

# **COVID-19: What we need to know**

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**BIOHAZARD**

# Springville NY (14141 Zip Code)

- 11/16/2020
  - 89 Total Cases
  - 33 Active Cases
  - 11 Total Cases in the Springville School District

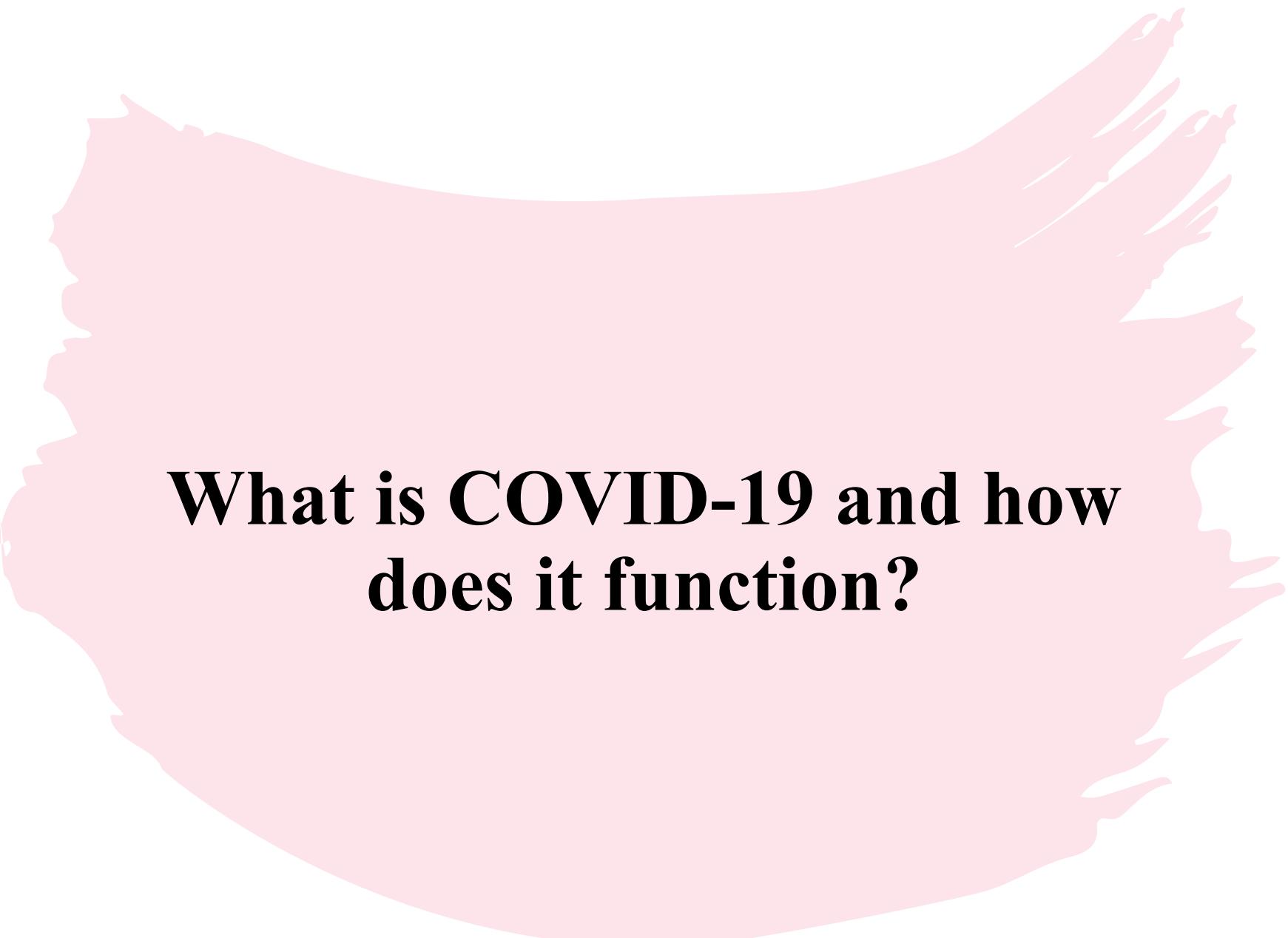
# ***Why am I giving this presentation:***

**WE OWE IT TO OURSELVES, OUR COMMUNITY AND  
EACH OTHER TO KNOW WHAT THE TRUTH IS AND HOW  
TO HANDLE THIS**

- For the last 8 years I have specialized research in infectious diseases including:
  - Bacterial- MRSA, Clostridium difficile, Streptococcus pneumoniae, Proteus, Enterococcus, Pseudomonas, Acinetobacter baumannii
  - Viral- CMV, HIV, EBV, Adenovirus, Norovirus, RSV, Influenza, Zika
  - About 20 other pathogens not listed above

# *Why is there so much misinformation from the general public?*

- Politics (Conservative vs Liberal Arguments)
- Social Media (the ease to spread false information to a mass of people instantaneously)
- Forcing the general public to understand very difficult complex scientific principles (the thousands of variables in play during a pandemic)
- Mistrust in science, and medicine (CDC vs WHO vs local experts)
- Mistrust in governments (local all the way to federal)

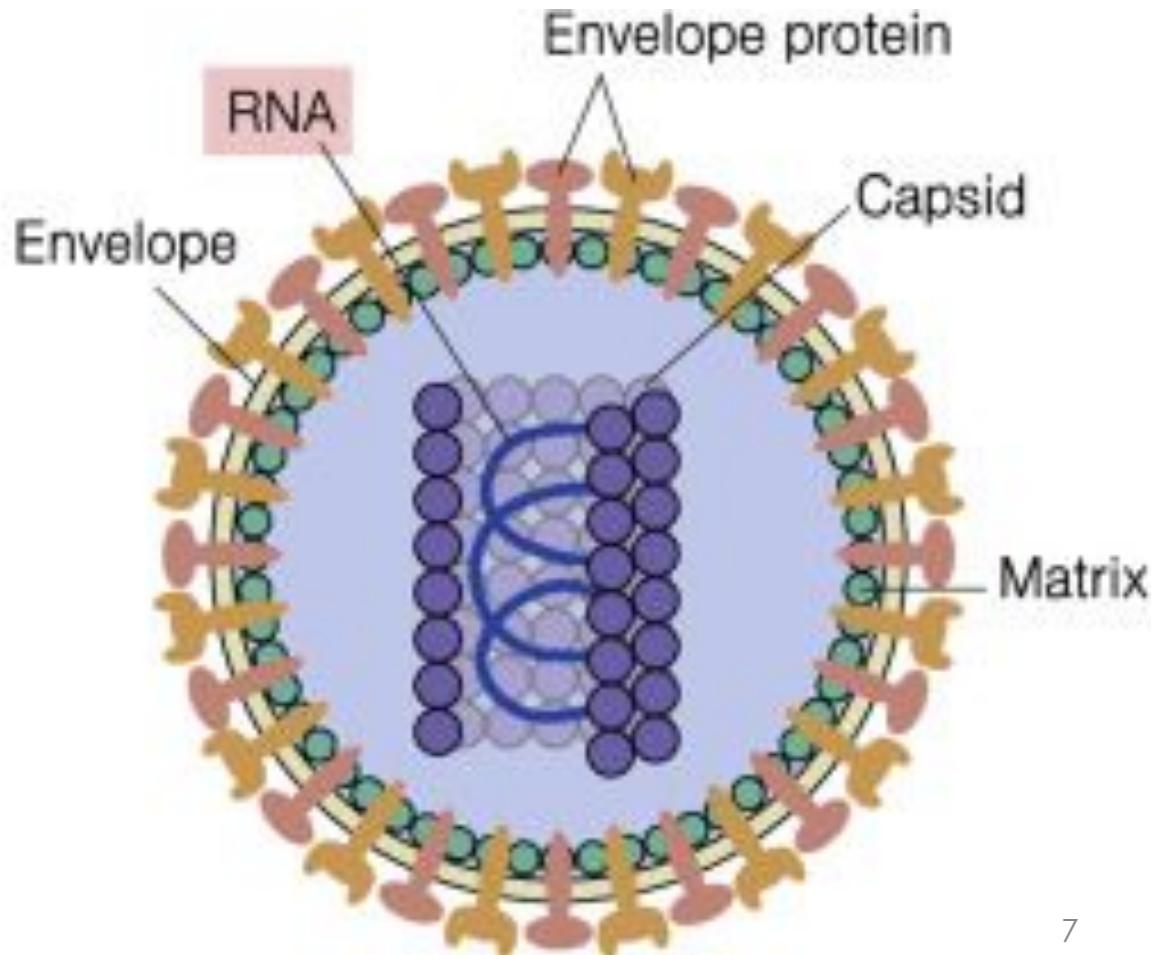
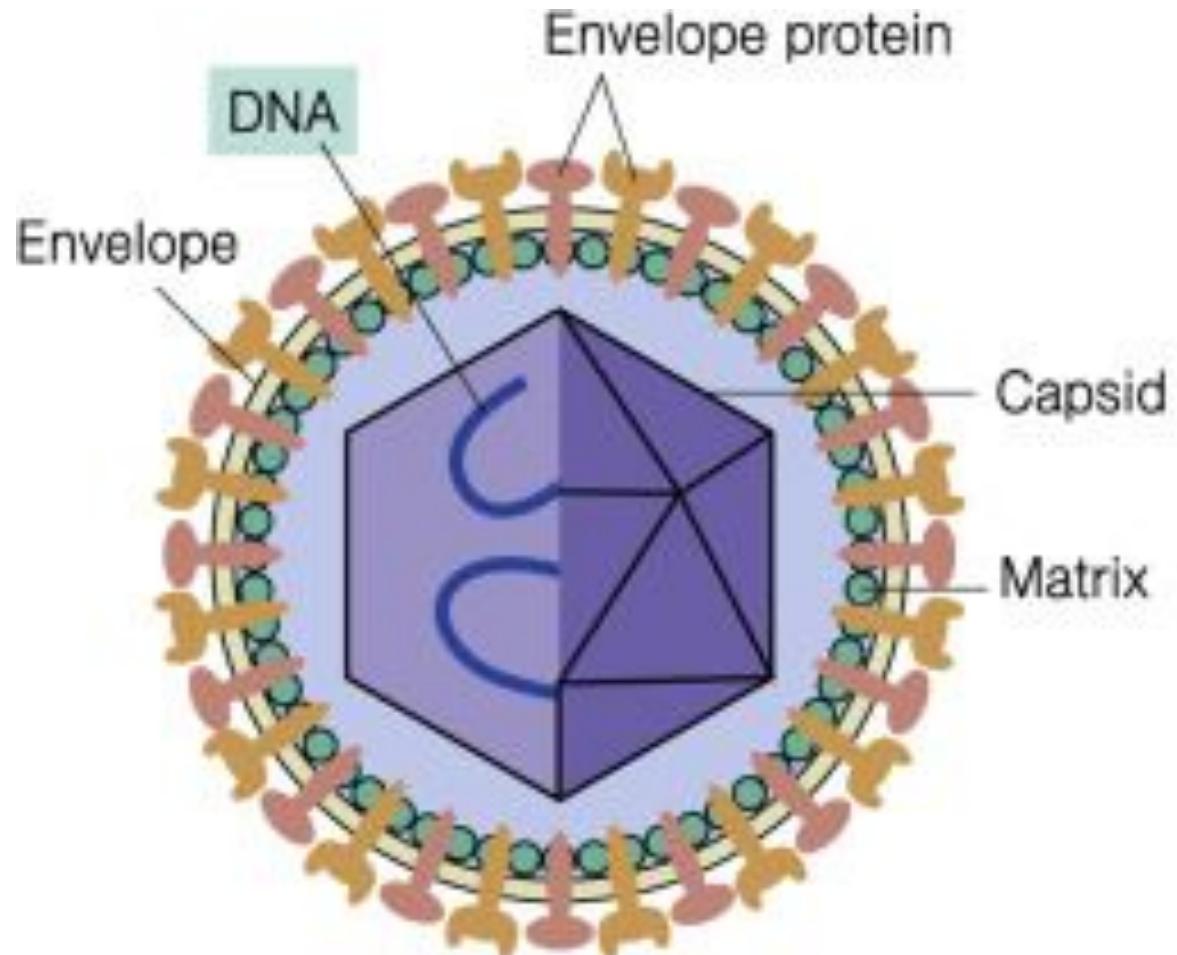


# **What is COVID-19 and how does it function?**

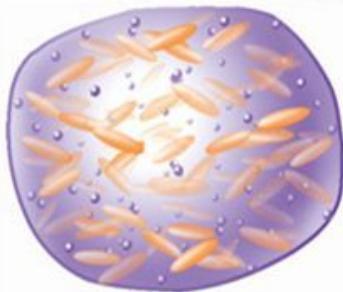
# **What is a virus:**

- A **virus** is neither living nor dead. It can not replicate without a host. Unlike bacteria that can replicate on surfaces without a host, viruses can not. A virus however, can stay “infectious” from minutes to weeks once outside of a host.
- A **host** is a person, or animal that the virus can use to replicate.
- A virus is nothing more than a DNA or RNA sequence, that is protected by proteins that hijacks its host cells and tells the cells to do something that the cells normally don’t do.
- Depending on the viruses DNA or RNA sequence, the cells then die and release more virus.

# **What is a virus:**



# **What is a virus: They come in many shapes and sizes**



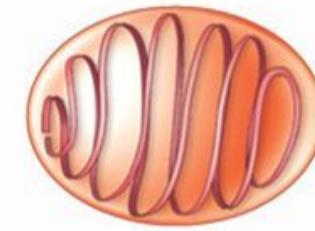
(a) Vaccinia virus



(b) Paramyxovirus (mumps)



(c) Herpesvirus



(d) Orf virus



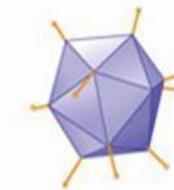
(e) Rhabdovirus



(f) T-even coliphage



(g) Flexuous-tailed phage



(h) Adenovirus



(i) Influenza virus



(j) Polyomavirus



(k) Picornavirus



(l) φX174 phage



(m) Tubulovirus

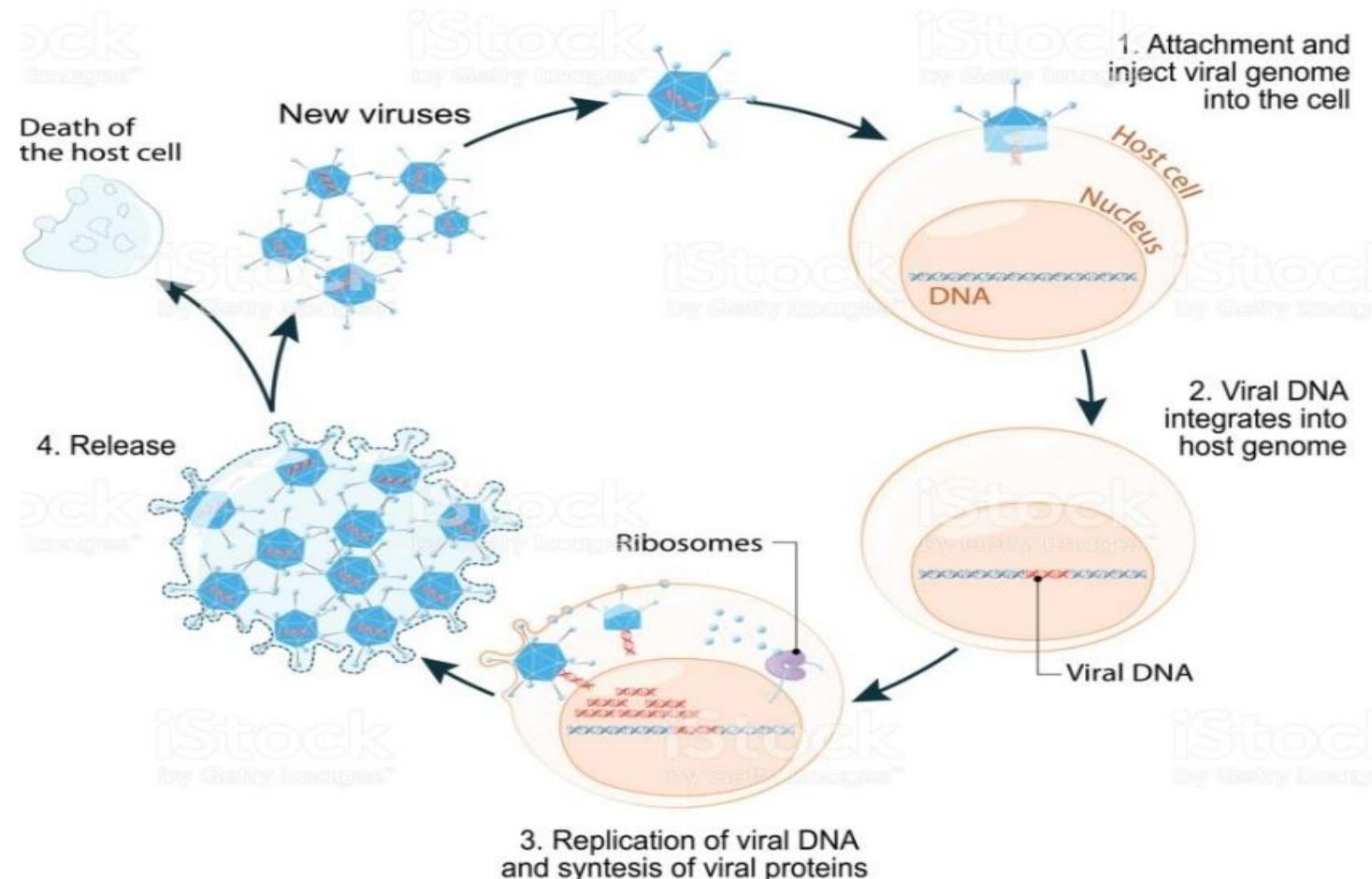
1 μm

12

8

# **What is a virus:**

## LIFE CYCLE OF VIRUSES



# **What is a virus:**

- Viruses cause many different types of problems and scenarios for their host.
  - Does the infection set up lifelong infections (HIV, Herpes)
  - Does the infection colonize the host run its course and then clear (Influenza, RSV, Coronavirus)
  - Viruses have a particular type of cell they target depending on the virus (Herpes- skin epithelial and fibroblast cells, Coronavirus- lung epithelial cells)
- Viruses can have **2 strains** (variola virus-smallpox) Others have many (Coronavirus- has 7)
- A **strain** is a type of pathogen of the same family

# **Coronaviruses:**

- 4 of the 7 coronavirus strains are responsible for many of our “colds.”
- The remaining 3 coronavirus strains are very unique
  - **SARS**- Sudden Acute Respiratory Syndrome
  - **MERS**- Middle Eastern Respiratory Syndrome
  - **SARS COV2 (COVID-19)**
- Why are these 3 strains unique?
  - These strains originated in animals and transmitted to humans
  - Each of these strains when transmitted to humans posed significant risk to the human population

# ***COVID-19- Corona Virus Infectious Disease 2019***

You can and probably will see COVID-19 being called simply **Coronavirus**, **Novel Coronavirus** or in my field we call it **SARS-CoV2**

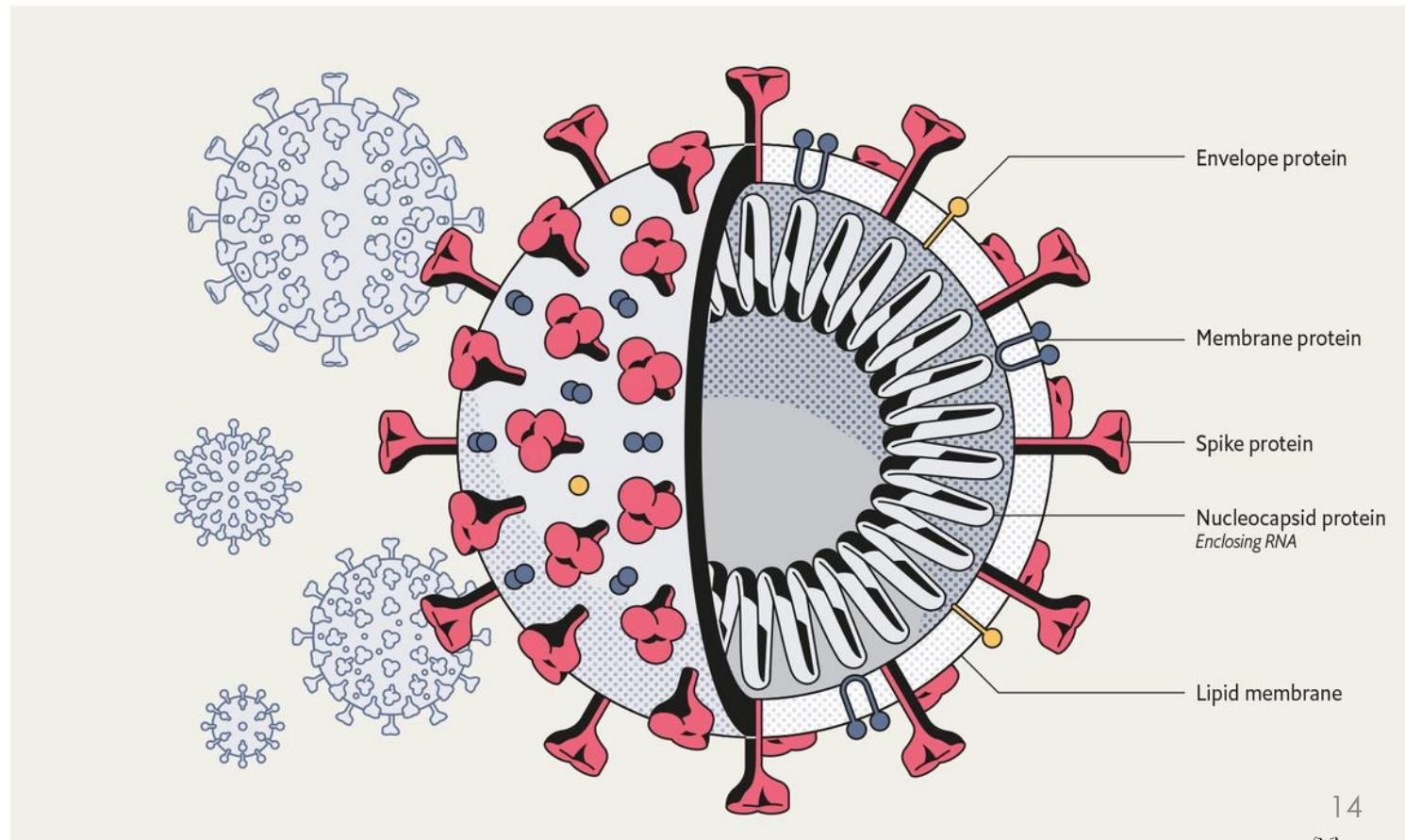
# ***COVID-19: What is it***

- COVID-19 is a **novel** (NEW) strain of coronavirus that has not been seen before
- Because it's new, our immune systems don't have any immunological memory of it. That's why we are quite vulnerable to it
- Because it's new, we do NOT have many treatments or vaccines to specifically target this virus.

# ***COVID-19: What is it***

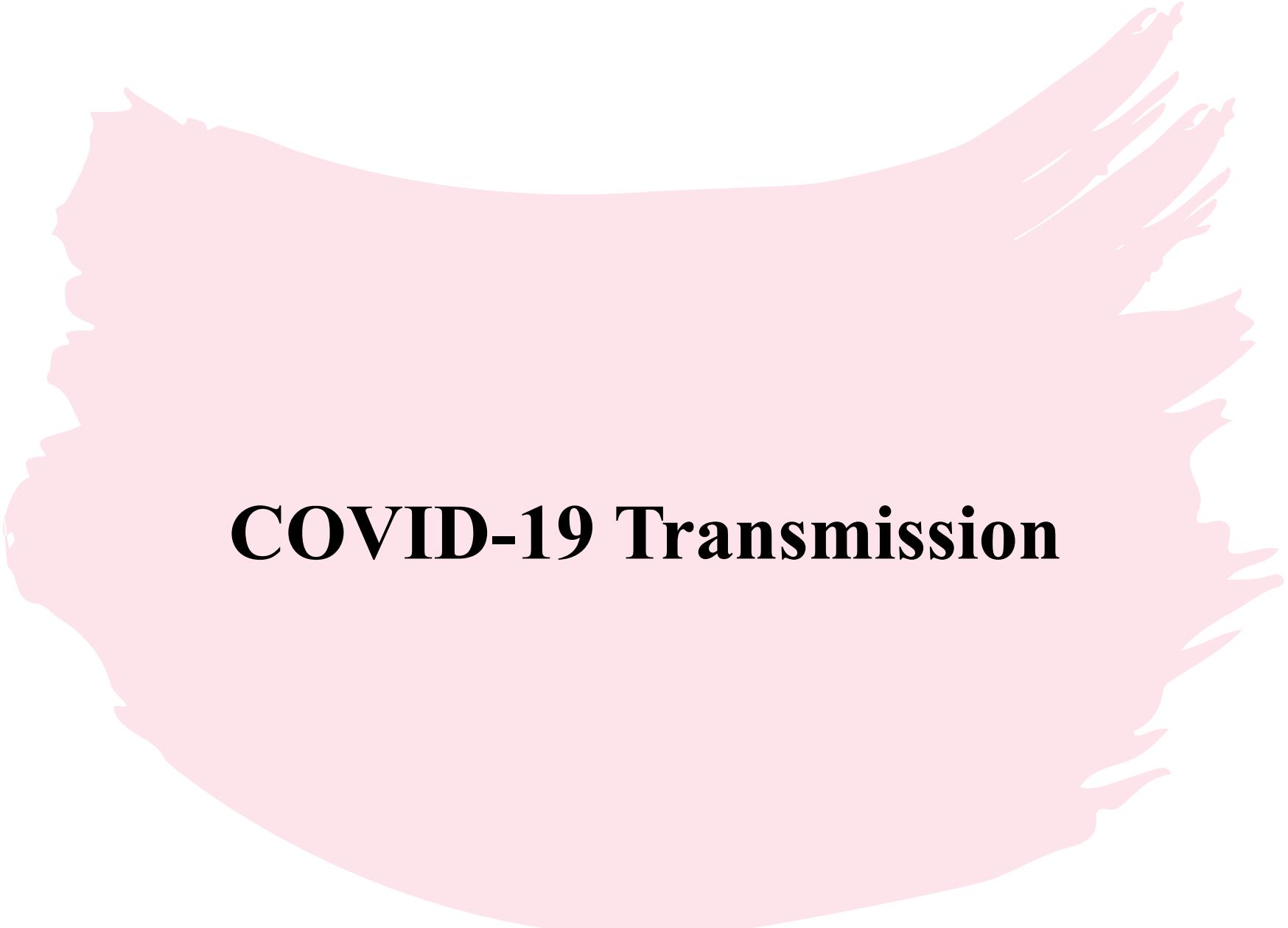
- Coronaviruses as a whole are enveloped, positive-stranded RNA viruses with nucleocapsid.

COVID19 (right) structure. Enveloped viruses are the most susceptible to environmental disinfectants. The structure of these viruses includes a lipid envelope, which is easily compromised by most disinfectants. Once the lipid envelope is dissolved the core is exposed and vulnerable.



# ***History and Epidemiology of Covid19:***

- The virus infected its first human host in Wuhan China in November or December of 2019 (current belief is after consuming improperly cooked bat meat)
- The Chinese government covered up much of the cases and didn't notify the WHO (World Health Organization) until well into an outbreak. (2/12/20)
- In the matter of 12 months this virus has spread to 191 countries
- This virus is spreading fast and is deadly.



# COVID-19 Transmission

# ***COVID-19 Modes of Transmission (How does it spread)***

- **Droplet**: The Virus is contained within a moisture bubble. The moisture bubble or droplet is then inhaled or lands on a surface.
- **Droplet Nuclei**: Develops when the fluid of pathogenic droplets (1-5 µm in size; micrometre = one-thousandth of a millimetre) evaporates. They are so small and light they may remain suspended in the air for several hours.
- **Direct Contact**: When a droplet containing the virus or a droplet nuclei is on hands, face or other body parts and directly ingested by a person.
- **Indirect Contact**: When droplets containing the virus or a droplet nuclei are on an inanimate object. After a period of time a person touches that object, carries the virus to their hands, or body and ingests the virus particles.
- **Airborne Transmission**: When droplets or droplet nuclei are ingested through means by inhalation during respirations.

\*Studies have shown with many other pathogens that a person can be infected by means of mucous membranes (lips, interior of nasal passage, eyes and eyelids, anal and vaginal canals). Studies are still ongoing regarding all routes of transmission of COVID19, however preliminary studies suggest all the mucous membranes listed above can cause infection of a person if the virus makes entry via one of these routes.

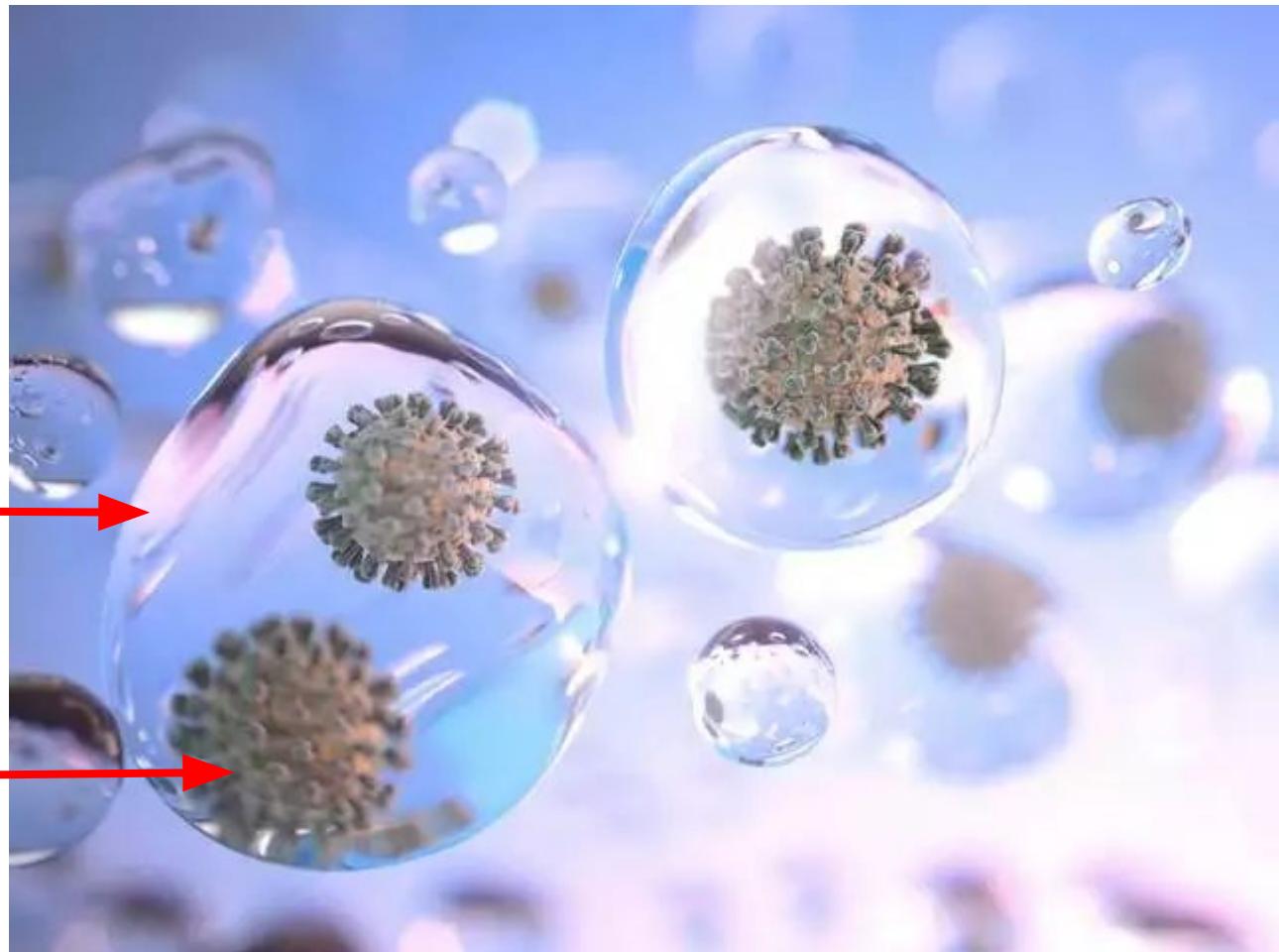
# ***COVID-19 Transmission (How does it spread)***

The COVID19 is suspended in moisture droplets. The virus is not necessarily aerosolized as a virus particle itself but rather contained within the moisture droplet. What causes the aerosolization of the viruses is actually the expulsion during cough, sneeze, breath, or talking.

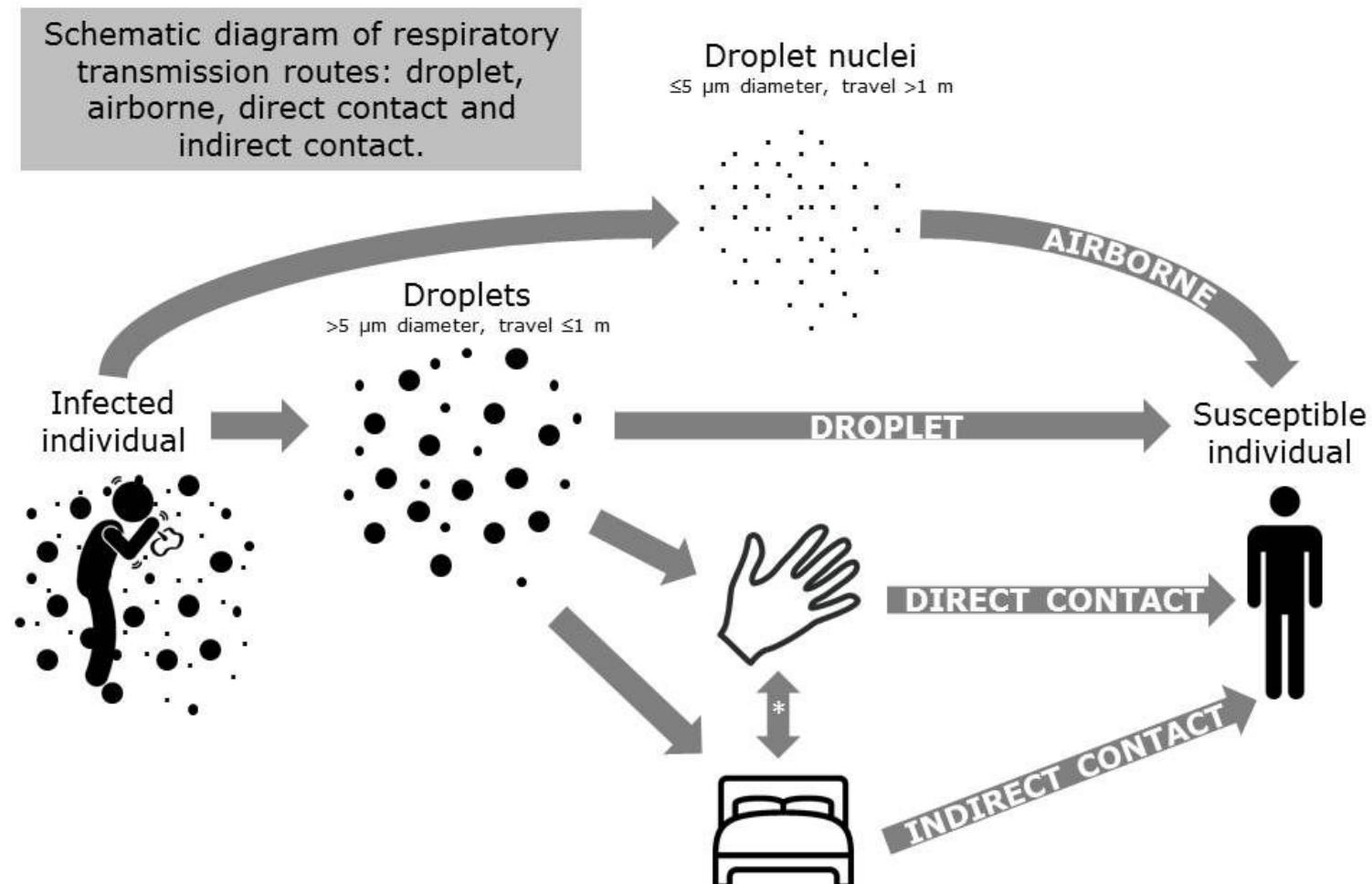
**Moisture (water droplet)**



**Virus Particle**

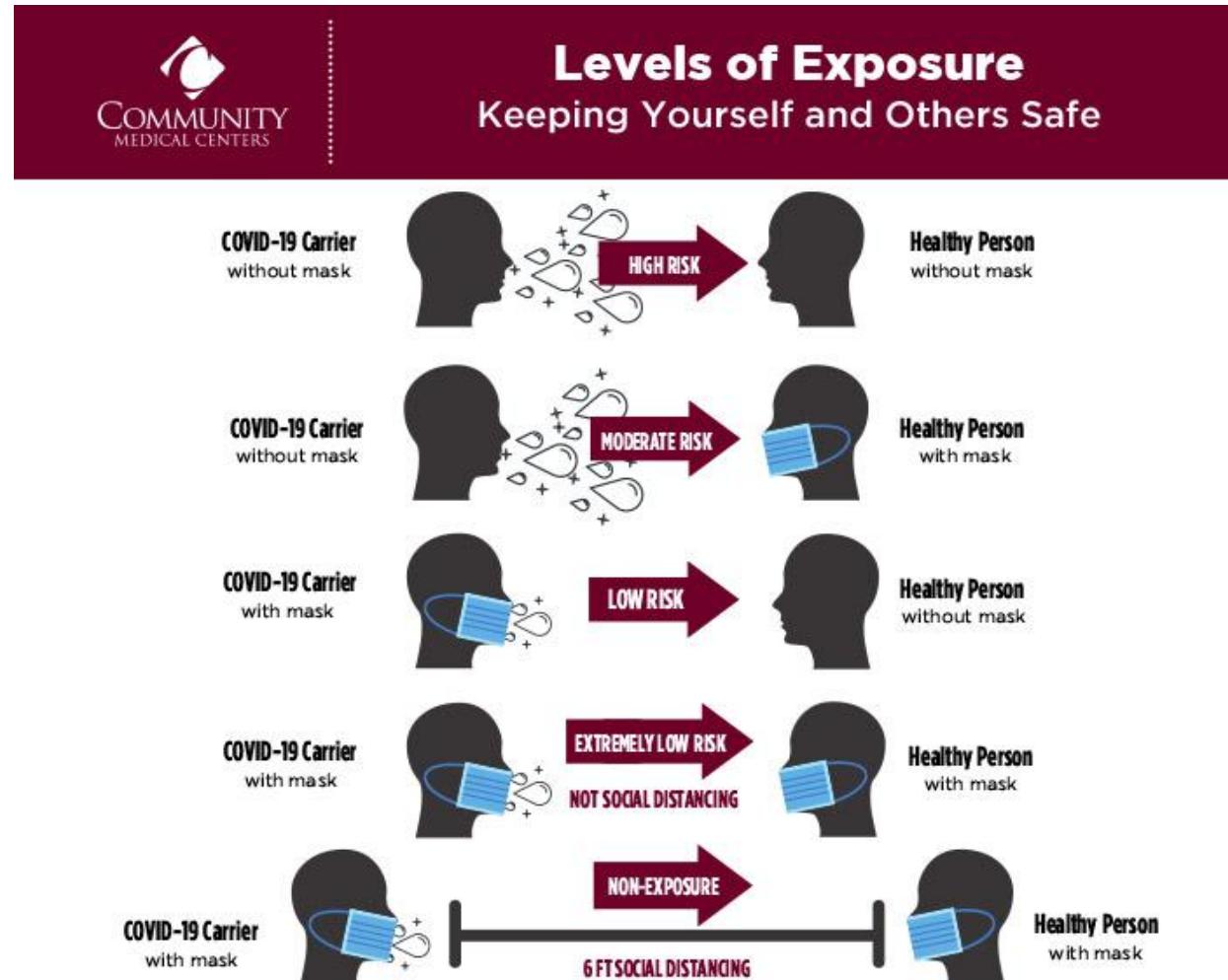


# *COVID-19 Transmission (How does it spread)*



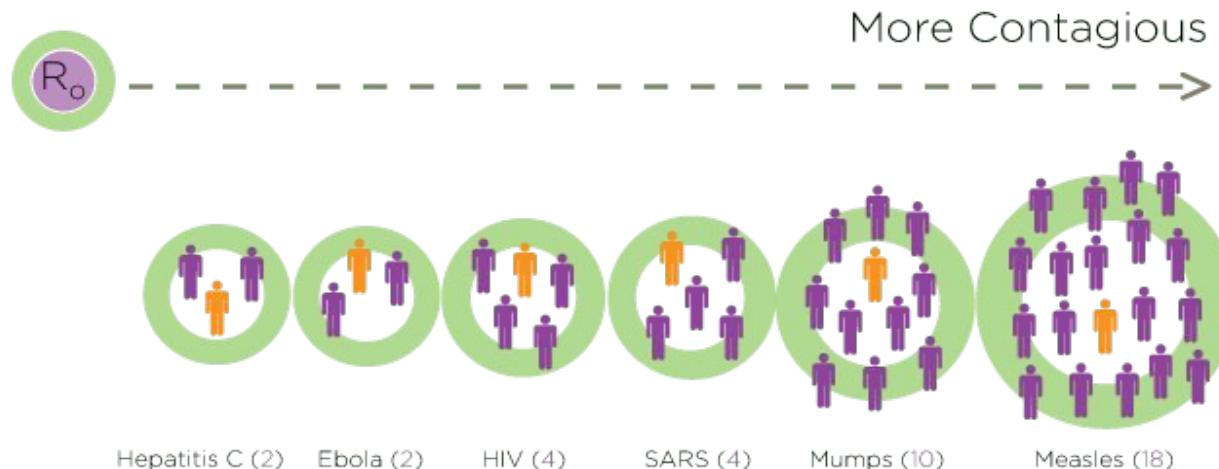
\* Transmission routes involving a combination of hand & surface = indirect contact.

# Why masks do work:



# ***COVID-19 Transmission Rates***

- Since COVID-19 was recognized by the WHO the transmission rate has been between 2.4 and 4.4
- This rate means that at most patient 0 (orange) will infect 5 people (purple).
- By comparison COVID 19 (SARS)

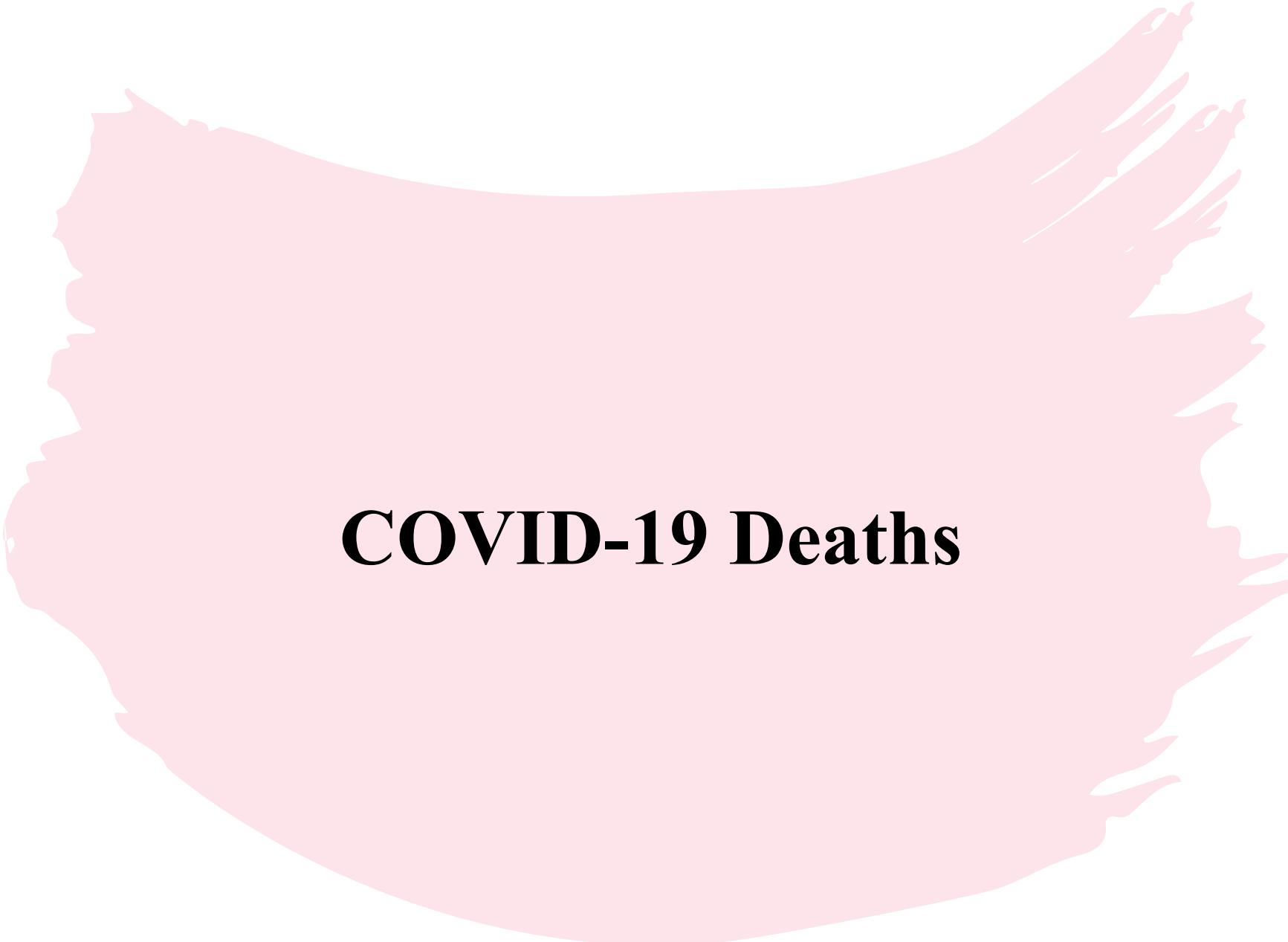


# *Virus Mutations and Infection Rates*

July 4, 2020

National Institute of Allergy and Infectious Diseases (NIAID) director Dr. Anthony Fauci has said that the coronavirus has mutated in a way that makes it more infectious than it had been previously, he said this in an interview with the *Journal of the American Medical Association*.

- Instead of infecting at a rate of 4 people per 1 person infected this number could be substantially higher (I haven't read the scientific paper validating this however is very likely)
- Seeing more severe cases in younger population than previously seen (specifically ages 22-40)
- New symptoms being seen (this could be variance of infection vs. mutations)



# **COVID-19 Deaths**

# **COVID-19 Death Rates**

- **Transmission Rates** are characterized by if one person (Patient 0) is infected, how many people will patient 0 transmit the virus to until either patient 0 is no longer infectious or is deceased.
- **Death Rate** is a mathematical calculation, where 10n for calculating death to case ratios is 100. This gives us a percentage (meaning out of 100)

$$\left( \frac{\text{Deaths occurring during a given time period}}{\text{Size of the population among which the deaths occurred}} \right) 10^n$$

Source for calculation:

<https://www.cdc.gov/csels/dsepd/ss1978/lesson3/section3.html>

# **COVID-19 Death Rates**

- **Death Rate: COVID-19 Globally 11/16/2020 2PM**

$$(1,320,742 / 54,615,099) \times 100 = 2.42$$

**What this means: is that per 100 persons infected with COVID-19  
2.42 people have died.**

# **COVID-19 Death Rates**

- **Death Rate: COVID-19 United States 11/16/2020 2PM**

$$(246,586 / 11,082,027) \times 100 = 2.23$$

**What this means: is that per 100 persons infected with COVID-19  
2.23 people have died.**

# **COVID-19 Death Rates**

- **Death Rate: COVID-19 Erie County, NY 11/16/2020 2PM.**

(746 Deaths/ 17,869 Positive Cases) x 100 = 4.17

**What this means: is that per 100 persons infected with COVID-19  
4.17 people have died.**

# ***COVID-19 Death Rates***

- Aspects if We will ever know the true death rate:

<https://www.nytimes.com/2020/04/17/us/coronavirus-death-rate.html>

The New York Times

## ***Why We Don't Know the True Death Rate for Covid-19***

Determining what percentage of those infected by the coronavirus will die is a key question for epidemiologists, but an elusive one during the pandemic.

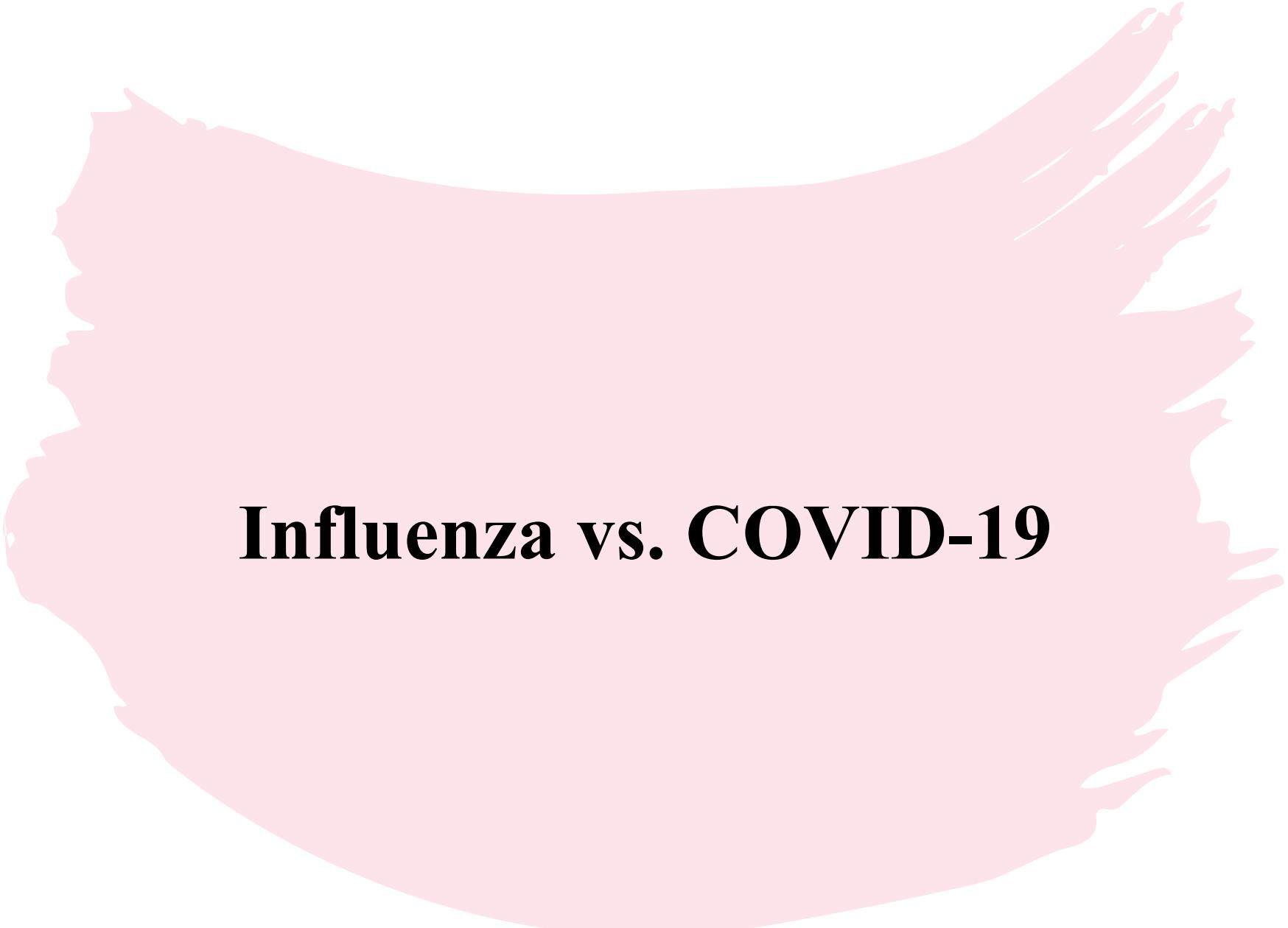


# ***COVID-19 Death Rates***

- **Is this death rate true?**
  - With the new ability to perform **Antibody testing** it is possible that the death rate is much lower than expected.
- **Why would the death rate be lower with increased antibody testing?**
  - Antibody testing provides an updated picture of people that were infected, however didn't have any symptoms during their infection and therefore did not get tested. Therefore increasing the number of population that are or were infected (the denominator in our equation) decreases the death rate.

# ***COVID-19 Death Rates***

- What factors alter death rates:
- As shown previously, getting an accurate number of people infected (COVID 19 testing or antibody testing)
- The quality of medical care (1st World Countries vs. 3rd World Countries)
- The health care system being overwhelmed.
- Current studies are going on as to whether genetic predisposition or nationality can affect death rates.



# Influenza vs. COVID-19

# ***COVID-19 vs. Influenza (ALL STRAINS)***

**THIS IS NOT JUST A FLU...CAN NOT COMPARE APPLES TO ORANGES**

These are global numbers and not just the United States\*\*

	Influenza*	COVID19
Infected	51,000,000	54,678,159
Dead	55,000	1,321,403
Death Rate	0.001	0.024
Death Percent	0.10%	2.4%
Infection Rate	0.8	~ 3.5
Infection Time	12 Months**	12 Months**

\*High Estimates

# ***COVID-19 vs. Influenza (ALL STRAINS)***

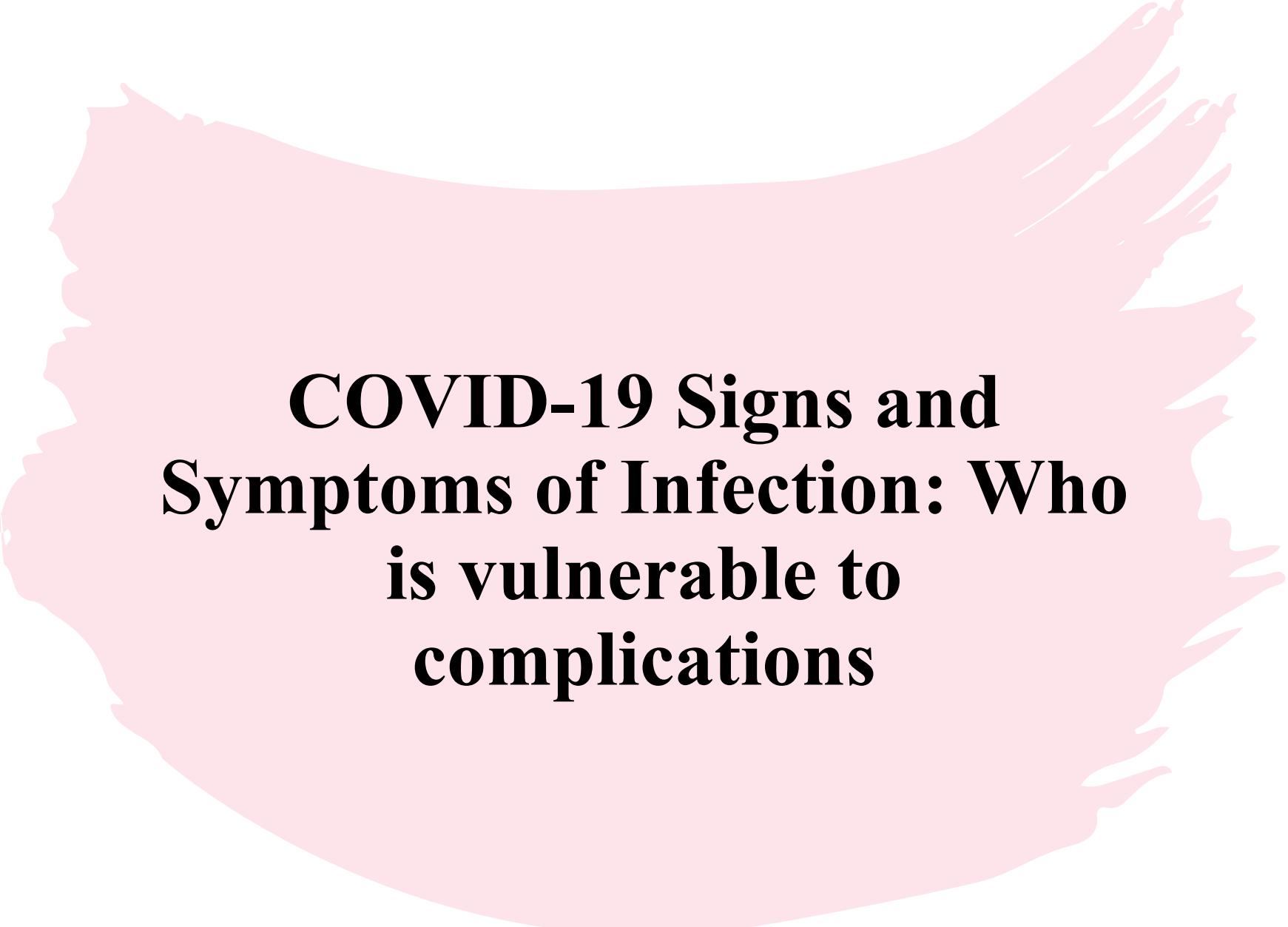
- COVID19 is more infectious and more deadly with our current statistics than Influenza. If we test more patients and confirm more cases then the ratio of dead/infected goes down.
- If these stats hold true and nothing was done about social distancing, quarantining suspected cases and positive cases, and wearing masks in public the United States would have been around 97.8% infected within 12 months of the first positive case.
- With a population of 327 million people that would be 22 million people dead.
  - This does not take into account age, previous health concerns, or the quality of medical care, just the current death rate.

# ***COVID-19 vs. Influenza (ALL STRAINS)***

- **Transmission Rate Comparison:**
  - Influenza: each person infected will infect 1.3 people. So to understand the whole numbers aspect if 10 people are infected from the flu, combined those 10 people will infect 13 people (not each but combined)
  - COVID-19: each person will infect at max 4 people.

Sources: <https://www.livescience.com/new-coronavirus-compare-with-flu.html>  
<https://www.cdc.gov/coronavirus/2019-ncov/hcp/planning-scenarios.html>

**Something to think about: If the flu has a transmission rate of 1.3 and last year infected a reported 55 million people, how many people do you think COVID-19 can infect with a transmission rate of max 4?**



# **COVID-19 Signs and Symptoms of Infection: Who is vulnerable to complications**

# **Signs and Symptoms**

People with COVID-19 have had a wide range of symptoms reported – ranging from mild symptoms to severe illness. Symptoms may appear 2-14 days after exposure to the virus. People with these symptoms may have COVID-19:

- Fever or chills
- Cough
- Shortness of breath or difficulty breathing
- Fatigue
- Muscle or body aches
- Headache
- New loss of taste or smell
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea

**Reminder: positive patients could also be asymptomatic therefore not showing any signs or symptoms**

This list does not include all possible symptoms. CDC will continue to update this list as we learn more about COVID-19.

# ***COVID-19: Symptoms***

- If you develop emergency warning signs for COVID-19 get medical attention immediately. Emergency warning signs include:
  - Difficulty breathing or shortness of breath
  - Persistent pain or pressure in the chest
  - New confusion or inability to arouse
  - Bluish lips or face
- Call 911 Immediately and notify dispatch of positive COVID19 symptoms

# CORONAVIRUS, FLU, COLD?

As the number of coronavirus cases rise, some key differences set coronavirus apart from the seasonal flu and the common cold — mainly the intensity of the symptoms and the recovery period. A guide at identifying the differences in the three conditions All three, however, are spread by air-borne respiratory droplets and contaminated surfaces

## CORONAVIRUS

**Onset:** Sudden

### Symptoms

- Fever
- Dry cough
- Muscle ache
- Fatigue

### Less common symptoms

- Headache
- Coughing up blood (haemoptysis)
- Diarrhoea

**Incubation:**  
**1-14 days,**  
may go up to 24 days

### Complications:

**5% cases**

(acute pneumonia, respiratory failure, septic shock, multiple organ failure)

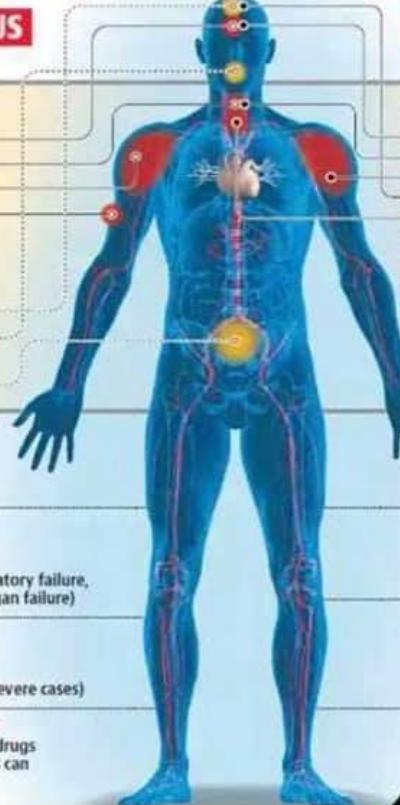
### Recovery:

**2 weeks**

(mild cases); 2-6 weeks (severe cases)

### Treatment or vaccine

No vaccines or anti-viral drugs available; only symptoms can be treated



## SEASONAL FLU

**Onset:** Abrupt

### Symptoms

- Fever
- Dry cough
- Muscle ache
- Fatigue
- Headache
- Sore throat
- Runny or stuffy nose

### Less common symptoms

- Diarrhoea
- Vomiting

**WHAT THIS MEANS** If you have a stuffy/runny nose or are sneezing, you likely **DO NOT** have coronavirus

**Incubation:**  
**1-4 days**

**Complications:**  
**1% cases**  
(including pneumonia)

**Recovery:**  
**1 week**

(mild cases);  
2 weeks (severe cases)

**Treatment/vaccine**  
An annual seasonal flu vaccine is available

## COMMON COLD

**Onset:** Gradual

### Symptoms

- Runny or stuffy nose
- Sneezing
- Sore throat

### Less common symptoms

- Low grade fever
- Muscle or body ache
- Headache
- Fatigue

**Incubation:**  
**2-3 days**

**Complications:**  
**Extremely rare**

**Recovery:**  
**1 week**

for most cases; may last as long as 10 days

**Treatment/vaccine**  
No treatment, but doctors advise treating symptoms

## SEVEN KINDS OF CORONA

Seven strains of coronavirus (CoV) that infect humans have been identified. These cause illness ranging from the common cold to more severe diseases such as Middle East Respiratory Syndrome (MERS-CoV)

### Harmless

- Serotype 229E
- Serotype OC43
- Serotype NL63
- Serotype HUK1

These cause symptoms of the common cold, and rarely cause severe pneumonia

### Dangerous

These are known to cause more severe disease. These are:

1. **Sars-CoV** which causes severe acute respiratory syndrome (Sars)
2. **Mers-CoV** was that causes Middle East respiratory syndrome (Mers)
3. **Sars-CoV2** that causes coronavirus disease (Covid-19)

## The unknowns of Sars-CoV2

Sars-CoV2 is closely related (with 88% identity) to two bat-derived Sars-like coronaviruses (bat-SL-CoV-ZC45 and bat-SL-CoVZC21) collected in 2018 in Zhoushan, eastern China. It has 79% genetic affinity with Mers-CoV.

On smooth surfaces such as tables, phones etc, Sars-CoV retains its viability for 5 days at 22-25°C and relative humidity of 40-50%, which is typical for air-conditioned rooms. Though this may vary for Sars-CoV2, experts say this is a good indicator for its behaviour



# ***COVID-19: Population most at risk for complications***

- 65 years or older\*
- COPD
- Bronchitis
- Asthma
- High Cholesterol
- High Blood Pressure
- Obesity
- Diabetes
- Heart Disease
- Immunocompromised
- Any person that has had the flu or pneumonia in the last 3 months\*

\*The CDC lists the complication age at 65 years of age, according to recent scientific studies this age may be as low as 50 years old. The CDC does not list recent history of flu or pneumonia, according to recent studies this could be a complication risk factor

# **COVID-19: Long Term Complications**

- Even though this virus has been circulating the world for almost a year, in the scope of viral understanding it is still a very new virus.
- Scientist and medical experts are still learning much about what this virus does to a person's body long term.
- Unlike the flu, where once the viral infection is over most people will recover fully without any lasting complications. The COVID-19 virus has shown to have many long term complications even of previously healthy individuals.

**Death is not the only complication of COVID-19 we need to worry about**

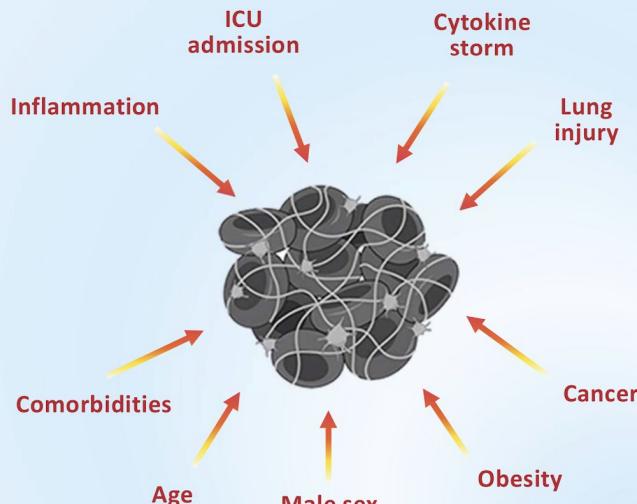
# ***COVID-19: Long Term Complications***

## **COVID-19 may increase the risk of long-term health problems**

### **Body systems and organs that can be affected :**

- **Heart**
  - Damage to heart muscle, heart failure
- **Lungs**
  - Damage to lung tissue and restrictive lung failure
- **Brain and the nervous system**
  - Loss of sense of smell (anosmia)
  - Consequences of thrombo-embolic events such as pulmonary embolism, heart attack, stroke
  - Cognitive impairment (e.g. memory and concentration)
- **Mental health**
  - Anxiety, depression, post-traumatic stress disorder and sleep disturbance
- **Musculoskeletal and others**
  - Pain in joint and muscles
  - Fatigue

### **COVID-19 related risk factors for venous thromboembolism**



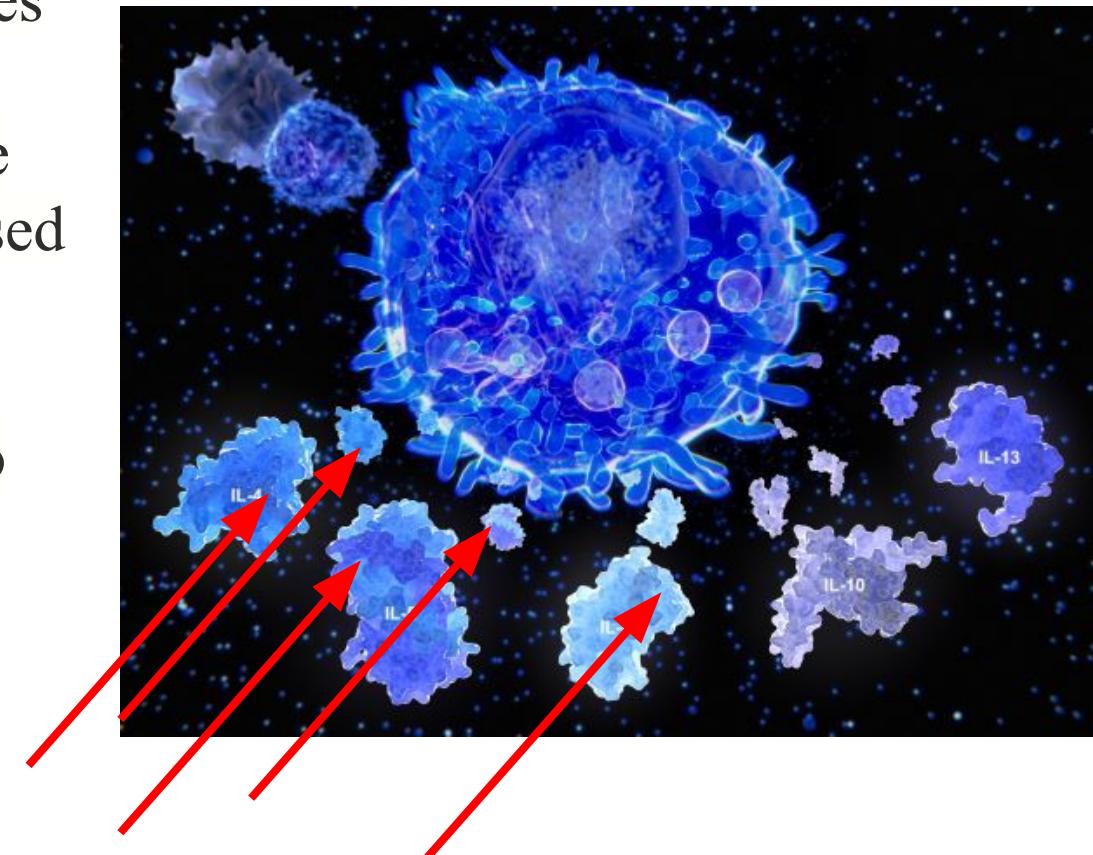
# *Why do some people die and others don't have any symptoms?*

One must understand that the severity of infection including deaths with this virus are complex and complicated. The more complex aspects of this virus are all based on what is happening during the cytokine storm SARS-CoV2 creates. The complexity dives head first into immunology, biochemistry, and signal transduction. This is the main reason why patients with pre-existing health concerns have high morbidity with this virus. Deaths from infections always lag behind active cases.

# Cytokine Storm- What is it?

A severe immune reaction in which the body releases too many cytokines into the blood too quickly.

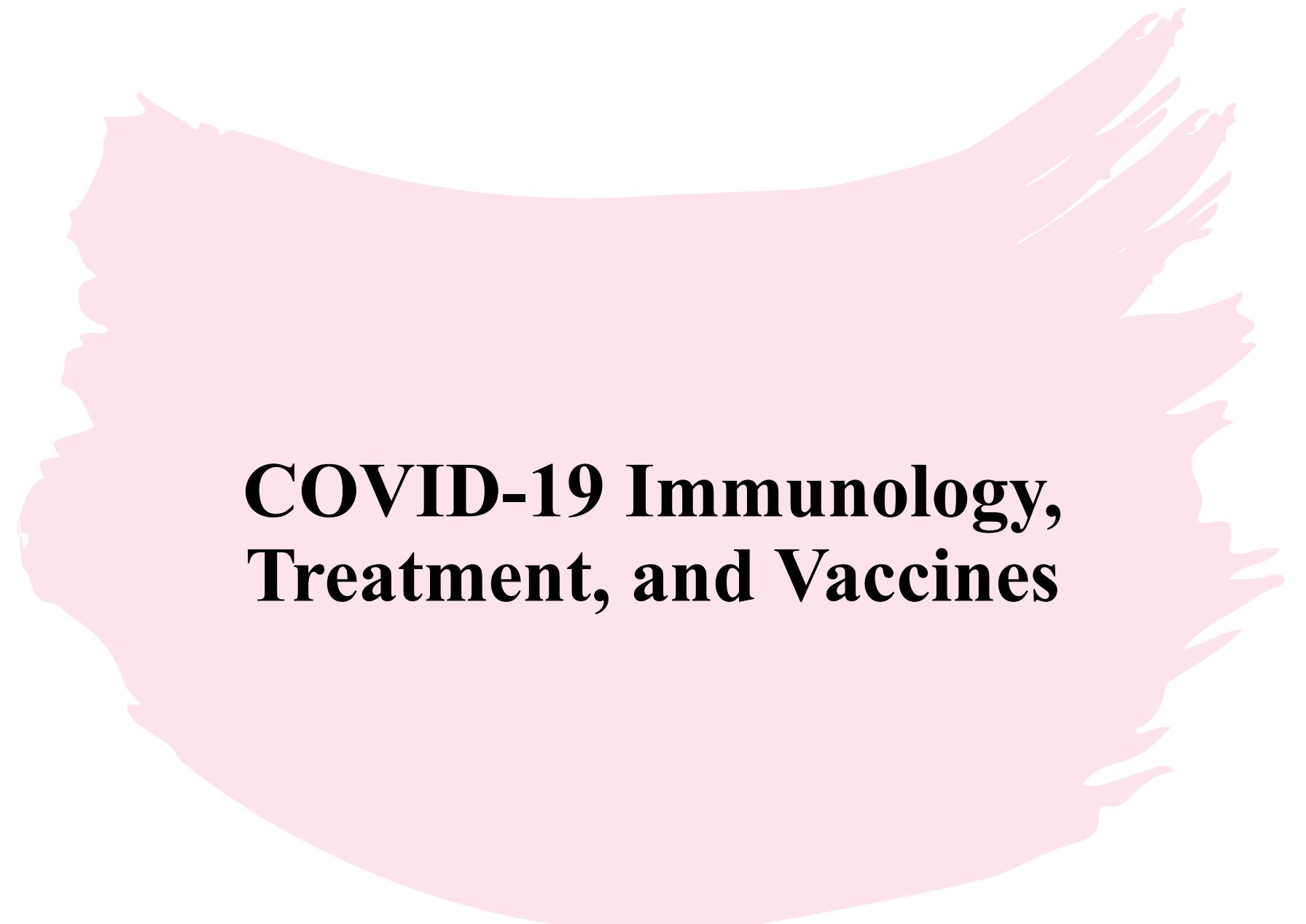
Cytokines play an important role in normal immune responses, but having a large amount of them released in the body all at once can be harmful. A cytokine storm can occur as a result of an infection, autoimmune condition, or other disease. It may also occur after treatment with some types of immunotherapy. Signs and symptoms include high fever, inflammation (redness and swelling), and severe fatigue and nausea. Sometimes, a cytokine storm may be severe or life threatening and lead to multiple organ failure. Also called hypercytokinemia.



# *Cytokine Storm- What is it?*

The Cytokine storm opens up new possibilities of a patient's body to fail. The body can manage a cytokine storm however, if it does not the follow can be true:

1. Exacerbate an already diagnosed problem: A person can live all of their life with asthma however a cytokine storm can produce extreme constriction of the airways and blood vessels in the lungs. This can create a respiratory arrest situation.
2. Open up the body for co-infections: A person that is fighting off a COVID-19 infection is more susceptible to developing other infections such as pneumonia, sepsis, and also a co-infection with influenza as the body's immune response is focussing on attacking COVID.



# **COVID-19 Immunology, Treatment, and Vaccines**

# Immunology: COVID-19 Antibody Testing

## **Antibody testing:**

- Is a test that is performed by collecting blood samples from people and looking for the antibodies that are specific to a COVID-19 infection.

## **Antibody, What is it?**

- a blood protein produced in response to and counteracting a specific antigen. Antibodies combine chemically with substances which the body recognizes as alien, such as bacteria, viruses, and foreign substances in the blood (Antigens).

# Immunology: COVID-19 War within, the antibodies

- There are 5 main types of antibodies:
  - IgM - first recognizes a foreign substance (bacterial or viral) and begins the fight
  - IgG - Sets up longer term fighting capabilities.
  - IgA- a few papers discuss the presence of this antibody during the COVID-19 immune response. Mucosal response for protection of other invasions
  - The other 2 are not functional fighters during the infection (at least at this point in our understanding)

# Immunology: COVID-19- War within, the antibodies

After our primary infection of COVID-19 the Memory B-cells determine how long our bodies recognize this virus, and can survive for decades providing lasting immunity. There are many other soldiers in this fight such as T-Cells, Natural Killer (NK cells), and others. Without getting to much into the immunology and signal transduction discussions all these cells including the antibodies play a major role in primary infection response, as well as re-infections.

This is where the concept of immunity or herd immunity comes from. If the B-cells last for a long time we can develop natural immunity to this virus.

**CURRENT DATA: B-cell memory of COVID-19, weeks to a few months**

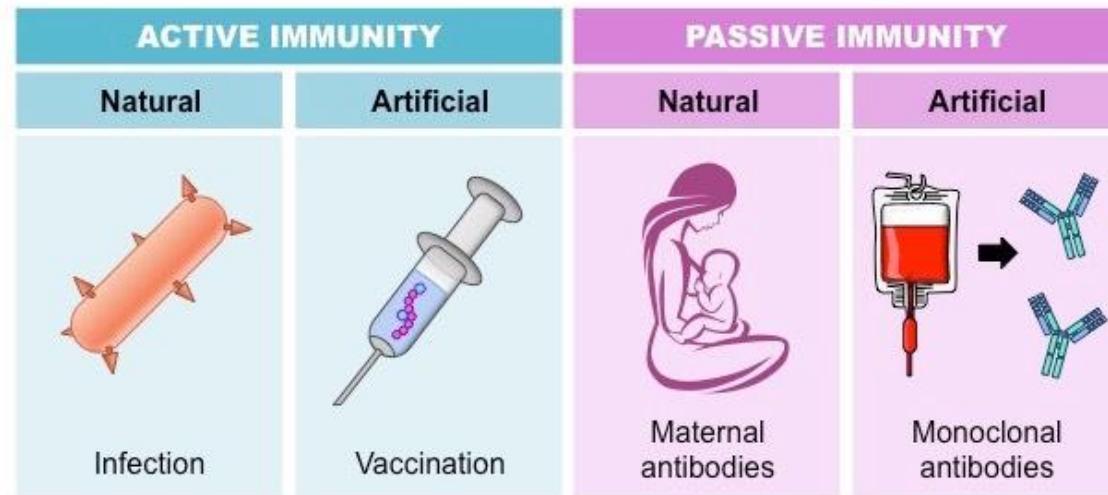
# Immunology: COVID-19- Viral Clearance and Immunity

Viral Clearance- is defined as the time it take for the virus to longer be detected in viral tests. A person is no longer infectious.

Viral Immunity- once the virus is cleared, the time that the patient is no longer susceptible of contracting the virus.

As we get closer to a vaccine for COVI-19 the topic of immunity is going to be coming up in conversation and media.

# Immunology: COVID-19- Viral Clearance and Immunity

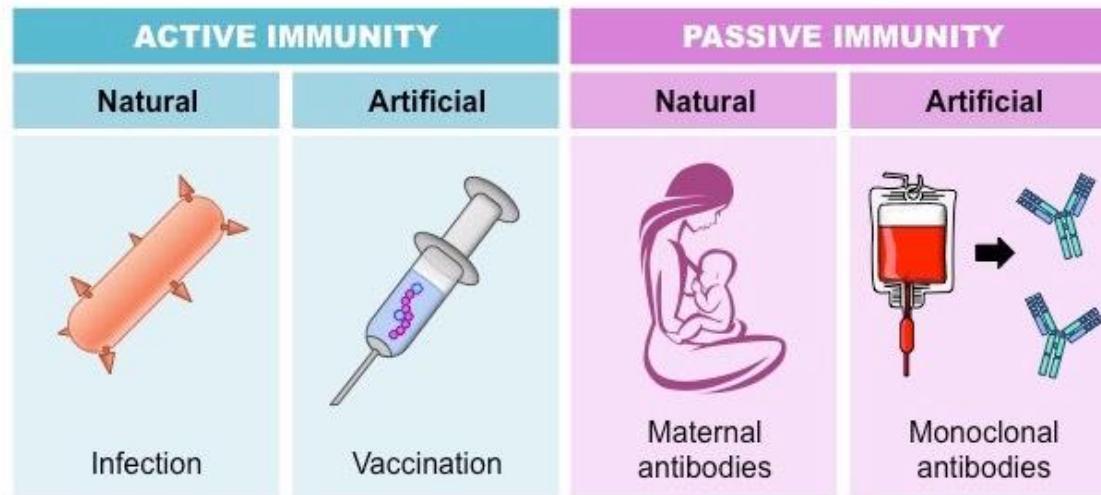


There are 2 main types of immunity. Active Immunity and Passive Immunity. Each of those are broken down further.

Active Natural Immunity: SARS-CoV2 has been shown to produce short lasting Natural Immunity. This is the reason why previously infected patients can get re-infected. The Natural Immune response produces immunity for an estimated 3 months.

Active Artificial Immunity: This type of immunity comes by the way of vaccinations. The vaccine candidates that are currently being talked about in the news give 2 shots. One is to develop the antibody response while the other is to boost it. The hope is that by boosting it we can extend the immunity from 3 months to greater than a year.

# Immunology: COVID-19- Viral Clearance and Immunity



There are 2 main types of immunity. Active Immunity and Passive Immunity. Each of those are broken down further.

Passive Natural Immunity: This type of immunity has not been studied widely or at all with SARS-CoV2. This type of immunity relies on a mother having antibodies to certain infections and passes them to the baby either during pregnancy or through breast milk.

Passive Artificial Immunity: This type of immunity is by isolating the antibodies from an infected person and transferring those antibodies to another patient. This boosts the immune response to help fight off the infection. (This was the experimental antibody treatment that President Trump had received).

# ***COVID-19: Immunity and Herd Immunity***

“There is currently no evidence that people who have recovered from COVID-19 and have antibodies are protected from a second infection.”

“At this point in the pandemic, there is not enough evidence about the effectiveness of antibody-mediated immunity to guarantee the accuracy of an “immunity passport” or “risk-free certificate.” People who assume that they are immune to a second infection because they have received a positive test result may ignore public health advice. The use of such certificates may therefore increase the risks of continued transmission.” **HERD IMMUNITY WILL NOT WORK AT THIS POINT.**

# ***COVID-19: Treatment***

I am not a healthcare practitioner and can only speak on behalf of research articles that are published. I will caution everyone to understand the difference between treating the Virus (by means of targeted antiviral therapies) and treating the symptoms (by means of treating the breathing problems etc).

Currently, there are **2 approved treatments:** **Remdesivir** (which is fully FDA Approved) and **Bamlanivimab** (which is approved by FDA Emergency Use Authorization)

# ***COVID-19: Treatment***

- Majority of the treatments that had been pushed for the treatment of COVID-19 patients have since been either pulled from use for infected patients or shown no evidence of effectiveness.
- **Remdesivir** is an antiviral drug that is the first and only FDA antiviral therapy approved to treat COVID-19 patients. “Patients in the remdesivir group had a shorter time to recovery than patients in the placebo group (median, 10 days, as compared with 15 days; rate ratio for recovery, 1.29; 95% confidence interval)”

<https://www.nejm.org/doi/full/10.1056/NEJMoa2007764>

# ***COVID-19: Treatment***

- Majority of the treatments that had been pushed for the treatment of COVID-19 patients have since been either pulled from use for infected patients or shown no evidence of effectiveness.
- **Bamlanivimab** is a therapeutic monoclonal antibody treatment that as of November 9, 2020 received emergency use authorization, to treat non-hospitalized mild to moderate cases of COVID-19.

<https://www.hhs.gov/about/news/2020/11/10/hhs-allocates-lilly-therapeutic-treat-patients-mild-moderate-covid-19.html>

# ***COVID-19: Vaccine Development***

## Vaccine Development Process:

1. Researchers must find a specific area that can target the RNA of COVID19 Virus
  - a. This area of RNA can not be prone to mutations or changes as the virus evolves. This area is called gene or sequence conservation. The RNA sequence is conserved through all evolutions of the virus progression.
2. Once a targeted drug shows that it can bind to or destroy the viruses ability to transmit, replicate, or inhibit the virus replication cycle, animal model studies can be performed in a series of progressions from mice to primates. (Usually this progression is the case not always)

# ***COVID-19: Vaccine Development***

## Vaccine Development Process:

3. Once moved through animal studies to ascertain the complications, efficacy, and methodology of drug administration small batches of vaccine doses can be made available for a clinical trial on human patients.
4. Once a full panel of clinical trial vaccinations have been completed all human subjects are monitored for a period of time to verify no long term complications arise.
5. Finally with the approval of CDC, NIH and FDA the vaccine can go into mass production to produce enough vaccines for a population.<sup>57</sup>

# ***COVID-19: Vaccine Development***

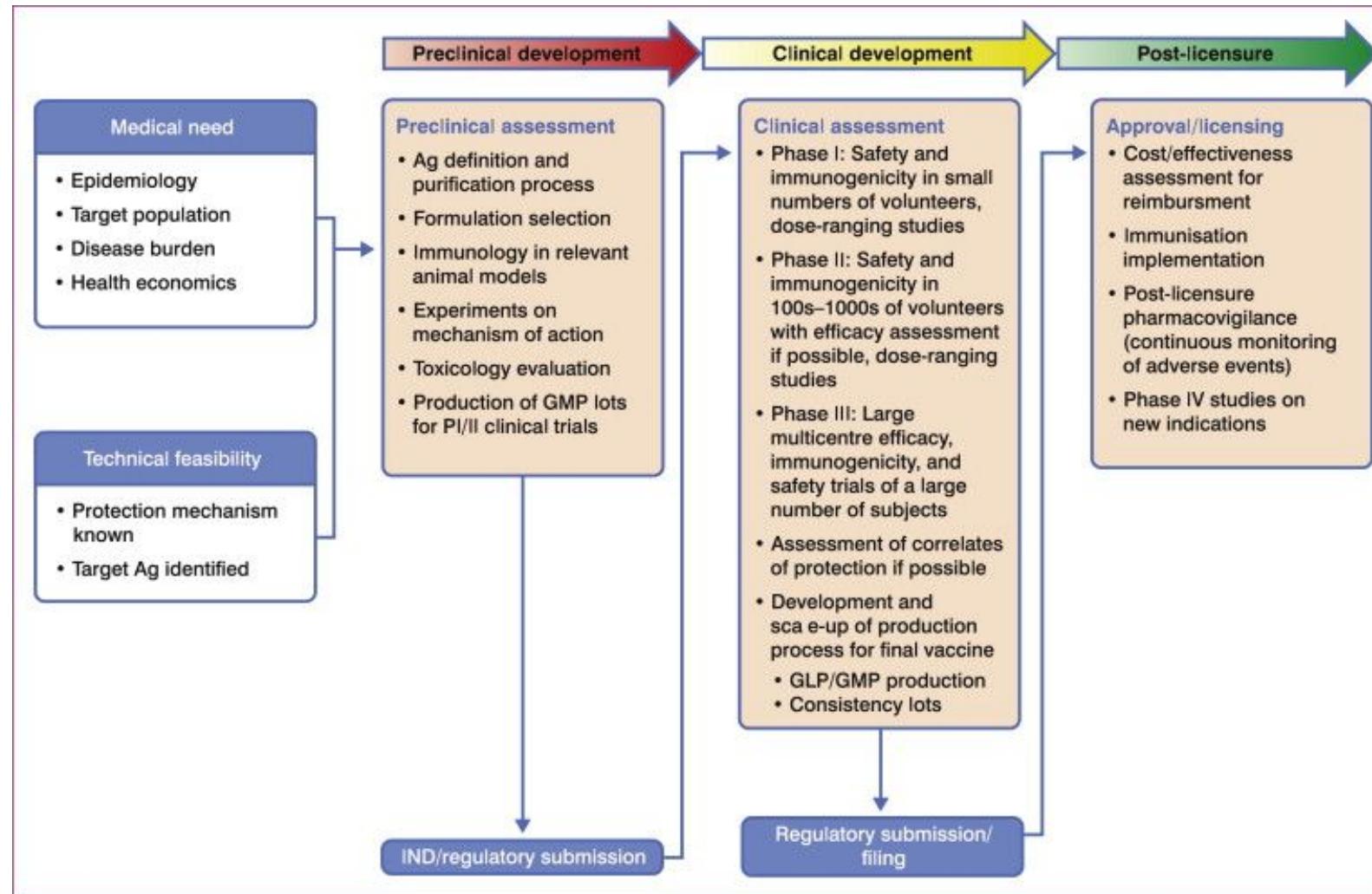
Vaccine Development Process:

6. Lastly, medical practitioners can administer the vaccine.

We all have been given this sheet that list all the scary side-effects and contraindications to a vaccine this process is how that information sheet is formed. (See MMR vaccine Sheet below)

<https://www.cdc.gov/vaccines/hcp/vis/vis-statements/mmr.pdf>

# *COVID-19: Vaccine Development*



# ***COVID-19: Vaccine Development***

There are 2 vaccine candidates that have been shown to have promise:

- **Pfizer:** Pfizer released interim results that showed its candidate vaccine was more than 90% effective, after 94 patients developed COVID-19 – the vast majority of whom received the placebo.
- **Moderna:** Moderna's vaccine appears to be 94.5% effective against the disease, after 95 people out of the 30,000 volunteers came down with COVID-19, 90 of whom received the placebo. Eleven people – all in the placebo group – developed “serious” cases of the disease.

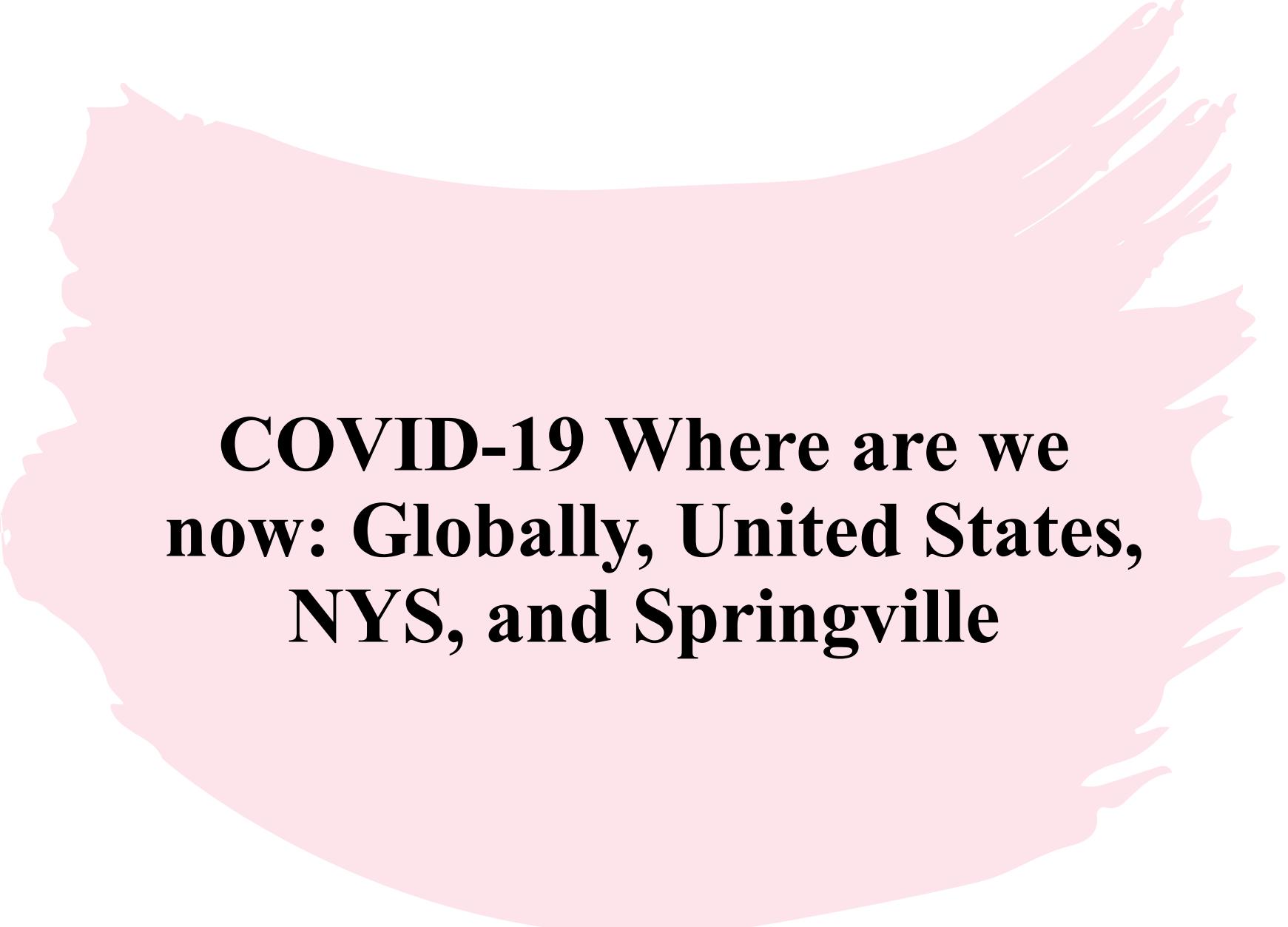
# ***COVID-19: Vaccine Development***

While these vaccines hold promise that we will have an effective vaccine in the near future the following is also true:

- Neither vaccine company has released the full data of the clinical trials. Also, neither clinical trial has been peer reviewed to independently validate the findings.
- Scientists have predicted vaccines won't be available to the general public until summer or fall of 2021. That is when enough doses will be produced and distributed.

<https://www.usatoday.com/story/news/health/2020/11/16/moderna-pfizer-covid-vaccine-heres-what-we-know-them/6308571002/>

<https://www.bmjjournals.org/content/371/bmjm4471>



# **COVID-19 Where are we now: Globally, United States, NYS, and Springville**

# ***COVID-19: How to stop it***

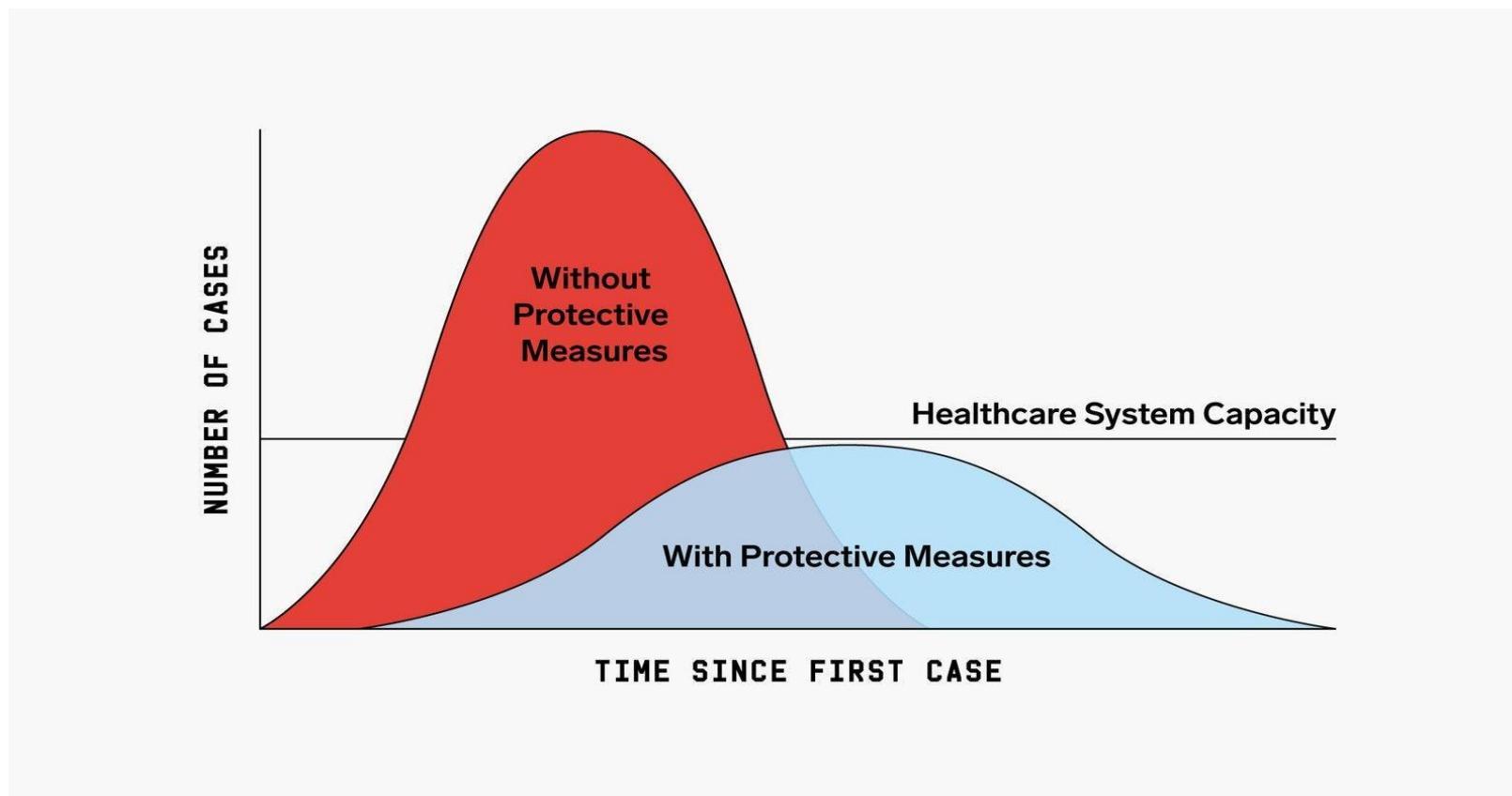
Until we have an approved FDA vaccine we can NOT stop it. We can slow the spread by wearing a mask, social distancing, washing your hands, and limiting indoor gatherings.

# **COVID-19: How to slow it down**

- **Social Distancing-** Don't go to large gatherings. If you have to be near other people keep a distance of 6 feet between you and the person next to you.
- **Wash hands-** minimum of 20 seconds with soap and water.
- **Keep your house, and work area as clean as possible.**
  - 10% bleach does inactivate the virus. A \$2 bottle of bleach and spray bottle will last a long time.
  - If it can't be bleached wash with soap and water.
- **Wear a face mask-** as explained the virus is carried in moisture droplets (humidity that we expel as we breathe, cough, sneeze, and talk)
- **Stay home if you are sick.** Don't go to work, don't go to the store. STAY HOME!
- **Limit Indoor Gatherings:** Limit the number of people in a gathering (10) and limit the amount of times you gather.

# ***COVID-19: Why slow it down, flatten the curve***

If we can't keep this virus load under the healthcare system capacity, we could see extreme amount of death. The amount of patients needing treatment greatly exceeds the capacity to treat them. We need to slow the transmission down. As the curve flattens, the time until virus transmission stops increases.



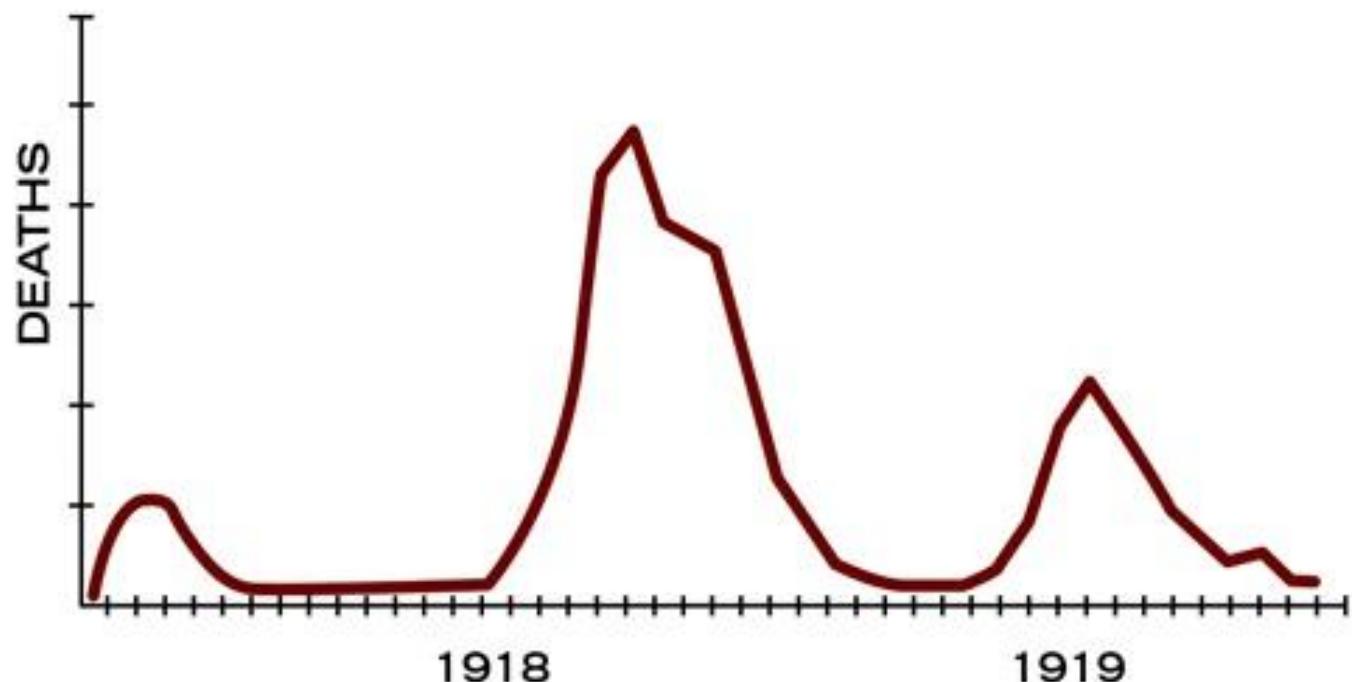
**“Those who cannot remember the past are condemned to repeat it” George Santayana**

- As with the last major pandemic to hit the United States (Spanish Flu of 1918) this pandemic has multi-faceted problems.
  - Medicine: The infection itself, pre-existing health conditions, treatment of patients.
  - Mental Health: How has the pandemic affected a person's mental well being. (Financial problems, worry of the health of self or loved ones, shutdown, lack of social interaction)
  - Economic: How will the economy recover (speed of recovery, full recovery or new normal economic expectations, job loss, retirement funds etc.)
  - Science: How the virus functions, transmits, and exists in our lives (the variables of which are in the thousands...environmental, population density, genetics etc)

# **Spanish Flu Pandemic-Are we ready for what's next in the COVID19 Pandemic?**

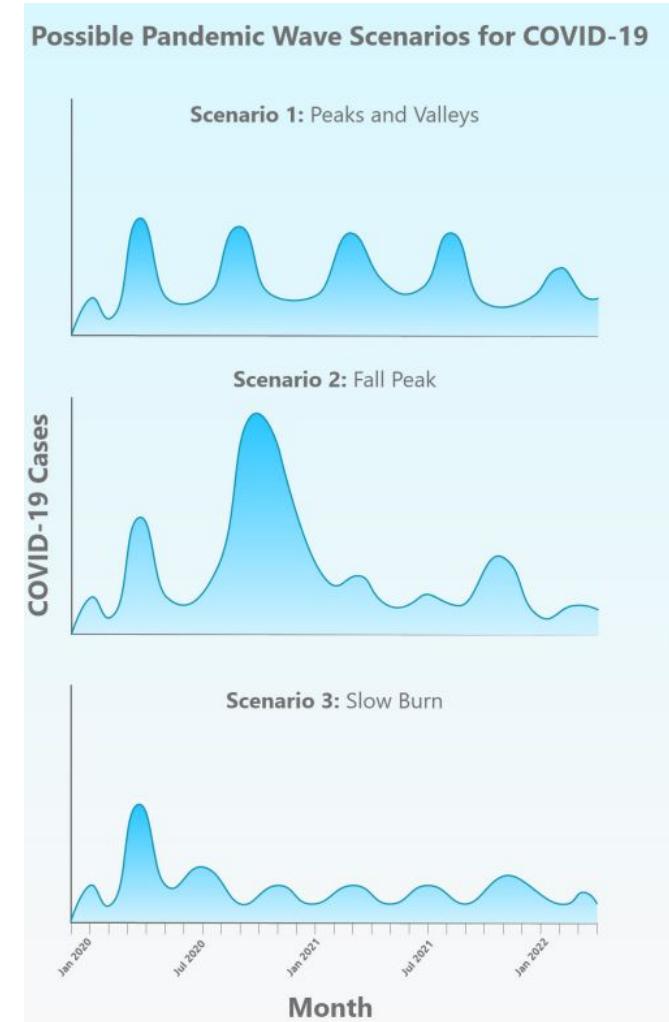
There were 3 different waves of illness during the pandemic, starting in March 1918 and subsiding by summer of 1919. The pandemic peaked in the U.S. during the second wave, in the fall of 1918. This highly fatal second wave was responsible for most of the U.S. deaths attributed to the pandemic.

**Waves of Illness of The Spanish Flu**



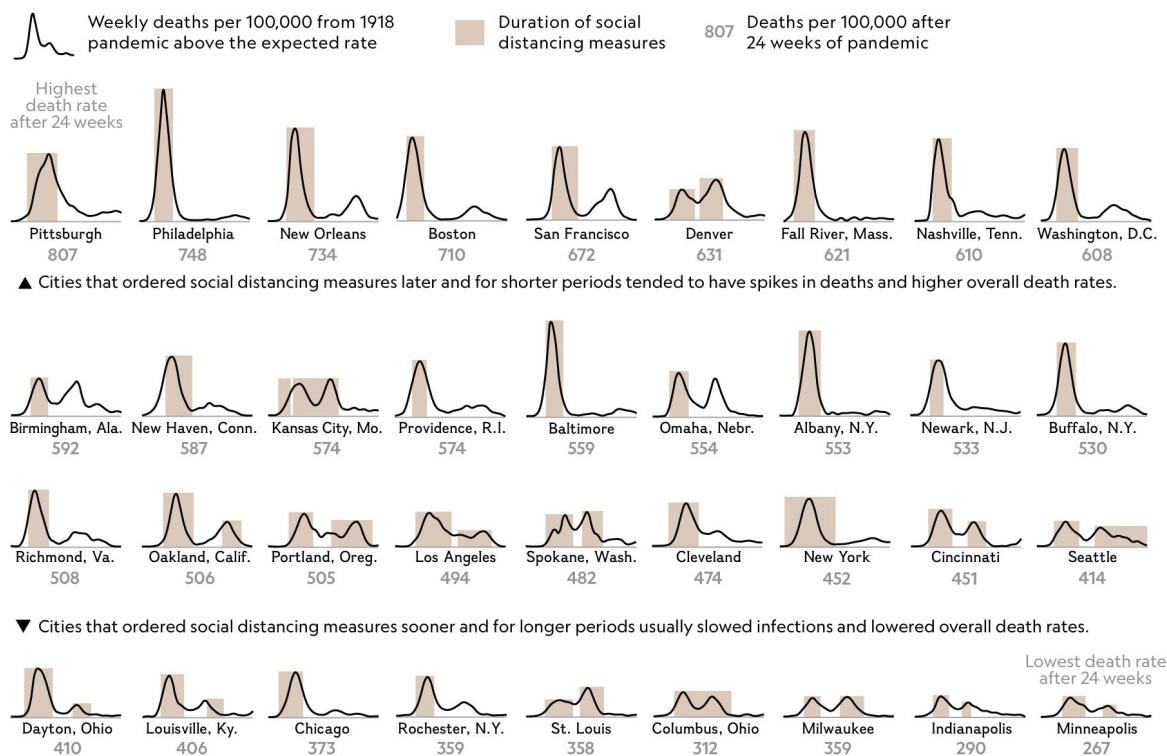
# *Into the next Wave....*

Waves of infection are very typical in many outbreaks, epidemics, and pandemics. What could happen...this is not all scenarios just a snapshot of different possibilities.



# Pandemic Response-Spanish Flu 1918

## First Wave Response of the Spanish Flu (from week 1 of first reported case to week 24)

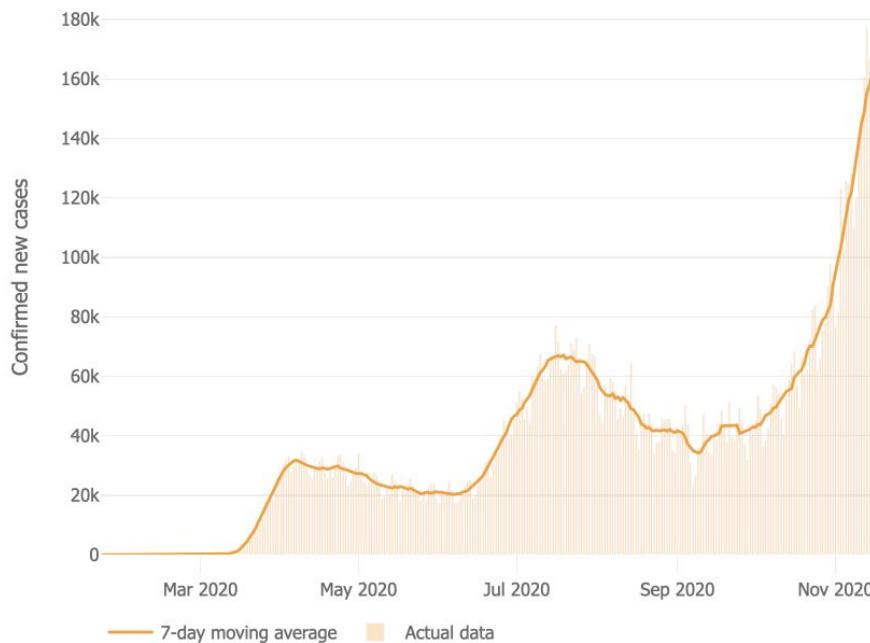


RILEY D. CHAMPIRE, NG STAFF. SOURCE: MARKEL H, LIPMAN HB, NAVARRO JA, ET AL. NONPHARMACEUTICAL INTERVENTIONS IMPLEMENTED BY US CITIES DURING THE 1918-1919 INFLUENZA PANDEMIC. JAMA.

Deaths are cumulative from week 1 to week 24. The earlier the social distancing measures were put into place and longer duration of those measures, the lower the death count after 24 weeks.

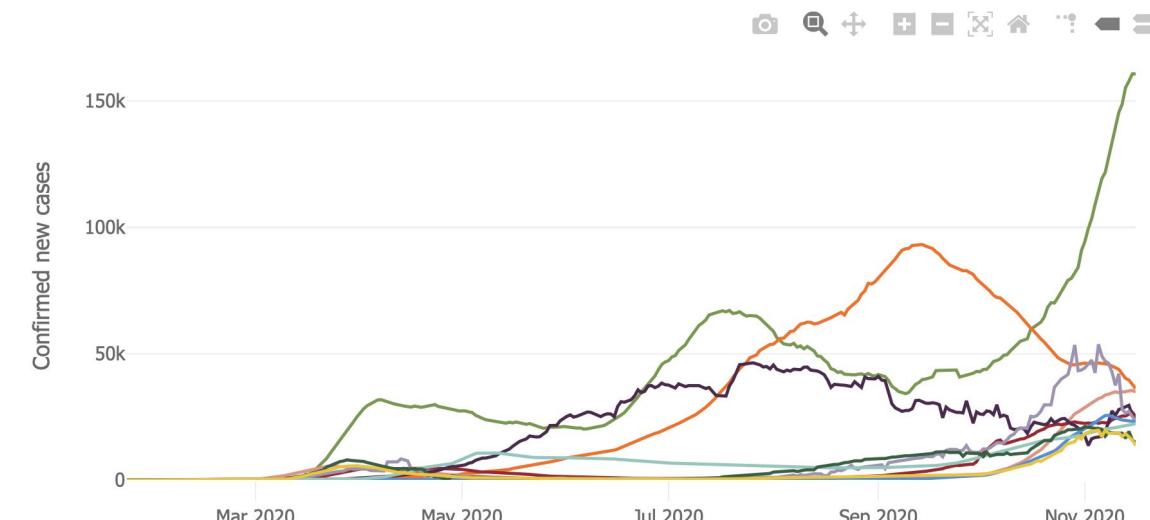
# COVID-19 Pandemic: United States Confirmed Cases

The first case of COVID-19 in US was reported 299 days ago on 1/21/2020. Since then, the country has reported 11,202,980 cases, and 247,202 deaths.



DAILY CONFIRMED NEW CASES (7-DAY MOVING AVERAGE)

Outbreak evolution for the current 10 most affected countries

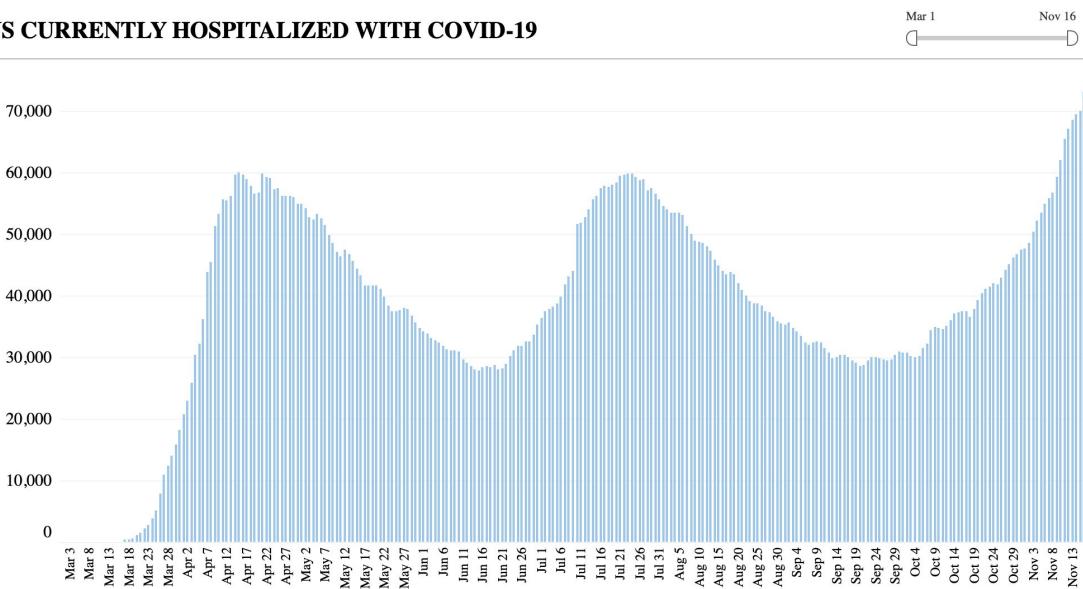


Click any country below to hide/show from the graph:

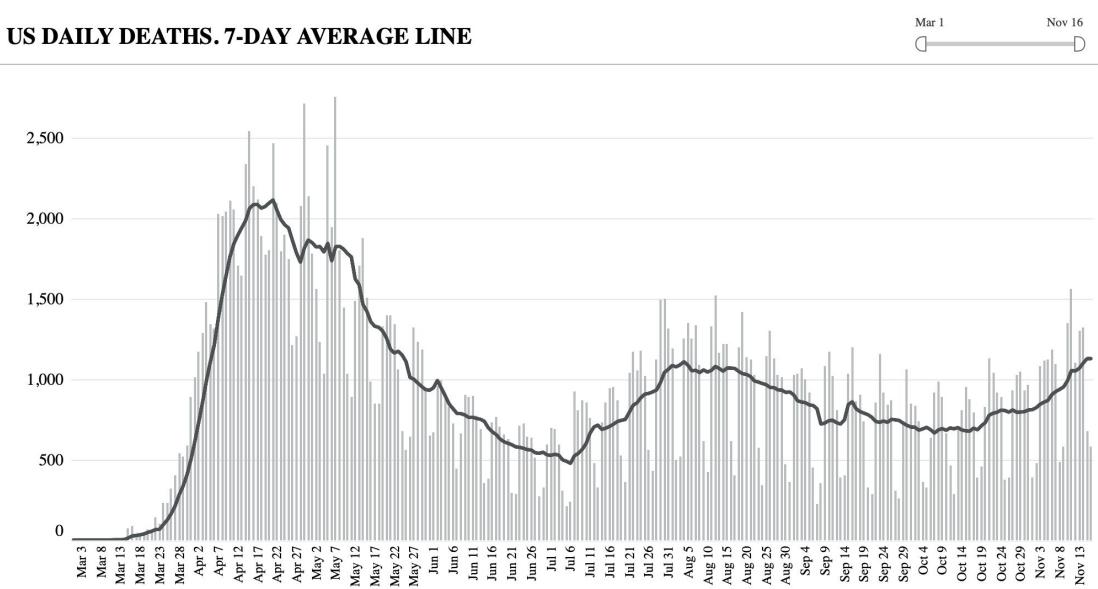
- |        |         |        |                |
|--------|---------|--------|----------------|
| US     | India   | Italy  | United Kingdom |
| Brazil | France  | Poland | Russia         |
| Spain  | Germany |        |                |

# *COVID-19 Pandemic: United States*

US CURRENTLY HOSPITALIZED WITH COVID-19



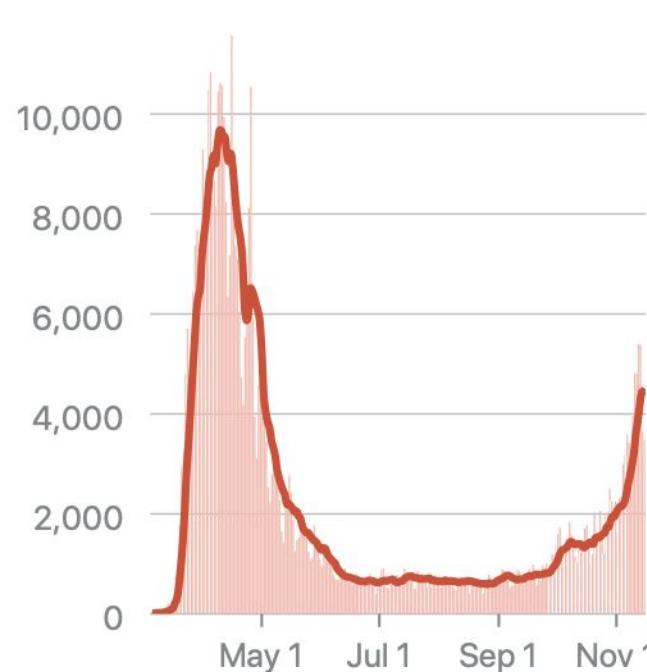
US DAILY DEATHS. 7-DAY AVERAGE LINE



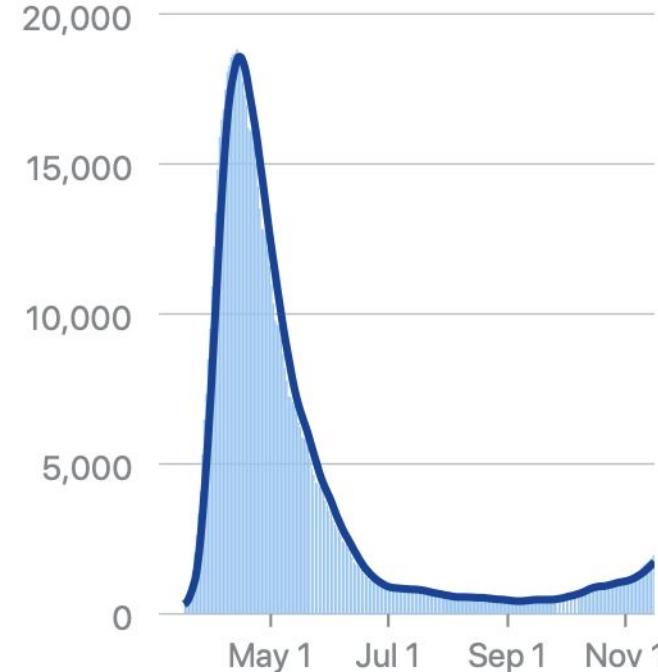
Notes: Deaths always lag behind infection. See the similarities in the hospitalized vs death. The death count is beginning to shift into that 3rd 'hump' of the graph as the hospitalized did.

# New York State Response:

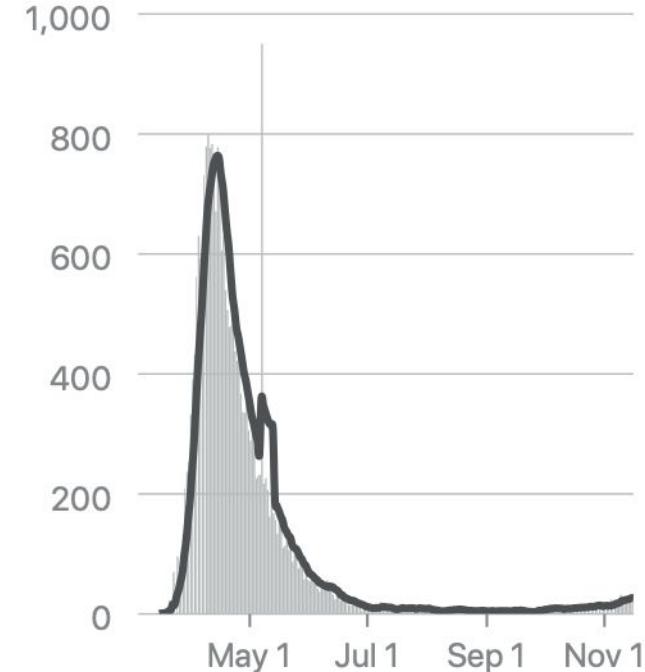
**New cases** (Calculated)



**Current hospitalizations**



**New deaths** (Calculated)



# **Springville: COVID19**

Following the same calculation introduced in the original powerpoint

- **4/27/2020**

Springville:  $(25/7728) \times 1000 = 3.23$  people infected per **1000** residents of Springville (or about 3 people per thousand)

- **7/10/2020**

Springville:  $(43/7728) \times 1000 = 5.56$  people infected per **1000** residents of Springville (or about 6 people per thousand)

- **11/16/2020**

Springville:  $(89/7728) \times 1000 = 11.52$  people infected per **1000** residents of Springville (or about 12 people per thousand)

# *Understanding the NYS Microcluster Plan:*

To compare one community to another community (or on a larger scale of county-to-county or state-to-state) you have to take into account the population differences. By doing so we can make comparisons of infectious cases in an area per 1000 people, or an even larger scale of per 100,000. New York State and Erie County are reporting numbers and plans based on 100,000 population.

Some of this data I have any time I want to view it, other data I have to wait for the county or state to report it. This is due to HIPAA regulations.

# *Understanding the NYS Microcluster Plan:*

The microcluster plan is based on data collected in a geographic area (county) and the demographic information (population). Based on the population of the county the county is placed into a Tier.

Erie County: Tier 1 (Population >900,000)

- Population: 918,702\*
- \* 2010 census

Then the positive cases and populations of individual communities come into play (See Following Slide)

# *Understanding the NYS Microcluster Plan:*

New York's "Micro-Cluster" strategy contains five key processes:

1. **Monitor Data:** Using the dozens of daily data inputs, including from tests, hospital admissions, transmission rate data, to closely monitor COVID impact, trends, and detect spread levels across New York State
2. **Identify Area of Concern & Create Specific Geographic Focus Area:** Using data monitoring to identify areas such as ZIPs, townships, census tracts, etc. that are experiencing a concerning increase in COVID spread, and then using epidemiological data to form a defined and specific geographic area that transcends traditional boundaries such as ZIPs, town lines, county borders, to create a specific zone for particular focus on reducing viral transmission
3. **Implement Cluster Zone Focus Area to Control the Virus:** Once geographic area has been formed, including buffer areas where necessary, implement appropriate restrictions relative to viral transmission, including pausing of non-essential economic activities, transition to remote education, limiting mass gatherings and attendance at houses of worship. In addition, increase community testing access and improve compliance enforcement mechanisms.
4. **Review Data:** Closely monitor data within focus area to track whether restrictions are reducing viral spread, and monitor data in neighboring buffer zones to ensure COVID is not spreading beyond cluster zone focus area.
5. **Adjust Restrictions:** Once data demonstrates COVID spread has decreased to a manageable level, ease restrictions, or if spread continues, tighten as needed

# *Understanding the NYS Microcluster Plan:*

Geographic Area	TARGET METRIC FOR ENTERING YELLOW PRECAUTIONARY ZONE	TARGET METRIC FOR ENTERING ORANGE WARNING ZONE	TARGET METRIC FOR ENTERING RED ZONE
<b>Tier 1</b> Geographic area (ZIP, census tract, etc.) is located within a county of 900,000 or more people or located within city of 90,000 or more people.  Included in Tier 1: New York City boroughs; Nassau, Suffolk, Westchester, Erie counties; cities of Buffalo, Rochester, Syracuse, Albany, Yonkers	Geographic area has 7-day rolling average positivity above 2.5% for 10 days  <u>AND</u>  Geographic area has 10 or more new daily cases per 100,000 residents on 7-day average	Geographic area has 7-day rolling average positivity above 3% for 10 days  <u>AND</u>  Geographic area has 10 or more new daily cases per 100,000 residents on 7-day average	Geographic area has 7-day rolling average positivity above 4% for 10 days  <u>AND</u>  Geographic area has 10 or more new daily cases per 100,000 residents on 7-day average

These geographic areas can be as broad (county level) or narrow ‘zoomed in’ (community). This is why some of Erie County is Yellow and not all of it. The plan allows for targeted restrictions based on positive cases per population and rate of positivity.

# *Understanding the NYS Microcluster Plan:*

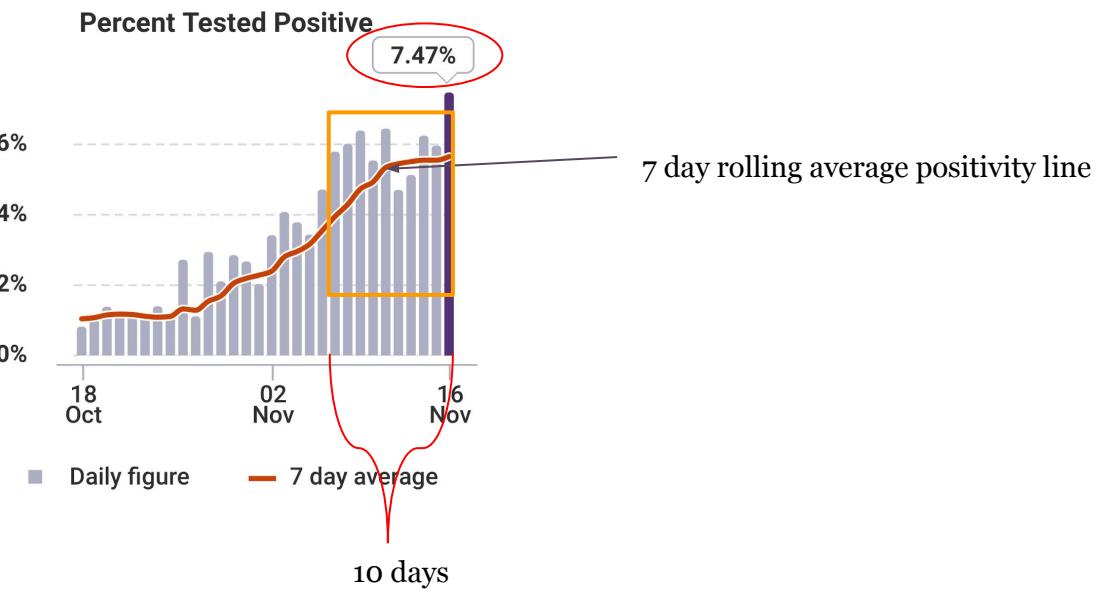
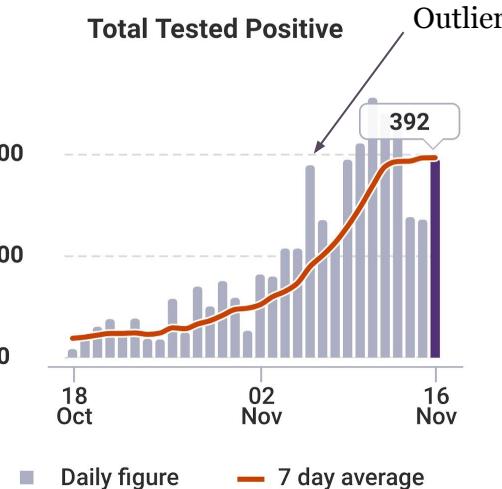
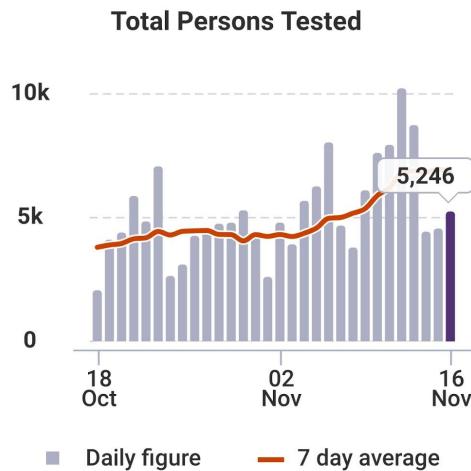
Type of Activity	RED	ORANGE (BUFFER & WARNING)	YELLOW (BUFFER & PRECAUTIONARY)
<b>Worship</b>	25% capacity 10 people maximum	33% capacity 25 people maximum	50% capacity
<b>Mass Gathering</b>	Prohibited	10 people maximum, indoor and outdoor	25 people maximum, indoors and outdoors
<b>Businesses</b>	Only essential businesses open	Closing high-risk non-essential business (gyms, personal care, etc.)	Open
<b>Dining</b>	Takeout/delivery only	Outdoor dining only, 4 person maximum per table	Indoor and outdoor dining, 4 person maximum per table
<b>Schools</b>	CLOSED Remote-only		Open Mandatory 20% weekly testing of students and teachers/staff for in-person settings.

# *Understanding the NYS Microcluster Plan:*

<b>Geographic Area</b>	<b>TARGET METRIC FOR ANY ZONE TO LEAVE ANY ZONE AREA</b>	<b>TARGET METRIC TO LEAVE ORANGE WARNING ZONE</b>	<b>TARGET METRIC TO LEAVE RED “MICRO-CLUSTER” ZONE</b>
<b>Tier 1</b> Geographic area (ZIP, census tract, etc.) is located within a county of 900,000 or more people or located within city of 90,000 or more people.  Included in Tier 1: New York City boroughs; Nassau, Suffolk, Westchester, Erie counties; cities of Buffalo, Rochester, Syracuse, Albany, Yonkers	Geographic area demonstrates decline in positivity (daily 7-day rolling average) over 10-day period AND has positivity below 1.5% (7-day rolling average) for at least 3 consecutive days at end of 10-day period.	Geographic area demonstrates decline in positivity (daily 7-day rolling average) over 10-day period AND has positivity below 2% (7-day rolling average) for at least 3 consecutive days at end of 10-day period.	Geographic area demonstrates decline in positivity (daily 7-day rolling average) over 10-day period AND has positivity below 3% (7-day rolling average) for at least 3 consecutive days at end of 10-day period.

# *Understanding the NYS Microcluster Plan:*

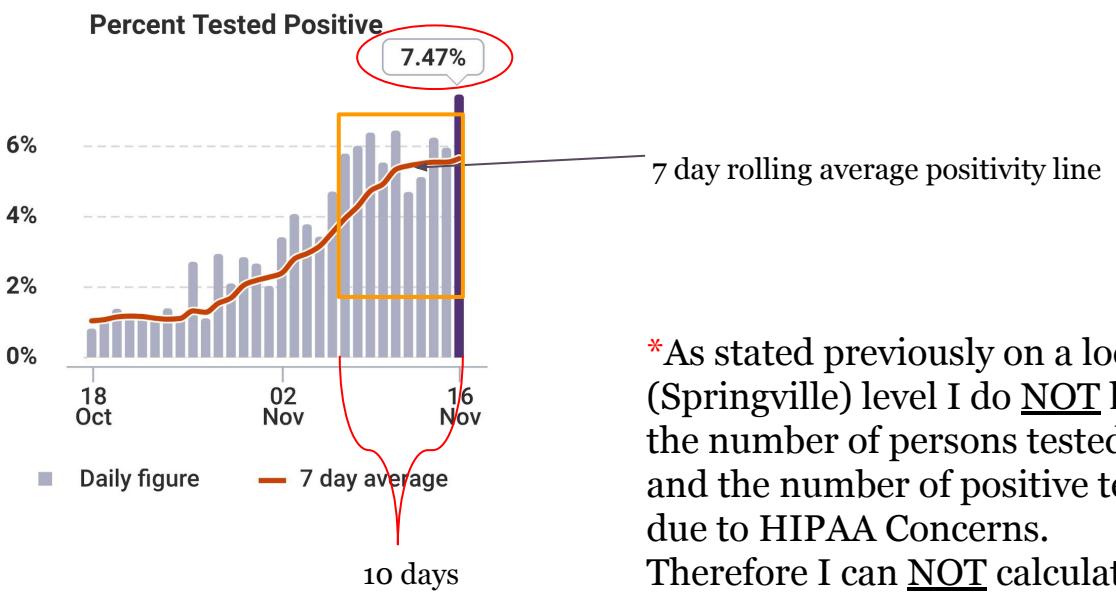
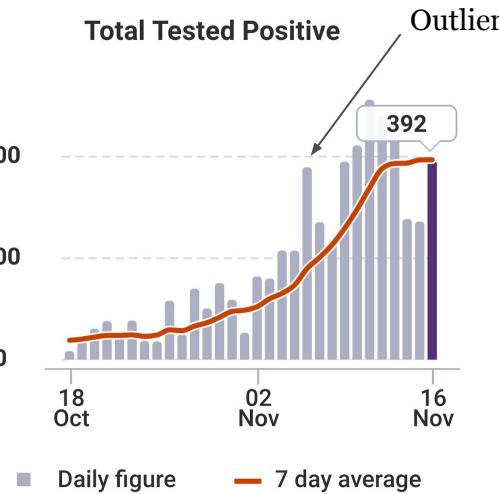
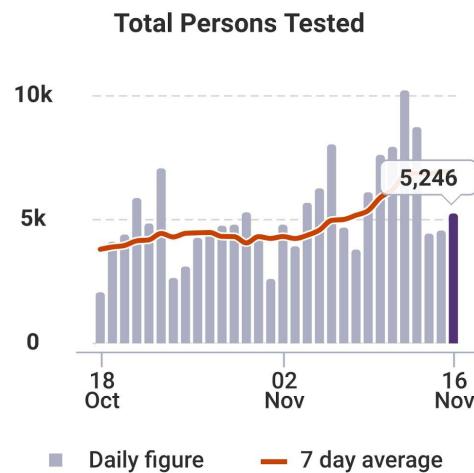
- What is a 7-Day Rolling Average Positivity Rate? (this is data for Erie County)



To calculate the percent positive: (Total Positive/Total Tested) x 100= percent tested positive

$$(392/5246) \times 100 = 7.47\%$$

# *Understanding the NYS Microcluster Plan:*



To calculate the 7-day rolling average positivity for 10 days: Add 10 days of percent positives together and divide by 10. If this average is above 2.5% we will enter microcluster plans.

\*As stated previously on a local (Springville) level I do NOT have the number of persons tested and the number of positive tests due to HIPAA Concerns. Therefore I can NOT calculate our positivity rate. I get the raw data from the county once a week during press conferences.

# *Understanding the NYS Microcluster Plan:*

## **Springville and our neighboring communities 11/16/20**

Zip Code	Community	New Active Cases 11/16/20	2010 Zip Code Population	New Daily Cases per 100,000 Population on 7 Day Average*
14075	Hamburg	234	41937	79.7
14127	Orchard Park	109	29961	52.0
14057	Eden	30	8116	52.8
14085	Evans	29	7353	56.3
14141	Springville	15	7728	27.7
14025	Boston	11	3039	51.7
14111	North Collins	11	3352	46.9
14080	Holland	9	4330	29.7
14070	Gowanda	7	6732	14.9
14091	Lawtons	5	1079	66.2

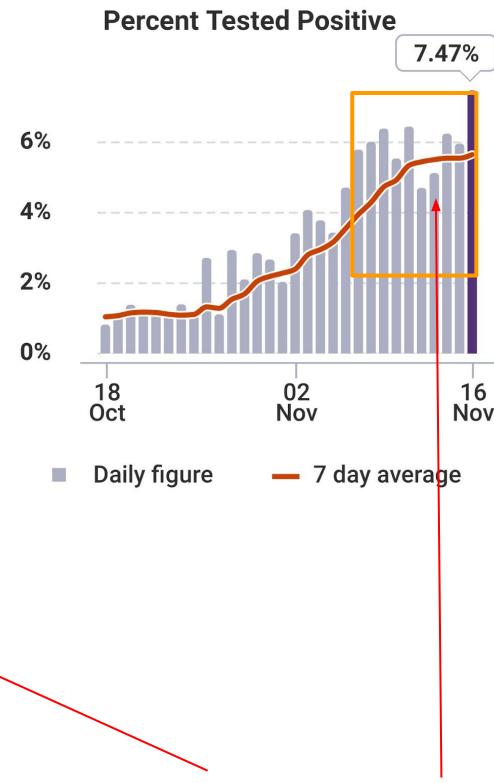
\* This number is the number we need to be focused on. This number needs to be under 10 for us to stay out of the yellow zone.

Due to HIPAA regulations I can not view daily data on positivity rate for Springville (14141 Zip Code). I do however get alerts weekly on the positivity rate of our zip code.

# *Understanding the NYS Microcluster Plan:*

## DATA THAT MATTERS

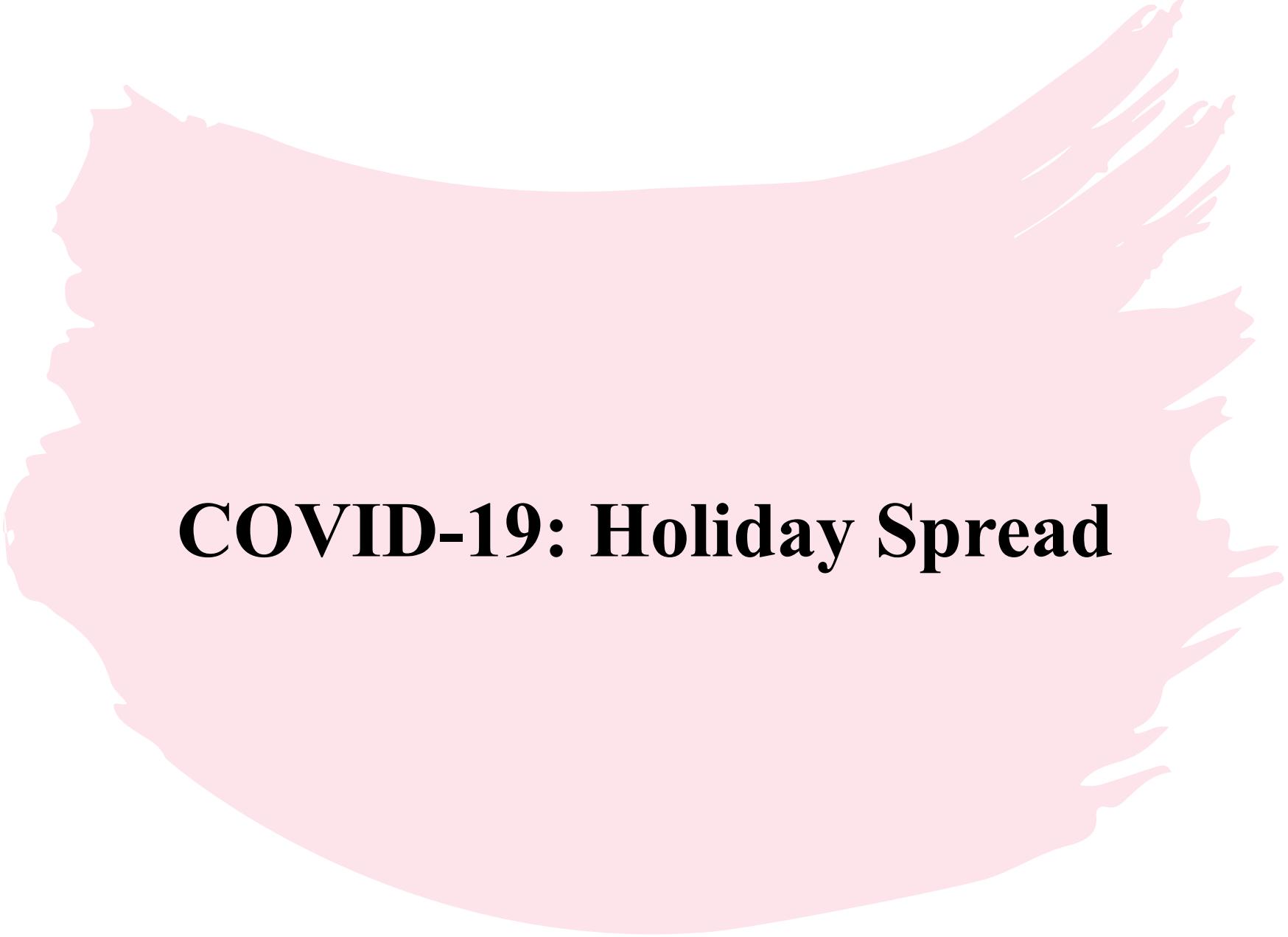
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14070	Gowanda	7	6732	14.9
14091	Lawtons	5	1079	66.2



Need to be less than 10

Need to be less than 2.5% Average

To not be listed in yellow, orange, or red zones the New Daily cases needs to be <10 AND the 7-Day rolling average for 10 day average needs to be less than 2.5%



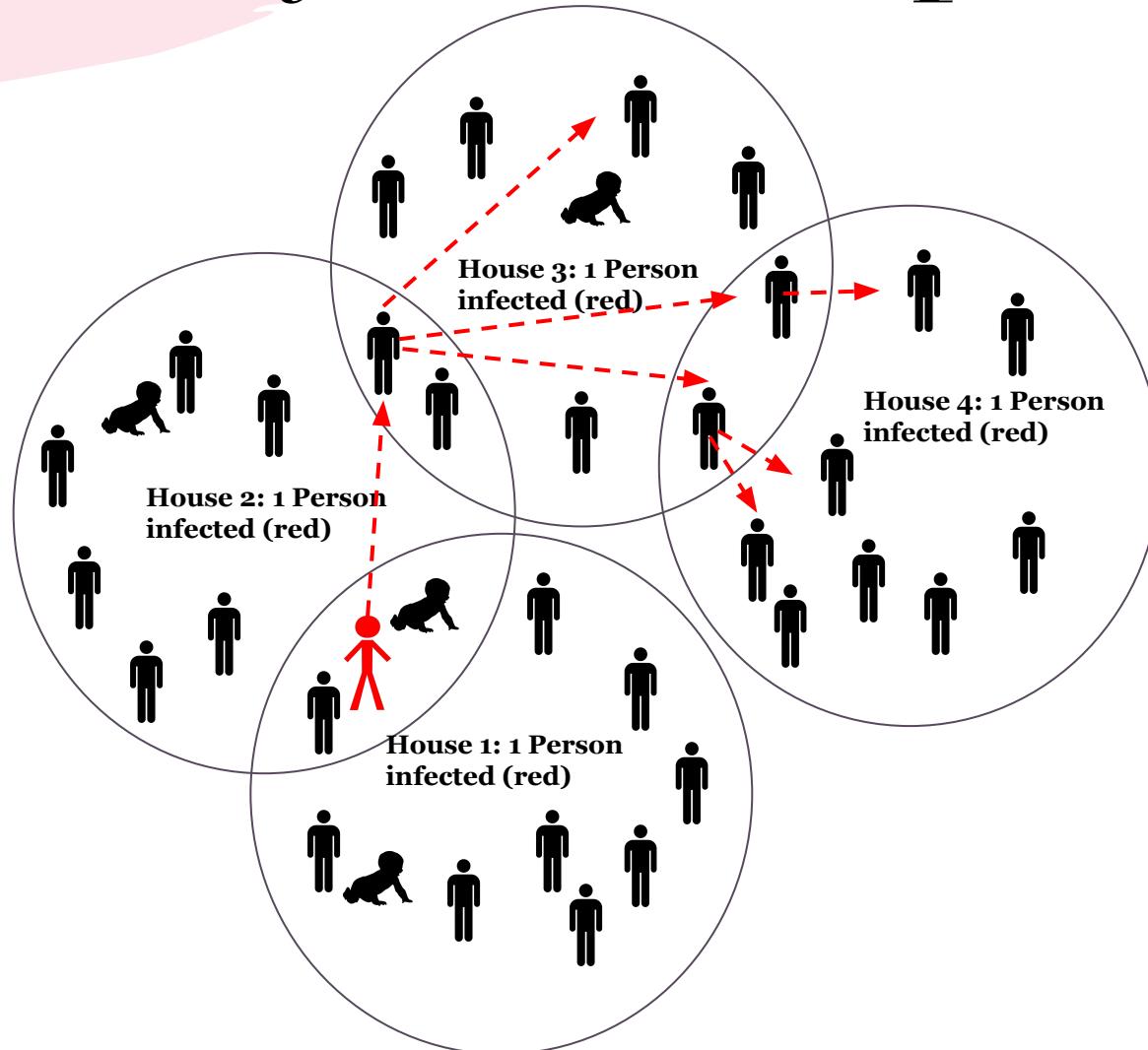
# **COVID-19: Holiday Spread**

# *Holiday COVID-19 Spread*

Why are experts worried about people gathering for the holidays?

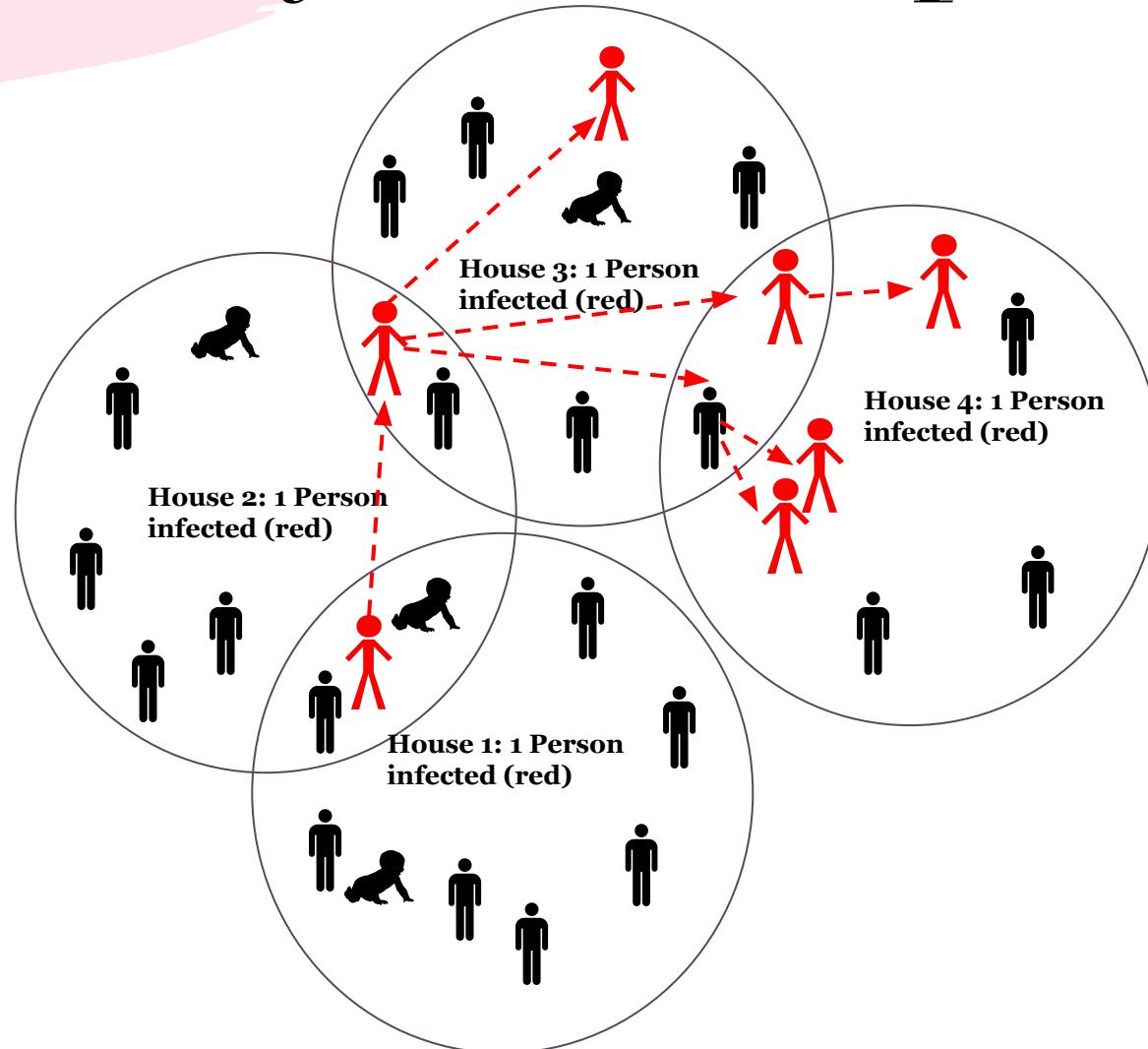
- Living Room Spread: Small gatherings of people to where at least 1 person is unknowingly infected and spreads the infection to others in that gathering.
- Now with holidays coming and people going to multiple houses in either the same day or over the course of a few days the small gathering actually turns into many infected from a single person versus just a few from the single small gathering.

# *Holiday COVID-19 Spread*



**Holiday Spread:** Even though no house has more than 10 people gathering, 1 infected person that shares between 2 houses has now infected a total of 4 houses.

# Holiday COVID-19 Spread

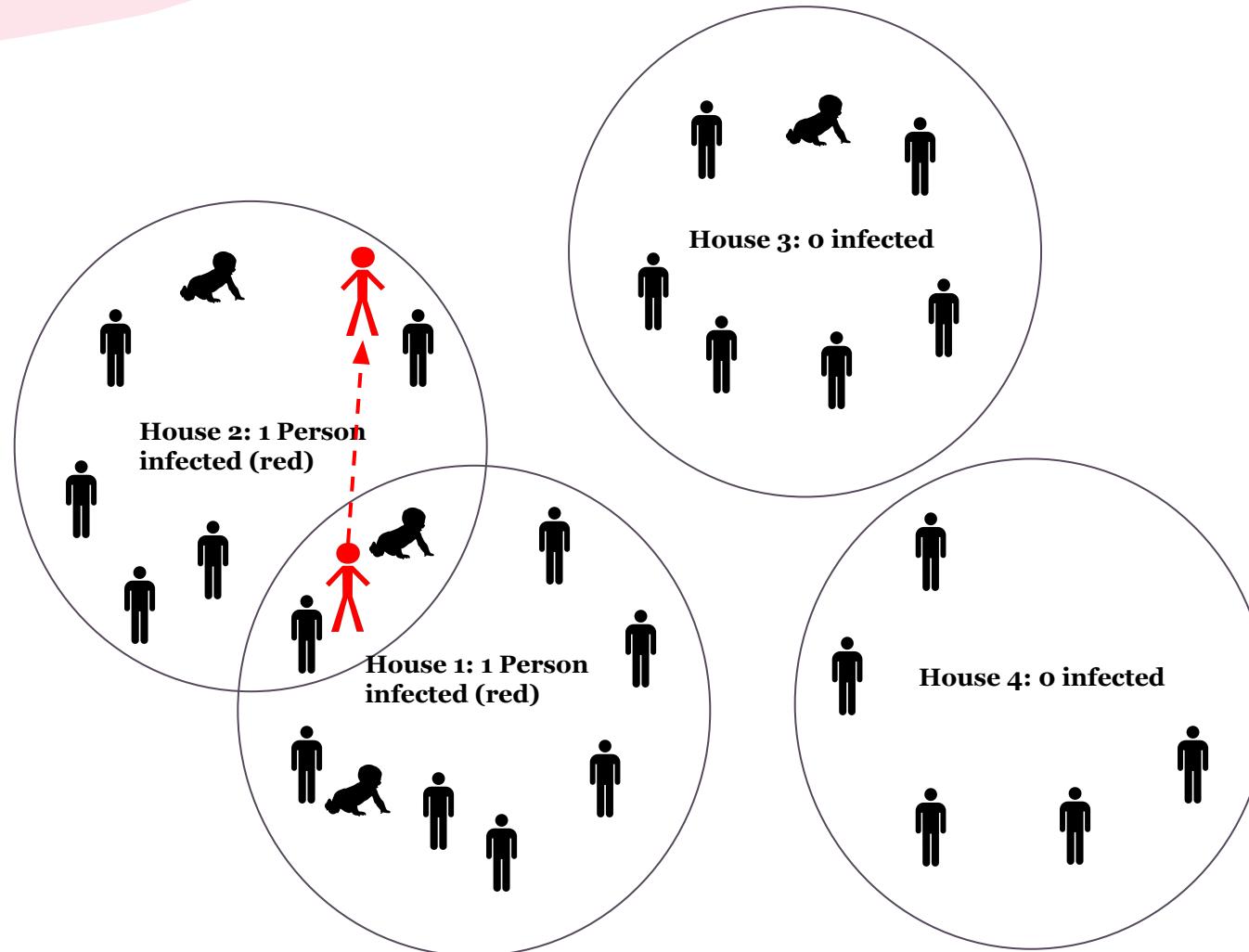


**Holiday Spread:** Even though no house has more than 10 people gathering, 1 infected person that shares between 2 houses has now infected a total of 4 houses.

This ultimately leads to a mass gathering exposure risk of 31 people even though no house had more than 10.

Now if each house has more than 10, one could see how out of control the infection could become.

# *Holiday COVID-19 Spread*



Holiday Spread: If you limit to just your house gathering and infection positivity rates decreases drastically

# *How Long Will This Pandemic Last*

This is a very difficult question to answer. Variables such as treatment and vaccine development play a key role. Many scientific community members suggest another 1-2 years until we can safely say the Pandemic is over. We will be in waves of infection for 1-2 years and should plan on periodic interruptions of business, education, and normalcy throughout this time period.

# *COVID-19: Summary*

- COVID19 is a virus that can be regulated by measures we as the general public should take. Following all recommendations handed down from local, state, and federal agencies to slow the spread.
- COVID19 does **NOT NEED TO BE FEARED** but demands **RESPECT**
  - This is not the worst virus out there however, with all of the aspects of transmission, death rate, complication rates etc. We need to pay attention and be more aware of our surroundings and personal hygiene.

This power point was formed in part by the following resources:

- CDC, NIH, WHO, NYSDOH, ERIE COUNTY DEPARTMENT OF HEALTH
  - Publications whether press releases or research journal articles
- News Media outlets, college and university websites
- My educational and experience background

# ***COVID-19: Summary***

- IF you have any concerns or questions please contact via email as this is the most efficient method of communication for me.

[gstowell@buffalo.edu](mailto:gstowell@buffalo.edu)

**THANK YOU, STAY SAFE AND HEALTHY!**