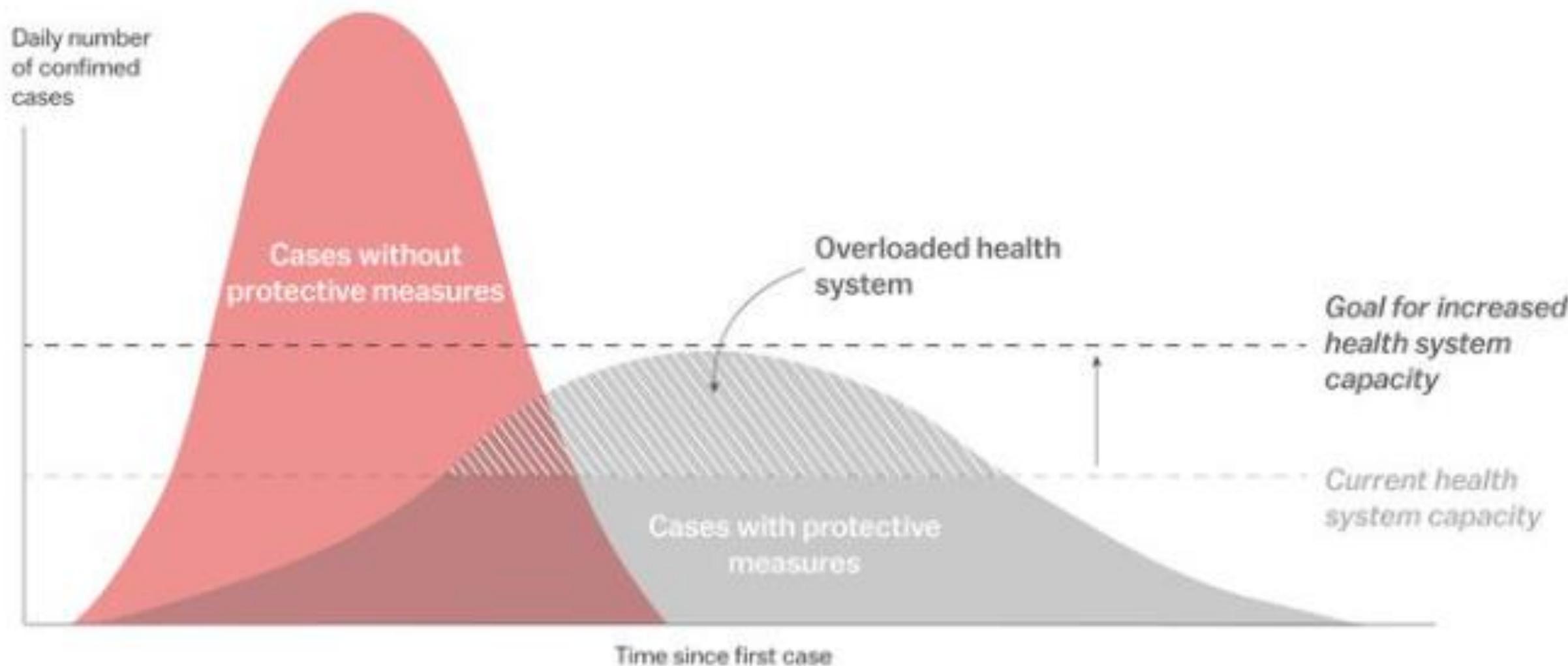
- Contact between an uninfected person and surface or object, which has been recently (within hours) contaminated with SARS-CoV-2, can occur.
- When a person touches a contaminated surface or object with their hands, and then touches their hands to their mouth, nose, or eyes, contact transmission occurs.

Basic Reproduction Number—R Naught

- An R_0 value of 1 means the average person who gets COVID-19 will transmit it to one other person.
 - COVID-19 is spreading at a stable rate.
- An $R_0 > 1$ means the disease spreads exponentially.
- Goal is to bring the $R_0 < 1$ which would put the coronavirus in decline until it dies out.
 - Identify, isolate and contact trace
 - Reduces the time during which cases are infectious in the community, thereby reducing the R_0



Raising the line while flattening the curve



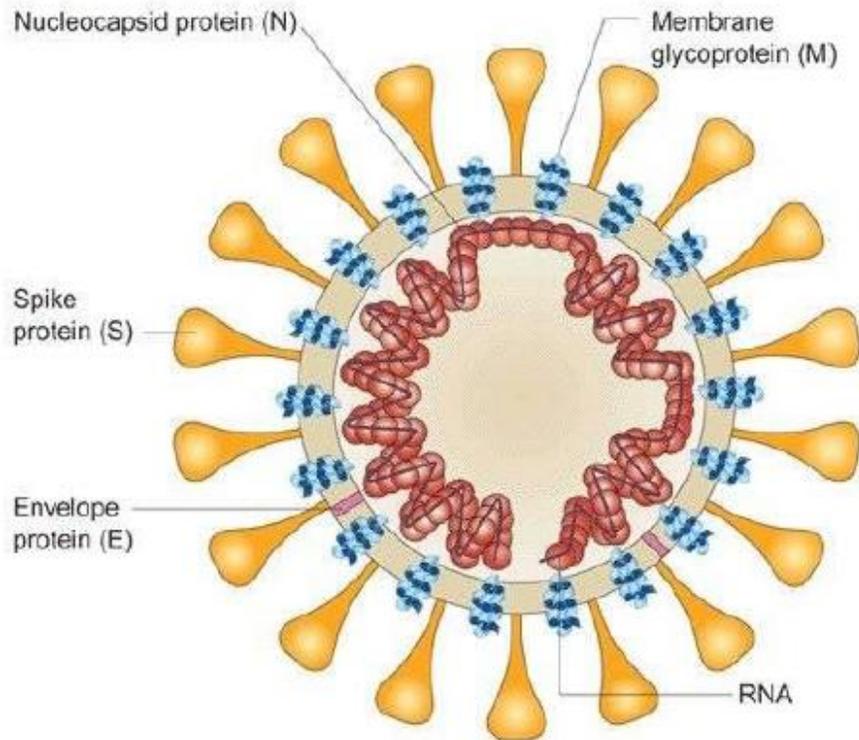
Testing

What do the diagnostic tests for COVID-19 detect?

Diagnostic tests for COVID-19 detect either the virus or the immune response.

The virus:

- Viral RNA detected by NAAT/RT-PCR (molecular testing)
- COVID-19 viral antigen

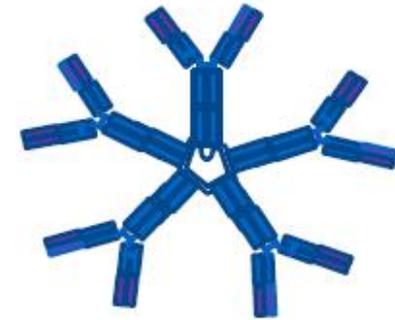


The immune response:

- Antibodies against COVID-19 antigen (IgM, IgG, IgA) (serology testing)



IgG



IgM

Antigen Testing: Newest Test

- **Polymerase Chain Reaction (PCR) Test**
 - Gold standard for COVID-19 testing
 - Genetic material collected in nasal swab is copied millions/billions of times over so that markers for COVID-19 can be identified
 - PCR testing takes time, energy & trained personnel
- **Antigen test**
 - Looks for fragments of viral surface proteins as a marker of infection—usually from surface spikes—big enough to study on their own without spending time and energy making new copies
 - Antigen tests are not easy to make, but can deliver results on the spot

PRIORITIES FOR TESTING PATIENTS WITH SUSPECTED COVID-19 INFECTION



- **Priority 1**
 - Hospitalized patients
 - Healthcare facility workers with symptoms
- **Priority 2**
 - Patients in long term care facilities with symptoms
 - Patients 65 years of age and older with symptoms
 - Patients with underlying conditions with symptoms
 - First responders with symptoms
- **Priority 3**
 - Critical infrastructure worker with symptoms
 - Individuals not in above categories with symptoms
 - Healthcare facility workers and first responders
 - Individuals with mild symptoms in communities experiencing high COVID-19 cases
- **Non-priority**
 - Asymptomatic individuals

New Criteria for Laboratory COVID-19 Testing

- Revisions were made on **April 27**, 2020 to reflect updated priorities for testing patients with suspected COVID-19 infection:
- Clinicians should use their judgment to determine if a patient has signs and **symptoms** compatible with COVID-19 and whether the patient should be tested.
- **Other considerations** that may guide testing are epidemiologic factors such as the occurrence of local community transmission of COVID-19 infections in a jurisdiction.

PRIORITIES FOR COVID-19 TESTING

(Nucleic Acid or Antigen)

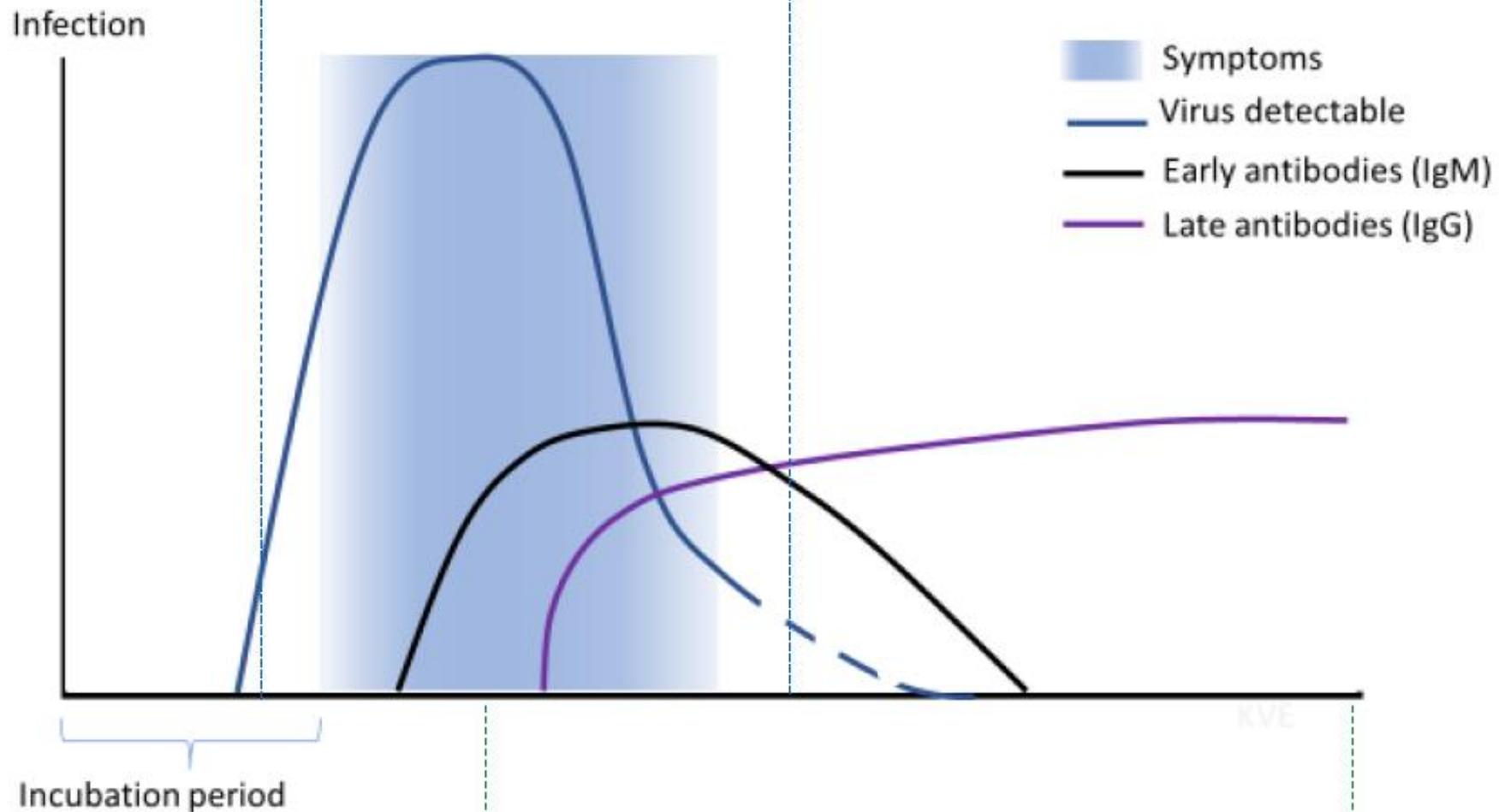
High Priority

- Hospitalized patients
- Healthcare facility workers, workers in congregate living settings, and first responders **with** symptoms
- Residents in long-term care facilities or other congregate living settings, including prisons and shelters, **with** symptoms
- Persons identified through public health cluster and selected contact investigations

Priority

- Persons **with** symptoms of potential COVID-19 infection, including: fever, cough, shortness of breath, chills, muscle pain, new loss of taste or smell, vomiting or diarrhea and/or sore throat
- Persons **without** symptoms who are prioritized by health departments or clinicians, for any reason, including but not limited to: public health monitoring, sentinel surveillance, or screening of other asymptomatic individuals according to state and local plans.

Molecular testing to detect the virus



Serology testing to detect the immune response (antibodies)

New Point-of-Care Antibody Tests

- Availability versus reliability
 - Rapid and easy-to-use to facilitate testing outside of laboratory settings.
- Based on proteins in respiratory samples or detection in blood or serum of antibodies.
- Cautions:
 - Validation needed in appropriate populations
 - False positive & false negative results a concern
 - WHO recommends the use of point-of-care tests **only** in research settings

Antibody Testing: Still Many Questions

- Do antibodies actually neutralize SARS-CoV-2?
 - Unclear if antibodies detected are virus-neutralizing.
- Does the level of antibodies matter?
 - Some recovered people have very low levels of neutralizing antibodies.
- Do antibodies indicate immunity?
 - No human study done showing that antibodies confers durable immunity.
- Should “certificates of Immunity” or “immunity passports” be used?
 - Not enough evidence about the effectiveness of antibody-mediated immunity.
- Various populations are being surveyed for antibody prevalence
 - For example, 17% in NYC EMTs

Testing

<https://www.whitehouse.gov/wp-content/uploads/2020/04/Testing-Blueprint.pdf>

TESTING BLUEPRINT

OPENING UP

 **AMERICA AGAIN**

Mitigation

Fundamental Mitigation Principles

- Public Health
 - Keep infected individuals separated from uninfected individuals.
 - SARS-CoV does not have wings or feet, it needs people close together

- Occupational Health
 - Hierarchy of controls



Physical Distancing

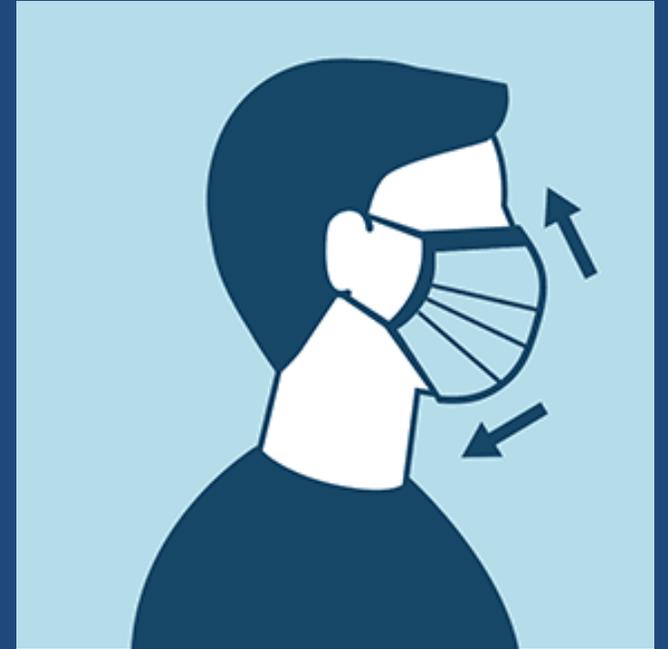
- Physical distancing
 - Maintaining a *minimum* 6-foot separation between people
 - When working
 - When obtaining services
 - When recreating
- “Social distancing” does not differentiate between social activities that maintain physical distance while fostering social connectivity.
 - Differentiating the two terms fosters sustainability of the physical distancing required to “flatten the curve”

Cough Etiquette

- Cough etiquette is a series of actions to take if you are **coughing** or **sneezing**, which are designed to reduce the spread of respiratory illness to others.
 - Given various combinations of an individual patient's physiology and environmental conditions, such as humidity and temperature, the gas cloud and its payload of pathogen-bearing droplets of all sizes can travel 23 to 27 feet (7-8 meters).
 - Bourouiba L. *JAMA* (March 26, 2020)
- Sneeze, blow your nose or **cough** into a disposable tissue, and discard the tissue immediately into a bin.

Cloth Face Coverings

- “Recommendation Regarding the Use of Cloth Face Coverings, Especially in Areas of Significant Community-Based Transmission”
- <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/cloth-face-cover.html>
- A significant portion of individuals with coronavirus lack symptoms (“asymptomatic”), and that even those who eventually develop symptoms (“pre-symptomatic”) can transmit the virus to others *before* showing symptoms.
- This means that the virus can spread between people interacting in close proximity—for example, coughing, sneezing, singing or speaking forcibly.
- CDC recommends wearing cloth face coverings in public settings where other social distancing measures are difficult to maintain (e.g., grocery stores and pharmacies) **especially** in areas of significant community-based transmission.



Respirators and Healthcare Workers

<https://www.cdc.gov/niosh/index.htm>

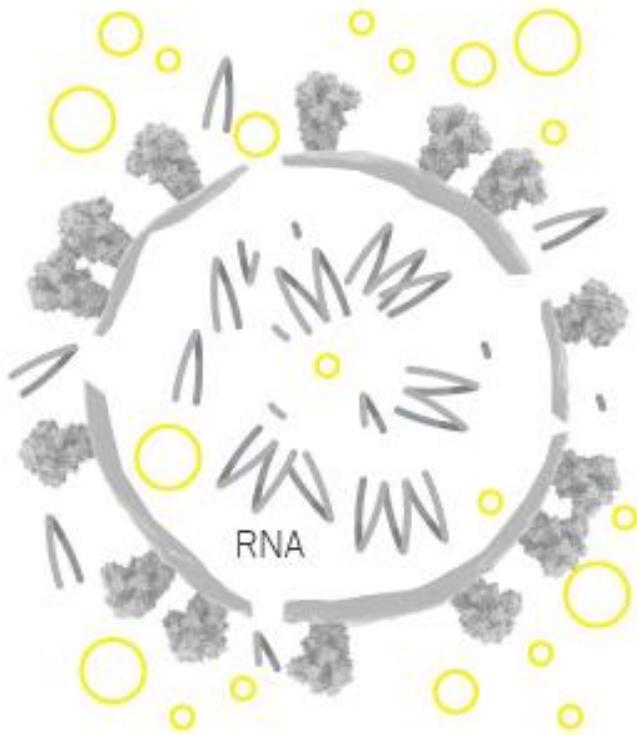
- Goal is to provide science-based infection prevention recommendations for PPE that also account for the current reality of the limited supply of N95 respirators in healthcare settings.
- These PPE recommendations comprise five strategies:
 - Optimizing the supply of N95s through using all steps in the hierarchy of controls
 - Using NIOSH-approved alternatives to N95 respirators where feasible, including elastomeric and powered–air-purifying respirators (PAPRs)
 - Extend use of N95s when alternative are not available
 - Using stockpiled respirators beyond their designated shelf life
 - Using respirators made in other countries which comply with international standards
 - Decontaminating and reusing N95 respirators

Decontamination: N95 Respirators

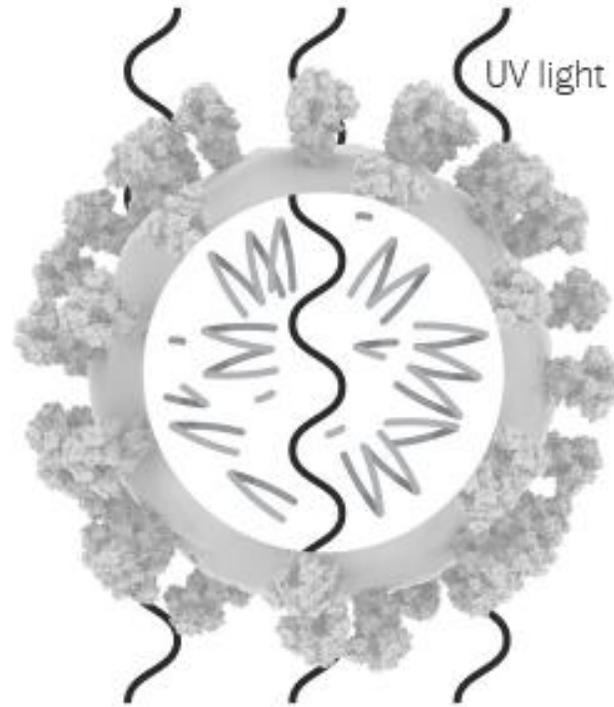
- N95 respirators are in short supply, especially in healthcare settings
- “Decontamination and Reuse of Filtering Facepiece Respirators using Contingency and Crisis Capacity Strategies”
 - <https://www.cdc.gov/coronavirus/2019-ncov/hcp/ppe-strategy/decontamination-reuse-respirators.html>
- Major Methods:
 - Vaporous Hydrogen Peroxide
 - Ultraviolet Germicidal Irradiation (UVGI)
 - Heat & Humidity

Handwashing

Soap and water break the virus membrane.



Ultraviolet light disrupts the genetic material.



Heat breaks the structure of spike.



Cleaning—Sanitizing—Disinfection

- **Environmental persistence of SARS-CoV-2**
 - Limited studies have led to concerns about the persistence of SARS-CoV-2 on environmental surfaces. For example, viral RNA could be detected:
 - Up to 3 hours in aerosols
 - Up to 4 hours on copper
 - Up to 24 hours on cardboard
 - Up to 2-3 days on plastic
 - Up to 2-3 days on stainless steel
- While detection of viral RNA *may* indicate that viral shedding occurred at some point in the past, equating detection of viral RNA with *viable* virus—virus which can cause infection—can be misleading.
- National Biodefense Analysis and Countermeasures Center
 - <https://www.dhs.gov/science-and-technology/national-biodefense-analysis-and-countermeasures-center>

Environmental Decontamination

- Good news is that exposures can be minimized without the use of any environmental sampling. Environmental contamination can be minimized with routine cleaning and disinfection practices with readily available and affordable products.
- Currently, 287 products are registered with the EPA that can be used for COVID-19. See the EPA **List N: Disinfectants for Use Against SARS-CoV-2**
 - <https://www.epa.gov/pesticide-registration/list-n-disinfectants-use-against-sars-cov-2>
- CDC Guidance for Cleaning and Disinfecting
 - <https://www.cdc.gov/coronavirus/2019-ncov/community/reopen-guidance.html>
- For example, contaminated surfaces and objects can be disinfected using:
 - 70% ethanol-containing products;
 - 50% isopropanol-containing products; or
 - 0.5% sodium hypochlorite-containing products.
 - Contact time with the surface or object should not be brief—at least 30 seconds.

Medications

- Currently, there are no proven medications to treat COVID-19.
 - However, several medications are undergoing clinical evaluation.
 - See <https://clinicaltrials.gov/>
- Investigational Categories:
 - Antivirals
 - Remdesivir
 - Grein J et al. NEJM. <https://www.10.1056/NEJMoa2007016>
 - Anti-parasitic agents
 - Hydroxychloroquine and chloroquine
 - VA Study—increased risk of death compared with patients treated with standard care
 - » Magagnoli et al. medRxiv (April 21, 2020)
 - Anti-inflammatory agents
 - Monoclonal antibodies
 - Antibody
 - Convalescent plasma collected from those post-COVID-19
 - Cloned antibodies to block entry of SARS-CoV-2 into host cells.

Remdesivir Randomized Clinical Trial Interrupted

29 April 2020

- Mode of action—blocks viral RNA polymerase enzyme
- Clinical trial of about 1000 COVID-19 hospitalized patients
 - Study outcome was “time to recovery”
- “Significant positive effect in diminishing the time to recover”
 - Shortened from 11 days in drug group compared to 15 days in placebo group (31%)—statistically significant
 - Mortality 8% in drug group; 11% in placebo group—not statistically significant
- Promising treatment—not a cure

Vaccine

- Vaccine candidates are currently in development
- Phases to a vaccine trial:
 - Safety
 - Efficacy
 - Large population trial
- Timeline—12 to 18 months (Spring of 2021)

Vaccine versus Herd Immunity

- Vaccine
 - Easy way to achieve immunity for a population
- Herd immunity
 - When enough people in a given community have had COVID-19 and developed what is called “natural immunity,” then the rest of the population becomes a lot less *susceptible* to becoming infected.
 - The “herd effect” is the decrease in infection rate among the uninfected or “*susceptibles*.”
 - Typically, at least 60% is the minimum for the most viruses that needs to be achieved before herd immunity becomes probable.

Reopening



GUIDELINES

OPENING UP

AMERICA AGAIN

Opening Up America Again

<https://www.whitehouse.gov/openingamerica/>

- **Phase One**
 - States and Regions that satisfy the gating criteria
- **Phase Two**
 - States and Regions with no evidence of a rebound and that satisfy the gating criteria a second time
- **Phase Three**
 - States and Regions with no evidence of a rebound and that satisfy the gating criteria a third time.

Proposed State or Regional Gating Criteria

Satisfy Before Proceeding to Phased Comeback

SYMPTOMS

Downward trajectory of influenza-like illnesses (ILI) reported within a 14-day period

AND

Downward trajectory of covid-like syndromic cases reported within a 14-day period

CASES

Downward trajectory of documented cases within a 14-day period

OR

Downward trajectory of positive tests as a percent of total tests within a 14-day period (flat or increasing volume of tests)

HOSPITALS

Treat all patients without crisis care

AND

Robust testing program in place for at-risk healthcare workers, including emerging antibody testing

Guidance for Employers to Plan & Respond to COVID-19

<https://www.cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html>

- **Preparing Workplaces for a COVID-19 Outbreak**
 - Respond flexibly to varying levels of transmission in the community—“trigger brakes”
 - Identify a workplace infection plan control coordinator
 - Consider COVID-19 testing as a part of workplace medical surveillance
- **Reduce Transmission Among Employees**
 - Encourage sick employees to stay home
 - Identify where and how employees might be exposed at work
 - De-densify workplace by physical distancing, staggered shifts, telework, virtual meetings
 - Partitions between employees and customers
- **Maintain Healthy Business Operations**
 - Flexible sick and leave policies
 - Determine how you will operate if absenteeism spikes
- **Maintain a Healthy Work Environment**
 - Increase ventilation rates, increase percentage of outdoor air that circulates into workplace
 - Perform routine environmental cleaning and disinfection of touched surfaces and objects
 - Perform enhanced cleaning and disinfection after suspected/confirmed COVID-19 have been in workplace

Future

- Keep up with CDC Guidance
 - <https://www.cdc.gov/coronavirus/2019-ncov/whats-new-all.html>
- Expansion of testing
 - Molecular
 - Antigen
 - Antibody
- Seasonality
- Economic opening and rebounds

Thank You!

