



2020 NCODA Fall Summit

CDC National COVID-19 Update

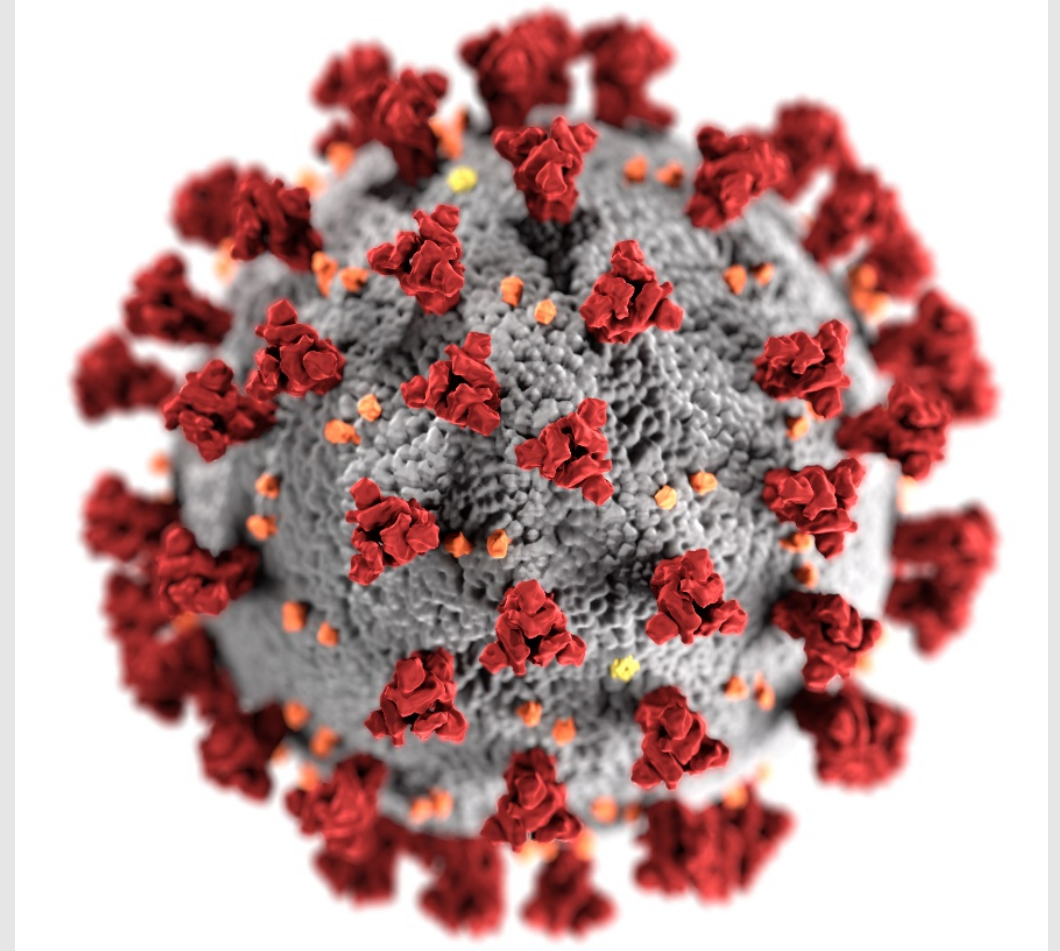
Jay C Butler, MD, FAAP, MACP, FIDSA

Deputy Director for Infectious Diseases | Centers for Disease Control and Prevention

#NCODASummit20

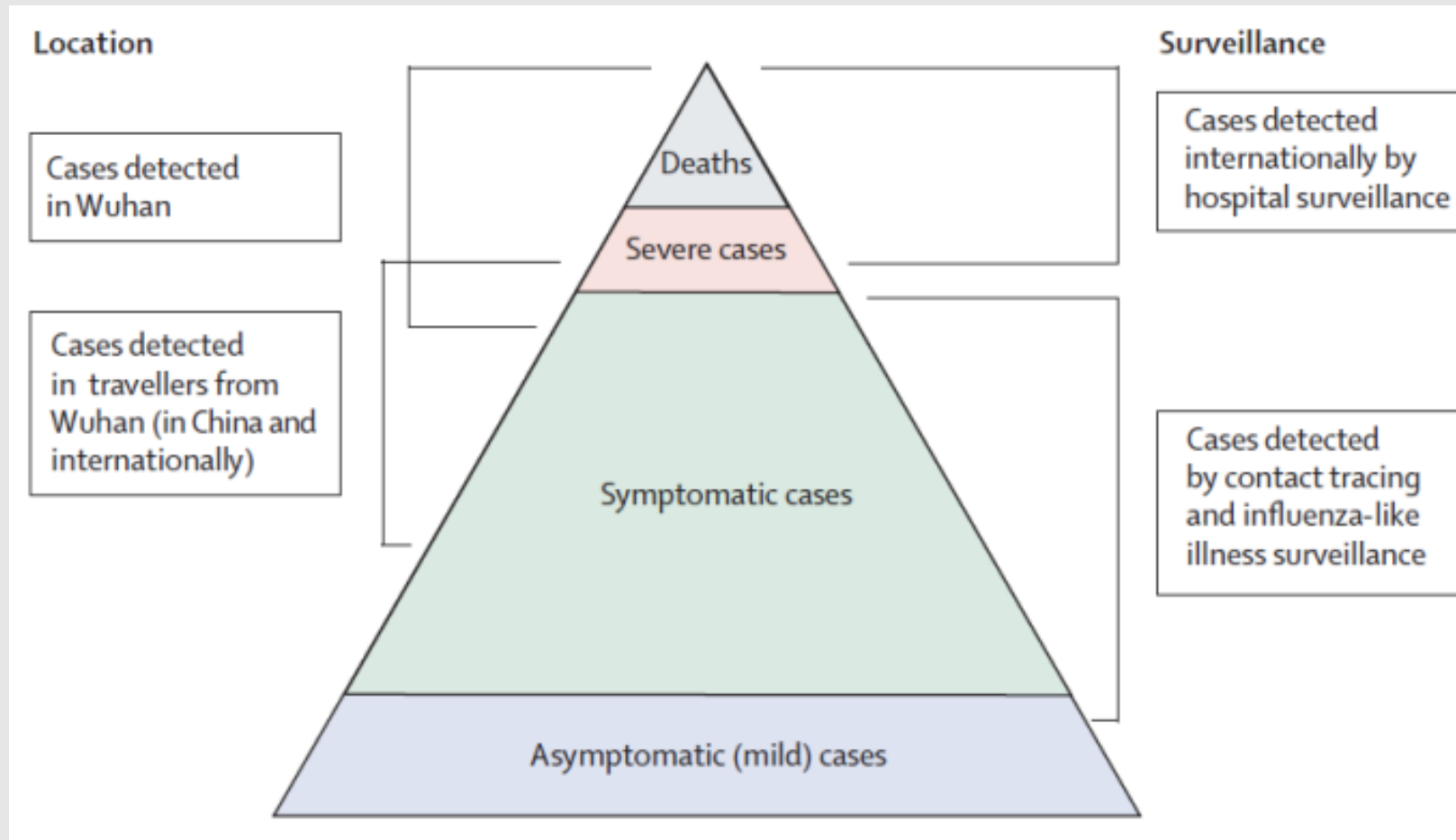
COVID-19 Update: Focus on Epidemiology, Transmission, and Prevention

Jay C. Butler, MD, FAAP, MACP, FIDSA
Deputy Director for Infectious Diseases



National Community Oncology Dispensing Association
October 23, 2020

Spectrum of Illness





Number of New COVID-19 Cases in the US reported to the CDC by States/Territories

22-Jan-20 | 12-Oct-20 | 13-Oct-20

DATA FROM*

DATA THROUGH

LAST UPDATED

7,787,548

Total Cases Reported

46,614

New Cases Reported

0.6%

24-Hour Change

50,181.4

Current 7-Day Average

06-Oct-20 to 12-Oct-20

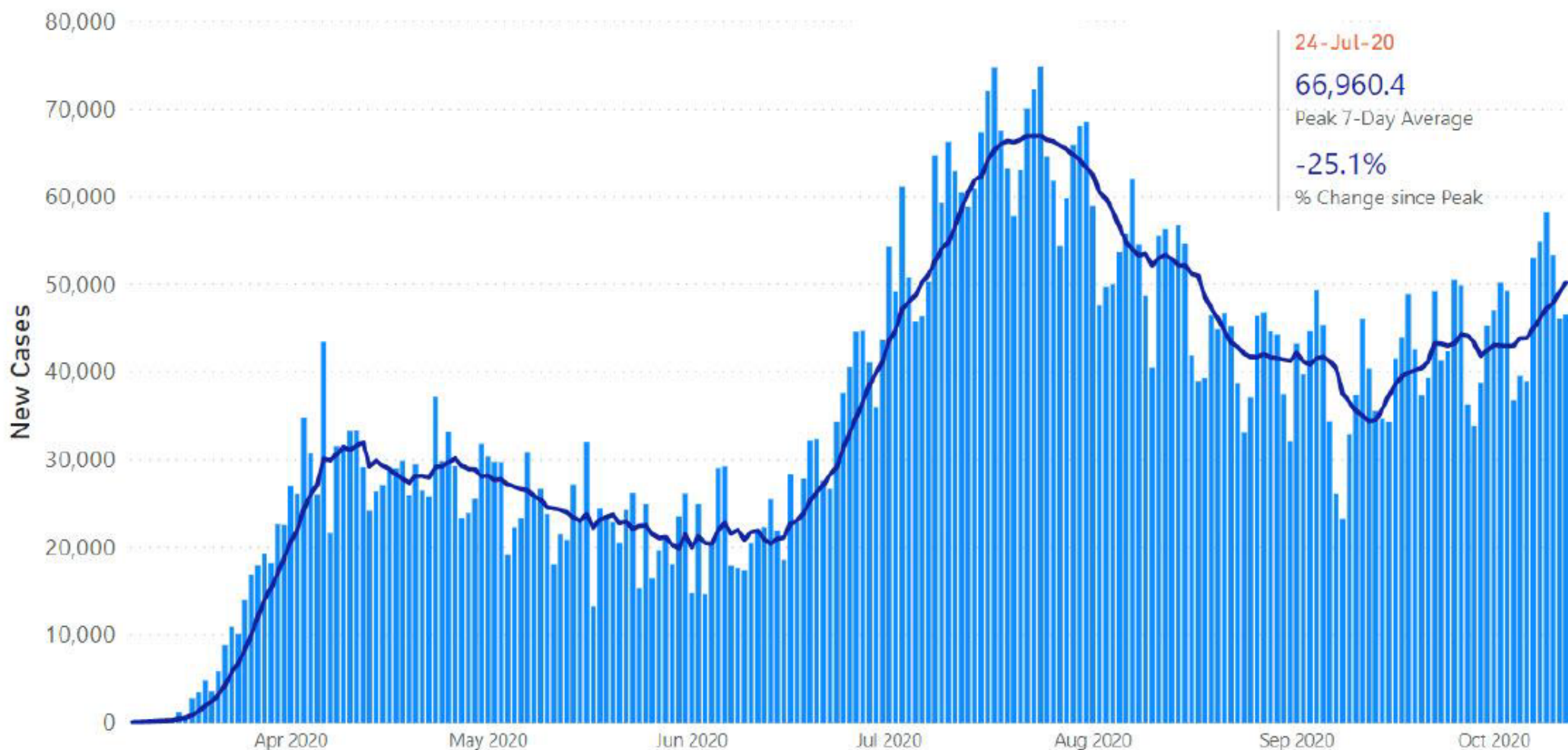
43,852.1

Prior 7-Day Average

29-Sep-20 to 05-Oct-20

14.4%

1 Week Change





Number of New COVID-19 Deaths in the US Reported to the CDC by States/Territories

22-Jan-20 | 12-Oct-20 | 13-Oct-20

DATA FROM*

DATA THROUGH

LAST UPDATED

214,446

Total Deaths Reported

338

New Deaths Reported

0.2%

24-Hour Change

698.0

Current 7-Day Average

06-Oct-20 to 12-Oct-20

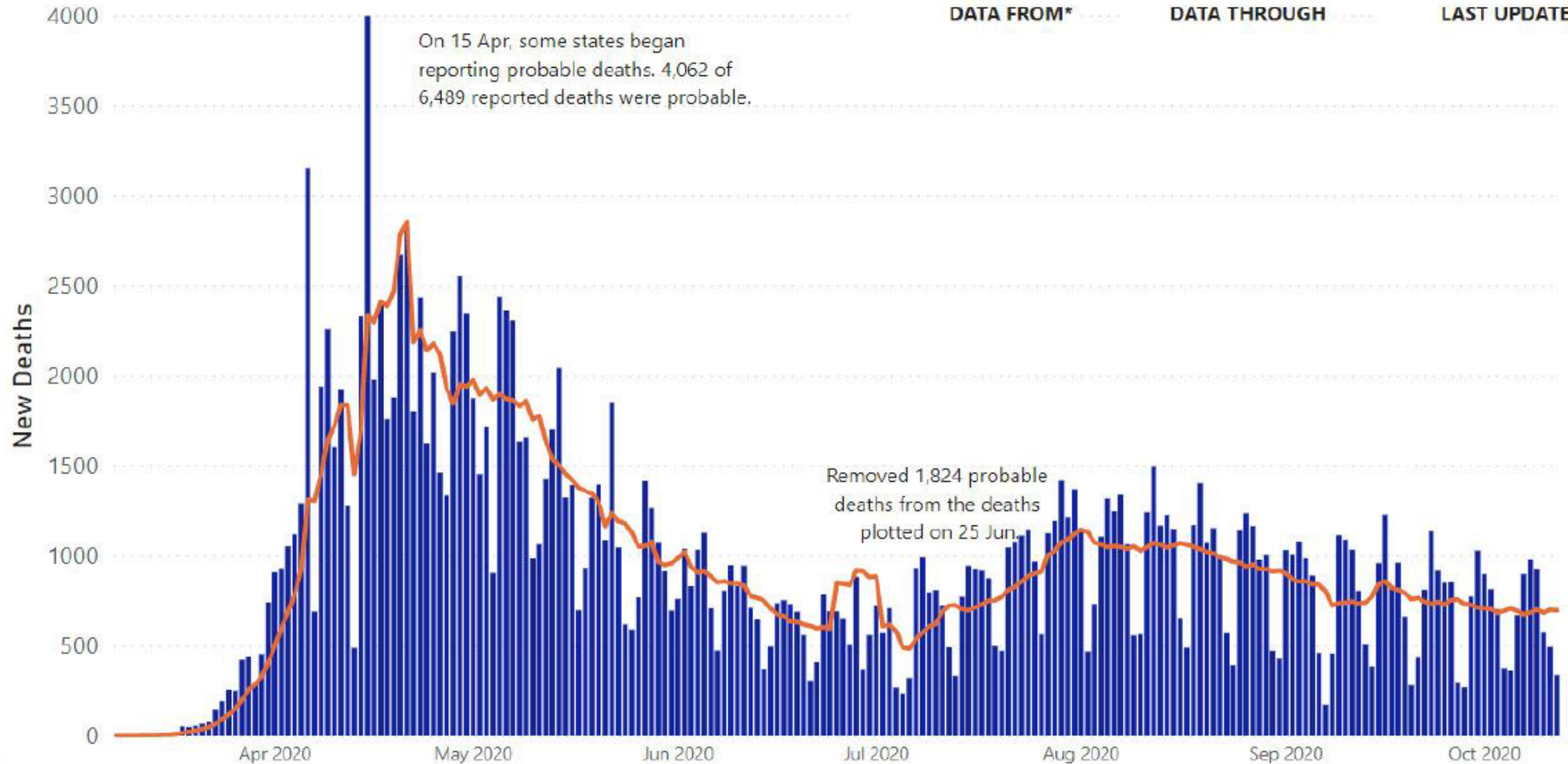
708.9

Prior 7-Day Average

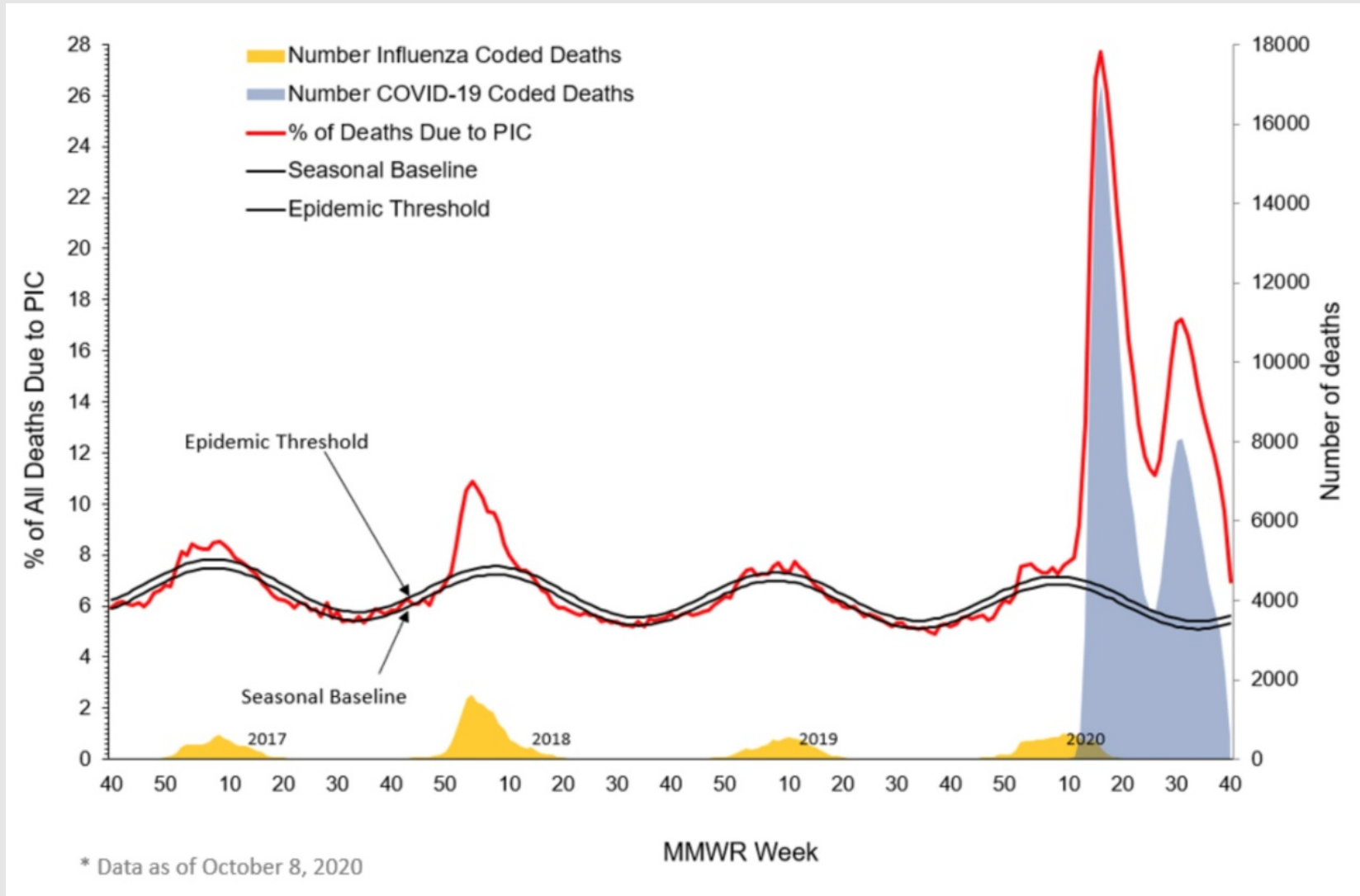
29-Sep-20 to 05-Oct-20

-1.5%

1 Week Change in Average



COVID-19 and Influenza Mortality, 2017-2020



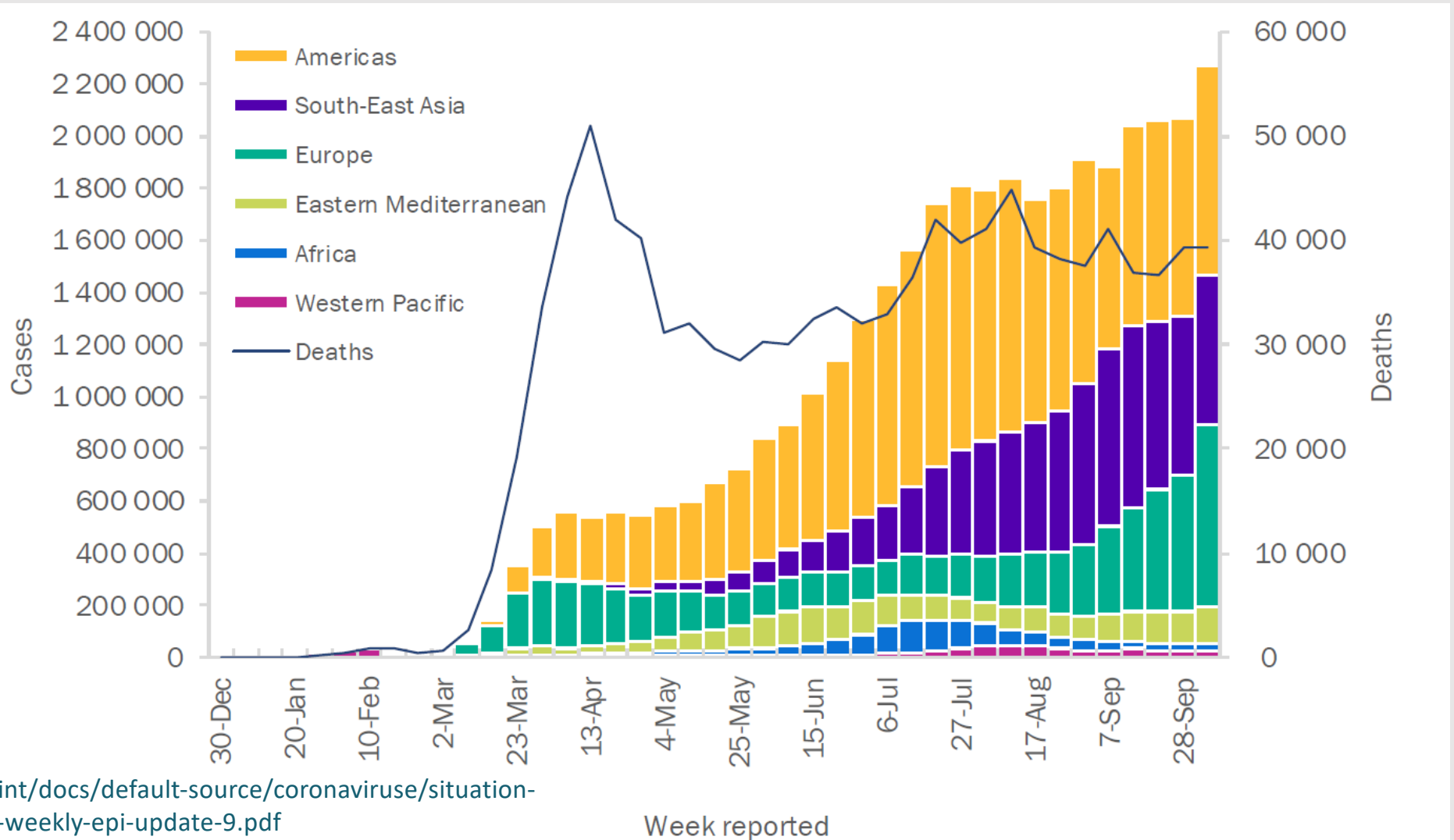
COVID-19 Cases and Death by WHO Region, Dec 30, 2019-Oct 11, 2020

>37,000,000 cases

>1,000,000 deaths

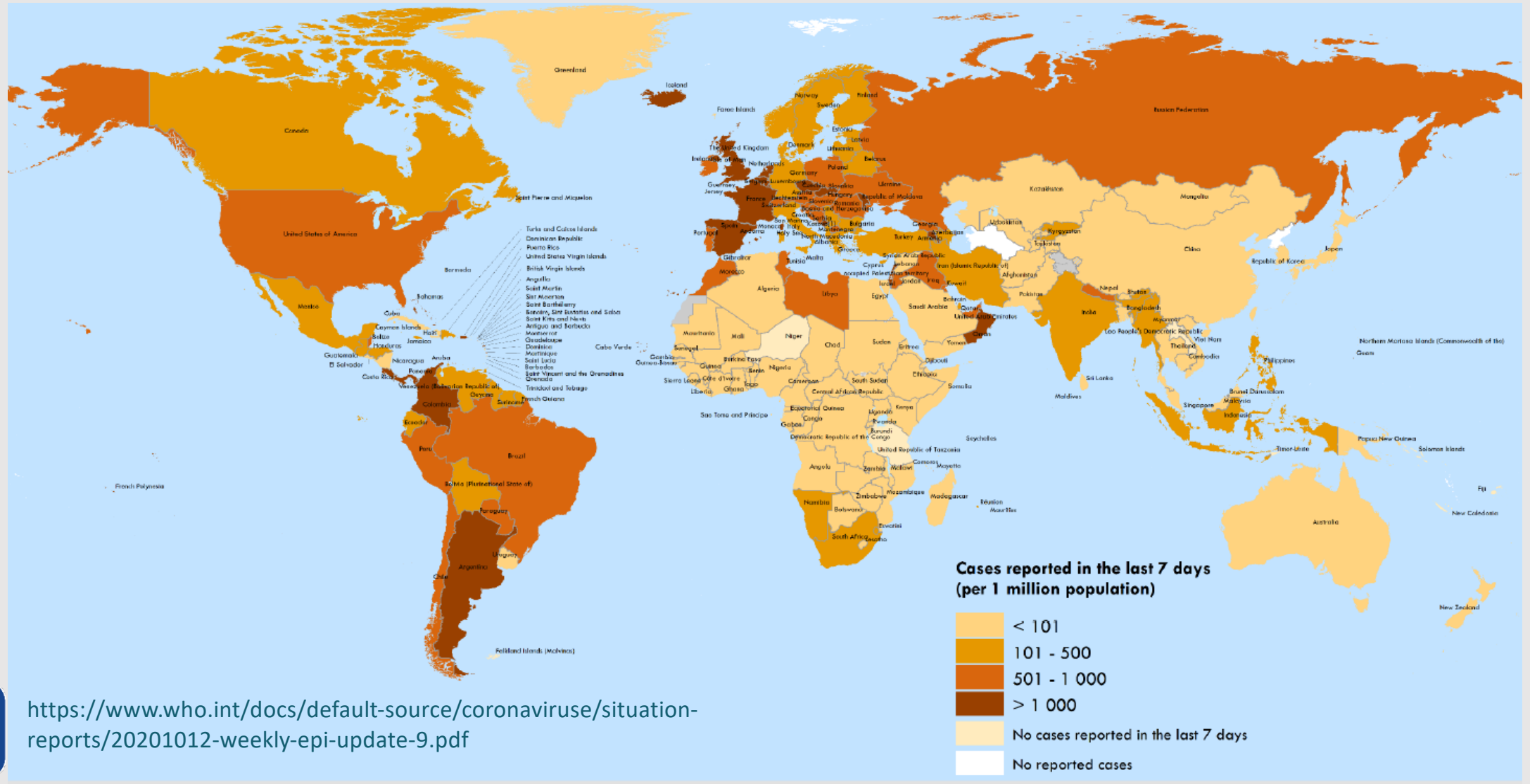
Cumulatively ~50%
of cases from
Americas:

- USA
- Brazil
- Chile



<https://www.who.int/docs/default-source/coronaviruse/situation-reports/20201012-weekly-epi-update-9.pdf>

COVID-19 Rates, Oct 5-11, 2020



Relative Risk of Hospitalization and Death by Age

Rate ratios compared to 18-29 year olds	0-4 years	5-17 years	18-29 years	30-39 years	40-49 years	50-64 years	65-74 years	75-84 years	85+ years
HOSPITALIZATION ¹	4x lower	9x lower	Comparison Group	2x higher	3x higher	4x higher	5x higher	8x higher	13x higher
DEATH ²	9x lower	16x lower	Comparison Group	4x higher	10x higher	30x higher	90x higher	220x higher	630x higher

¹ Data source: COVID-NET (<https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html>, accessed 08/06/20). Numbers are unadjusted rate ratios.

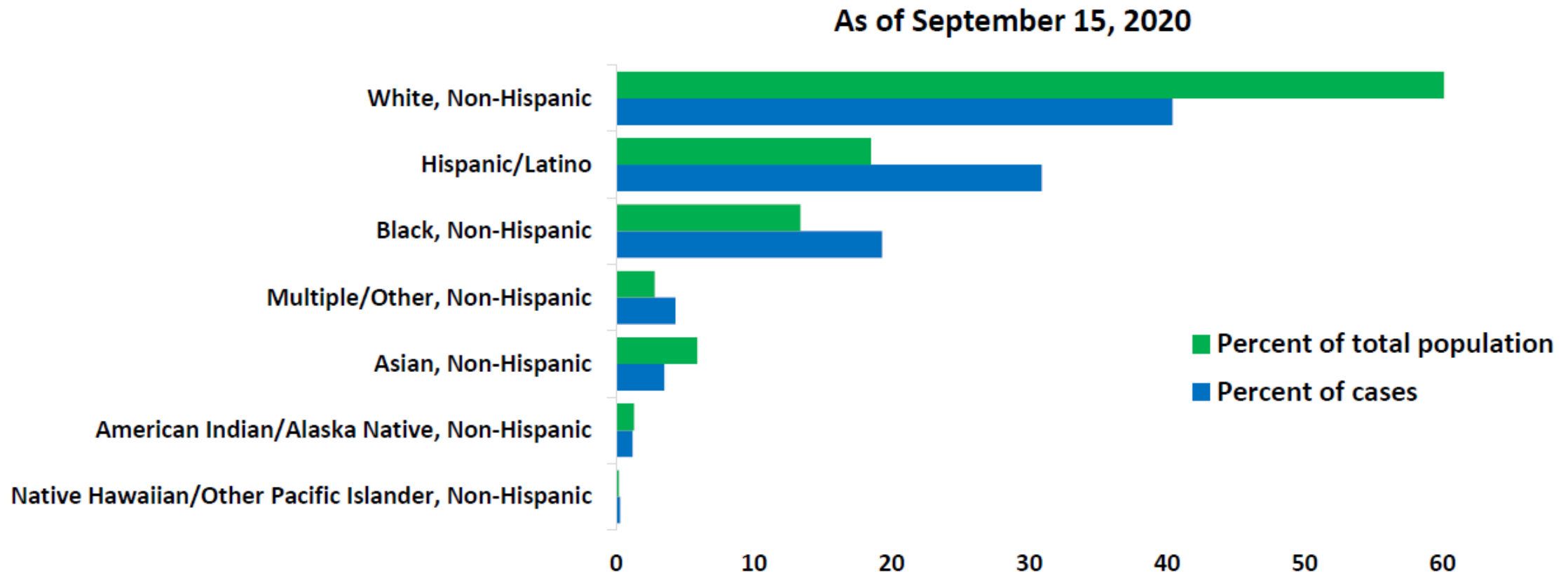
² Data source: NCHS Provisional Death Counts (<https://www.cdc.gov/nchs/nvss/vsrr/COVID19/index.htm>, accessed 08/06/20). Numbers are unadjusted rate ratios.

cdc.gov/coronavirus

CS319360-A 08/10/2020



Proportion of COVID-19 Cases by Race/Ethnicity



*Data from 4,909,175 cases. Race/Ethnicity was available for 2,453,808 (50%) cases.

Updated as of 9/15/2020. Data are based on COVID-19 case-level data reported by state and territorial jurisdictions to the Centers for Disease Control and Prevention (CDC). The numbers are confirmed and probable COVID-19 cases as reported by U.S. states, U.S. territories, New York City, and the District of Columbia from the previous day.

U.S. Census: <https://www.census.gov/quickfacts/fact/table/US/PST045219> <https://www.cdc.gov/covid-data-tracker/index.html#demographics>



Relative Risk of Infection, Hospitalization, and Death by Race/Ethnicity

Rate ratios compared to White, Non-Hispanic Persons	American Indian or Alaska Native, Non-Hispanic persons	Asian, Non-Hispanic persons	Black or African American, Non-Hispanic persons	Hispanic or Latino persons
CASES ¹	2.8x higher	1.1x higher	2.6x higher	2.8x higher
HOSPITALIZATION ²	5.3x higher	1.3x higher	4.7x higher	4.6x higher
DEATH ³	1.4x higher	No Increase	2.1x higher	1.1x higher

Race and ethnicity are risk markers for other underlying conditions that impact health — including socioeconomic status, access to health care, and increased exposure to the virus due to occupation (e.g., frontline, essential, and critical infrastructure workers).



¹ Data source: COVID-19 case-level data reported by state and territorial jurisdictions. Case-level data include about 80% of total reported cases. Numbers are unadjusted rate ratios.

² Data source: COVID-NET (<https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html>, accessed 08/06/20). Numbers are ratios of age-adjusted rates.

³ Data source: NCHS Provisional Death Counts (<https://www.cdc.gov/nchs/nvss/vsrr/COVID19/index.htm>, accessed 08/06/20). Numbers are unadjusted rate ratios.

cdc.gov/coronavirus

CS319360-A 08/08/2020

Age is Highly Associated With Risk of Death

8 out of **10** COVID-19 deaths reported in the U.S. have been in adults 65 years old and older. Visit [CDC.gov/coronavirus](https://www.cdc.gov/coronavirus) for steps to reduce your risk of getting sick.



[cdc.gov/coronavirus](https://www.cdc.gov/coronavirus)

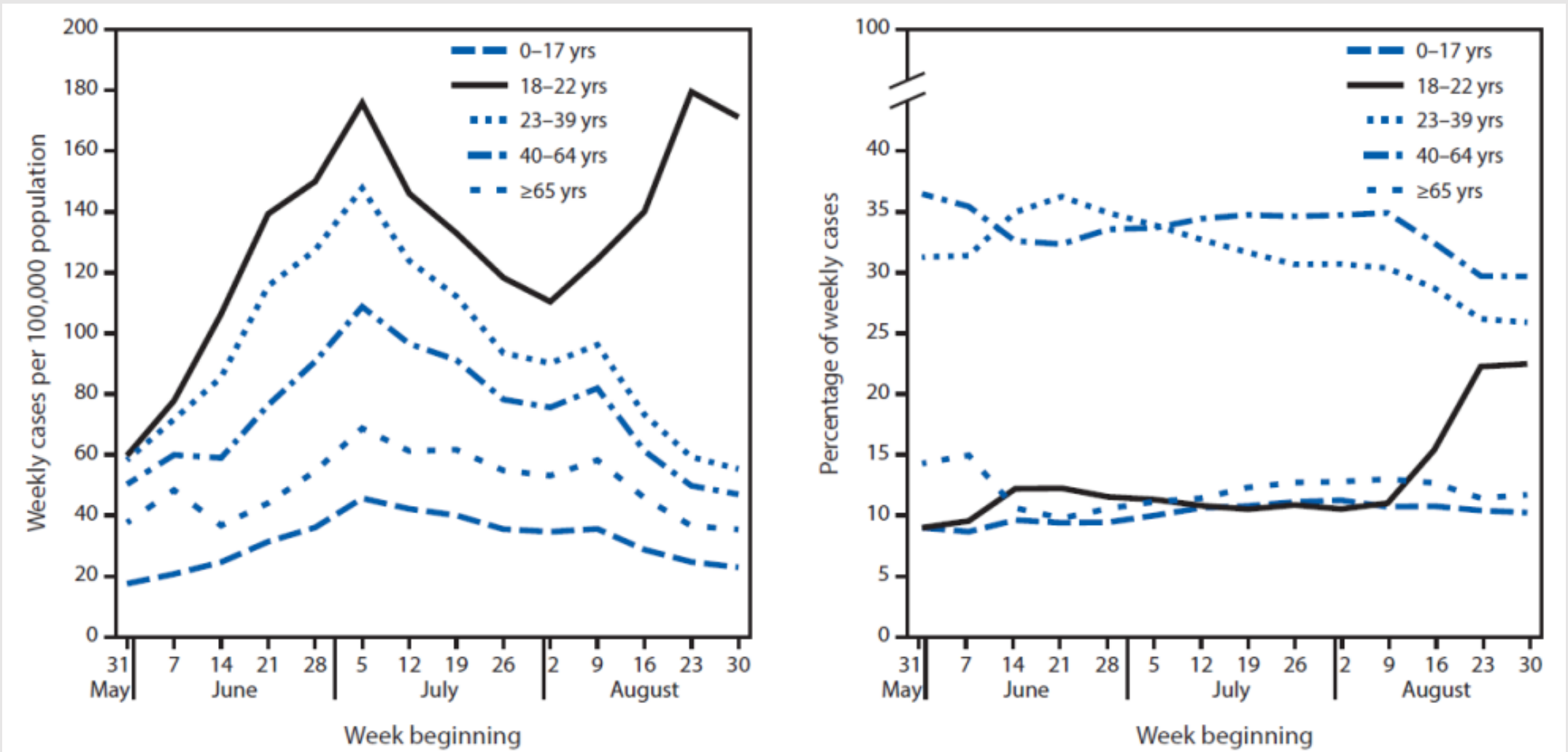
Medical Conditions Associated With Higher Risk of Severe COVID-19

- Cancer
- Chronic kidney disease
- COPD (chronic obstructive pulmonary disease)
- Heart disease: heart failure, coronary artery disease, or cardiomyopathies
- Immunocompromised state from solid organ transplant
- Obesity (body mass index [BMI] of 30 kg/m² or higher but < 40 kg/m²)
- Severe Obesity (BMI ≥ 40 kg/m²)
- Sickle cell disease
- Smoking
- Type 2 diabetes mellitus

Medical Conditions That *May Be* Associated With Higher Risk of Severe COVID-19

- Asthma (moderate-to-severe)
- Cerebrovascular disease
- Cystic fibrosis
- Hypertension
- Immunocompromised state (weakened immune system) from blood or bone marrow transplant, immune deficiencies, HIV, use of corticosteroids, or use of other immune weakening medicines
- Neurologic conditions, such as dementia
- Liver disease
- Overweight (BMI > 25 kg/m², but < 30 kg/m²)
- Pregnancy
- Pulmonary fibrosis (having damaged or scarred lung tissues)
- Thalassemia (a type of blood disorder)
- Type 1 diabetes mellitus

Increase in COVID-19 Cases Among Young Adults, August 2020



Salvatore PP, et al. *MMWR* 2020; 69(39):1419-1424

Community and Close Contact Exposures among Symptomatic Adults – 11 U.S. Medical Centers

- Influenza Vaccine Effectiveness in the Critically Ill (IVY) Network sites in 10 states
- Symptomatic adults, first SARS-CoV-2 test at outpatient testing centers during July 1-29, 2020
- Cases (SARS-CoV-2 positive) and controls (SARS-CoV-2 test-negative) in outpatient testing settings
- Participants (n=314): 154 cases and 160 test-negative controls
- Interviewed 14-23 days after test

	Negative (n = 160)	Positive (n = 154)
Reported close contact with a known COVID-19 case		
No	86%	58%
Yes	14%	42%
Relationship to close contact (n = 88)		
Family	22%	51%
Friend	17%	14%
Work colleague	26%	17%
Other	35%	9%
Multiple	0%	9%



Fisher KA, et al. *MMWR* 2020; 69(36);1258–1264

Community and Close Contact Exposures among Symptomatic Adults – 11 U.S. Medical Centers

- Similar community exposures between cases and controls, with the exception of dining at a restaurant
 - 41% of cases and 28% of controls reported dining at a restaurant 14 days prior to illness onset
- High rates of participants reported “Always” wearing a mask 14 days prior to illness onset (74% controls and 71% cases)

	Negative (n = 160)	Positive (n = 154)	p-value
Community exposure 14 days prior to illness onset			
Shopping	88%	86%	0.51
Home, 10 or less	52%	51%	0.83
Restaurant	28%	41%	0.01
Office setting	30%	24%	0.27
Salon	18%	16%	0.63
Home, more than 10	15%	14%	0.73
Gym	6%	8%	0.60
Public transportation	6%	5%	0.68
Bar/coffee shop	5%	8%	0.22
Church/religious gathering	5%	8%	0.32
Restaurant: others following recommendations such as wearing a mask or social distancing (n = 107)			0.03
None/A few	2%	19%	
About half/Most	48%	40%	
Almost all	50%	41%	
Cloth face covering or mask 14 days prior to illness onset			0.86
Never	3%	4%	
Rarely	4%	4%	
Sometimes	4%	7%	
Often	15%	14%	
Always	74%	71%	



Fisher KA, et al. *MMWR* 2020; 69(36);1258–1264

Risk of Person-to-Person Infectious Disease Transmission is Complex

- Driven by a number of biological, behavioral, and environmental factors:
 - Exposure to a greater number of infected persons
 - Proximity of a susceptible person to an infectious person
 - Cumulative length of exposure during infectious period
 - Lack of protective measures
 - Environmental factors (e.g., air and airflow characteristics)

COVID-19 Outbreak Setting	Reference, e.g.
Long-term Care Facilities	McMichael T , et al. <i>N Engl J Med</i> 2020; 382(21):2005-2011
Cruise Ships; Navy Vessel	Moriarty LF, et al. <i>MMWR</i> 2020; 69(12):347-352
Meatpacking Plants	Dyal JW, et al. <i>MMWR</i> 2020; 69(18):557-561
Correctional/Detention Facilities	Wallace M, et al. <i>MMWR</i> 2020; 69(19):587-590
Homeless Shelters	Mosites E, et al. <i>MMWR</i> 2020; 69(17):521-522
Choir Practice	Hamner L, et al. <i>MMWR</i> 2020; 69(19):606-610
Church Service	James A, et al. <i>MMWR</i> 2020; 69(20);632–635
Schools, Colleges, Universities	Wilson E, et al. <i>MMWR</i> 2020; 69(39):1416-1418
Child Care Centers	Lopez AS, et al. <i>MMWR</i> 2020; 69(37):1319-1323
Bars	Multiple unpublished reports from public health agencies
Gyms (Dance class, squash court)	Jang S, et al. <i>Emerg Infect Dis</i> 2020; 26(8):1917-1920
Summer Camps	Szablewski CM, et al. <i>MMWR</i> 2020; 69(31):1023-1025
Extended Family Gatherings	Schwartz NG, et al. <i>MMWR</i> 2020; 69(40):1457-1459
Hockey Tournaments	Atrubin D, et al. <i>MMWR in press</i>

Common Factors in COVID-19 Point-Source Outbreaks

- Crowds
- Close contact
- Continuous exposure
- Coverings
- Cold (?)
- Closed spaces



Transmission Dynamics of Pathogenic Human *Coronaviridae* (CoV)

	SARS-CoV-1	MERS-CoV	SARS-CoV-2
Incubation period, median (range)	4-6 days (up to 16)	4-6 days (range 2-14)	4-6 days (range 2-14)
Infectious before ill	No	No	Yes

SARS-CoV-2

- Peak infectiousness days before symptom onset (*pre-symptomatic*) and shortly thereafter
- A substantial fraction of infections, **estimated 15-45%, are *asymptomatic***

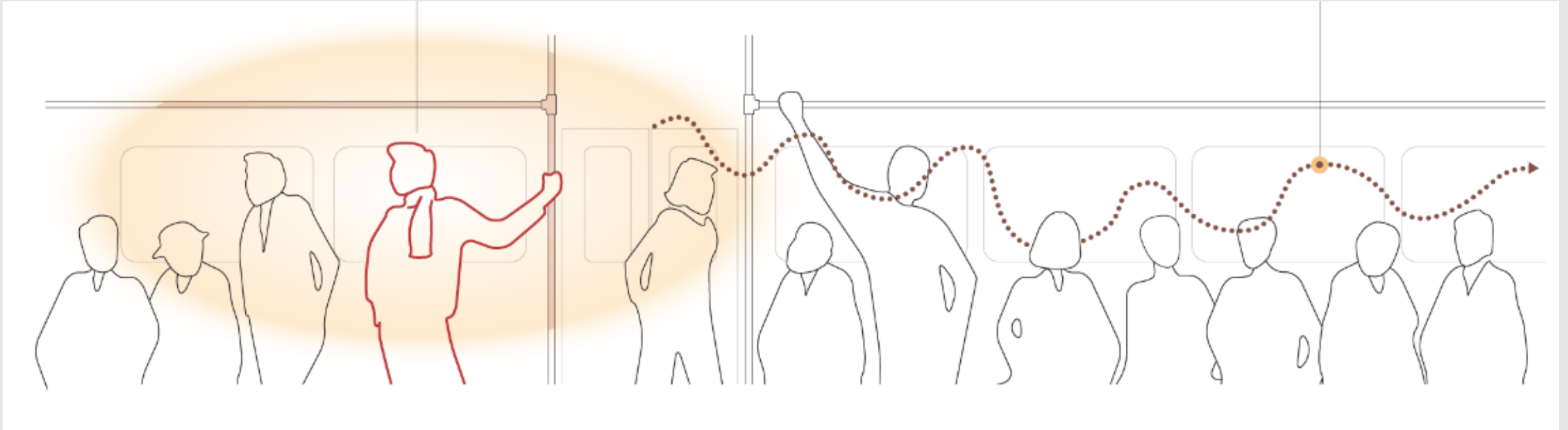


Lauer 2020, [Ann Intern Med](#); doi:10.7326/M20-0504. Du 2020, [Emerg Infect Dis](#); doi.org/10.3201/eid2606.200357.
Nichiura 2020, [Int J Infect Dis](#); doi.org/10.3201/eid2606.200357. Lipsitch 2003, [Science](#);300(5627):1966-70.
Park 2018, [BMC Public Health](#); doi.org/10.1186/s12889-018-5484-8

Classical Terminology in Infection Control: Droplet Transmission and Airborne Spread

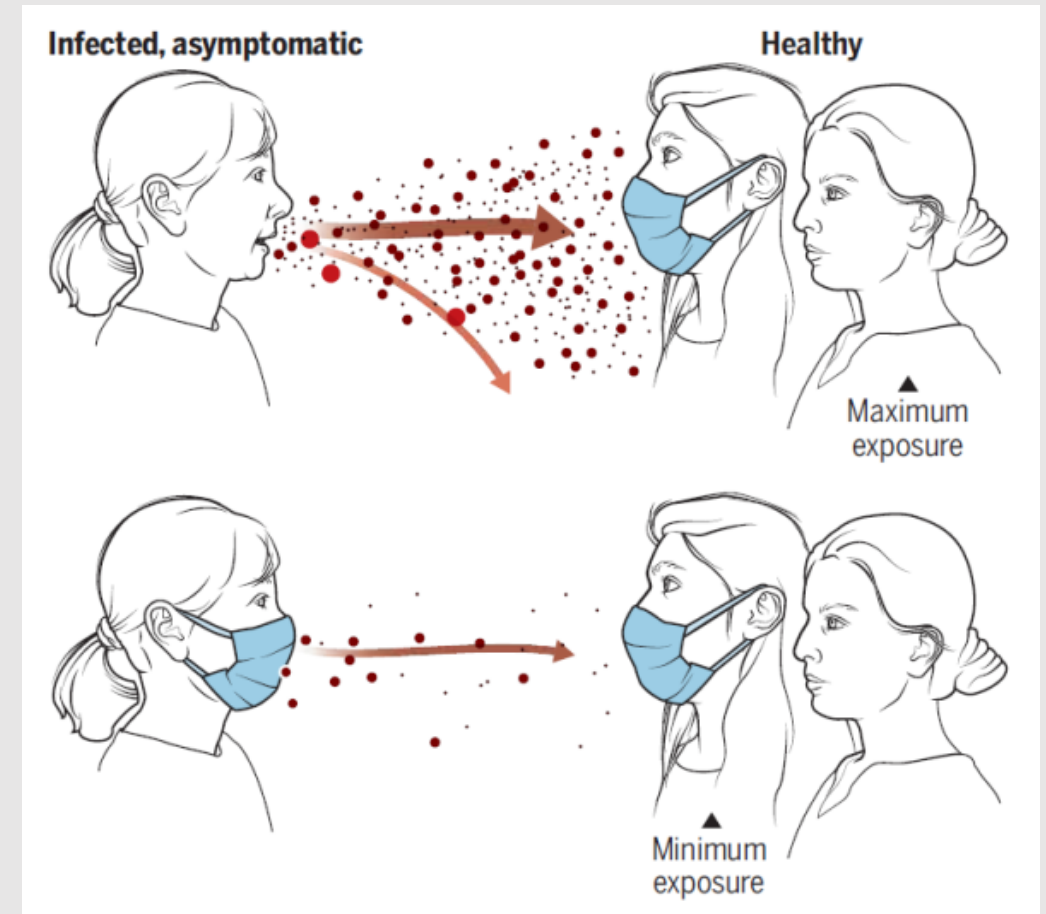
Droplet: infectious particles are projectiles; spread limited by gravity

Airborne: infectious droplets remain airborne minutes to hours, potential spread by air currents (e.g., via HVAC)



Droplet Transmission and Aerosol Spread

- Larger droplets are ballistic projectiles; spread limited by gravity
- Smaller droplets remain airborne minutes to hours, potential spread by air currents (e.g., via HVAC)



Paradigm for Classification of Airborne Transmission

- Obligate: infection initiated only by aerosol deposition in the distal lung
 - E.g., tuberculosis
- Preferential: multiple routes of transmission but predominantly via aerosols deposited in distal airways; clinical presentation determined by mode of transmission and site of inoculation
 - E.g., smallpox, *Legionella* sp., anthrax
- Opportunistic: transmission most common via non-airborne route, but fine-particle aerosols may transmit infection under favorable conditions
 - E.g., SARS outbreak, Amoy Gardens apartment complex, 2003



Current View on Transmission of SARS-CoV-2



- Spreads more efficiently than influenza, but not as efficiently as measles
- Thought to spread mainly person to person:
 - Through large droplets produced when an infected person coughs, sneezes, or talks
 - These droplets spread to the mouths, noses, or eyes of people who are nearby SARS-CoV2.
 - Small droplet aerosol (airborne spread) is plausible and likely occurs
- The virus may be spread in other ways.
 - Fomites: touching a surface or object that has the virus on it and then touching the mouth, nose, or possibly their eyes.
 - Animal-to-human: appears to be rare

SARS-CoV-2 in Human Samples and Transmission

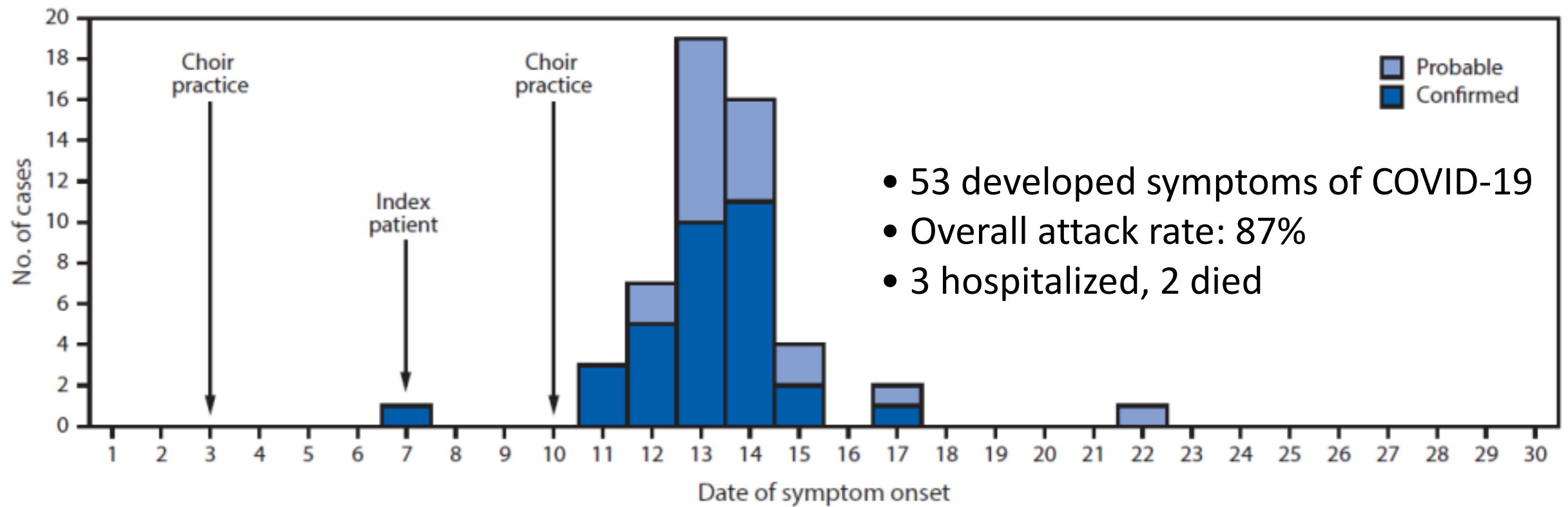
Sample	Possible mode of transmission	Detected by PCR	Isolated by culture	Observed mode of transmission
Nasopharyngeal swab	RESPIRATORY	Yes	Yes	Yes
Oropharyngeal swab		Yes	Yes	Yes
Sputum		Yes	Yes	Yes
Stool	FECAL	Yes	Yes but likely rare	Not yet reported
Urine	URINARY	No	Not yet reported	Not yet reported
Blood/serum	TRANSFUSION	Not reliably	No	Not yet reported
Cervicovaginal fluid	SEXUAL	No	Not yet reported	Not yet reported
Semen		Yes, but likely rare	Not yet reported	Not yet reported



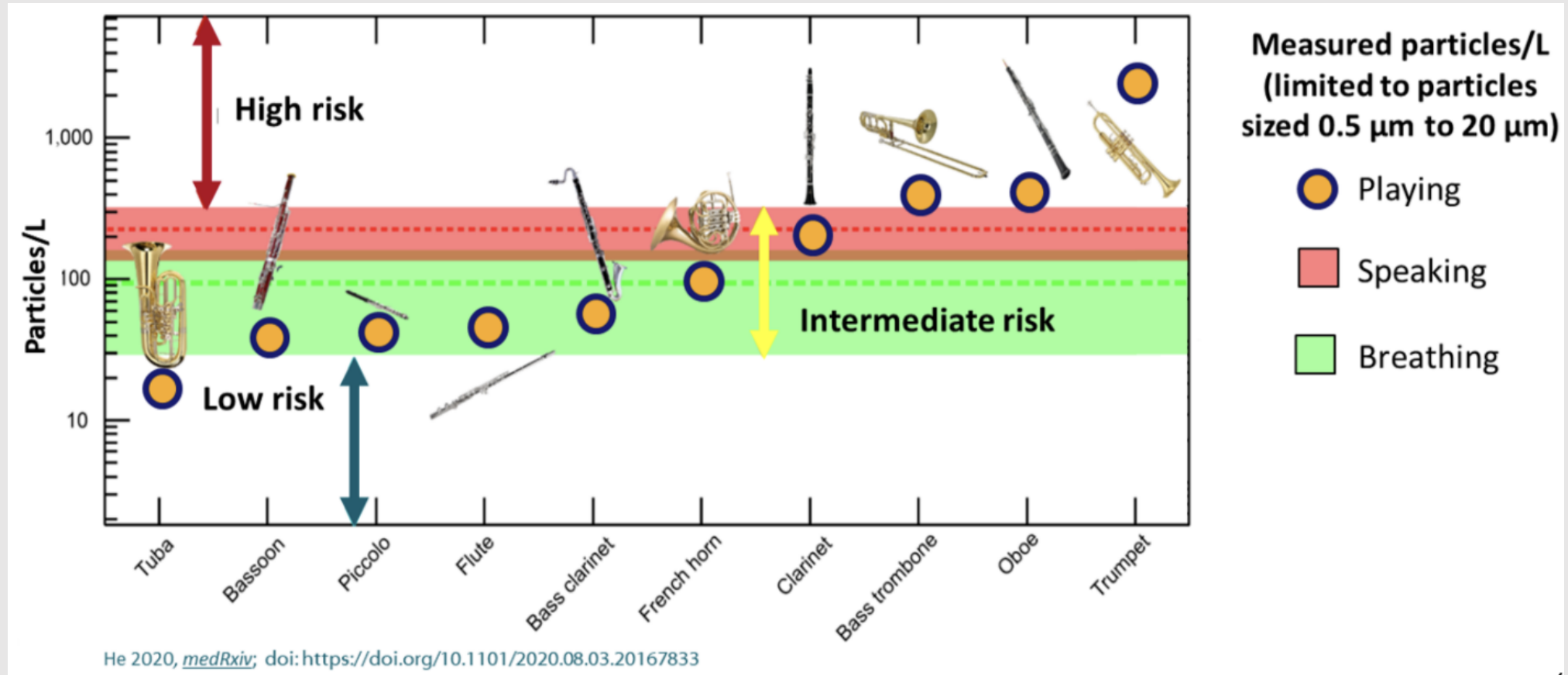
Zou 2020, [N Engl J Med](#); DOI: 10.1056/NEJMc2001737. Pan 2020, [Lancet Infect Dis](#); [https://doi.org/10.1016/S1473-3099\(20\)30113-4](https://doi.org/10.1016/S1473-3099(20)30113-4). Zhang 2020; [China CDC Weekly](#): <http://weekly.chinacdc.cn/en/article/id/ffa97a96-db2a-4715-9dfb-ef662660e89d>. Chen 2020; [Lancet](#): [https://doi.org/10.1016/S0140-6736\(20\)30360-3](https://doi.org/10.1016/S0140-6736(20)30360-3). Zhu 2020, [Transl Pediatr](#); <http://dx.doi.org/10.21037/tp.2020.02.06>. Li 2020, [JAMA Network Open](#); doi:10.1001/jamanetworkopen.2020.8292. Yu 2020, [Lancet Infect Dis](#); doi.org/10.1016/S1473-3099(20)30320-0. Chang 2020, [Emerg Infect Dis](#); in press. Xiao 2020, [Emerg Infect Dis](#); August 26(8). Xiao 2020, [Gastroenterol](#); doi.org/10.1053/j.gastro.2020.02.055

Choir Practice, Skagit County, WA, March 2020

- 61 persons attending a 2.5 hour choir practice on March 10



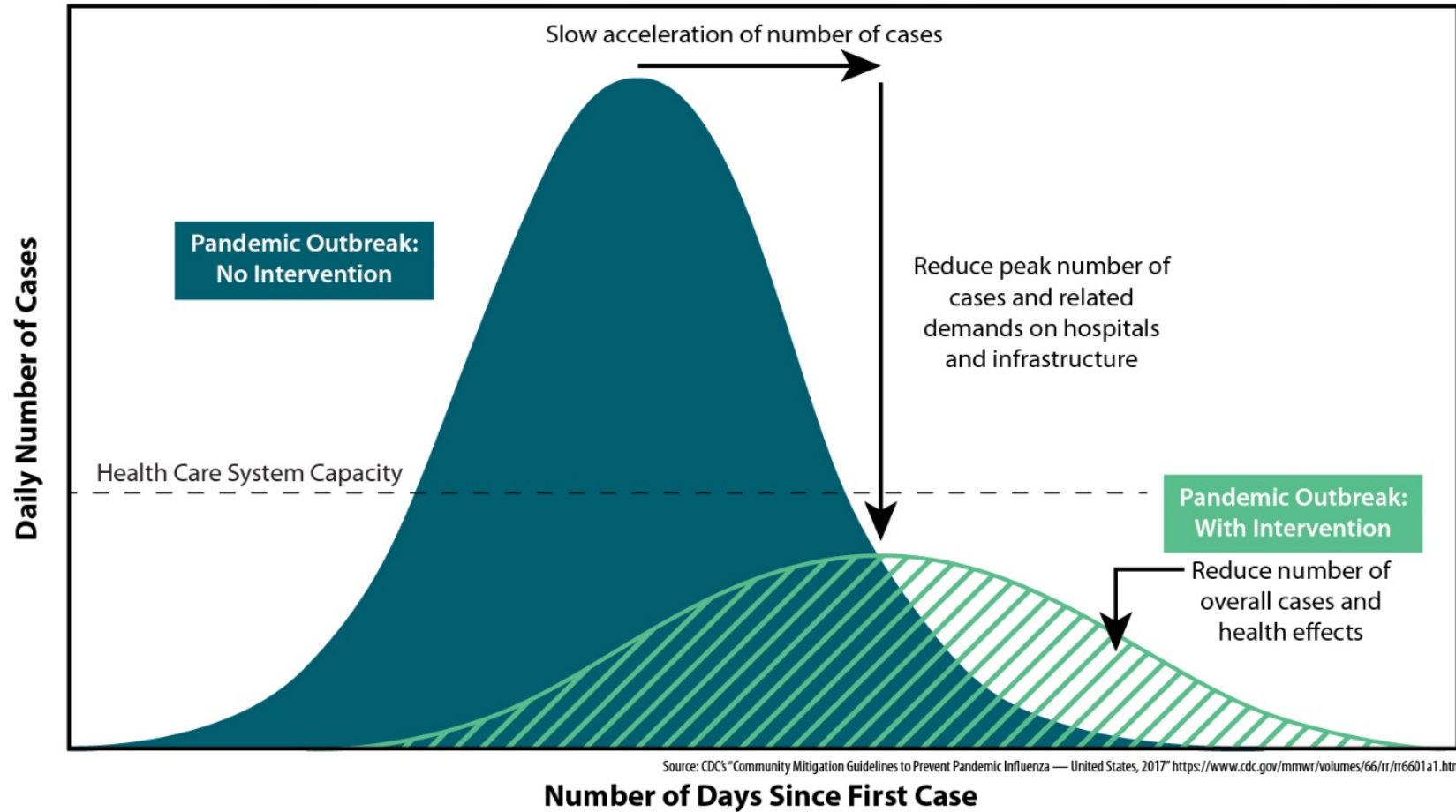
Aerosolized Particles Produced by Wind Instruments



Critical Unknowns Regarding Transmission

- What is the proportion of SARS-CoV-2 infections acquired by the airborne route?
- What are the conditions that facilitate superspreading events?
- What is the infectious dose for SARS-CoV-2?
- Is disease severity influenced by:
 - Inoculum size?
 - Route of inoculation?
- What role do face masks play in preventing spread?
- What are the appropriate masks for use in the community?

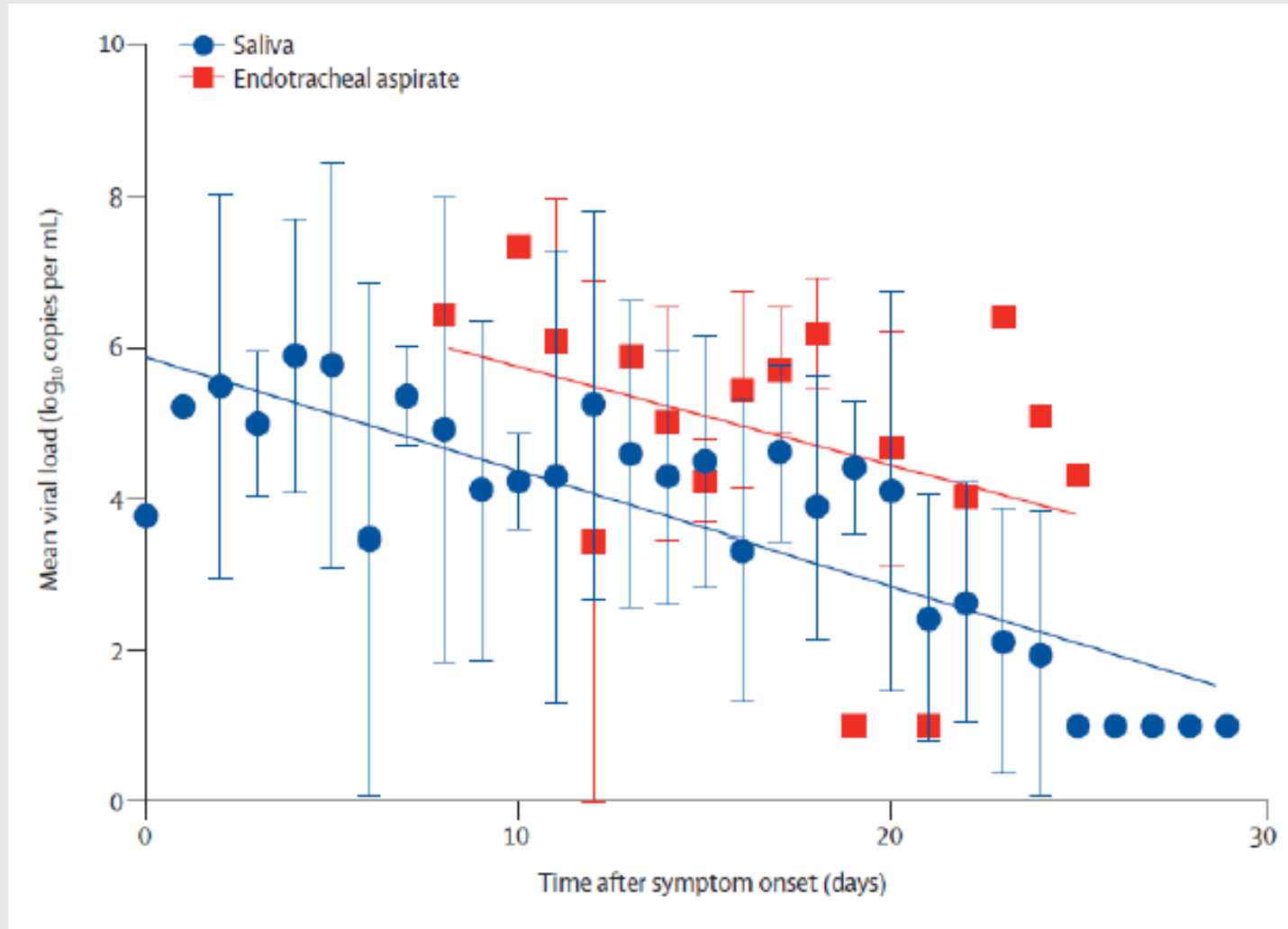
Goals of Community Mitigation for COVID-19 Pandemic



The United States is using community mitigation measures, including social distancing, to slow the spread and lessen the impact of the COVID-19 pandemic.

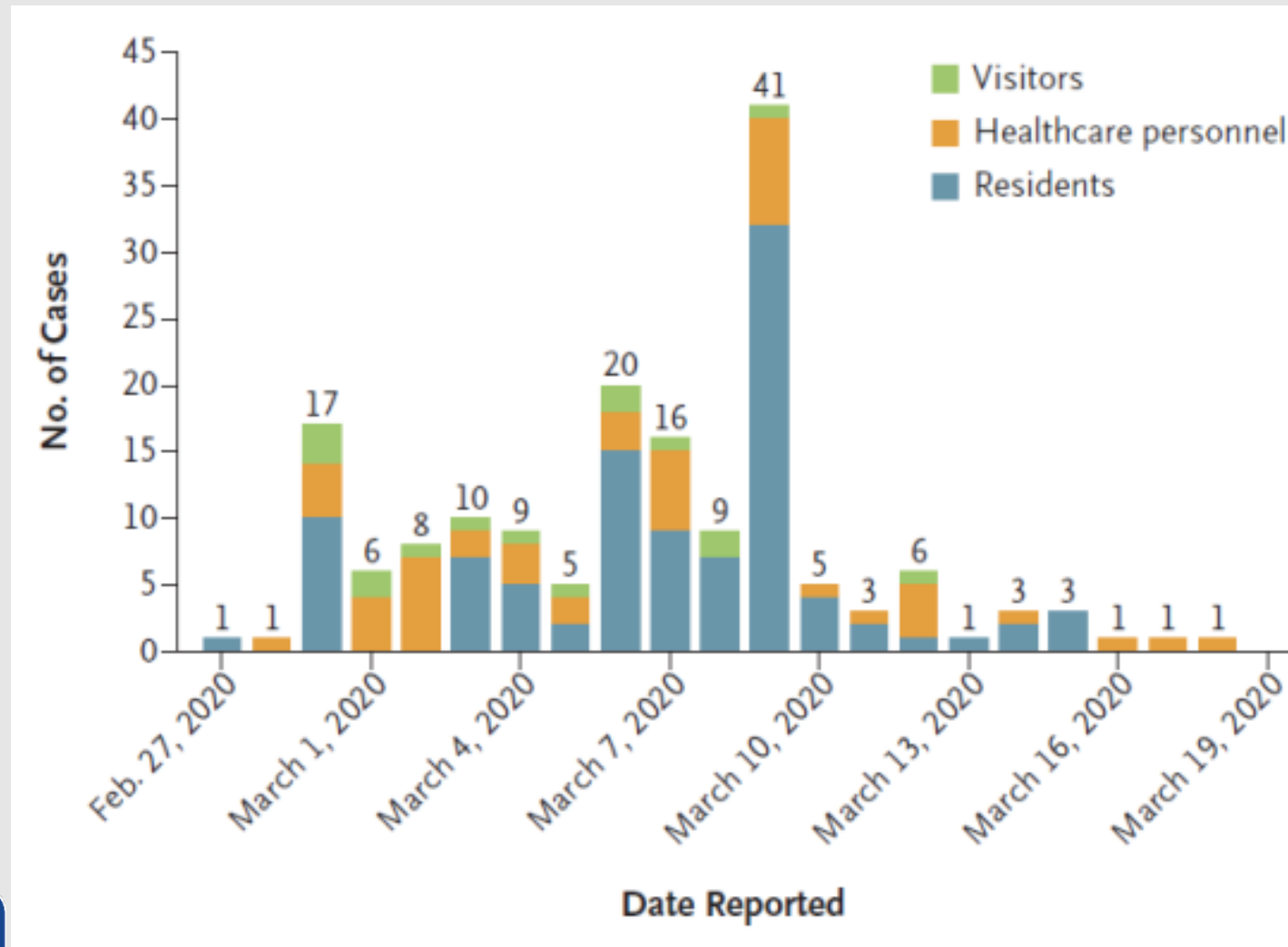
cdc.gov/coronavirus

Viral Shedding in Respiratory Secretions Is Greatest At Time Symptom Onset



To KK-W, et al. *Lancet Infect Dis* 2020; doi: 10.1016/S1473-3099(20)30196-1

Outbreak of COVID-19 at a LTCF, Seattle, February-March 2020

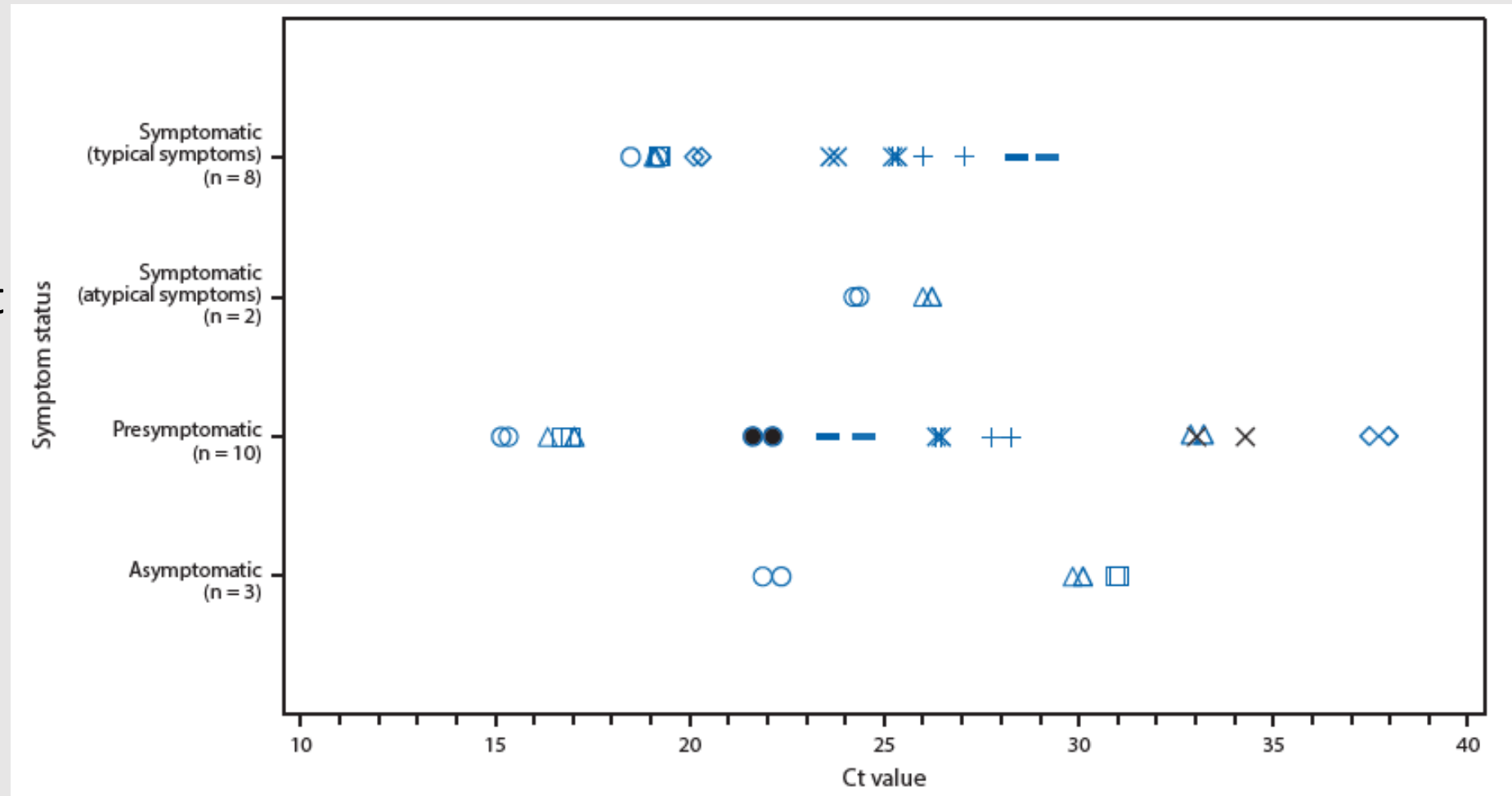


167 Cases Through March 18:

- 16 Visitors
- 50 HCWs
- 101 Residents

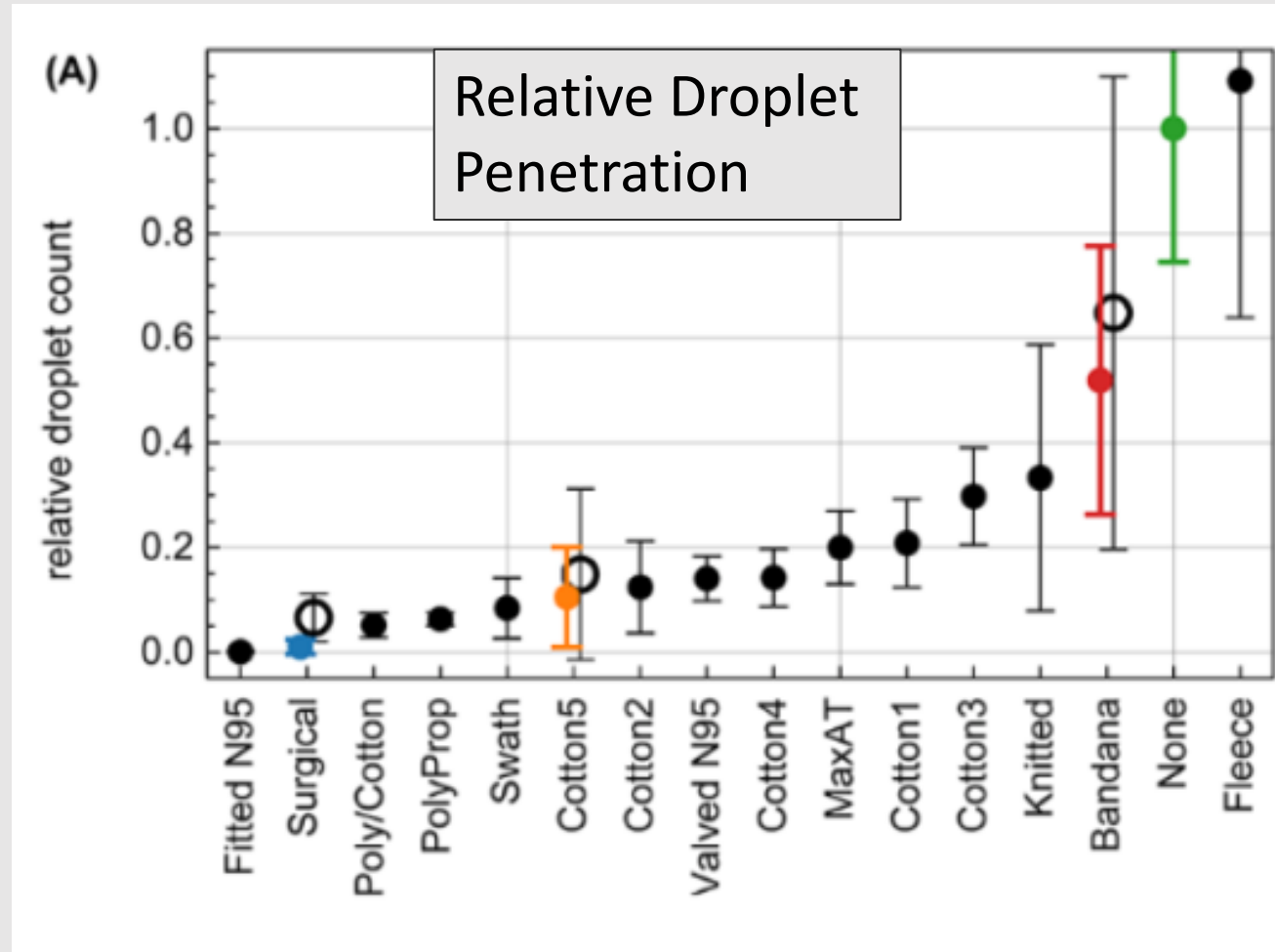
Cycle Threshold Values for 23 Residents of a LTCF With + NP/OP Swab PCR for SARS-CoV-2

No significant difference in Ct values by symptom status ($p=0.3$)



Kimball A, et al. *MMWR Early Release* 2020, March 27

Masks: So Many Choices!



N-95 Respirators With Vented Exhalation Ports: Not Recommended for Source Control



Standard, Fitted N-95

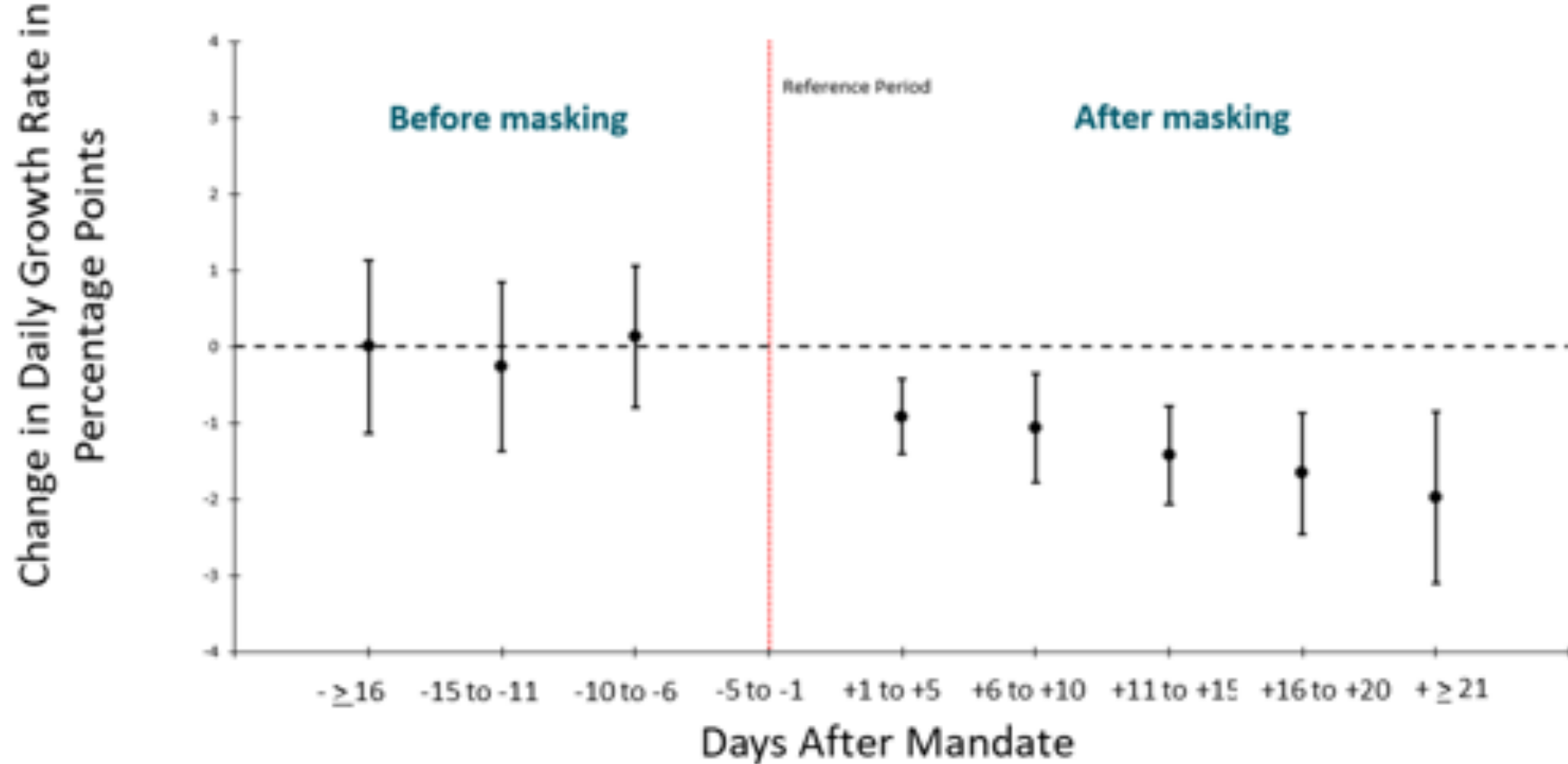


N-95 With Exhalation Port



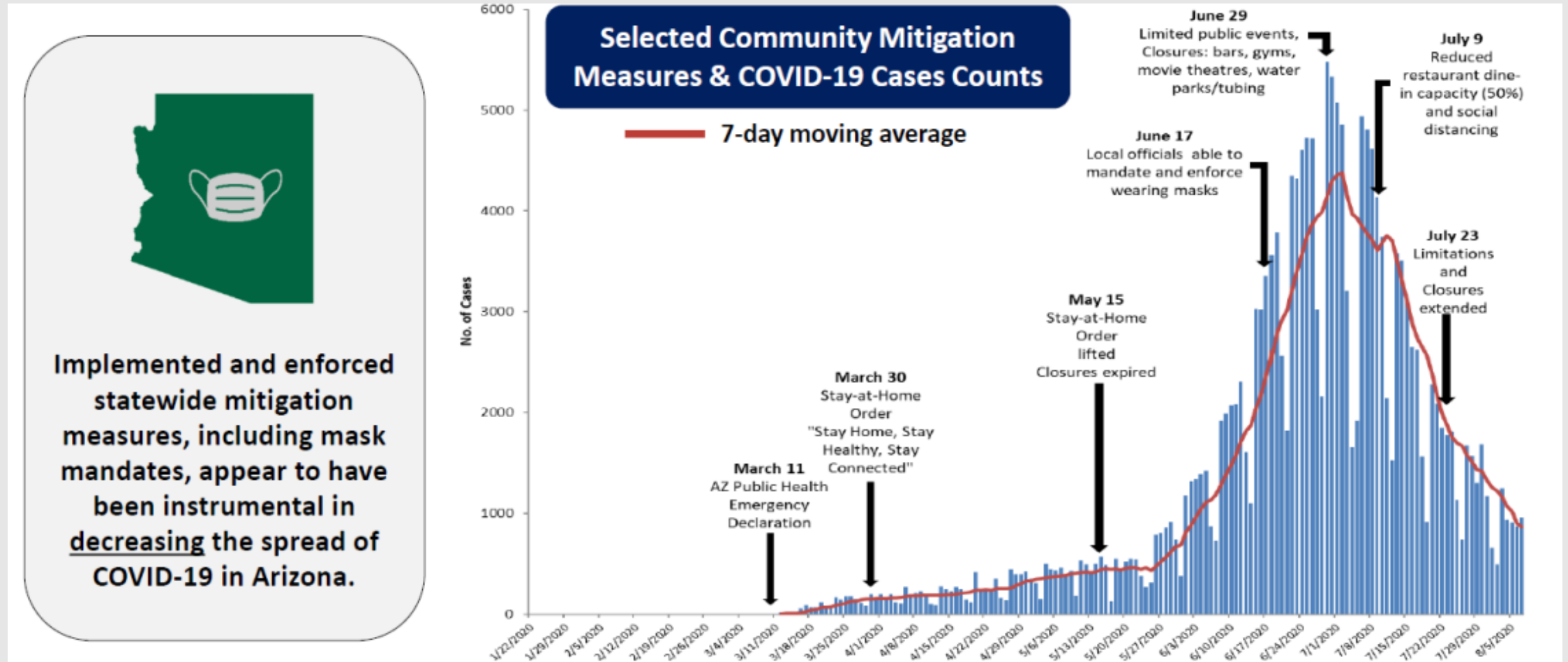
Verma S, et al. *Physics Fluids* 2020; <https://doi.org/10.1063/5.0022968>

Community Face Mask Use Associated with Slowing of Daily COVID-19 Case Growth Rate, April-May 2020



Lyu W, Wehby GL. *Health Affairs* 2020; 39(8):1419-1425

COVID-19 Cases and Community Mitigation Measures, Arizona, Jan 22-Aug 7, 2020



Ode to Community Mitigation, Dr. Willam Nazaroff, Univ of California, Berkeley

Layered Approach to COVID-19 Risk Management

Outdoors is better than indoors

Short is better than long

Masked is better than unmasked

Socially distant is better than too close

Sparse is better than crowded

Quiet is better than loud

Gentle breathing is better than vigorous breathing

Risk can be lowered indoors (but not eliminated) by improved ventilation and air filtration



Proceedings of a NASEM Workshop, Aug 28-29, 2020

COVID-19 vaccines in human clinical trials – United States*

Candidate	Manufacturer	Type	Phase	Trial characteristics	Trial #	Recruiting
mRNA-1273	Moderna TX, Inc.	mRNA	III	<ul style="list-style-type: none"> • 2 doses (0, 28d) • IM administration • 18-55, 56+ years 	NCT04470427	✓
mRNA-BNT162	Pfizer, Inc./BioNTech	mRNA	II/III	<ul style="list-style-type: none"> • Single or 2 doses • IM administration • 18-85 years 	NCT04368728	✓
AZD1222	University of Oxford/AstraZeneca consortium**	Viral vector (NR)	III	<ul style="list-style-type: none"> • 2 doses (0, 28d) • IM administration • ≥18 years 	NCT04516746	On Hold
Ad26COVS1	Janssen Pharmaceutical Companies	Viral vector (NR)	I/II	<ul style="list-style-type: none"> • 2 doses (0,56d) • IM administration • 18-55, 65+ 	NCT04436276	✓
--	Sanofi/GSK	Protein Subunit	I/II	<ul style="list-style-type: none"> • Single or 2 doses • 18-49, 50+ 	NCT04537208	✓
NVX-CoV2373	Novavax	Protein Subunit	I/II		NCT04368988	✓
AV-COVID-19	Aivita	AuDendritic cell	I/II		NCT04386252	
INO-4800	Inovio Pharmaceuticals, Inc.	DNA plasmid	I	<ul style="list-style-type: none"> • 2 doses (0, 4w) • SC administration/ electroporation • ≥18 years 	NCT04336410	

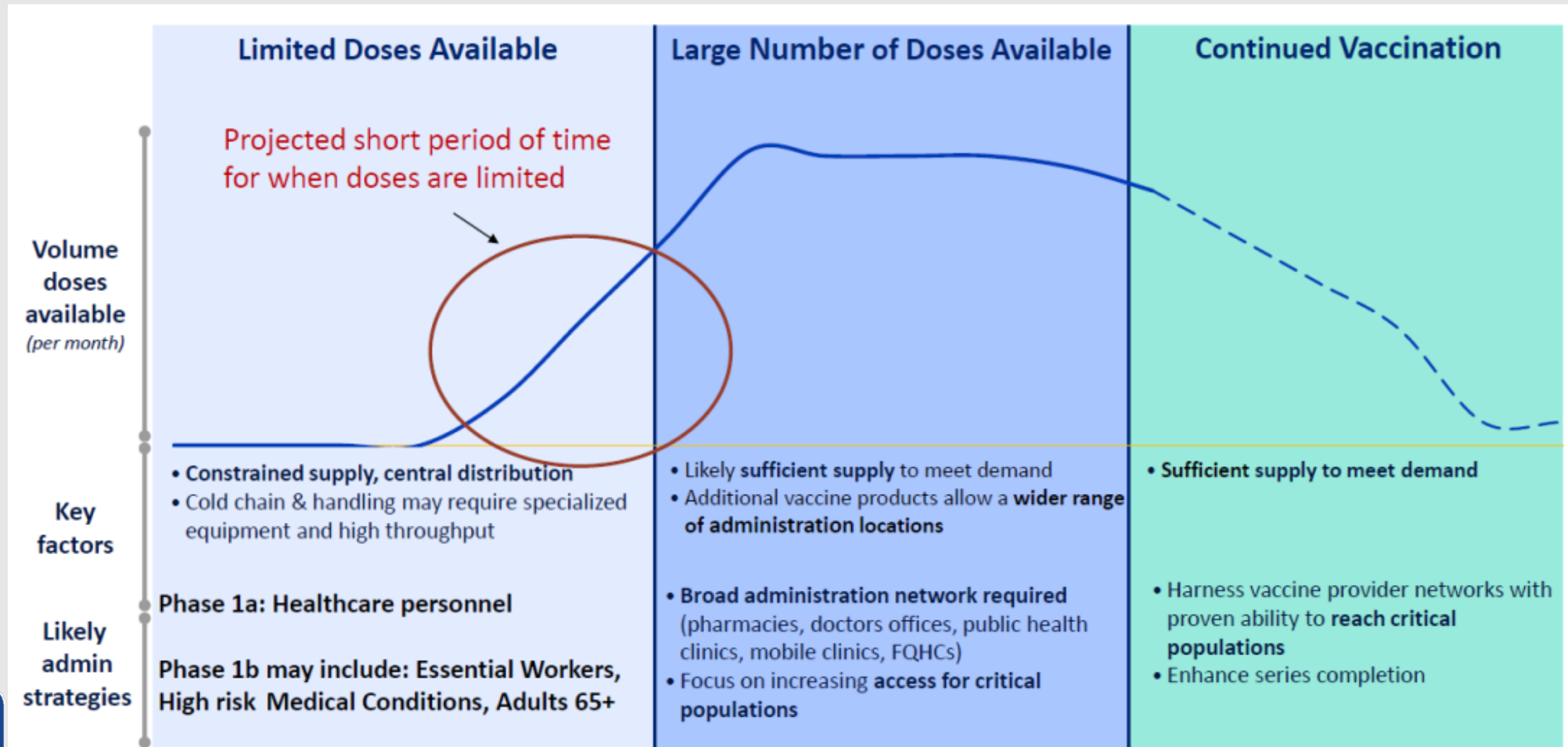
*As of September 14, 2020

**Currently on hold in US

Sources: <https://milkeninstitute.org/covid-19-tracker>; <https://www.who.int/who-documents-detail/draft-landscape-of-covid-19-candidate-vaccines>; https://vaccine.shinyapps.io/ncov_vaccine_landscape/; <https://clinicaltrials.gov/>; <https://www.nytimes.com/interactive/2020/science/coronavirus-vaccine-tracker.html>



COVID-19 Vaccine Distribution



Vaccine Prioritization and Equitable Access

- **Johns Hopkins:** “Promoting equity and social justice requires addressing higher rates of COVID-19 related severe illness and mortality among systematically disadvantaged or marginalized groups.”
- **National Academies:** “The committee recommends that vaccine access should be prioritized for geographic areas identified as vulnerable through CDC’s Social Vulnerability Index”
- **World Health Organization:** “The overarching goal is for COVID-19 vaccines to contribute significantly to the equitable protection and promotion of human well-being among all people of the world.”

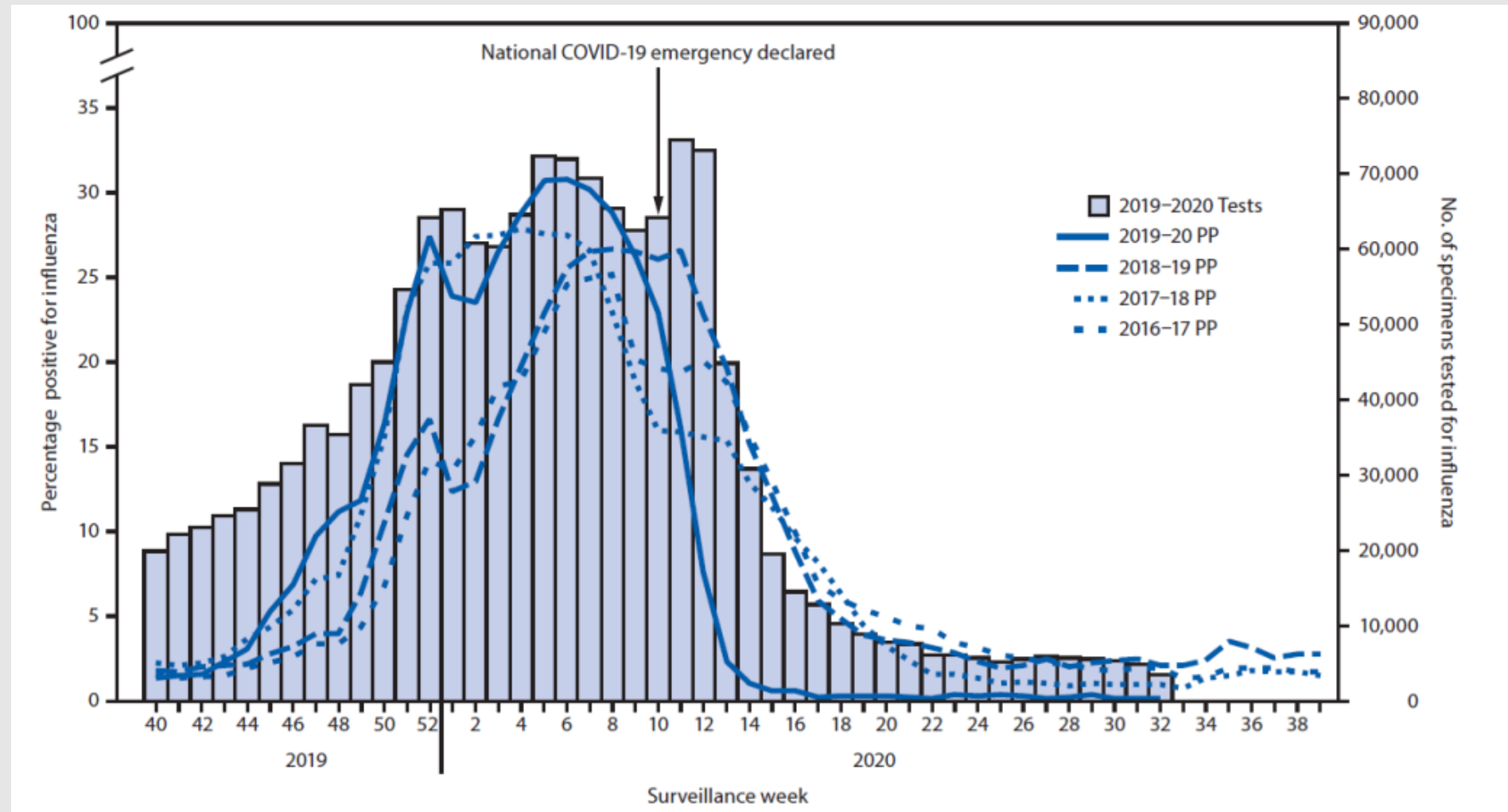
Key Unknowns For COVID-19 Vaccine Planning

- Vaccine characteristics
 - Magnitude and balance of benefits and potential risks
 - Storage/distribution/handling cold chain requirements
 - Vaccine efficacy/immunogenicity in younger and older adult
- The pathway to approval
 - Emergency Use Authorization (all adults vs younger adults)
 - Licensure
- The number of doses available at time of approval and rate of scale-up

2020-21 Flu Season

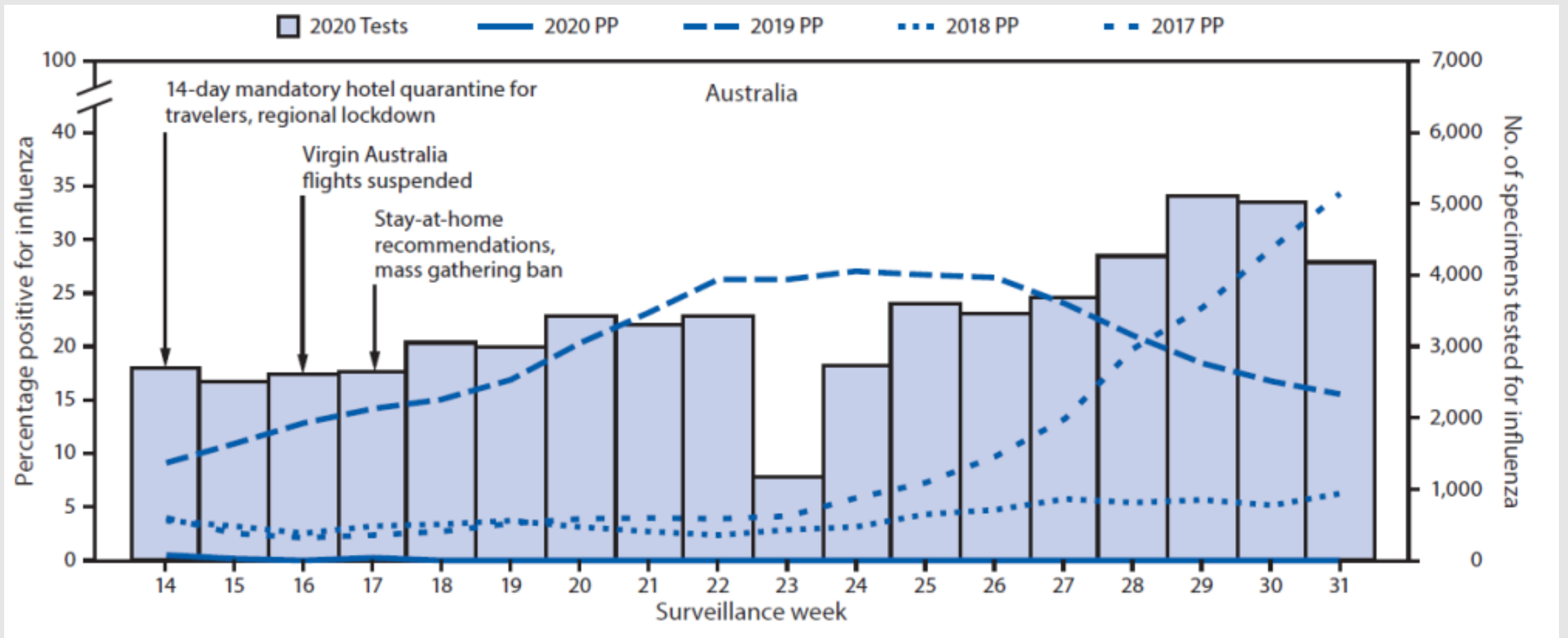
- **Co-infection with influenza A or B viruses and SARS-CoV-2 can occur**
 - Documented in case reports, case series
 - Frequency, severity, and risk factors are unknown
- Overlapping signs, symptoms, some differences with either infection
 - Incubation period is shorter with influenza (1-3 days) than COVID-19 (2-14 days)
 - Viral shedding, period of viral RNA detection is generally shorter for influenza
 - Ageusia/dysgeusia, anosmia are more common with COVID-19 than influenza
 - Diarrhea can occur in young children with influenza; at any age with COVID-19
 - Timing of onset of complications/severe disease is earlier with influenza
- High-risk groups for influenza and COVID-19 are similar
 - Young children, pregnant women are at high-risk for influenza complications

2019-2020 Influenza Season, US



Olsen SJ, et al. *MMWR* 2020; 69(37):1305-1309

2020 Influenza Season, Australia



Olsen SJ, et al. *MMWR* 2020; 69(37):1305-1309

Navigating the Infodemic



Sara Gironi Carnevale, AAAS

Useful Weblinks



- <https://www.cdc.gov/library/covid19/scienceupdates.html?Sort=Date%3A%3Adesc>
- Issued twice weekly



Useful Weblinks



COVID-19 Journals and Databases

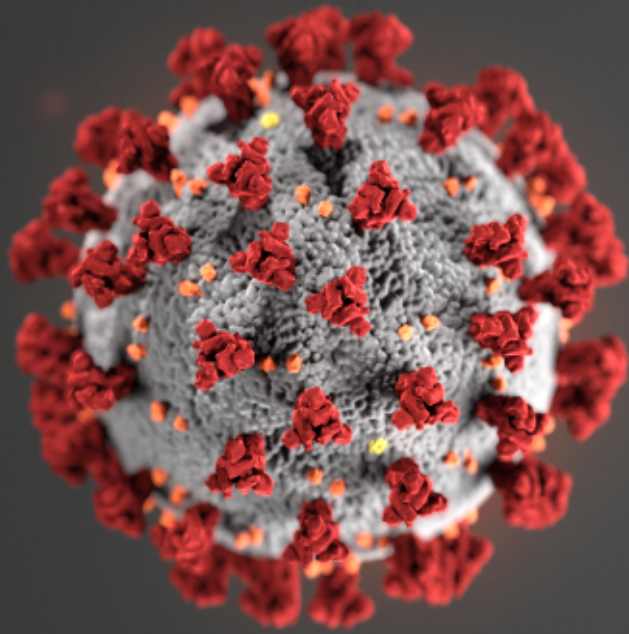
- <https://www.cdc.gov/library/researchguides/2019novelcoronavirus/databasesjournals.html>



Useful Weblinks



- <https://www.covid19treatmentguidelines.nih.gov/>



For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

