

COVID-19: An Update for the Research Community

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Disclosures

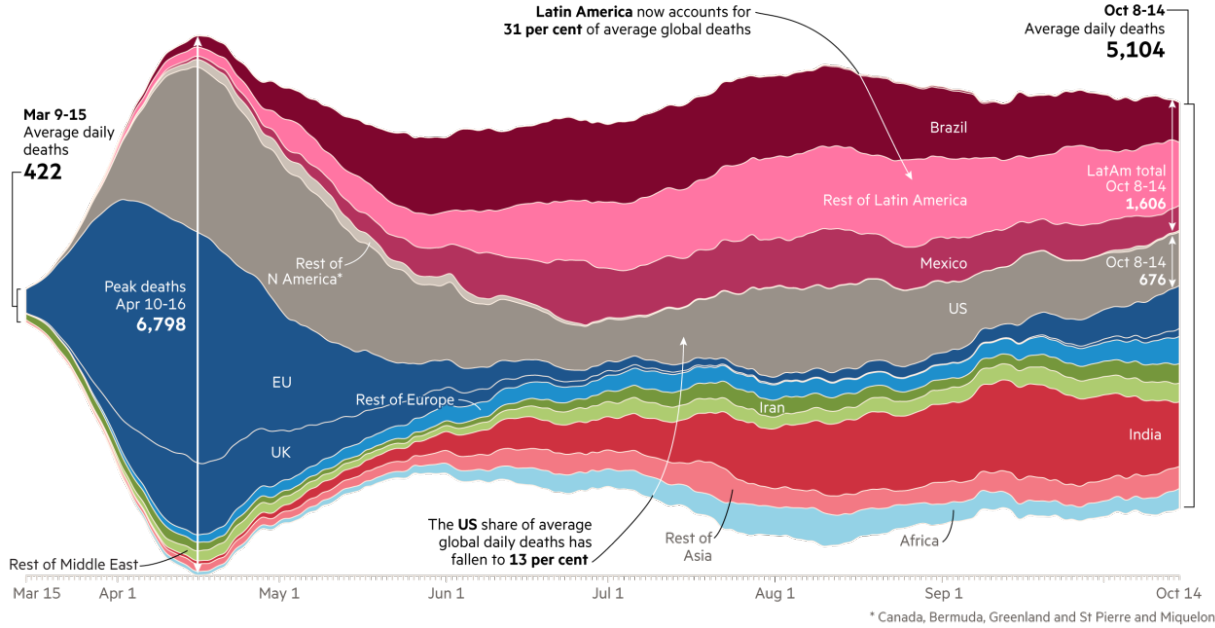
- Research Support^o
 - AiCuris, Janssen, Shire
- Paid Consultation
 - Adagio, AlloVir, Celltrion, Cidara, Genentech/Roche, Janssen, Shionogi, Viracor Eurofins
- Unpaid Consultation
 - Romark
- Data & Safety Monitoring Board Participation
 - NIH, Janssen, Merck, SAB Biotherapeutics, Sequiris, Takeda, Vitaeris

COVID-19 Update

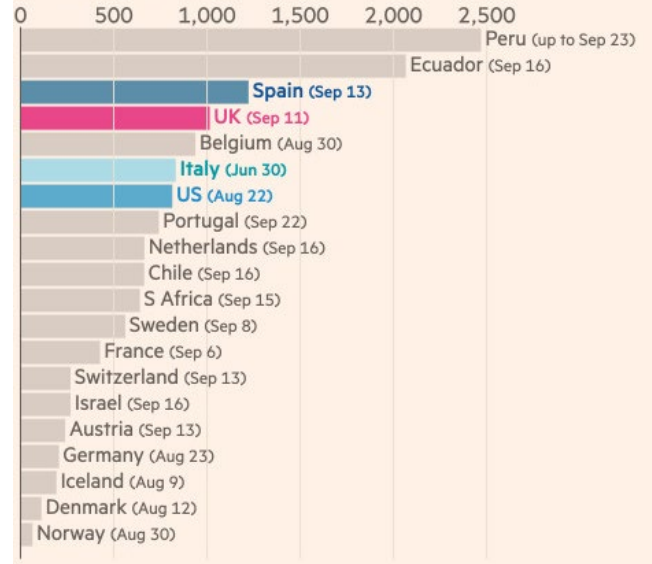
- Epidemiology
- Prevention
 - Masking and social distancing
 - Vaccines
- Treatment Options
- What to Expect from the Flu Season

COVID-19: Current Global Situation

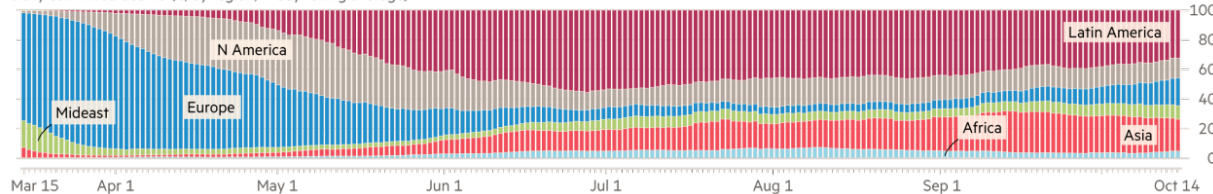
Daily deaths of patients diagnosed with coronavirus (7-day rolling average)



Total excess deaths per million people

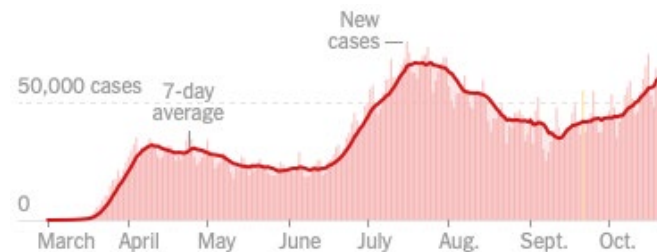
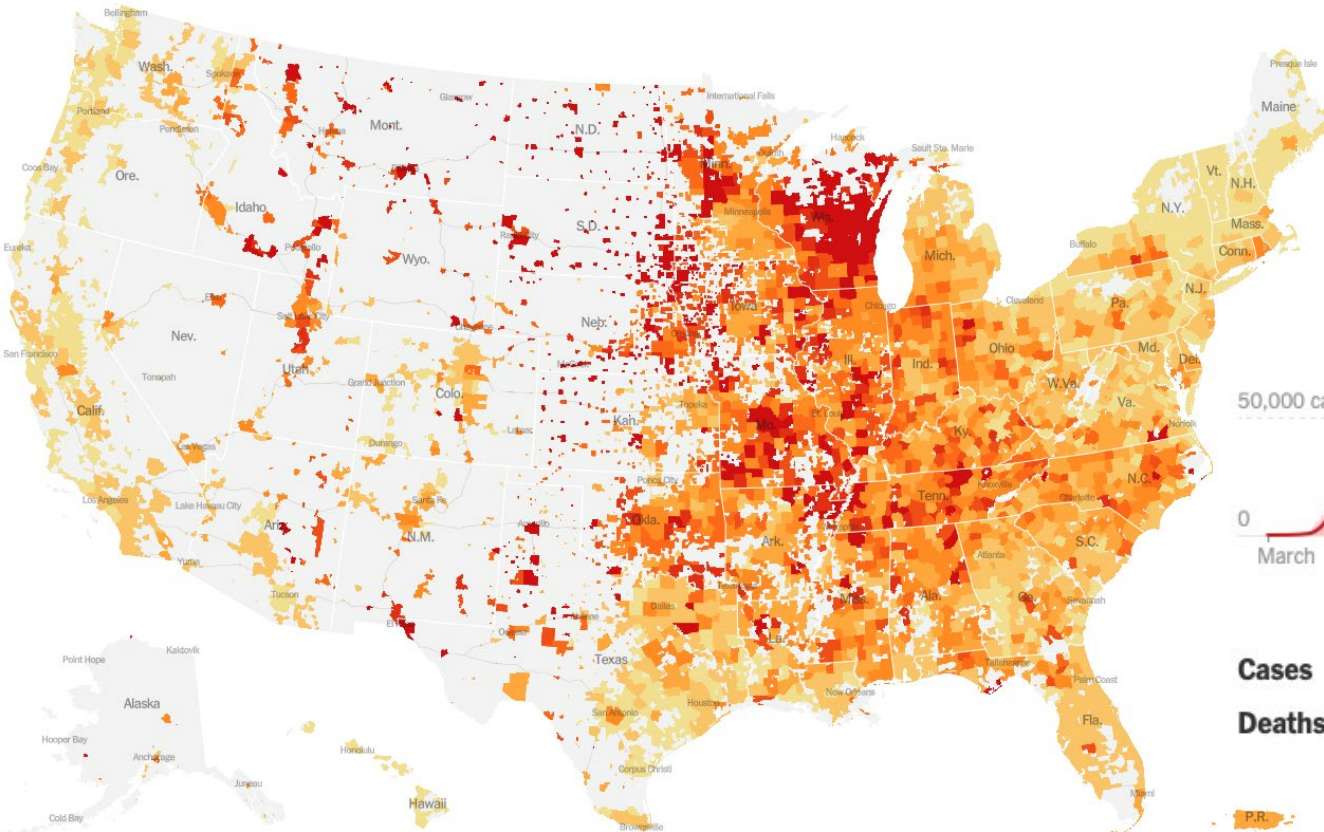


Daily confirmed deaths (% by region, 7-day rolling average)



COVID-19: Current Situation in the United States

How the number of new cases has changed in the last two weeks

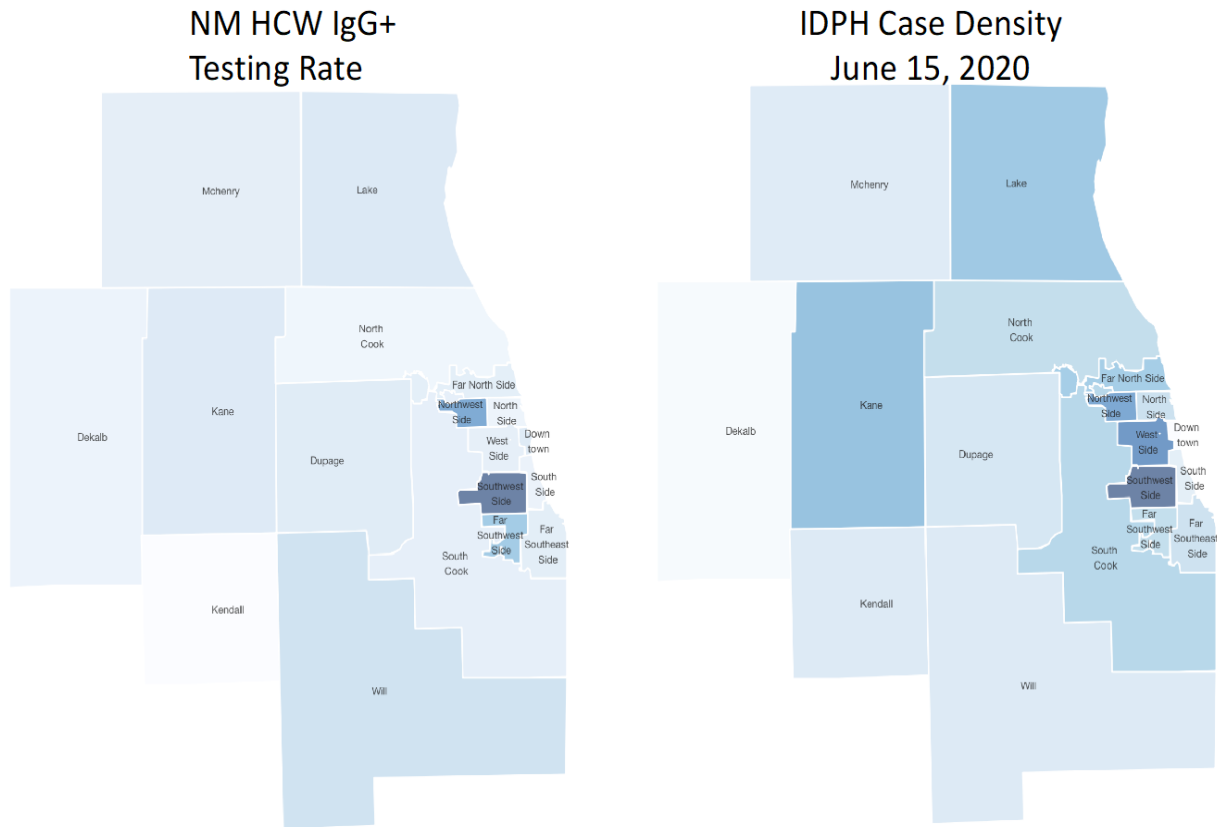


| | TOTAL REPORTED | ON OCT. 20 | 14-DAY CHANGE |
|---------------|---------------------|---------------|---------------|
| Cases | 8.3 million+ | 60,598 | +36% → |
| Deaths | 220,987 | 929 | +7% → |

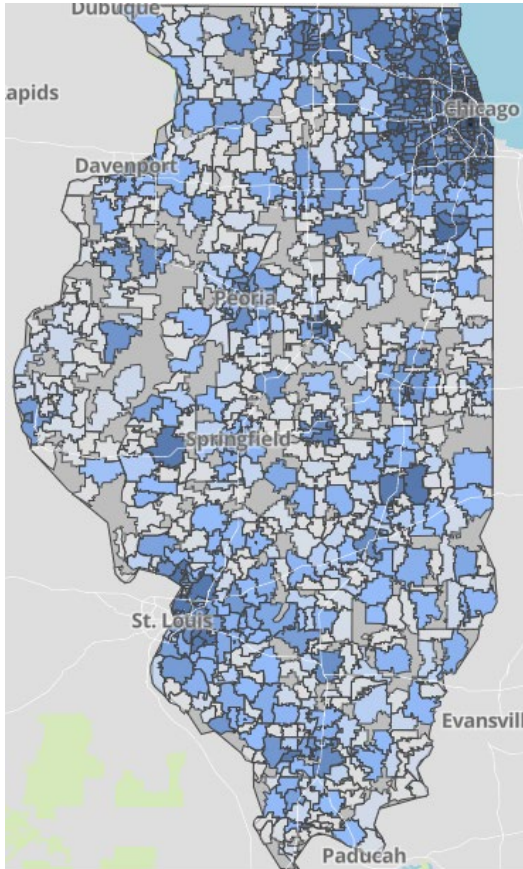
Seropositivity of NM Employees: *Seroprevalence Rate 4.8%*

| Characteristics | IgG Positive % (95% CI) | Total (N) |
|-------------------------------------|-------------------------|-----------|
| Age Category | | |
| - N | 316 | 6510 |
| - 18-29 | 97 (7.4%, 6.1 - 9%) | 1304 |
| - 30-39 | 97 (4.4%, 3.6 - 5.3%) | 2208 |
| - 40-49 | 60 (4.4%, 3.4 - 5.6%) | 1368 |
| - 50-59 | 47 (4.5%, 3.3 - 6%) | 1042 |
| - 60+ | 15 (2.6%, 1.4 - 4.2%) | 588 |
| Gender | | |
| - N | 316 | 6510 |
| - Female ^a | 256 (4.9%, 4.4 - 5.6%) | 5180 |
| - Male | 60 (4.5%, 3.5 - 5.8%) | 1330 |
| Race/Ethnicity | | |
| - N | 316 | 6510 |
| - Asian | 29 (4.6%, 3.1 - 6.5%) | 634 |
| - Hispanic/Latino | 46 (9.6%, 7.1 - 12.7%) | 477 |
| - Non-hispanic Black | 17 (8.5%, 5 - 13.2%) | 201 |
| - Non-hispanic White | 212 (4.3%, 3.8 - 5%) | 4877 |
| - Other/Multiracial/NA ^b | 12 (3.7%, 1.9 - 6.4%) | 321 |

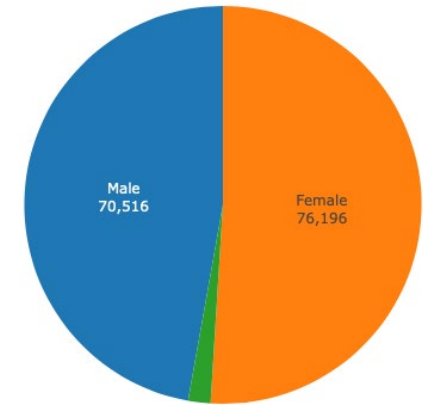
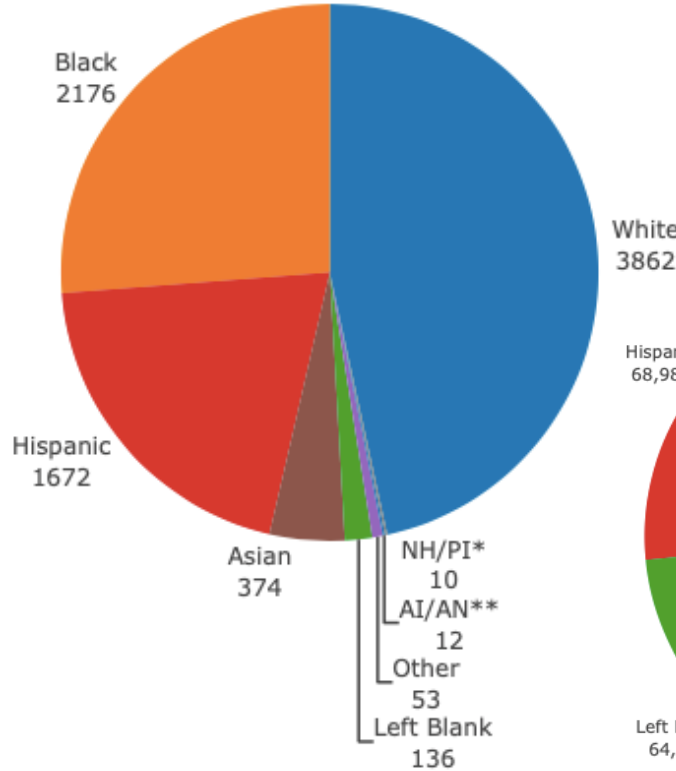
Seropositivity by Neighborhood: *NM HCW vs. IDPH Data*



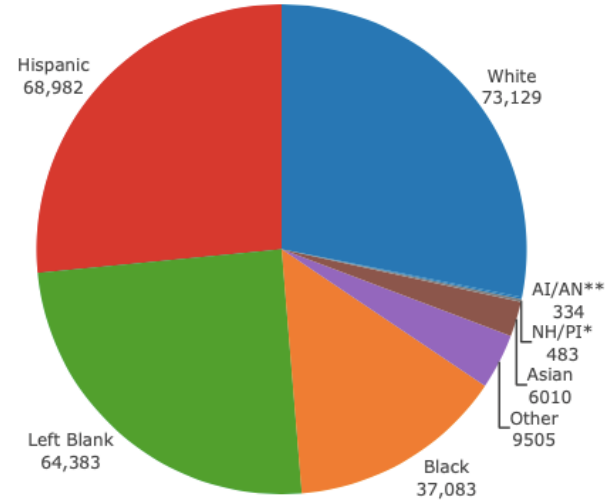
COVID-19: Illinois Situation



Race: *Death*

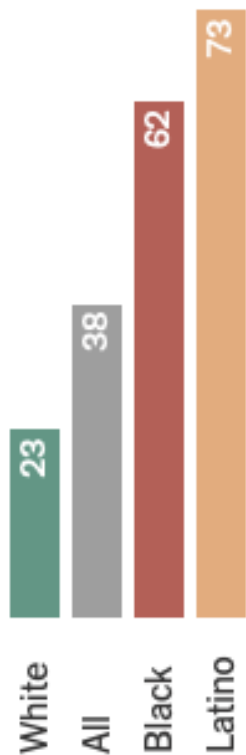


Race: *Diagnosis*

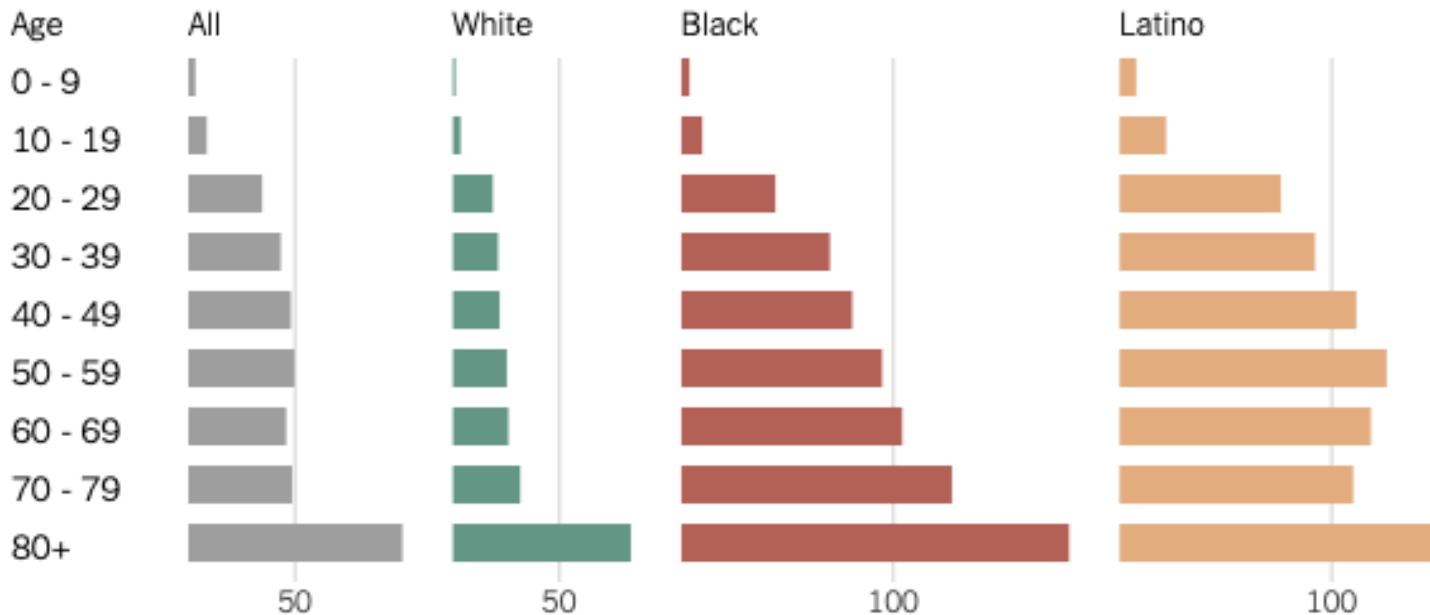


COVID-19: Special Populations - Minorities

Coronavirus cases per 10,000 people



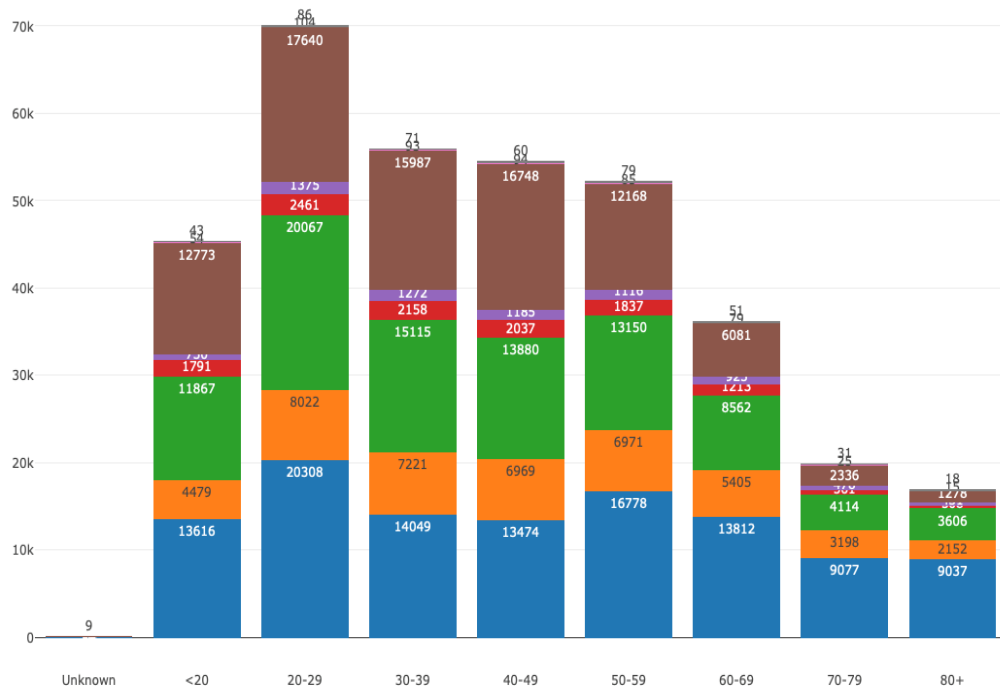
Coronavirus cases per 10,000 people, by age and race



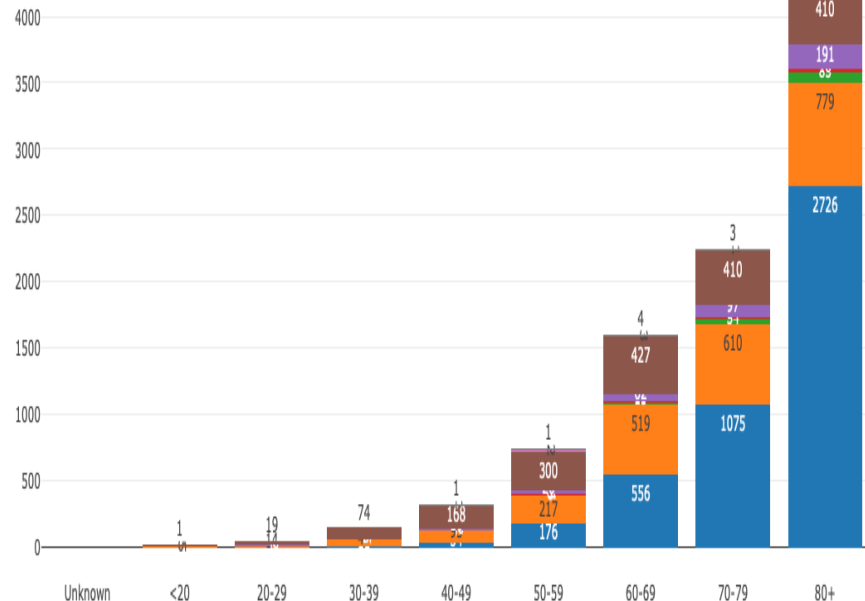
Source: Centers for Disease Control and Prevention | Note: Data is through May 28.

COVID-19: Illinois Situation

Diagnosis by Age

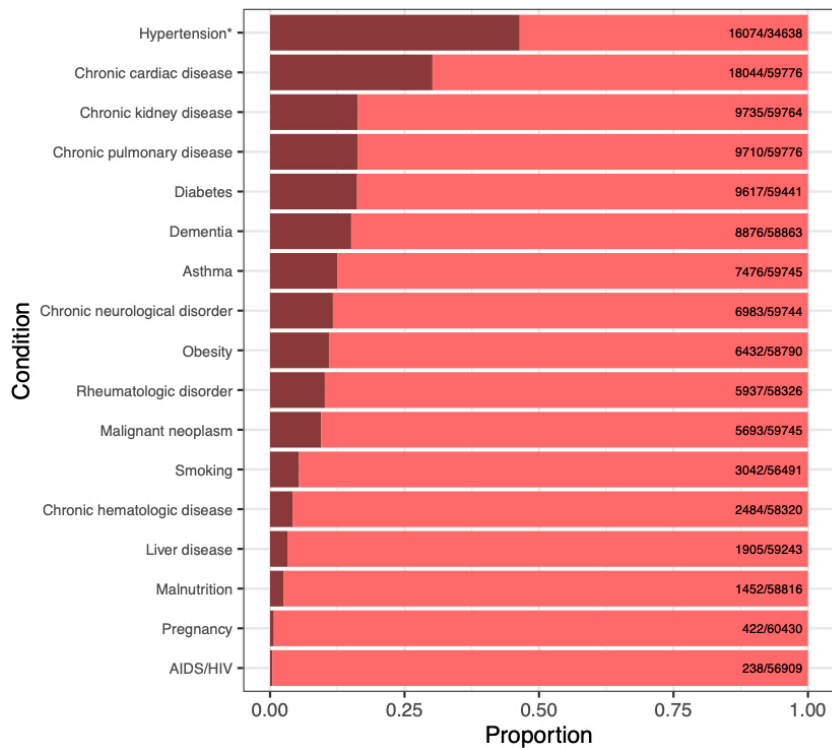


Death by Age

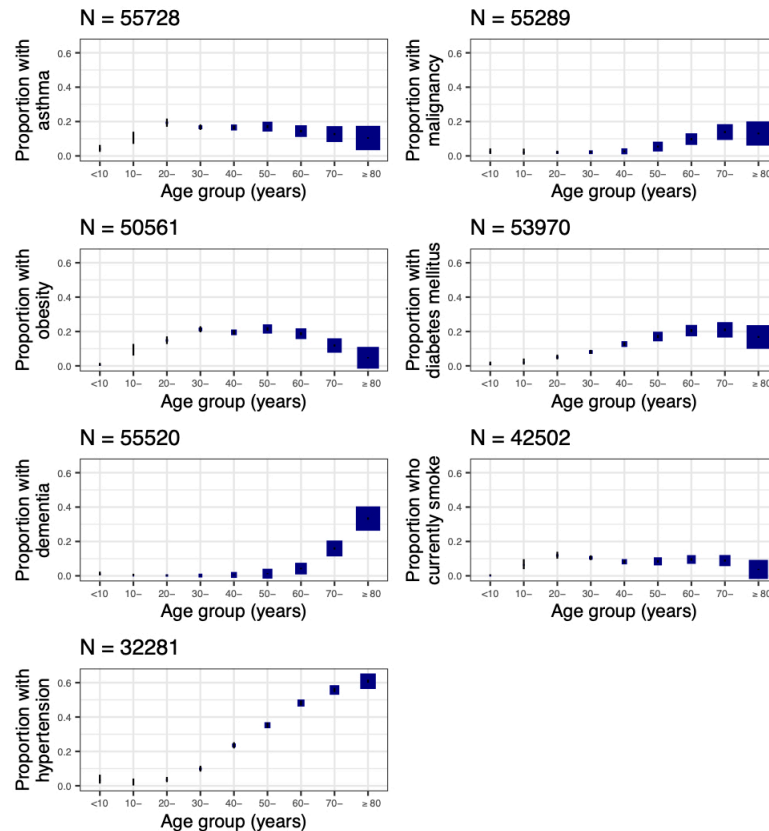


■ Total
 ■ AI/AN**
 ■ NH/PI*
 ■ Hispanic
 ■ Asian
 ■ Other
 ■ Left Blank
 ■ Black
 ■ White

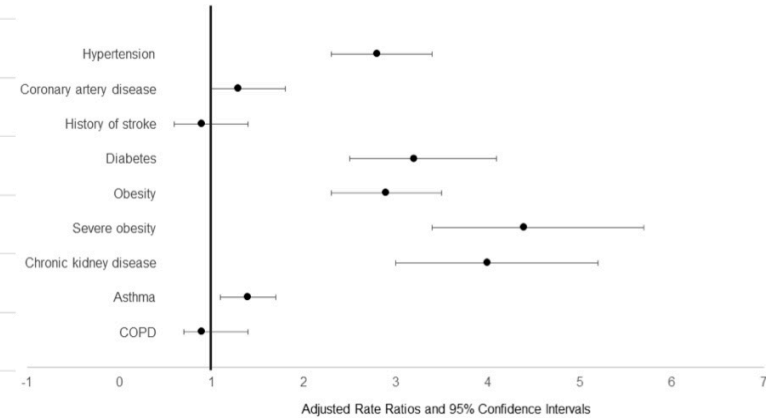
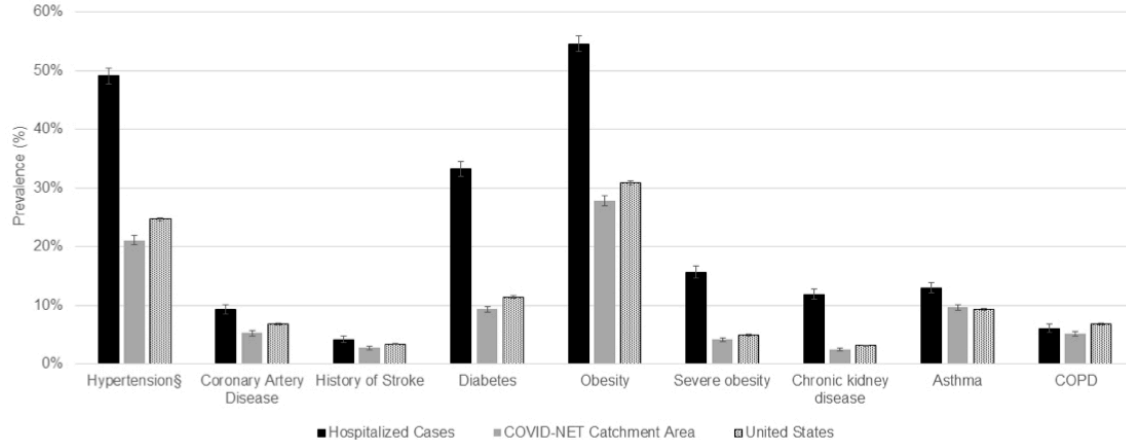
COVID-19: Epidemiology – Co-Morbidity



Condition present
■ No
■ Yes



COVID-19 and Risk of Hospitalizations

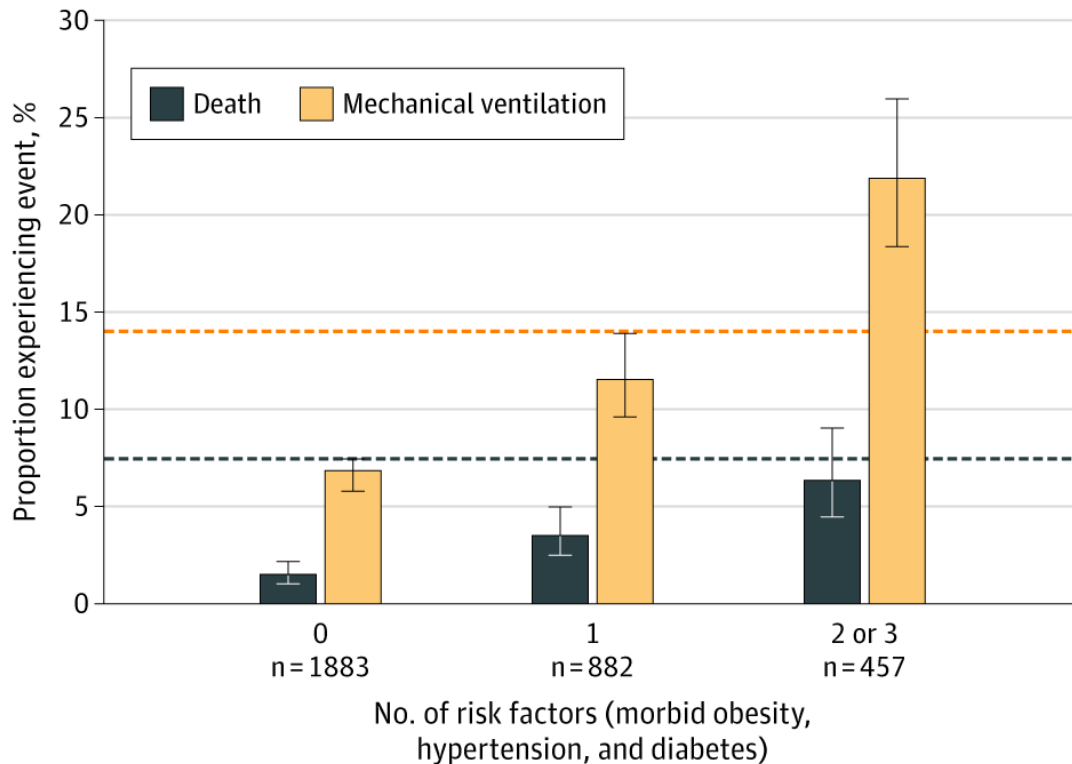
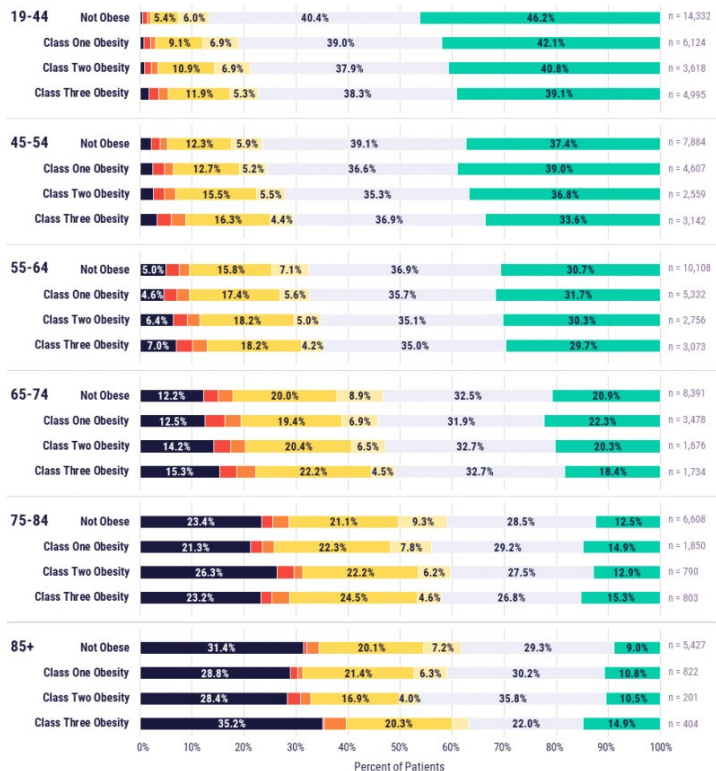


| Factor | Unadjusted Rate Ratio (95% CI) | Adjusted Rate Ratio (95% CI) |
|-----------------------|--------------------------------|------------------------------|
| 1 Medical Condition | 2.8 (2.7, 3.1) | 2.5 (2.1, 3.0) |
| 2 Medical Conditions | 5.6 (5.2, 6.1) | 4.5 (3.7, 5.5) |
| 3+ Medical Conditions | 7.2 (6.6, 7.9) | 5.0 (3.0, 6.3) |
| Age 45-65 years | | 1.8 (1.5, 2.2) |
| Age >65 years | | 2.6 (2.1, 3.1) |
| Non-Hispanic Black | | 3.9 (3.3, 4.7) |
| Other Race/Ethnicity | | 3.3 (2.8, 3.9) |

COVID-19: Special Populations - Obesity

● Death ● Ventilator - Admitted ● Advanced O₂ - Admitted ● Basic O₂ - Admitted ● No O₂ - Admitted ● Unknown Outcome ● Never Admitted

Age



COVID-19: Symptoms



Symptoms can range from mild to severe illness, and appear 2-14 days after you are exposed to the virus that causes COVID-19.

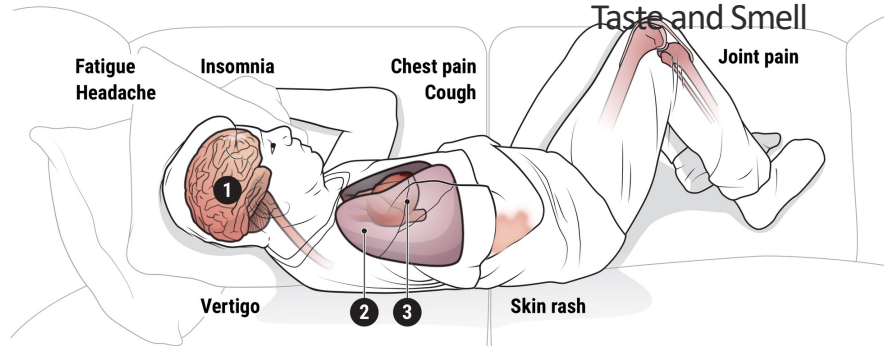
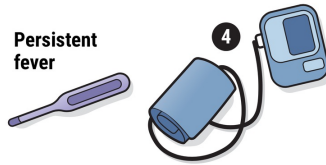
Seek medical care immediately if someone has emergency warning signs of COVID-19.

- Trouble breathing
- Persistent pain or pressure in the chest
- New confusion
- Inability to wake or stay awake
- Bluish lips or face

Long-Term Complications of COVID-19

Pain that lingers

A subset of COVID-19 patients experiences ongoing symptoms and complications such as organ damage, and researchers are proposing reasons for some of them (bottom). Scientists are trying to identify such symptoms, how common they are, how long they last, who's at risk, and how to treat and prevent them.



1 Brain fog

Difficulty thinking can occur after acute COVID-19 infection. The virus may damage brain cells, and inflammation in the brain or body may also cause neurologic complications. Other viral infections can also lead to brain fog.

2 Shortness of breath

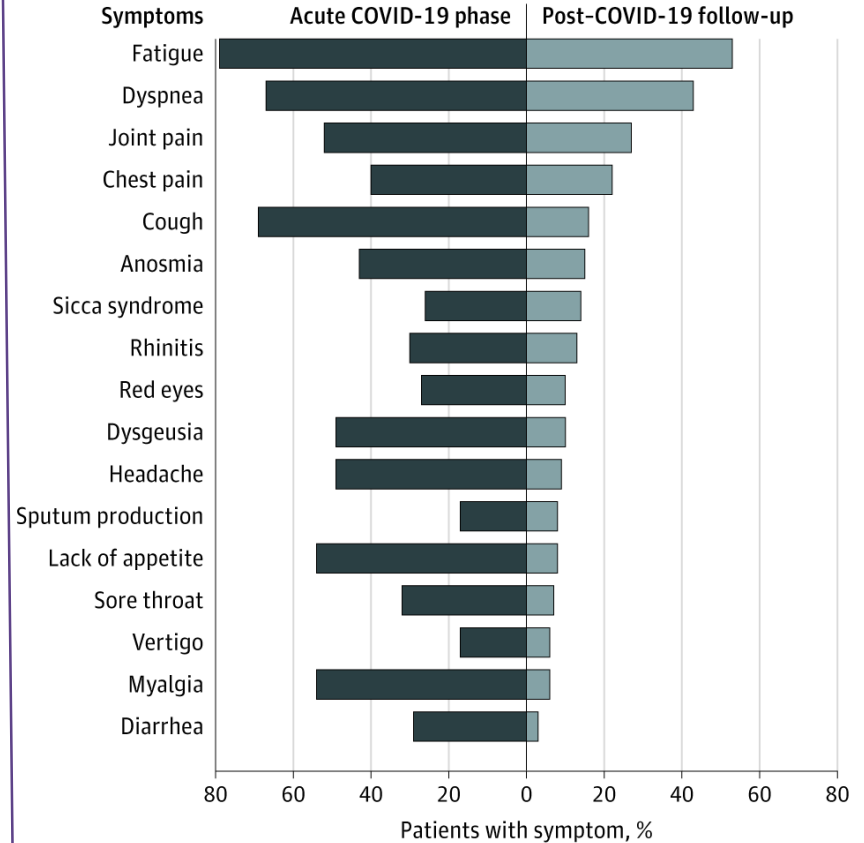
Doctors are eyeing lung and heart complications including scarring. Patients who become critically ill with COVID-19 seem more likely to have lingering shortness of breath, but those with mild cases are also at risk.

3 Heart arrhythmia

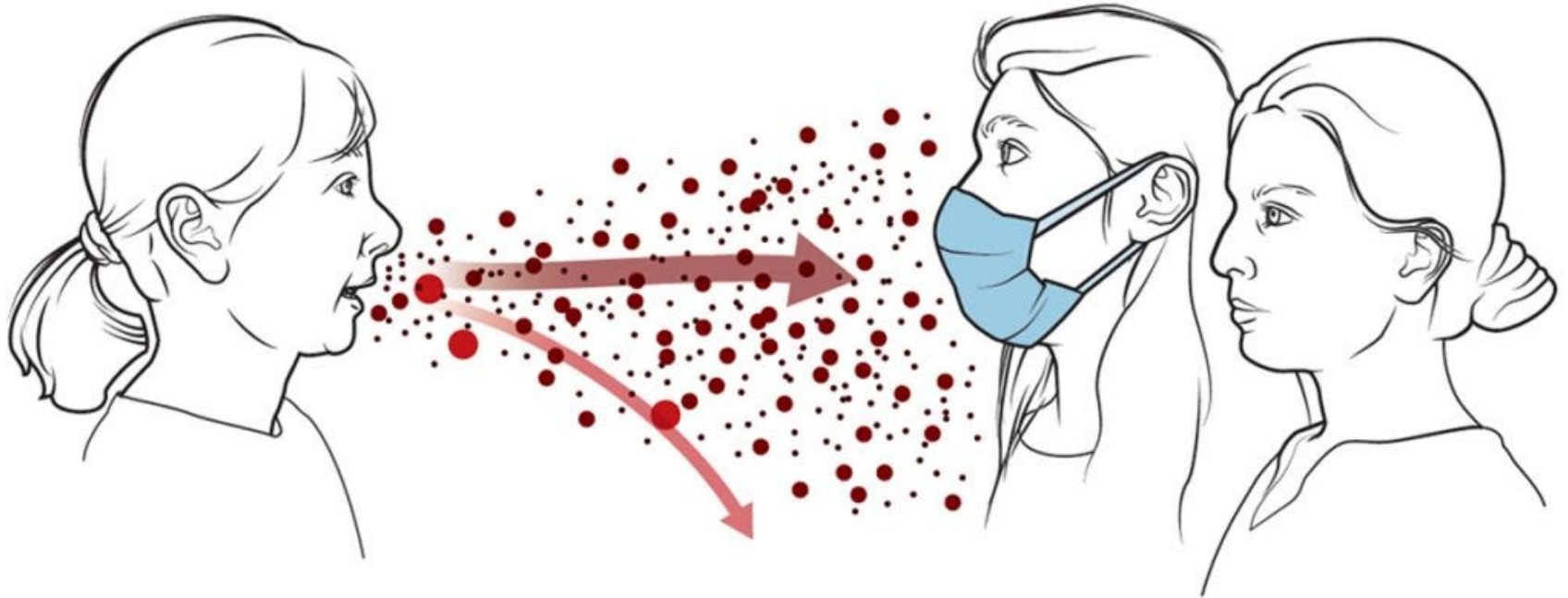
The virus can harm the heart, and doctors are concerned about long-term damage. How the heart heals after COVID-19 could help determine whether a patient develops an irregular heartbeat.

4 Hypertension













Some patients have high blood pressure after an acute infection, even when cases were relatively mild and people were previously healthy, possibly because the virus targets blood vessels and heart cells.



Prevention Strategies



COVID-19: *Transmission and Masks*

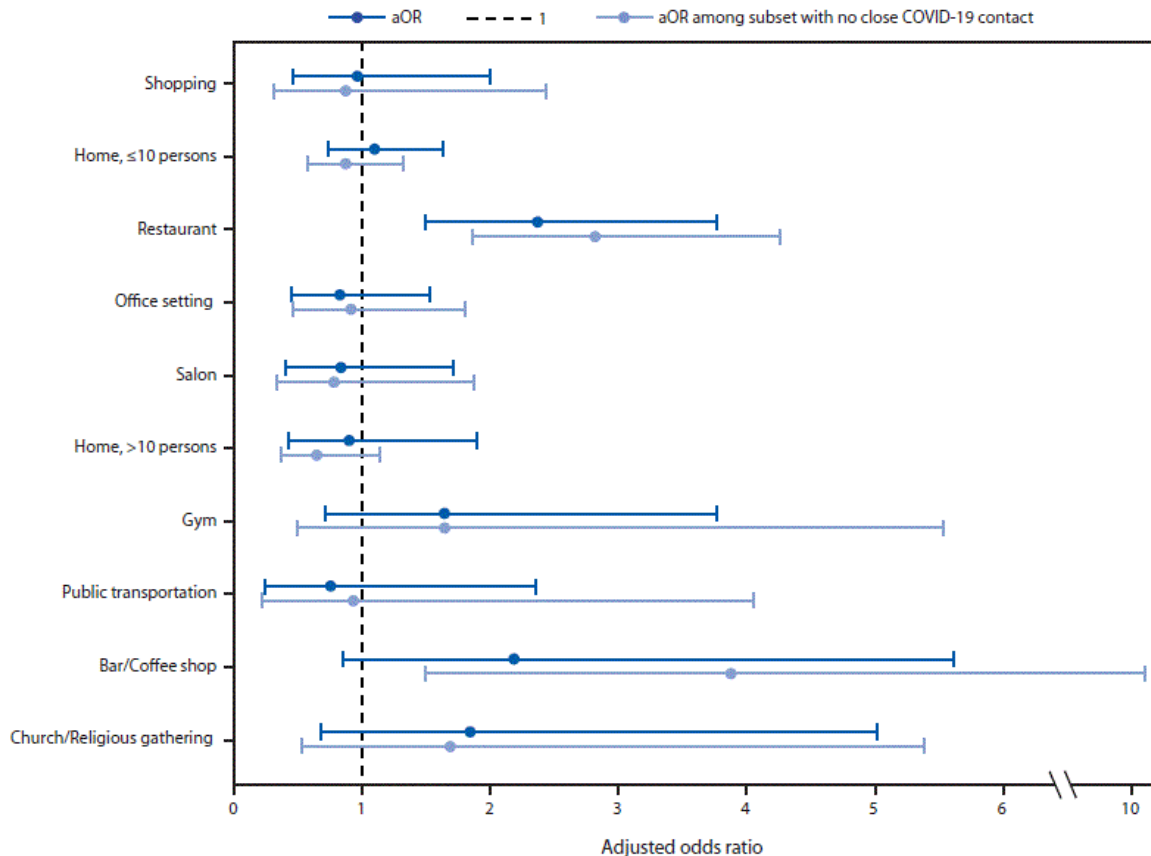
| Chance of Transmission | Asymptomatic COVID-19 Carrier | Uninfected Person |
|------------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| HIGHEST |  |  |
| HIGH |  |  |
| MEDIUM |  |  |
| LOW |  |  |
| LOWEST |  |  |
| PRACTICALLY NONE |  |  |

6 ft

COVID-19: *Transmission and Masks*

| | | |
|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  <p>it only works</p> |  <p>if you wear it</p> |    |
|  <p>it only works</p> |  <p>if you wear it</p> | |
|  <p>it only works</p> |  <p>if you wear it</p> | |

COVID-19 Risk and Usual Activity



| Type and level of group activity | Low occupancy | | | High occupancy | | |
|-----------------------------------------------------------|------------------------------|-----------------------------|-------------------|------------------------------|-----------------------------|-------------------|
| | Outdoors and well ventilated | Indoors and well ventilated | Poorly ventilated | Outdoors and well ventilated | Indoors and well ventilated | Poorly ventilated |
| Wearing face coverings, contact for short time | | | | | | |
| Silent | Low | Low | Low | Low | Low | High |
| Speaking | Low | Low | Low | Low | Low | High |
| Shouting, singing | Low | Low | High | High | High | High |
| Wearing face coverings, contact for prolonged time | | | | | | |
| Silent | Low | Low | High | Low | High | High |
| Speaking | Low | Low | High | High | High | High |
| Shouting, singing | Low | High | High | High | High | High |
| No face coverings, contact for short time | | | | | | |
| Silent | Low | Low | High | High | High | High |
| Speaking | Low | High | High | High | High | High |
| Shouting, singing | High | High | High | High | High | High |
| No face coverings, contact for prolonged time | | | | | | |
| Silent | Low | High | High | High | High | High |
| Speaking | High | High | High | High | High | High |
| Shouting, singing | High | High | High | High | High | High |

Risk of transmission: Low (Green), Medium (Yellow), High (Red)

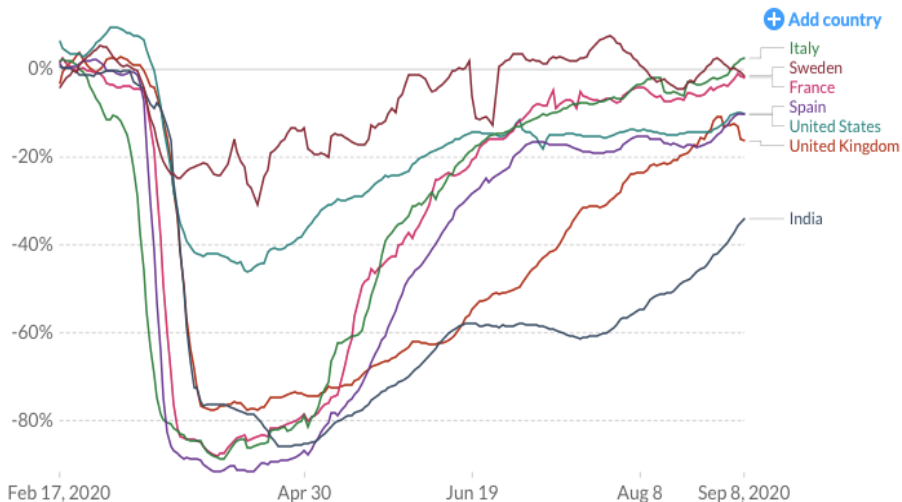
* Borderline case that is highly dependent on quantitative definitions of distancing, number of individuals, and time of exposure

Fuente: BMJ 2020;370:m3223

Social Distancing: *How the US Did Compared to Other Countries*

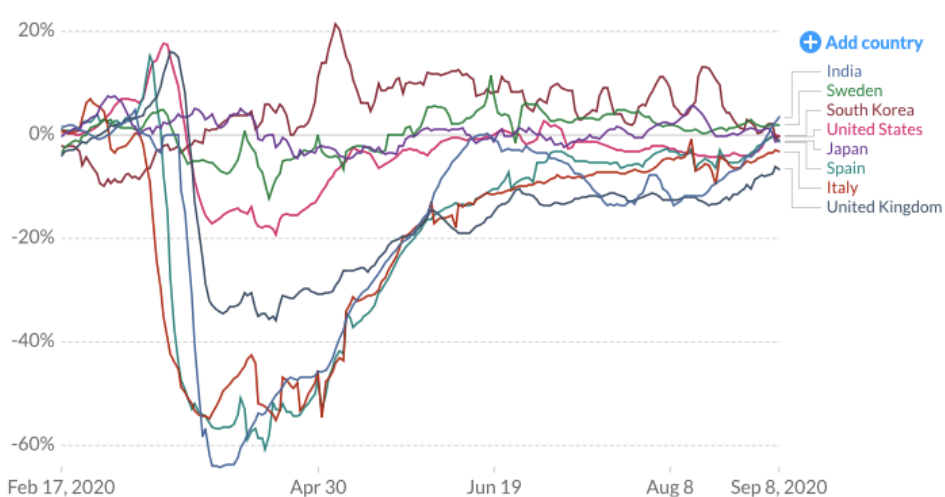
Change in Retail and Recreation Visits

Change in visitor numbers is measured relative to a baseline day; a baseline day is the median value from the 5-week period between Jan 3rd and Feb 6th 2020. This index is smoothed to the rolling 7-day average.



Change in Grocery and Pharmacy Visits

Change in visitor numbers is measured relative to a baseline day; a baseline day is the median value from the 5-week period between Jan 3rd and Feb 6th 2020. This index is smoothed to the rolling 7-day average.

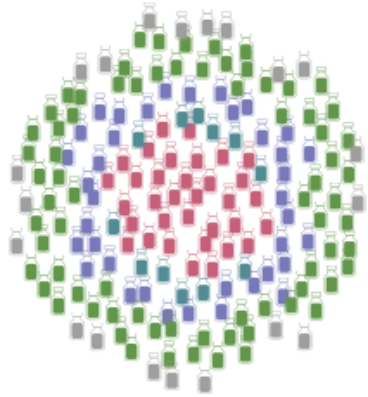


SARS-CoV-2 Vaccines: *Current Status*



COVID-19: Prevention - Vaccines

Technology used:  Nucleic acid  Viral-vectored  Subunit  Virus  Other



Pre-clinical



Phase 1



Phase 2

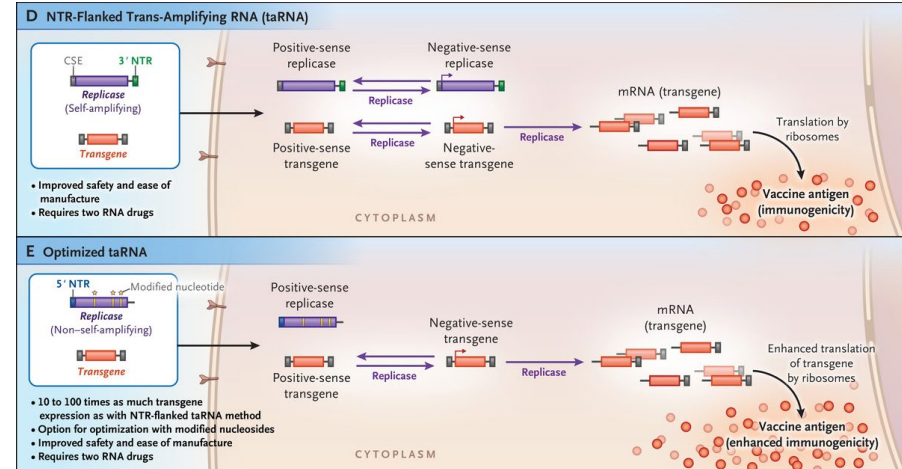
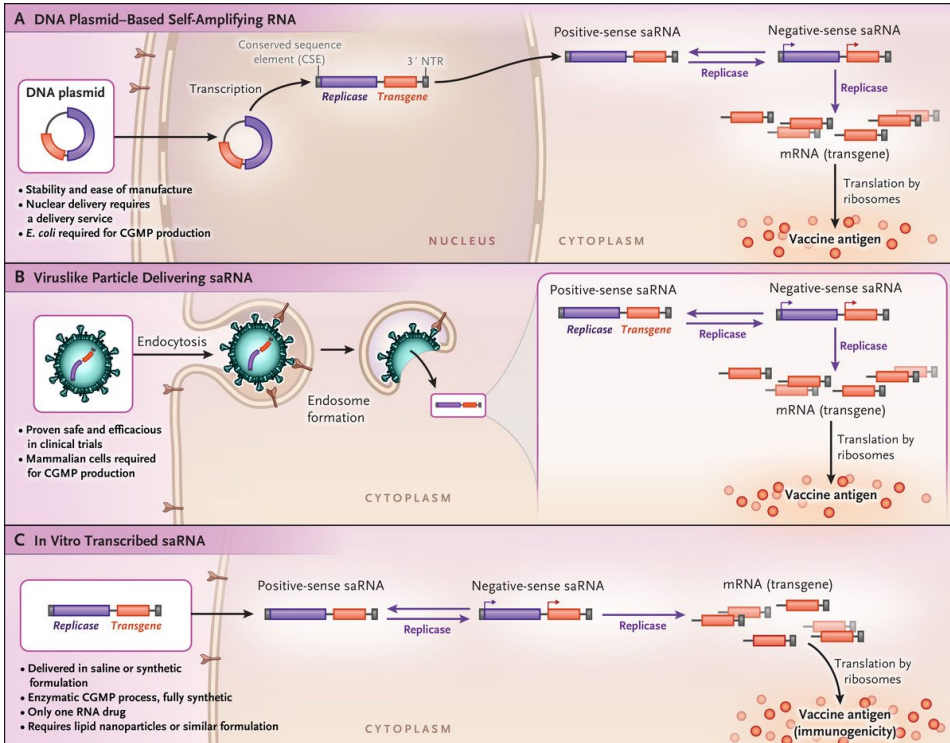


Phase 3

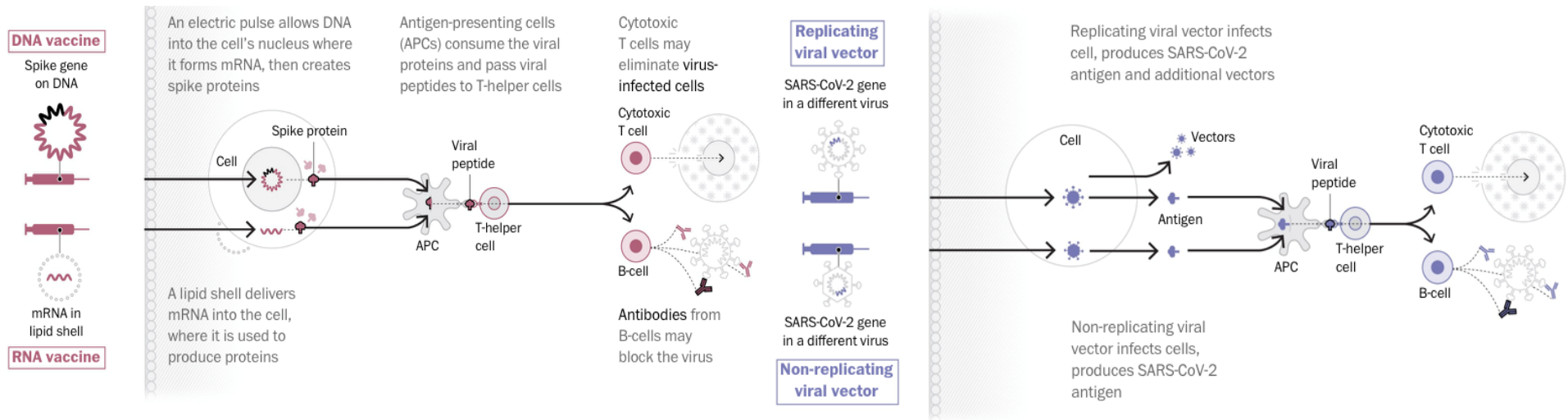
CanSino: AdV Vector
Gamaleya: AdV Vector
SinoVac: CornaVac, protein

Approved

COVID-19: RNA/DNA Vaccines



COVID-19: RNA/DNA and Viral Vaccines



Nucleic acid vaccines, developed by...

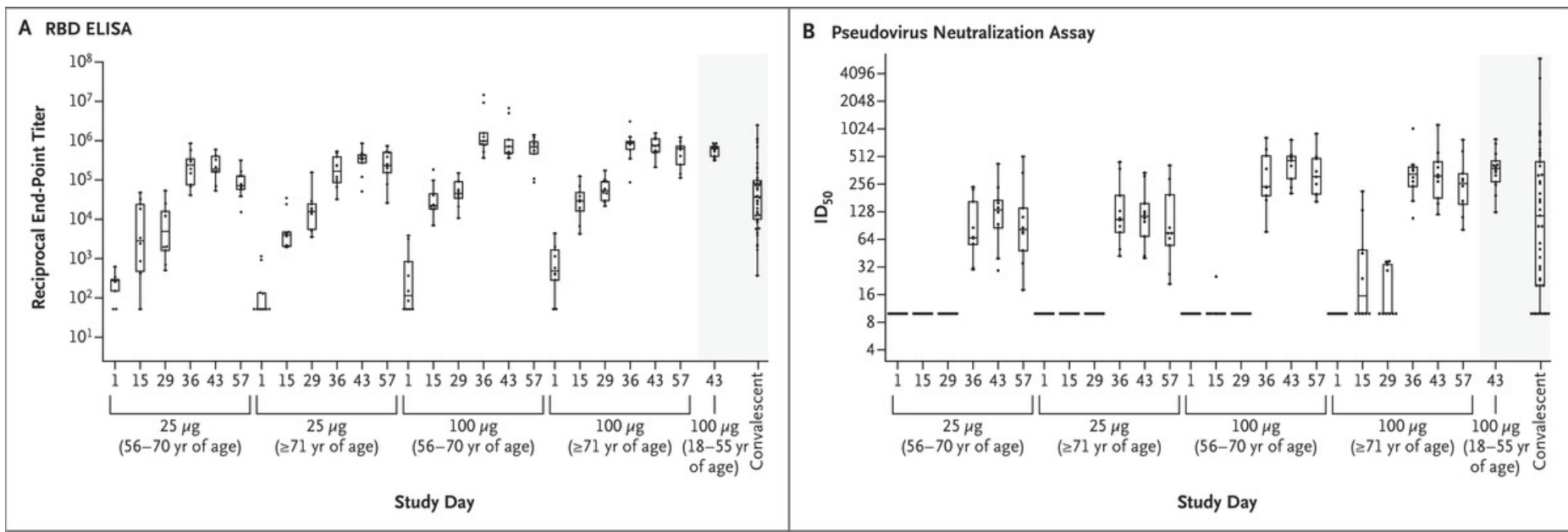
| | | | | | |
|----------------------------------------|----|----|----|----|---|
| Moderna; National Institutes of Health | PC | P1 | P2 | P3 | A |
| Pfizer; BioNTech; Fosun Pharma | PC | P1 | P2 | P3 | A |
| AnGes; Osaka University; Takara Bio | PC | P1 | P2 | P3 | A |
| Arcturus Therapeutics; Duke-NUS | PC | P1 | P2 | P3 | A |
| CureVac | PC | P1 | P2 | P3 | A |
| Genexine | PC | P1 | P2 | P3 | A |

Viral-vectored vaccines, developed by...

| | | | | | |
|-----------------------------------------------------------------------------|----|----|----|----|---|
| AstraZeneca; University of Oxford | PC | P1 | P2 | P3 | A |
| CanSino Biologics; Beijing Institute of Biotechnology* | PC | P1 | P2 | P3 | A |
| Gamaleya Research Institute* | PC | P1 | P2 | P3 | A |
| Johnson & Johnson, Beth Israel Deaconess Medical Center | PC | P1 | P2 | P3 | A |
| Institut Pasteur; Themis; University of Pittsburgh CVR; Merck Sharp & Dohme | PC | P1 | P2 | P3 | A |

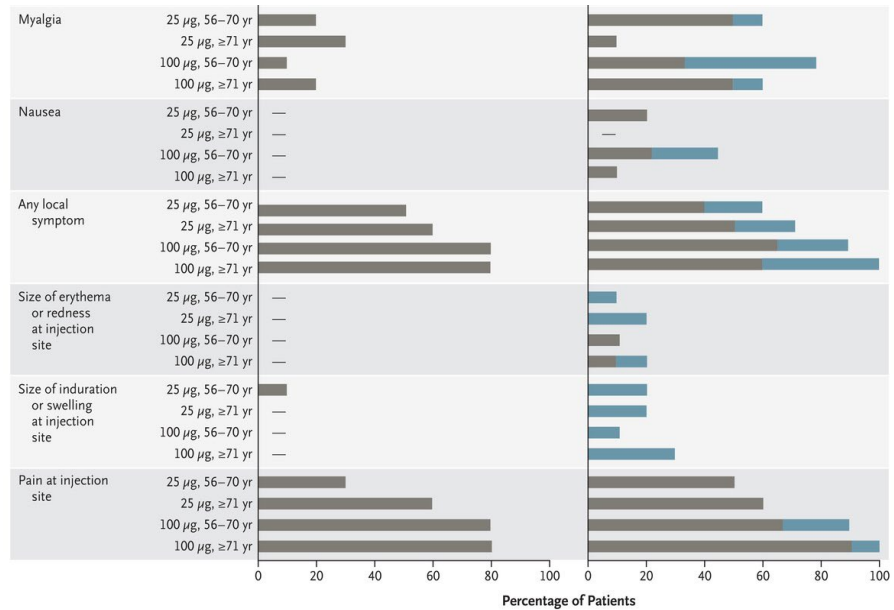
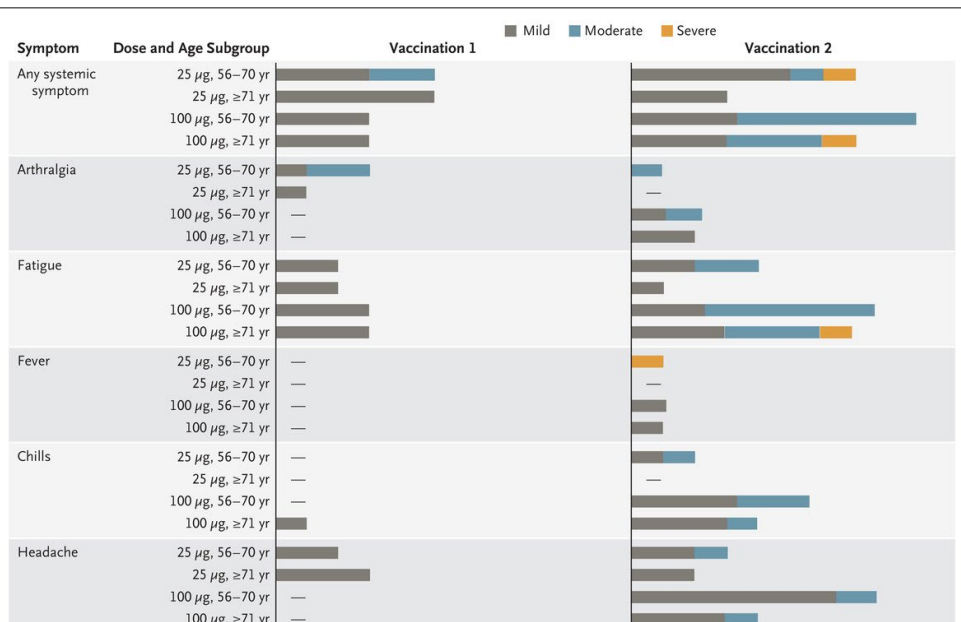
COVID-19 Vaccines: *RNA Vaccines*

- **Moderna/NIH (mRNA-1273):** Lipid nanoparticle–formulated, mRNA encoding full-length spike glycoprotein trimer, S-2P, with two proline substitutions in the central helix in the S2 subunit



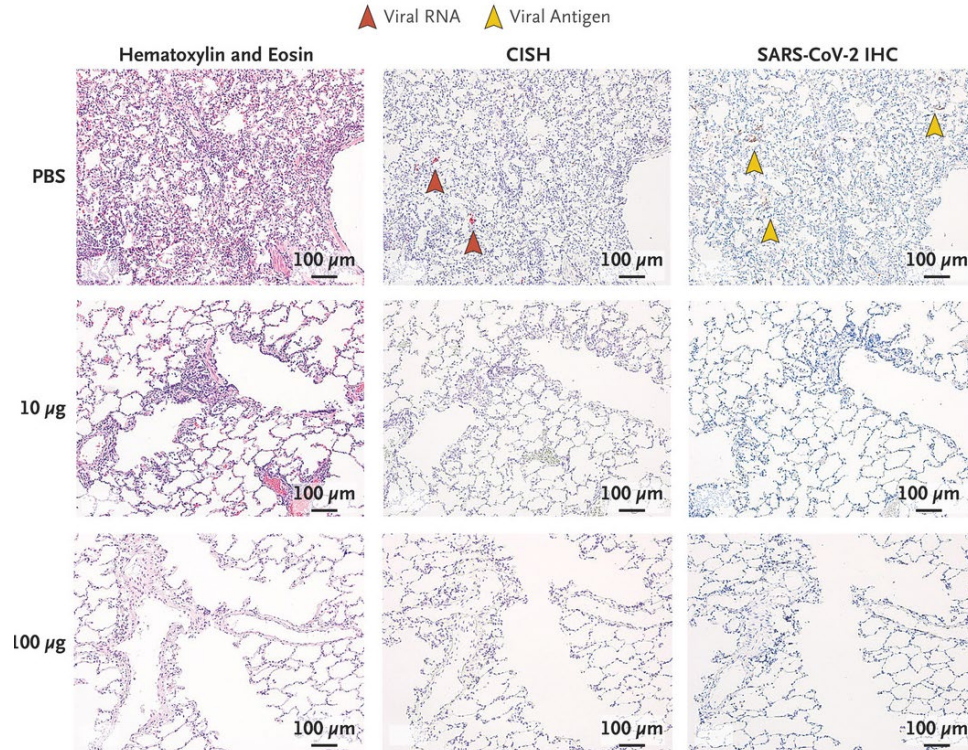
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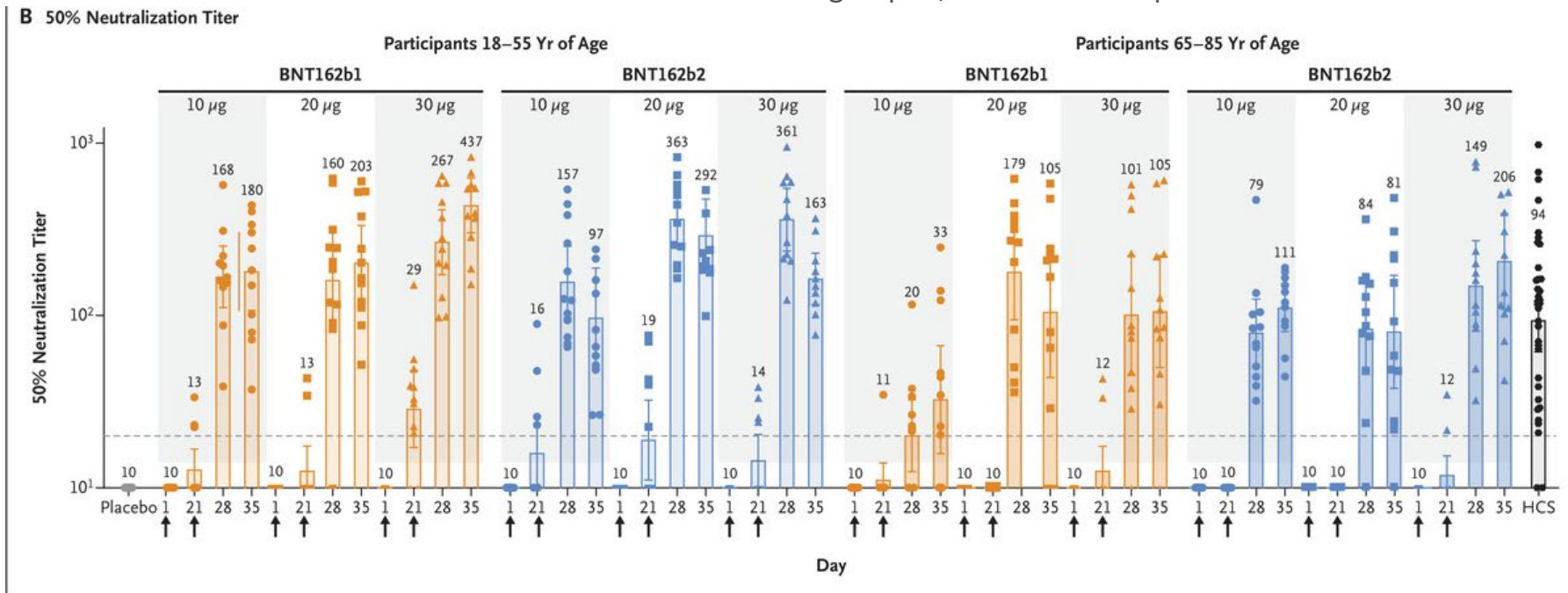
COVID-19 Vaccines: *RNA Vaccines*

- Moderna/NIH (mRNA-1273): Animal Studies



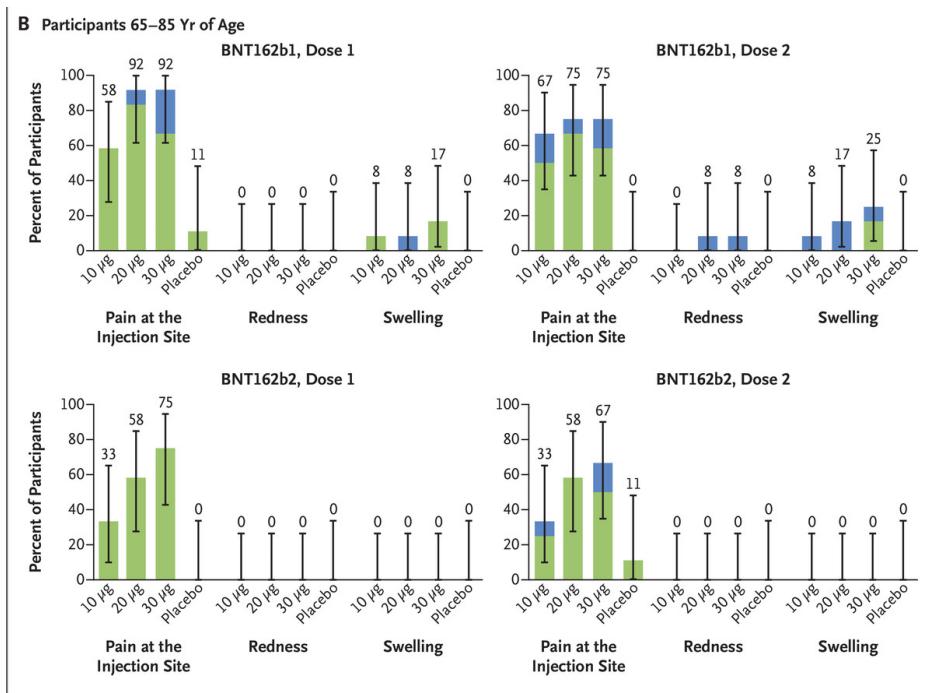
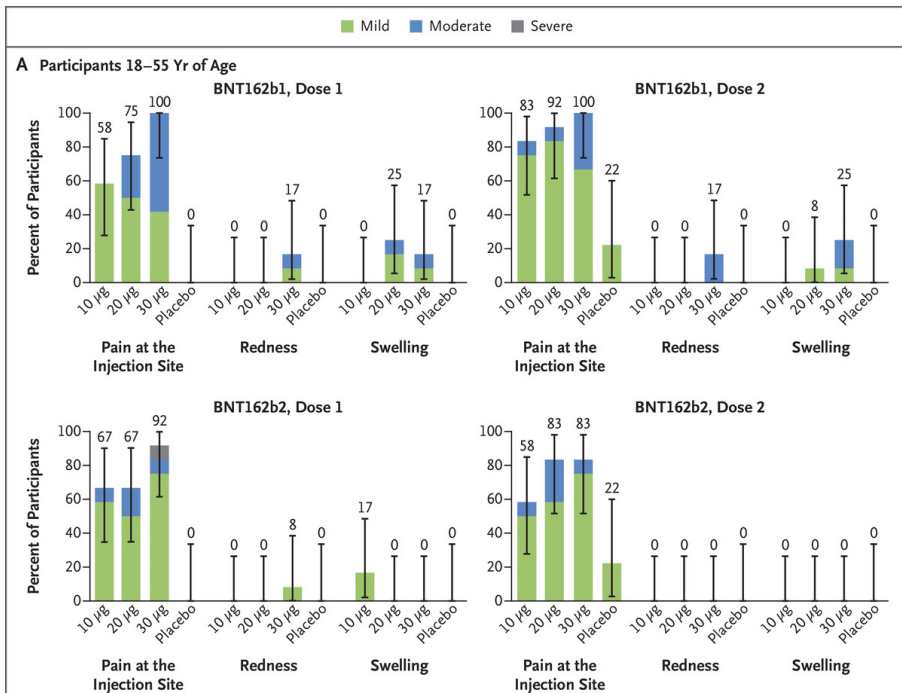
COVID-19 Vaccines: RNA Vaccines

- **BioNTech/Pfizer:** Lipid nanoparticle–formulated, nucleoside-modified RNA vaccine candidates
 - BNT162b1: Secreted trimerized SARS-CoV-2 receptor–binding domain
 - BNT162b2: Membrane-anchored SARS-CoV-2 full-length spike, stabilized in the prefusion conformation



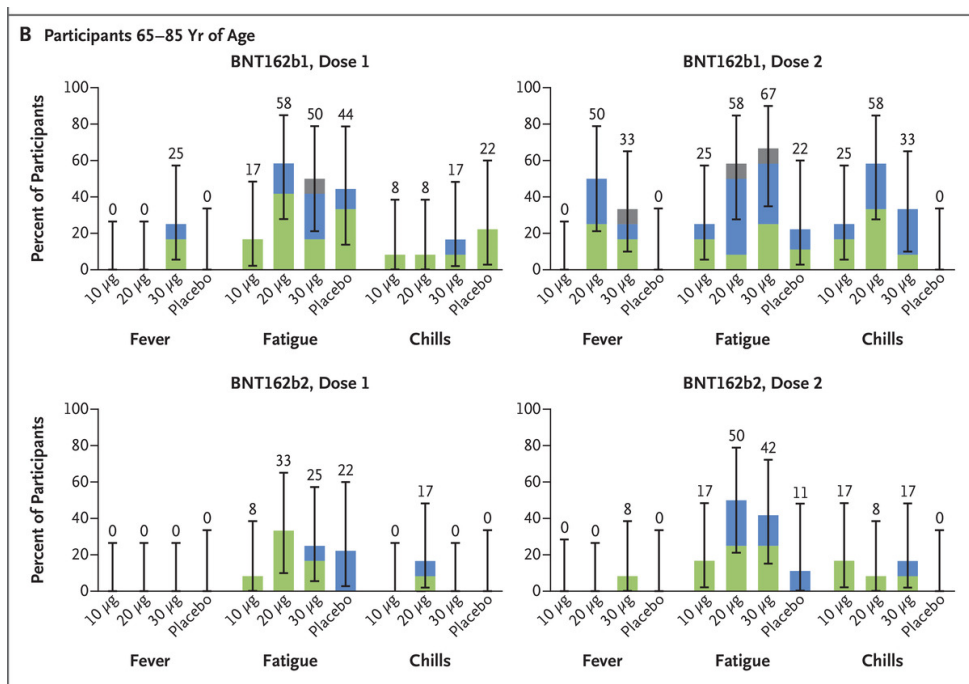
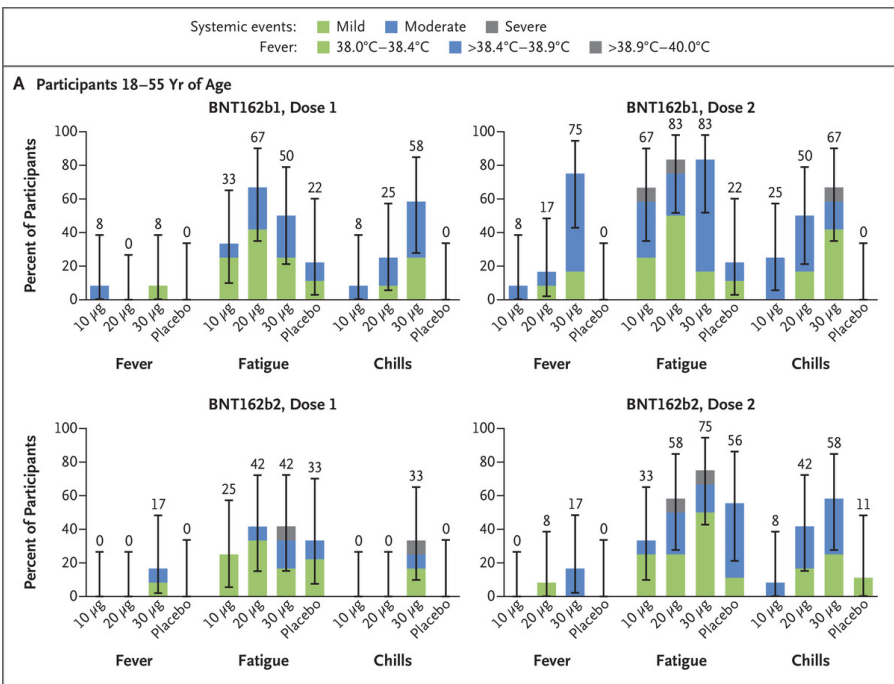
COVID-19 Vaccines: RNA Vaccines

- BioNTech/Pfizer: Lipid nanoparticle–formulated, nucleoside-modified RNA vaccine candidates



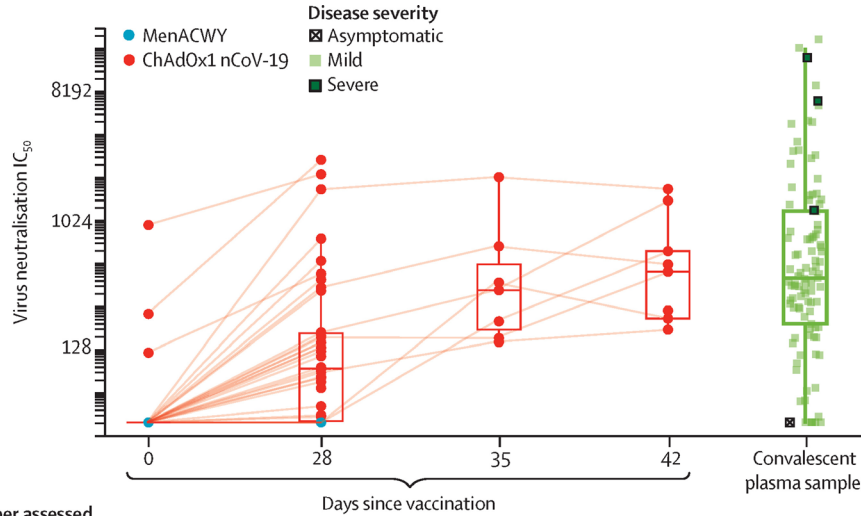
COVID-19 Vaccines: RNA Vaccines

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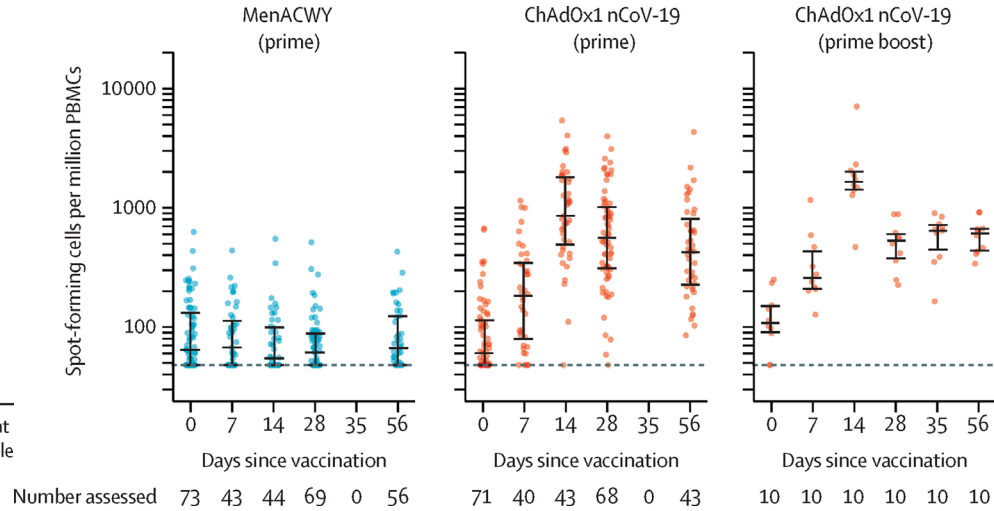


COVID-19 Vaccines: Adenovirus Vector Vaccines

- **AstraZeneca/Oxford ChAdOx1 nCov-19:** Chimpanzee adenovirus-vectored vaccine expressing the SARS-CoV-2 spike protein

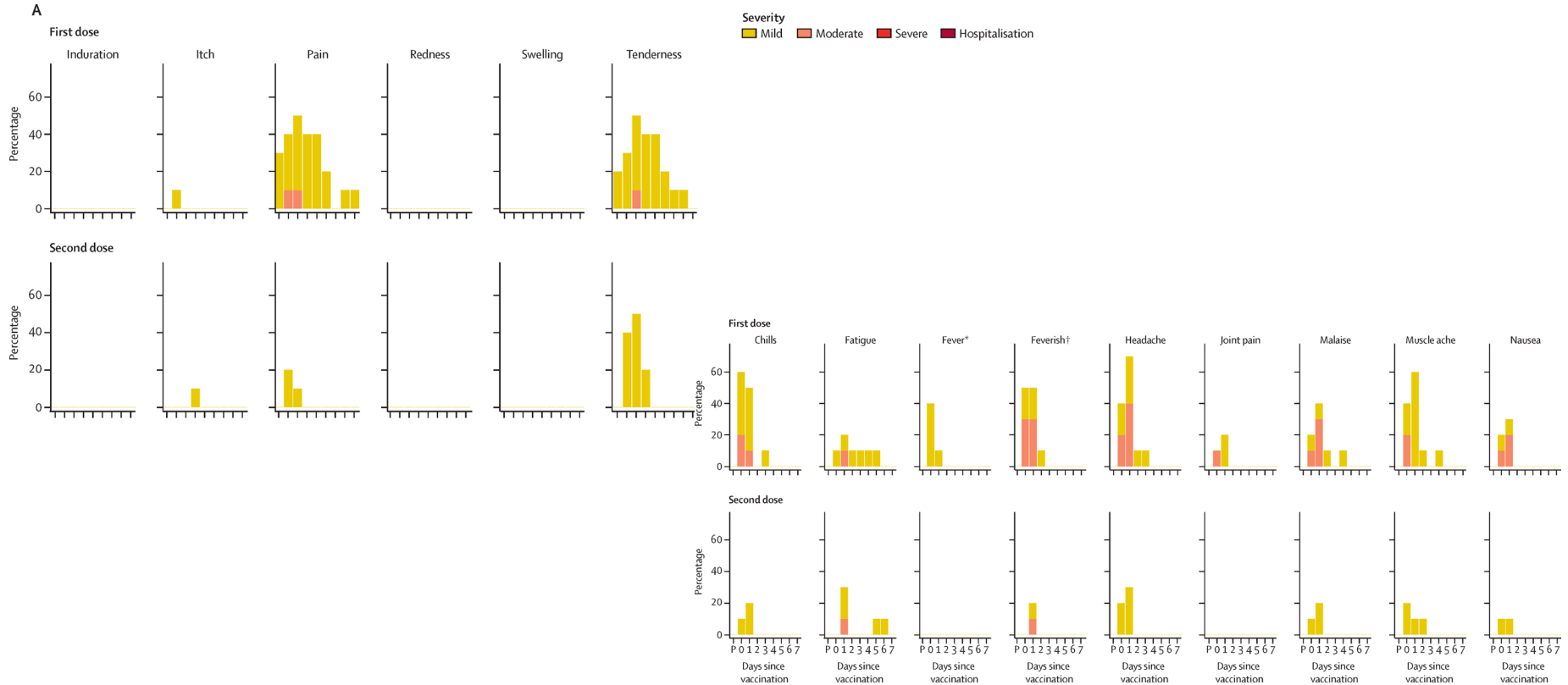


| Number assessed | Days since vaccination | | | |
|-----------------|------------------------|----|----|---|
| ChAdOx1 nCoV-19 | 39 | 38 | 10 | 9 |
| MenACWY | 30 | 30 | 0 | 0 |



COVID-19 Vaccines: Adenovirus Vector Vaccines

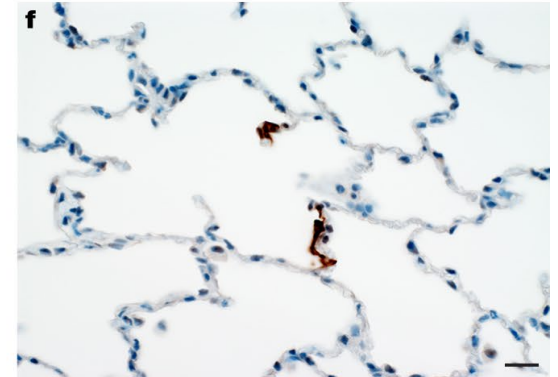
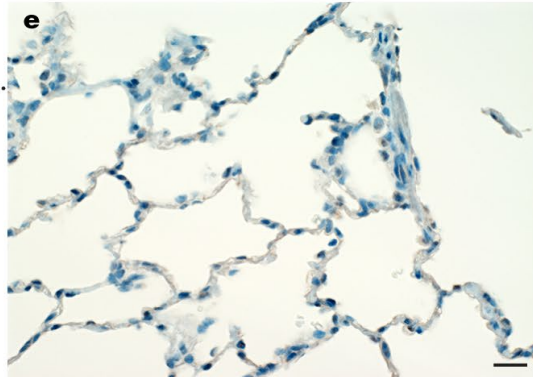
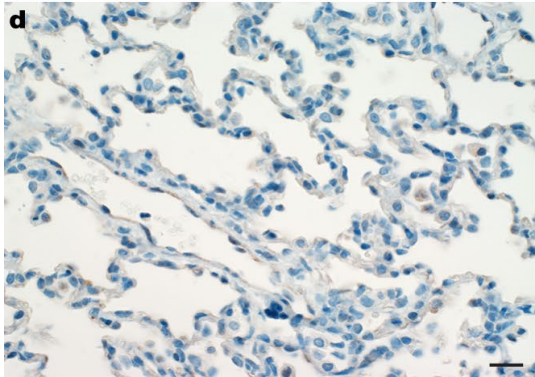
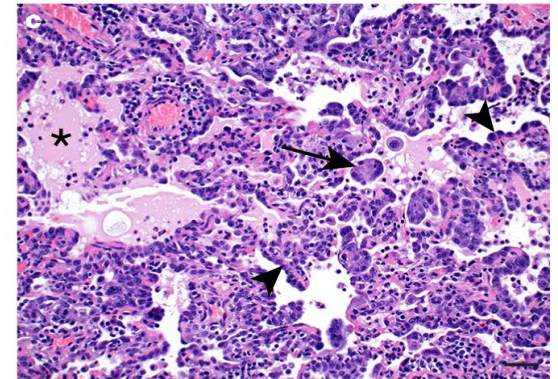
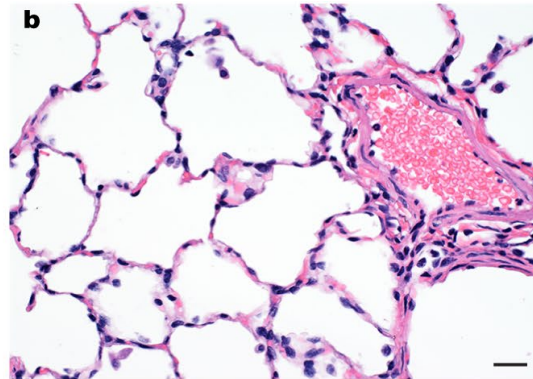
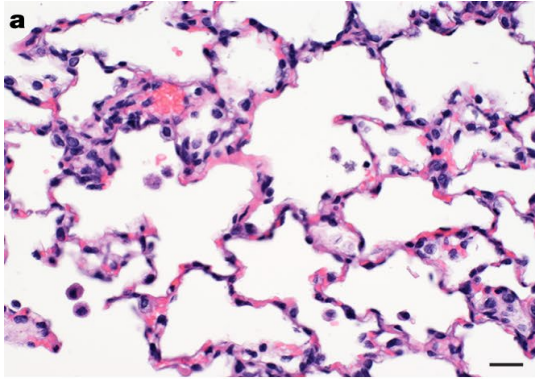
• AstraZeneca/Oxford ChAdOx1 nCov-19



COVID-19 Vaccines: *Adenovirus Vector Vaccines*

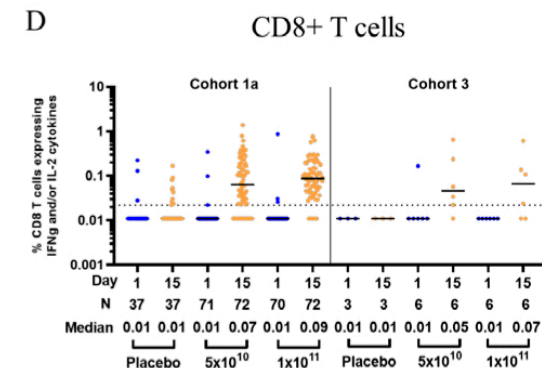
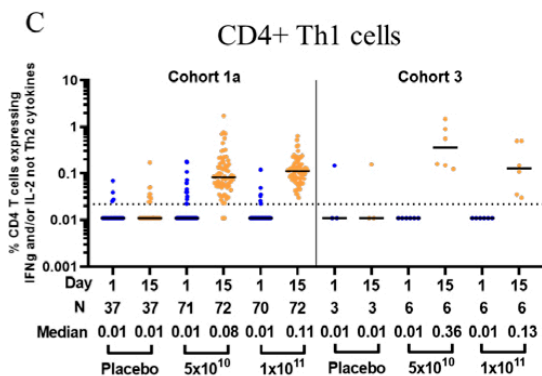
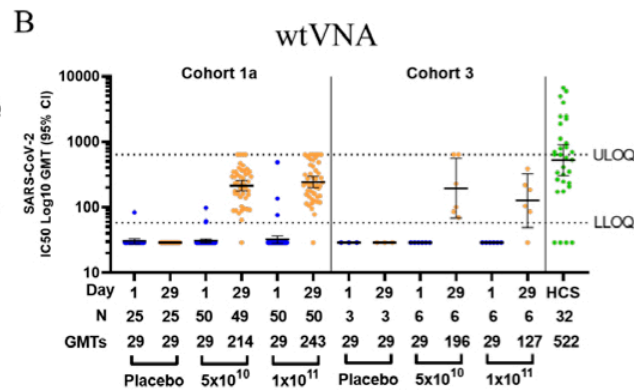
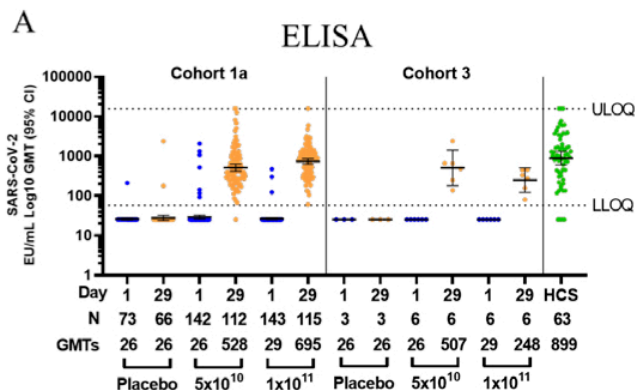
- AstraZeneca ChAdOx1 nCov-9 Vaccine: Animal Data
Prime
Prime/Boost

Placebo

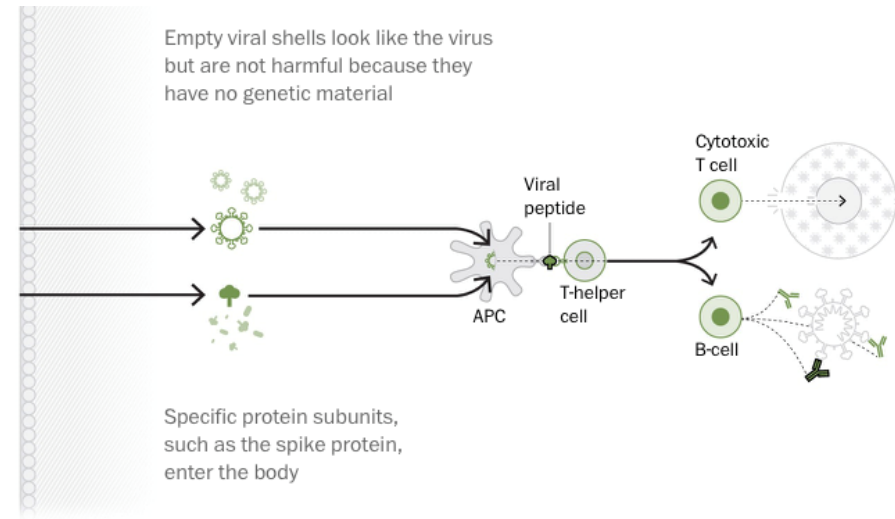
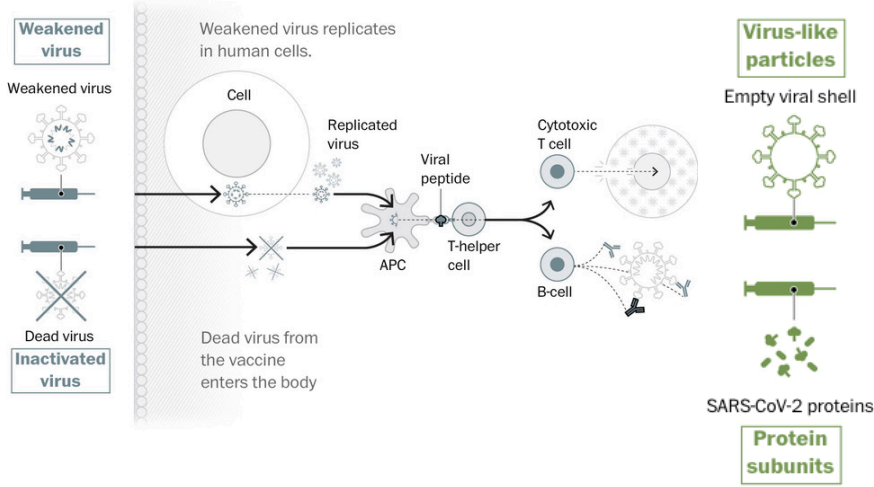


COVID-19 Vaccines: Adenovirus Vector Vaccines

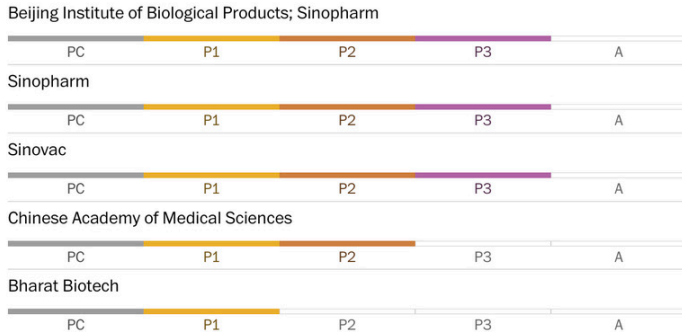
- JNJ-78436725/Ad26.COVS Vaccine: Non-replicating adenovirus 26 based vector expressing the stabilized pre-fusion spike (S) protein of SARS-CoV-2. Ad26.COVS



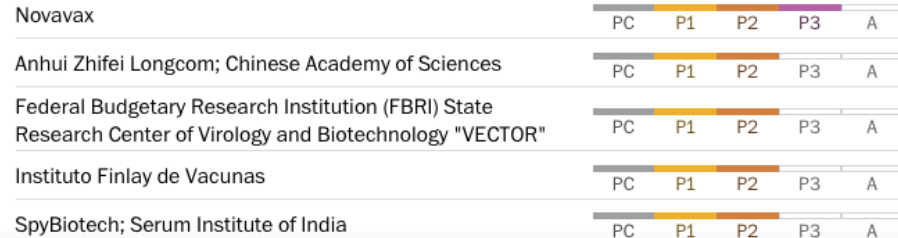
COVID-19: Protein Vaccines



Weakened and inactivated virus vaccines, developed by...



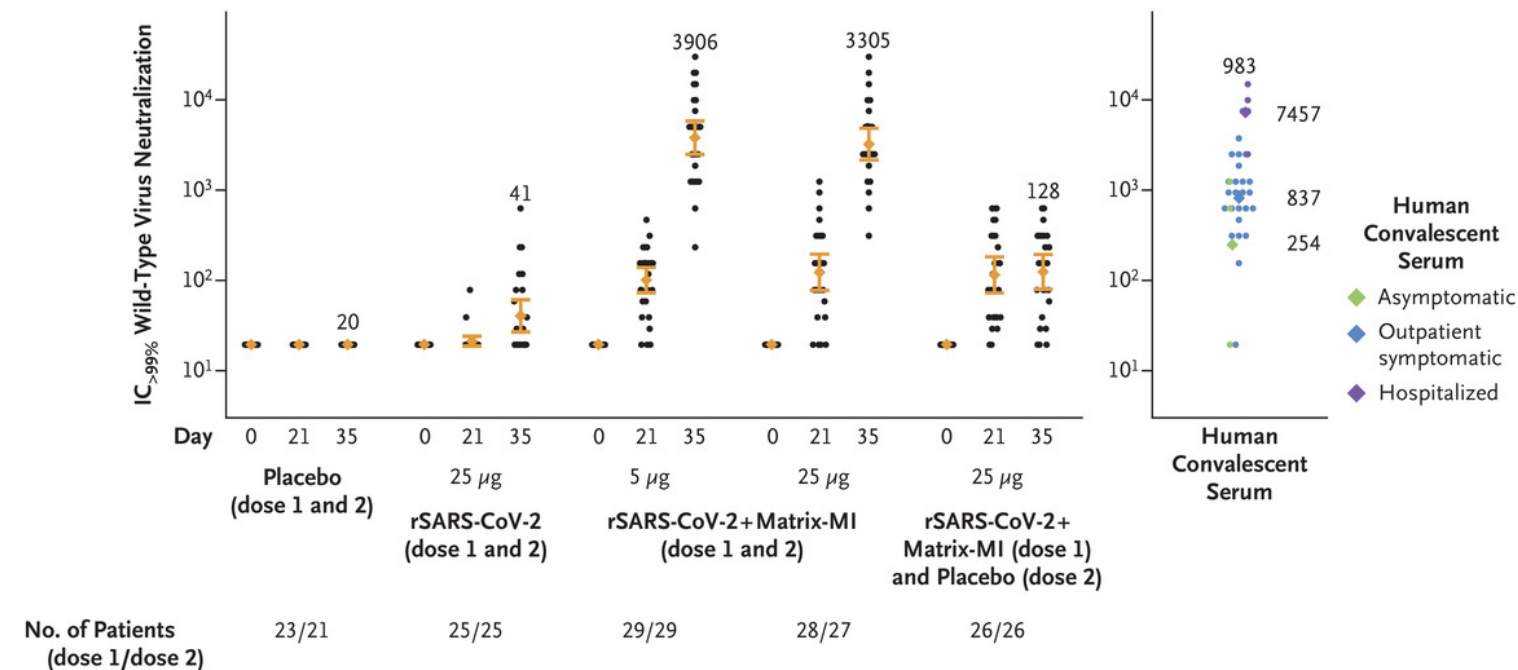
Subunit vaccines, developed by...



COVID-19 Vaccines: RNA Vaccines

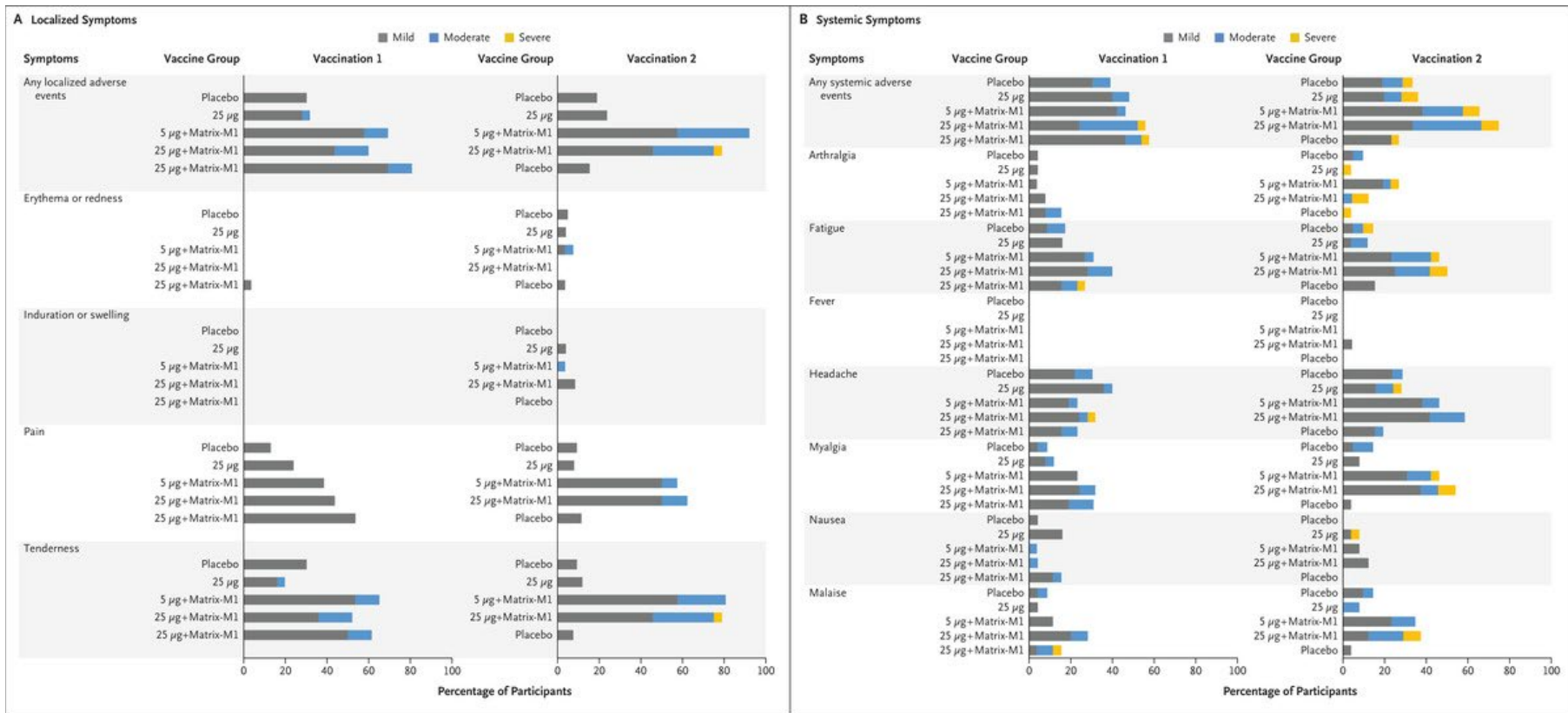
- Novovax: SARS-CoV-2 spike glycoprotein with Matrix-M1, a saponin-based adjuvant
 - Baculovirus *Spodoptera frugiperda* (Sf9) insect cell-expression system

B Wild-Type SARS-CoV-2 Microneutralization

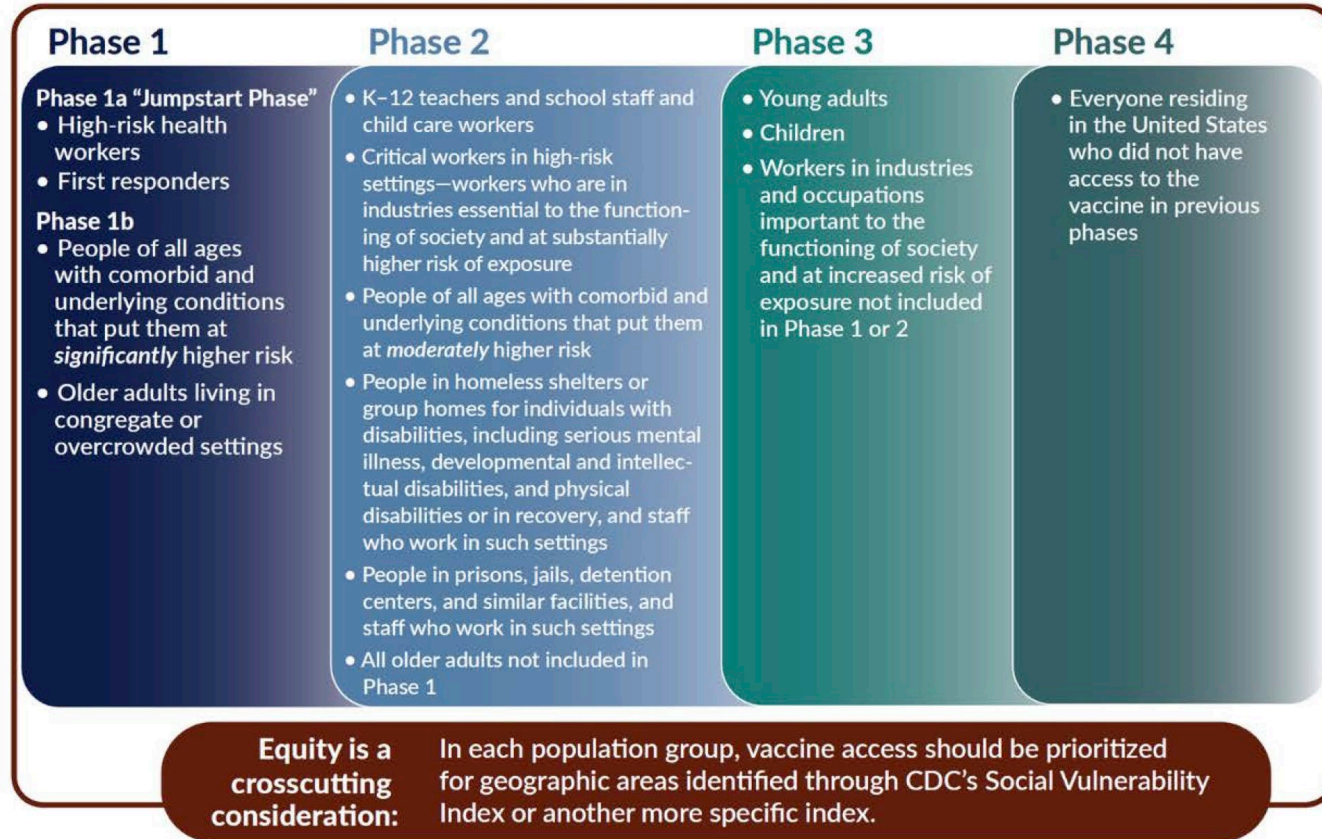


COVID-19 Vaccines: RNA Vaccines

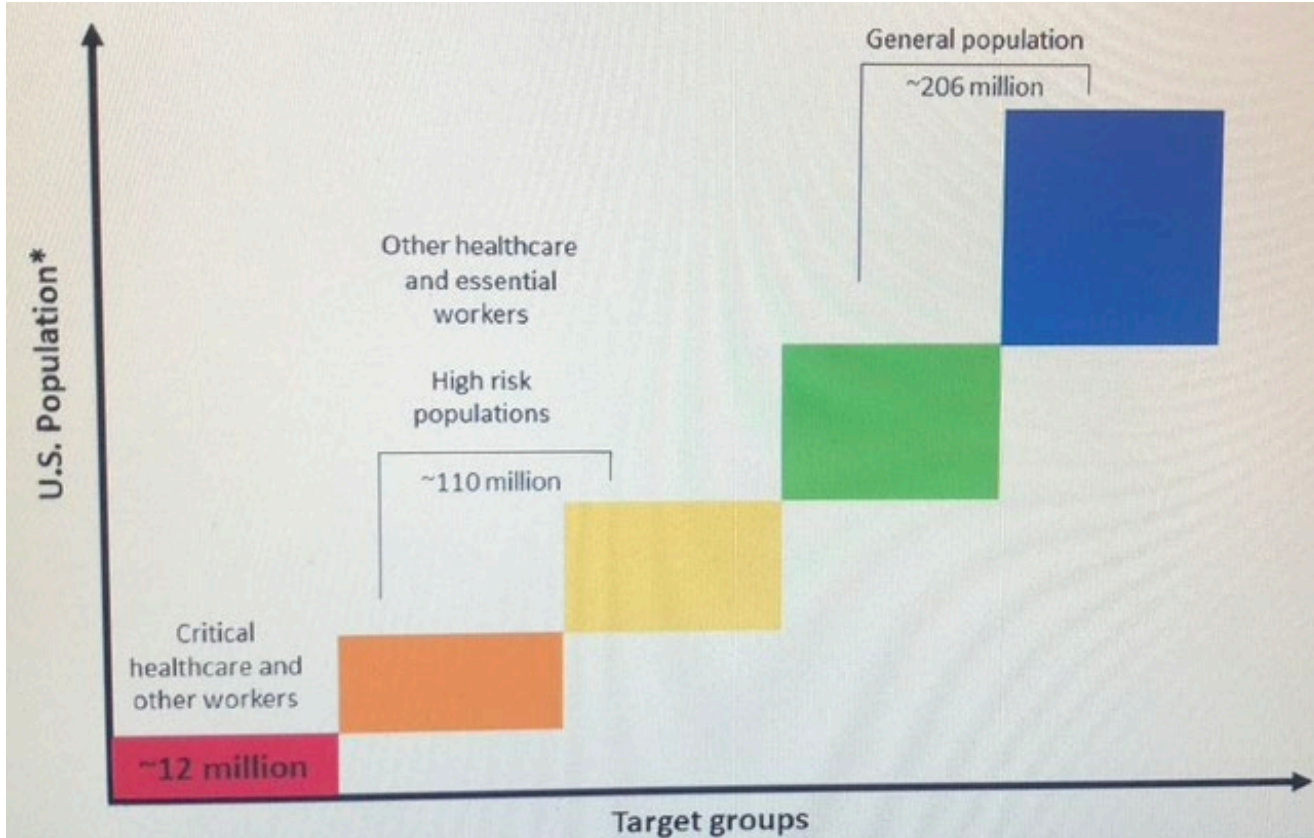
• Novovax:



COVID-19: Time to Vaccination



COVID-19: Time to Vaccination



Want to Help? Join a Study of SARS-CoV-2/COVID-19 Vaccine!

- Current COVID-19 Vaccine Trials
 - Multiple Centers in Chicago Participating
 - Priority given to high risk populations
 - Older adults
 - Minorities
 - Essential employees
 - Sign Up Online
 - <https://www.coronaviruspreventionnetwork.org>

Help find a vaccine for COVID-19!

We're looking for:

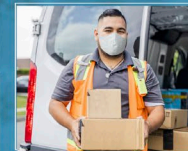
- Adults aged 18 and older
- People who are more likely to be exposed to COVID-19, including:
 - People with underlying medical conditions
 - People with greater chances of exposure at their job
 - People who live or work in elder-care facilities
 - People over age 65
 - People who work in jails or prisons
 - People from racial and ethnic groups that have been impacted in greater numbers by the epidemic, such as African Americans, Latinx, and Native Americans

If you are interested in being contacted about COVID-19 vaccine and other prevention studies, please register in the online Northwestern

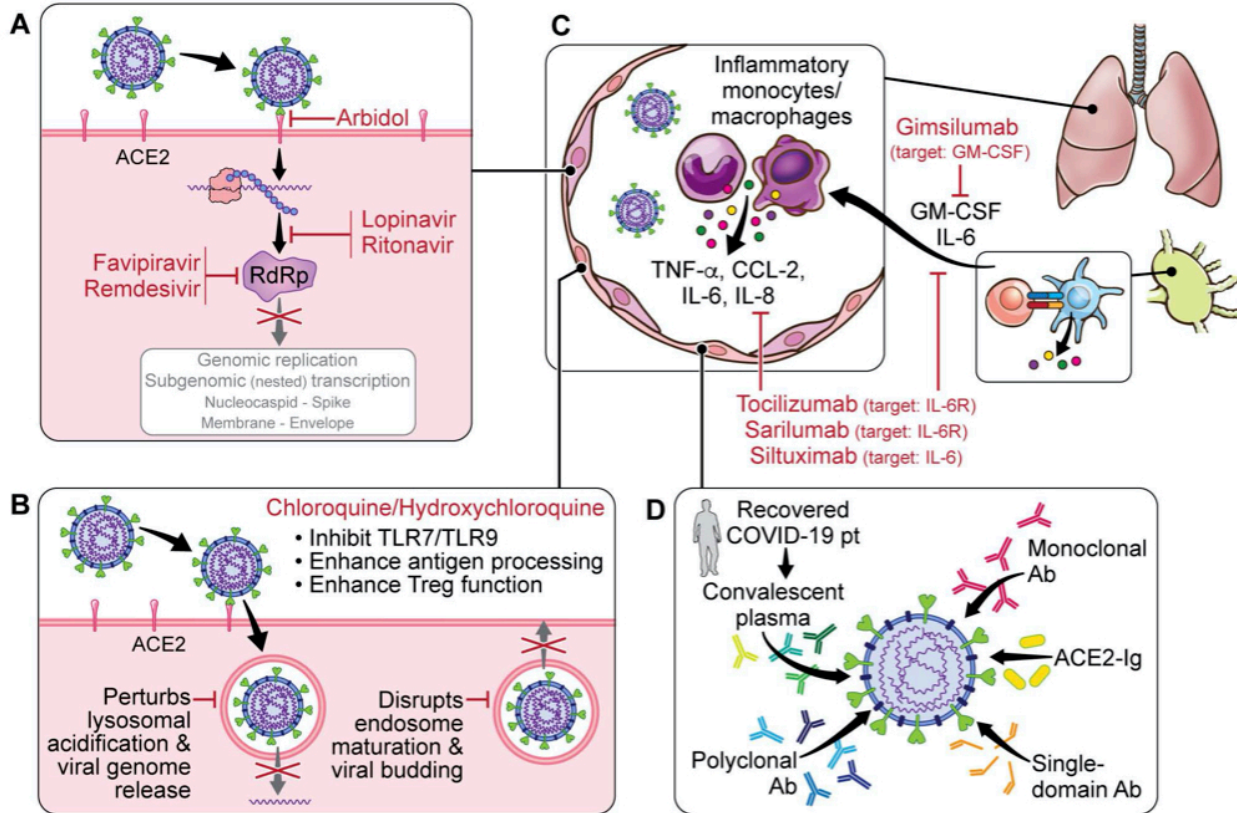
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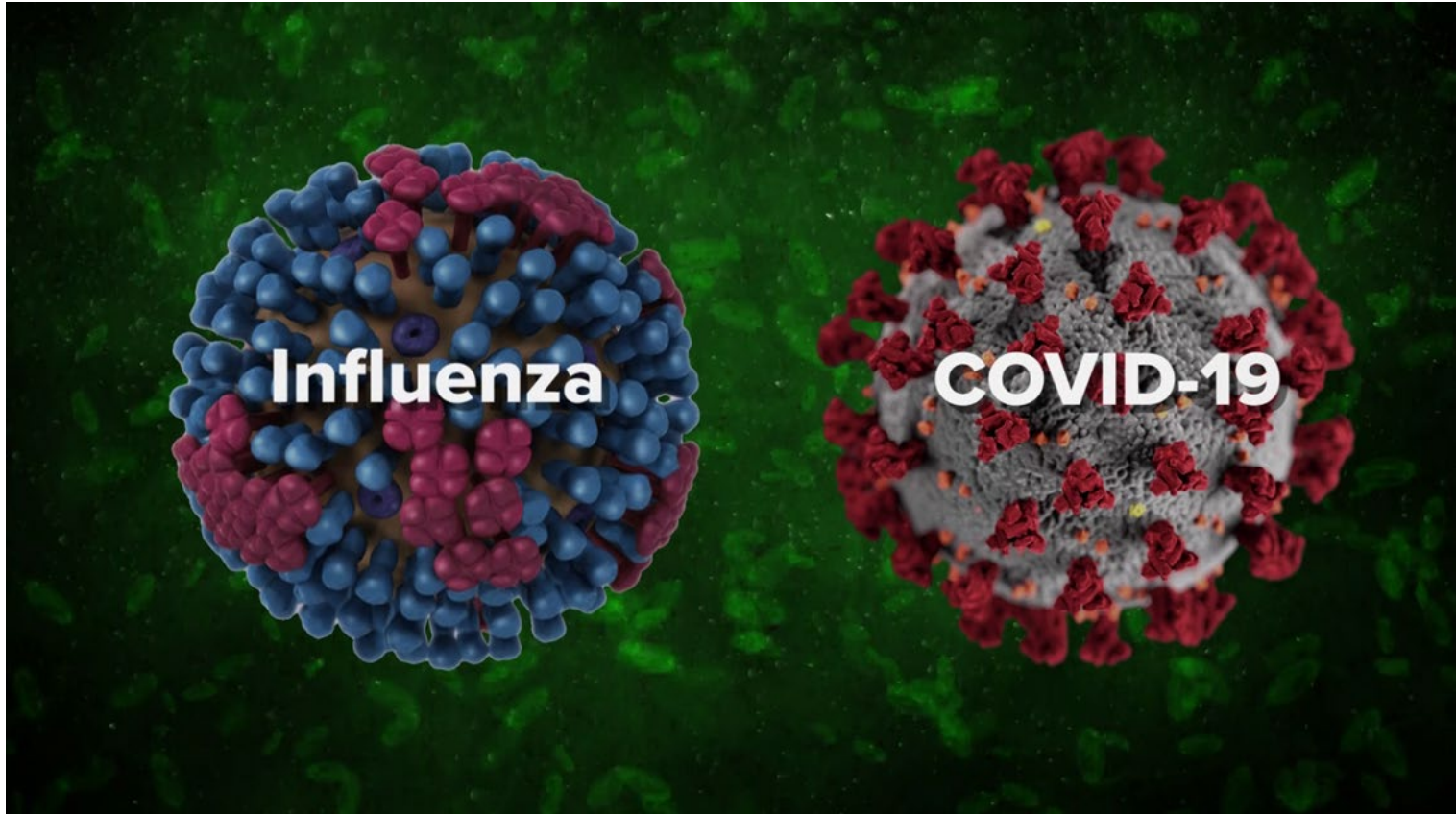


COVID-19: Management Options



J Gregory ©2020 Mount Sinai Health System

COVID-19: *What Does the Future Hold?*



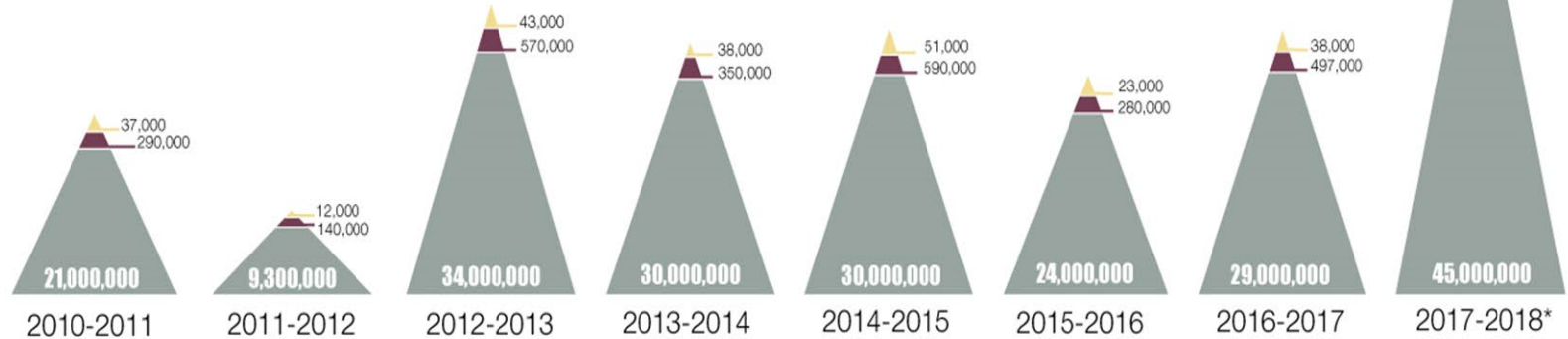
Influenza: What We Normally See

Estimated U.S. Influenza Burden, By Season (2010 - 2019)

Deaths

Hospitalizations

Illnesses



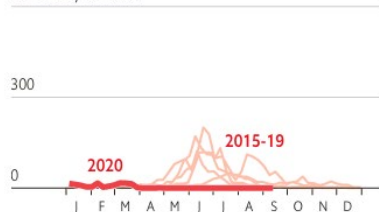
*Estimates for these seasons are preliminary and may change as data are finalized.

What We Know from the Southern Hemisphere

Paraguay



600 weekly flu cases*

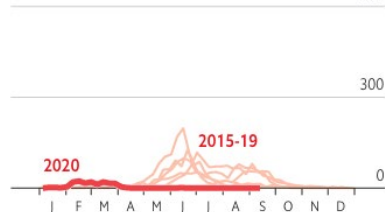


*As reported to WHO's Global Influenza Surveillance and Response System

South Africa



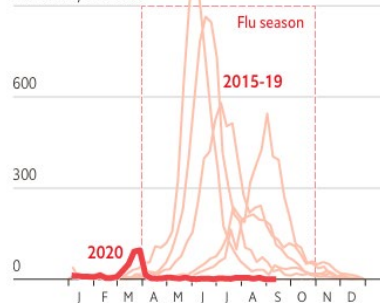
600 weekly flu cases*



Argentina



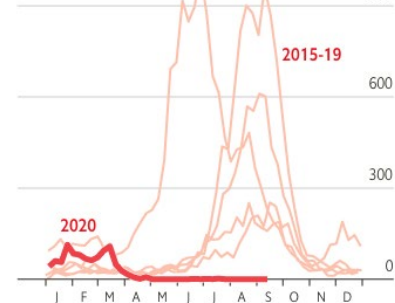
900 weekly flu cases*



Australia



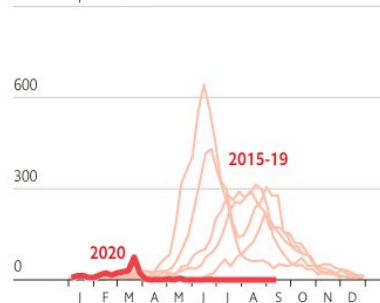
900 weekly flu cases*



Chile



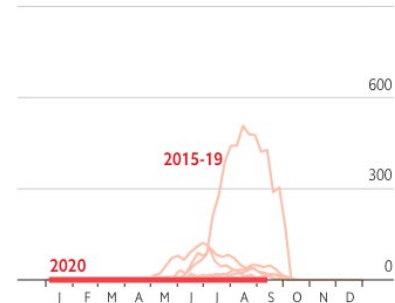
900 weekly flu cases*



New Zealand



900 weekly flu cases*



Influenza Vaccines: *Knowing Which Vaccine to Get*

- Types of Influenza Vaccine
 - Standard Quadravalent Influenza Vaccine
 - High Dose Quadravalent Influenza Vaccine
 - Adjuvanted Quadravalent Influenza Vaccine
 - Cell Culture Vaccines
 - Recombinant Vaccine
 - Live Attenuated Vaccine

Influenza Vaccine: *Composition and Recommendations*

- 2020-2021 Influenza Vaccine Composition
 - A/Hawaii/70/2019 (H1N1)pdm09-like virus (updated)
 - A/Hong Kong/45/2019 (H3N2)-like virus (updated)
 - B/Washington/02/2019 (B/Victoria lineage)-like virus (updated)
 - B/Phuket/3073/2013-like (Yamagata lineage) virus
- Current Recommendations for Vaccine
 - All individuals \geq 6 months of age should be vaccinated
 - September and October are good times to get vaccinated
 - Contraindications: Egg allergy, Guillain-Barre Syndrome due to vaccine

Key Take Home Points

- Get your flu shot (now is the time)
- Where a mask whenever not at home
- Expect a large second wave of disease this winter
- COVID-19 is real
 - Over 8,232,367 cases in the US
 - Over 438,967 (~5%) hospitalizations (39,230 currently hospitalized)
 - Over 22,662 in ICU (5% of hospitalized; 8,178 currently in ICU)
 - Over 212,678 deaths (2.5% mortality, >20% if in ICU)
 - Obesity, hypertension and diabetes are key risk factors

Help find a vaccine for COVID-19!

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Questions?

Sign Up to Participate in COVID-19 Vaccines

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