COVID-19-Associated Hospitalization Surveillance Network (COVID-NET)

For more information: www.cdc.gov/COVID19
Overview of Coronavirus Disease 2019-Associated Hospitalization Surveillance Network (COVID-NET)
COVID-NET Overview

- Population-based surveillance for laboratory-confirmed COVID-19-associated hospitalizations in all ages
- Catchment area: >250 acute care hospitals in 99 counties in 14 states, representing all 10 HHS regions and 10% of U.S. population
- Created using existing infrastructure of FluSurv-NET and RSV-NET (Respiratory virus hospitalization surveillance platforms)
- Surveillance was initiated on March 1, 2020
COVID-NET Surveillance Overview

States participating in COVID-NET

• 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 and abstracted by trained surveillance officers using a standardized case report form

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

MMWR April 17, 2020
https://www.cdc.gov/mmwr/volumes/69/wr/mm6915e3.htm
Case Ascertainment

- Laboratory records
- Reportable Condition System
- Infection Control Practitioners
- Admission / Discharge List

Notification of positive SARS-CoV-2 Test*

Hospitalized AND resident of catchment area

- Case
- Not a case
Data Collection and Flow

Case

Minimum data collected for weekly rates
- Site
- Age
- Sex
- Admission Date
- SARS-CoV-2 Test Results

Weekly data transmission

Data transmitted to CDC

Weekly data transmission

Standardized Medical Chart Abstractions Conducted to Obtain Detailed Clinical Data

- Signs/Symptoms
- Underlying Conditions
- Interventions
- Outcomes

Data lags due to time required to access charts and complete abstractions

Data posted weekly to COVID-NET Interactive

Weekly Data Quality Feedback To Sites
COVID-NET Interactive: Hospitalization Rates by Age, Sex, Race/Ethnicity and Site


Laboratory-Confirmed COVID-19-Associated Hospitalizations
Preliminary cumulative rates as of Aug 29, 2020

The Coronavirus Disease 2019 (COVID-19)–Associated Hospitalization Surveillance Network (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. COVID-NET conducts population-based surveillance for laboratory-confirmed COVID-19-associated hospitalizations in children (less than 18 years of age) and adults. COVID-NET covers nearly 100 counties in the 10 Emerging Infections Program network.
COVID-NET Interactive: Hospitalization Characteristics

COVID-19 Laboratory-Confirmed Hospitalizations
Preliminary data as of Aug 29, 2020

COVID-19-Associated Hospitalizations by Age

Selected Underlying Medical Conditions

Characteristics of COVID-19-Associated Admissions
COVID-NET Surveillance Updates

March 1–September 5, 2020
Laboratory-Confirmed COVID-19-Associated Hospitalization Rates by Age — COVID-NET, March 1–September 5, 2020 (n=54,425)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Hospitalizations per 100,000 population</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4 yrs</td>
<td>16.8</td>
</tr>
<tr>
<td>5-17 yrs</td>
<td>9.7</td>
</tr>
<tr>
<td>18-29 yrs</td>
<td>72.5</td>
</tr>
<tr>
<td>30-39 yrs</td>
<td>113.4</td>
</tr>
<tr>
<td>40-49 yrs</td>
<td>167.5</td>
</tr>
<tr>
<td>50-64 yrs</td>
<td>249.8</td>
</tr>
<tr>
<td>65-74 yrs</td>
<td>338.9</td>
</tr>
<tr>
<td>75-84 yrs</td>
<td>534.9</td>
</tr>
<tr>
<td>85+ yrs</td>
<td>814.6</td>
</tr>
<tr>
<td>Overall</td>
<td>166.9</td>
</tr>
<tr>
<td>18-49 yrs</td>
<td>451.2</td>
</tr>
<tr>
<td>65+ yrs</td>
<td>113.8</td>
</tr>
</tbody>
</table>
Laboratory-Confirmed COVID-19-Associated Hospitalization Rates by Sex—COVID-NET, March 1–September 5, 2020 (n=54,425)*

![Bar graph showing hospitalization rates by sex.](image)

- Male: 171.8 hospitalizations per 100,000 population
- Female: 161.1 hospitalizations per 100,000 population

*184 cases missing sex
Age-adjusted Laboratory-Confirmed COVID-19-Associated Hospitalization Rates*† by Race/Ethnicity — COVID-NET, March 1–September 5, 2020

*Calculated using hospitalized COVID-NET cases with known race/ethnicity for the numerator and NCHS bridged-race population estimates (https://www.cdc.gov/nchs/nvss/bridged_race.htm) for the denominator. Rates are adjusted to account for differences in age distributions within race/ethnicity strata in the COVID-NET catchment area.

†Race and ethnicity missing for 5.8% of cases.
Laboratory-Confirmed COVID-19-Associated Hospitalization Cases by Admission Date—COVID-NET, March 1–August 29*, 2020

*Cases submitted to CDC through September 5, 2020 with an admission date through August 29, 2020 are included. Cases submitted to CDC with admission dates after August 29 are excluded from the curve. Case counts for cases with admission dates after August 29 have a higher likelihood of backfill as compared to those with admission dates prior to August 29.
COVID-19-Associated Hospitalization Cases* by MMWR Week and Age Group, COVID-NET, March 1–August 29, 2020

* Y-axis scale varies by age group; † Weeks 10–11 not included for 5–17 year age group as no cases were reported; ‡ Weeks 10–12 not included for 0–4 year age group as no cases were reported
Clinical Characteristics of and Risk Factors for Severe Disease Among Hospitalized Patients with COVID-19, COVID-NET
Underlying conditions are common among adults aged 18 years or older with COVID-19 associated hospitalizations

*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 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. https://gis.cdc.gov/grasp/COVIDNet/COVID19_5.html
Nearly 90% of hospitalized adults 18 years or older have at least one of the selected underlying medical conditions*, and over 60% have 3 or more

March 1-August 15, 2020

<table>
<thead>
<tr>
<th>Condition Type</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>3 or more conditions</td>
<td>60-70%</td>
</tr>
<tr>
<td>2 conditions only</td>
<td>10-20%</td>
</tr>
<tr>
<td>1 condition only</td>
<td>5-15%</td>
</tr>
<tr>
<td>No conditions</td>
<td>0-5%</td>
</tr>
</tbody>
</table>

*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 between March 1 and 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.
The most common underlying medical conditions among hospitalized adults vary by age group

**March 1-August 15, 2020**

<table>
<thead>
<tr>
<th>18-49 years</th>
<th>50-64 years</th>
<th>65+ years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obesity (61.5%)</td>
<td>Hypertension (60.5%)</td>
<td>Hypertension (77.8%)</td>
</tr>
<tr>
<td>Hypertension (27.2%)</td>
<td>Obesity (56.5%)</td>
<td>Cardiovascular disease (55.2%)</td>
</tr>
<tr>
<td>Diabetes (21.8%)</td>
<td>Diabetes (37.9%)</td>
<td>Neurologic disease (42.5%)</td>
</tr>
<tr>
<td>Asthma (14.1%)</td>
<td>Cardiovascular disease (26.3%)</td>
<td>Diabetes (41.8%)</td>
</tr>
<tr>
<td>Chronic lung disease (9.8%)</td>
<td>Chronic lung disease (18.8%)</td>
<td>Obesity (34.6%)</td>
</tr>
</tbody>
</table>

*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 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. [https://gis.cdc.gov/grasp/COVIDNet/COVID19_5.html](https://gis.cdc.gov/grasp/COVIDNet/COVID19_5.html)*
Risk factors for ICU Admission, COVID-NET, March 1–May 2, 2020 (N=2490)

- Age 40-49 years, Race/Ethnicity, Hypertension, Smoking, Chronic Lung Disease, Cardiovascular Disease, Neurologic Disease and Renal Disease were included in the model, but not statistically significant.
- \( \text{aRR} = 1.43 (1.00, 2.04) \)†
- \( \text{aRR} = 1.84 (1.6, 2.11) \)
- \( \text{aRR} = 1.65 (1.34, 2.03) \)
- \( \text{aRR} = 1.53 (1.28, 1.83) \)
- \( \text{aRR} = 1.34 (1.20, 1.50) \)
- \( \text{aRR} = 1.31 (1.16, 1.47) \)
- \( \text{aRR} = 1.29 (1.13, 1.47) \)

\( \text{aRR} = \) adjusted risk ratio; RR = risk ratio; CI = confidence interval

*Age 40-49 years, Race/Ethnicity, Hypertension, Smoking, Chronic Lung Disease, Cardiovascular Disease, Neurologic Disease and Renal Disease were included in the model, but not statistically significant; †p = 0.0494
**Risk Factors for In-Hospital Death, COVID-NET, March 1–May 2, 2020 (N=2490)**

<table>
<thead>
<tr>
<th>Factor</th>
<th>aRR</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td>85+ years vs 18-39 years</td>
<td>10.98</td>
<td>(5.09, 23.69)</td>
</tr>
<tr>
<td>75-84 years vs 18-39 years</td>
<td>7.67</td>
<td>(3.35, 17.59)</td>
</tr>
<tr>
<td>65-74 years vs 18-39 years</td>
<td>5.77</td>
<td>(2.64, 12.64)</td>
</tr>
<tr>
<td>50-64 years vs 18-39 years</td>
<td>1.19</td>
<td>(1.01, 1.40)</td>
</tr>
<tr>
<td>Male vs Female</td>
<td>1.31</td>
<td>(1.13, 1.52)</td>
</tr>
<tr>
<td>Diabetes</td>
<td>1.28</td>
<td>(1.03, 1.58)</td>
</tr>
<tr>
<td>Chronic Lung Disease</td>
<td>1.25</td>
<td>(1.04, 1.50)</td>
</tr>
<tr>
<td>Cardiovascular Disease</td>
<td>1.33</td>
<td>(1.10, 1.61)</td>
</tr>
<tr>
<td>Neurologic</td>
<td>1.39</td>
<td>(1.13, 1.70)</td>
</tr>
</tbody>
</table>

aRR=adjusted risk ratio; RR=risk ratio; CI=confidence interval

*Age 40-49 years, Race/Ethnicity, Hypertension, Smoking, Obesity, Blood Disorders, and Rheumatologic/Autoimmune Disease were included in the model but not statistically significant.
Risk factors for COVID-19-associated hospitalization among U.S. Adults, COVID-NET and BRFSS
The prevalence of underlying medical conditions was greater in adults with COVID-19 associated hospitalizations compared to COVID-NET catchment areas.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Hospitalized Cases</th>
<th>COVID-NET Catchment Area</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension§</td>
<td>50%</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>Coronary Artery Disease</td>
<td>40%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>History of Stroke</td>
<td>20%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Diabetes</td>
<td>30%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Obesity</td>
<td>60%</td>
<td>30%</td>
<td>20%</td>
</tr>
<tr>
<td>Severe obesity</td>
<td>40%</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>Chronic kidney disease</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>Asthma</td>
<td>10%</td>
<td>10%</td>
<td>10%</td>
</tr>
<tr>
<td>COPD</td>
<td>5%</td>
<td>10%</td>
<td>10%</td>
</tr>
</tbody>
</table>

§Estimates for hypertension from COVID-NET Catchment Area and Nationwide BRFSS estimates are from 2017, Obesity=BMI ≥30kg/m²
; Severe obesity = BMI ≥ 40kg/m²

https://medrxiv.org/cgi/content/short/2020.07.27.20161810v1
The magnitude of risk for COVID-19 associated hospitalization was greatest for adults with severe obesity, chronic kidney disease, and diabetes.

- Severe obesity
- Chronic kidney disease
- Diabetes
- Obesity
- Hypertension
- Asthma
- Coronary Artery Disease
- History of Stroke
- COPD

Adjusted Rate Ratios and 95% Confidence Intervals

COPD: Chronic obstructive pulmonary disease
Obesity=BMI ≥30kg/m² ; Severe obesity = BMI ≥40kg/m²
*Each underlying medical condition is in a separate model, adjusted for age, sex, race/ethnicity
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

<table>
<thead>
<tr>
<th>Unadjusted Rate Ratio (95%CI)</th>
<th>Adjusted Rate Ratio* (95%CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of conditions†</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>2.8 (2.7, 3.1)</td>
</tr>
<tr>
<td>2</td>
<td>5.6 (5.2, 6.1)</td>
</tr>
<tr>
<td>3+</td>
<td>7.2 (6.6, 7.9)</td>
</tr>
<tr>
<td><strong>Age 45-64 years‡</strong></td>
<td>-----</td>
</tr>
<tr>
<td><strong>Age 65+ years‡</strong></td>
<td>-----</td>
</tr>
<tr>
<td><strong>Male§</strong></td>
<td>-----</td>
</tr>
<tr>
<td>**Non-Hispanic black</td>
<td></td>
</tr>
<tr>
<td>**Other race/ethnicity</td>
<td></td>
</tr>
</tbody>
</table>

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

*Model for number of underlying medical 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
Summary Points

- Hospitalization rates increase with increasing age
- Hospitalization rates are higher among Hispanic or Latino, non-Hispanic Black, and non-Hispanic American Indian/Alaskan Native persons compared to non-Hispanic White persons
- Underlying conditions are common among hospitalized patients with COVID-19 with obesity, hypertension and diabetes most common
- Older age, male sex, and underlying conditions increase the risk for ICU admission and death among hospitalized patients with COVID-19
- Underlying conditions increase risk for COVID-19 hospitalization
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