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How Deadly Is Covid-19? Researchers Are Getting Closer to an Answer

Brianna Abbott and Jason Douglas

10-12 minutes

Six months into the pandemic, researchers are homing in on an answer to one of the basic questions about the virus: How deadly is it?

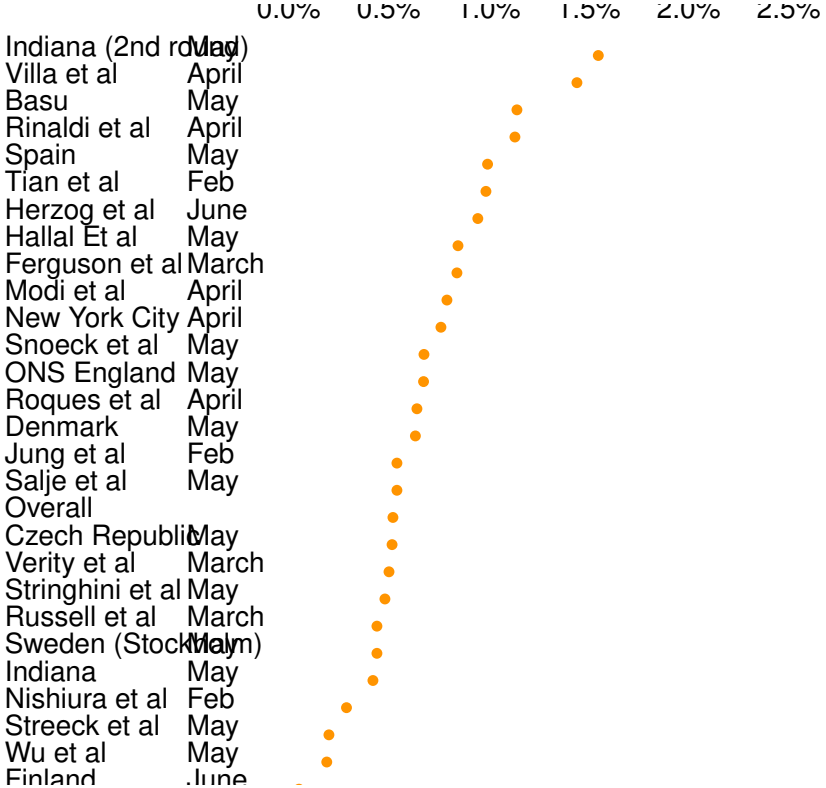
Researchers, initially analyzing data from outbreaks on cruise ships and more recently from surveys of thousands of people in virus hot spots, have now conducted dozens of studies to calculate the infection fatality rate of Covid-19.

That research—examining deaths out of the total number of infections, which includes unreported cases—suggests that Covid-19 kills from around 0.3% to 1.5% of people infected. Most studies put the rate between 0.5% and 1.0%, meaning that for every 1,000 people who get infected, from five to 10 would die on average.

Covid-19 Fatality: Analyzing the Evidence

A comparison of 26 studies that estimate the disease's infection fatality rate* found varying results but pinpointed an overall rate of around 6.8 deaths per 1,000 infections.

Infection fatality rate by study



*The infection fatality rate measures deaths out of total estimated infections as opposed to confirmed cases

Note: Studies not identified by author names were led by governments or local authorities.

Source: Gideon Meyerowitz-Katz, Lea Merone

The estimates suggest the new coronavirus is deadlier than the seasonal flu, though not as lethal as Ebola and other infectious diseases that have emerged in recent years. The coronavirus is killing more people than the deadlier diseases, however, in part because it is more infectious.

“It’s not just what the infection-fatality rate is. It’s also how

contagious the disease is, and Covid is very contagious," said Eric Toner, an emergency medicine physician and senior scholar at Johns Hopkins Center for Health Security, who studies health-care preparedness for epidemics and infectious diseases. "It's the combination of the fatality rate and the infectiousness that makes this such a dangerous disease."

A patient with Covid-19 was treated in April at a hospital in Geneva. Researchers have looked at data from the Swiss city to estimate fatality rates for different age groups.

Photo: martial trezzini/Agence France-Presse/Getty Images

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How confident are you that scientists will eventually gain a clear understanding of Covid-19's death rate across the globe? Join the conversation below.

Health authorities and researchers have been working to gauge the death rate from the coronavirus to better understand the risk of the disease, estimate how many people might die and respond with the necessary public-health measures.

Pinpointing that rate has been challenging, however, because a significant chunk of cases have few to no symptoms or haven't been tested. The rate also varies depending on factors such as a person's age and the strength of a jurisdiction's health-care system.

"It's very difficult to measure, but robust studies are finding a clear signal in the noise," said Timothy Russell, a research fellow at the London School of Hygiene and Tropical Medicine.

A study by Dr. Russell and colleagues published in February that examined data from China and an outbreak on the Diamond Princess cruise ship put the infection-fatality rate at around 0.6%.

More than 14.7 million people have been infected with SARS-CoV-2 across the globe, and over 609,000 people have died, with nearly a quarter of the fatalities in the U.S., according to data compiled by Johns Hopkins University. That means that among confirmed global cases, roughly 4.2% of those people died.

The percentage of deaths among people with confirmed infections is higher than the percentage of deaths among infections overall, researchers say, because so many milder and asymptomatic Covid-19 cases go missed.

The U.S. Centers for Disease Control and Prevention has estimated that for every known case of Covid-19, roughly 10 more went unrecorded through the beginning of May. From March to early May, the total number of infections was likely six to 24 times greater than the number of reported cases depending on the state, the agency

said Tuesday in a paper published in the journal JAMA Internal Medicine.

“The hard bit really is to work out how many people have been infected,” said Lucy Okell, who alongside colleagues at Imperial College London estimated the infection-fatality rate in China at 0.66% in a paper published in March.

Scientists Work to Produce Covid-19 Treatments Under New Conditions

2:03

Scientists Work to Produce Covid-19 Treatments Under New Conditions

It’s far from business as usual at the Indianapolis headquarters of Eli Lilly, with only a sixth of the pharma company’s employees working on-site to develop potential Covid-19 treatments. WSJ’s Peter Loftus takes us inside. Photo: Eli Lilly

To come up with an estimate for the fatality rate, some researchers take the known cases and numbers of deaths, then estimate the proportion missed or asymptomatic cases. Death tallies, however, might also miss undetected Covid-19 fatalities, and researchers must adjust for that as well.

Other researchers develop estimates based on results from antibody test surveys, which scan the blood of participants for signs of past infections.

Yet antibody testing data has its own flaws, as scientists work to understand the immune response to the virus. The researchers must also tweak their estimates to compensate for the risk of faulty

test results or delays between infection and death.

No matter their approach, the researchers use complex mathematical models and statistical techniques to fine-tune their estimates.

An analysis of 26 different studies estimating the infection-fatality rate in different parts of the globe found an aggregate estimate of about 0.68%, with a range of 0.53% to 0.82%, according to a report posted in July on the preprint server medRxiv, which hasn't yet been reviewed by other researchers.

"To say that we will ever have one absolute true estimate is erroneous. We can get an idea of a trend, but we need to be mindful that this can change and vary," said Lea Merone, a public-health physician and health economist at James Cook University in Australia who co-wrote the paper. "It is context dependent."

The CDC is now using the report as the basis for its own best-estimate for the infection-fatality rate in its pandemic planning scenarios. The agency's estimate is 0.65% as of July 10, higher than its previous estimates.

The fatality rate for an individual varies, sometimes markedly, depending on factors such as age, sex and the presence of pre-existing medical conditions, studies show.

Researchers in the U.S. and Switzerland examined data from the Swiss city of Geneva to calculate fatality rates for different age groups. They found those over 65 had an infection-fatality rate of 5.6%—40 times the risk of someone in their 50s.

Quality and access to health care and treatment could shift the mortality rate. Better treatment in the future could push the rate down, but a situation in which a hospital system is overwhelmed

can drive the rate up, said Gideon Meyerowitz-Katz, an epidemiologist at the University of Wollongong who co-wrote the July medRxiv paper.

An infection-fatality rate of roughly 0.6% is six times greater than the 0.1% estimate for seasonal influenza, which is based on CDC data. Though researchers point out the estimates are calculated in different ways and the flu estimate doesn't take asymptomatic cases into account.

Diseases such as SARS, or severe acute respiratory syndrome; MERS, or Middle East respiratory syndrome; and Ebola are much deadlier, with case fatality rates ranging from roughly 10% to 50%.

There have been far fewer deaths from those diseases than the new coronavirus and even the seasonal flu because they aren't nearly as infectious or widespread.

SARS and MERS have killed 774 and 858 people, respectively. More than 11,300 people have died from Ebola.

Also, many doctors worry Covid-19 might result in longer-term complications for some patients, especially those who have spent weeks in the hospital before being discharged.

"There's this narrative I think a lot of people have that you get the disease and you die, or you're fine. And that's not true," Dr. Toner said. "There's a large range of health-care consequences for people who get severely ill, not just death."

Write to Brianna Abbott at brianna.abbott@wsj.com and Jason Douglas at jason.douglas@wsj.com