

Coronavirus Disease 2019 (COVID-19)

MENU >

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

Updated July 22, 2020

[Print](#)

Updates to the list of underlying medical conditions that put individuals at increased risk for severe illness from COVID-19 were based on published reports, articles in press, unreviewed pre-prints, and internal data available between December 1, 2019 and July 10, 2020. **This list is a living document that will be periodically updated by CDC, and it could rapidly change as the science evolves.** Severe illness from COVID-19 was defined as hospitalization, admission to the ICU, intubation or mechanical ventilation, or death.

The level of evidence for each condition was determined by CDC reviewers based on available information about COVID-19. Conditions were added to the list (if not already on the previous underlying medical conditions list [originally released in March 2020]) if evidence for an association with severe illness from COVID-19 met any of the following criteria:

- **Strongest and most consistent evidence:** Defined as consistent evidence from multiple small studies or a strong association from a large study,
- **Mixed evidence:** Defined as multiple studies that reached different conclusions about risk associated with a condition, or
- **Limited evidence:** Defined as consistent evidence from a small number of studies. categorization for a condition’s association with severe illness from COVID-19, the condition was added to the list (if not already on the previous underlying medical conditions list [originally released in March 2020]).

Qualifiers to previously listed conditions were added or removed if there was strong evidence to support that the condition be expanded. Conditions previously listed were to be removed if there was strong and consistent evidence demonstrating no association with severe outcomes. Based on this criterion, no conditions were removed from the previous underlying medical conditions list dated March 2020.

Level of Evidence	Condition	Evidence of Impact on COVID-19 Severity	Notes
Strongest and Most Consistent Evidence	Serious heart conditions, such as heart failure, coronary artery disease, or cardiomyopathies	Cohort Study [1, 2] Meta Analyses [3, 4] Case Series [5]	On previous version of list as “Serious Heart Conditions”
	Cancer	Systematic Review [6] Cohort Study [7, 8] Case Series [9]	New to updated list as of July 17, 2020
	Chronic kidney disease	Case Series [6, 7, 8] Cohort Studies [9, 10, 11]	On previous version of list as “Chronic Kidney Disease Requiring Dialysis”
	COPD	Meta Analyses [4, 12]	On previous version of list

		Case Series [13] Cohort Study [10]	
	Obesity (BMI \geq 30)	Cohort Studies [14, 15, 16, 17, 18] Cross-sectional [19]	On previous version of list as “Severe Obesity (BMI \geq 40)”
	Sickle cell disease	Case Series [20, 21, 22, 23, 24]	On previous version of list
	Solid organ transplantation	Case Series [8, 25, 26, 27, 28, 29, 30]	New to updated list as of June 25, 2020
	Type 2 diabetes mellitus	Case Series [7] Longitudinal Study [31] Cohort Study [32, 33] Meta Analysis [34]	On previous version of list
Mixed Evidence	Asthma	Cohort Study [10, 35, 36, 37] Case Series [13]	On previous version of list
	Cerebrovascular disease	Meta Analysis [38, 39, 40, 41] Synthesis of Evidence [42] Cohort Study [1, 2, 43, 44, 45]	New to updated list as of June 25, 2020
	Hypertension	Cohort Study [1, 2, 45, 46, 47] Systematic Review [48] Meta Analyses [3, 4, 49]	New to updated list as of June 25, 2020
	Pregnancy	Systematic Review [50] Case Control Study [51] Case Series [52, 53, 54, 55] Cohort Study [56, 57, 58]	
	Smoking	Meta Analyses [3, 59, 60, 61, 62]	On previous version of list
	Use of corticosteroids or other immunosuppressive medications	Case Series [63, 64, 65] Cohort Study [66, 67]	On previous version of list
Limited Evidence	Bone marrow transplantation	Review [68]	On previous version of list
	HIV	Case Series [69, 70]	On previous version of list
	Immune deficiencies	Case Series [71] Systematic Review [72]	On previous version of list
	Inherited metabolic disorders	Cohort Study [43, 73]	New to updated list as of June 25, 2020; specific to pediatric populations at this time
	Neurologic conditions	Cross-Sectional Study [74] Cohort Study [37, 45, 73]	New to updated list as of June 25, 2020; specific to pediatric populations at this time
	Other chronic lung diseases	Meta Analysis [4] Case Series [13] Cohort Study [10, 75]	On previous version of list
	Pediatrics	Systematic Review [84, 85] Cross-Sectional Study [82, 86] Cohort Study [77, 87, 88]	New to updated list as of July 17, 2020

Liver disease	Meta Analysis [76] Cohort Study [77, 78] Literature Review [79]	On previous version of list
Type 1 diabetes mellitus	Case Series [7] Cohort Study [32, 33] Meta Analysis [34]	On previous version of list
Thalassemia	Case Series [80] Cross-Sectional Study [81]	On previous version of list

Bold citations indicate the reference is published

Italicized citations indicate the reference is not peer reviewed

Non-bold, non-italicized citations indicate the reference is in press

References:

1. Chen, R., et al., *Risk Factors of Fatal Outcome in Hospitalized Subjects With Coronavirus Disease 2019 from a Nationwide Analysis in China*. CHEST.
2. Williamson, E., et al., *OpenSAFELY: factors associated with COVID-19-related hospital death in the linked electronic health records of 17 million adult NHS patients*. medRxiv, 2020: p. 2020.05.06.20092999.
3. Zheng, Z., et al., *Risk factors of critical & mortal COVID-19 cases: A systematic literature review and meta-analysis*. Journal of Infection, 2020.
4. Yang, J., et al., *Prevalence of comorbidities and its effects in patients infected with SARS-CoV-2: a systematic review and meta-analysis*. International Journal of Infectious Diseases, 2020. **94**: p. 91-95.
5. Guo, T., et al., *Cardiovascular Implications of Fatal Outcomes of Patients With Coronavirus Disease 2019 (COVID-19)*. JAMA Cardiology, 2020.
6. Fung M, Babik JM. COVID-19 in Immunocompromised Hosts: What We Know So Far [published online ahead of print, 2020 Jun 27]. *Clin Infect Dis*. 2020;ciaa863. doi:10.1093/cid/ciaa863
7. Robilotti, Elizabeth V et al. "Determinants of COVID-19 disease severity in patients with cancer." *Nature medicine*, 10.1038/s41591-020-0979-0. 24 Jun. 2020, doi:10.1038/s41591-020-0979-0
8. Liang W, Guan W, Chen R, et al. Cancer patients in SARS-CoV-2 infection: a nationwide analysis in China. *Lancet Oncol*. 2020;21(3):335-337
9. Zhang H, Wang L, Chen Y, et al. Outcomes of novel coronavirus disease 2019 (COVID-19) infection in 107 patients with cancer from Wuhan, China [published online ahead of print, 2020 Jun 23]. *Cancer*. 2020;10.1002/cncr.33042. doi:10.1002/cncr.33042.
10. Garg, S., et al., *Hospitalization Rates and Characteristics of Patients Hospitalized with Laboratory-Confirmed Coronavirus Disease 2019 – COVID-NET, 14 States, March 1-30, 2020*. MMWR Morbidity Mortality Weekly Report, 2020. **69**(15): p. 458-464.
11. Richardson, S., et al., *Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area*. JAMA, 2020. **323**(20): p. 2052-2059.
12. Akalin, E., et al., *Covid-19 and Kidney Transplantation*. New England Journal of Medicine, 2020.
13. Myers, L.C., et al., *Characteristics of Hospitalized Adults With COVID-19 in an Integrated Health Care System in California*. JAMA, 2020. **323**(21): p. 2195-2198.
14. Gold, J.A.W., et al., *Characteristics and Clinical Outcomes of Adult Patients Hospitalized with COVID-19 – Georgia, March 2020*. MMWR Morbidity Mortality Weekly Report, , 2020. **69**(18): p. 545-550.
15. Hirsch, J.S., et al., *Acute kidney injury in patients hospitalized with COVID-19*. Kidney international, 2020: p. S0085-2538(20)30532-9.

16. Lippi, G. and B.M. Henry, *Chronic obstructive pulmonary disease is associated with severe coronavirus disease 2019 (COVID-19)*. *Respiratory medicine*, 2020. **167**: p. 105941-105941.
17. CDC Covid-19 Response Team, *Preliminary Estimates of the Prevalence of Selected Underlying Health Conditions Among Patients with Coronavirus Disease 2019 – United States, February 12-March 28, 2020*. *MMWR Morbidity and Mortality Weekly Report*, 2020. **69**(13): p. 382-386.
18. Lighter, J., et al., *Obesity in Patients Younger Than 60 Years Is a Risk Factor for COVID-19 Hospital Admission*. *Clinical Infectious Diseases*, 2020.
19. Hur, K., et al., *Factors Associated With Intubation and Prolonged Intubation in Hospitalized Patients With COVID-19*. *Otolaryngology–Head and Neck Surgery*. **0**(0): p. 0194599820929640.
20. Simonnet, A., et al., *High Prevalence of Obesity in Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) Requiring Invasive Mechanical Ventilation*. *Obesity (Silver Spring)*, 2020.
21. Kalligeros, M., et al., *Association of Obesity with Disease Severity Among Patients with Coronavirus Disease 2019*. *Obesity*, 2020(n/a).
22. Palaiodimos, L., et al., *Severe obesity, increasing age and male sex are independently associated with worse in-hospital outcomes, and higher in-hospital mortality, in a cohort of patients with COVID-19 in the Bronx, New York*. *Metabolism*, 2020. **108**: p. 154262.
23. Petrilli, C.M., et al., *Factors associated with hospitalization and critical illness among 4,103 patients with COVID-19 disease in New York City*. *medRxiv*, 2020: p. 2020.04.08.20057794.
24. McCloskey, K.A., et al., *COVID-19 infection and sickle cell disease: a UK centre experience*. *British Journal of Haematology*.
25. Heilbronner, C., et al., *Patients with sickle cell disease and suspected COVID-19 in a paediatric intensive care unit*. *British Journal of Haematology*.
26. Nur, E., et al., *Vaso-occlusive crisis and acute chest syndrome in sickle cell disease due to 2019 novel coronavirus disease (COVID-19)*. *American Journal of Hematology*, 2020. **95**(6): p. 725-726.
27. Hussain, F.A., et al., *COVID-19 infection in patients with sickle cell disease*. *British Journal of Haematology*, 2020. **189**(5): p. 851-852.
28. Panepinto et al., *Cases of COVID-19 among Persons with Sickle Cell Disease in the United States, March 20-May 21, 2020*. *Personal Pre-Publication Correspondence with Authors 2020*.
29. Ketcham, S.W., et al., *Coronavirus Disease-2019 in Heart Transplant Recipients in Southeastern Michigan: A Case Series*. *Journal of Cardiac Failure*, 2020.
30. Latif, F., et al., *Characteristics and Outcomes of Recipients of Heart Transplant With Coronavirus Disease 2019*. *JAMA Cardiology*, 2020.
31. Zhu, L., et al., *Successful recovery of COVID-19 pneumonia in a renal transplant recipient with long-term immunosuppression*. *American Journal of Transplantation*.
32. Fernández-Ruiz, M., et al., *COVID-19 in solid organ transplant recipients: A single-center case series from Spain*. *American Journal of Transplantation*.
33. Travi, G., et al., *Clinical outcome in solid organ transplant recipients with COVID-19: A single-center experience*. *American Journal of Transplantation*, 2020.
34. Tschopp, J., et al., *First experience of SARS-CoV-2 infections in solid organ transplant recipients in the Swiss Transplant Cohort Study*. *American Journal of Transplantation*.
35. Zhu, L., et al., *Association of Blood Glucose Control and Outcomes in Patients with COVID-19 and Pre-existing Type 2 Diabetes*. *Cell Metabolism*, 2020. **31**(6): p. 1068-1077.e3.
36. Bode, B., et al., *Glycemic Characteristics and Clinical Outcomes of COVID-19 Patients Hospitalized in the United States*. *Journal of Diabetes Science and Technology*, 2020: p. 1932296820924469.

37. Chen, Y., et al., *Clinical Characteristics and Outcomes of Patients With Diabetes and COVID-19 in Association With Glucose-Lowering Medication*. *Diabetes Care*, 2020.
38. Fadini, G.P., et al., *Prevalence and impact of diabetes among people infected with SARS-CoV-2*. *J Endocrinological Investigations*, 2020. **43**(6): p. 867-869.
39. Mahdavinia, M., et al., *Asthma prolongs intubation in COVID-19*. *The journal of allergy and clinical immunology. In practice*, 2020: p. S2213-2198(20)30476-1.
40. Chao, J.Y., et al., *Clinical Characteristics and Outcomes of Hospitalized and Critically Ill Children and Adolescents with Coronavirus Disease 2019 (COVID-19) at a Tertiary Care Medical Center in New York City*. *The Journal of Pediatrics*, 2020.
41. DeBiasi, R.L., et al., *Severe COVID-19 in Children and Young Adults in the Washington, DC Metropolitan Region*. *The Journal of Pediatrics*, 2020.
42. Pranata, R., et al., *Impact of Cerebrovascular and Cardiovascular Diseases on Mortality and Severity of COVID-19 – Systematic Review, Meta-analysis, and Meta-regression*. *Journal of stroke and cerebrovascular diseases : the official journal of National Stroke Association*, 2020. **29**(8): p. 104949-104949.
43. Wang, B., et al., *Does comorbidity increase the risk of patients with COVID-19: evidence from meta-analysis*. *Aging*, 2020. **12**(7): p. 6049-6057.
44. Ssentongo, P., et al., *The association of cardiovascular disease and other pre-existing comorbidities with COVID-19 mortality: A systematic review and meta-analysis*. *medRxiv*, 2020: p. 2020.05.10.20097253.
45. Khan, M., et al., *Effects of underlying morbidities on the occurrence of deaths in COVID-19 patients: A systematic review and meta-analysis*. *medRxiv*, 2020: p. 2020.05.08.20095968.
46. Martins-Filho, P.R., C.S.S. Tavares, and V.S. Santos, *Factors associated with mortality in patients with COVID-19. A quantitative evidence synthesis of clinical and laboratory data*. *European journal of internal medicine*, 2020. **76**: p. 97-99.
47. Shi, S., et al., *Association of Cardiac Injury With Mortality in Hospitalized Patients With COVID-19 in Wuhan, China*. *JAMA Cardiology*, 2020.
48. Wang, L., et al., *Coronavirus disease 2019 in elderly patients: Characteristics and prognostic factors based on 4-week follow-up*. *Journal of Infection*, 2020. **80**(6): p. 639-645.
49. Killerby ME et al., *Characteristics Associated with Hospitalization Among Patients with COVID-19 — Metropolitan Atlanta, Georgia, March–April 2020*. *MMWR Morbidity and Mortality Weekly Report*, 2020
50. Guan, W.J., et al., *Comorbidity and its impact on 1590 patients with COVID-19 in China: a nationwide analysis*. *European Respiratory Journal*, 2020. **55**(5).
51. Kim, L., et al., *Interim Analysis of Risk Factors for Severe Outcomes among a Cohort of Hospitalized Adults Identified through the U.S. Coronavirus Disease 2019 (COVID-19)-Associated Hospitalization Surveillance Network (COVID-NET)*. *medRxiv*, 2020: p. 2020.05.18.20103390.
52. Pranata, R., et al., *Hypertension is associated with increased mortality and severity of disease in COVID-19 pneumonia: A systematic review, meta-analysis and meta-regression*. *Journal of the Renin-Angiotensin-Aldosterone System*, 2020. **21**(2): p. 1470320320926899.
53. Matsushita, K., et al., *The relationship of COVID-19 severity with cardiovascular disease and its traditional risk factors: A systematic review and meta-analysis*. *medRxiv*, 2020: p. 2020.04.05.20054155.
54. Yang, Z., et al., *Coronavirus disease 2019 (COVID-19) and pregnancy: a systematic review*. *The Journal of Maternal-Fetal & Neonatal Medicine*, 2020: p. 1-4.
55. Li, N., et al., *Maternal and neonatal outcomes of pregnant women with COVID-19 pneumonia: a case-control study*. *Clinical Infectious Diseases*, 2020.
56. Collin, J., et al., *Public Health Agency of Sweden’s Brief Report: Pregnant and postpartum women with severe acute respiratory syndrome coronavirus 2 infection in intensive care in Sweden*. 2020. **99**(7): p. 819-822.

57. Yan, J., et al., *Coronavirus disease 2019 in pregnant women: a report based on 116 cases*. American Journal of Obstetrics and Gynecology, 2020.
58. Breslin, N., et al., *Coronavirus disease 2019 infection among asymptomatic and symptomatic pregnant women: two weeks of confirmed presentations to an affiliated pair of New York City hospitals*. American Journal of Obstetrics & Gynecology MFM, 2020. 2(2, Supplement): p. 100118.
59. Chen, L., et al., *Clinical Characteristics of Pregnant Women with Covid-19 in Wuhan, China*. 2020. **382**(25): p. e100.
60. Pierce-Williams, R.A.M., et al., *Clinical course of severe and critical COVID-19 in hospitalized pregnancies: a US cohort study*. American Journal of Obstetrics & Gynecology MFM, 2020: p. 100134.
61. Savasi, V.M., et al., *Clinical Findings and Disease Severity in Hospitalized Pregnant Women With Coronavirus Disease 2019 (COVID-19)*. Obstet Gynecol, 2020.
62. Ellington S, Strid P, Tong VT, et al. *Characteristics of Women of Reproductive Age with Laboratory-Confirmed SARS-CoV-2 Infection by Pregnancy Status — United States, January 22–June 7, 2020*. MMWR Morb Mortal Wkly Rep 2020;69:769–75.
63. Patanavanich, R. and S.A. Glantz, *Smoking Is Associated With COVID-19 Progression: A Meta-analysis*. Nicotine & Tobacco Research, 2020.
64. Guo, F.R., *Active smoking is associated with severity of coronavirus disease 2019 (COVID-19): An update of a meta-analysis*. Tobacco Induced Diseases, 2020. **18**: p. 37.
65. Zhao, Q., et al., *The impact of COPD and smoking history on the severity of COVID-19: A systemic review and meta-analysis*. Journal of Medical Virology, 2020.
66. Lippi, G. and B.M. Henry, *Active smoking is not associated with severity of coronavirus disease 2019 (COVID-19)*. European Journal of Internal Medicine, 2020. **75**: p. 107-108.
67. Di Giorgio, A., et al., *Health status of patients with autoimmune liver disease during SARS-CoV-2 outbreak in northern Italy*. Journal of hepatology, 2020: p. S0168-8278(20)30300-7.
68. Marlais, M., et al., *The severity of COVID-19 in children on immunosuppressive medication*. The Lancet. Child & adolescent health, 2020: p. 10.1016/S2352-4642(20)30145-0.
69. Montero-Escribano, P., et al., *Anti-CD20 and COVID-19 in multiple sclerosis and related disorders: A case series of 60 patients from Madrid, Spain*. Multiple sclerosis and related disorders, 2020. **42**: p. 102185-102185.
70. Brenner, E.J., et al., *Corticosteroids, but not TNF Antagonists, are Associated with Adverse COVID-19 Outcomes in Patients With Inflammatory Bowel Diseases: Results from an International Registry*. Gastroenterology, 2020: p. 10.1053/j.gastro.2020.05.032.
71. Michelena, X., et al., *Incidence of COVID-19 in a cohort of adult and paediatric patients with rheumatic diseases treated with targeted biologic and synthetic disease-modifying anti-rheumatic drugs*. Seminars in arthritis and rheumatism, 2020. 50(4): p. 564-570.
72. Ljungman, P., et al., *The challenge of COVID-19 and hematopoietic cell transplantation; EBMT recommendations for management of hematopoietic cell transplant recipients, their donors, and patients undergoing CAR T-cell therapy*. Bone Marrow Transplantation, 2020.
73. Härter, G., et al., *COVID-19 in people living with human immunodeficiency virus: a case series of 33 patients*. Infection, 2020: p. 1-6.
74. Altuntas Aydin, O., H. Kumbasar Karaosmanoglu, and K. Kart Yasar, *HIV/SARS-CoV-2 coinfecting patients in Istanbul, Turkey*. Journal of Medical Virology, 2020.
75. Soresina, A., et al., *Two X-linked agammaglobulinemia patients develop pneumonia as COVID-19 manifestation but recover*. Pediatric Allergy and Immunology, 2020.
76. Gao, Y., et al., *Impacts of immunosuppression and immunodeficiency on COVID-19: A systematic review and meta-analysis*. The Journal of infection, 2020: p. S0163-4453(20)30294-2.
77. Parri, N., M. Lenge, and D. Buonsenso, *Children with Covid-19 in Pediatric Emergency Departments in Italy*. New

England Journal of Medicine, 2020.

78. Mantovani, A., G. Beatrice, and A. Dalbeni, *Coronavirus disease 2019 and prevalence of chronic liver disease: A meta-analysis*. 2020. **40**(6): p. 1316-1320.
79. Moon, A.M., et al., *High Mortality Rates for SARS-CoV-2 Infection in Patients with Pre-existing Chronic Liver Disease and Cirrhosis: Preliminary Results from an International Registry*. Journal of Hepatology, 2020.
80. Ji, D., et al., *Non-alcoholic fatty liver diseases in patients with COVID-19: A retrospective study*. J Hepatol, 2020.
81. Garrido, I., R. Liberal, and G. Macedo, *Review article: COVID-19 and liver disease—what we know on 1st May 2020*. Alimentary Pharmacology & Therapeutics, 2020.
82. Shekerdemian, L.S., et al., *Characteristics and Outcomes of Children With Coronavirus Disease 2019 (COVID-19) Infection Admitted to US and Canadian Pediatric Intensive Care Units*. JAMA Pediatrics, 2020.
83. Cosgriff, R., et al., *A multinational report to characterise SARS-CoV-2 infection in people with cystic fibrosis*. Journal of Cystic Fibrosis, 2020.
84. Alsaied T, Aboulhosn JA, Cotts TB, et al. Coronavirus Disease 2019 (COVID-19) Pandemic Implications in Pediatric and Adult Congenital Heart Disease. J Am Heart Assoc. 2020;9(12):e017224. doi:10.1161/JAHA.120.017224
85. Sanna, G., Serrau, G., Bassareo, P.P. et al. Children's heart and COVID-19: Up-to-date evidence in the form of a systematic review. Eur J Pediatr 179, 1079–1087 (2020).
86. Sabatino, J.; Ferrero, P.; Chessa, M.; Bianco, F.; Ciliberti, P.; Secinaro, A.; Oreto, L.; Avesani, M.; Bucciarelli, V.; Calcaterra, G.; Calabrò, M.P.; Russo, M.G.; Bassareo, P.P.; Guccione, P.; Indolfi, C.; Di Salvo, G. COVID-19 and Congenital Heart Disease: Results from a Nationwide Survey. J. Clin. Med. 2020, 9, 1774.
87. DeBiasi RL, Song X, Delaney M, et al. Severe COVID-19 in Children and Young Adults in the Washington, DC Metropolitan Region [published online ahead of print, 2020 May 13]. *J Pediatr*. 2020;10.1016/j.jpeds.2020.05.007. doi:10.1016/j.jpeds.2020.05.007
88. Chao, J. Y., Derespina, K. R., Herold, B. C., Goldman, D. L., Aldrich, M., Weingarten, J., ... & Medar, S. S. (2020). Clinical characteristics and outcomes of hospitalized and critically ill children and adolescents with coronavirus disease 2019 (COVID-19) at a Tertiary Care Medical Center in New York City. *The Journal of Pediatrics*.
89. Motta, I., et al., *SARS-CoV-2 infection in beta thalassemia: Preliminary data from the Italian experience*. American Journal of Hematology, 2020.
90. Karimi, M., et al., *Prevalence and Mortality due to Outbreak of Novel Coronavirus Disease (COVID-19) in β -Thalassemias: The Nationwide Iranian Experience*.

Last Updated July 22, 2020

Content source: [National Center for Immunization and Respiratory Diseases \(NCIRD\)](#), Division of Viral Diseases