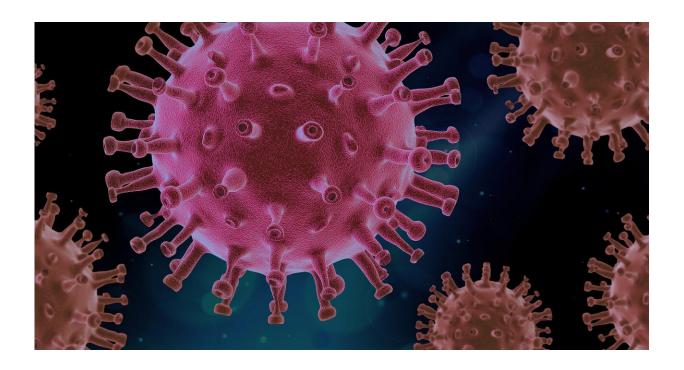# Study finds different comorbidities have different impacts on COVID outcomes

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A new paper in *Biology Methods & Protocols*, published by Oxford University Press, indicates that some pre-existing conditions—including degenerative neurological diseases, dementia, and severe disabilities—matter a lot more than once thought when assessing who is at risk for death due to COVID-19.

COVID-19 has changed lives dramatically. In the United States, the disease may result in a mortality rate as much as 163 times higher than that associated with seasonal influenza. COVID-19 can also be more likely to result in patients needing mechanical ventilation or being admitted to intensive care.

Pre-existing conditions, or comorbidities, make severe illness or death from COVID-19 more likely. But assessing the risk of various conditions for COVID severity has been challenging. Researchers have proposed several mathematical models for predicting death from COVID-19 based on comorbidities. Medical establishments use these models since they help with patient management and resource allocation.

Many diseases increase the mortality rate because they weaken the immune system, make the patient more likely to develop infections, and cause end-organ dysfunction. One method for assessing the risk of various conditions is to group them under broad categories (like "malignancy") and predict outcomes for each category. Another method is to weigh different pre-existing conditions differently and use the sum to predict outcomes. The researchers here believe that these approaches have substantial flaws; the real impact of a specific pre-existing condition is often not well known, broadly similar diseases are often lumped together in prediction models even if the COVID-19 outcomes can be very different, and rare diseases are not well represented.

The researchers here believe that a better approach is to do a systematic survey of all pre-existing conditions, determine which have an impact on outcomes, and then use that to generate a predicted probability of death that represents the aggregate risk posed due to the comorbidity.

Using all diagnostic codes employed by the Department of Veterans Affairs, the researchers developed a new prediction model to estimate

the probability of death from COVID-19. This is the largest study to date following patients with COVID-19 to predict mortality. Starting in 1997, researchers here used diagnoses from the first time a patient sought care until 14 days before a positive COVID-19 test and then compared that to COVID outcomes for the 347,220 COVID patients treated in Veterans Affairs facilities as of September 2021. They found that their new model, which they call PDeathDx, outperformed other conventional prediction models.

What is more, the researchers here found that certain underlying conditions are much more likely to result in death. These include degenerative neurological diseases, dementia, and severe disabilities. Because physicians don't associate these pre-existing conditions with respiratory injury or weakened immunity, conventional risk assessments fail to capture the serious COVID risk for patients with such conditions.

  More information: Heather M Campbell et al, A Novel Method for Handling Pre-Existing Conditions in Multivariate Prediction Model Development for COVID-19 Death, *Biology Methods and Protocols* (2022). DOI: 10.1093/biomethods/bpac017

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