Centers for Disease Control and Prevention
CDC 24/7: Saving Lives, Protecting People™

COVID-19

CDC has updated its guidance for people who are fully vaccinated. See Recommendations for Fully Vaccinated People.

Underlying Medical Conditions Associated with High Risk for Severe COVID-19: Information for Healthcare Providers

Updated May 13, 2021 Print

Purpose

This webpage provides an evidence-based resource for healthcare providers caring for patients with underlying medical conditions who are at higher risk of developing severe outcomes of COVID-19. Severe outcomes are defined as hospitalization, admission to the intensive care unit (ICU), intubation or mechanical ventilation, or death. This page summarizes data from preprinted and published studies that were included in a literature review conducted by subject-matter experts. The summary of information reflects current evidence regarding underlying medical conditions and is intended to help healthcare providers make informed decisions about patient care and increasing the awareness of risk among their patients.

This page is distinct from the People with Certain Medical Conditions webpage which is intended for the general public.

Background

We are learning more about the risk factors for severe COVID-19 outcomes every day. Age is the strongest risk factor for severe COVID-19 outcomes. Approximately 54.1 million people aged 65 years or older reside in the United States; this age group accounts for more than 80% of U.S. COVID-19 related deaths.[1, 2] Residents of long-term care facilities

make up less than 1% of the U.S. population but account for more than 35% of all COVID-19 deaths.[3-7] Additionally, adults of any age with certain underlying medical conditions are at increased risk for severe illness from COVID-19.[8]

Studies have shown that COVID-19 does not affect all population groups equally. The risk of severe COVID-19 increases as the number of underlying medical conditions increases in an individual.[9–11] People with disabilities are more likely than those without disabilities to have chronic health conditions, live in congregate settings, and face more barriers to healthcare.[12-14] Studies have shown that some people with certain disabilities are more likely to get COVID-19 and have worse outcomes.[15-17] Some chronic medical conditions occur more frequently or at a younger age in racial or ethnic minority populations. Moreover, data has also shown that compared to non-Hispanic White persons, members of certain racial and ethnic minority groups are dying from COVID-19 at younger ages.[18] Based on mortality data from CDC's National Vital Statistics System (NVSS), an estimated 299,028 excess deaths occurred from late January through October 3, 2020 in the United States, with 198,081 (66%) excess deaths attributed directly and indirectly to COVID-19. The largest percentage increases in mortality occurred among adults aged 25–44 years and among Hispanic or Latino persons.[19] Additionally, we are still learning about how conditions that affect the environments where people live, learn and work (i.e., social determinants of health, such as neighborhood and physical environment, housing, occupation, education, food security, access to healthcare, and economic stability) can influence the risk for infection and severe COVID-19 outcomes.

This page lists high-risk underlying medical conditions based on available evidence. The list of underlying medical conditions is not exhaustive and includes only conditions with sufficient evidence to draw conclusions. This document will be updated as the science evolves.

Actions Providers Can Take

- Educate and encourage everyone, especially older people and those with underlying medical conditions, to be fully vaccinated against COVID-19 as soon as a vaccine becomes available to them. For additional information, including a link to your state or territorial health department's website on eligibility for and locations for COVID-19 vaccination, check here.

- Encourage patients to keep appointments for routine care and adhere to treatment regimens.
- Consider use of telehealth in coordination with community-based organizations, family members, or other providers, when appropriate, although some patients may not have knowledge of or access to appropriate technology or internet service.
- Encourage patients with underlying medical conditions to continue practicing preventive measures, such as wearing a mask and physical distancing, to avoid infection with the virus that causes COVID-19. This becomes even more important

with increasing age and number and severity of underlying conditions.

- Carefully consider potential additional risks of COVID-19 illness for patients who are members of racial and ethnic minority groups, and how to facilitate access to culturally and linguistically appropriate resources. These patients are often younger when they develop chronic medical conditions, might be at higher risk of having more than one underlying medical condition, and at higher risk for acquisition of COVID-19. Studies have shown that people in ethnic and racial minority groups are dying from COVID-19 at younger ages.
- Based on their clinical judgement, healthcare providers might recommend that people with underlying conditions that are not included on this list receive vaccination as soon as it becomes available.

Key Findings from Two Large Cohort Studies

Risk Factors Associated with In-Hospital Mortality in a U.S. National Sample of Patients with COVID-19 (USA)

This study used data from the Premier Healthcare Database, which represents approximately 20% of all inpatient admissions in the United States since 2000. This retrospective cohort study of 64,781 patients with COVID-19 included both inpatients and hospital-based outpatients with laboratory-diagnosed COVID-19 between April 1 and May 31, 2020. The database included reports from 592 acute care hospitals in the United States. The study was designed to examine risk factors associated with in-hospital mortality, and the analysis was conducted using multivariable logistic regression among adults for whom sex was known, adjusting for demographic characteristics, visit characteristics, comorbidities, and hospital characteristics, among other factors.

Main Findings:

- 29.9% of inpatients and 74.9% of outpatients diagnosed with COVID-19 had no comorbidities as defined in the study.
- The most common comorbidities were hypertension (30,236 [46.7%]), hyperlipidemia (18,744 [28.9%]), diabetes (18,091 [27.9%]), and chronic pulmonary disease (10,434 [16.1%]).
- 6,849 (19.4%) inpatients were admitted to an ICU.
- 5,628 (15.9%) inpatients received invasive mechanical ventilation.
- 7,355 (20.3%) inpatients died in the hospital.
- Very old age was the risk factor most strongly associated with death (e.g., age 80 years vs 18–34 years: odds ratio [OR], 16.20; 95% confidence interval [CI], 11.58–22.67; P <0.001).
- Preexisting comorbidities significantly associated with increased odds of in-hospital mortality were:
  - Metastatic solid tumor, 57% increase (adjusted odds ratio [aOR] =1.57; 95% CI, 1.20–2.05)

- History of myocardial infarction, 47% increase (aOR=1.47; 95% CI, 34–1.62)
- Cerebrovascular disease, 39% increase (aOR=1.39; 95% CI, 1.25–1.56)
- Congestive heart failure, 37% increase (aOR=1.37; 95% CI, 1.26–1.49)
- Hemiplegia, 34% increase (aOR=1.34; 95% CI, 1.05–1.72)
- Any malignant neoplasm, 27% increase (aOR=1.27; 95% CI, 1.09–1.47)
- Dementia, 20% increase (aOR=1.21; 95% CI, 1.11–1.32)
- Diabetes, 20% increase (aOR=1.20; 95% CI, 1.12–1.28)
- Chronic pulmonary disease, 16% increase (aOR=1.16; 95% CI, 1.08–1.26)
- Hyperlipidemia, 11% increase (aOR=1.11; 95% CI, 1.03–1.19)

- The risk for inpatient mortality was higher with increasing number of comorbid conditions. Among patients with COVID-19 who died, there was a higher prevalence of all comorbidities (except for metastatic solid tumor) than among patients who survived.
- The Charlson-Deyo Comorbidity Index (CCI) score was used to assess the baseline comorbidities of patients with COVID-19. Comorbidities were assessed during the index visit and 6 months prior to that visit. Associations of number of comorbidities and COVID-19-associated death are shown in the table below, highlighting that there was increased risk of in hospital mortality among patients with multiple comorbidities.

	Patients with confirmed COVID-19		
	Survived (n= 57,426)	Deceased (n=7,355)	***P* value**
Charlson Comorbidity Index score, mean (SD)	1.1 (1.8)	3.1 (2.5)	<0.001*
Charlson comorbidities=0	31,650 (55.1)	928 (12.6)	<0.001**
1 to 4	21,876 (38.1)	4,475 (60.8)	
5 or more	3,900 (6.8)	1,952 (26.5)	

* Wilcoxon rank sum test

** $\chi 2$ tests

Reference: Rosenthal, N et al. Risk Factors Associated with In-Hospital Mortality in a US National Sample of Patients With COVID-19. *JAMA Network Open*.2020;3(12):e2029058. doi:10.1001/jamanetworkopen.2020.29058

More Info: Charlson-Deyo Comorbidities and Related ICD-10-CM Diagnosis Codes, and ICD-10 Diagnosis Codes for Defining Acute Complications

Factors Associated with COVID-19-related Death Using OpenSAFELY (UK)

This study used data from OpenSAFELY, a health analytics platform that covers 40% of all patients in England. Primary care records of 17,278,392 adults with 10,926 COVID-19 related deaths from February 1, 2020 through May 6, 2020 were used to examine factors associated with COVID-19-related death. This study provides data on clinical indications of severity for underlying medical conditions (e.g., asthma was grouped by use of oral corticosteroids as an indication of severity, hemoglobin A1c level was used in people with diabetes, estimated glomerular filtration rate was used in people with chronic kidney disease).

The study analysis was conducted using a multivariable Cox proportional hazard model, adjusting for age, sex, body mass index (BMI), smoking, index of multiple deprivation quintile, and many underlying conditions.

Main Findings:

1. Older adults and persons of male sex were associated with higher risk of COVID-19 death. Black persons or persons of South Asian race were also associated with higher risk of COVID-19 death. An adjusted (full model) hazard ratio (HR) for those over 80 years old compared to those 50–59 years old was 20.60 (95% CI, 18.7–22.7). Age was the strongest risk factor.
2. Underlying conditions that were associated with COVID-19 death are in the table below with the adjusted hazard ratio value from the multivariable Cox proportional hazard model.

Condition	Hazard Ratio (95% CI)
Solid organ transplant (vs none)	3.53 (2.77–4.49)
Hematological malignancy (versus none)	
Diagnosed <1 year ago	2.80 (2.08–3.78)
Diagnosed 1–4.9 years ago	2.46 (2.06–2.95)
Diagnosed ≥5 years ago	1.61 (1.39–1.87)

Other neurological disease	2.58 (2.38–2.79)
Reduced kidney function (versus none)	
eGFR 30–60	1.33 (1.28–1.40)
eGFR <30	2.52 (2.33–2.72)
Other immunosuppressive condition (vs none)	2.21 (1.68–2.90)
Stroke or dementia	2.16 (2.06–2.27)
Diabetes (versus none)	
With HbA1c <58 mmol/mol (<7.5%)	1.31 (1.24–1.37)
With HbA1c ≥58 mmol/mol (≥7.5%)	1.95 (1.83–2.08)
With no recent HbA1c measure	1.90 (1.72–2.09)
Liver disease (vs none)	1.75 (1.51–2.03)
Cancer (nonhematological, versus none)	
Diagnosed <1 year ago	1.72 (1.50–1.96)
Diagnosed 1–4.9 years ago	1.15 (1.05–1.27)
Diagnosed ≥5 years ago	0.96 (0.91–1.03)
Respiratory disease, excluding asthma (vs none)	1.63 (1.55–1.71)
Asplenia vs intact spleen	1.34 (0.98–1.83)
Rheumatoid arthritis, lupus, or psoriasis (vs none)	1.19 (1.11–1.27)
Chronic cardiac disease (coronary artery disease, congestive heart failure, cardiomyopathy)	1.17 (1.12–1.22)
Asthma (versus none)	
With no recent oral corticosteroid use	0.99 (0.93–1.05)
With recent oral corticosteroid use	1.13 (1.01–1.26)

High blood pressure or diagnosed hypertension (versus normal blood pressure)	0.89 (0.85–0.93)

Reference: Williamson EJ, Walker AJ, Bhaskaran K, et al. Factors associated with COVID-19-related death using OpenSAFELY. ***Nature***. 2020;584(7821):430-436. doi: 10.1038/s41586-020-2521-4.

More Info: Clinical and Medicine Code lists Used in OpenSAFELY

Summary of Conditions with Evidence

An updated list of high-risk underlying conditions, based on what has been reported in the literature, and the level of evidence for risk of severe COVID-19 outcomes are provided below. Updates to the list of high-risk underlying medical conditions that put adults of any age at increased risk for severe COVID-19 illness were based on evidence from published reports, scientific articles in press, unreviewed preprints, and internal data. This list of conditions was categorized into four groups primarily based on the study method used in the analyses at the time of review. Some of the conditions listed represent a larger category (e.g., heart conditions) and some are listed as one specific health condition (e.g., sickle cell disease). This reflects how conditions were defined in studies. For example, ICD-10-CM codes were used in some studies and others used lab codes.

1. Co-morbidities that are supported by meta-analysis/systematic review: Defined as having a significant association with risk of severe COVID-19 illness in at least one meta-analysis or systematic review.
    - Cancer
    - Cerebrovascular disease
    - Chronic kidney disease*
    - COPD (chronic obstructive pulmonary disease)
    - Diabetes mellitus, type 1 and type 2*
    - Heart conditions (such as heart failure, coronary artery disease, or cardiomyopathies)
    - Obesity (BMI ≥30 kg/m2)*
    - Pregnancy and recent pregnancy
    - Smoking, current and former
2. Co-morbidities that are supported by mostly observational (e.g., cohort, case-control, or cross-sectional) studies: These might include systematic review or meta-analysis that represents one condition in a larger group of conditions (for example, kidney transplant under the category of solid organ or blood stem cell transplantation).
    - Children with certain underlying conditions
    - Down syndrome

      HIV (human immunodeficiency virus)

- Neurologic conditions, including dementia
- Overweight (BMI ≥25 kg/m2, but <30 kg/m2)
- Other lung disease (including interstitial lung disease, pulmonary fibrosis, pulmonary hypertension)*
- Sickle cell disease
- Solid organ or blood stem cell transplantation
- Substance use disorders
- Use of corticosteroids or other immunosuppressive medications

3. Co-morbidities that are supported by mostly case series, case reports, or, if other study design, the sample size is small (and no systematic review or meta-analysis available was available to review): Defined as having an association in one or more case series studies. If there are cohort or case-control studies, the sample size was small. Conditions included might be less common.
    - Cystic fibrosis
    - Thalassemia
4. Co-morbidities that are supported by mixed evidence: Defined as having an association in at least one meta-analysis or systematic review and additional studies or reviews that reached different conclusions about risk associated with a condition.
    - Asthma
    - Hypertension*
    - Immune deficiencies
    - Liver disease

Find Evidence used to update the list of underlying medical conditions that increase a person's risk of severe illness from COVID-19.

* indicates underlying conditions for which there is evidence for pregnant and non-pregnant people

Additional Resources

- CDC strongly encourages healthcare providers, patients and their advocates, and health system administrators to regularly consult the COVID-19 Treatment Guidelines by the National Institutes of Health (NIH)
- Information about enrolling in clinical trials related specifically to COVID-19 can be found at hhs.gov , and includes opportunities for people with and without COVID-19
- Visit Clinical Care Guidance for Healthcare Professionals about Coronavirus (COVID-19) for CDC guidance documents, including guidance by patient type (i.e., newborn, pediatric, breastfeeding women)
- Visit CDC's COVID Data Tracker for current data

- Visit CDC's COVID-19 Vaccination for vaccine information and resources
- Visit CDC's Demographic Trends of COVID-19 Cases and Deaths in the U.S. for COVID-19 hospitalization and death data by race/ethnicity
- Visit CDC's Health Equity page for health equity considerations for racial and ethnic minority groups
- Please contact your state, tribal, local, or territorial health department for more information on COVID-19 vaccination in your area

References

1. Cronin AM, Railey S, Fortune D, Wegener DH, Davis JB. Notes from the Field: Effects of the COVID-19 Response on Tuberculosis Prevention and Control Efforts—United States, March–April 2020. MMWR Morb Mortal Wkly Rep **2020**; 69(29): 971–2. doi: 10.15585/mmwr.mm6929a4
2. Centers for Disease Control and Prevention COVID-19 Response Team. Severe Outcomes Among Patients with Coronavirus Disease 2019 (COVID-19)—United States, February 12–March 16, 2020. MMWR Morb Mortal Wkly Rep **2020**; 69(12): 343–6. doi: 10.15585/mmwr.mm6912e2
3. Abrams HR, Loomer L, Gandhi A, Grabowski DC. Characteristics of US Nursing Homes with COVID-19 Cases. Journal of the American Geriatrics Society **2020**; 68(8): 1653-1656. doi: /10.1111/jgs.16661
4. Grabowski DC, Mor V. Nursing Home Care in Crisis in the Wake of COVID-19. Journal of the American Medical Association **2020**. doi:10.1001/jama.2020.8524
5. Brown KA, Jones A, Daneman N, et al. Association between nursing home crowding and COVID-19 infection and mortality in Ontario, Canada. Journal of the American Medical Association, Internal Medicine **2020**. doi:10.1001/jamainternmed.2020.6466
6. Sarah HY, See I, Kent AG, et al. Characterization of COVID-19 in assisted living facilities—39 states, October 2020. MMWR Morb Mortal Wkly Rep **2020**; 69(46): 1730. doi: 10.15585/mmwr.mm6946a3
7. Fisman DN, Bogoch I, Lapointe-Shaw L, McCready J, Tuite AR. Risk factors associated with mortality among residents with coronavirus disease 2019 (COVID-19) in long-term care facilities in Ontario, Canada. Journal of the American Medical Association **2020**; 3(7): e2015957-e. doi:10.1001/jamanetworkopen.2020.15957
8. Harrison, S. L., Fazio-Eynullayeva, E., Lane, D. A., Underhill, P., & Lip, G. (2020). Comorbidities associated with mortality in 31,461 adults with COVID-19 in the United States: A federated electronic medical record analysis. *PLoS medicine*, *17*(9), e1003321. doi: 10.1371/journal.pmed.1003321
9. De Giorgi, F. Fabbian, S. Greco, et al. Prediction of in-hospital mortality of patients with SARS-CoV-2 infection by comorbidity indexes: an Italian internal medicine single center study Eur Rev Med Pharmacol Sci. 2020, 24(19), 10258-10266. doi: 10.26355/eurrev_202010_23250
10. Lenin Dominguez-Ramirez, Francisco Rodriguez-Perez, Francisca Sosa-Jurado,

Gerardo Santos-Lopez, Paulina Cortes-Hernandez The role of metabolic comorbidity in COVID-19 mortality of middle-aged adults. The case of Mexico medRxiv 2020.12.15.20244160; doi: 10.1101/2020.12.15.20244160

11. Rosenthal, N et al. Risk Factors Associated With In-Hospital Mortality in a US National Sample of Patients With COVID-19. *JAMA Network Open*.2020;3(12):e2029058. doi:10.1001/jamanetworkopen.2020.29058
12. Dixon-Ibarra A, Horner-Johnson W. Disability status as an antecedent to chronic conditions: National Health Interview Survey, 2006-2012. Prev Chronic Dis. 2014 Jan 30;11:130251. doi: 10.5888/pcd11.130251
13. Landes SD, Turk MA, Formica MK, McDonald KE, Stevens JD. COVID-19 outcomes among people with intellectual and developmental disability living in residential group homes in New York State. Disabil Health J. 2020 Oct;13(4):100969. doi: 10.1016/j.dhjo.2020.100969
14. Okoro CA, Hollis ND, Cyrus AC, Griffin-Blake S. Prevalence of Disabilities and Health Care Access by Disability Status and Type Among Adults — United States, 2016. MMWR Morb Mortal Wkly Rep 2018;67:882–887. doi: 10.15585/mmwr.mm6732a3
15. Gleason J, Ross W, Fossi A, Blonsky H, Tobias J, Stephens M. The devastating impact of Covid-19 on individuals with intellectual disabilities in the United States. NEJM Catalyst Innovations in Care Delivery. 2021 Mar 5;2(2).
16. Turk MA, Landes SD, Formica MK, Goss KD. Intellectual and developmental disability and COVID-19 case-fatality trends: TriNetX analysis. Disability and Health Journal. 2020 Jul 1;13(3):100942.
17. Makary M, West Health Institute. Risk Factors for COVID-19 Mortality among Privately Insured Patients: A Claims Data Analysis. FAIR Health White Paper. November 2020.
18. Health Disparities: Race and Hispanic Origin. Provisional Death Counts for Coronavirus Disease 2019 (COVID-19)
19. Rossen LM, Branum AM, Ahmad FB, Sutton P, Anderson RN. Excess Deaths Associated with COVID-19, by Age and Race and Ethnicity — United States, January 26–October 3, 2020. MMWR Morb Mortal Wkly Rep 2020;69:1522–1527.

Last Updated May 13, 2021
Content source: National Center for Immunization and Respiratory Diseases (NCIRD), Division of Viral Diseases