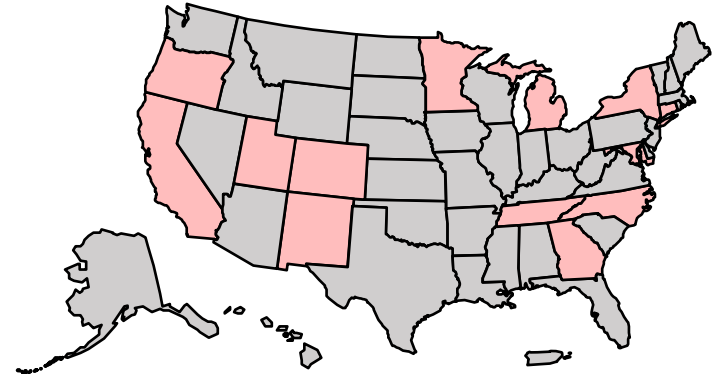# Updates to COVID-19 epidemiology

Advisory Committee on Immunization Practices

September 19, 2025

COVID-NET monitors COVID-19 hospitalizations across parts of the U.S.

- **RESP-NET includes COVID-NET, RSV-NET, FluSurv-NET**

- **Collaboration between state and local health departments and CDC**

- **Includes data from >300 hospitals in 185 counties across 13 states, covering about 10% of the U.S. population**

Types of COVID-NET data

1. **Population-based rates of COVID-19–associated hospitalizations**
   - Counts every laboratory-confirmed COVID-19–associated hospitalization among people living in COVID-NET counties
   - Includes all hospitalizations that meet the COVID-NET case definition:
     - Laboratory-confirmed SARS-CoV-2-positive test result
     - Resident of COVID-NET catchment area
   - Collects some data (age, sex, race/ethnicity, site, test/admission dates) for all cases

2. **Clinical data (including outcomes, underlying medical conditions, treatment, discharge diagnoses)**
   - Obtained via detailed medical chart reviews from anonymous, random sample of hospitalizations (since reviewing every case is not possible)
     - Monthly random sample from each of six age groups at each site designed to represent the broader population
   - Clinical analyses limited to hospitalizations due to COVID-19

Purpose of COVID-NET data

1. Population-based rates of COVID-19–associated hospitalizations

⬇

- **Monitor laboratory-confirmed COVID-19-associated hospitalizations among children and adults**
- **Provide decision-makers and public with broad and timely (weekly) understanding of general trends**
  - Rates published weekly on public dashboard since 2020
- **Estimate and compare disease burden over time**
- **Respond to rising rates**

2. Clinical data (including outcomes, underlying medical conditions, treatment, discharge diagnoses)

⬇

- **Categorize hospitalizations that are due to COVID-19**
- **Better understand hospitalization trends and who is most at risk**
- **Track severity of illness**
- **Examine how many people hospitalized due to COVID-19 have underlying medical conditions**
- **Provide insight into treatments used**

Defining Hospitalizations in COVID-NET

1. Definition of COVID-NET hospitalizations for population-based rates

How does COVID-NET define a COVID-19—associated hospitalization?

- **A hospitalization (case) is counted if:**
  - The person lives in a defined COVID-NET surveillance catchment area AND
  - Tests positive for SARS-CoV-2 (using a laboratory-based molecular, antigen or serology test) within 14 days before or during hospitalization

1. Definition of COVID-NET hospitalizations for population-based rates (cont'd)

Why use this definition?

- Designed to monitor overall trends in hospitalizations
  - Simple approach works across hundreds of hospitals
  - Available in near real-time
  - Same definition used to monitor hospitalizations for other pathogens (RSV, influenza) in the U.S. and worldwide
- Developed by infectious disease experts
- Balances accuracy, speed, and broad coverage

This approach is used internationally* to conduct COVID-19 hospitalization surveillance, including in Australia, Canada, Denmark, France, Germany, India, Ireland, Italy, Netherlands, New Zealand, South Africa, Spain, Sweden, the United Kingdom, and the European Union.

*Australia: PAEDS, Denmark; SSI national registers, France: SI-VIC, Germany: SurvNet, India: NCRC, Ireland: HPSC, Italy: Sorveglianza Integrata COVID-19, Netherlands: NICE/RIVM, South Africa: DATCOV, Spain: RENAVE, Sweden: FoHM national reporting, the United Kingdom: NHS COVID-19 Hospital Activity data, and the European Union: ERVISS.

2. Definition of hospitalizations due to COVID-19 used for clinical analyses

How does COVID-NET define hospitalizations "due to COVID-19"?
- "With" vs. "for" (due to) debate related to COVID-19 hospitalizations
- Early in the pandemic, hospitals screened every patient when they arrived at the hospital
- This captured hospitalizations among patients who tested positive for SARS-CoV-2 admitted for other reasons (e.g., surgery, labor and delivery)
- To address this, COVID-NET developed an algorithm to identify cases for which COVID-19 was the likely primary reason for admission, hereafter referred to as "hospitalizations due to COVID-19"
  - Algorithm uses chief complaint and history of present illness
  - Data for all current and previous surveillance periods back to March 2020 are posted monthly on public dashboard
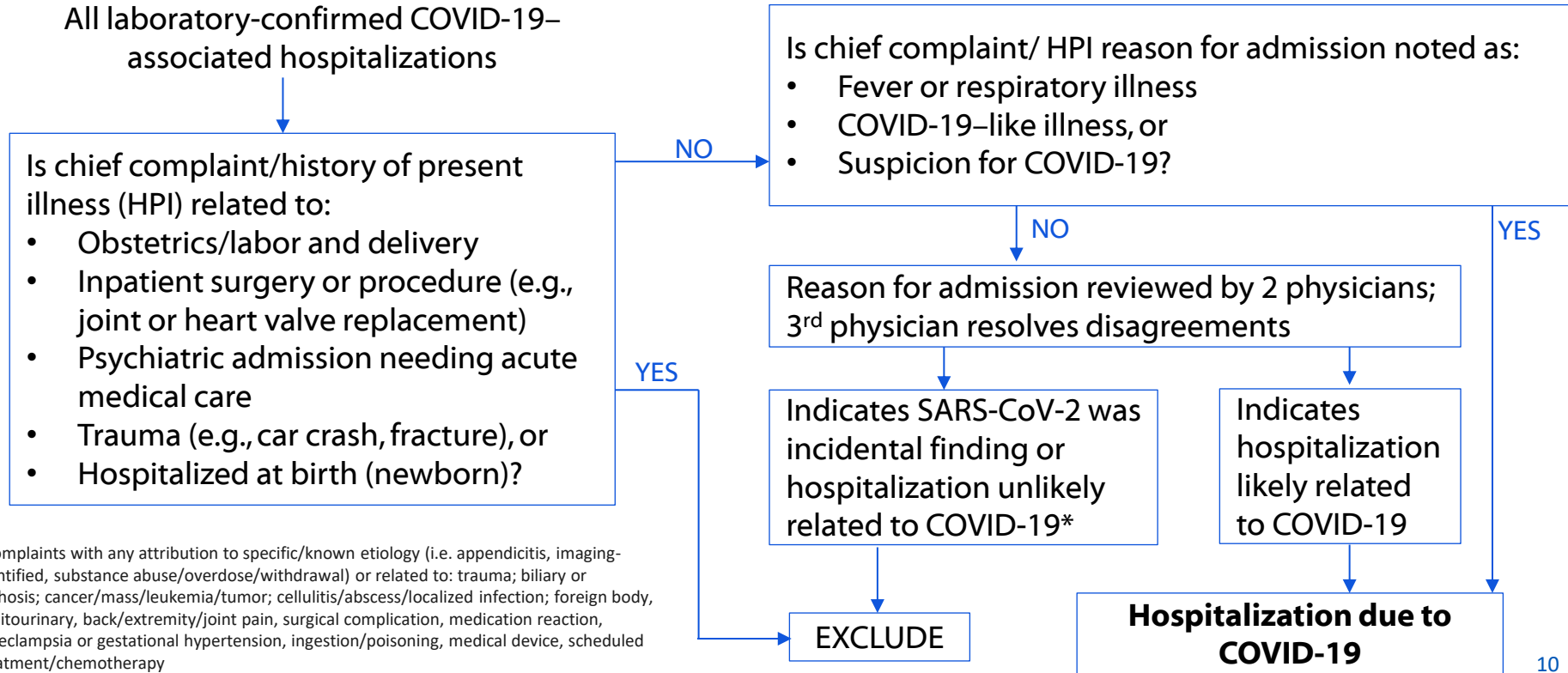
Why classifying hospitalizations as "with" or "due to" COVID-19 is not simple

- **It can be difficult to identify a single cause for hospitalization**

- A positive SARS-CoV-2 test can influence the decision to admit someone with medical conditions/comorbidities

- Additionally, presence of medical conditions/comorbidities can influence the decision to admit someone who tests positive

- SARS-CoV-2 testing, treatment, discharge diagnosis codes, and other clinical data elements can all misclassify hospitalizations with respect to whether or not they are due to COVID-19

  - ICD-10-CM codes in the U.S. are designed for administrative and billing purposes, not surveillance, and may overcount or undercount

  - COVID-19 code may be used just to indicate positive SARS-CoV-2 test*
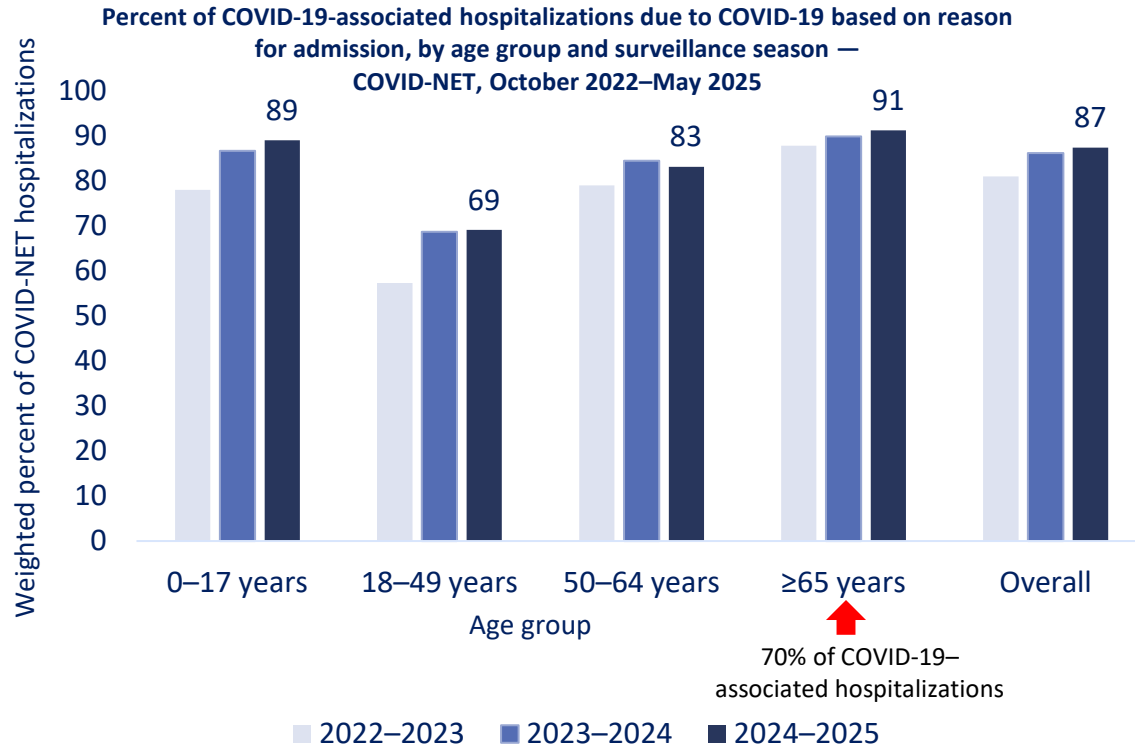
ICD-10-CM: *International Classification of Disease, Tenth Revision, Clinical Modification*
*ICD-10-CM Official Guidelines for Coding and Reporting FY 2025 -- UPDATED October 1, 2024 (October 1, 2024 - September 30, 2025): https://stacks.cdc.gov/view/cdc/158747. Inpatient guidance: *If the diagnosis documented at the time of discharge is qualified as "probable," "suspected," "likely," "questionable," "possible," "still to be ruled out," "compatible with," "consistent with," or other similar terms indicating uncertainty, code the condition as if it existed or was established.*

How COVID-NET defines hospitalizations due to COVID-19 using likely primary reason for admission

All laboratory-confirmed COVID-19– associated hospitalizations

Is chief complaint/history of present illness (HPI) related to:
- Obstetrics/labor and delivery
- Inpatient surgery or procedure (e.g., joint or heart valve replacement)
- Psychiatric admission needing acute medical care
- Trauma (e.g., car crash, fracture), or
- Hospitalized at birth (newborn)?

NO

Is chief complaint/ HPI reason for admission noted as:
- Fever or respiratory illness
- COVID-19–like illness, or
- Suspicion for COVID-19?

NO

Reason for admission reviewed by 2 physicians; 3rd physician resolves disagreements

Indicates SARS-CoV-2 was incidental finding or hospitalization unlikely related to COVID-19*

Indicates hospitalization likely related to COVID-19

YES

YES

EXCLUDE

Hospitalization due to COVID-19

*Complaints with any attribution to specific/known etiology (i.e. appendicitis, imaging-identified, substance abuse/overdose/withdrawal) or related to: trauma; biliary or cirrhosis; cancer/mass/leukemia/tumor; cellulitis/abscess/localized infection; foreign body, genitourinary, back/extremity/joint pain, surgical complication, medication reaction, preeclampsia or gestational hypertension, ingestion/poisoning, medical device, scheduled treatment/chemotherapy

87% of all recent hospitalizations among SARS-CoV-2-positive patients were due to COVID-19 based on reason for admission

Percent of COVID-19-associated hospitalizations due to COVID-19 based on reason for admission, by age group and surveillance season — COVID-NET, October 2022–May 2025

70% of COVID-19–associated hospitalizations

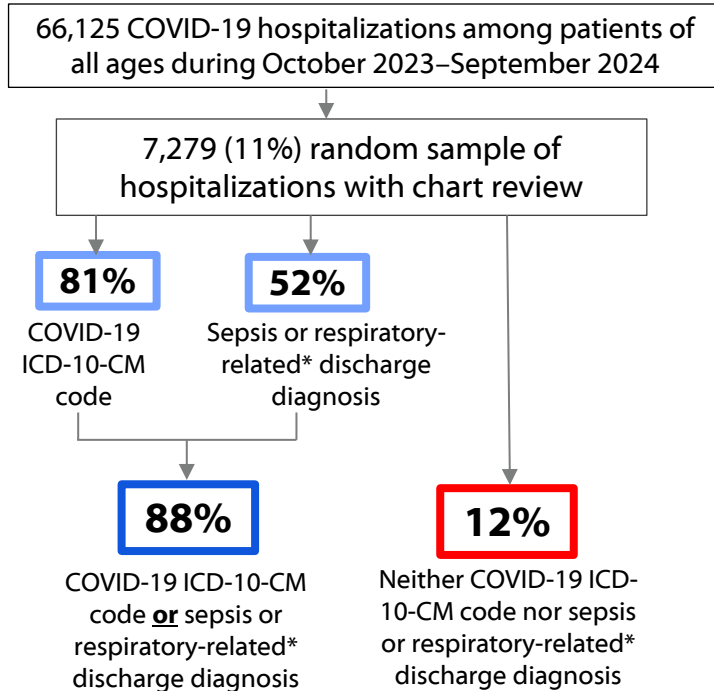Legend: 2022–2023, 2023–2024, 2024–2025

- Percent of COVID-19–associated hospitalizations due to COVID-19 have increased over time
  - No longer widespread screening of asymptomatic patients
- Percent of COVID-NET hospitalizations due to COVID-19 increases with age among adults
- Adults ages ≥65 years account for 70% of COVID-19–associated hospitalizations, of which 91% are considered due to COVID-19 based on reason for admission.
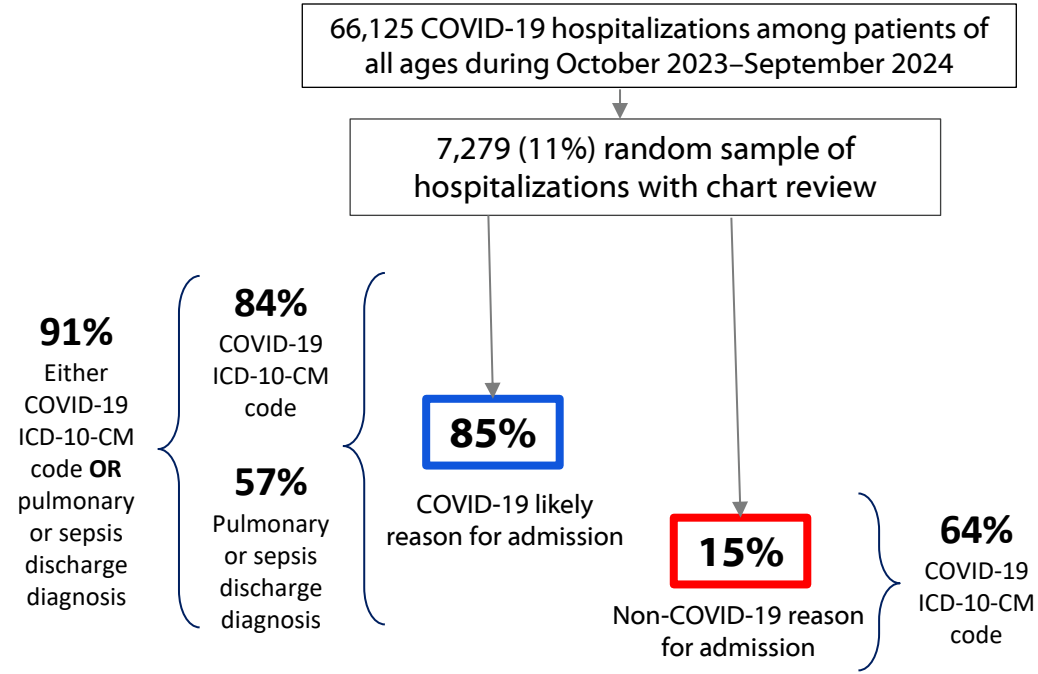
How COVID-NET goes beyond billing codes

- **Not all partner hospitals are able to provide final ICD-10-CM codes**
  - Coding may be delayed or limited
  - Coding may be stored only in inaccessible billing systems
- **COVID-NET surveillance officers also review the discharge summary for each patient**
  - Capture conditions that were not present at admission but developed during the hospital stay
  - Gives fuller picture of patient's hospitalization and reduces some of the bias that comes from relying only on billing codes

COVID-NET hospitalizations classified as due to COVID-19 or with COVID-19 using two different approaches

ICD-10 codes and discharge diagnoses approach

66,125 COVID-19 hospitalizations among patients of all ages during October 2023–September 2024

7,279 (11%) random sample of hospitalizations with chart review

81%
COVID-19 ICD-10-CM code

52%
Sepsis or respiratory-related* discharge diagnosis

88%
COVID-19 ICD-10-CM code **or** sepsis or respiratory-related* discharge diagnosis

12%
Neither COVID-19 ICD-10-CM code nor sepsis or respiratory-related* discharge diagnosis

COVID-NET reason for admission approach

66,125 COVID-19 hospitalizations among patients of all ages during October 2023–September 2024

7,279 (11%) random sample of hospitalizations with chart review

91%
Either COVID-19 ICD-10-CM code **OR** pulmonary or sepsis discharge diagnosis

84%
COVID-19 ICD-10-CM code

57%
Pulmonary or sepsis discharge diagnosis

85%
COVID-19 likely reason for admission

15%
Non-COVID-19 reason for admission

64%
COVID-19 ICD-10-CM code

*Respiratory-related defined as acute respiratory distress syndrome (ARDS), acute respiratory failure, asthma exacerbation, bronchiolitis, bronchitis, chronic obstructive pulmonary disorder (COPD) exacerbation, or pneumonia as indicated by the abstracted condition from discharge summary or the presence of an ICD-10-CM discharge diagnosis code.
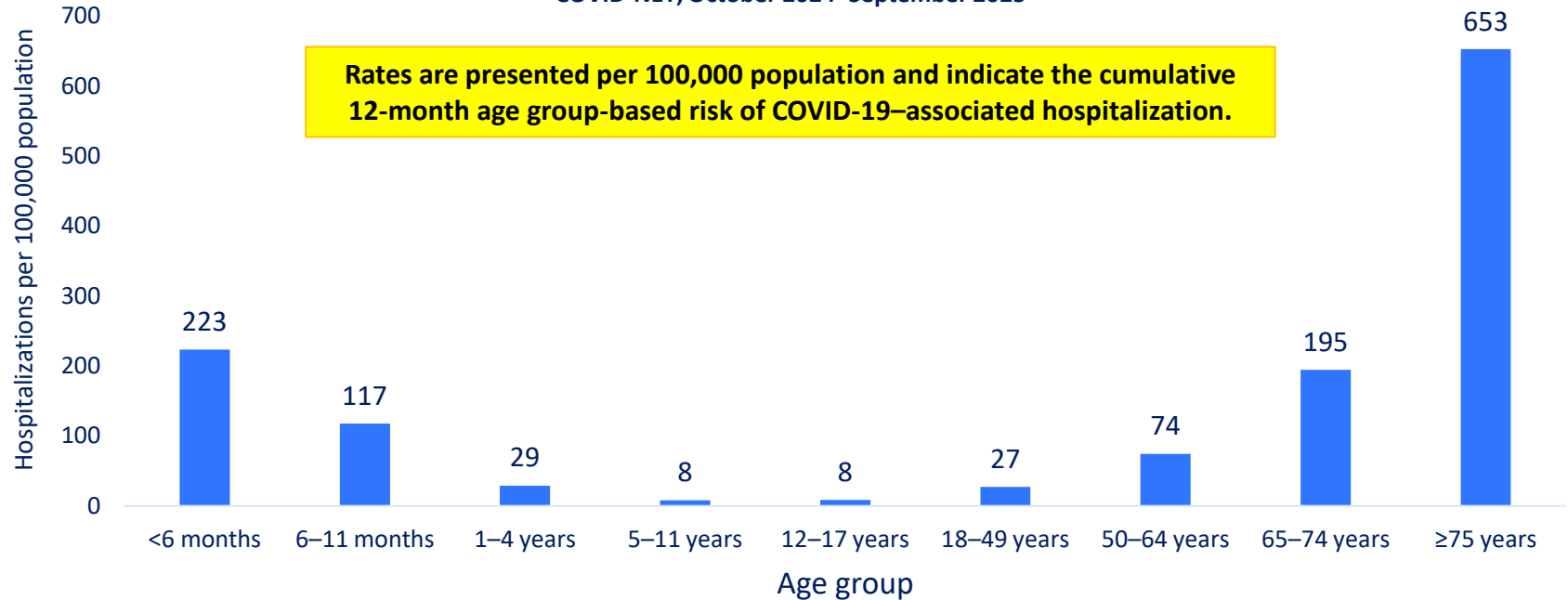
Key Takeaways

- **Two approaches for defining hospitalizations due to COVID-19**
  - COVID-19 identified as reason for admission
  - COVID-19-related discharge diagnoses

- **Similar proportions of patients classified using both methods:**
  - 88% had COVID-19 ICD-10-CM code or sepsis or respiratory diagnosis
  - 85% identified by COVID-NET as COVID-19 being likely primary reason for admission
    - 91% of hospitalizations using COVID-NET's reason for admission approach had a COVID-19 ICD-10-CM code or sepsis or respiratory diagnosis

- **COVID-NET's reason for admission approach is more conservative than examining discharge diagnoses**

- **COVID-NET's methods for identifying hospitalizations due to COVID-19 balances timeliness, accuracy, and representativeness**

Population-based rates of COVID-19–associated hospitalizations

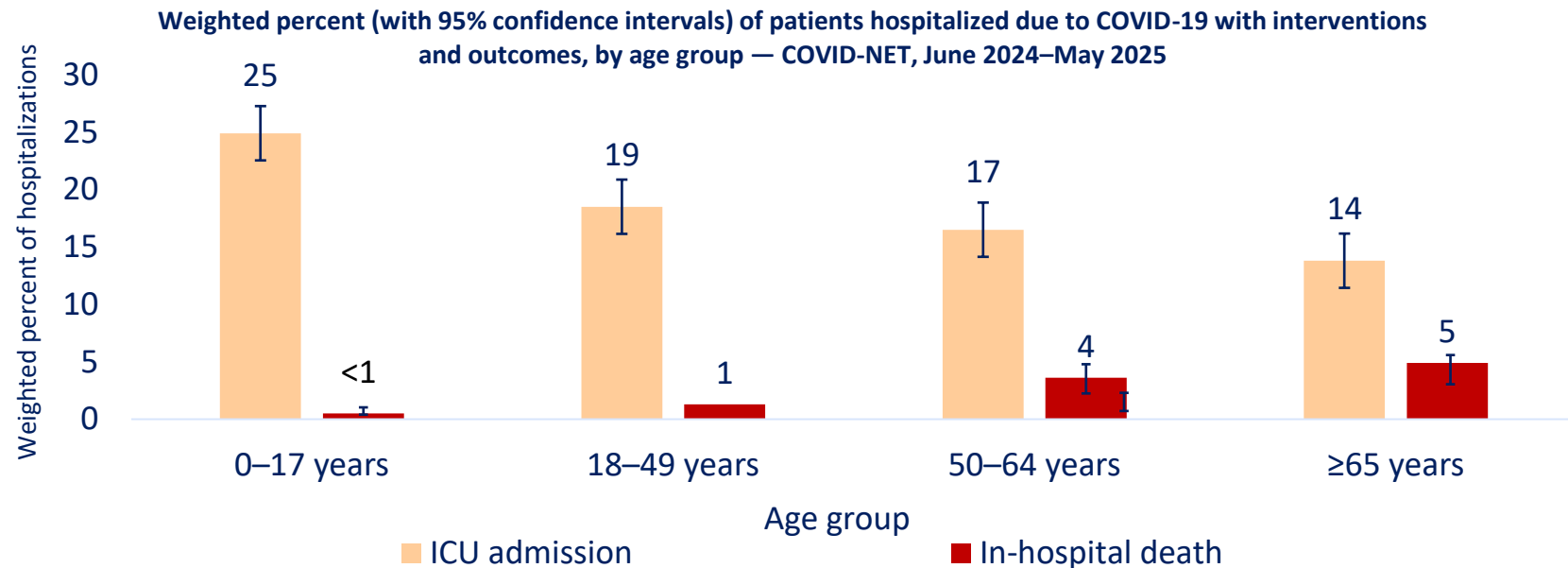# Rates of COVID-19–associated hospitalization are highest among the youngest and oldest age groups

Population-based COVID-19–associated hospitalization rates (per 100,000 population), by age group — COVID-NET, October 2024–September 2025

Rates are presented per 100,000 population and indicate the cumulative 12-month age group-based risk of COVID-19–associated hospitalization.

Hospitalizations per 100,000 population

Age group	Rate
<6 months	223
6–11 months	117
1–4 years	29
5–11 years	8
12–17 years	8
18–49 years	27
50–64 years	74
65–74 years	195
≥75 years	653

A COVID-19–associated hospitalization is defined as laboratory-confirmed SARS-CoV-2 in a person who (a) lives in a defined COVID-NET surveillance catchment area AND (b) tests positive for SARS-CoV-2 (using a laboratory-based molecular, antigen or serology test) within 14 days before or during hospitalization.

Among adults hospitalized due to COVID-19, 15% were admitted to the intensive care unit (ICU)

Weighted percent (with 95% confidence intervals) of patients hospitalized due to COVID-19 with interventions and outcomes, by age group — COVID-NET, June 2024–May 2025
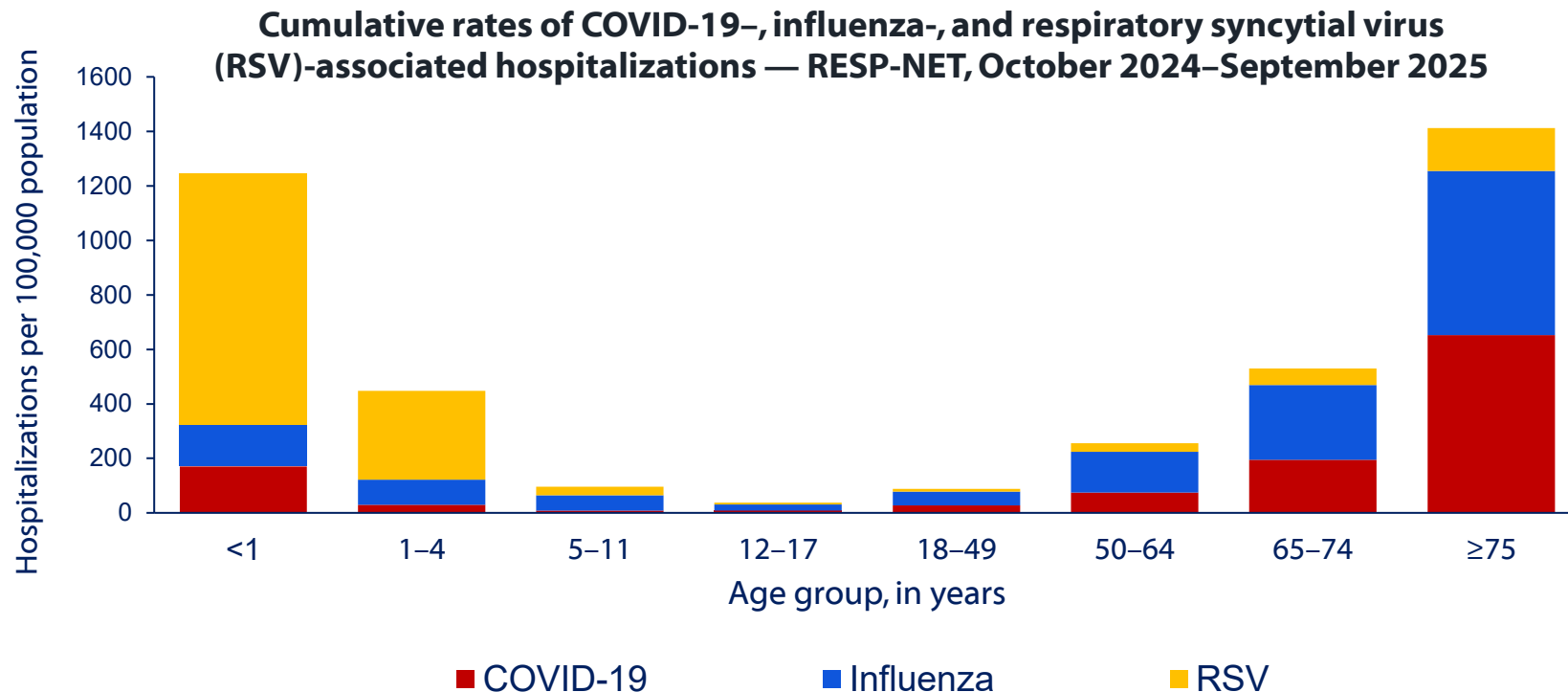

During this period, 84% of all adults hospitalized due to COVID-19 who died in-hospital were ages ≥50 years.

The figure displays the proportion of adults hospitalized due to COVID-19 based on reason for admission with interventions and outcomes, by age group — COVID-NET, June 2024–May 2025. Error bars denote 95% confidence intervals (95% CI). Data are limited to hospitalizations where COVID-19 is a likely primary reason for admission. Deaths do not include other COVID-19-related deaths that might occur after a patient is discharged to hospice or deaths that occur soon after hospital discharge that could be attributable to COVID-19-related illness.

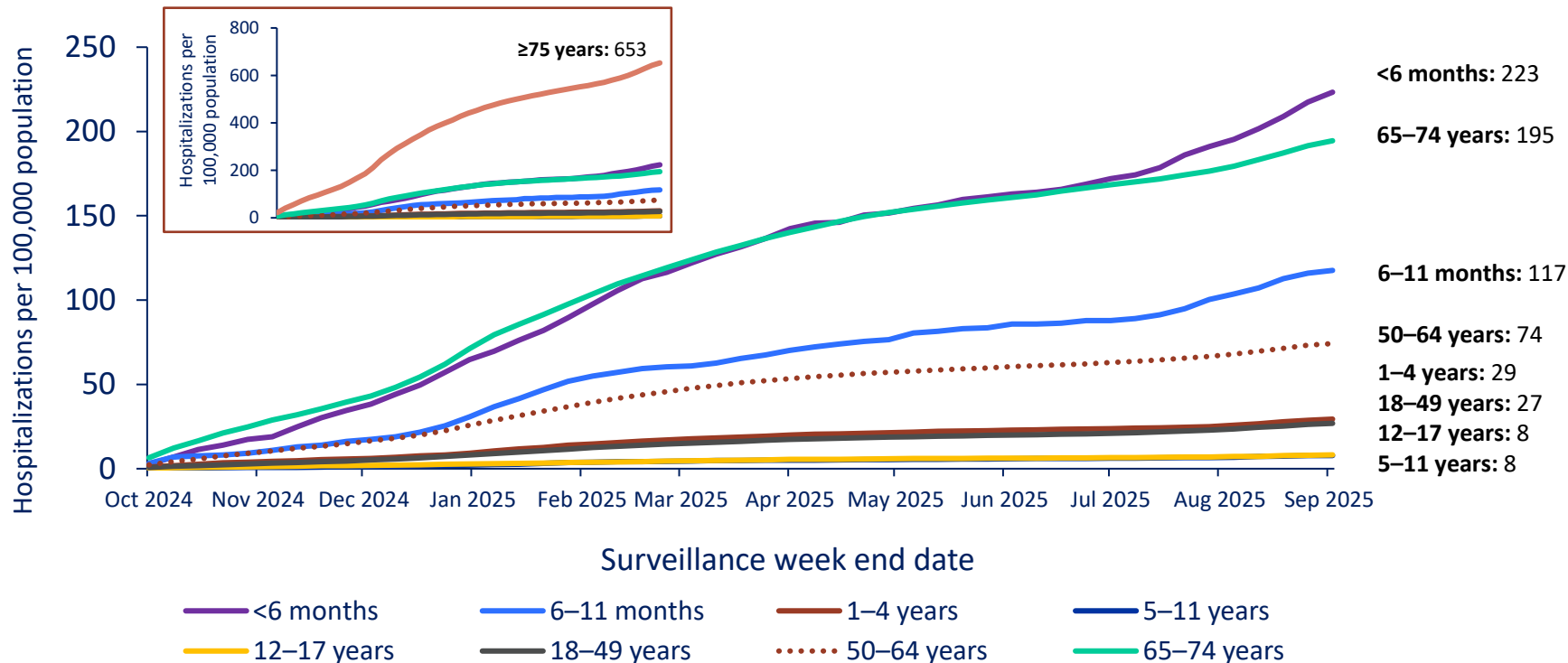# Burden of COVID-19-Associated Hospitalizations among Infants

Rates of respiratory virus-associated hospitalizations vary by age group and pathogen.

Cumulative rates of COVID-19–, influenza-, and respiratory syncytial virus (RSV)-associated hospitalizations — RESP-NET, October 2024–September 2025

Rates for all three pathogens (COVID-19, influenza, and respiratory syncytial virus [RSV]) are laboratory-confirmed. Data source: https://www.cdc.gov/resp-net/dashboard/
Note that rates are not adjusted for testing or limited to admissions where the respiratory infection is the reason for admission. Influenza surveillance was conducted October 2024–April 2025.

Cumulative COVID-19-associated hospitalization rates are highest among adults aged ≥75 years, followed by infants aged <6 months and adults ages 65–74 years.
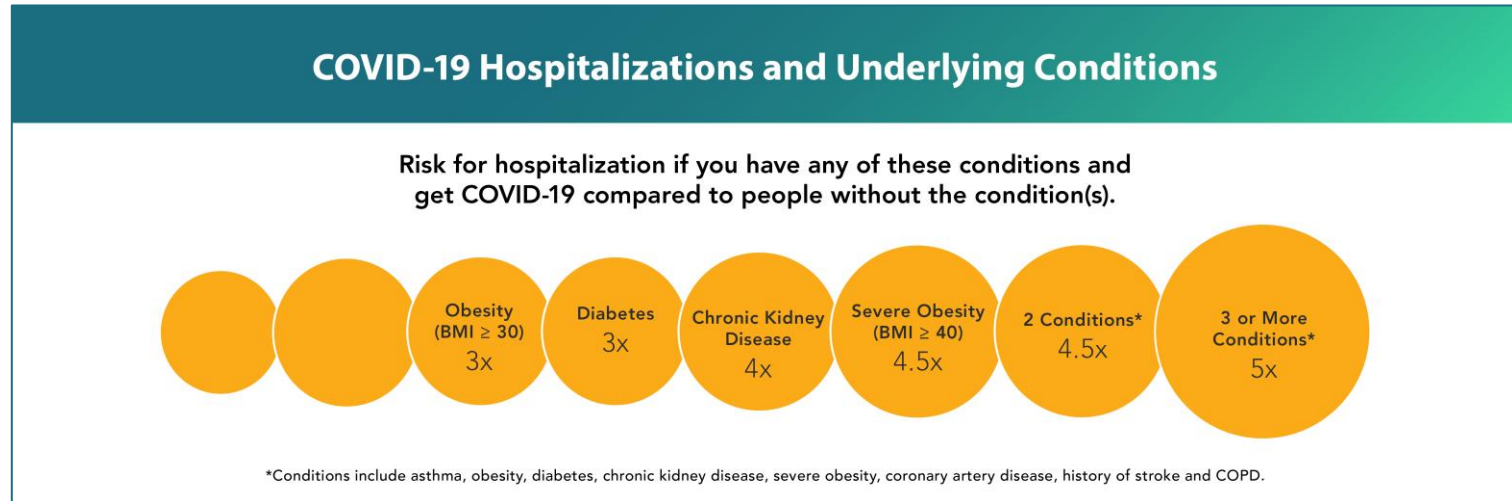

Weekly rates of COVID-19–associated hospitalizations per 100,000 population by age group—COVID-NET, October 2024–September 2025

Note that rates are not adjusted for testing. Rates are not limited to admissions where the respiratory infection is the likely primary reason for admission.

Relative risks of hospitalization due to COVID-19 among adults by chronic condition

Background

- **Update to peer-reviewed manuscript by Ko, et al. published in *Clinical Infectious Diseases* in 2021***

COVID-19 Hospitalizations and Underlying Conditions

Risk for hospitalization if you have any of these conditions and get COVID-19 compared to people without the condition(s).

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

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

Data Sources

- **COVID-NET (number of hospitalizations due to COVID-19)**
  - October 2022–September 2023
  - 98 counties across 13 states
- **Behavioral Risk Factor Surveillance System (BRFSS) (chronic conditions)**
  - Largest continuously conducted health survey system in the world (hundreds of thousands of interviews among community-dwelling U.S. adults each year)
  - 2022 survey
- **National Center for Health Statistics (population data)**
  - 2020 U.S. Census data
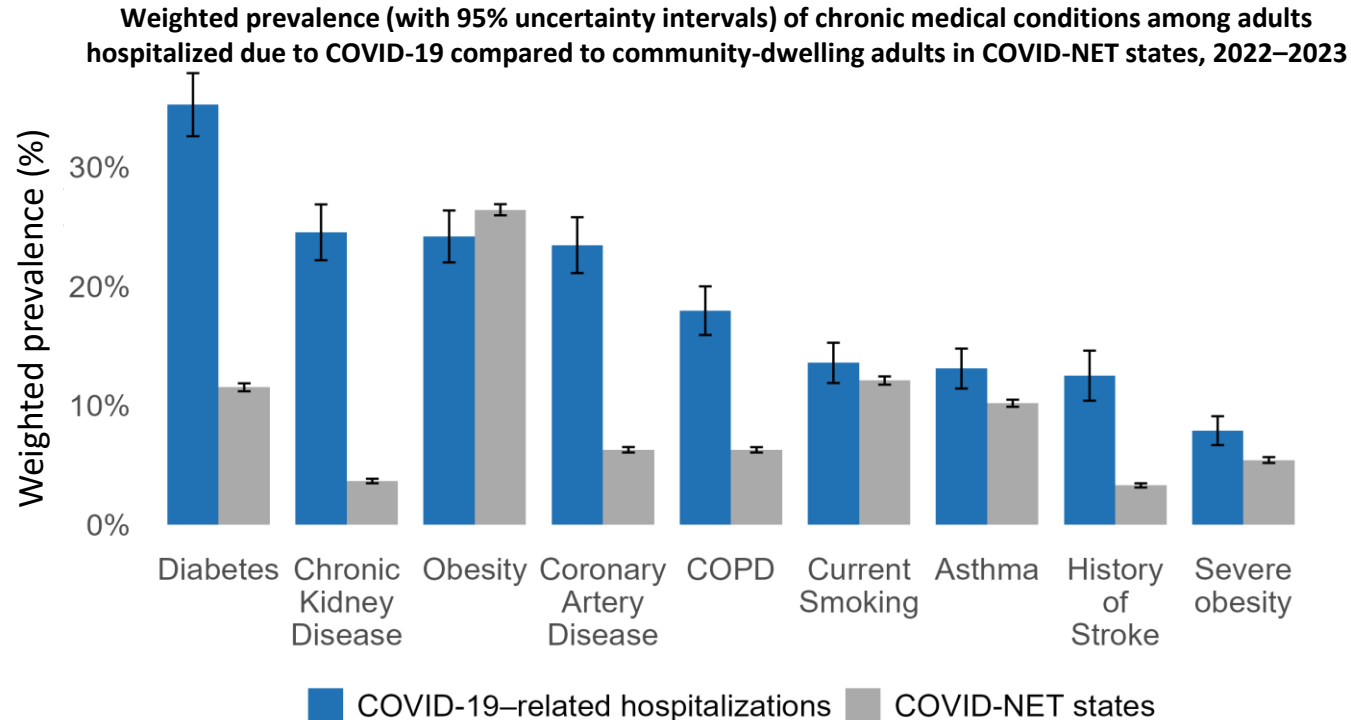
Overview of the Analysis

- **Obtain weighted counts of persons hospitalized due to COVID-19 with and without underlying conditions (COVID-NET)**
  - Limited to hospitalizations with COVID-19 as likely primary reason for admission
  - Limited to community-dwelling adults to match BRFSS parameters
- **Calculate weighted counts of community-dwelling adults with and without chronic diseases of interest in participating states (BRFSS)**
- **Generate proportion of state population residing in the COVID-NET county catchment area (Census)**
- **Calculate adjusted rate ratios of hospitalization rates with vs. without chronic conditions**
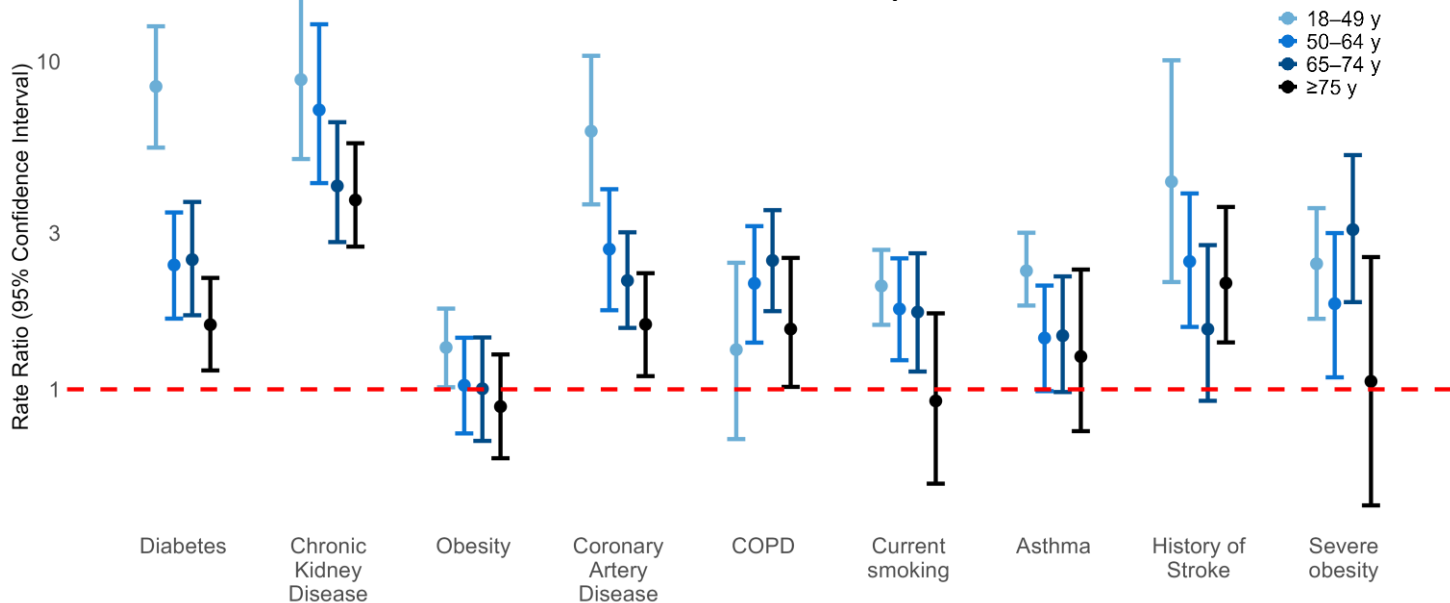
Chronic conditions examined

- **Coronary artery disease**
- **History of stroke**
- **Diabetes mellitus**
- **Chronic kidney disease**
- **Chronic obstructive pulmonary disease (COPD)**
- **Asthma**
- **Obesity (body mass index [BMI] 30–<40 kg/m²)**
- **Severe obesity (BMI ≥40 kg/m²)**
- **Current smoker**

The prevalence of most chronic conditions among adults hospitalized due to COVID-19 was generally higher than the prevalence observed in the general population.

Weighted prevalence (with 95% uncertainty intervals) of chronic medical conditions among adults hospitalized due to COVID-19 compared to community-dwelling adults in COVID-NET states, 2022–2023

Error bars denote 95% uncertainty intervals (95% CI). Obesity is defined as BMI 30–<40 kg/m². Severe obesity is BMI ≥40 kg/m².
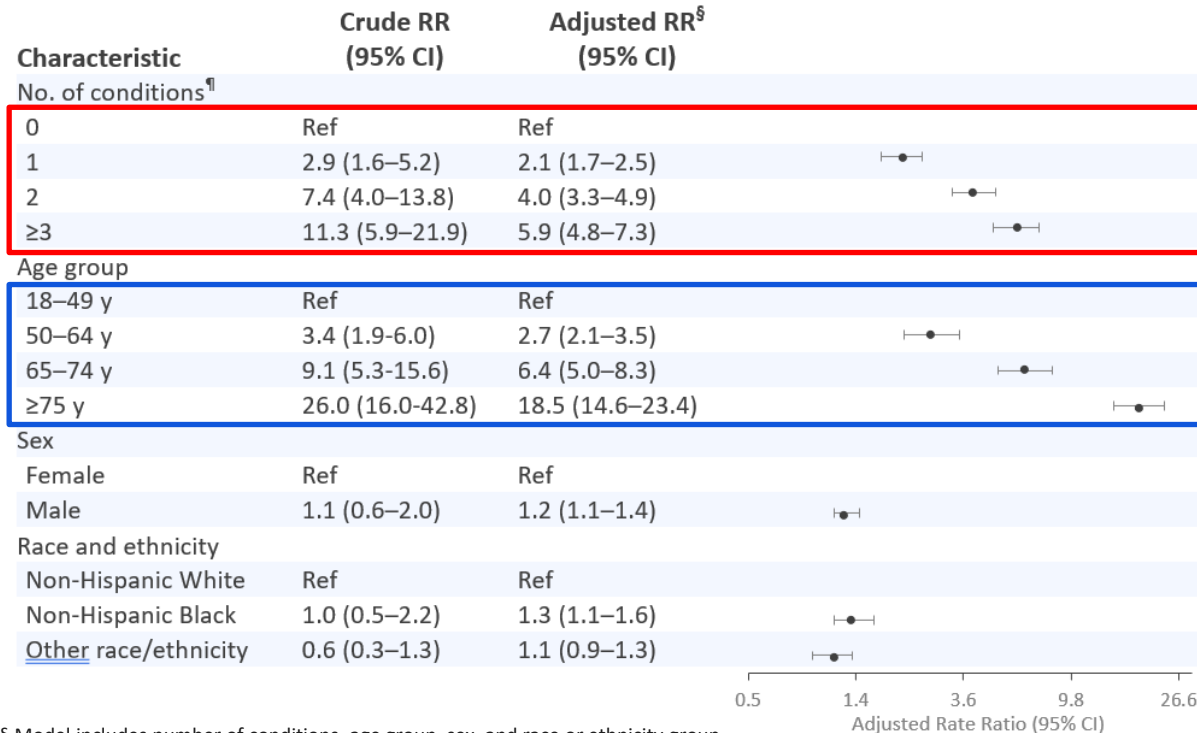
Among adults, most chronic conditions examined increased the risk of being hospitalized due to COVID-19

Rate ratio (with 95% uncertainty intervals) comparing rates of COVID-19 hospitalization among community-dwelling adults with a chronic medical condition to those without, by age group — COVID-NET states, October 2022–September 2023

- Risk conferred by several conditions appear to decline with age (CAD, diabetes, obesity). This might be a consequence of:
  - Inability to adjust for comorbidities in the models
  - Low population prevalence of some conditions in some age groups

COPD: chronic obstructive pulmonary disease. Obesity is defined as BMI 30–39 kg/m². Severe obesity is BMI ≥40 kg/m². Note that vertical axis is presented in logarithmic scale.

Risk for hospitalization due to COVID-19 increases with the number of chronic conditions and age.

Characteristic	Crude RR (95% CI)	Adjusted RR§ (95% CI)	
No. of conditions¶			
0	Ref	Ref	
1	2.9 (1.6–5.2)	2.1 (1.7–2.5)	
2	7.4 (4.0–13.8)	4.0 (3.3–4.9)	
≥3	11.3 (5.9–21.9)	5.9 (4.8–7.3)	
Age group			
18–49 y	Ref	Ref	
50–64 y	3.4 (1.9-6.0)	2.7 (2.1–3.5)	
65–74 y	9.1 (5.3-15.6)	6.4 (5.0–8.3)	
≥75 y	26.0 (16.0-42.8)	18.5 (14.6–23.4)	
Sex			
Female	Ref	Ref	
Male	1.1 (0.6–2.0)	1.2 (1.1–1.4)	
Race and ethnicity			
Non-Hispanic White	Ref	Ref	
Non-Hispanic Black	1.0 (0.5–2.2)	1.3 (1.1–1.6)	
Other race/ethnicity	0.6 (0.3–1.3)	1.1 (0.9–1.3)	

Adjusted Rate Ratio (95% CI): 0.5 1.4 3.6 9.8 26.6

- Multiple chronic medical conditions and older age were the strongest risk factors for COVID-19 hospitalization among adults.
- Hospitalization rates were 18.5-times as high among adults ages ≥75 years compared to 18–49 years.
  - The greatest risk factor examined in this analysis

§ Model includes number of conditions, age group, sex, and race or ethnicity group.

¶ Number of conditions is a sum of chronic conditions (asthma, COPD, chronic kidney disease, coronary artery disease, diabetes, history of stroke, severe obesity, and current smoking). Note that vertical axis is presented in logarithmic scale.

Strengths and Limitations

- **Data are gathered from robust COVID-19 hospitalization public health surveillance system**
- **Ability to compare underlying conditions using state-level prevalence**
- **Capability to examine and compare specific underlying conditions, prevalence of multiple conditions and age group as risk factors**
- **Limitations**
  - Results are preliminary and under review
  - Analysis is limited to community-dwelling adults
  - Adjustments for some comorbidities could not be made due to sparse data, especially in younger groups.
  - Unable to look at differences in rate ratios across outcomes (e.g., ICU admission) or race and ethnicity categories due to sparse data in some categories.