

SARS-CoV-2

**COVID-19:****Assessing Infection Severity**

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## 1. HOW CAN THE SEVERITY OF COVID-19 BE CALCULATED?

COVID-19 (coronavirus disease 2019) is caused by the SARS-CoV-2 virus, the newest strain among seven coronaviruses known to infect humans.<sup>1</sup> Although more than 99% of people infected with SARS-CoV-2 fully recover, some cases involve severe complications and could be fatal.<sup>2</sup> The severity of COVID-19 can be measured by calculating a case-fatality rate (CFR): dividing the number of people who died from the infection by the total number of people who were infected.<sup>3</sup> In the context of COVID-19 epidemiological studies, the CFR is sometimes expressed as an infection-fatality rate (IFR).<sup>4</sup>



$$\text{Case-Fatality Rate} = \frac{\# \text{ COVID-19 Deaths}}{\# \text{ SARS-CoV-2 Infections}}$$

## 2. HOW CAN THE TOTAL NUMBER OF SARS-COV-2 INFECTIONS BE DETERMINED?

Public health departments and Centers for Disease Control and Prevention (CDC) track and report SARS-CoV-2 infections detected from people seeking medical care (i.e., those who have a nose or throat swab test that is positive for genetic material from the virus).<sup>5</sup> However, the majority of infections occur in people who don't seek medical care and are therefore not reported. Per CDC, "Most people have mild illness and can recover at home without medical care."<sup>6</sup>

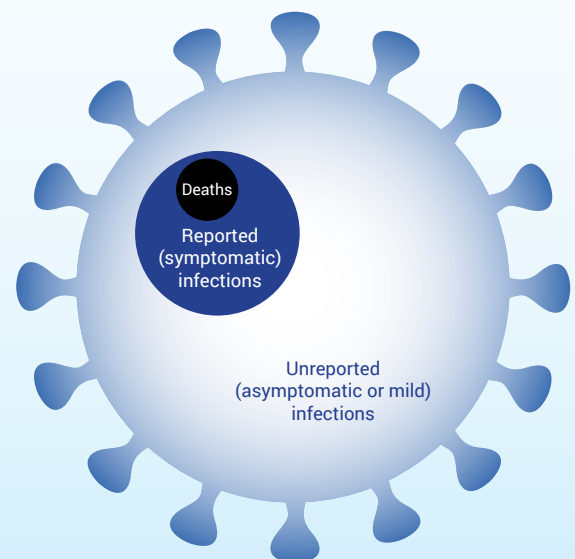
Antibody surveillance studies, however, are able to capture the proportion of asymptomatic and mild infections that occur from unreported cases (people who don't seek medical care) by testing for SARS-CoV-2 antibodies in blood (specific proteins produced by one part of the immune system in response to previous infection).<sup>5,7</sup> These types of antibody tests more comprehensively capture the total number of SARS-CoV-2 infections (both reported and unreported cases) in a population, increase the denominator in the CFR equation, and decrease the reported case-fatality rate to more closely match the true rate.<sup>8</sup> See Figure 1.

## 3. HOW ARE THE NUMBER OF COVID-19 DEATHS DETERMINED?

Until the peak of the pandemic, all deaths with positive laboratory confirmation of SARS-CoV-2 infection were counted as COVID-19 related deaths. However, on April 14, 2020, the CDC adjusted the criteria for counting a COVID-19 death to no longer require a positive laboratory test.<sup>9</sup> This adjustment can increase the numerator in the CFR equation and increase the CFR.

## 4. HAVE THERE BEEN ANY CFR ESTIMATES BASED ON ANTIBODY STUDIES?

Yes, several public health departments and research institutions have conducted antibody surveillance studies to determine the prevalence of SARS-CoV-2 in a sample of the population and used that data to estimate the total number of infections (both reported and unreported).<sup>10-18</sup> See Table 1. The number of deaths is divided by the number of infections to calculate the case-fatality rate. The average CFR of the antibody studies shown on Table 1 is 0.26%.



**Figure 1:** Case-fatality rate (CFR) = Deaths ÷ total infections. Total infections = Reported (symptomatic) infections + unreported (asymptomatic or mild) infections.

COVID-19: Location	Infections (% of population)	Deaths	Case-Fatality Rate (CFR)
Los Angeles County, CA	367,000 (4.65%) <sup>10</sup>	423 <sup>11</sup>	0.12%
Santa Clara County, CA	54,000 (2.8%) <sup>12</sup>	94 <sup>12</sup>	0.17%
Miami-Dade County, FL	165,000 (6%) <sup>13</sup>	374 <sup>14</sup>	0.23%
Arizona	226,000 (3.1%) <sup>15</sup>	549 <sup>16</sup>	0.24%
New York City, NY	2.075 million (24.7%) <sup>17</sup>	10,746 <sup>18</sup>	0.52%
<b>Average CFR</b>			<b>0.26%</b>

**Table 1:** Estimated CFR from antibody studies of SARS-CoV-2 conducted by several public health departments and research institutions.



## 5. WERE INITIAL ESTIMATES OF SARS-COV-2 SEVERITY BASED ON ANTIBODY STUDIES?

No. On March 3, 2020, the World Health Organization (WHO) wrote that globally “about 3.4% of reported COVID-19 cases have died”<sup>19</sup>—a figure that did not include unreported cases. On March 16, a report from Imperial College London stated, “the public health threat [that COVID-19] represents is the most serious seen in a respiratory virus since the 1918 H1N1 influenza pandemic” and that SARS-CoV-2 is “a virus with comparable lethality to H1N1 influenza in 1918.”<sup>20</sup> Neither the latter report nor similar CDC modeling predictions publicized on March 13 were based on antibody testing.<sup>21</sup>



## 6. HAVE THERE BEEN ANY ESTIMATES OF THE SARS-COV-2 CFR SINCE THE ANNOUNCEMENT OF THE RESULTS OF ANTIBODY STUDIES?

Yes. In May 2020, the CDC estimated that the overall CFR of SARS-CoV-2 based on symptomatic cases is 0.4%. The CDC also estimated that 35% of SARS-CoV-2 infections are asymptomatic, resulting in an overall CFR of 0.26% (0.4% times 65%), ranging from 0.03% in people younger than 50 to 0.8% in people 65 and older.<sup>2</sup>



**In May 2020, the CDC estimated that the overall CFR of COVID-19 is 0.26%.**



## 7. WHAT IS THE SEVERITY OF SARS-COV-2 RESPIRATORY ILLNESS COMPARED TO FLU SEASONS?

Relative to CFRs that are based on both reported and unreported cases, the CFR of SARS-CoV-2 is comparable to that of respiratory illness (both flu and pneumonia) during seasons of typical or pandemic flu, and SARS-CoV-2 is significantly less severe than the 1918 flu pandemic.<sup>22-24</sup> Table 2 shows the CFR of respiratory illness during several flu seasons and pandemics.

Influenza: Period	Infections (% of population)	Deaths	Case-Fatality Rate
2017–2018 Seasonal Flu	45 million (14%) <sup>22</sup>	61,000 <sup>22</sup>	0.14%
2015–2016 Seasonal Flu	24 million (7.5%) <sup>22</sup>	23,000 <sup>22</sup>	0.1%
1968–1972 Flu Pandemic	80 million (39%) <sup>23</sup>	111,927 <sup>24</sup>	0.14%
1957–1960 Flu Pandemic	42 million (24%) <sup>24</sup>	115,700 <sup>24</sup>	0.28%
1918–1920 Flu Pandemic	30 million (29%) <sup>24</sup>	675,000 <sup>24</sup>	2.25%

**Table 2:** Estimated overall CFR of respiratory illness during several seasonal and pandemic flu periods.

As Fauci et al. noted in the New England Journal of Medicine, a case-fatality rate of SARS-CoV-2 “considerably less than 1%...suggests that the overall clinical consequences of COVID-19 may ultimately be more akin to those of a severe seasonal influenza (which has a case fatality rate of approximately 0.1%) or a pandemic influenza (similar to those in 1957 and 1968).”<sup>25</sup>

*...the overall clinical consequences of COVID-19 may ultimately be more akin to those of a severe seasonal influenza...*

**Note:** CFR calculations of both SARS-CoV-2 and influenza may be affected by several factors, including the accuracy of disease diagnosis, the accuracy of antibody testing, the time it takes for antibodies to develop after infection, the time span between infection and reporting of death, treatment protocols, and the characteristics of study populations, such as geography and age distribution.

All references are available at [physiciansforinformedconsent.org/COVID-19](https://www.physiciansforinformedconsent.org/COVID-19).

These statements are intended for informational purposes only and should not be construed as personal medical advice.

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Note: Population estimates obtained from the U.S. Census Bureau.