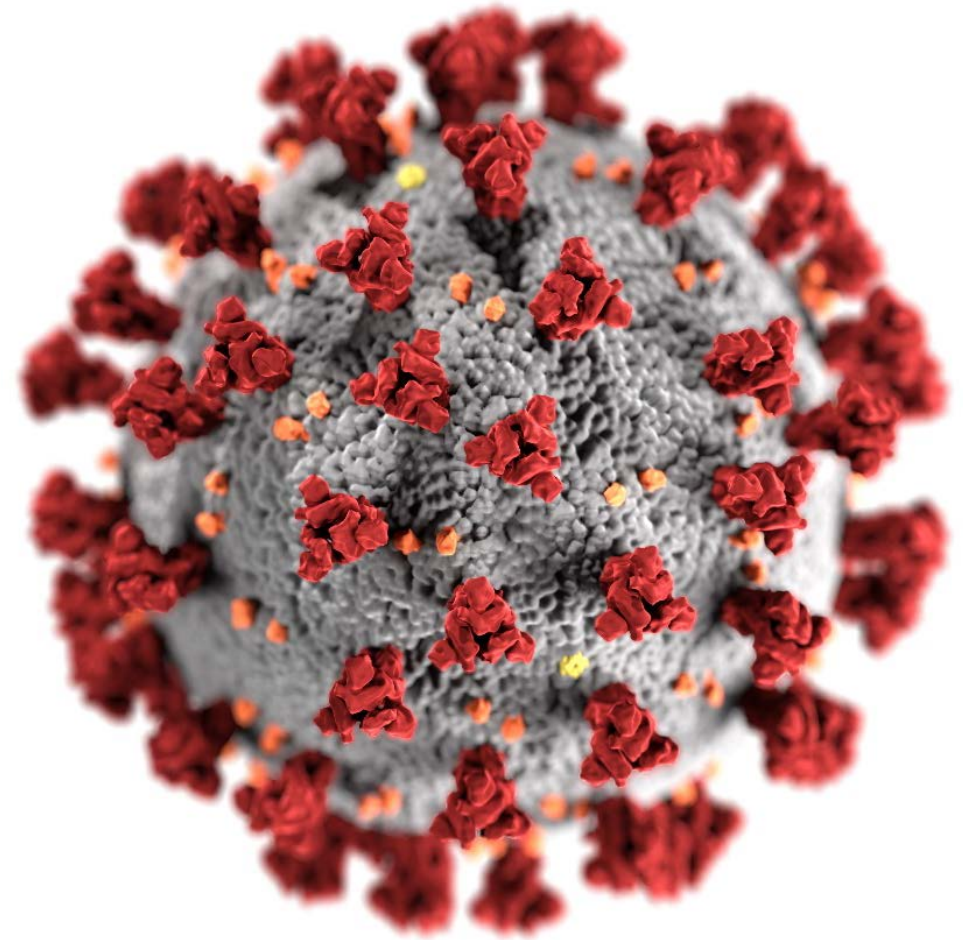# Epidemiology of Individuals at Increased Risk of COVID-19 Disease

Nancy McClung, PhD, RN
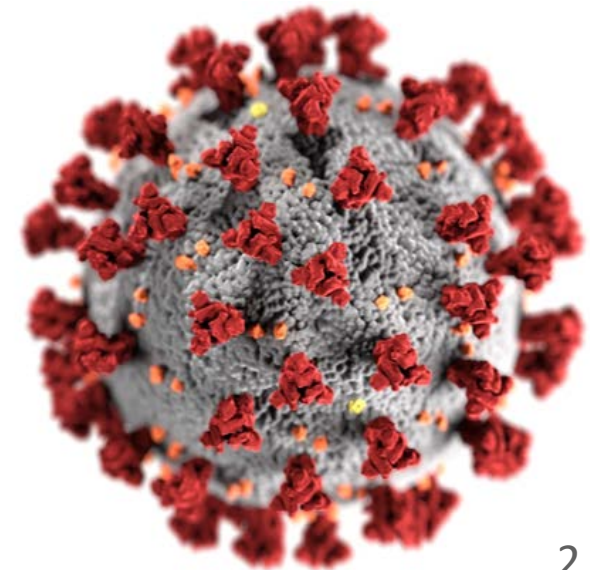
ACIP Meeting
August 26, 2020

For more information: **www.cdc.gov/COVID19**

Outline

- Overview of U.S. COVID-19 Epidemiology

- Epidemiology of Individuals at Increased Risk of Severe COVID-19 Disease
  - Older Adults (aged 65 years or older)
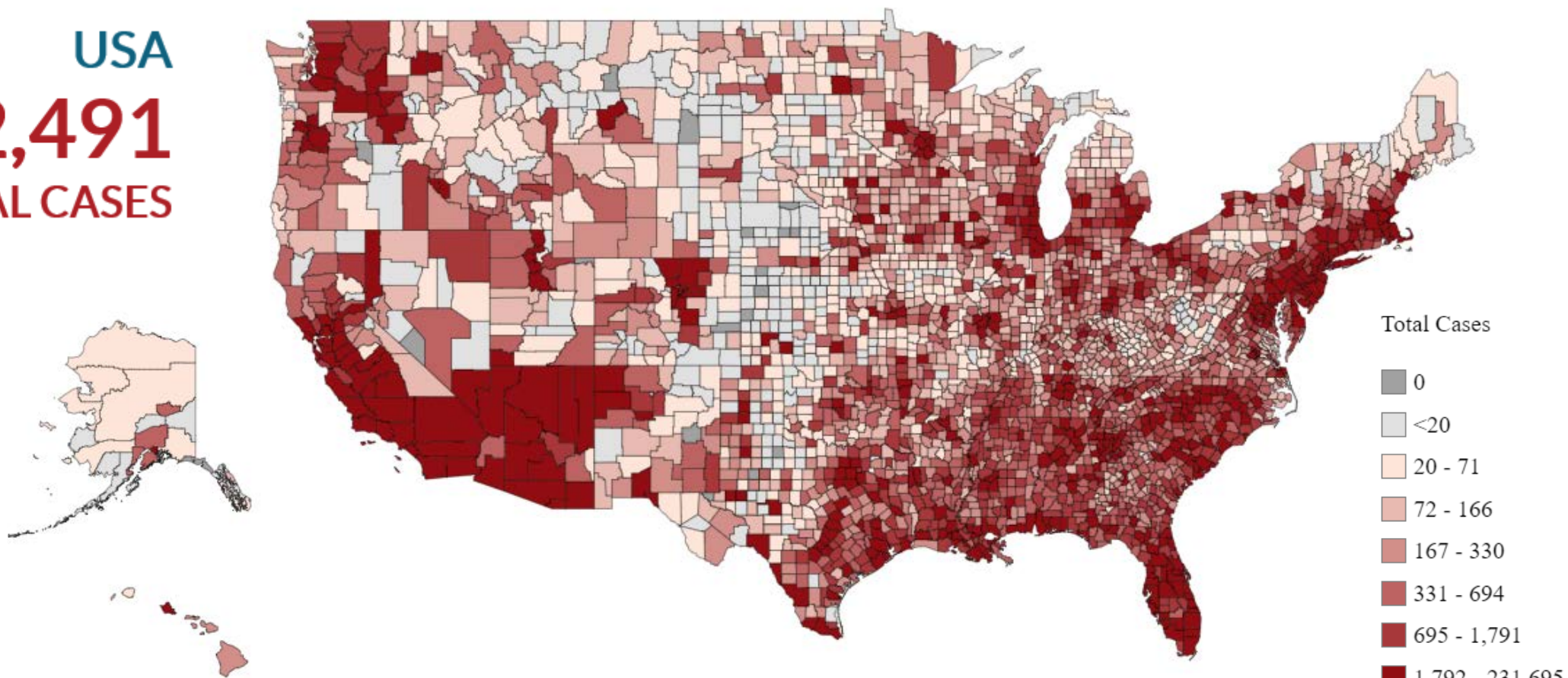 - Adults with Underlying Medical Conditions (aged 18 years or older)

Overview of U.S. COVID-19 Epidemiology

United States COVID-19 Cases by County

January 21 to August 23, 2020

USA

5,682,491
TOTAL CASES

Total Cases

- ■ 0
- ■ <20
- ■ 20 - 71
- ■ 72 - 166
- ■ 167 - 330
- ■ 331 - 694
- ■ 695 - 1,791
- ■ 1,792 - 231,695

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

Trends in Number of COVID-19 Cases in the US

January 21 to August 23, 2020

https://www.cdc.gov/covid-data-tracker/index.html#trends
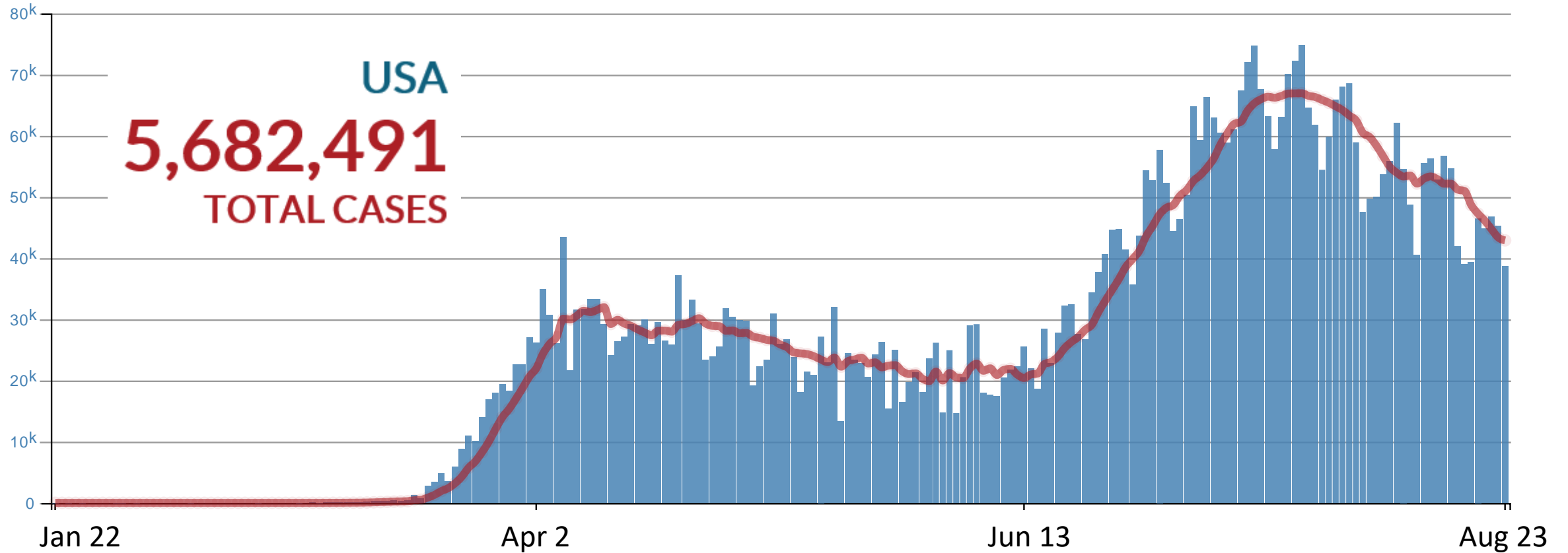
U.S. State and Local **Public Health Laboratories** Reporting to CDC:
Number of Specimens Tested and Percent Positive for SARS-CoV-2
March 1, 2020 – August 15, 2020

Week 33
6.6%

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

6
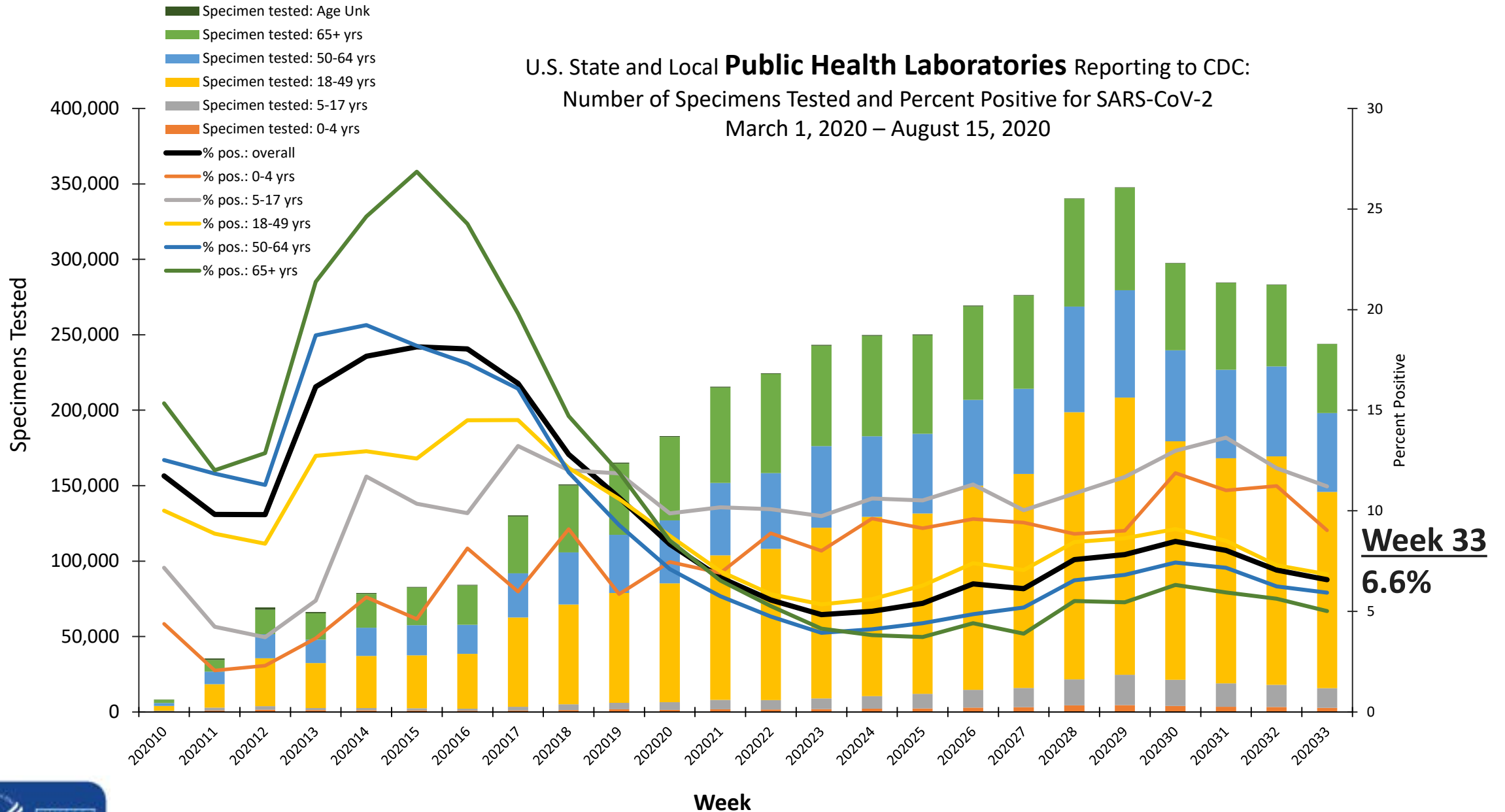
Select **Commercial Laboratories** Reporting to CDC: Number of Specimens Tested and Percent Positive for SARS-CoV-2 March 29, 2020 – August 15, 2020

Legend:
- Specimen tested: Age Unk
- Specimen tested: 65+ yrs
- Specimen tested: 50-64 yrs
- Specimen tested: 18-49 yrs
- Specimen tested: 5-17 yrs
- Specimen tested: 0-4 yrs
- % pos.: overall
- % pos.: 0-4 yrs
- % pos.: 5-17 yrs
- % pos.: 18-49 yrs
- % pos.: 50-64 yrs
- % pos.: 65+ yrs

Week 33 **6.3%**

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

United States COVID-19 Deaths by County

January 21 to August 23, 2020

USA

176,223
TOTAL DEATHS

Total Deaths
- 0
- <20
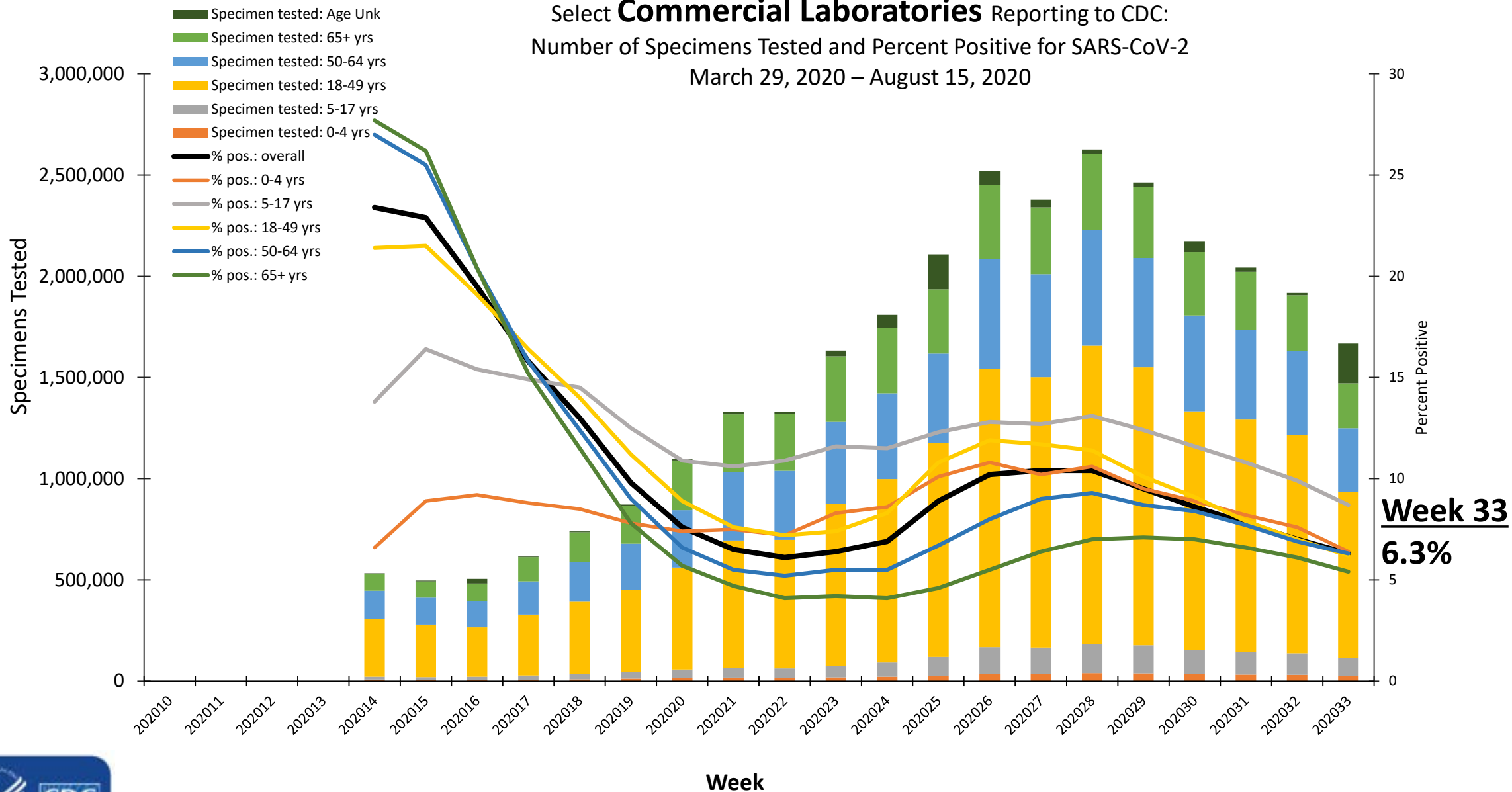- 20 - 27
- 28 - 39
- 40 - 56
- 57 - 105
- 106 - 277
- 278 - 7,273

https://www.cdc.gov/covid-data-tracker/index.html
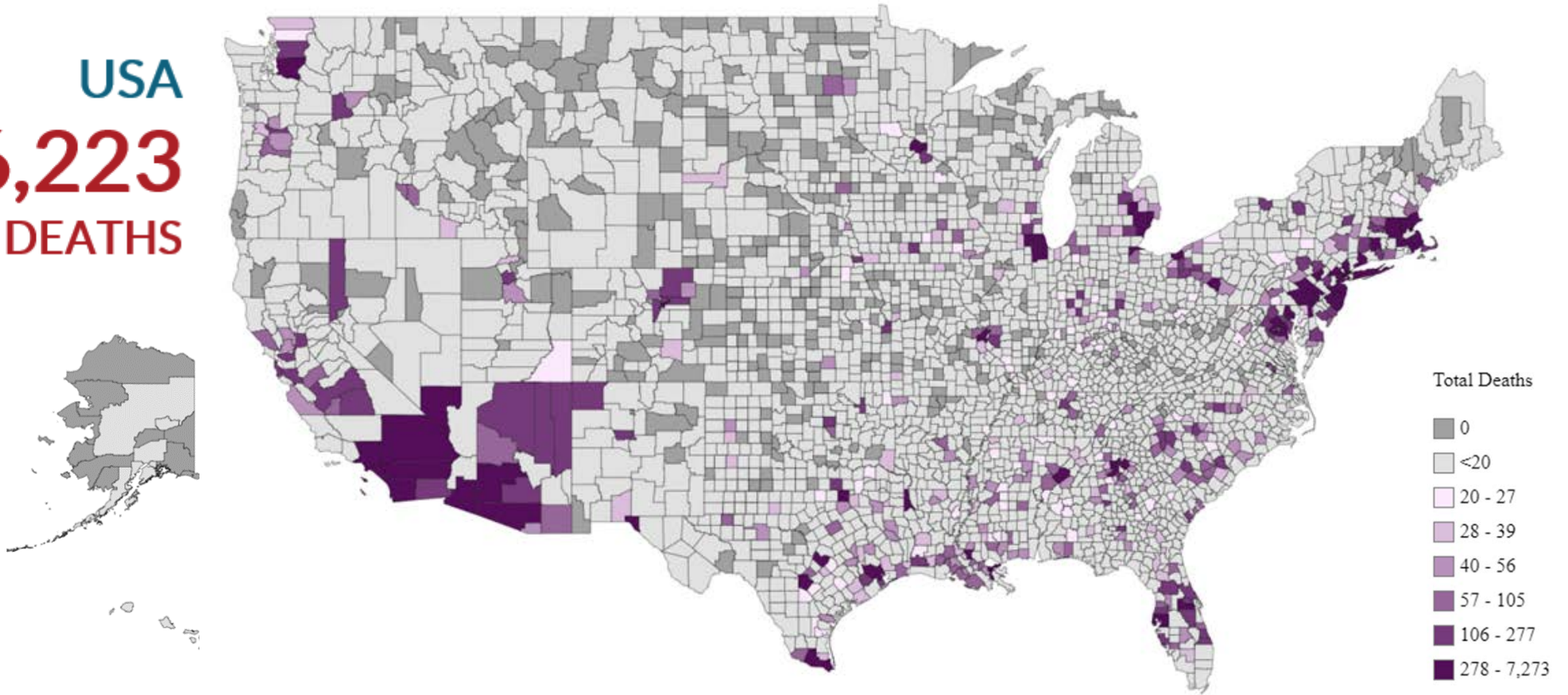
Trends in Number of COVID-19 Deaths in the US

January 21 to August 23, 2020

USA

176,223
TOTAL DEATHS

https://www.cdc.gov/covid-data-tracker/index.html#trends
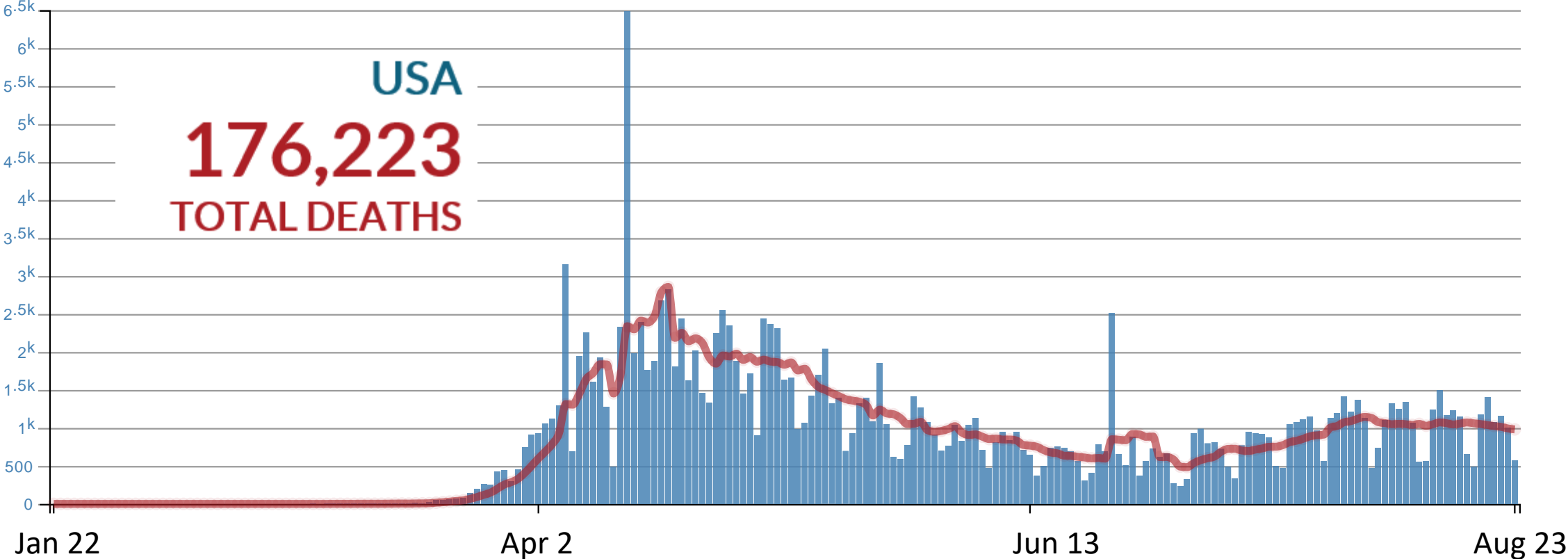
COVID-19 Epidemiology of Adults Aged 65 Years or Older

Adults aged 65 years and older and people of any age with certain underlying medical conditions are at increased risk for severe illness from COVID-19:

Adults aged 65 years and older and people of any age with certain underlying medical conditions are at increased risk for **severe illness from COVID-19**:
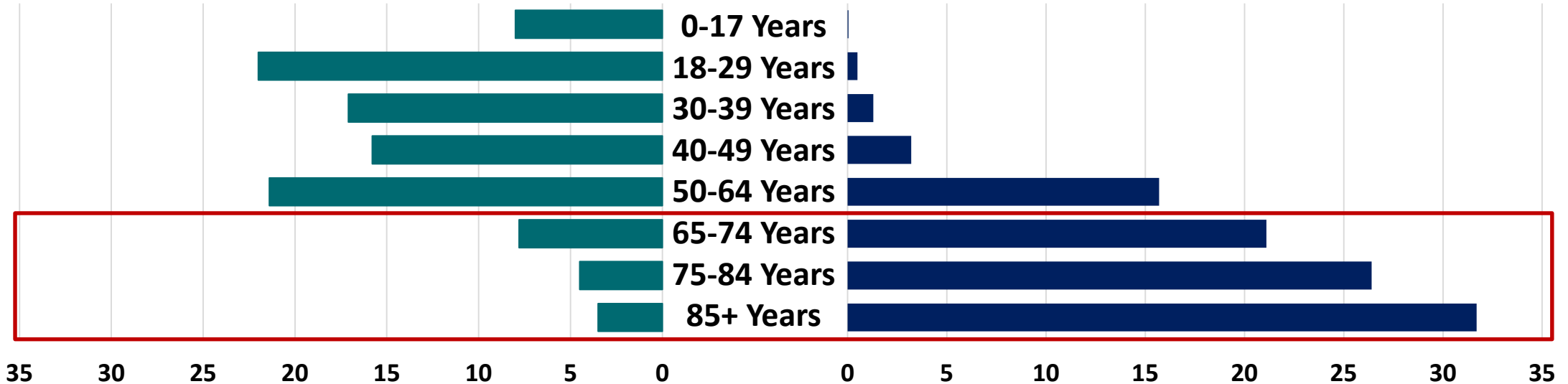
- Hospitalization
- Intensive Care Unit (ICU) care
- Intubation or mechanical ventilation
- Death

In the United States, adults aged 65 years or older represent 16% of COVID-19 cases, but nearly 80% of COVID-19 deaths

Percentage of cases   **Percentage of deaths**

Age Group
0-17 Years
18-29 Years
30-39 Years
40-49 Years
50-64 Years
65-74 Years
75-84 Years
85+ Years

*Data from 4,272,205 cases. Age group was available for 4,109,540 (96%) cases

*Data from 131,692 deaths. Age group was available for 131,676 (99%) deaths

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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 and data include **underlying medical conditions**

COVID-NET: Older adults aged 65 years or older have the highest cumulative rate of COVID-19 associated hospitalizations*
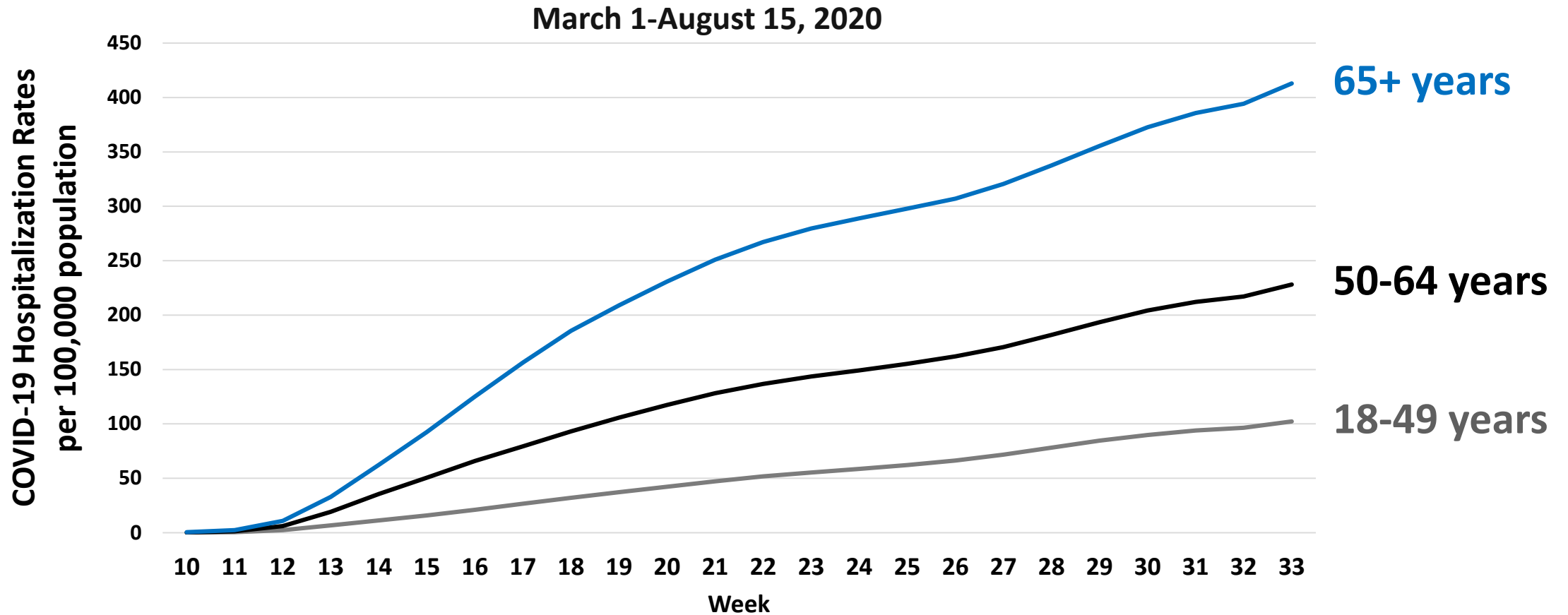
March 1-August 15, 2020

Chart: COVID-19 Hospitalization Rates per 100,000 population (y-axis, 0 to 450) by Week (x-axis, 10 to 33), showing three lines: **65+ years** (blue, reaching ~415), **50-64 years** (black, reaching ~225), and **18-49 years** (gray, reaching ~100).

15

COVID-NET: Adults aged 50 years and older are more likely to have severe outcomes during COVID-19 associated hospitalizations compared to adults aged 18-49 years

March 1-August 15, 2020

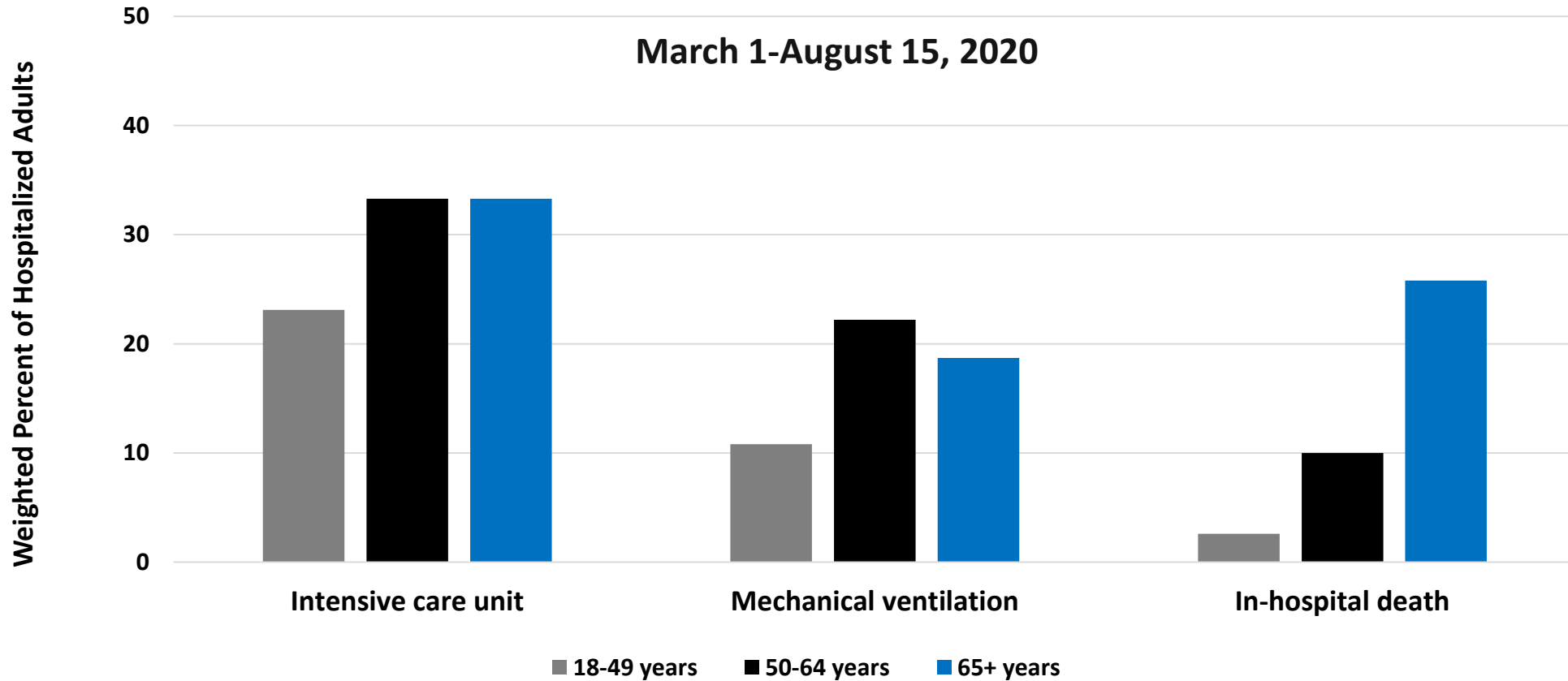*COVID-19 associated hospitalizations reported to Coronavirus Disease 2019 (COVID-19)-Associated Hospitalization Surveillance Network (COVID-NET) surveillance system between March 1 and August 15, 2020. The denominator for intensive care unit, mechanical ventilation, in-hospital mortality, and discharge diagnoses is restricted to cases who are no longer hospitalized and who have complete medical chart reviews. COVID-NET is a population-based surveillance system that collects data on laboratory-confirmed COVID-19-associated hospitalizations among children and adults through a network of over 250 acute-care hospitals in 14 states. https://gis.cdc.gov/grasp/COVIDNet/COVID19_5.html

COVID-NET: Among <u>2,491 adults</u> with COVID-19 associated hospitalization between <u>March 1 and May 2, 2020</u>, older age was the strongest, independent risk factor for in-hospital death

85+ years vs 18-39 years	10.98
75–84 years vs 18-39 years	7.67
65–74 years vs 18-39 years	5.77
50-64 years vs 18-39 years	3.11
Male	1.3
Immunosuppression	1.39
Renal disease	1.33
Chronic Lung Disease	1.31
Cardiovascular Disease	1.28
Neurologic disorder	1.25
Diabetes	1.19

-5   0   5   10   15   20

Adjusted Rate Ratios and 95% Confidence Intervals

Multi-center U.S. cohort study: Among 2,215 adults with COVID-19 associated intensive care unit(ICU)-admission between March 4 and April 4, 2020, older age was the strongest, independent risk factor for in-hospital death within 28 days of admission

Characteristic	Odds ratio (95% CI) for death
Age group, y	
18-39	1 [Reference]
40-49	1.65 (0.97-2.80)
50-59	1.71 (1.05-2.80)
60-69	3.18 (1.95-5.18)
70-79	5.36 (3.20-9.00)
≥80	11.15 (6.19-20.06)
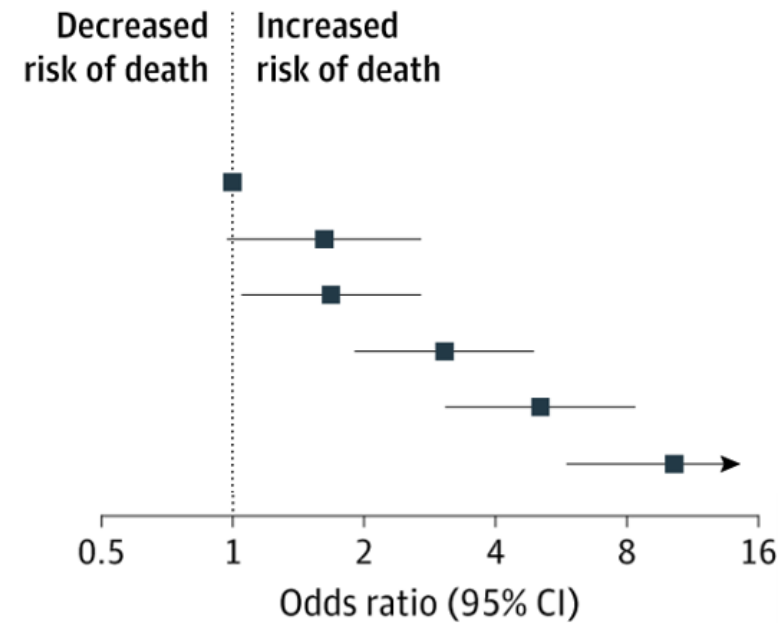
*Modified from Gupta *et al*, 2020, JAMA Int Med. Multivariable risk model for 28-day death after ICU admission. Model adjusted for age, sex, race, other patient-level characteristics such as comorbidities, symptoms, and body mass index, and hospital-level characteristics such as number of ICU beds.

COVID-19 Epidemiology of Individuals with Underlying Medical Conditions

COVID-NET: Underlying conditions among adults aged 18 years or older with COVID-19 associated hospitalizations

March 1-August 15, 2020

COVID-NET: The most common underlying medical conditions among hospitalized adults varies by age group

March 1-August 15, 2020

18-49 years	50-64 years	65+ years
Obesity (61.5%)	Hypertension (60.5%)	Hypertension (77.8%)
Hypertension (27.2%)	Obesity (56.5%)	Cardiovascular disease (55.2%)
Diabetes (21.8%)	Diabetes (37.9%)	Neurologic disease (42.5%)
Asthma (14.1%)	Cardiovascular disease (26.3%)	Diabetes (41.8%)
Chronic lung disease (9.8%)	Chronic lung disease (18.8%)	Obesity (34.6%)

COVID-NET: Over 60% of hospitalized adults had 3 or more of the selected underlying medical conditions*

March 1-August 15, 2020

*Defined as one or more of hypertension, obesity, diabetes, cardiovascular disease, neurologic disease, chronic lung disease, renal disease, asthma, immune suppression, gastrointestinal/liver disease, and autoimmune disease. **Unadjusted for age or other demographic variables.

COVID-19 associated hospitalizations reported to Coronavirus Disease 2019 (COVID-19)-Associated Hospitalization Surveillance Network (COVID-NET) surveillance system from March 1-August 15, 2020. The denominator is restricted to cases with a discharge disposition and for which chart review was completed. COVID-NET is a population-based surveillance system that collects data on laboratory-confirmed COVID-19-associated hospitalizations among children and adults through a network of over 250 acute-care hospitals in 14 states.

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COVID-NET: Of hospitalized adults that died, nearly 80% had 3 or more underlying medical conditions*

March 1-August 15, 2020

Weighted Percent of Hospitalized Persons**

*Defined as one or more of hypertension, obesity, diabetes, cardiovascular disease, neurologic disease, chronic lung disease, renal disease, asthma, immune suppression, gastrointestinal/liver disease, and autoimmune disease. **Unadjusted for age or other demographic variables. Each severe outcome adds up to 100 percent.
COVID-19 associated hospitalizations reported to Coronavirus Disease 2019 (COVID-19)-Associated Hospitalization Surveillance Network (COVID-NET) surveillance system from March 1-August 15, 2020. The denominator is restricted to cases with a discharge disposition and for which chart review was completed. COVID-NET is a population-based surveillance system that collects data on laboratory-confirmed COVID-19-associated hospitalizations among children and adults through a network of over 250 acute-care hospitals in 14 states.

23

COVID-NET: Of hospitalized adults 65 years or older, 80% had 3 or more underlying medical conditions*
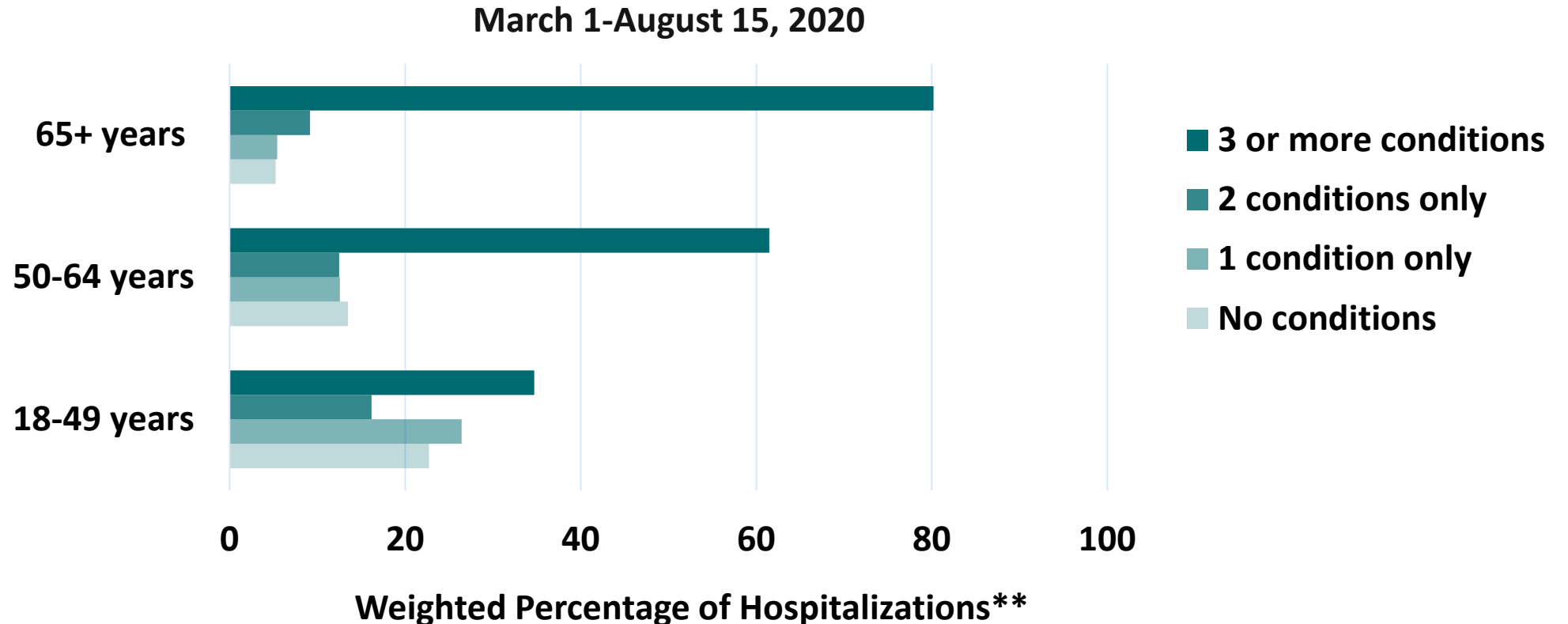
March 1-August 15, 2020

Weighted Percentage of Hospitalizations**

Legend: 3 or more conditions; 2 conditions only; 1 condition only; No conditions
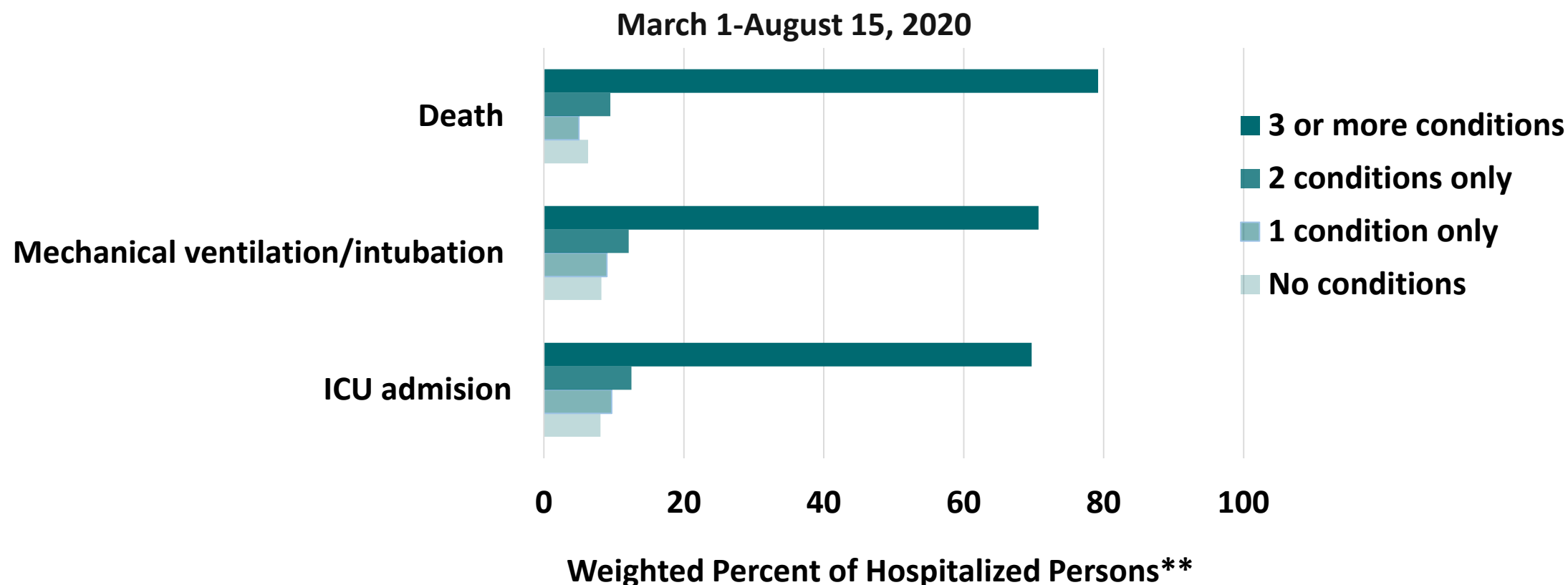
Age groups: 65+ years; 50-64 years; 18-49 years

*Defined as one or more of hypertension, obesity, diabetes, cardiovascular disease, neurologic disease, chronic lung disease, renal disease, asthma, immune suppression, gastrointestinal/liver disease, and autoimmune disease. **Unadjusted for other demographic variables. Each age group adds to 100 percent.
-COVID-19 associated hospitalizations reported to Coronavirus Disease 2019 (COVID-19)-Associated Hospitalization Surveillance Network (COVID-NET) surveillance system from March 1-August 15, 2020. The denominator is restricted to cases with a discharge disposition and for which chart review was completed. COVID-NET is a population-based surveillance system that collects data on laboratory-confirmed COVID-19-associated hospitalizations among children and adults through a network of over 250 acute-care hospitals in 14 states.

Are underlying medical conditions an <u>independent risk factor</u> for COVID-19-associated hospitalization in <u>adults aged 18 years or older</u>?

Population-based data sources

- COVID-19-Associated Hospitalization Surveillance Network (COVID-NET)
  - 14 sites representing 10% of U.S. population
  - Community-dwelling adults (≥ 18 years of age) prior to hospitalization with **chart-abstracted data on underlying medical condition** (N=5,416)
  - March 1 – June 23, 2020
- Behavioral Risk Factor Surveillance System (BRFSS)
  - Annual, cross-sectional survey on health behaviors and **self-reported underlying medical conditions** among community-dwelling adults (≥ 18 years of age) in all 50 statues, D.C., and 3 U.S. territories
  - Weighted to be representative of population residing in COVID-NET catchment area

https://medrxiv.org/cgi/content/short/2020.07.27.20161810v1

Are underlying medical conditions an <u>independent risk factor</u> for COVID-19-associated hospitalization in <u>adults aged 18 years or older</u>?

Statistical Analysis

- Prevalence of underlying medical conditions was calculated among COVID-NET hospitalized adults, COVID-NET catchment area, and nationwide

- Unadjusted and adjusted rate ratios and 95% confidence intervals (CIs) associated with hospitalization

  - Generalized Poisson regression models with a scaled deviance term to account for overdispersion

  - Multivariable models included an <u>individual</u> underlying medical condition and were adjusted for age, sex, and race/ethnicity

- Non-overlapping 95% CIs were considered to represent statistically significant differences

The prevalence of underlying medical conditions was greater among adults with COVID-19 associated hospitalizations compared to COVID-NET catchment areas
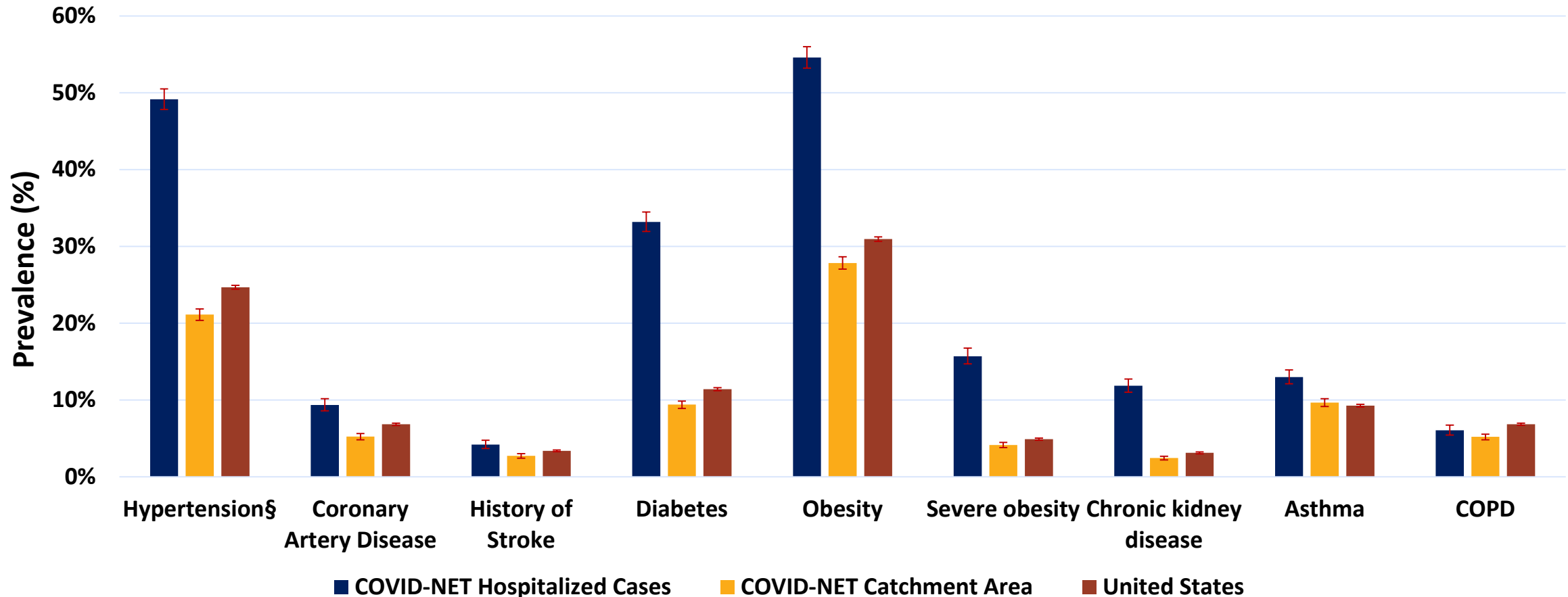
§Estimates for hypertension from COVID-NET Catchment Area and Nationwide BRFSS estimates are from 2017, Obesity=BMI ≥30kg/m^2 ; Severe obesity = BMI ≥40kg/m^2

https://medrxiv.org/cgi/content/short/2020.07.27.20161810v1

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The magnitude of risk for COVID-19 associated hospitalization was greatest for adults with severe obesity, chronic kidney disease, and diabetes.
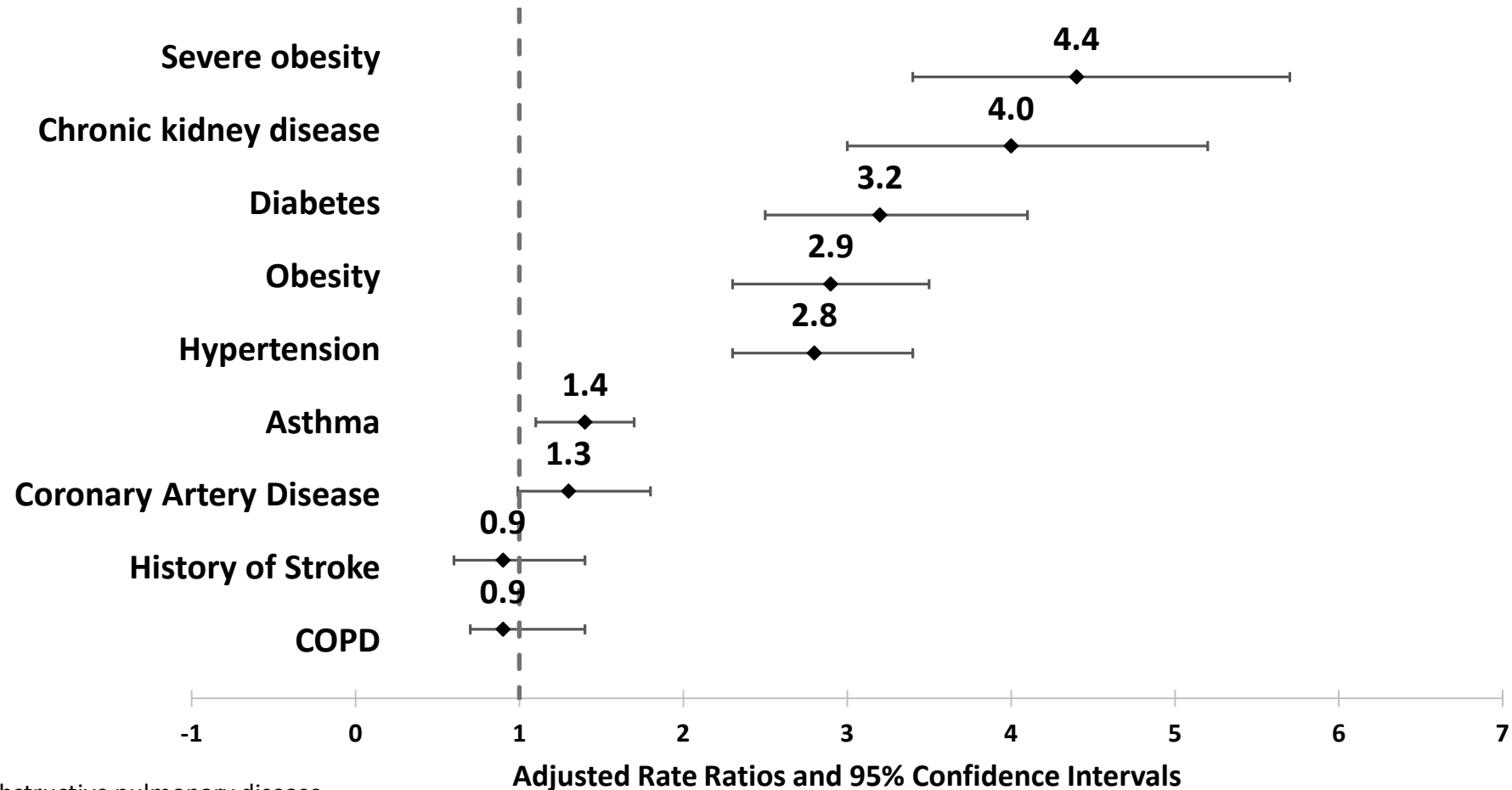
Condition	Adjusted Rate Ratio
Severe obesity	4.4
Chronic kidney disease	4.0
Diabetes	3.2
Obesity	2.9
Hypertension	2.8
Asthma	1.4
Coronary Artery Disease	1.3
History of Stroke	0.9
COPD	0.9

Adjusted Rate Ratios and 95% Confidence Intervals

COPD: Chronic obstructive pulmonary disease
Obesity=BMI ≥30kg/m^2 ; Severe obesity = BMI ≥40kg/m^2
*Each underlying medical condition is in a separate model, adjusted for age, sex, race/ethnicity

BRFSS™ COVID-NET A Weekly Summary of U.S. COVID-19 Hospitalization Data

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The magnitude of risk for COVID-19 associated hospitalization was greatest for adults aged 65 years or older for all underlying medical conditions

Adjusted Rate Ratios and 95% Confidence Intervals for Age and COVID-19-Associated Hospitalizations

	Hypertension	Coronary Artery Disease	History of Stroke	Diabetes	Obesity	Severe Obesity	Chronic Kidney Disease	Asthma	COPD
Age 65+ vs. 18-44 years	2.2 (1.7, 2.7)	3.7 (2.9, 4.6)	3.8 (3.1, 4.7)	2.5 (1.9, 3.4)	4.5 (3.4, 5.9)	4.6 (3.6, 5.9)	3.4 (2.7, 4.2)	3.8 (3.1, 4.6)	3.8 (3.0, 4.8)
Age 45-64 vs. 18-44 years	1.6 (1.3, 1.9)	2.3 (1.9, 2.9)	2.4 (2.0, 2.9)	1.9 (1.4, 2.4)	2.5 (2.0, 3.3)	2.7 (2.1, 3.4)	2.2 (1.8, 2.7)	2.3 (2.0, 2.8)	2.4 (1.9, 2.9)

*Each underlying medical condition is modeled separately; models include the specific underlying medical condition of interest, age, sex, and race/ethnicity categories
COPD: Chronic obstructive pulmonary disease; Obesity=BMI ≥30kg/m^2 ; Severe obesity = BMI ≥40kg/m^2

BRFSS   COVID-NET
A Weekly Summary of U.S. COVID-19 Hospitalization Data

The magnitude of risk for hospitalization increased with the number of underlying medical conditions, with the greatest risk among adults with 3 or more conditions.

Unadjusted and Adjusted* Rate Ratios for Number of Underlying Medical Conditions and COVID-19-Associated Hospitalization

	Unadjusted Rate Ratio (95%CI)	Adjusted Rate Ratio* (95%CI)
Number of conditions†		
1	2.8 (2.7, 3.1)	2.5 (2.1, 3.0)
2	5.6 (5.2, 6.1)	4.5 (3.7, 5.5)
3+	7.2 (6.6, 7.9)	5.0 (3.9, 6.3)
Age 45-64 years‡	-----	1.8 (1.5, 2.2)
Age 65+ years‡	-----	2.6 (2.1, 3.1)
Male§	-----	1.2 (1.1, 1.4)
Non-Hispanic black||	-----	3.9 (3.3, 4.7)
Other race/ethnicity||	-----	3.3 (2.8, 3.9)

CI: Confidence Interval; COVID-NET: Coronavirus Disease 2019-Associated Hospitalization Surveillance Network

*Model for number of conditions (variable) is adjusted for age, sex, and race/ethnicity

†Reference group is no underlying medical condition; Number of conditions is a sum of underlying medical conditions excluding hypertension; the most recent year of available BRFSS data for hypertension was 2017.

‡Reference group is 18-44 years

§Reference group is female

||Reference group is non-Hispanic white

BRFSS™   COVID-NET
A Weekly Summary of U.S. COVID-19 Hospitalization Data

COVID-NET/BRFSS Analysis Summary

- Accounting for age, race and ethnicity, and sex, higher hospitalization rates observed for community-dwelling adults with underlying medical conditions
  - Adults with 3+ medical conditions had highest hospitalization risk
  - Certain underlying medical conditions with higher risk
    - Severe obesity and chronic kidney disease associated with 4x hospitalization risk
    - Diabetes, obesity, hypertension associated with approximately 3x hospitalization risk
- Accounting for the presence of an individual underlying medical condition, higher hospitalization rates were observed:
  - Adults 65 years or older, 45-64 years (versus 18-44 years)

COVID-NET: Among <u>2,491 adults</u> with COVID-19 associated hospitalization between <u>March 1 and May 2</u>, certain underlying medical conditions were independent risk factor for <u>in-hospital death</u>:

Category	Adjusted Rate Ratio
85+ years vs 18-39 years	10.98
75–84 years vs 18-39 years	7.67
65–74 years vs 18-39 years	5.77
50-64 years vs 18-39 years	3.11
Male	1.3
Immunosuppression	1.39
Renal disease	1.33
Chronic Lung Disease	1.31
Cardiovascular Disease	1.28
Neurologic disorder	1.25
Diabetes	1.19

Adjusted Rate Ratios and 95% Confidence Intervals

(x-axis: -5, 0, 5, 10, 15, 20)
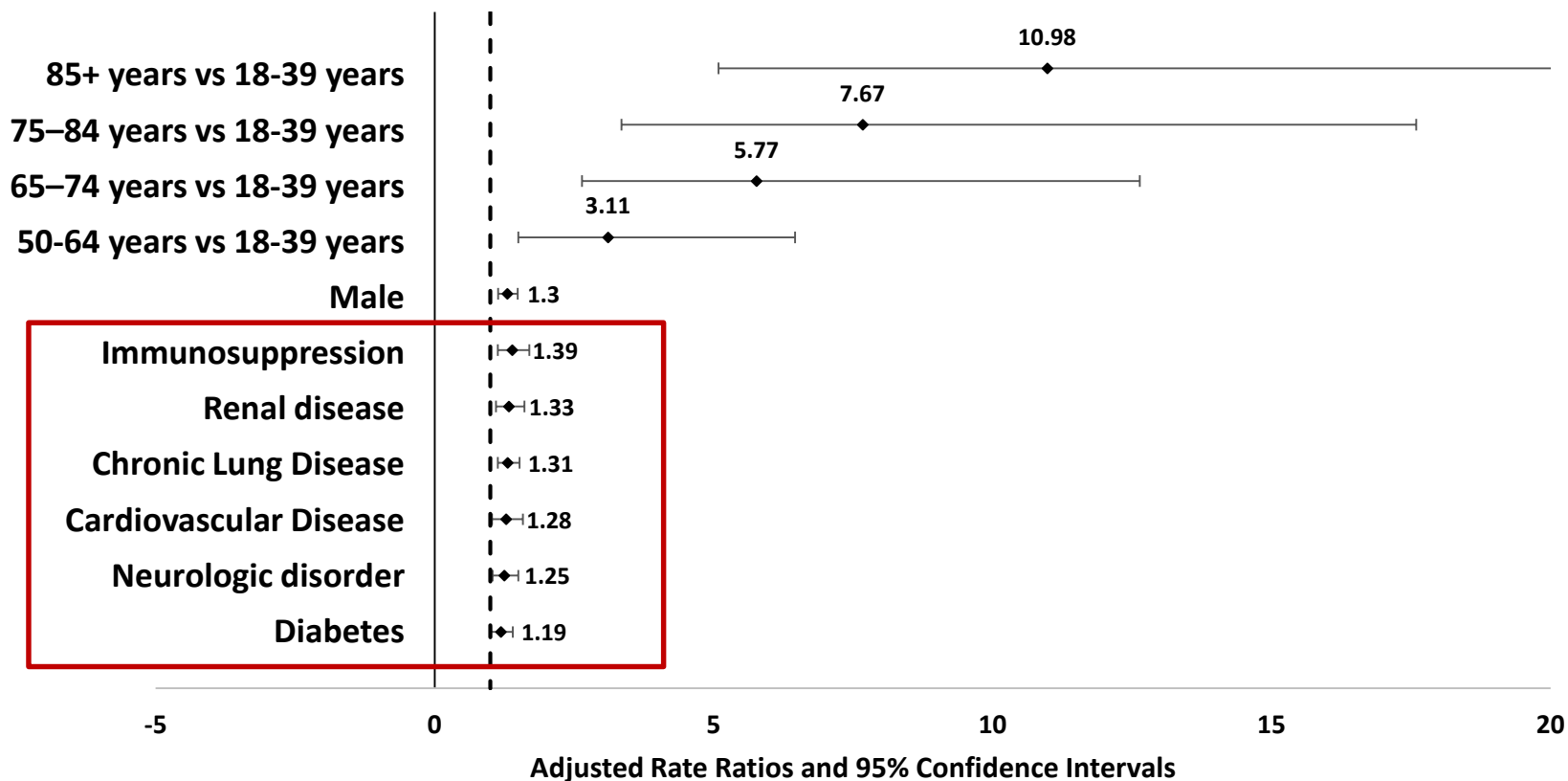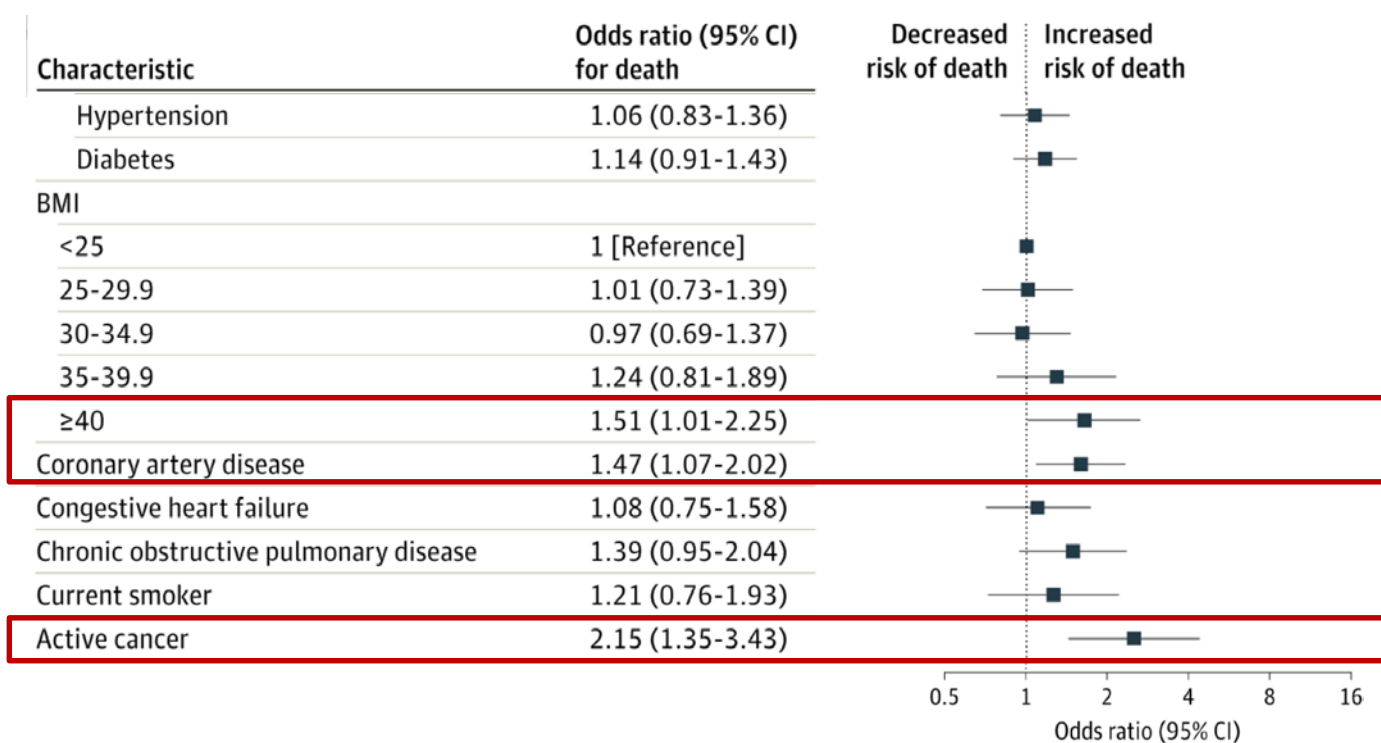
*COVID-NET Surveillance; Final model adjusted for age, sex, race/ethnicity, smoker, hypertension, obesity, diabetes, chronic lung disease, cardiovascular disease, neurologic disease, renal disease, immunosuppression, hematologic disorders, and rheumatologic or autoimmune disease. Kim *et al*, 2020, https://academic.oup.com/cid/advance-article/doi/10.1093/cid/ciaa1012/5872581

Multi-center U.S. cohort study: Among <u>2,215 adults</u> with COVID-19 associated <u>intensive care unit (ICU)-admission</u> between <u>March 4 and April 4, 2020</u>, certain underlying medical conditions were independent risk factor for <u>death within 28 days of admission</u>

Characteristic	Odds ratio (95% CI) for death
Hypertension	1.06 (0.83-1.36)
Diabetes	1.14 (0.91-1.43)
BMI	
<25	1 [Reference]
25-29.9	1.01 (0.73-1.39)
30-34.9	0.97 (0.69-1.37)
35-39.9	1.24 (0.81-1.89)
≥40	1.51 (1.01-2.25)
Coronary artery disease	1.47 (1.07-2.02)
Congestive heart failure	1.08 (0.75-1.58)
Chronic obstructive pulmonary disease	1.39 (0.95-2.04)
Current smoker	1.21 (0.76-1.93)
Active cancer	2.15 (1.35-3.43)

Decreased risk of death | Increased risk of death

Odds ratio (95% CI): 0.5 1 2 4 8 16

Supplementary U.S. case-based surveillance: Among a convenience sample of 10,647 COVID-19 deaths that occurred during February 12-April 24 in 16 health jurisdictions, 76% of decedents had at least one underlying medical conditions, and majority of decedents of any age had multiple conditions
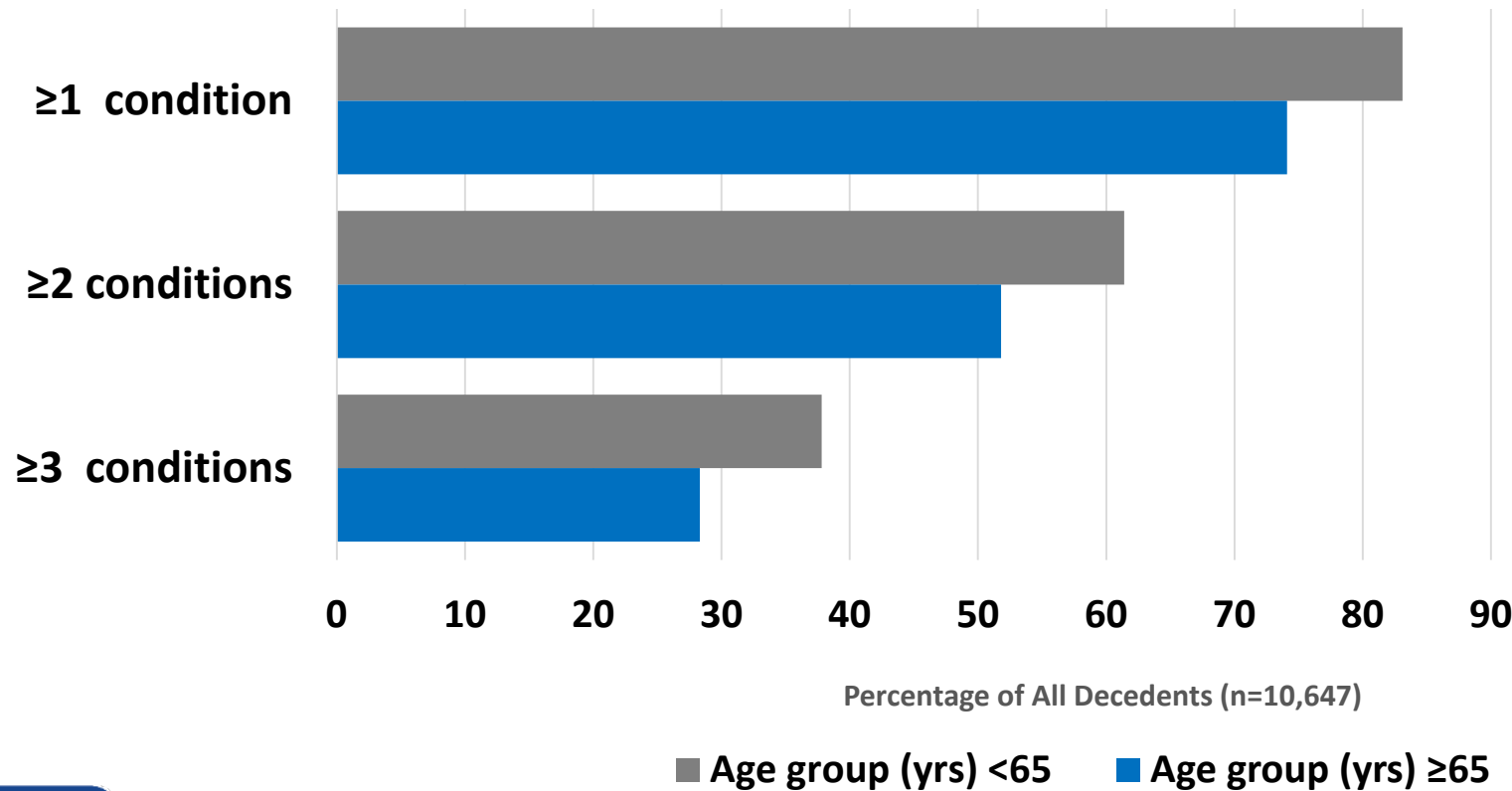
Most common conditions:

Cardiovascular disease (60.9%)

Diabetes (39.5%)

Chronic Kidney Disease (20.8%)

Chronic Lung Disease (19.2%)

Percentage of All Decedents (n=10,647)

■ **Age group (yrs) <65**   ■ **Age group (yrs) ≥65**

CDC has an ongoing, evidence-informed process to assess the risk for severe illness from COVID-19 for individuals with underlying medical conditions

- Comprehensive literature review ongoing
  - Internal database to track reviewed articles (U.S. and global)
  - Collaborating with SMEs across agency
  - Standardized process for weekly updates of new peer-reviewed or in-press articles that may change our current understanding of the evidence
- Monthly updates to published list of underlying medical conditions and associated evidence

Evidence Informed Process

- Two-tiered system based on level of evidence
    - **ARE** associated with risk of severe illness from COVID-19 → informed by STRONG evidence
    - **MIGHT BE** associated with risk of severe illness from COVID-19 → informed by MIXED or LIMITED evidence
- *Strongest evidence:* consistent evidence from multiple small studies or a strong association from a large study
- *Mixed evidence:* multiple studies that reached different conclusions
- *Limited evidence:* consistent evidence from a small number of studies

People with the following conditions ARE at increased risk for severe illness from COVID-19

- Cancer
- Chronic kidney disease
- Chronic obstructive pulmonary disease
- Immunocompromised state from solid organ transplant
- Obesity (Body Mass Index of 30 or greater)
- Serious heart conditions (heart failure, coronary artery disease or cardiomyopathies)
- Sickle cell disease
- Type 2 diabetes mellitus

People with the following conditions MIGHT BE at increased risk for severe illness from COVID-19

- Asthma (moderate-to-severe)
- Cerebrovascular disease
- Hypertension
- Immunocompromised state from blood or BMT, immune deficiencies, HIV, steroid use, or other immunomodulators
- Neurologic conditions
- Liver disease
- Pregnancy
- Pulmonary fibrosis
- Smoking
- Thalassemia
- Type 1 diabetes mellitus

https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/people-with-medical-conditions.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fneed-extra-precautions%2Fgroups-at-higher-risk.html

Nationally, 41% of U.S. adults have at least one underlying medical condition that puts them at higher risk for severe illness from COVID-19

- By county, the prevalence varies from almost **one in four** to as many as **two-thirds** of adults having at least one underlying medical condition.

- In half of U.S. counties almost **half** of adults are estimated to have an underlying medical condition.

Percent (%)

- 22.0 - 41.7
- 41.8 - 45.7
- 45.8 - 48.7
- 48.8 - 52.2
- 52.3 - 66.2

Classification: Quintiles
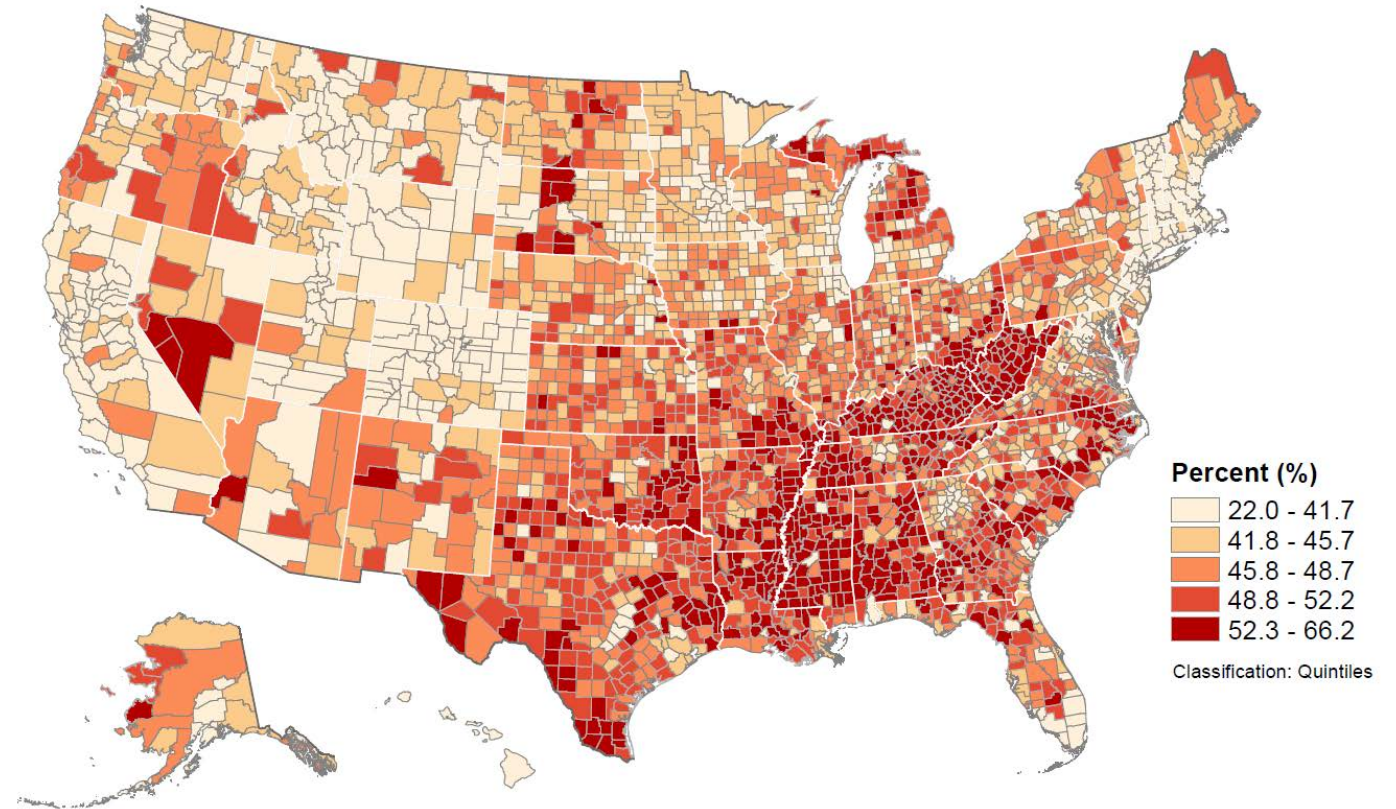
Figure. Model-based estimates of U.S. number of adults aged >=18 years with any selected underlying medical condition,* by county—United States, 2018. Modified from MMWR reference
*Selected underlying conditions include chronic obstructive pulmonary disease, emphysema, or chronic bronchitis; heart disease (angina or coronary heart disease, heart attack, or myocardial infarction); diabetes; chronic kidney disease; or obesity (body mass index >=30 km/m2)

Razzaghi *et al*, 2020: https://www.cdc.gov/mmwr/volumes/69/wr/mm6929a1.htm?s_cid=mm6929a1_w

Summary

Summary

- As of August 23, over 5.6 million cases of COVID-19 diagnosed and over 173,000 COVID-19-associated deaths reported in the United States

- Older adults aged 65 years or older have the highest risk of severe COVID-19 disease
  - Risk increases with increasing age
- Adults with underlying medical conditions are at increased risk for severe COVID-19
  - Obesity, diabetes, and cardiovascular disease are common conditions observed across data sources
  - Multi-morbidity increases risk of severe COVID-19 disease

- Surveillance/projects ongoing to continue to monitor COVID-19-associated hospitalizations and deaths and identify persons at higher risk for severe COVID-19 disease
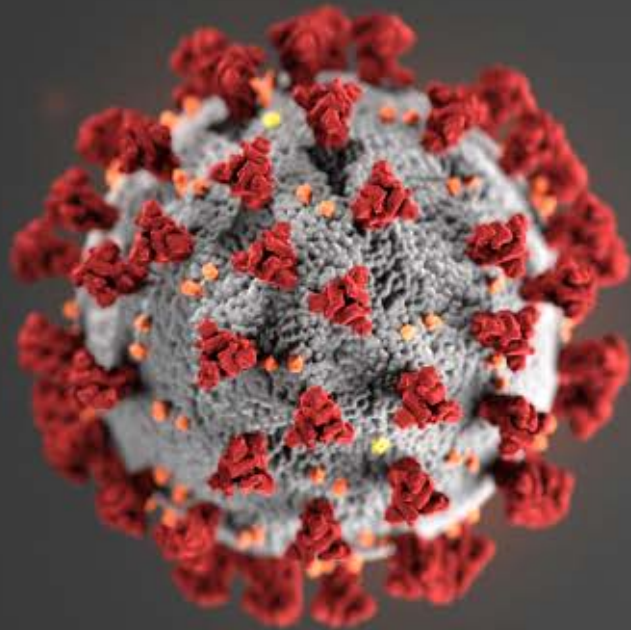
For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348   www.cdc.gov

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.

Coronavirus Disease 2019-Associated Hospitalization Surveillance (COVID-NET)

- All age population-based surveillance system of laboratory-confirmed COVID-19-associated hospitalizations

  - Positive SARS-CoV-2 test no more than 14 days before admission or during hospitalization

  - Be a resident of the pre-identified surveillance catchment area

  - Be admitted to a hospital where residents of the surveillance catchment area receive care

- Medical chart abstractions using a standard case report form

  - Patient demographics and underlying medical conditions

Behavioral Risk Factor Surveillance System (BRFSS) Overview

- Cross sectional survey that collects data on health-related risk behaviors, chronic health conditions, and use of preventative services among adults (≥ 18 years).

- BRFSS collects data annually in all 50 states, D.C., and three U.S. territories.

- More than 400,000 adult interviews each year.

- Standardized methodology for weighting data to be representative of population.

20,046 adults with laboratory-confirmed COVID-19-associated hospitalizations as of June 23, 2020 from 70 counties in 12 states* participating in COVID-NET

Excluded: 2,258 non-community dwelling adults and 12,073 adults with data yet to be abstracted†

Eligible adults
N= 5,715

299 excluded due to missing data on all the underlying medical conditions

Included in analysis
N=5,416
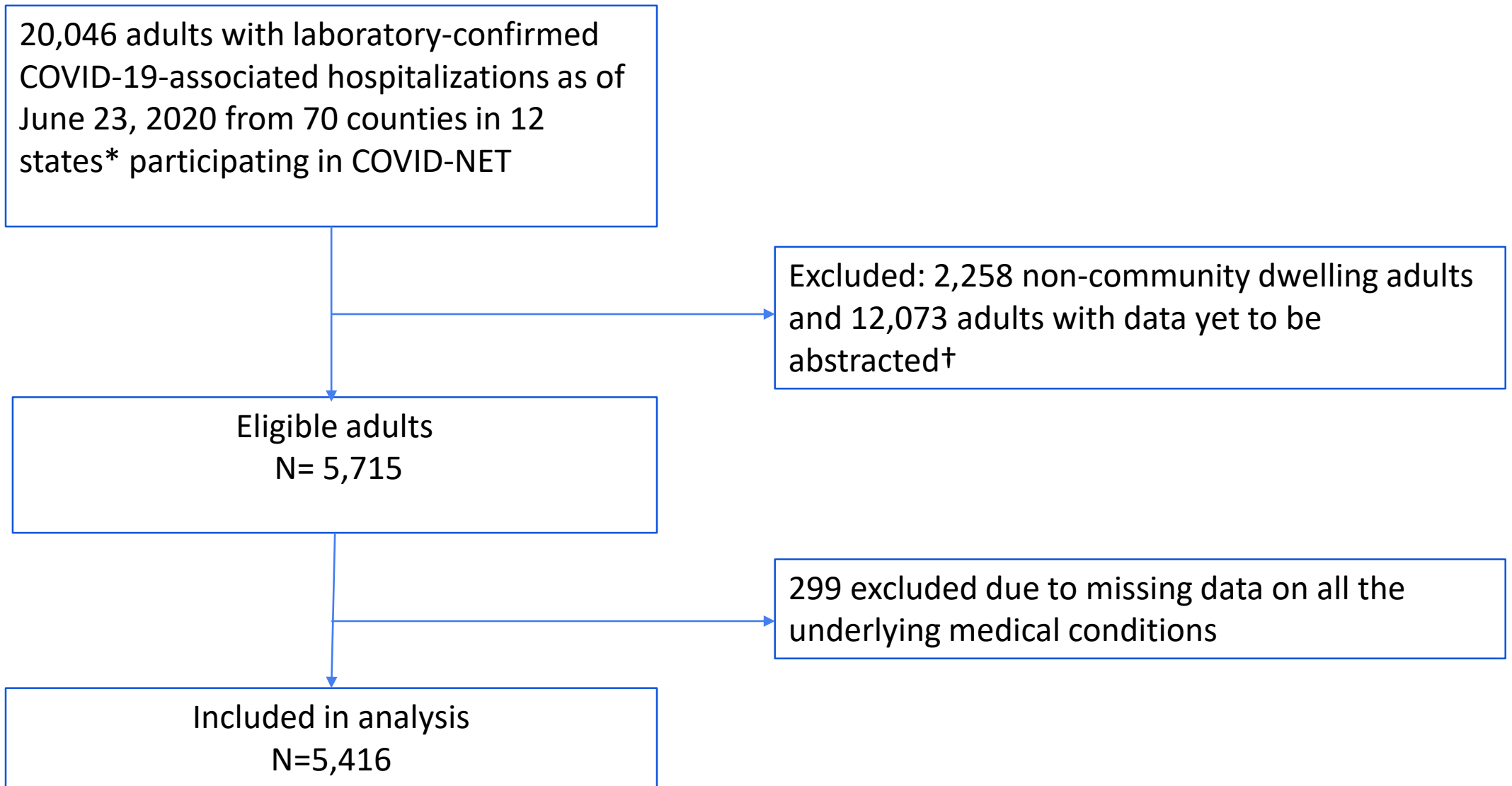
*California, Colorado, Connecticut, Georgia, Maryland, Michigan, Minnesota, New Mexico, New York, Oregon, Tennessee, and Utah.
†Additional data beyond the minimum required data elements may be subject to a time lag for submission to CDC.

Demographic Characteristics of Adults with COVID-19-Associated Hospitalizations in Analytic Sample (N=5,416)
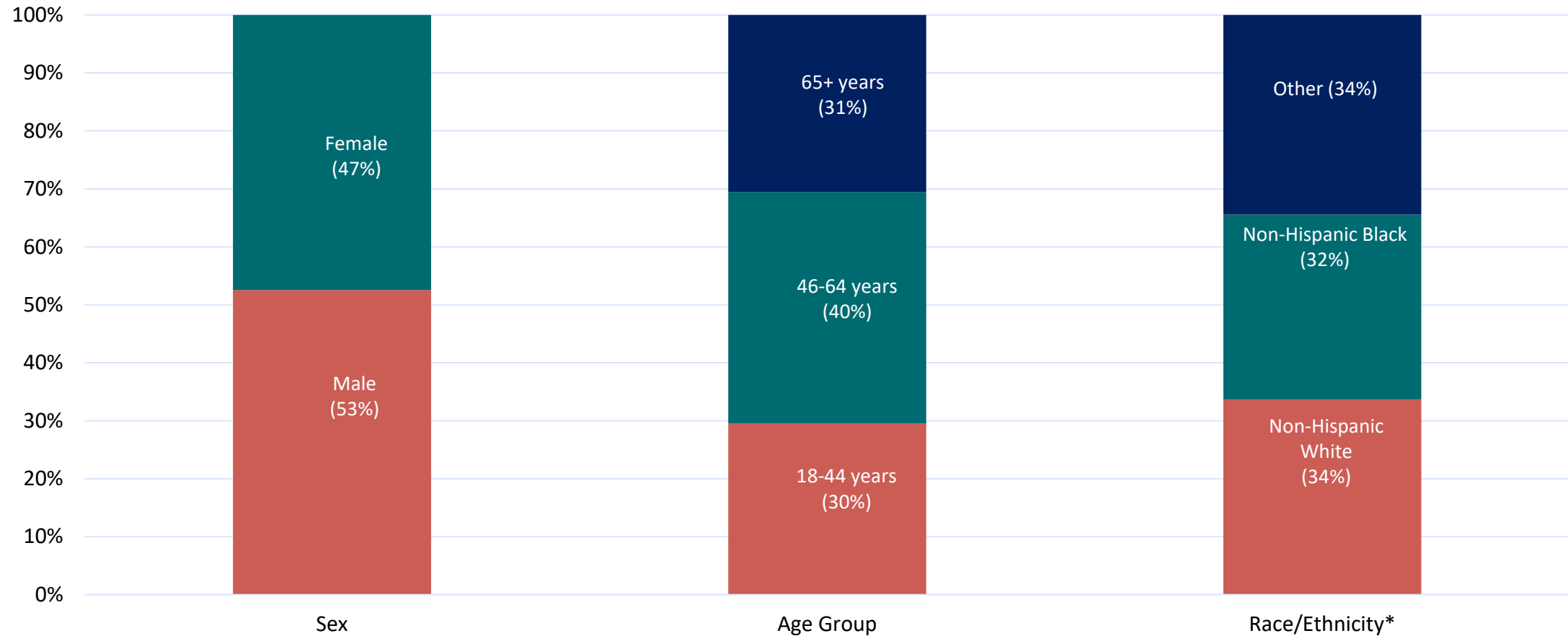
*197 hospitalizations missing race/ethnicity information

Defining Underlying Medical Conditions

Underlying medical condition	COVID-NET (medical chart abstraction)	BRFSS (self-report) Has a doctor, nurse, or other health professional ever told you that you had any of the following?
Hypertension	Hypertension	Yes to ever told you have high blood pressure and are currently taking medication for high blood pressure (2017 BRFSS)
Coronary Artery Disease	History of myocardial infarction, coronary artery disease, coronary artery bypass graphing	Yes to ever told you had a heart attack also called myocardial infarction? Or Yes to ever told you had angina or coronary heart disease?
Stroke	Stroke	Yes to ever told you had a stroke
Diabetes	Diabetes	Yes to ever told you have diabetes?
Obesity	BMI≥30kg/m^2; denominator is everyone in sample	Obesity defined as BMI≥30kg/m^2 based on self-reported height and weight.
Severe Obesity	BMI≥40kg/m^2; denominator is everyone in sample	Severe obesity defined as BMI≥40kg/m2 based on self-reported height and weight.
Chronic Kidney Disease	Chronic Kidney Disease	Yes to ever told kidney disease
Asthma	Asthma	Yes to do you still have asthma
Chronic obstructive pulmonary disease (COPD)	COPD	Yes ever told you have COPD, emphysema, or chronic bronchitis
Number of conditions	Sum of any of the above underlying medical condition except for hypertension; categorized (0,1,2,3+)	Sum of any of the above underlying medical condition except for hypertension (because hypertension not available in 2018 BRFSS data); categorized (0,1,2,3+)

BRFSS = Behavioral Risk Factor Surveillance System; COVID-NET: Coronavirus Disease 2019-Associated Hospitalization Surveillance

Adjusted Rate Ratios (aRR) and 95% Confidence Intervals for Race/Ethnicity and COVID-19-Associated Hospitalizations by Underlying Medical Condition*

	Hypertension	Coronary Artery Disease	History of Stroke	Diabetes	Obesity	Severe Obesity	Chronic Kidney Disease	Asthma	COPD
Non-Hispanic black vs. non-Hispanic white	4.0 (3.3, 4.8)	4.7 (3.8, 5.8)	4.7 (3.9, 5.7)	4.0 (3.1, 5.2)	4.4 (3.4, 5.7)	4.7 (3.8, 5.9)	4.5 (3.7, 5.6)	4.7 (3.9, 5.6)	4.7 (3.8, 5.9)
Other race/ethnicity vs. non-Hispanic white	3.5 (2.9, 4.2)	3.3 (2.7, 4.0)	3.3 (2.7, 4.0)	3.0 (2.3, 3.9)	3.5 (2.8, 4.5)	3.5 (2.8, 4.3)	3.3 (2.7, 4.1)	3.2 (2.7, 4.0)	3.3 (2.7, 4.1)

COPD: Chronic obstructive pulmonary disease
*Each underlying medical condition is modeled separately; models include the specific underlying medical condition of interest, age, sex, and race/ethnicity categories

Adjusted Rate Ratios (aRR) and 95% Confidence Intervals for Sex and COVID-19-Associated Hospitalizations by Underlying Medical Condition*

|	Hypertension	Coronary Artery Disease	History of Stroke	Diabetes	Obesity	Severe Obesity	Chronic Kidney Disease	Asthma	COPD
Male vs. females	1.2 (1.1, 1.4)	1.2 (1.03, 1.4)	1.2 (1.1, 1.4)	1.2 (0.98, 1.5)	1.4 (1.1, 1.7)	1.4 (1.1, 1.7)	1.2 (1.02, 1.4)	1.2 (1.1, 1.5)	1.2 (1.03, 1.5)

COPD: Chronic obstructive pulmonary disease
*Each underlying medical condition is modeled separately; models include the specific underlying medical condition of interest, age, sex, and race/ethnicity categories

Laboratory-Confirmed COVID-19-Associated Hospitalizations

Preliminary weekly rates as of Aug 15, 2020

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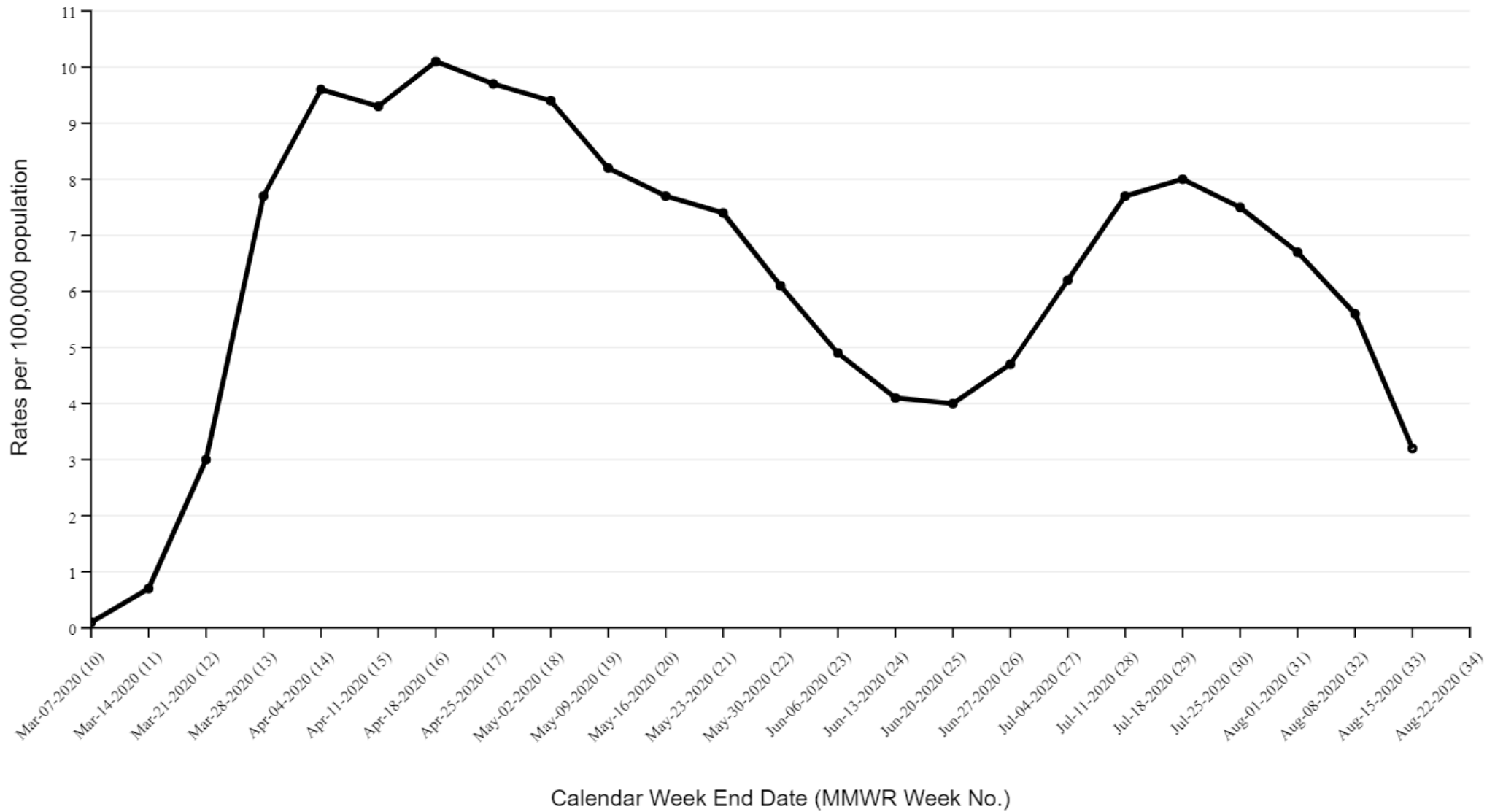
Selected underlying medical conditions contributing to deaths involving COVID-19 from U.S. death certificate data (n=153,504)
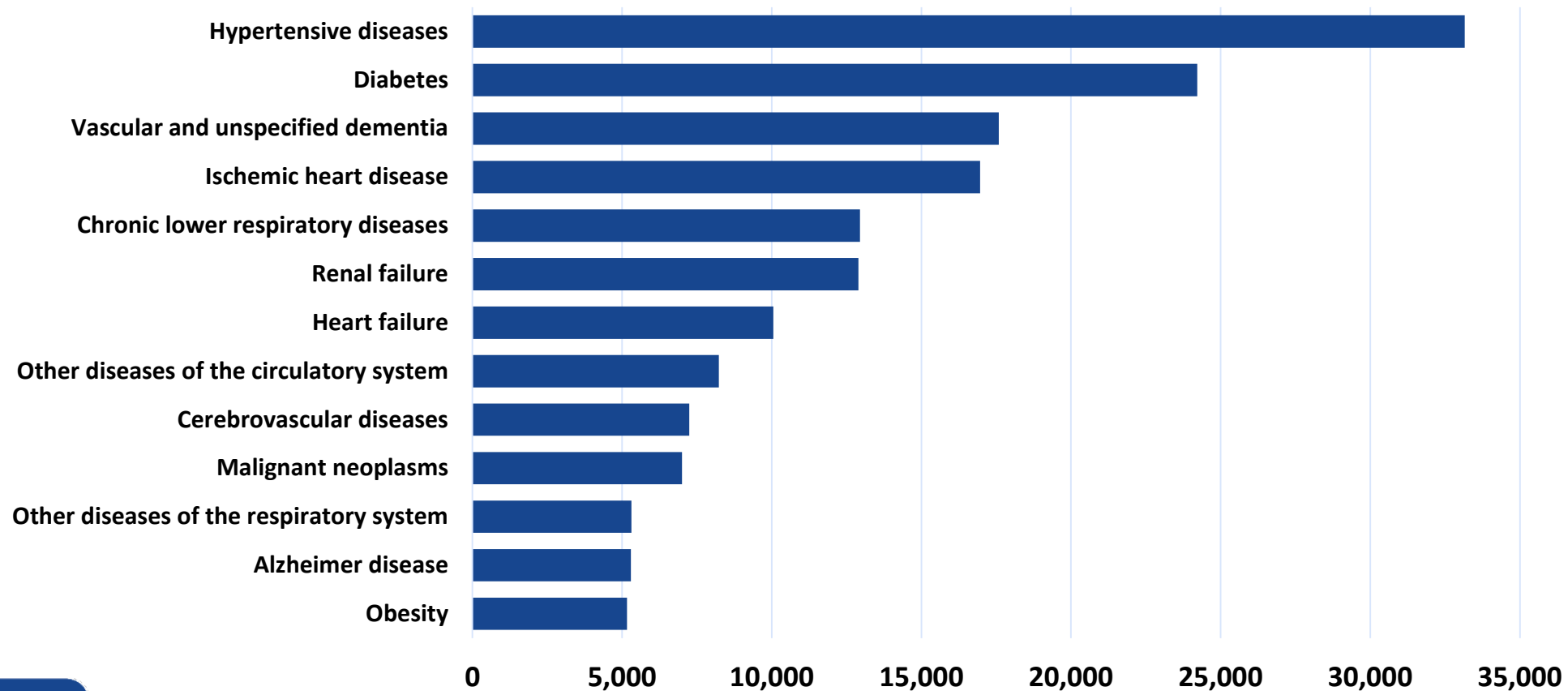
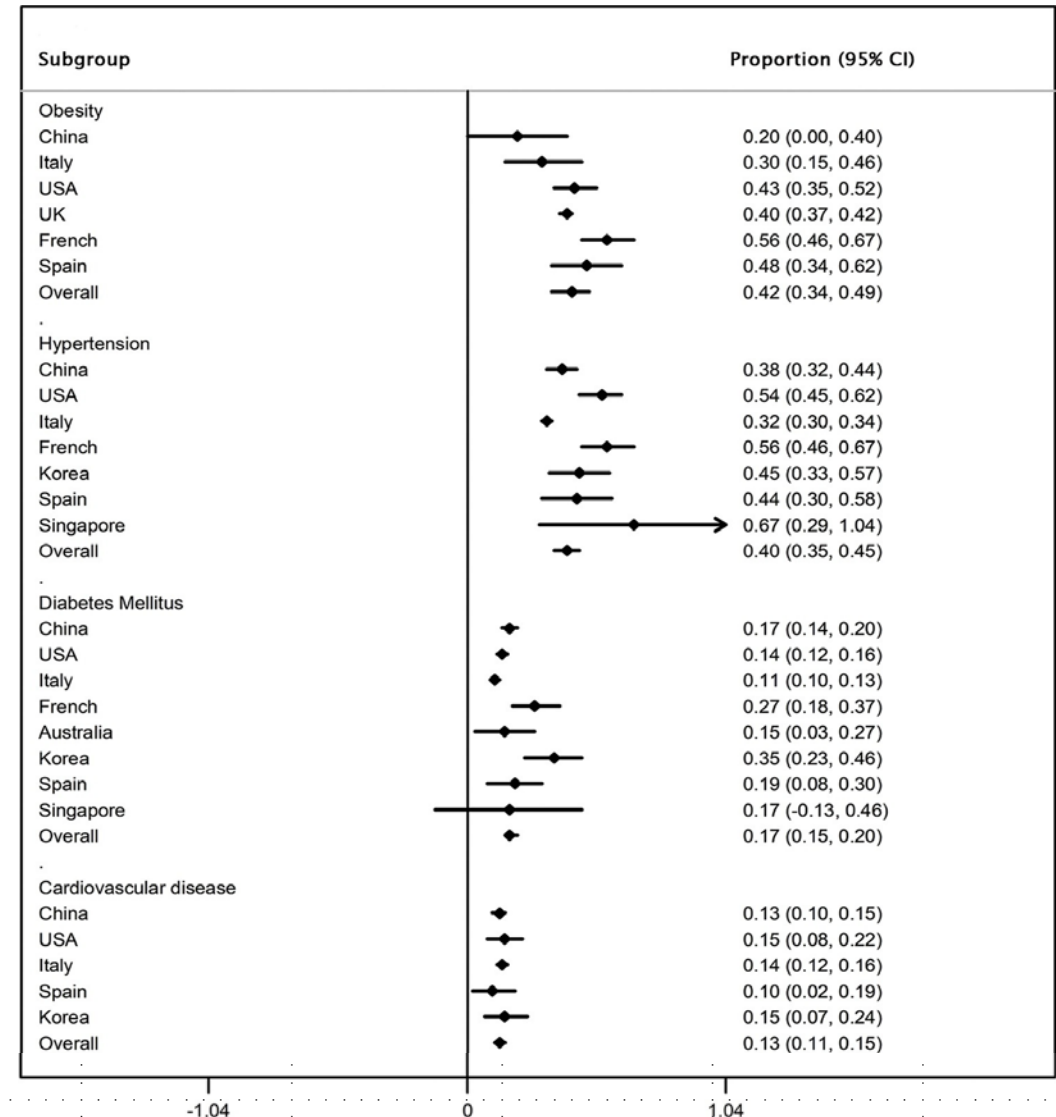Recent global meta-analysis of underlying medical conditions and severe COVID-19 disease showed similar results to U.S. studies.

Most prevalent conditions, unadjusted for age:

- **Obesity**

- **Hypertension**

- **Diabetes**

- **Cardiovascular Disease**

Fig. Most prevalent underlying medical conditions

Modified from Zhou *et al*, July 2020: https://www.sciencedirect.com/science/article/pii/S1201971220305725

COVID-19 ASSOCIATED HOSPITALIZATION RELATED TO UNDERLYING MEDICAL CONDITIONS

FACTORS THAT INCREASE COMMUNITY SPREAD AND INDIVIDUAL RISK

CROWDED SITUATIONS

CLOSE / PHYSICAL CONTACT

ENCLOSED SPACE

DURATION OF EXPOSURE

RISK FOR HOSPITALIZATION IF YOU HAVE ANY OF THESE CONDITIONS AND GET COVID-19 COMPARED TO PEOPLE WITHOUT THE CONDITION(S).

Asthma 1.5x

Hypertension 3x

Obesity (BMI ≥ 30) 3x

Diabetes 3x

Chronic Kidney Disease 4x

Severe Obesity (BMI ≥ 40) 4.5x

2 Conditions* 4.5x

3 or More Conditions* 5x

Data has shown that racial and ethnic minority groups with the referenced conditions are at even higher risk for severe COVID-19 illness. 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).

*Conditions include asthma, obesity, diabetes, chronic kidney disease, severe obesity, coronary artery disease, history of stroke and COPD.

ACTIONS TO REDUCE RISK OF COVID-19

WEARING A MASK

SOCIAL DISTANCING (6 FT GOAL)

HAND HYGIENE

CLEANING AND DISINFECTION

ALTHOUGH RISK GENERALLY INCREASES WITH AGE, ALL INDIVIDUALS SHOULD ROUTINELY TAKE ACTIONS TO REDUCE RISK OF INFECTION AND AVOID ACTIVITIES THAT INCREASE COMMUNTY SPREAD.
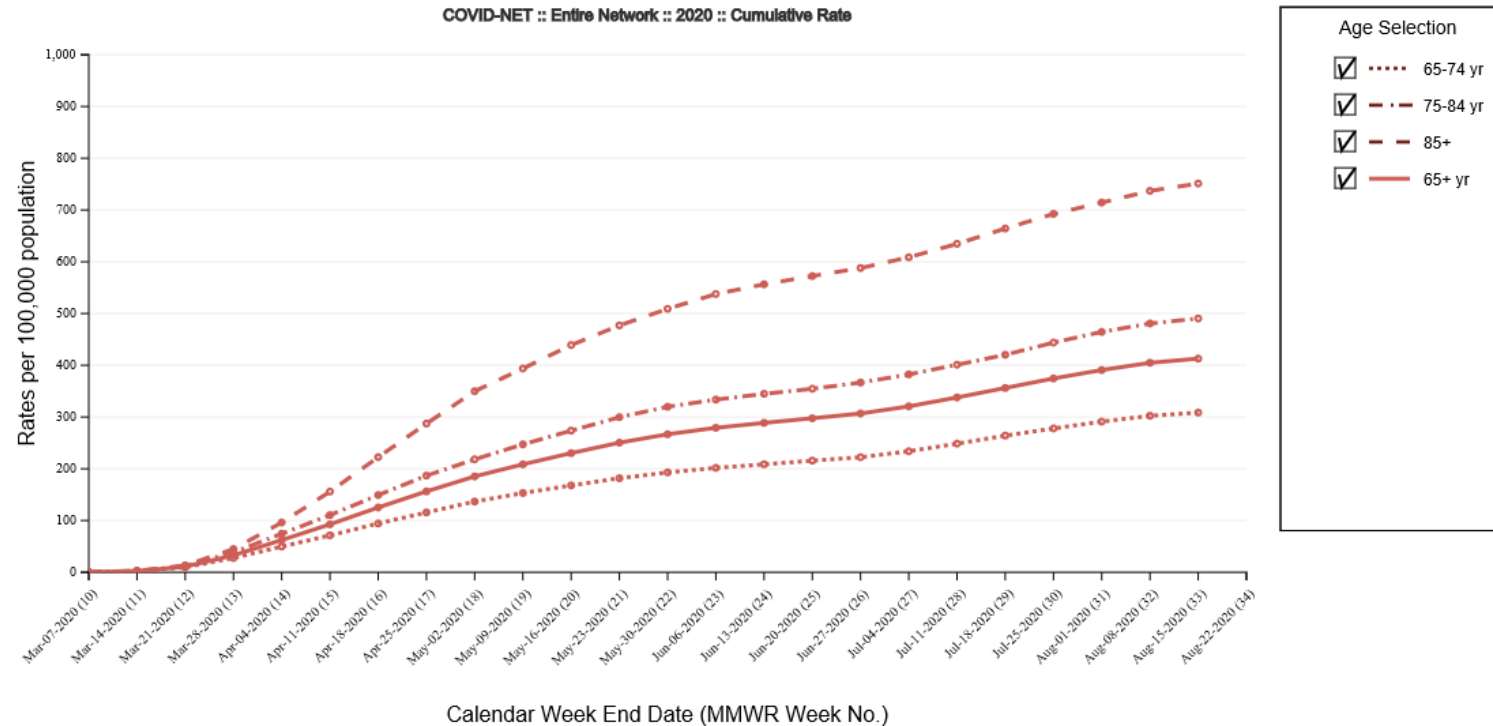
cdc.gov/coronavirus

Source: Ko JY, Danielson ML, Town M et al. 2020.

CS319360-A 08/08/2020

Laboratory-Confirmed COVID-19-Associated Hospitalizations

Preliminary cumulative rates as of Aug 15, 2020

COVID-NET :: Entire Network :: 2020 :: Cumulative Rate

Age Selection
- ☑ ······ 65-74 yr
- ☑ —·— 75-84 yr
- ☑ — — 85+
- ☑ —— 65+ yr

Calendar Week End Date (MMWR Week No.)

The Coronavirus Disease 2019 (COVID-19)-Associated Hospitalization Surveillance Network (COVID-NET) conducts population-based surveillance for laboratory-confirmed COVID-19-associated hospitalizations in children (persons younger than 18 years) and adults. The current network covers nearly 100 counties in the 10 Emerging Infections Program (EIP) states (CA, CO, CT, GA, MD, MN, NM, NY, OR, and TN) and four additional states through the Influenza Hospitalization Surveillance Project (IA, MI, OH, and UT). The network represents approximately 10% of US population (~32 million people). Cases are identified by reviewing hospital, laboratory, and admission databases and infection control logs for patients hospitalized with a documented positive SARS-CoV-2 test. Data gathered are used to estimate age-specific hospitalization rates on a weekly basis and describe characteristics of persons hospitalized with COVID-19. Laboratory confirmation is dependent on clinician-ordered SARS-CoV-2 testing. Therefore, the unadjusted rates provided are likely to be underestimated as COVID-19-associated hospitalizations can be missed due to test availability and provider or facility testing practices. COVID-NET hospitalization data are preliminary and subject to change as more data become available. In particular, case counts and rates for recent hospital admissions are subject to lag. As data are received each week, prior case counts and rates are updated accordingly. All incidence rates are unadjusted. Please use the following citation when referencing these data: "COVID-NET: COVID-19-Associated Hospitalization Surveillance Network, Centers for Disease Control and Prevention. WEBSITE. Accessed on DATE".

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