

BC COVID-19 Surveillance System Update: Infection episode-based approach

May 2023

Key messages

- The British Columbia (BC) COVID-19 surveillance system is being updated on May 4, 2023 to better reflect COVID-19 epidemiology in the province. The changes include:
 - Shifting from ‘cases of COVID-19’ to ‘infection episodes of COVID-19’ to capture multiple COVID-19 infections in the same person.
 - Moving from hospital or critical care admissions related to a person’s first positive test only to including all hospital or critical care admissions (first or subsequent positive tests).
 - Switching from deaths occurring within 30 days of a first lab positive result to deaths that have a positive lab test within 30 days of date of death.
- The impact of this system change on reported numbers is minimal, and does not change trends or patterns, nor the conclusions that were shared in previous surveillance reports.

Background – COVID-19 Surveillance in BC

Disease surveillance systems are important for tracking and controlling infectious diseases like COVID-19. However, interpretation of surveillance data is affected by a number of factors, such as changes in the virus, testing strategies, case definitions and data systems. To make sure the surveillance systems work well and stay relevant, they need to be flexible and able to adjust to changes in the epidemiology of the virus and data collection methods. The COVID-19 surveillance system in British Columbia (BC) has gone through three transitions to effectively monitor COVID-19 activity (**Figure 1**).

In January 2020, when BC started to collect case data, a manual line list model was initially implemented based on contact tracing from the five regional health authorities (Fraser Health, Interior Health, Island Health, Northern Health, and Vancouver Coastal Health). Such methodology is commonly used during outbreak management when little information is known about a disease. This system was based on regionally collected data that was submitted to the BC Centre for Disease Control (BCCDC) for collation, standardization, and public reporting. Manual data collection was resource-intensive even during periods with low levels of circulating virus, and became unsustainable after the Omicron wave of 2022 led to a large increase in daily reported cases and in addition to the declining value of information collected on the case report form.

On April 2, 2022, an automated process using lab, hospital and mortality data was implemented. This new system was designed to mirror, where possible, the data found in the regionally submitted line lists, and linked

an individual’s first positive Medical Services Plan-funded lab test¹ to a hospitalization and mortality event, if applicable. However, this dependency on an individual’s first positive result limited the system’s ability to capture multiple infection episodes and severe outcomes related to multiple infections. Viral evolution, particularly during the Omicron wave, led to an increase in multiple infections and meant the system was underreporting cases. Major factors that have contributed to the underreporting of cases included the shift in [testing strategy](#) to a select population group and the increased availability of point of care testing.

On May 4, 2023, the BCCDC will move away from a system anchored on the first positive lab test to an infection episode-based model. This will allow the system to capture multiple infection episodes for the same person as well as hospitalizations, critical care admissions, and mortality related to these additional infection episodes.

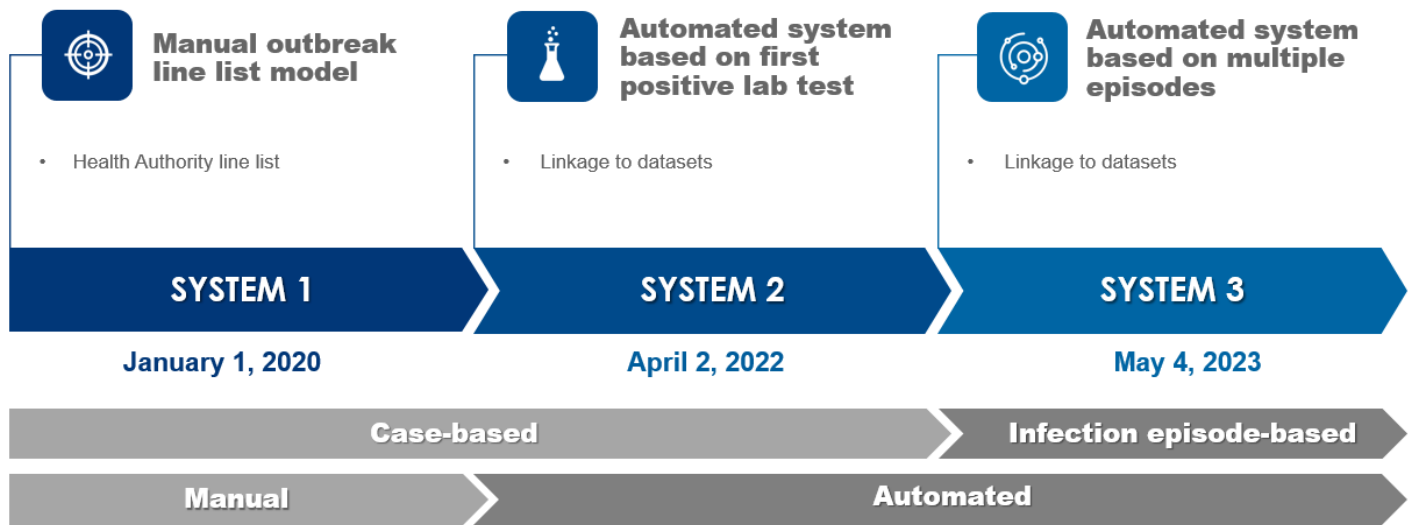


Figure 1. BC COVID-19 surveillance system transitions over time.

System Updates

The new infection episode-based system for COVID-19 surveillance and reporting will be deployed on May 4, 2023. This affects definitions for cases, hospitalizations, critical care admissions and deaths:

Cases: In the updated COVID-19 surveillance system, lab COVID-19 positive tests occurring within 30 days of each other for the same person will be grouped together and classified as one COVID-19 infection episode. If

¹ Lab tests refer to polymerase chain reaction (PCR)

an individual has another positive test that occurs more than 30 days from their last positive test, the system will create a new, separate COVID-19 infection episode (**Figure 2**). This marks a change from the previous system which was limited to first-time lab positive tests, and did not count individuals more than once. Going forward, we will report on all COVID-19 infection episode(s) in a given time period, thus capturing multiple infection events per person.

Please note that the surveillance system only includes people who have tested positive for COVID-19 through a lab test that is funded by the Medical Services Plan. Due to a targeted testing strategy primarily aimed to inform patient care, the system will not capture all COVID-19 infections in the BC population. Positive results through rapid antigen tests (RAT), which became available in December 2021, are not reported to public health. While the surveillance system may not capture all COVID-19 infections, the system is able to monitor changes over time.

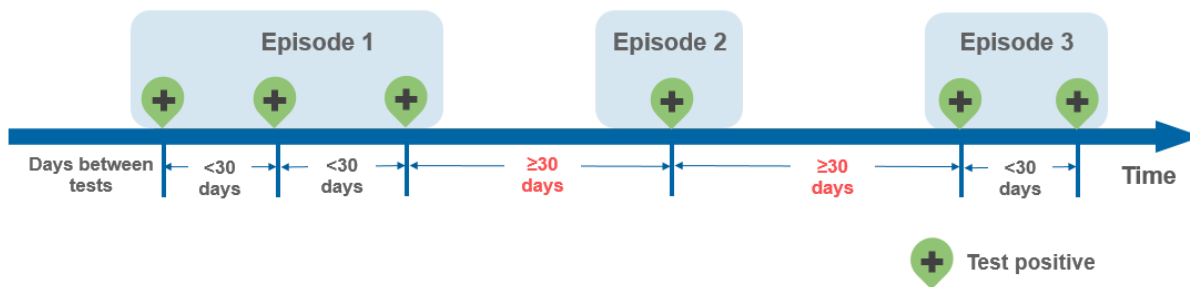


Figure 2. Example of COVID-19 infection episode methodology.

Hospitalizations: The updated surveillance system will capture all hospitalizations with a positive COVID-19 test, regardless if it was the first or subsequent test. In contrast, the previous definition only captured first-time hospital admissions related to COVID-19.

Critical care admissions: The updated surveillance system will capture all critical care admissions with a positive COVID-19 test, regardless if it was the first or subsequent test. In contrast, the previous definition only captured first-time critical care admissions related to COVID-19.

Deaths: The updated surveillance system will continue to monitor deaths in people with a positive lab COVID-19 test. However, the new definition will capture deaths that have any lab COVID-19 test within 30 days of death. This is a change from the previous approach, which captured deaths within 30 days of the first lab positive test.

A complete description of changes to the surveillance system over the course of the pandemic can be seen in Appendix 1.

Strengths and Limitations

Strengths

Able to report on multiple COVID-19 infection episodes, and all admissions to hospital and critical care with any positive test: The surveillance system is agile and a robust algorithm has been developed to capture multiple COVID-19 infection episodes, as well as multiple admissions to hospital and critical care.

Uses automated processes: The surveillance system is designed using automated processes to streamline data collection and reduce the risk of errors or discrepancies in the data. This also allows for more timely and efficient reporting of COVID-19 cases, hospitalizations, critical care admissions, and deaths.

Leverages established datasets: The surveillance system uses existing, reliable administrative datasets from the BCCDC Public Health Laboratory and British Columbia Vital Statistics. The Provincial Health Services Authority's (PHSA) Provincial COVID-19 Monitoring Solution was created in response to the COVID-19 pandemic.

Limitations

Limitations in identifying true reinfections: Not all COVID-19 samples are sent for genetic testing, which means that the system cannot confirm whether separate episodes are due to re-infection or ongoing virus shedding from the same infection. True reinfections can only be confirmed by comparing genetic differences between samples. Based on internal validation of laboratory data, the time-based approach of a 30-day COVID-19 episode interval aims to minimize the impact of this limitation. However, it is possible that individuals with more than one COVID-19 infection episode may not actually have a true reinfection, but may instead be shedding SARS CoV-2, the virus that causes COVID-19, for a prolonged period of time.

Timeliness of data: We operate in a live database environment, with inputs from different clinical and administrative health data systems. There can be delays in flow of information to the BCCDC for reporting that may underestimate new hospital admissions, critical care admissions and deaths in more recent weeks. It is expected that those numbers will increase in the following weeks. This is a normal feature of surveillance data and is not limited to the BC COVID-19 surveillance system.

Deaths: To enable timely situational awareness on trends in COVID-19 deaths, the surveillance system reports on deaths that have any lab COVID-19 test within 30 days of death. It can take 4-8 weeks to identify COVID-19-related mortality and report the true underlying cause of death. Many deaths included in initial reporting are not ultimately attributed to COVID-19 infection as the underlying cause; however the trends are generally consistent and therefore this metric remains valuable for surveillance. Reporting of deaths by underlying cause of death is included in reporting when the information becomes available.

Impacts of the System Change

Retrospective analyses were conducted to evaluate how including multiple COVID-19 episodes impacts the number of cases and severe outcomes reported. The overall trends and patterns remain the same, indicating that the surveillance system is functioning as expected.

Overall, between April 1, 2022, and March 31, 2023, the system change results in a small increase in the number of infection episodes of COVID-19 (**Figure 3**). There were 45,124 infection episodes of COVID-19 in the updated system and 41,529 cases in the old system.

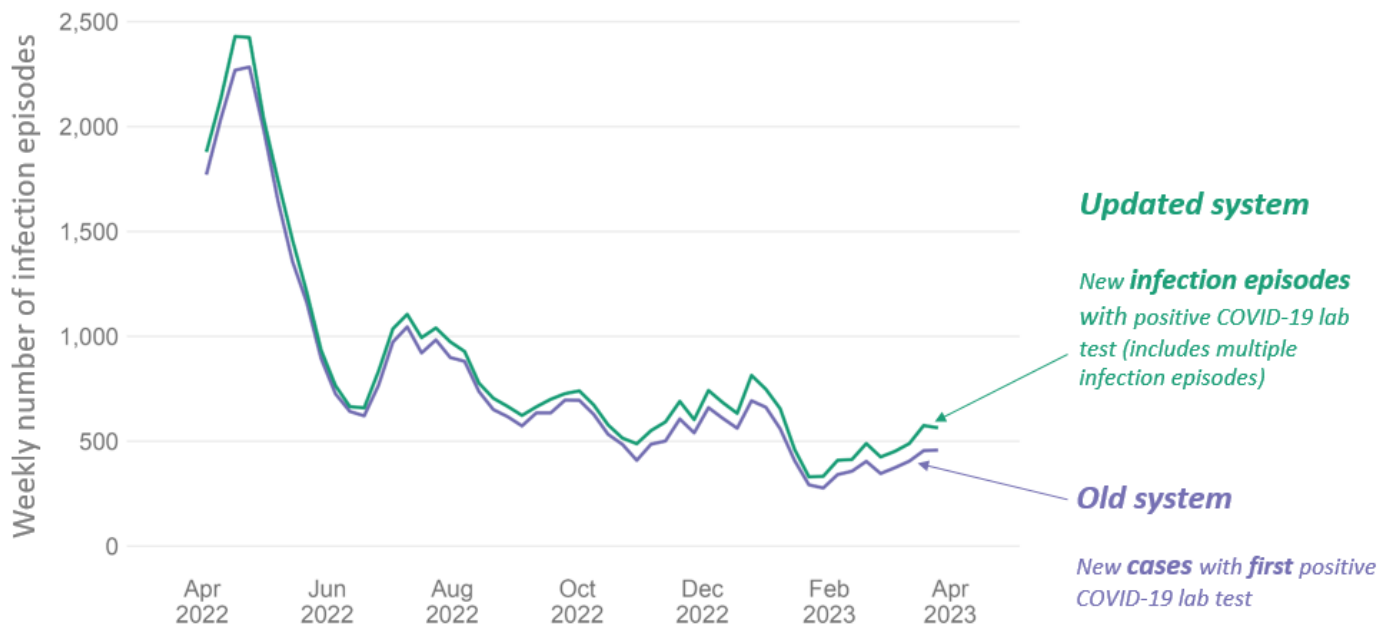


Figure 3. Comparison of case/infection episode numbers between the old and updated BC COVID-19 surveillance systems.

Between April 1, 2022, and March 31, 2023, multiple separate hospital or critical care stays with a positive COVID-19 test for the same patient are not common (**Figures 4 and 5**). There were 16,133 total admissions to hospital in the new system and 14,227 total admissions to hospital in the old system. Similarly, there were 2,242 total admissions to critical care in the new system and 2,099 total admissions to critical care in the old system.

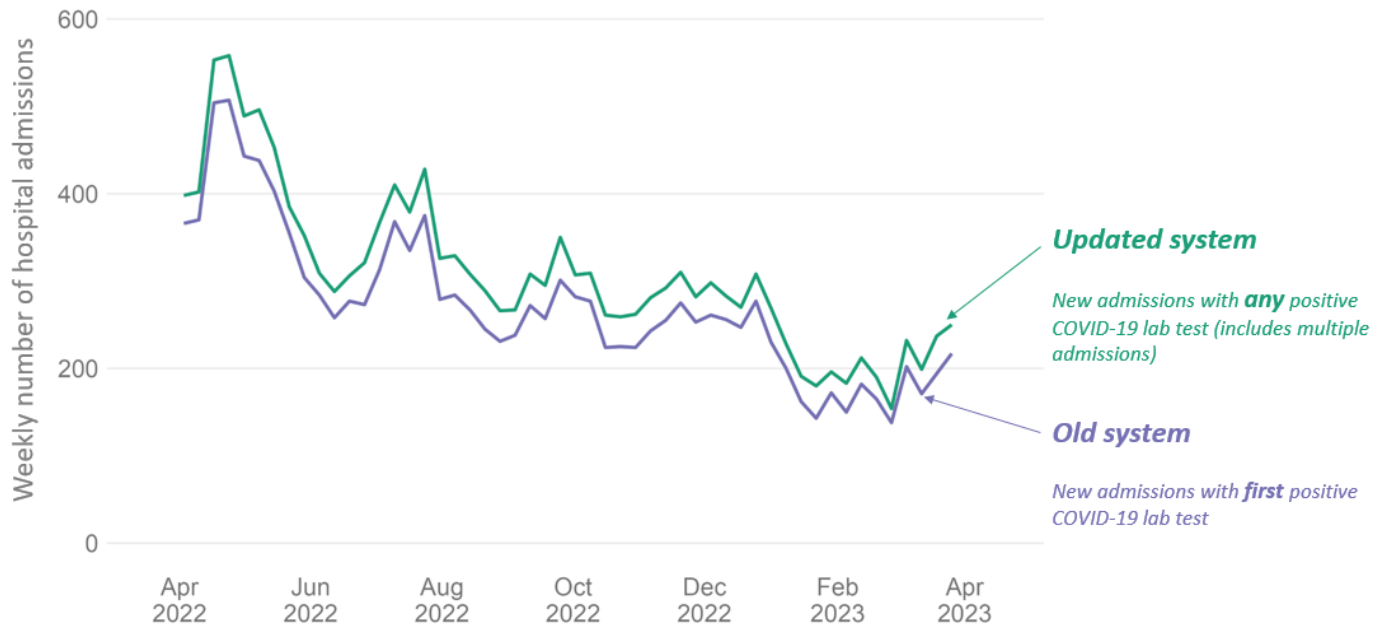


Figure 4. Comparison of hospital admission numbers between the old and updated BC COVID-19 surveillance systems.

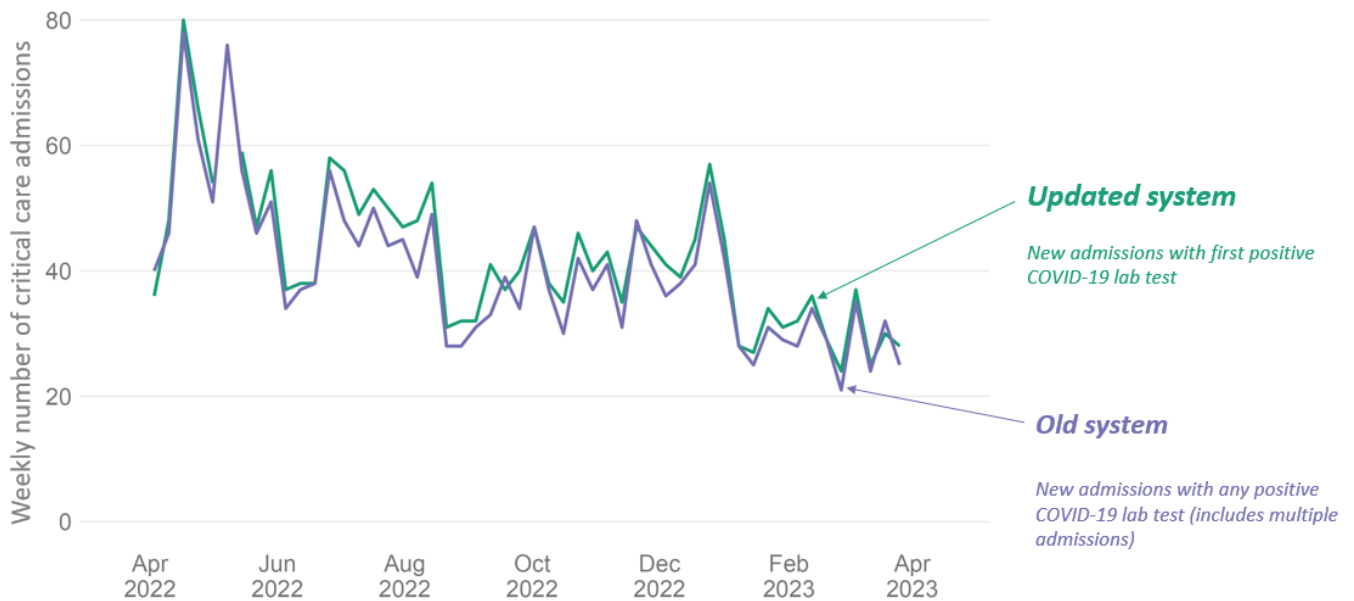


Figure 5. Comparison of critical care admission numbers between the old and updated BC COVID-19 surveillance systems.

From April 1, 2022 to March 31, 2022, the inclusion of deaths with any positive COVID-19 lab test within 30 days of the date of death was 2,656 (updated system), 279 (12%) more deaths compared to deaths from any cause within 30 days of a first positive test (old system) (**Figure 6**). From April 1, 2022 to February 4, 2023, deaths with an underlying cause of death of COVID-19 (n=1,151 deaths), which is a more accurate way of identifying COVID-19 related mortality, showed similar overall trends when compared to the two other systems.

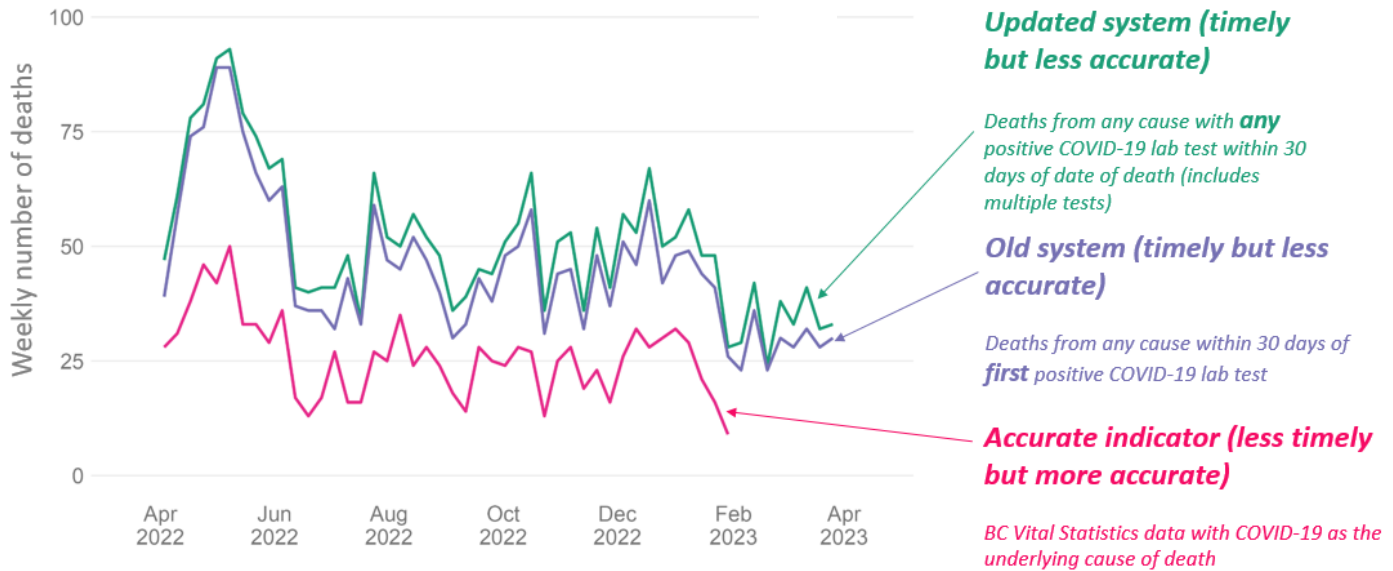


Figure 6. Comparison of death numbers between the old and updated BC COVID-19 surveillance systems.

One of the reasons why the impact of this system transition is small is because the vast majority of infections in BC are not captured through lab testing and lab testing generally reflects patients tested in health care settings. Another reason is that for the vast majority of people who are hospitalized or die and have a positive COVID-19 test, it is their first test in the lab system.

In summary, the transition to an infection episode-based definition allows for surveillance data to better reflect COVID-19 epidemiology in BC. The impact of this system change on reported numbers is minimal, and does not change trends or patterns, nor the conclusions that were shared in previous surveillance reports. At the core of public health surveillance is the triangulation of information across different sources of knowledge to obtain situational awareness. By integrating these data with other COVID-19 surveillance data, such as wastewater and community visits found on the [BCCDC Respiratory Diseases website](#), we can provide a more complete picture of the changing activity of respiratory diseases, including COVID-19, in BC.

Appendix 1: Indicator definition changes to the BC COVID-19 Surveillance System

	January 2020 – April 1, 2022	April 2, 2022 – May 3, 2023	May 4, 2023 - Present
Data sources	<p>Detailed case information: COVID-19 Case Report Form submitted by Regional Health Authorities to the BC Centre for Disease Control (BCCDC)</p> <p>Cases: Provincial Laboratory Information Solution (PLIS) or BCCDC Public Health Laboratory information system</p>	<p>Cases: Provincial Laboratory Information Solution (PLIS) or BCCDC Public Health Laboratory information system</p> <p>Hospitalizations: Provincial Health Services Authority Provincial COVID-19 Monitoring Solution</p> <p>Deaths: BC Vital Statistics Agency</p>	<p>Cases: Provincial Laboratory Information Solution (PLIS) or BCCDC Public Health Laboratory information system</p> <p>Hospitalizations: Provincial Health Services Authority Provincial COVID-19 Monitoring Solution</p> <p>Deaths: BC Vital Statistics Agency</p>
Cases	<p>Total COVID-19 cases include lab-confirmed, lab-probable and epi-linked cases. Cases included those reported by the health authorities for the first time and any individual with a first positive lab-confirmed COVID-19 test reported in the Provincial Laboratory Information Solution (PLIS) or Sunquest.</p>	<p>Any individual with a first positive lab-confirmed COVID-19 test reported in PLIS or Sunquest.</p> <p>Subsequent positive lab-confirmed COVID-19 tests were not included.</p>	<p>Positive lab-confirmed COVID-19 test(s) belonging to the same individual are grouped together and considered part of the same infection episode if they are within 30 days. Positive lab-confirmed COVID-19 tests that are 30 or more days apart (regardless of negative tests in between) are considered a separate infection episode, and therefore an individual may have more than one infection episode of COVID-19.</p>
Hospital admissions	<p>Any person admitted to a hospital for at least an overnight stay, or with a prolonged hospital stay, for reasons directly or indirectly related to their COVID-19 infection, and with no period of complete recovery between illness and admission. This includes persons admitted to hospital but without transfer to a ward/unit.</p>	<p>A single hospitalization is linked to a first positive lab-confirmed test and counted as a hospitalization if it meets one of the following criteria:</p> <ol style="list-style-type: none"> 1. The hospitalization was related to an individual identified as a COVID-19 patient by the facility based on a positive lab test (regardless time between positive test date and admission date) 2. The hospitalization was initiated within 0-14 days of the first positive lab-confirmed test (regardless of whether they were identified by the facility as being a COVID-19 patient) <p>Single day hospital stays (e.g. admission, discharge on same date) were excluded.</p>	<p>All hospitalizations related to an individual identified by the facility as a COVID-19 patient (based on a positive test).</p> <p>Single day hospital stays (e.g. admission, discharge on same date) were excluded.</p>

Critical Care Admissions	Any person with a COVID-19 related hospitalization and an admission to the intensive care unit.	Any individual hospitalized (see above) and admitted to critical care (Intensive Care Unit, High Acuity Unit, or critical care surge beds) during that hospitalization.	Any individual hospitalized (see above) and admitted to critical care (Intensive Care Unit, High Acuity Unit, or critical care surge beds) during that hospitalization.
Deaths	A death occurring in any individual with no period of complete recovery between illness with COVID-19 and death, unless there is evidence that COVID-19 did not contribute to the death (e.g., trauma, poisoning, and drug overdose).	A death (related or not related to COVID-19) that occurred within 30 days of a first positive lab-confirmed COVID-19 test.	A death (related or not related to COVID-19) that has a positive lab-confirmed COVID-19 test within 30 days of date of death.