Science Brief: Evidence Used to Update the List of Underlying Medical Conditions Associated with Higher Risk for Severe COVID-19 (Pending)

Updated Feb. 15, 2022

For more information, please see Underlying Medical Conditions Associated with Higher Risk for Severe COVID-19: Information for Healthcare Professionals and People with Certain Medical Conditions (for the general public).

Summary of Recent Changes

Updates as of February 15, 2022

Updates to the list of underlying medical conditions that put people ages 18 years and older at higher risk for severe illness from the virus that causes COVID-19 were based on evidence from published reports, scientific articles in press, unreviewed pre-prints, and internal data. Updates to the following conditions were completed based on evidence from the date range below:

- Physical inactivity, disabilities and primary immunodeficiencies were added based on evidence published before October 7, 2021.
- No conditions were removed from the previous underlying medical conditions list.

View Previous Updates

Overview

CDC continues to learn about COVID-19 and associated underlying medical conditions that put people ages 18 years and older at higher risk of severe illness. Severe illness from COVID-19 is defined here as hospitalization, admission to the intensive care unit (ICU), intubation or mechanical ventilation, or death. Evidence used to inform the list of underlying conditions was determined by CDC reviewers based on available literature about COVID-19 at time of review. Literature includes published reports, scientific articles in press, unreviewed pre-prints, and data from CDC-led investigations.

The methods used to assess the conditions have changed during the pandemic as the amount of literature and types of studies increased. For instance, preliminary versions of this list focused on providing the latest information based on descriptive data. As the literature grew, CDC investigators categorized the literature by study design.

> Since May 2021, the process has been updated to include a CDC-led review process that uses rigorous systematic review

methods. To learn more about the process of CDC's systematic reviews, see CDC systematic review process.

The Table of Evidence below only lists underlying conditions that are **associated** with severe COVID-19 outcomes.

Table of Evidence

Evidence used to inform the list of underlying medical conditions that increase a person's risk of severe illness from COVID-19, in alphabetic order by study design section. Conditions were categorized as higher risk, suggestive higher risk, and mixed evidence.

Higher Risk (conclusive)

Higher risk for underlying conditions is defined as having a published meta-analysis or systematic review or completing the CDC systematic review process. The meta-analysis or systematic review demonstrates a conclusive increase in risk for at least one severe COVID-19 outcome.

Condition	Evidence of Impact on COVID-19 Severity [Reference number]
Bronchiectasis	CDC systematic review [A]
Cancer	Meta-Analysis/ Systematic Review [1-5] Cohort Study [6-8] Case Series [9-11] Case Control Study [12]
Cerebrovascular disease	Meta-Analysis [13-16] Synthesis of Evidence [17] Cohort Study [18-20]
Chronic kidney disease	Meta-Analysis [16,21] Cohort Studies [19,22-43], [44]* Case Series [45-47]
Chronic liver disease (cirrhosis, non-alcoholic fatty liver disease, alcoholic liver disease, autoimmune hepatitis)	CDC systematic review [B]
COPD	Meta-Analysis [78-80] Systematic Review [81,82]
Cystic fibrosis	Case Series [83-85] Cohort [86]
Diabetes mellitus, type 1	Meta-Analysis [87] Case Series [46] Cohort Study [18,88-93]
Diabetes mellitus, type 2	Meta-Analysis [94] Systematic Review [95]* Gestational Diabetes Systematic Review [96] * Case Series [46] Longitudinal Study [97] Cohort Study [87,91,97-102]
Disabilities, including Down Syndrome	CDC systematic review [C]
HIV	Meta-Analysis/ Systematic Review [103] Cohort Study [35,104-106] Case Series [107-109]
Heart conditions (such as heart failure, coronary artery disease, or cardiomyopathies)	Meta-Analysis [110-112] Cohort Study [18,19]
Interstitial lung disease	CDC systematic review [D]
Mental health conditions (such as mood disorders, including depression, and schizophrenia spectrum disorders)	Meta-analysis/ systematic review [117,118]

Condition	Evidence of Impact on COVID-19 Severity [Reference number]
Neurologic conditions (Dementia)	Meta-Analysis/ Systematic Review [119-122] Cross-Sectional Study [123] Cohort Study [19,124]
Obesity	Meta-Analysis [125-127] Systematic Review [95]* Cohort [27,128-136], [44,137-140]*
Physical Inactivity	CDC systematic review [E]
Pregnancy and Recent Pregnancy	Meta-Analysis/ Systematic Review [95,141] Case Control [142,143] Case Series [144-146] Cohort Study [147-150]
Primary Immunodeficiencies	CDC systematic review [F]
Pulmonary hypertension and pulmonary embolism	CDC systematic review [G]
Smoking, current and former	Meta-Analysis [78,111,151-158]
Solid organ or blood stem cell transplantation	Meta-Analysis [134] Case Series [159-170] Cohort [171-174]
Tuberculosis	CDC systematic review [H]
Use of corticosteroids or other immunosuppressive medications	Meta-Analysis/ Systematic Review [175] Cohort Study [176] Cross-Sectional [177] Case Series [178-180]

Suggestive Higher Risk

Suggestive higher risk for underlying conditions is defined as not having a published meta-analysis or systematic review or completing the CDC systematic review process. The evidence is supported by mostly cohort, case-control, or cross-sectional studies. (Systematic reviews are available for some conditions for children with underlying conditions.)

Condition	Evidence of Impact on COVID-19 Severity [Reference number]
Children with certain underlying conditions	Systematic Review [181,182] Cross-Sectional Study 123,183,184] Cohort Study [124,185-192] Case Series [193,194]
Overweight	Cohort Study [131] Case Series [136]
Sickle cell disease	Cohort [193-196] Case Series [193,196-211]
Substance use disorders	Case-Control Study [212-214] Cohort Study [215,216]
Thalassemia	Case Series [217-220] Cross-Sectional [221]

Mixed Evidence (inconclusive: no conclusions can be drawn from the evidence)

Mixed evidence is defined as an underlying medical condition or risk factor that has a published meta-analysis or systematic review or completing the CDC systematic review process. The meta-analysis or systematic review is inconclusive, either because the aggregated data on the association between an underlying condition and severe COVID-19 outcomes are inconsistent in direction or there are insufficient data (or limited) on the association between an underlying conditions and severe COVID-19 outcomes.

- Limited: The evidence consists of one study, or several small studies with no comparison group limiting the conclusions that can be drawn.
- Inconsistent: The evidence suggests no clear direction of association, meaning no firm conclusions can be drawn.

Condition	Evidence of Impact on COVID-19 Severity [Reference number]
Alpha 1 antitrypsin deficiency	Limited: CDC systematic review [I]
Asthma	Inconsistent Meta-Analysis [218-220] Review [221] Case Series [222] Cohort Study [21, 45, 223-228]
Bronchopulmonary dysplasia	Limited: CDC systematic review [J]
Hepatitis B	Inconsistent: CDC systematic review [B]
Hepatitis C	Limited: CDC systematic review [B]
Hypertension	Inconsistent Meta-Analysis [111,222-225] Systematic Review [226], [95]* Cohort Study [18,19,22,227-234] Case Series [235]

Footnote: { }* indicates pregnancy–related reference.

Previous Updates

Updates from Previous Content

As of October 14, 2021

- Chronic lung disease (including bronchiectasis, bronchopulmonary dysplasia, interstitial lung disease, pulmonary hypertension, pulmonary embolism, tuberculosis) and chronic liver disease (including cirrhosis, non-alcoholic fatty liver disease, alcoholic liver disease, and autoimmune hepatitis) were added September 2021 based on evidence published between December 1, 2019 and August 31, 2021 using the updated review methods outlined below.
- Mental health disorders (such as mood disorders including depression, and schizophrenia spectrum disorders) were added September 2021 based on evidence published between December 1, 2019 and August 31, 2021.
- No conditions were removed from the previous underlying medical conditions list.

As of May 13, 2021

- Pregnancy related references were added in May 2021.
- Substance use disorders were based on evidence published between December 1, 2019 and January 1, 2021.
- Asthma, blood disorders, cancer, cerebrovascular disease, chronic obstructive pulmonary disease (COPD), chronic kidney disease (CKD), cystic fibrosis, diabetes, Down syndrome, heart disease, hypertension, immunosuppressant medications, use of corticosteroids or other immunosuppressive medications, solid organ or blood stem cell transplantation, neurological conditions, and obesity were based on evidence published between December 1, 2019 and December 1, 2020.
- Smoking was based on evidence published between December 1, 2019 and July 20, 2020.

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See CDC Systematic Review References

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B. Stone EC, Hofmeister M, Okasako-Schmucker DL, et al. Brief Summary of Findings on the Association Between Underlying Liver Diseases and Severe COVID-19 Outcomes. CDC COVID-19 Scientific Brief. October 2021.

C. So CN, Ryerson AB, Yeargin-Allsopp M, Kristie EN et al. Brief Summary of Findings on the Association Between Disabilities and Severe COVID-19 Outcomes. *CDC COVID-19 Scientific Brief*.

D. Okasako-Schmucker DL, Weissman D, Mazurek J et al. Brief Summary of Findings on the Association Between Interstitial Lung Diseases and Severe COVID-19 Outcomes. CDC COVID-19 Scientific Brief. October 2021.

E. Hill AL, Whitfield G, Morford M et al. Brief Summary of Findings on the Association Between Physical Inactivity and Severe COVID-19 Outcomes. *CDC COVID-19 Scientific Brief*.

F. Morford M, Green RF, Drzymalla E et al. Brief Summary of Findings on the Association Between Underlying Primary Immunodeficiency and Severe COVID-19 Outcomes. *CDC COVID-19 Scientific Brief*.

G. Wassef M, Weissman D, Mazurek J et al. Brief Summary of Findings on the Association Between a History of Pulmonary Embolism or Pulmonary Hypertension and Severe COVID-19 Outcomes. CDC COVID-19 Scientific Brief. October 2021.

H. Kumasaka JK, Jereb JA, Stone E et al. Brief Summary of Findings on the Association Between Tuberculosis and Severe COVID-19 Outcomes. CDC COVID-19 Scientific Brief. October 2021.

I. Morford M, Weissman, D, Mazurek J, et al. Brief Summary of Findings on the Association Between Alpha-1 Antitrypsin Deficiency and Severe COVID-19 Outcomes. CDC COVID-19 Scientific Brief. October 2021.

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