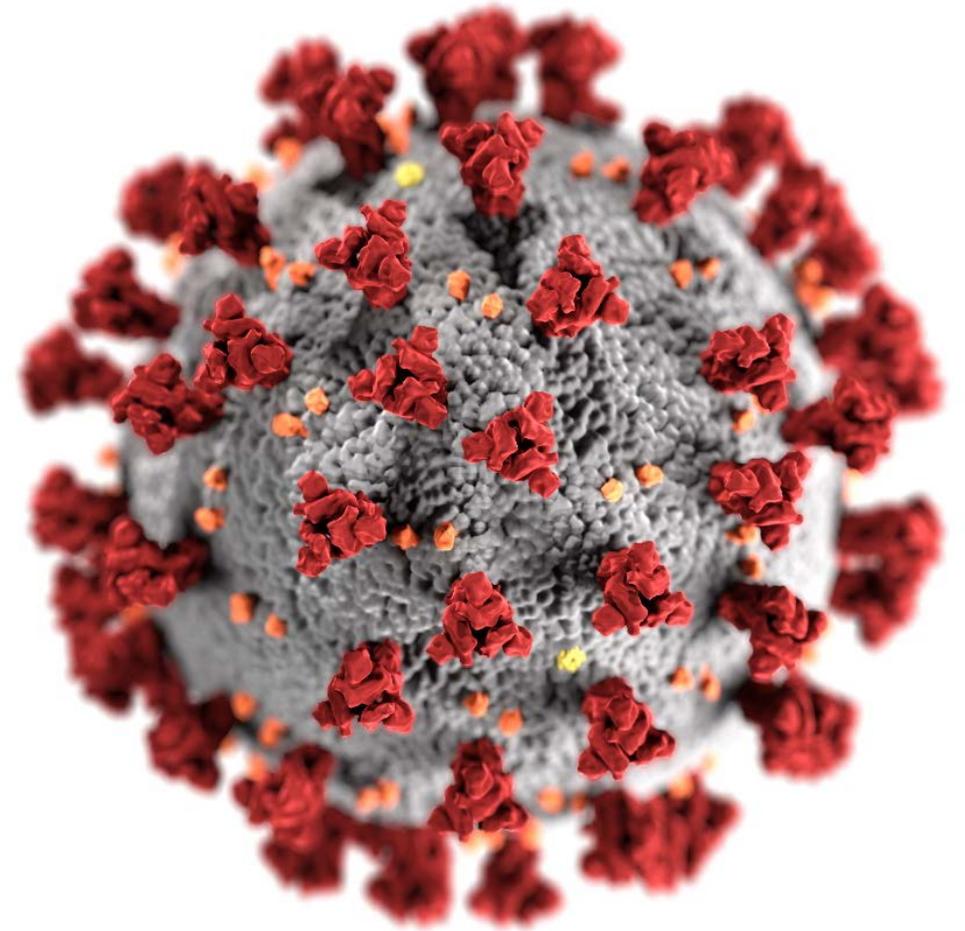


CDC Coronavirus Disease 2019 Response

Epidemiology of COVID-19 in Essential Workers, including Healthcare Personnel

Sara Oliver MD, MSPH

ACIP Meeting
July 29, 2020

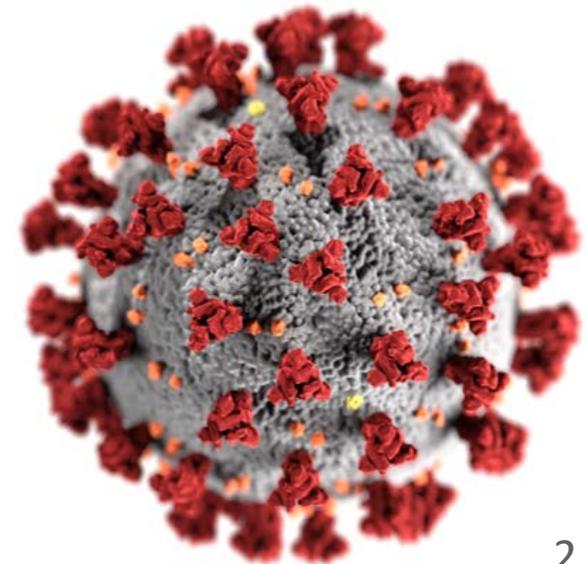


cdc.gov/coronavirus



Outline

- Overview of U.S. COVID-19 Epidemiology
- Epidemiology among Essential Workers
 - Healthcare Personnel
 - Workers at Long Term Care Facilities
 - Workers in Food Processing and Agriculture
 - Workers in Correctional Facilities
 - Military Personnel



Overview of U.S. COVID-19 Epidemiology

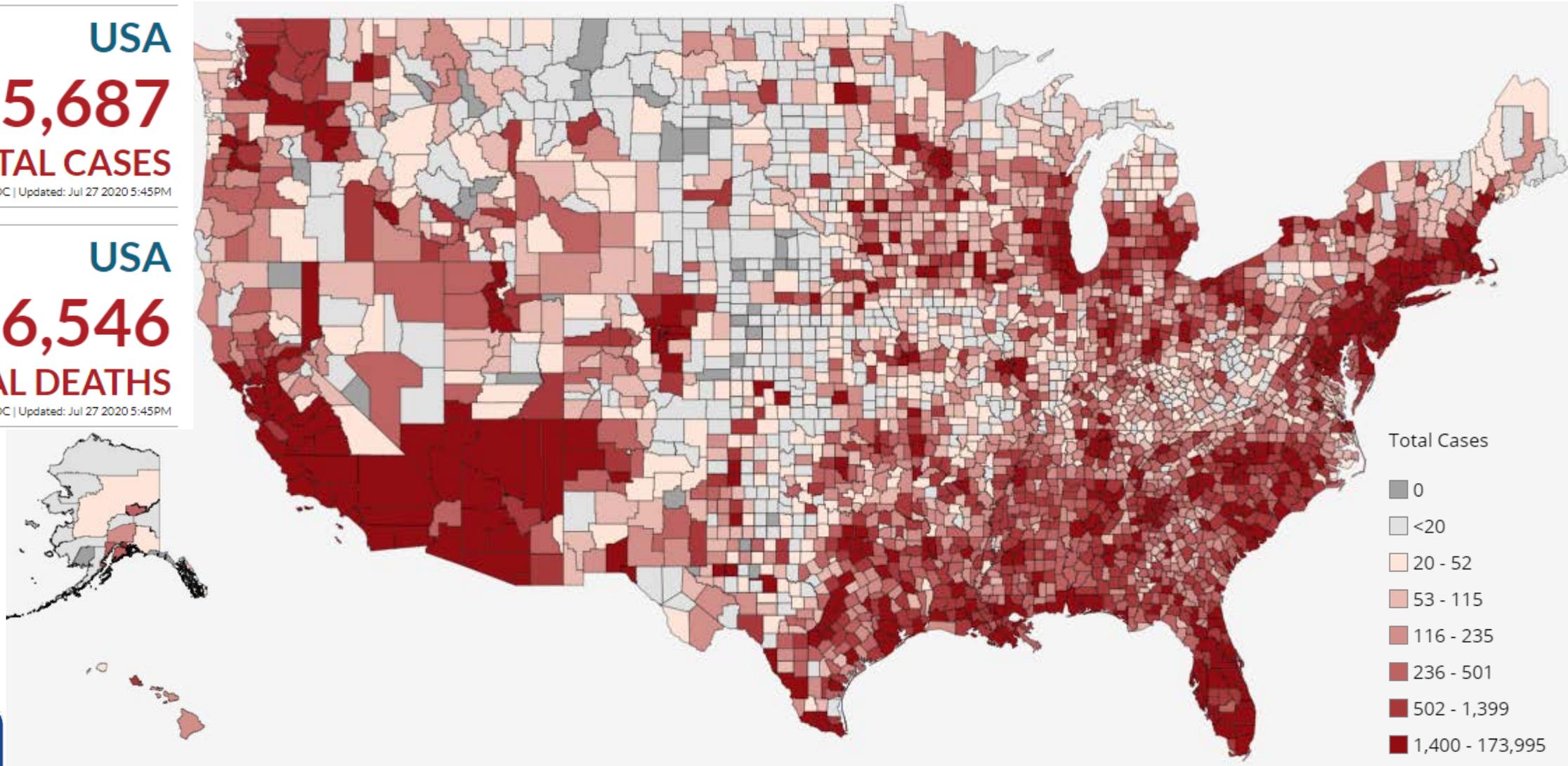


United States COVID-19 Cases by County

January 21 to July 27, 2020

USA
4,225,687
TOTAL CASES
CDC | Updated: Jul 27 2020 5:45PM

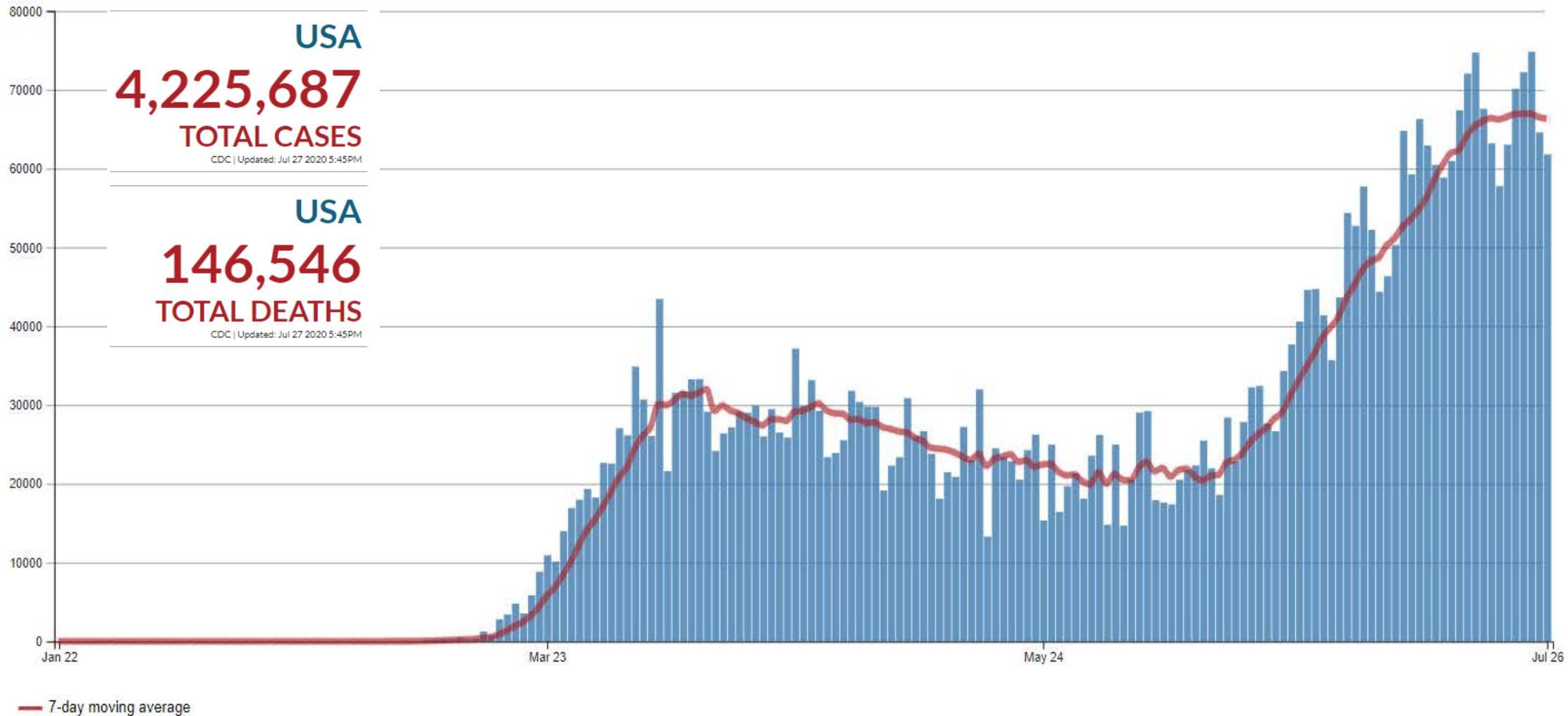
USA
146,546
TOTAL DEATHS
CDC | Updated: Jul 27 2020 5:45PM



<https://www.cdc.gov/covid-data-tracker/index.html>

Trends in Number of COVID-19 Cases in the US

January 22 to July 27, 2020

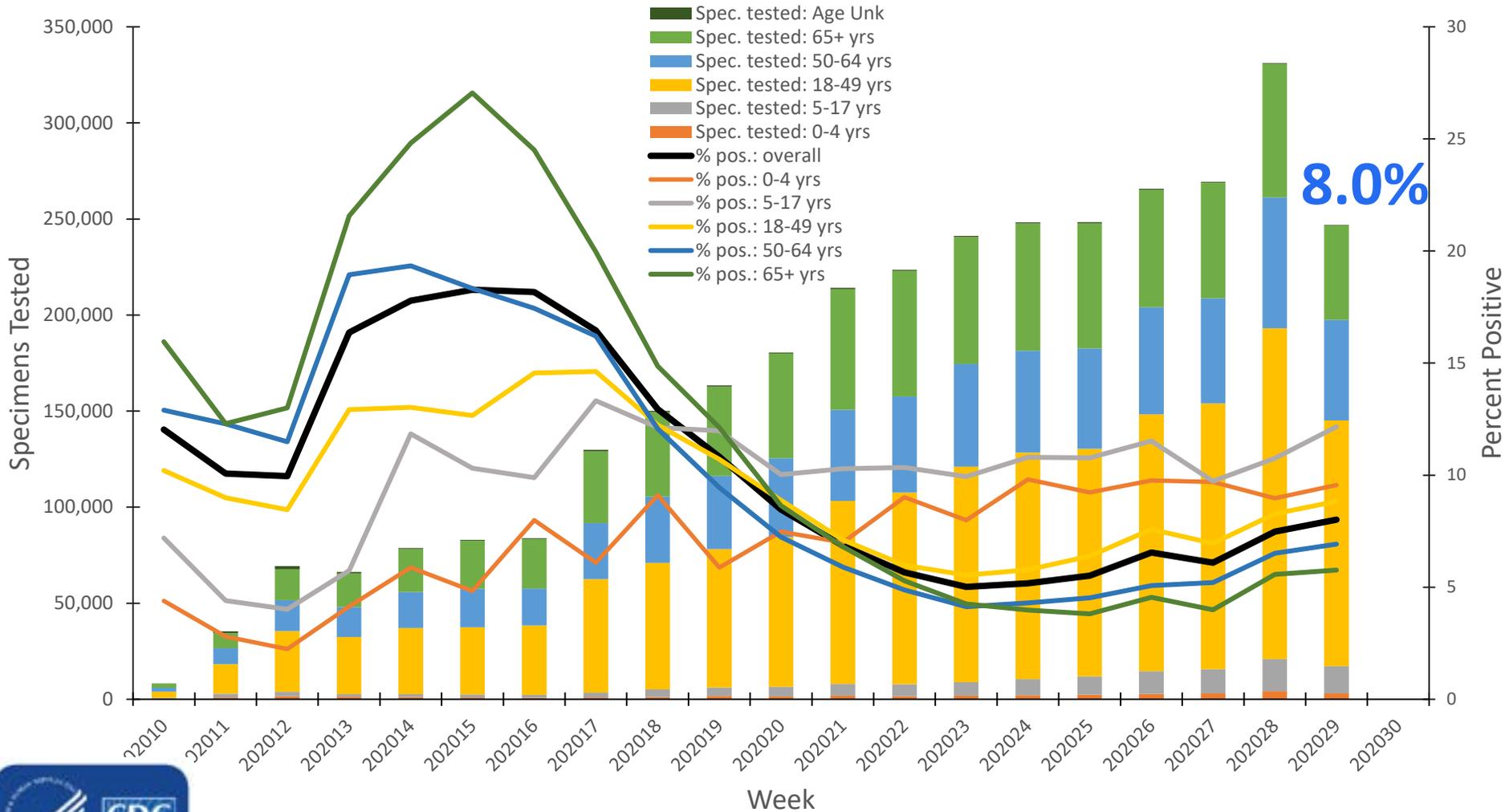


<https://www.cdc.gov/covid-data-tracker/index.html#trends>



Public Health Laboratories Reporting to CDC

March 1 to July 18, 2020



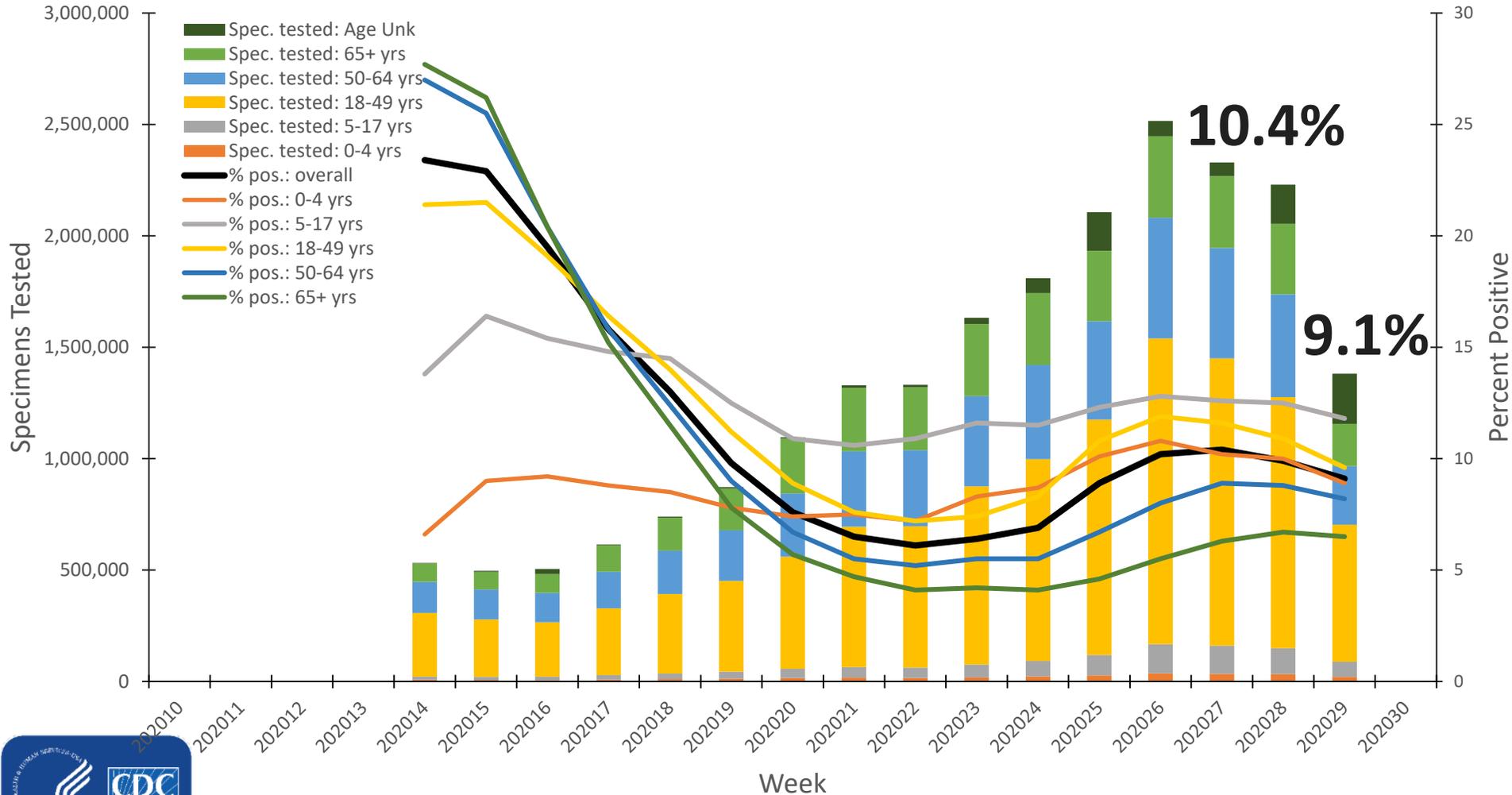
Percentage testing positive is **higher** in children and adults 18-49 years of age, compared to older adults



<https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html>

Commercial Laboratories Reporting to CDC

March 1 to July 18, 2020



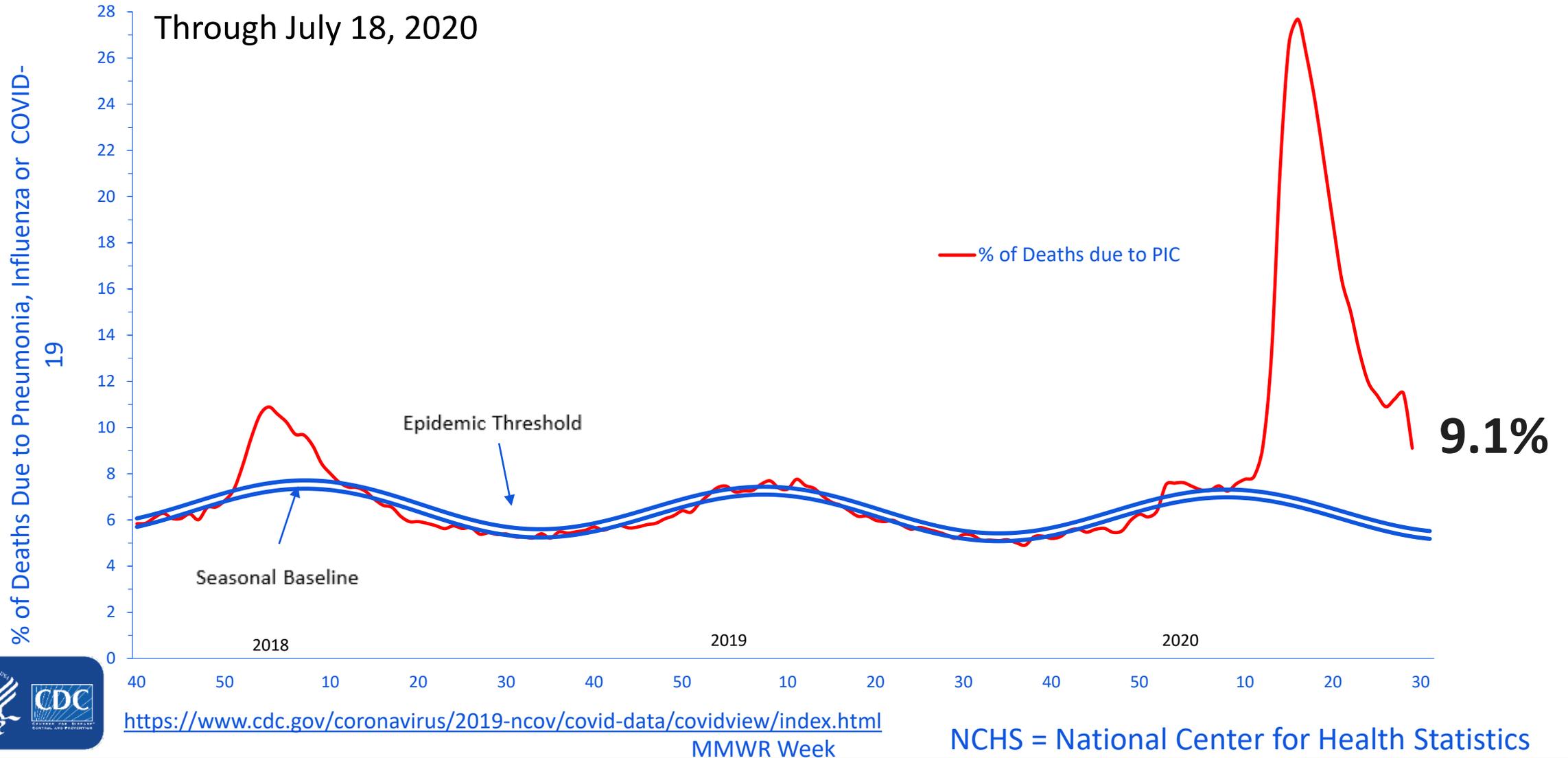
Percentage positive
increasing
since June,
peak in early July



<https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html>

Pneumonia, Influenza and COVID-19 Mortality

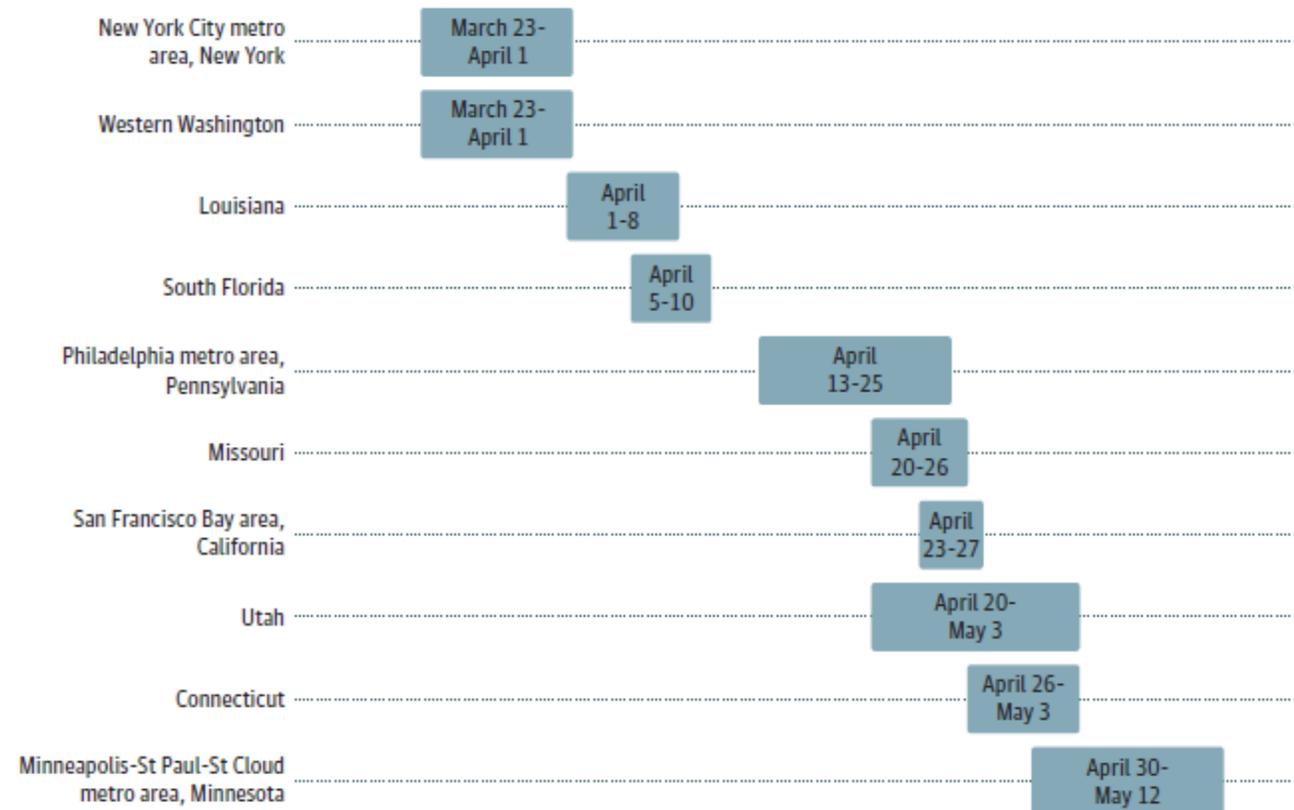
NCHS Mortality Reporting System



Seroprevalence of Antibodies to SARS-CoV-2

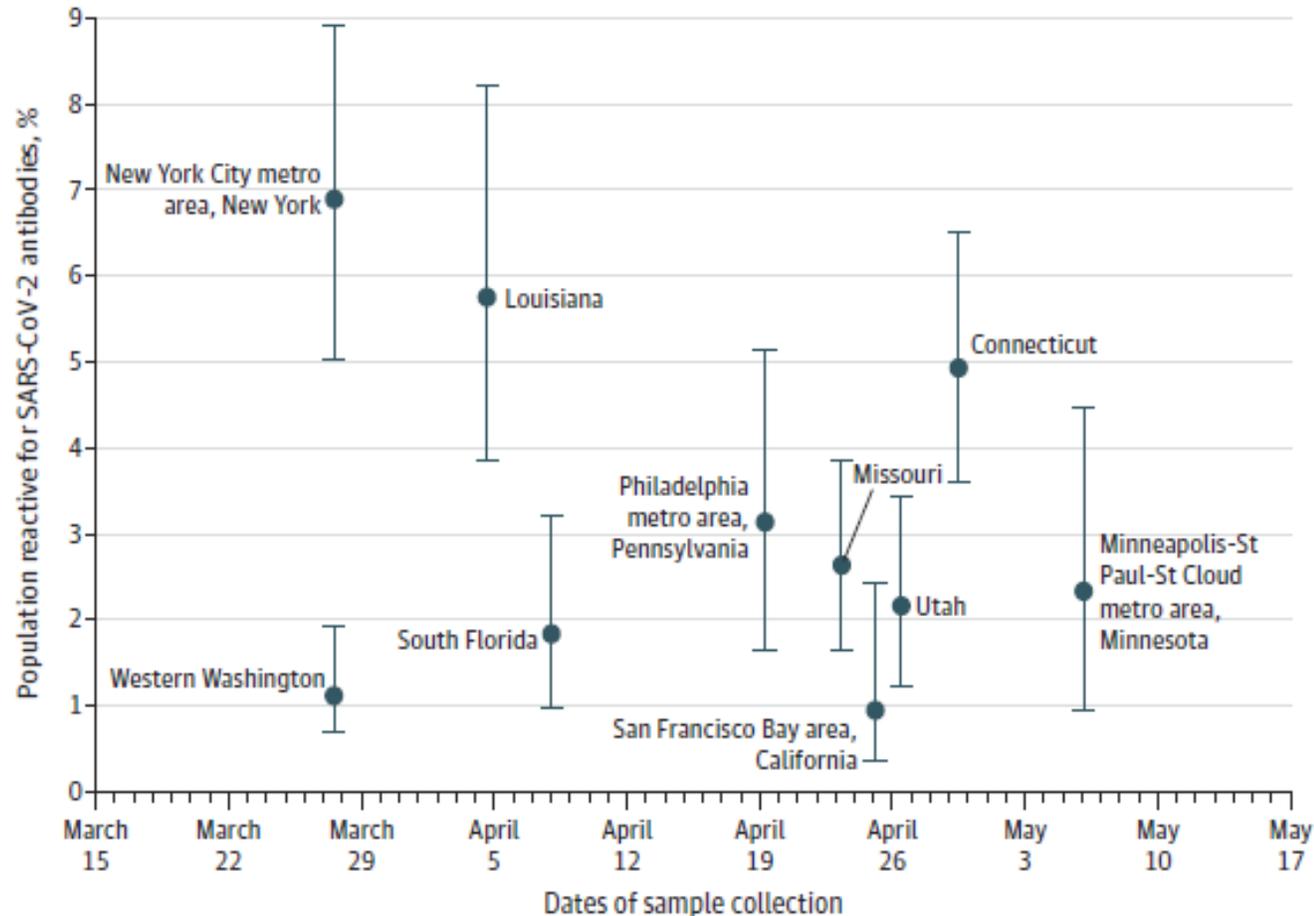
- Cross-sectional study performing serologic testing on a convenience sample of residual sera
 - March 23 through May 12
 - Estimates standardized to site populations by age and sex
- Serum samples tested from **16,025** persons

B Timeline of specimen collection



Seroprevalence of Antibodies to SARS-CoV-2

A Estimates of seroprevalence



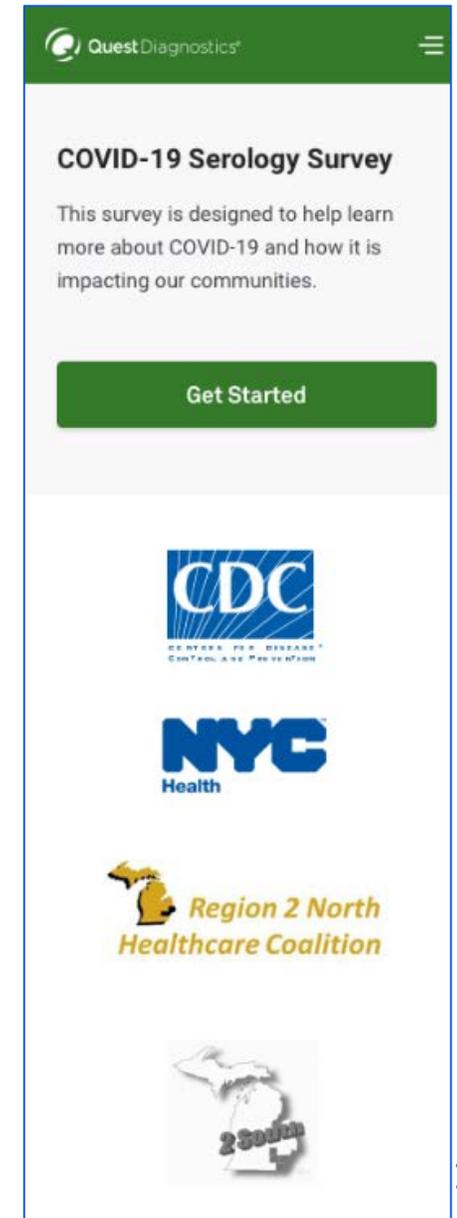
- Seroprevalence estimates ranged from **1.0%** to **6.9%**
- Estimated greater than **10** times more SARS-CoV-2 infections occurred than the number of reported cases
 - By site, the estimated number of infections ranged from **6** to **24** times the number of reported cases



Large Scale SARS-CoV-2 Serologic Studies in Health Care Workers and First Responders—

New York City and Detroit Metro Area

- May 18 to June 13 (Detroit) and July 2 (NYC)
- Questionnaire gathered information about demographics, previous COVID-19 testing and symptoms, previous medical conditions
- Eligibility: No COVID-like illness or +NAAT within previous 2 weeks
- Presence and risk factors for IgG antibody:
 - Testing with ORTHO IgG test (S1 target)



Quest Diagnostics

COVID-19 Serology Survey

This survey is designed to help learn more about COVID-19 and how it is impacting our communities.

[Get Started](#)

CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

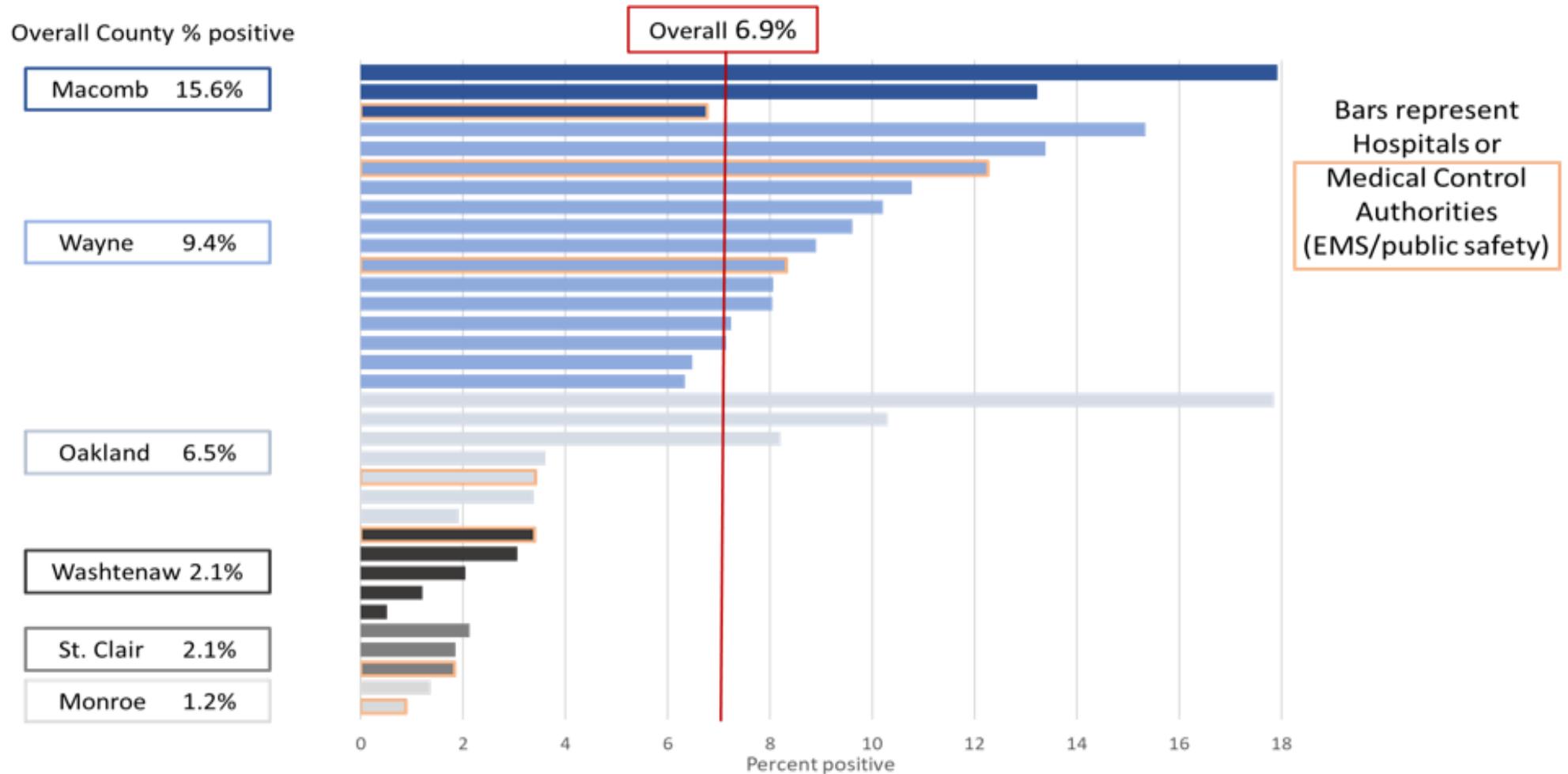
NYC
Health

Region 2 North
Healthcare Coalition

2 South



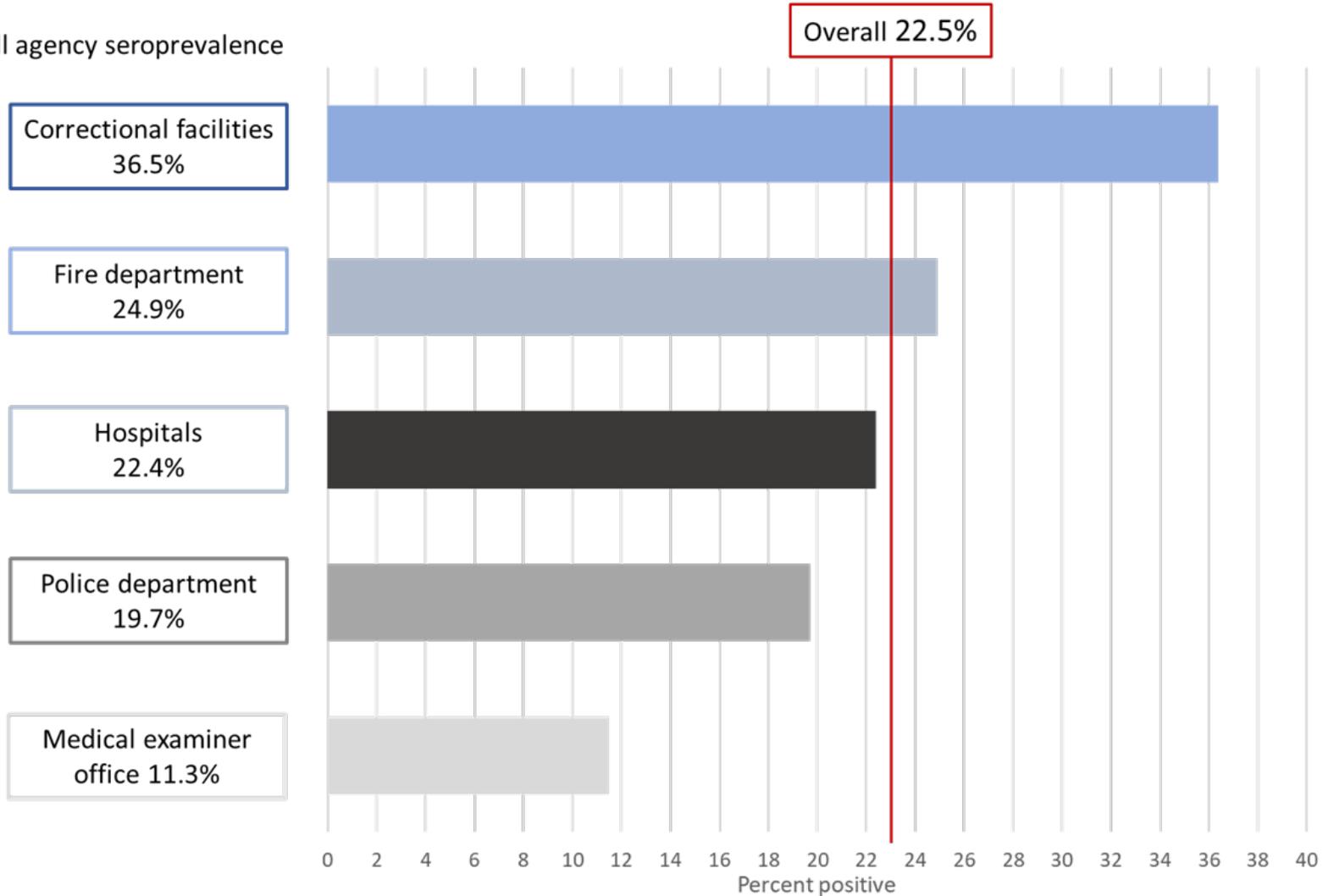
Seroprevalence at 27 Hospitals*, Detroit Metro Area, May 18-June 13, 2020 (N=16,403)



* Focus on ED, ICU, surgery, wrap-around services; includes first responders in Med Control Authorities

Seroprevalence by Agency, New York City, May 18-July 2, 2020 (N=24,682)

Overall agency seroprevalence



Seroprevalence among healthcare workers:

13 hospitals in April-May

- Objective:
 - Estimate seroprevalence of SARS-CoV-2 infection among healthcare workers (e.g. MDs, RN, respiratory therapists, phlebotomists) working in COVID-19 care areas
 - Explore risk factors for infection and immune response
- Design: Convenient sample of ~3250 HCWs across ~13 hospitals (250 per site)
- Assay: CDC Pan-Ig ELISA against spike protein
- Data sources:
 - Interviews from enrolled HCWs
 - Serum collection at **baseline** and **60 days** after enrollment



Seroprevalence among healthcare workers:

13 hospitals in April-May

Seroprevalence ranged from **0.8%** to **31%**



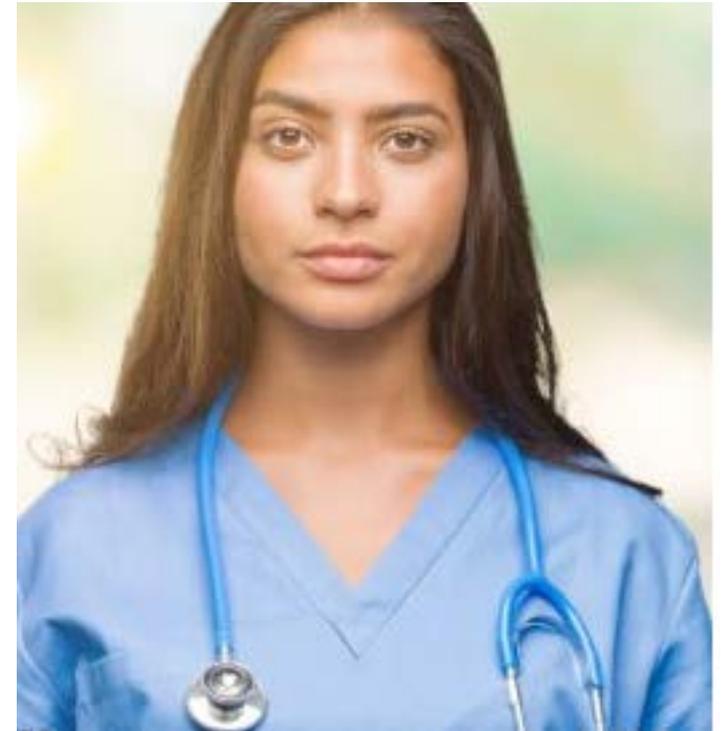
Location	Seroprevalence
NY	31.2%
MA	10.0%
TN	7.6%
CO	6.0%
MA	4.8%
CA	4.0%
WA	3.6%
MN	3.6%
MD	2.8%
OR	1.6%
OH	0.8%
UT	0.8%
NC	0.8%

COVID-19 Epidemiology among Healthcare Personnel



Healthcare Personnel

- **Healthcare Personnel (HCP)** are essential workers defined as **paid** and **unpaid** persons serving in healthcare settings who have the potential for direct or indirect exposure to patients or infectious materials



Cases among Healthcare Personnel

- CDC reports and routinely updates cases and deaths among healthcare personnel on the CDC website
 - Likely an underestimate

As of July 27th

Cases & Deaths among Healthcare Personnel

Data were collected from 3,184,064 people, but healthcare personnel status was only available for 688,270 (21.6%) people. For the 113,730 cases of COVID-19 among healthcare personnel, death status was only available for 76,253 (67.0%).

CASES AMONG HCP

113,730

DEATHS AMONG HCP

576



EIP COVID-19 Tracking in Healthcare Personnel

- **Emerging Infections Program (EIP):** network of 10 state health departments and local public health and academic partners
- Sentinel or population-based surveillance for COVID-19 in healthcare personnel
 - 7 sites (Connecticut, Colorado, Maryland, Minnesota, New Mexico, Oregon, Tennessee) conducting sentinel surveillance
 - 2 sites (California, Georgia) conducting population-based surveillance
 - 1 site (New York—Rochester) using hybrid approach: sentinel hospitals, with population-based surveillance for nursing home HCP with COVID-19
- >1100 HCP COVID-19 cases reported; >500 interviewed
 - **464** HCP COVID-19 cases with complete data as of 6/25
 - ~70% from CA or NY

EIP COVID-19 Tracking in Healthcare Personnel

	Hospital-based* HCP, N=188	Nursing home-based* HCP, N=190	Other facility-based* HCP, N=86
Age in years (interquartile range)	38 (30–48)	44 (32–55)	45 (33–56)
Female – no. (%)	157 (79.3)	158 (82.7)	68 (77.3)
Race – no. (%)			
American Indian or Alaska Native	7 (3.7)	0	0
Asian	31 (16.5)	19 (10.0)	12 (14.0)
Black or African American	31 (16.5)	82 (43.2)	14 (16.3)
Multiple races or other race	17 (9.0)	21 (11.1)	35 (40.7)
Native Hawaiian or Other Pacific Islander	6 (3.2)	2 (1.1)	5 (5.8)
Not reported	7 (3.7)	2 (1.1)	1 (1.2)
White	89 (47.3)	64 (33.7)	19 (22.1)
Hispanic or Latino – no. (%)	29 (15.4)	30 (15.8)	34 (39.5)
Role (selected) – no. (%)			
Registered nurse or licensed practical nurse	79 (42.0)	46 (24.2)	9 (10.5)
Nursing/medical assistant or patient care technician	27 (14.4)	85 (44.7)	18 (20.9)
Symptoms of COVID-19 in 14 days before positive test – no. (%)	160 (85.1)	135 (71.1)	56 (65.1)

Across healthcare settings, most HCP with COVID-19 were female, and more than half were nurses or patient care assistants

*21 HCP worked in 2 facility types. These HCP were categorized based on the facility providing the highest acuity of care (e.g., a HCP working in a hospital and nursing home was considered a hospital-based HCP).

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Close contact with a person with COVID-19 (any setting)	139 (73.9)	151 (79.5)	46 (53.5)
Close contact with a person with COVID-19 in the workplace	116 (61.7)	142 (74.7)	23 (26.7)
Close contact with a COVID-19 <i>patient</i> in the workplace	113 (60.1)	128 (67.4)	18 (20.9)
Wore gloves all the time during COVID-19 patient care	105/113 (92.9)	115/128 (89.8)	13/18 (72.2)
Wore a gown all the time during COVID-19 patient care	85/113 (75.2)	84/128 (44.2)	4/18 (22.2)
Wore a facemask, respirator or PAPR all the time during COVID-19 patient care	108/113 (95.6)	113/128 (59.5)	14/18 (77.8)
Wore eye protection all the time during COVID-19 patient care	74/113 (65.5)	84/128 (44.2)	5/18 (27.8)
Performed aerosol-generating procedures on a COVID-19 patient	51/113 (45.1)	21/128 (16.4)	1/18 (5.6)
Reported concerns about PPE during care of a COVID-19 patient	38/113 (33.6)	44/128 (34.4)	6/18 (33.3)
Had mucus membrane exposure to COVID-19 patient secretions	14/113 (12.4)	17/128 (13.3)	3/18 (16.7)
Had skin to skin contact with a COVID-19 patient	11/113 (9.7)	29/128 (22.7)	7/18 (38.9)
Practiced social distancing in the workplace all the time	39 (20.7)	36 (18.9)	43 (50.0)
Wore a mask for the entire shift in the workplace all the time	147 (78.2)	149 (78.4)	56 (65.1)
Close contact with a person with COVID-19 in the community	34 (18.1)	13 (6.8)	23 (26.7)

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Project COVERED: COVID-19 Evaluation of Risk in Emergency Departments

- 1600-participant enrolled prospective cohort of emergency department personnel in 20 medical centers for 20-week surveillance (serial questionnaires, serology, nasal PCR testing)
- Goals
 - Attributable risks in emergency care providers
 - Identify risk factors associated with COVID-19 acquisition and seroconversion
 - Describe evolution in emergency care practice through COVID-19 pandemic



National Emergency Airway Registry

Project COVERED: COVID-19 Evaluation of Risk in Emergency Departments

- At baseline, **29** (2%) had positive serologies (none had PCR positivity)
 - **22** (75%) had symptoms compatible with COVID-19
 - **19** (90%) had worked in the ED with symptoms (1-16 days)
- **9** COVID-19 HCP incident cases in 7,700 person-weeks of observation
 - None of the participants who developed infection participated in intubation of COVID-19-positive patient
- Projected **2.4%** infection rate over 20-week observation period
 - Preliminary findings



COVID-NET: Hospitalization Surveillance from 14 States

States participating in COVID-NET



Surveillance network collecting hospitalization data

- Catchment area ~10% of US population
- Patients must be a resident of the surveillance area and have a positive SARS-CoV-2 test within 14 days prior to or during hospitalization
- Charts reviewed by trained surveillance officers



MMWR April 17, 2020

COVID-NET = COVID-19-Associated Hospitalization Surveillance Network

<https://www.cdc.gov/mmwr/volumes/69/wr/mm6915e3.htm>

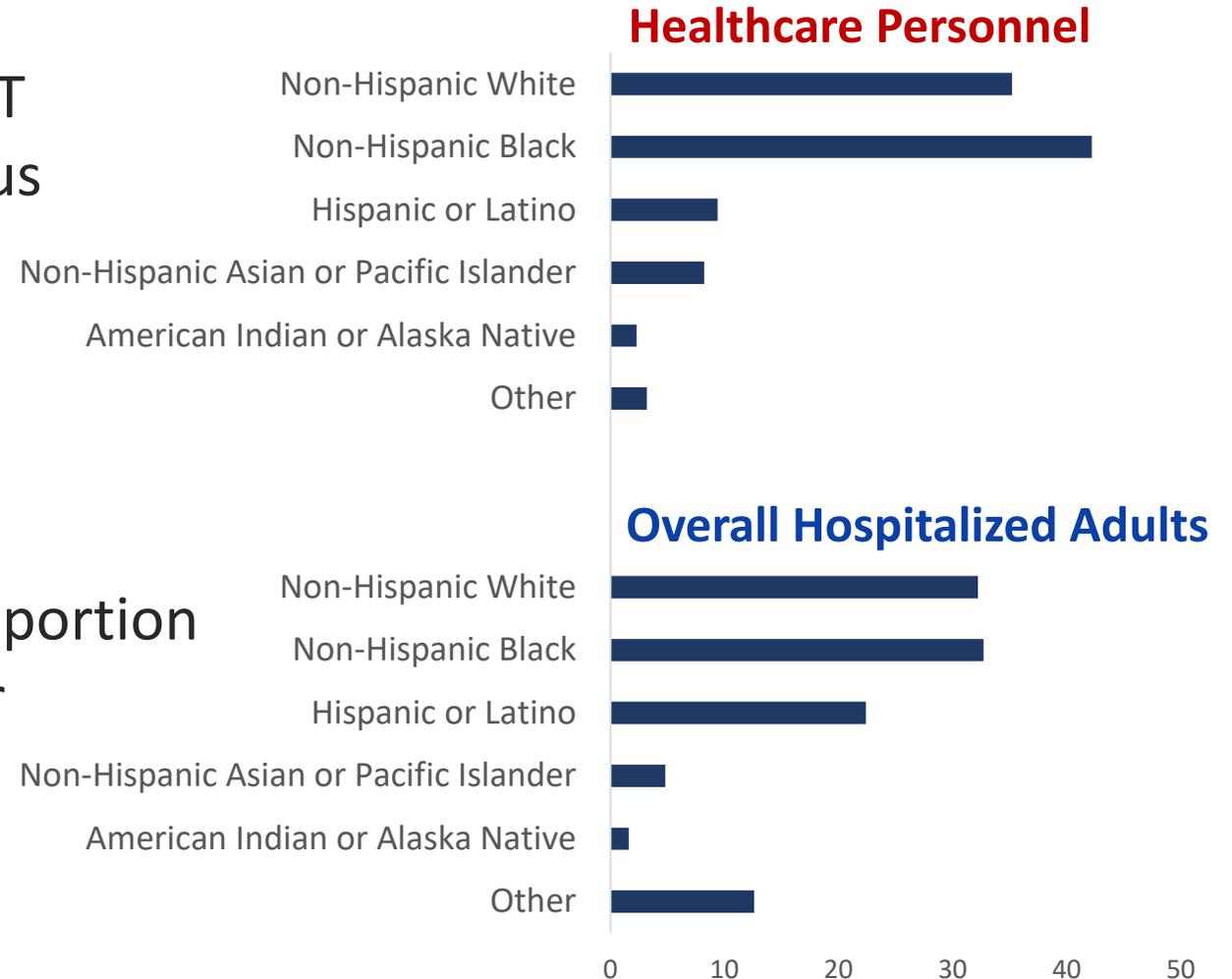
Healthcare Personnel within COVID-NET

March 1 to July 11, 2020

- 36,426 hospitalizations within COVID-NET
9,195 (25%) cases with data on HCP status

512 (5.6%) Healthcare Personnel

- Median age: 48 years (IQR: 38-57 years)
- Among Healthcare Personnel, higher proportion of Non-Hispanic Black persons and lower proportion of Hispanic persons



¹HCP status unknown for 399 (1.1%)



Healthcare Personnel within COVID-NET

March 1 to July 11, 2020

Healthcare Personnel Type: N=512

- Respiratory Therapist: 3 (<1%)
- Physician: 23 (5%)
- Nurse: 125 (24%)
- Other: 276 (54%)
- Not specified: 85 (17%)



Hospital-based patient care support (e.g. nursing assistant)	73
Other patient care	21
Housekeeping/Environmental Services	20
Other nursing home/LTCF staff	17
Technicians	15
Management	12
Home health worker	12
Emergency medical personnel	10
Social work/counselor	10
Pharmacy	9
Food Services	8
Dentistry	6
Laboratory	6
Other	57



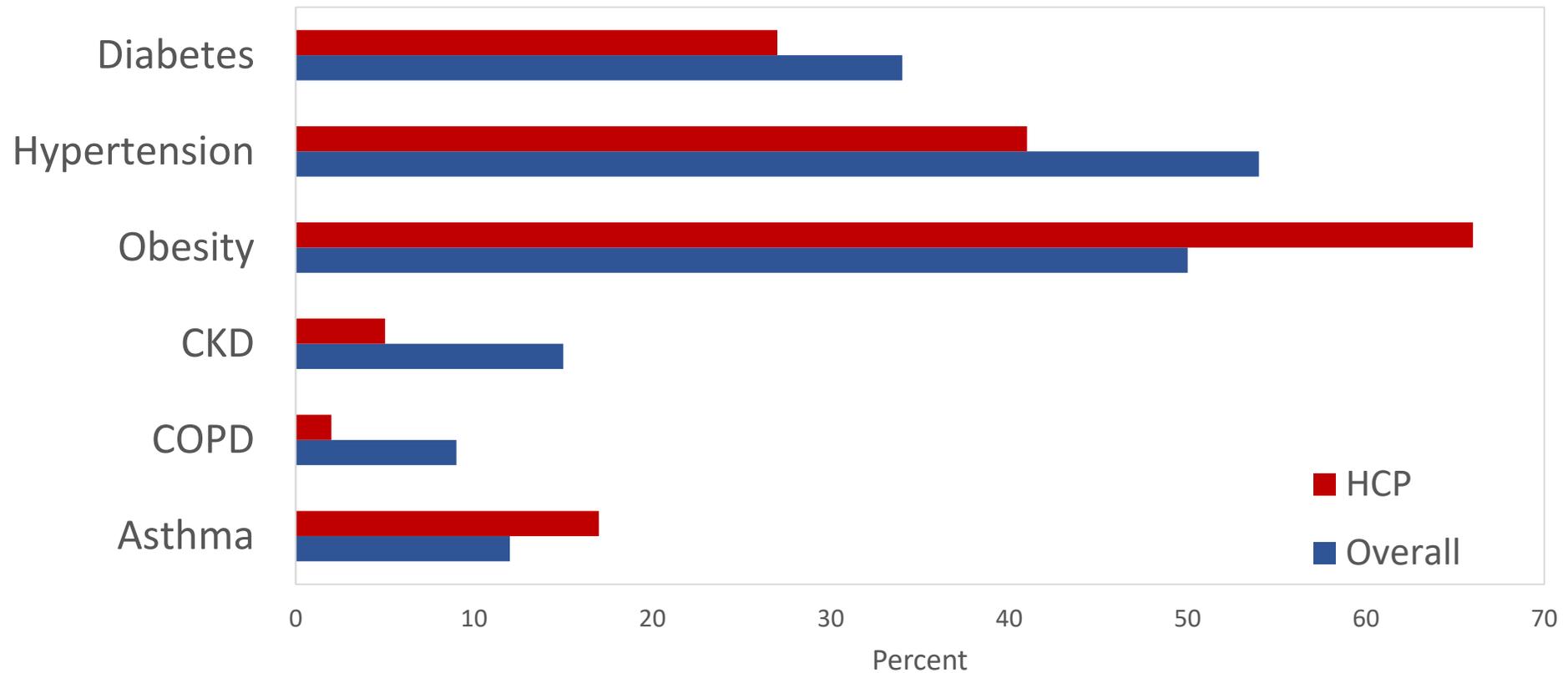
Healthcare Personnel within COVID-NET

March 1 to July 11, 2020

Underlying Medical Conditions

■ **87%** of Hospitalized HCP

91% of Hospitalized Adults

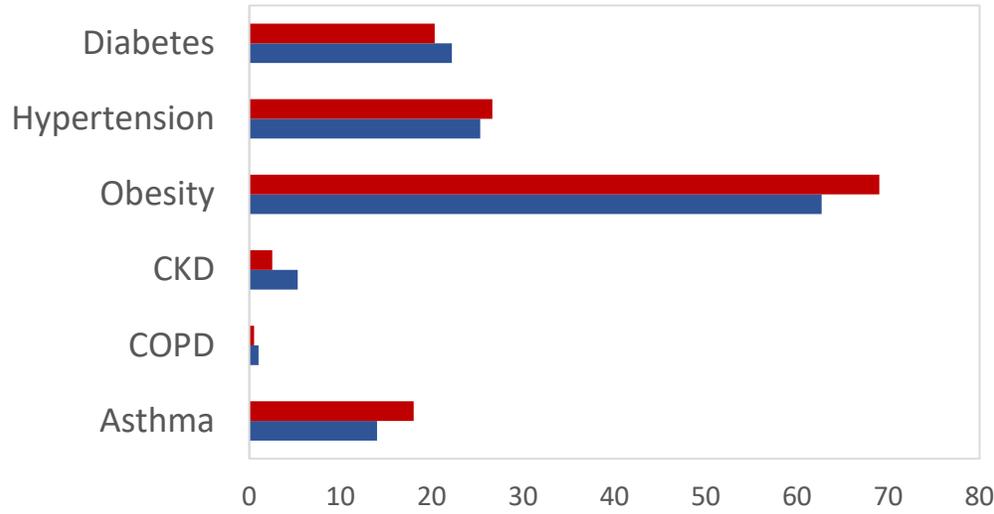


Healthcare Personnel within COVID-NET

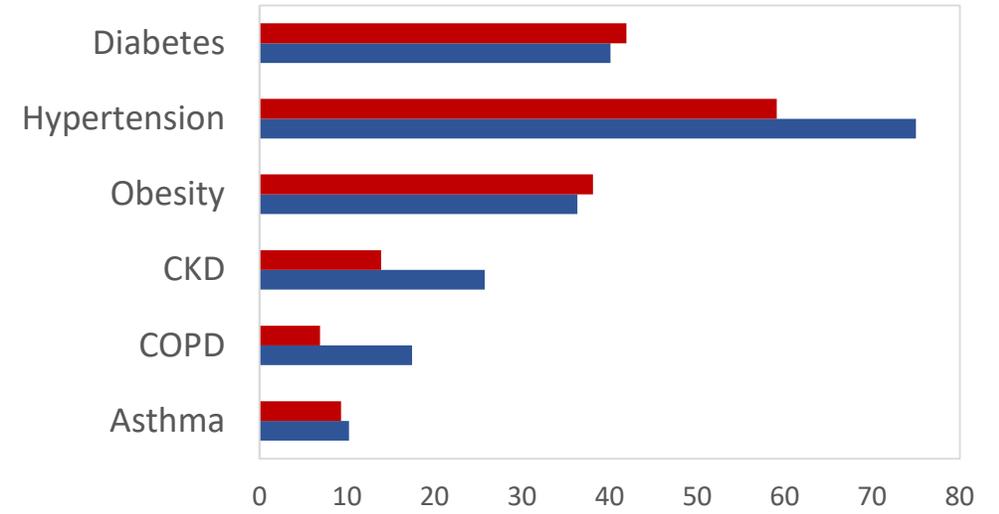
Underlying Medical Conditions

18-49 years

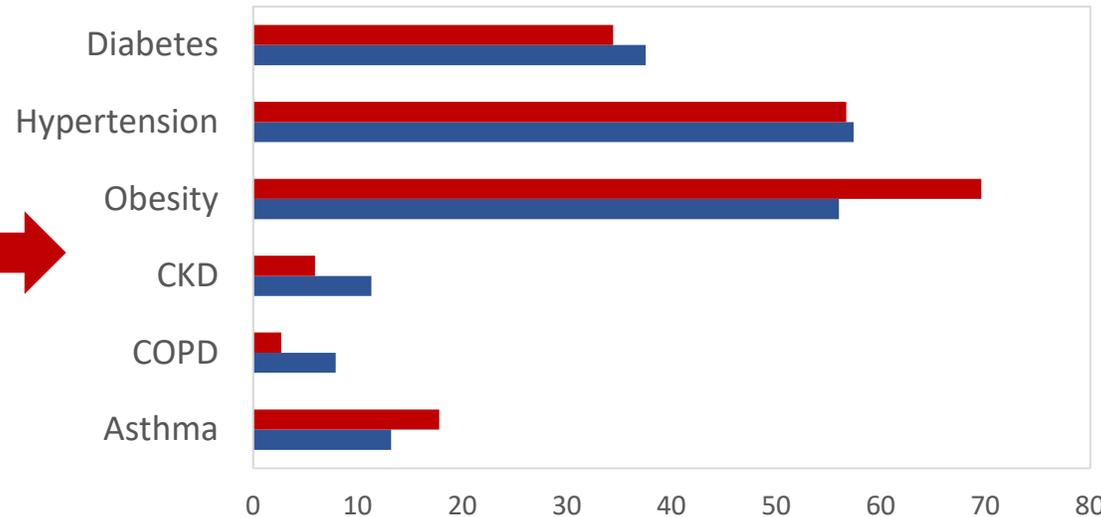
≥65 years



50-64 years



HCP with higher proportion of **obesity** and **asthma**, compared to Overall hospitalized adults



Older HCP with **lower** proportion of most underlying medical conditions

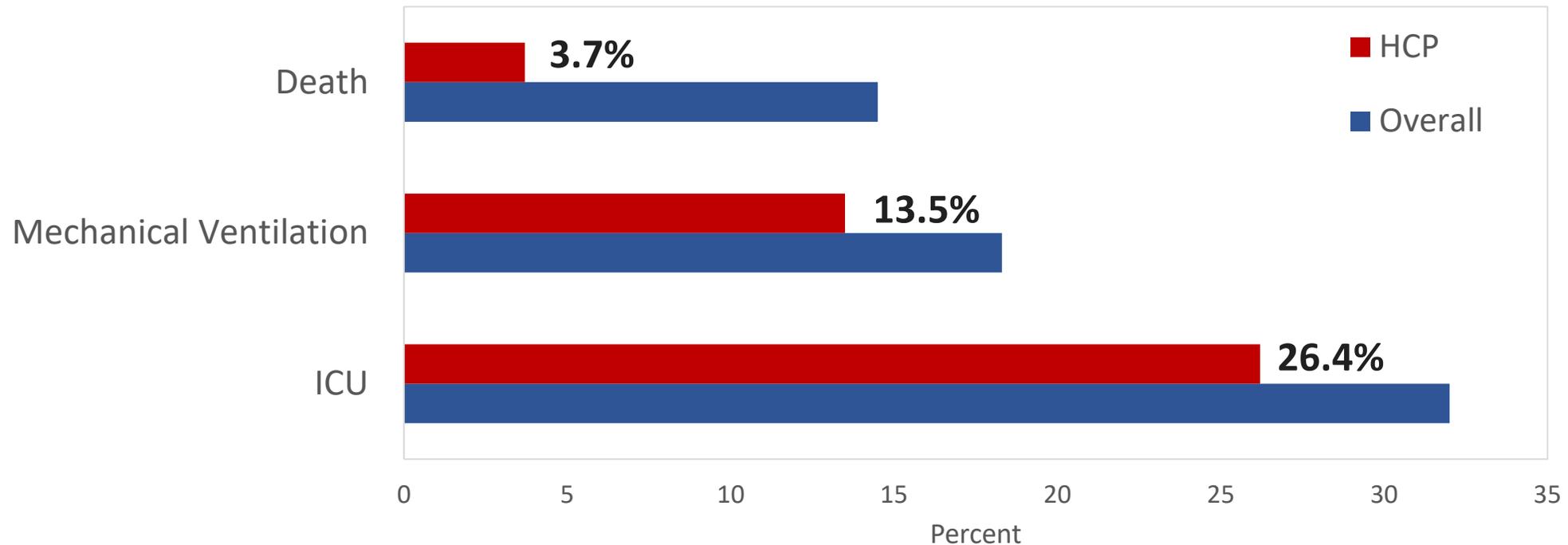


Healthcare Personnel within COVID-NET

March 1 to July 11, 2020

Clinical Outcomes

n=482 HCP with completed chart review



Hospitalization length of stay for **HCP** (days): Median 5 days (IQR: 2-8 days)



Summary of COVID-19 among Healthcare Personnel

- HCP with COVID-19 are demographically diverse: geography, occupation, race and ethnicity, and underlying conditions
- Many HCP report direct contact with COVID-19 patients through work (e.g. physicians, nurses, respiratory therapists)
- Among hospitalized HCP, similar proportions with underlying conditions
 - Higher prevalence of obesity and asthma, lower prevalence of diabetes, hypertension, chronic kidney/lung disease



Cases among Staff at Long Term Care Facilities

- Many U.S. states publicly report COVID-19 cases in staff of long-term care facilities (LTCF), including nursing homes and assisted living facilities
- As of July 16, there were at least **69,438** cumulative confirmed or probable COVID-19 cases based on publicly reported data from **36** U.S. states and territories
- **342** cumulative confirmed or probable COVID-19 deaths among LTCF HCP based on publicly reported data from **17** U.S. states and territories



COVID-19 Cases among Skilled Nursing Facilities

Percentage of Facilities with ≥ 1 Case among Residents

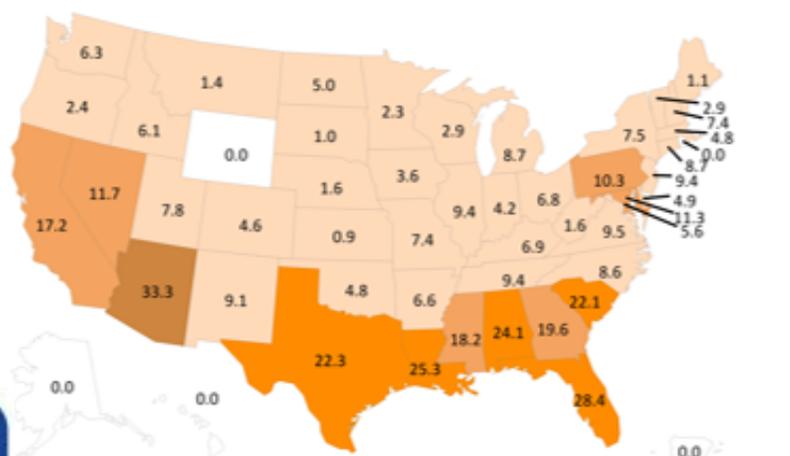
Week 1, June 22-June 28, N= 14, 199



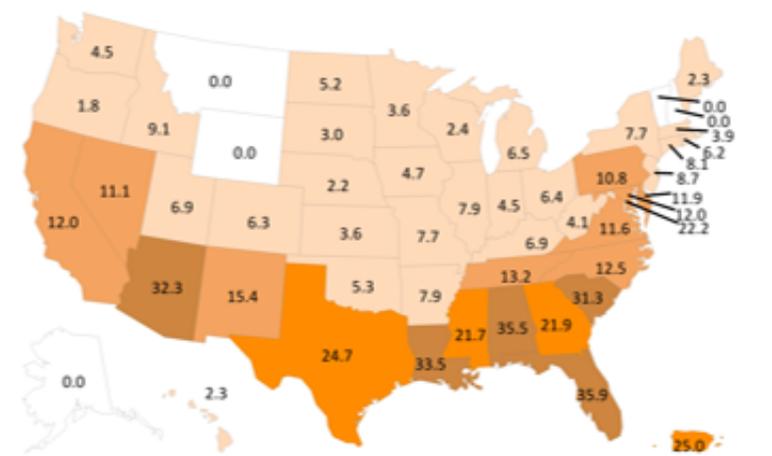
Week 2, June 29-July 5, N= 14, 256



Week 3, July 6- 13, N= 14, 170



Week 4, July 13-July 19, N= 13, 765



Inferred Data: For the purpose of best epidemiological understanding, data that fail quality checks or appear inconsistent with surveillance protocols are assigned a value based on their patterns of data-entry or excluded from analysis

Percent of facilities

- 0
- >0-10
- >10-20
- >20-30
- More than 30

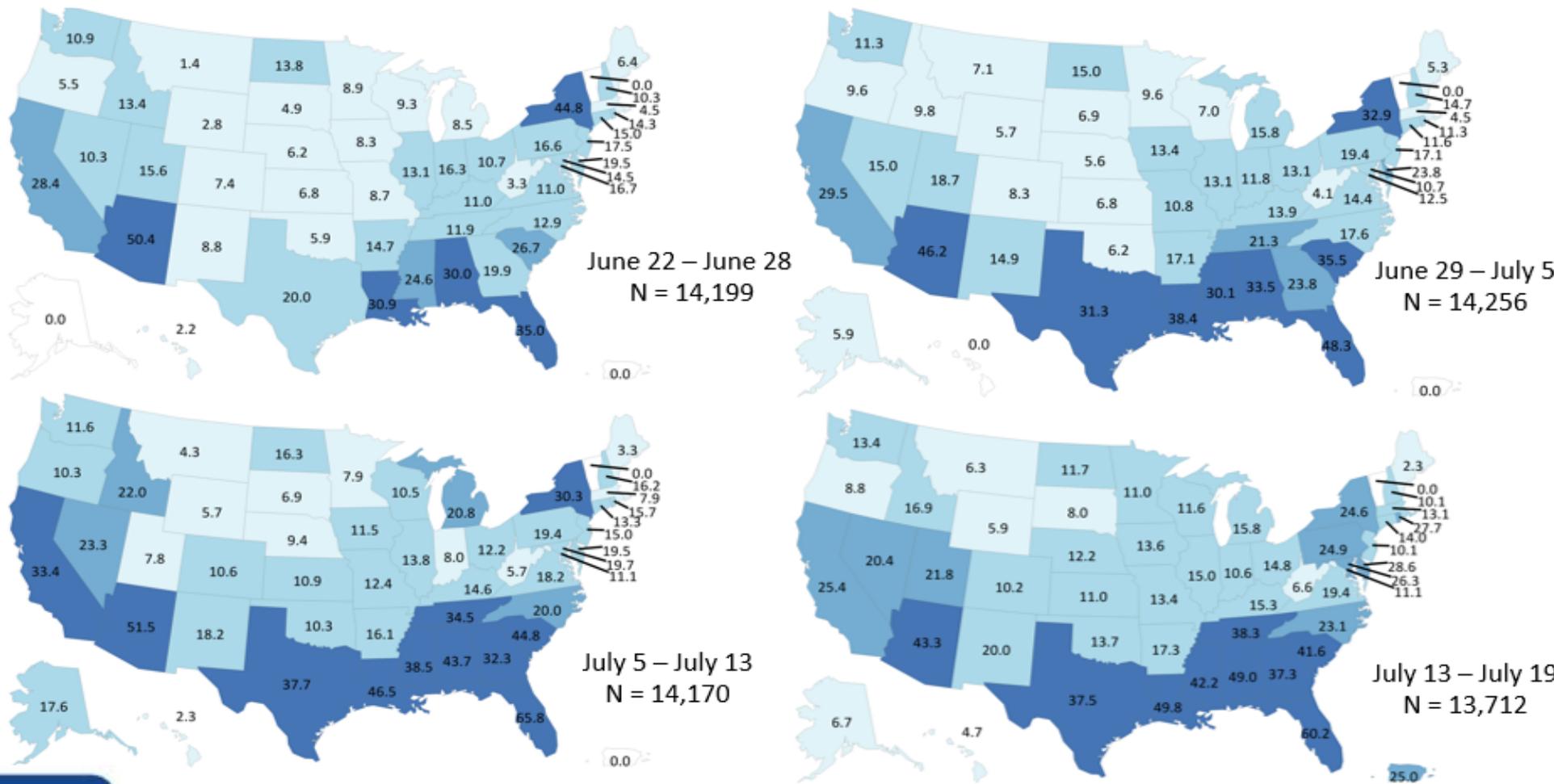


Data from NHSN LTCF module:

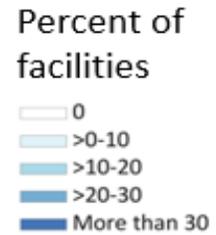
<https://data.cms.gov/stories/s/COVID-19-Nursing-Home-Data/bkwz-xpvg/>

COVID-19 Cases among Skilled Nursing Facilities

Percentage of Facilities with ≥ 1 Case among Staff



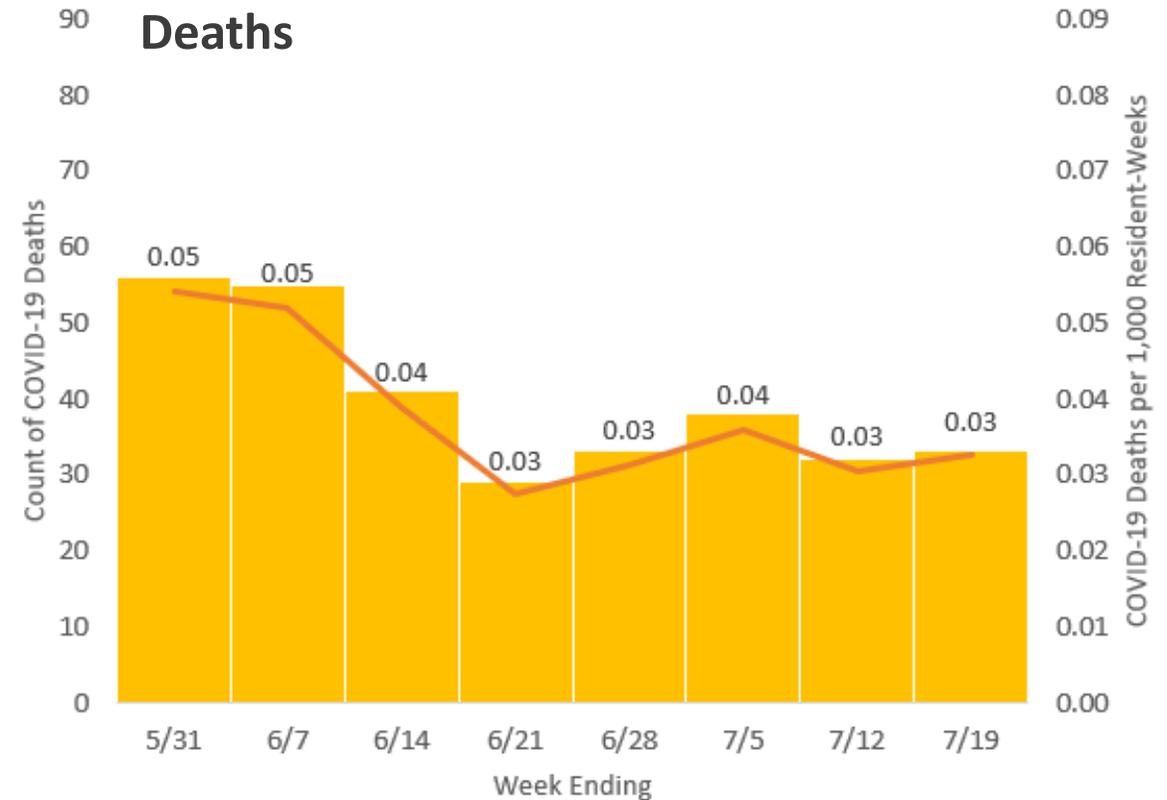
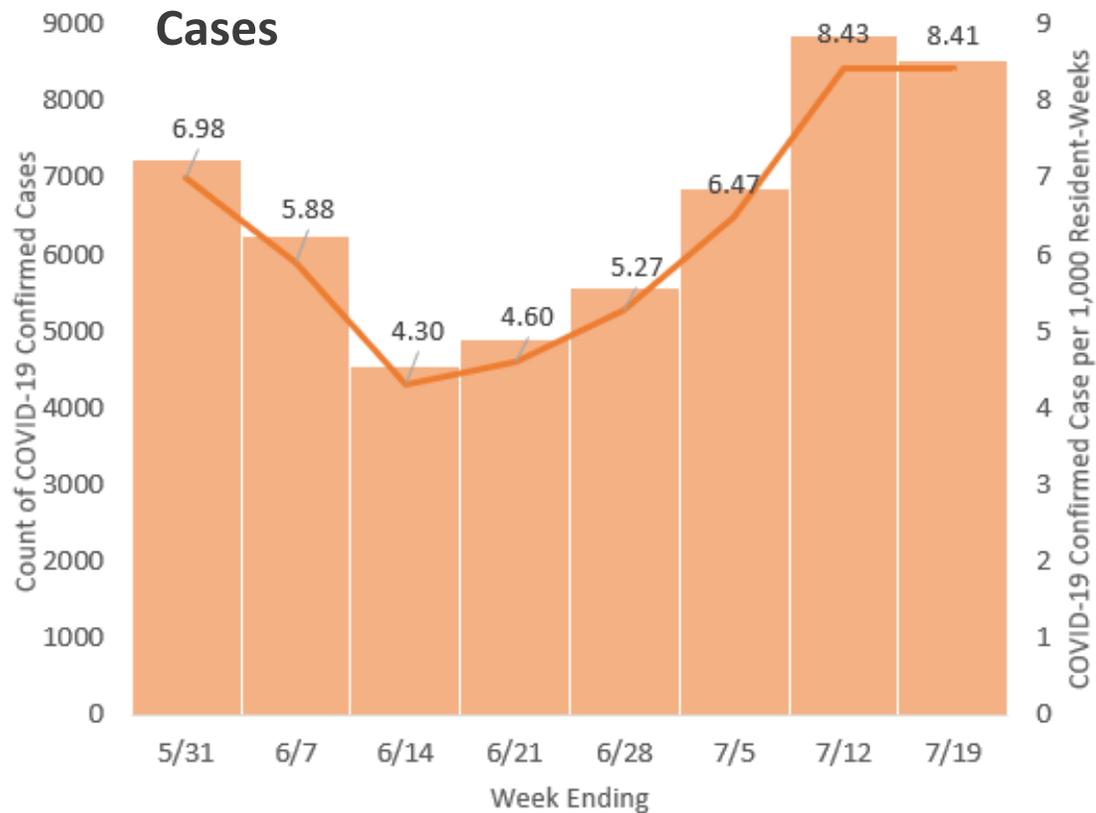
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Data from NHSN LTCF module:
<https://data.cms.gov/stories/s/COVID-19-Nursing-Home-Data/bkwz-xpvg/>

COVID-19 Cases among Staff at Skilled Nursing Facilities

Count and Incidence per 1,000 Resident-Weeks



*Number of facilities reporting may vary from week to week



Data from NHSN LTCF module:

<https://data.cms.gov/stories/s/COVID-19-Nursing-Home-Data/bkwz-xpvg/>

Inferred Data: For the purpose of best epidemiological understanding, data that fail quality checks or appear inconsistent with surveillance protocols are assigned a value based on their patterns of data-entry or excluded from analysis

Long Term Care Facilities Workforce

- Consists of a variety of occupations with different levels of direct patient contact
- Disproportionately lower-wage workers
- **39%** of workers are 50 years of age or older
- **82%** of workers are female, **26%** non-Hispanic Black persons
 - Among workers overall, 48% are female and 12% are non-Hispanic Black persons
- Staff can be shared among multiple facilities
- In many instances, COVID-19 activity increases among LTCF staff first, and then residents



Data from 2018 American Community Survey (ACS):

<https://www.kff.org/coronavirus-covid-19/issue-brief/covid-19-and-workers-at-risk-examining-the-long-term-care-workforce/>

COVID-19

Epidemiology among Workers in Food Processing and Agriculture



Meat & Poultry Processing

April–May 2020

- Among 23 states reporting COVID-19 outbreaks in meat or poultry processing plants, there were **16,233** cases in 239 facilities, including 86 (0.5%) deaths
 - Testing strategies and methods varied by workplace
- Symptom status reported for 10,284 (63%):
 - 9,072 (**88%**) were symptomatic
 - 1,212 (**12%**) asymptomatic/presymptomatic



Meat & Poultry Processing

April–May 2020

- Among 14 states reporting total number of workers in affected meat and poultry processing plants, COVID-19 diagnosed in **9.1%** of workers
 - Ranged from 3.1% to 24.5% per facility
- Among cases with race and ethnicity reported, **87%** occurred among racial or ethnic minorities
 - 56% Hispanic, 19% Black, 13% White, 12% Asian
 - Suggests that Hispanic and Asian workers might be disproportionately affected



Workers in Food Processing and Agriculture

- Outbreaks have been reported in other food production sectors, including food processing facilities and farms
- Compared to all U.S. salaried workers, individuals working in agriculture are more likely to be racial and ethnic minority, lacking a high school diploma, and less likely to be born in the United States¹



¹<https://www.ers.usda.gov/topics/farm-economy/farm-labor/#demographic>

Workers in Food Processing and Agriculture

- Multiple factors that increase food processing and agriculture workers' risk for exposure to SARS-CoV-2:
 - Prolonged close workplace contact with coworkers
 - Frequent community contact with fellow workers
 - Mobility of the work force (i.e. migrant workers)
 - Shared transportation to and from the workplace
 - Lack of paid sick leave
 - Congregate housing
 - Living in employer-furnished housing and shared living quarters
 - Living in crowded and multigenerational housing

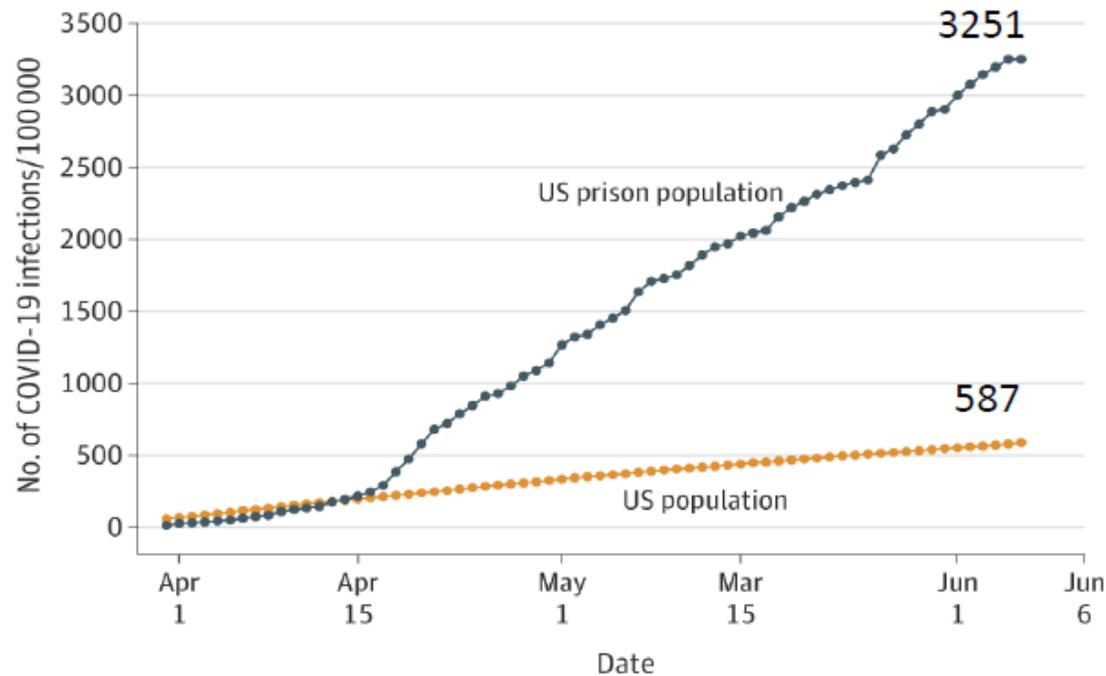


COVID-19

Epidemiology among Workers in Correctional Facilities



COVID-19 Confirmed Case Rate per 100,000 in Prison and U.S. Population



- COVID-19 case rate **5.5** times higher among incarcerated persons than case rate in US population

Source: [Saloner, et al. JAMA 2020](#); Data are from the UCLA Law COVID-19 Behind Bars Data Project, US Census & CDC. Rate calculations based upon the US population and the US prison population.

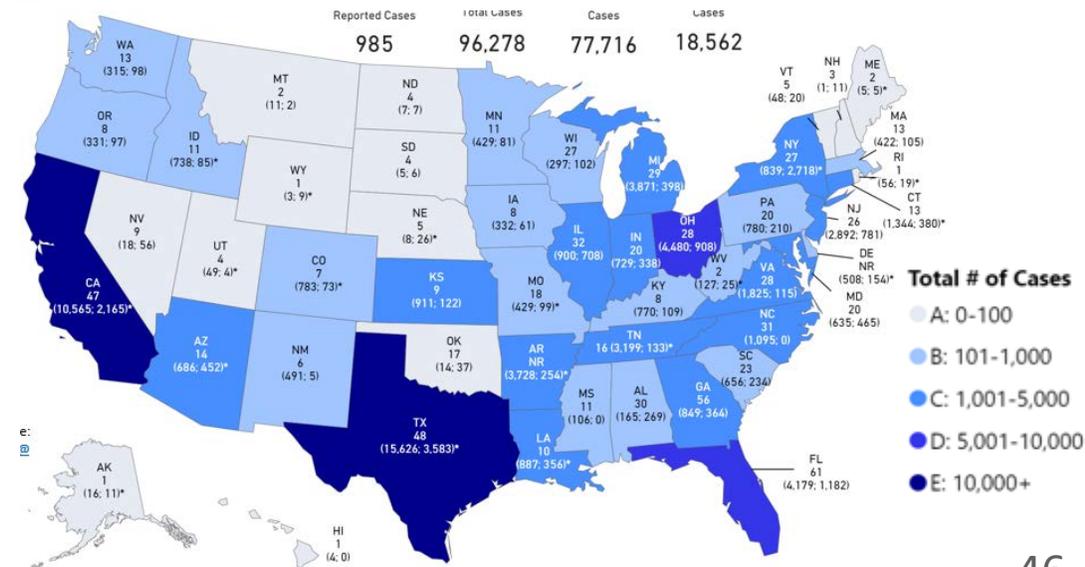


UCLA COVID-19 Behind Bars Data Project

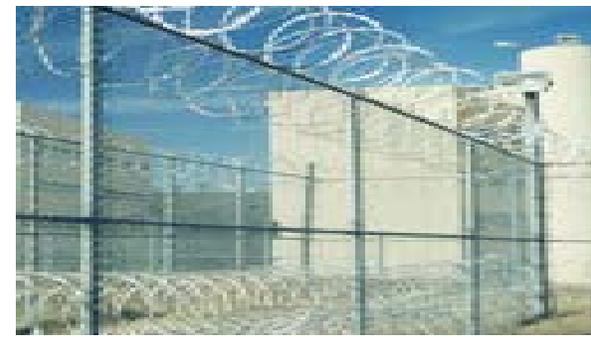
<https://law.ucla.edu/academics/centers/criminal-justice-program/ucla-covid-19-behind-bars-data-project>

Correction & Detention Facilities

- **985** correctional/detention facilities with ≥ 1 COVID-19 cases
- COVID-19 diagnosed in **77,716** incarcerated persons and **18,562** staff
- **707** COVID-19 related deaths reported among incarcerated persons, **56** among staff
- Actual case counts likely higher than reported



Correction & Detention Facilities



- Testing of staff does not always occur with larger facility investigations and may be self-reported
- In an analysis of 16 U.S. prisons and jails, 56% identified their first case of COVID-19 among staff members as opposed to incarcerated/detained persons¹
 - Indicates that staff members can introduce the virus into correctional and detention settings through their daily movements between the facility and the community

¹Hagan et al. MMWR – projected publication date August 7. Results of Mass Testing for SARS-CoV-2 in 16 Prisons and Jails— Six U.S. Jurisdictions, April–May 2020



COVID-19 Epidemiology among Military Personnel



Cases among Military Personnel

36,590 cases and **56** deaths among Department of Defense personnel

	Cases	Hospitalized	Recovered	Deaths
Military	25,590	465	10,855	3
Civilian	5,373	264	1,958	33
Dependent	3,417	103	1,434	7
Contractor	2,279	128	875	13
Total	36,659	960	15,122	56

					
Army	Marine Corps	Navy	Air Force	National Guard	DOD Agencies
8,623	3,003	6,340	3,964	3,398	262



SARS-CoV-2 Infections from U.S. Navy Service Members

USS Theodore Roosevelt, April 2020

- Aircraft carrier experiencing a COVID-19 outbreak
 - Approximately 1,000 service members infected with SARS-CoV-2
 - Portion provided specimens and questionnaire
- 98/267 (**37%**) had positive PCR results
- 228/382 (**60%**) had positive antibodies to SARS-CoV-2 spike protein
- 44/238 (**19%**) reported no symptoms
- Demonstrates risk factors for COVID-19 transmission among military personnel:
 - Congregate living quarters
 - Close working environments



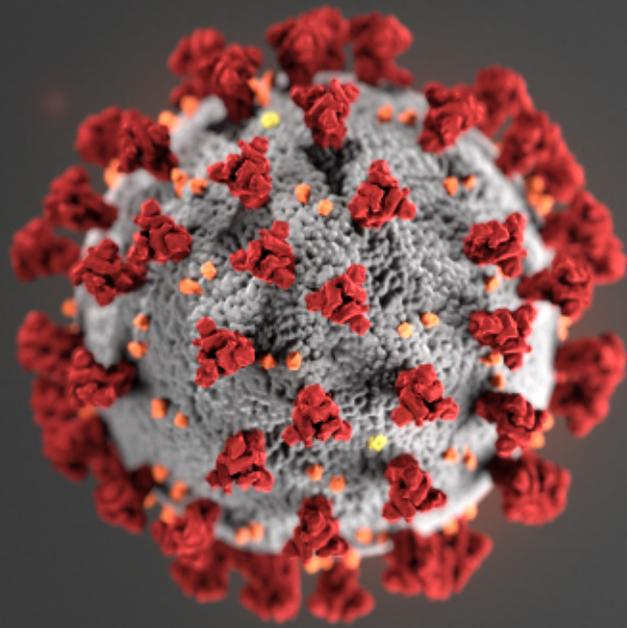
Summary



Summary

- Over 4 million cases of COVID-19 diagnosed in the United States through July
- Information on occupation for COVID-19 cases has not been systematically collected and reported on all cases
- Many occupations appear to have increased risk for COVID-19, including healthcare personnel and staff at long term care facilities, correctional and detention facilities, and food/agricultural settings
- Surveillance/projects ongoing to identify risk factors for COVID-19





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.

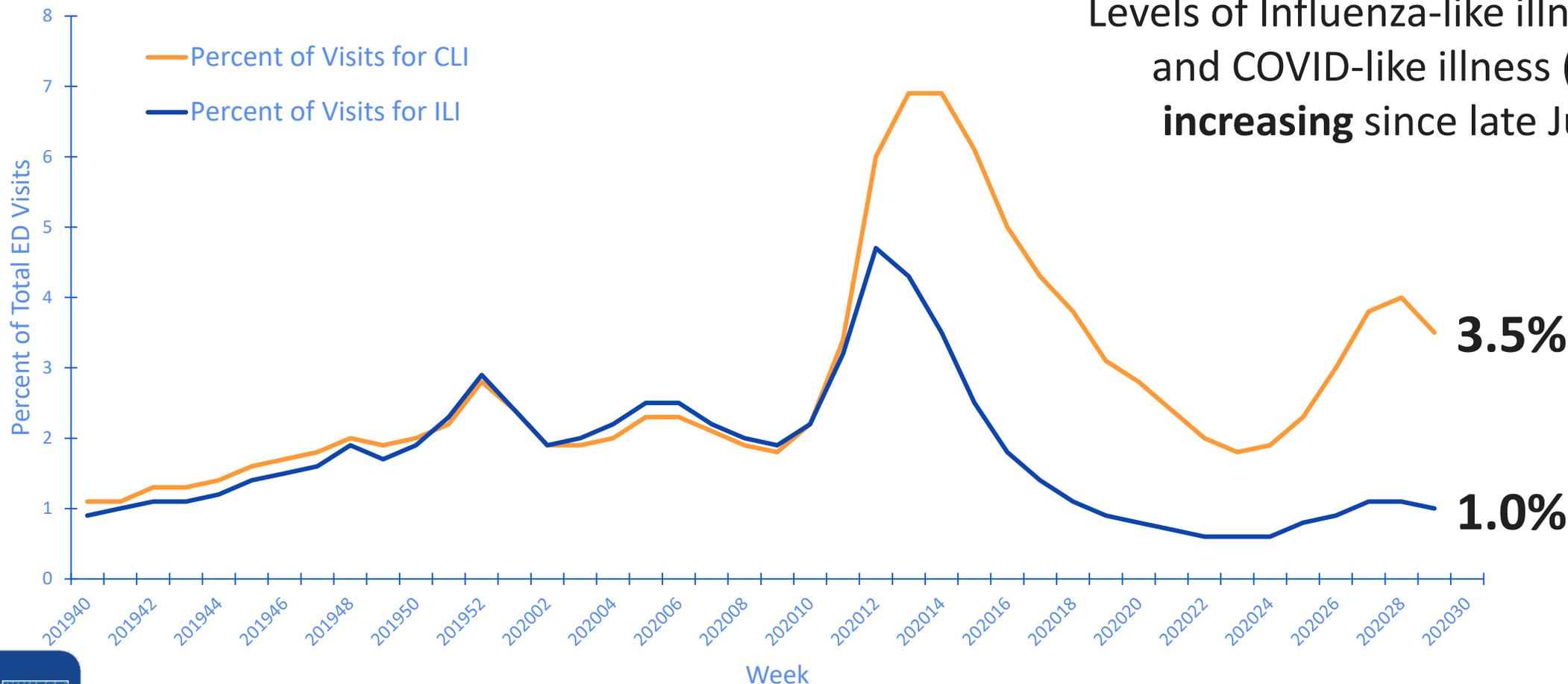


Percent of Visits for ILI and CLI in Emergency Departments

National Syndromic Surveillance Program (NSSP)

September 29, 2019 to July 18, 2020

Levels of Influenza-like illness (ILI) and COVID-like illness (CLI) **increasing** since late June



<https://www.cdc.gov/coronavirus/2019-ncov/covid-data/covidview/index.html>

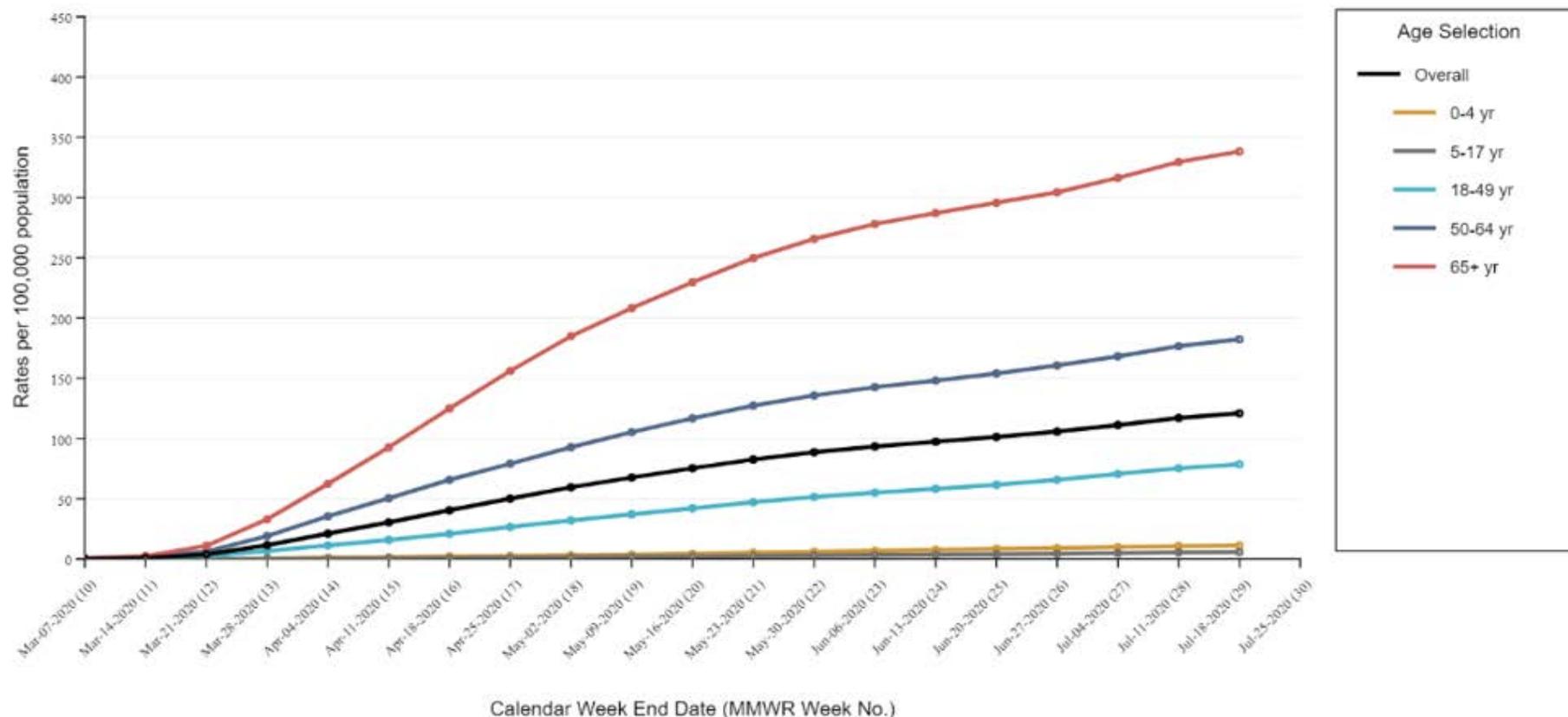
COVID-NET: Hospitalization Surveillance from 14 States

March 1 to July 18, 2020

Cumulative Hospitalization Rate

Overall:
121/100,000
population

Among adults ≥ 65
years of age:
338/100,000
population

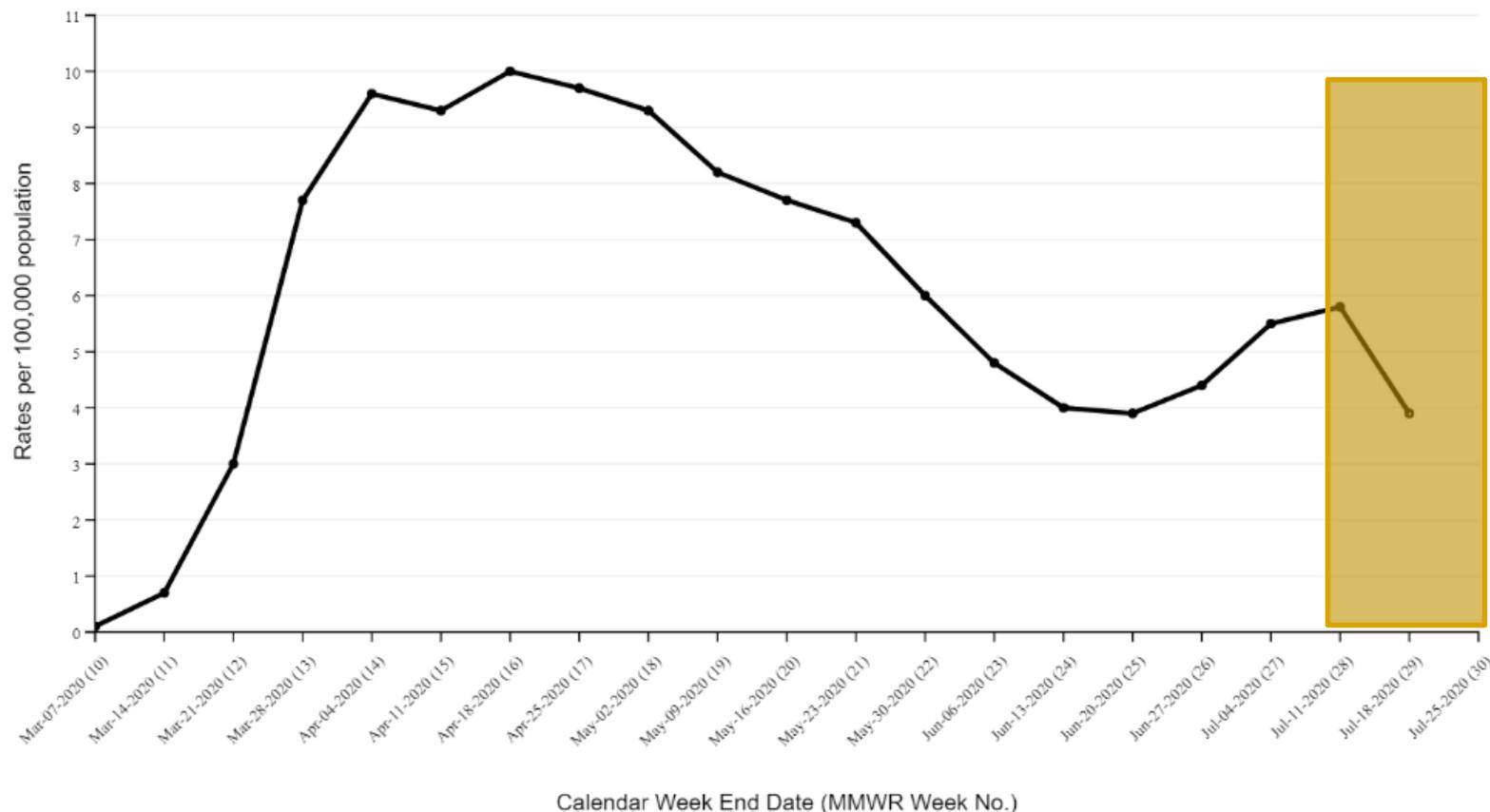


COVID-NET: Hospitalization Surveillance from 14 States

March 1 to July 18, 2020

Weekly hospitalization rate demonstrates an increase in rates over past several weeks

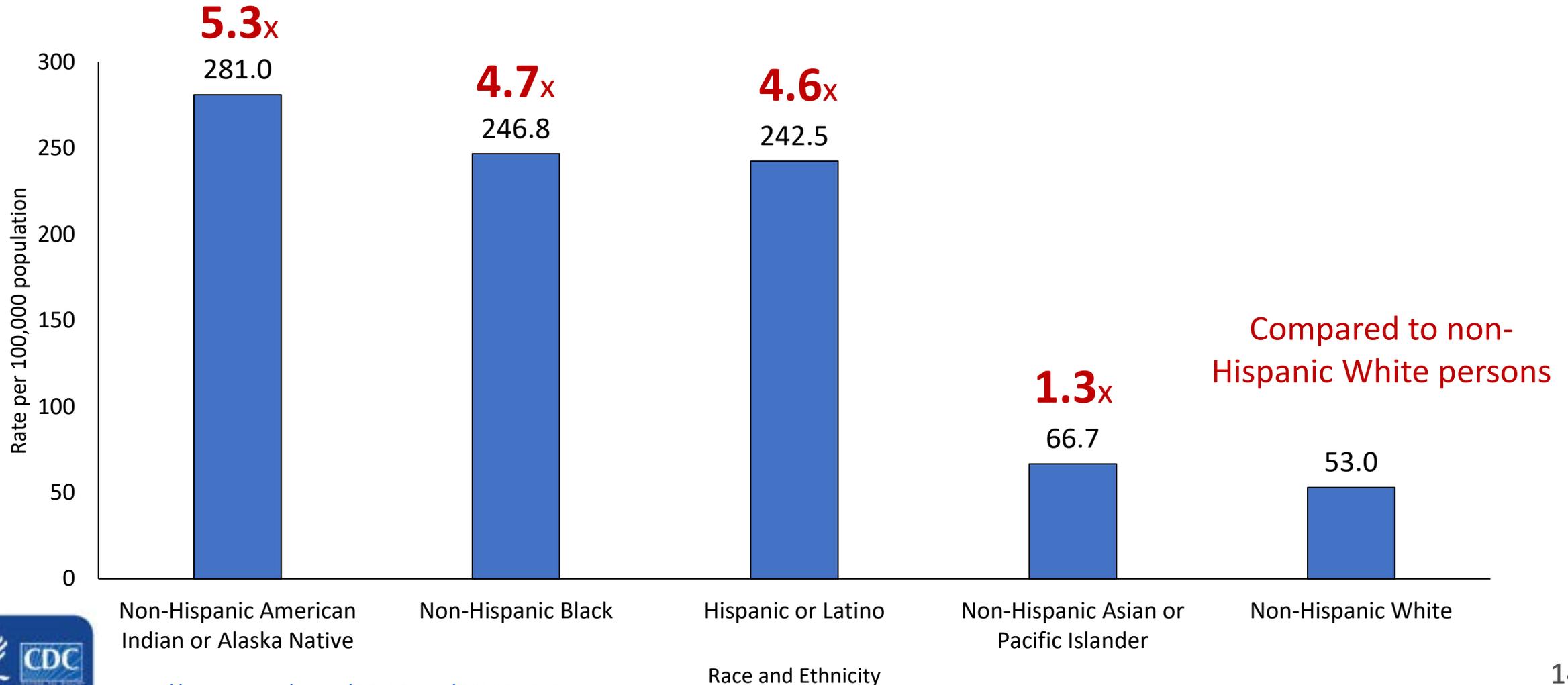
Weekly Hospitalization Rate



COVID-NET:

Age-adjusted COVID-19-associated hospitalization rates, by race and ethnicity

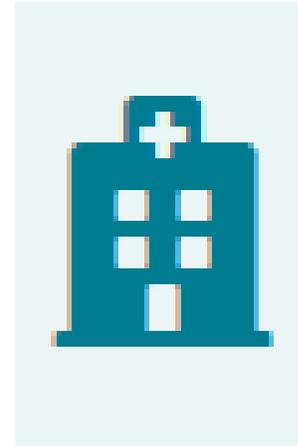
March 1 to July 18, 2020



Health Care Personnel and Transmission

- First reported case of community transmission in U.S. in Solano County, CA

Multiple aerosol-generating procedures including BiPAP and intubation, with no PPE



Patient remained on a closed system ventilator from arrival to receiving a positive test result

While at Hospital A:
121 HCP exposed,
Three tested positive

While at Hospital B:
146 HCP exposed,
None tested positive



Health Care Personnel and Transmission



HCP with lab-confirmed COVID-19 associated with:

Performing physical examination

Exposure to the patient during nebulizer treatments

Longer duration exposure to the patient



Of the three HCP with lab-confirmed COVID:

One present for 3 hours while patient on BiPAP

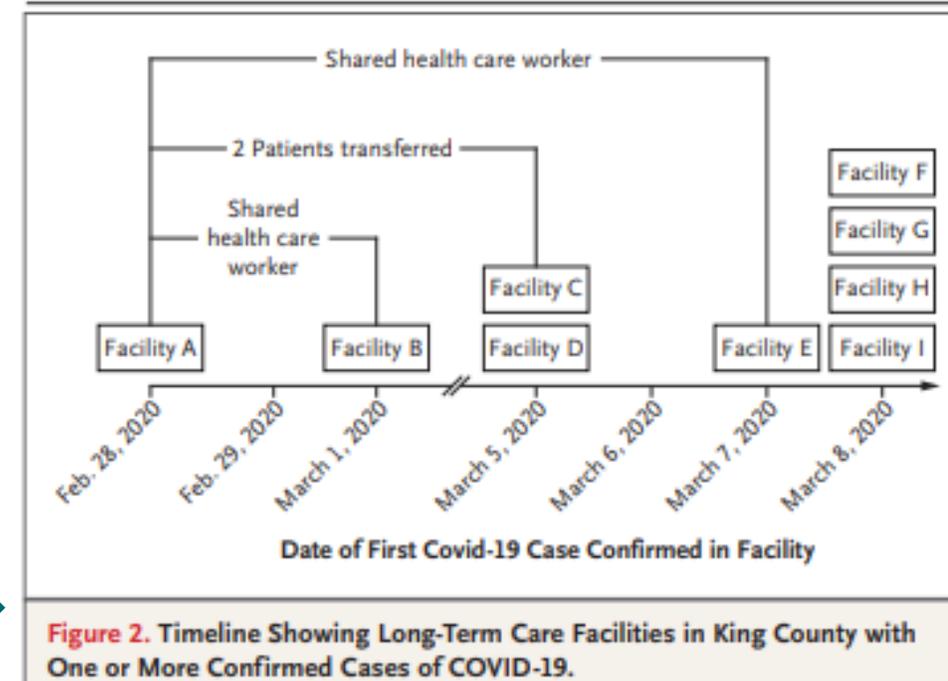
One participated with BiPAP placement and intubation

One reported close contact with patient for 2 hours but not during aerosol generating procedures



Long Term Care Facilities

- Reports suggest that once COVID-19 has been introduced into a long-term care facility, it has the potential to result in high attack rates among residents, staff members, and visitors.
- Many areas contribute to vulnerability of LTCFs:
 - Inadequate familiarity with PPE
 - Inadequate supplies of PPE
 - High prevalence of underlying conditions
 - Atypical presentations in elderly
 - Facilities share staff and patients



Healthcare Personnel Seroprevalence:

Other published reports

- Nashville, TN¹:
 - 249 HCP in hospital units with COVID-19 patients in April
 - 19 (**7.6%**) positive for SARS-CoV-2 antibodies
 - 11 of 19 reported previous symptoms
 - Seropositivity more common among those not universally wearing PPE
- Germany²:
 - 316 HCP tested in April
 - 5 (1.6%) positive for SARS-CoV-2 antibodies



¹Stubblefield et al. CID 2020 <https://pubmed.ncbi.nlm.nih.gov/32628750/>

²Korth et al. JCV 2020 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7219425/>

Healthcare Personnel Risk Factors

- Belgium¹:
 - 3056 hospital staff at a single institution in late April
 - 197 (6.4%) positive for SARS-CoV-2 antibodies

Figure 2. Exposure and Symptomatology Predictors of SARS-CoV-2 Antibodies Among Staff, Hospital East-Limburg, Belgium, 2020

