Oregon HOSCAP COVID-19 Review

April 2021–April 2022

Oregon Health Authority

Executive Summary

This report provides an overview of Oregon's COVID-19 hospitalization and hospital capacity data, as reported during the second year of COVID-19 data collection in Oregon's Hospital Capacity Web System (HOSCAP), a secure web-based dashboard where all Oregon and Southwest Washington hospitals share capacity data in a real-time environment. Hospital capacity metrics are used by hospitals, health systems, and state health authorities for health planning and responding to the current pandemic. Every hospital in Oregon is asked to submit data to HOSCAP, from which Oregon Health Authority (OHA) collects counts of hospitalized patients who are suspected to have COVID-19 or have tested positive for COVID-19 (and how many are in intensive care unit beds or on ventilators), as well as total and available staffed hospital beds (by type).

While HOSCAP is a valuable tool for tracking daily hospitalization counts over time, HOSCAP data do not include daily hospital admissions, hospital staffing decisions, or any patient's demographic information, length of hospital stay, or reasons for hospitalization. Understanding these limitations to HOSCAP data and including insights from other data sources can provide a more complete picture of COVID-19 pandemic trends in Oregon, particularly in seeking to understand and address health inequities. As the pandemic continues, OHA maintains ongoing conversations with hospitals and other stakeholders to monitor COVID-19 hospitalization and bed occupancy trends.

Major findings:

Oregon experienced three waves of COVID-19 positive hospitalizations between April 2021 and April 2022, with higher patient counts during the latter two surges than during any prior surge

- On May 3 and May 13, 2021, Oregon's hospitals reported a spring peak census of 351 hospitalized patients testing positive for COVID-19.
- The Delta variant fueled a summer surge in COVID-19 positive hospitalizations that peaked on September 1, 2021, with 1,178 patients. This patient count was more than double any previously recorded census.
- COVID-19 positive hospitalizations decreased following the summer peak but remained high. The lowest patient census reported before hospitalizations began to rise again was 338 COVID-19 positive patients on December 21 (4% lower than the peak of the spring surge).
- The Omicron variant drove a subsequent winter surge that peaked on January 27, 2022, with 1,130 COVID-19 positive patients.

Though the summer and winter surges saw similar volumes of hospitalized COVID-19 positive patients, the summer surge produced more patients needing care in intensive care unit (ICU) beds

- The peak number of COVID-19 positive patients in ICU beds during the spring surge occurred on May 6, 2021, with 90 ICU patients. These patients represented 27% of all COVID-19 positive patients in hospital beds that day.
- The COVID-19 positive ICU patient census peaked during the summer on August 29, 2021, at 330 patients. This was 29% of all COVID-19 positive hospitalized patients—the highest proportion recorded during the year.
- COVID-19 positive ICU patients peaked for the winter surge on February 7, 2022, at 197 patients in ICU beds (18% of all COVID-19 positive patients).

Hospital bed capacity constraints were widespread, and particularly persistent for adult non-ICU beds

- Overall adult bed occupancy reached the highest reported level on January 5, 2022, when 95% of adult ICU and non-ICU hospital beds were occupied.
- Hospital bed occupancy remained high following the winter surge, and the reporting year concluded with 91% of Oregon's adult ICU and non-ICU hospital beds occupied on April 5, 2022.
- Reported statewide adult non-ICU bed occupancy was over 90% on 266 days during the year, and adult ICU occupancy registered above 90% on 155 of these days.
- Most hospitals reached maximum occupancy for adult ICU or adult non-ICU beds at some point, with as many as 28 hospitals reporting full ICUs on a single day, and up to 27 hospitals reporting no available non-ICU beds.

Comparing data from the first two years of HOSCAP COVID-19 data collection shows greater demands on hospital capacity during the second year, as well as longer lag times between peaks in new cases and COVID-19 positive hospitalizations

- Oregon hospitals supported 73,084 COVID-19 positive patient bed days (the cumulative number of hospital beds occupied by COVID-19 positive patients) during the first year, including 18,988 COVID-19 positive ICU bed days. The second year saw more than twice this volume, at 181,423 COVID-19 positive patient bed days (42,028 in ICU).
- The lag between peaks in new cases and hospitalizations was 11 days for the summer 2020 surge (using a 14-day moving average). This increased with each subsequent surge to a lag of 20 days in the winter 2021–2022 surge.

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Introduction

Oregon's first presumptive case of COVID-19 was identified on February 28, 2020. By March 8, Governor Kate Brown issued a declaration of emergency due to the public health and safety threat posed by COVID-19. There were 14 COVID-19 cases in Oregon, 430 cases in the United States, and 101,927 cases worldwide at the time. Much has changed since then, as new COVID-19 variants have caused subsequent waves of illness and added to the ongoing capacity strains felt by hospitals and health systems.

Hospitals, health systems, and state health authorities nationwide use hospital capacity metrics for health planning and responding to the current pandemic. When the number of hospitalized patients testing positive for COVID-19 rises, it serves as a warning that demands on healthcare systems may increase. The dynamic nature of hospitalizations can further strain hospital resources. A previous report[1] summarizes trends in the first year of Oregon's COVID-19 hospitalization and hospital capacity data as reported to Oregon's Hospital Capacity Web System (HOSCAP). As we reflect on the ongoing pandemic response, this report provides an overview of the second year of HOSCAP COVID-19 data.

What is (and is not) HOSCAP?

Every hospital in Oregon is asked to submit data to HOSCAP, a secure web-based platform where all Oregon and Southwest Washington hospitals share bed availability in a real-time environment to inform hospital operations. Other partners using the system for situational awareness and patient routing include first responders, EMS providers, 911, and other local, state, and federal partners.

Whenever a patient surge or disruption to the healthcare delivery network occurs, the HOSCAP system plays a role. HOSCAP can be used during disease outbreaks, mass casualty incidents (MCIs), or communications disruptions to assist in zone management, relaying information, and coordinating recovery and response efforts. HOSCAP's use across the state allows for a redundant communication conduit when other systems are unavailable or compromised.

HOSCAP is federally funded and maintained by the OHA Public Health Division's Health Security, Preparedness and Response program (HSPR). Beginning in early April 2020, HOSCAP was expanded to include fields for COVID-19 data collection. HOSCAP also satisfies mandatory reporting of Oregon

[1] Oregon HOSCAP Covid-19 Review: April 2020–April 2021 available at https://sharedsystems.dhsoha.state.or.us/DHSForms/Served/le3805.pdf

hospital census data to the federal Department of Health and Human Services (as it did during the 2009 H1N1 influenza pandemic).

Using this system, OHA counts each day:

- currently hospitalized patients who test positive for, or are suspected to have, COVID-19
- currently hospitalized patients with COVID-19 in intensive care unit (ICU) beds or on ventilators
- the current number of total and available staffed hospital beds, by type

OHA aggregates these data for the state, as well as each of 7 hospital regions in Oregon.[2] OHA also calculates how many staffed beds are being used. Staffed beds are beds that the hospital has staff and equipment to support.

Data reported to HOSCAP do not include daily admissions, nor patients' length of stay. HOSCAP does not capture demographic information about patients (such as whether they live in Oregon or out of state), staffing ratios (or decisions around staffing), nor the cause of patients' hospitalizations. Finally, hospital capacity data do not show the maximum capacity of hospitals. Hospitals may need to repurpose other types of hospital beds, or postpone or cancel elective procedures, to maximize staff and bed capacity in hospitals.

COVID-19 hospitalization trends in Oregon

Figure 1 (on the following page) displays daily counts of COVID-19 positive patients in hospital beds, covering the first two years after the HOSCAP system began collecting COVID-19 data on April 6, 2020. During the first year of data collection, Oregon experienced two waves of COVID-19 positive hospitalizations. The fall 2020 wave peaked at more than three times the July 2020 peak census.

- July 24, 2020: hospitals reported 168 COVID-19 positive patients
- November 30, 2020: hospitals reported 584 COVID-19 positive patients

In the second year of HOSCAP COVID-19 data collection (April 6, 2021–April 5, 2022), Oregon faced three waves of COVID-19 positive hospitalizations. Hospitals reported far higher numbers of COVID-19 positive patients during the latter two of these surges, as compared to any previous surge in either year.

- May 13, 2021: hospitals reported 351 COVID-19 positive patients

[2] Region refers to the location of the hospital, not the residence of the patient.

- September 1, 2021: hospitals reported 1,178 COVID-19 positive patients
- January 27, 2022: hospitals reported 1,130 COVID-19 positive patients

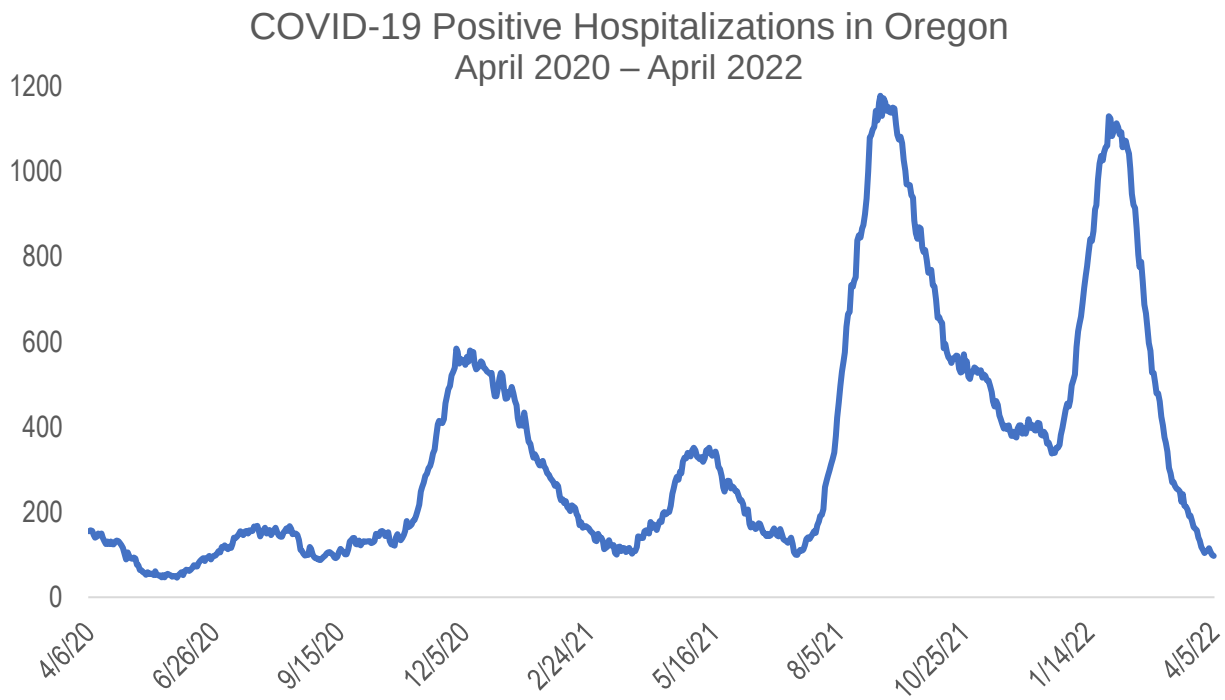


Figure 1. The number of hospitalized COVID-19 positive patients is shown for each day during the first two years of data collection. Oregon's COVID-19 positive hospitalizations peaked five times during this period, with higher patient counts during the second year.

Each patient in a hospital bed requires staffing and other resources to support their care. A metric known as "patient bed days" measures the cumulative number of hospital beds occupied over a period of time, giving a sense of the demand on hospital staff and resources over time. Measuring COVID-19 positive patient bed days (i.e., the cumulative number of hospital beds occupied by COVID-19 positive patients over time) provides another way to compare the impact of COVID-19 on hospitals across the first two years of HOSCAP COVID-19 data.

Figure 2 shows cumulative COVID-19 positive patient bed days for each year of data collection, with an additional chart focusing on COVID-19 positive patients in ICU beds. Oregon hospitals were tasked with supporting more than twice as many COVID-19 positive patient bed days in the second year than in the first year.

- 2020–2021: 73,084 COVID-19 positive patient bed days; 18,988 in ICU (on average, 200 COVID-19 positive patient bed days per day; 52 in ICU)
- 2021–2022: 181,423 COVID-19 positive patient bed days; 42,028 in ICU (on average, 497 COVID-19 positive patient bed days per day; 115 in ICU)

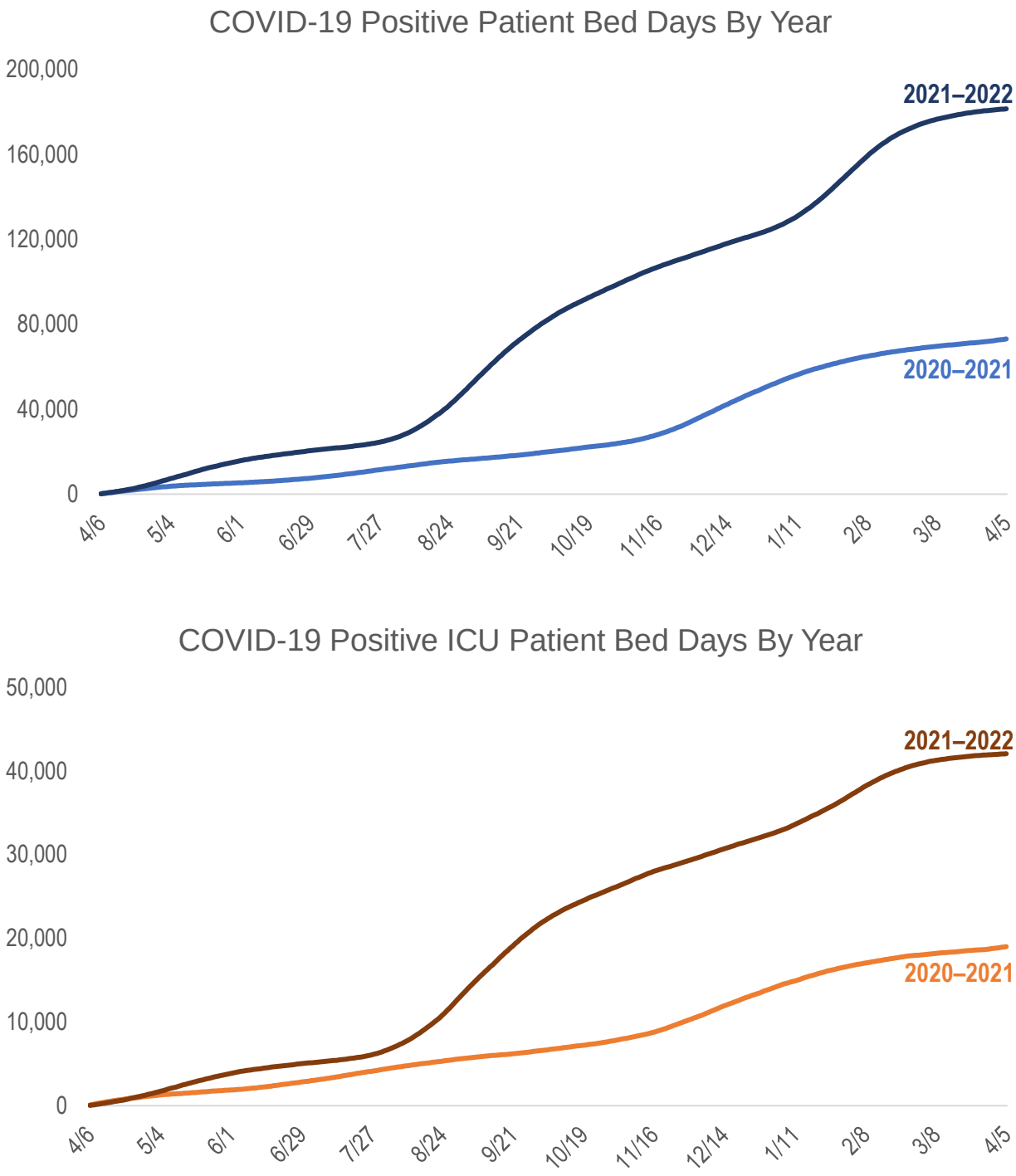
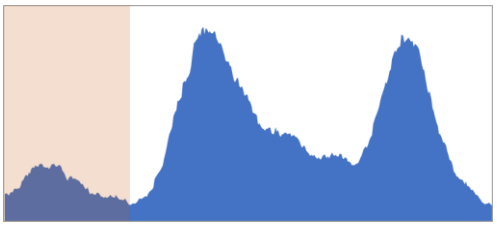


Figure 2. Cumulative patient bed days are shown for COVID-19 positive patients in hospital beds (top chart) and COVID-19 positive patients in ICU beds (bottom chart), for the first and second years of HOSCAP COVID-19 data collection. For ICU beds as well as overall hospital beds, COVID-19 positive patient bed days rose during the second year to more than double the cumulative patient bed days recorded during the first year.

Statewide trends

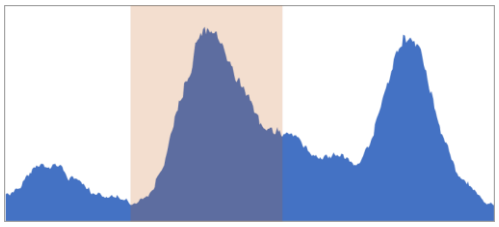
Focusing on the second year of HOSCAP COVID-19 data collection, the following sections break down statewide trends across four time periods.

April–June 2021



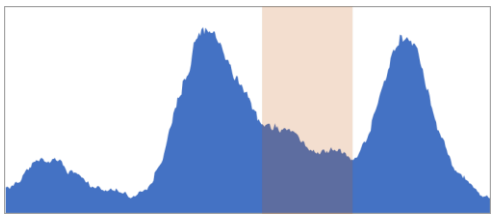
During the spring of 2021, counts of hospitalized patients testing positive for COVID-19 began to increase, culminating in a third wave of hospitalizations that reached 351 COVID-19 positive patients on May 3 and again on May 13. The spring peak in COVID-19 hospitalizations was 40% lower than the prior November 2020 peak. The peak number of hospitalized COVID-19 positive patients in ICU beds occurred on May 6 (90 patients). During this period, vaccinations for COVID-19 became available to the general public. Trends during this time period generally tracked with those of neighboring states.

July–October 2021



When cases rose again during the summer due to the Delta variant, increased numbers of COVID-19 hospitalizations and patients in ICU beds followed. Hospitalizations peaked on September 1 with 1,178 patients testing positive for COVID-19, more than double any previously recorded census. On this day, 28% of all hospitalized COVID-19 positive patients in Oregon were in ICU beds, a higher proportion than hospitals reported on May 13 (25%) or the subsequent January peak (15%). The number of hospitalized COVID-19 positive patients in ICU beds peaked on August 29 (330 patients). Hospitalizations decreased rapidly in September and early October but remained high.

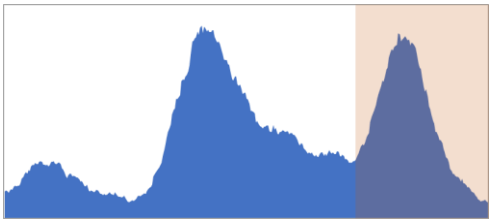
November–December 2021



Hospitalizations continued to decrease through late fall and early winter, but at a generally slower rate than reported in September and early October. Hospitals across the state continued to experience strain on hospital capacity during this period, even as COVID-19 positive hospitalizations decreased. The lowest patient census

reported before hospitalizations began to rise again was 338 COVID-19 positive patients on December 21, only 4% lower than the spring peak. There were 85 COVID-19 positive patients in ICU beds that day.

January–April 2022



The Omicron variant caused rapid increases in hospitalizations across Oregon during January. This surge culminated in a peak census of 1,130 hospitalized patients testing positive for COVID-19 on January 27, 2022 (48 fewer patients than reported at the peak of the summer surge on September 1). There were 169 hospitalized COVID-19 positive patients in ICU beds on January 27, which comprised 15% of the overall COVID-19 positive patient census. This ICU census was only slightly more than half of the ICU census reported on September 1. The peak number of hospitalized patients in ICU beds during this period occurred just over a week later than the peak in overall patients, on February 7 (197 patients). After peaking, COVID-19 positive hospitalizations decreased rapidly into the spring.

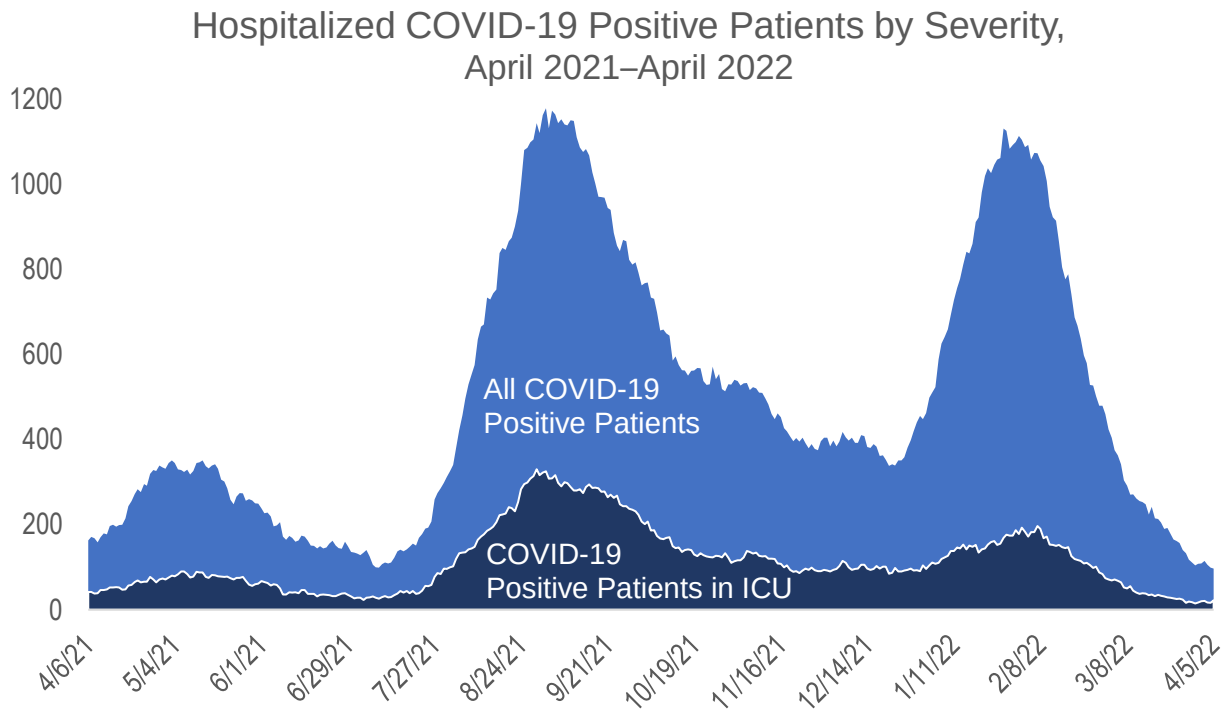


Figure 3. Counts of COVID-19 positive patients in ICU beds generally followed trends in overall COVID-19 positive hospitalizations, though the summer surge resulted in more ICU patients with COVID-19 than other surges during the second year of data collection.

Figure 3 displays daily counts of COVID-19 positive patients in ICU beds alongside daily counts of hospitalized COVID-19 positive patients, during the second year of HOSCAP COVID-19 data collection. Though overall patient counts reached similar levels at the peak of the summer and winter surges, the relative severity of illness due to the Delta variant resulted in substantially greater numbers of COVID-19 positive patients in ICU beds during the summer wave. There were three major peaks in the COVID-19 positive ICU census during the second year of reporting:

- May 6, 2021: 90 COVID-19 positive patients in ICU beds (27% of all COVID-19 positive hospitalized patients)
- August 29, 2021: 330 COVID-19 positive patients in ICU beds (29% of all COVID-19 positive hospitalized patients – this was the highest proportion of COVID-19 positive patients in ICU beds recorded during the year)
- February 7, 2022: 197 COVID-19 positive patients in ICU beds (18%)

Regional trends

Figure 4. Oregon has seven Hospital Preparedness Program regions.

Oregon's hospitals are organized into seven Hospital Preparedness Program regions (Figure 4). Region 1 surrounds the Portland metro area, Region 2 includes the central Willamette Valley, Region 3 is the southern Willamette Valley – plus

Coos and Curry counties, Region 5 comprises Jackson and Josephine counties, Region 6 includes the central Columbia River Gorge, Region 7 is central-southern Oregon, and Region 9 includes the eastern Gorge and eastern Oregon bordering Idaho.[3]

The stacked area chart in Figure 5 displays daily counts of COVID-19 positive patients hospitalized within each region throughout the year. Generally, hospitalizations in each region followed patterns similar to statewide trends, with three surges peaking in the spring, summer, and winter. Predictably, regions with larger populations (particularly Region 1) typically saw more hospitalized patients with COVID-19 than less populous regions. However, during the summer and winter surges, hospitals in Region 5 reported COVID-19 positive patient counts that at times outnumbered those reported in more populous regions, even Region 2 (whose population is roughly 2.6 times that of Region 5).

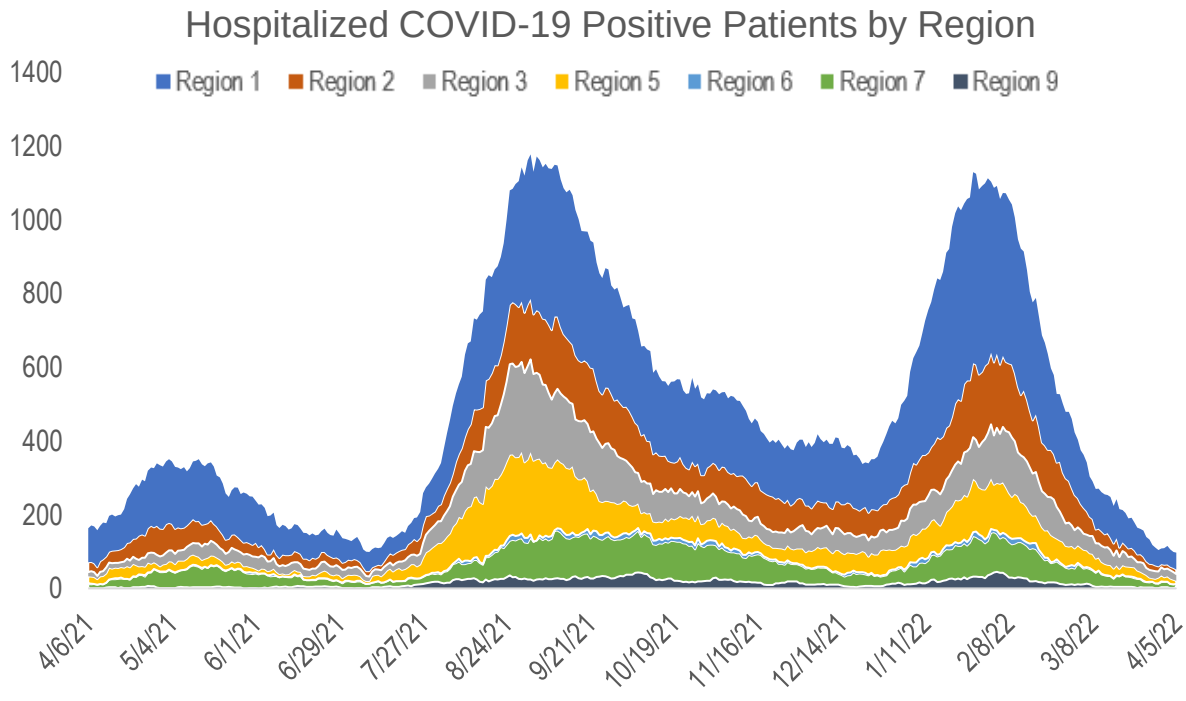


Figure 5. Counts of COVID-19 positive patients hospitalized in each region are shown, without adjusting for population. Trends in each region generally followed trends in the statewide census. More populous regions (such as Region 1, top) typically reported higher patient counts than less populous regions (such as Region 9, bottom) – with notable exceptions, when Region 5 surpassed all but Region 1.

[3] Regions 4 and 8 exist in southern Washington state and are not counted in Oregon tabulations. Region refers to the location of the hospital, not the residence of the patient. For a more detailed map of the regions: https://www.oregon.gov/oha/PH/PREPAREDNESS/PARTNERS/Documents/AllState.pdf

To compare hospitalization trends between regions while taking into account differences in their population sizes, Figure 6 displays the number of hospitalized COVID-19 positive patients per 100,000 residents in each region[4] (also referred to as the hospitalization rate). This rate is shown as a seven-day moving average, where the value reported for each date represents the average for the week leading up to (and including) that day. A seven-day moving average can help to reveal overall trends that may be obscured by day-to-day or weekly fluctuations in the data.

As Figure 6 shows, hospitalization rates in Regions 3, 5, and 7 typically exceeded those in the most populous regions (Regions 1 and 2) throughout the second year of data collection. For each surge, Region 5 in southern Oregon was the first to report an increase in hospital census before being joined by other regions shortly after. During both the summer and winter surges, Region 5 experienced the highest hospitalization rates reported by any region that year. The hospitalization rate in Region 3 also stood out during the summer surge as it rose to surpass all but Region 5. Region 7 surpassed Region 5 with the highest hospitalization rate in the state during the spring surge and the period following the summer surge, during which Region 7 reported more extended plateaus and slower declines in the hospital census than other regions.

[4] Population data used to calculate the hospitalization rate per 100,000 residents are from the 2021 Certified Population Estimates published by the Population Research Center, College of Urban and Public Affairs, Portland State University.

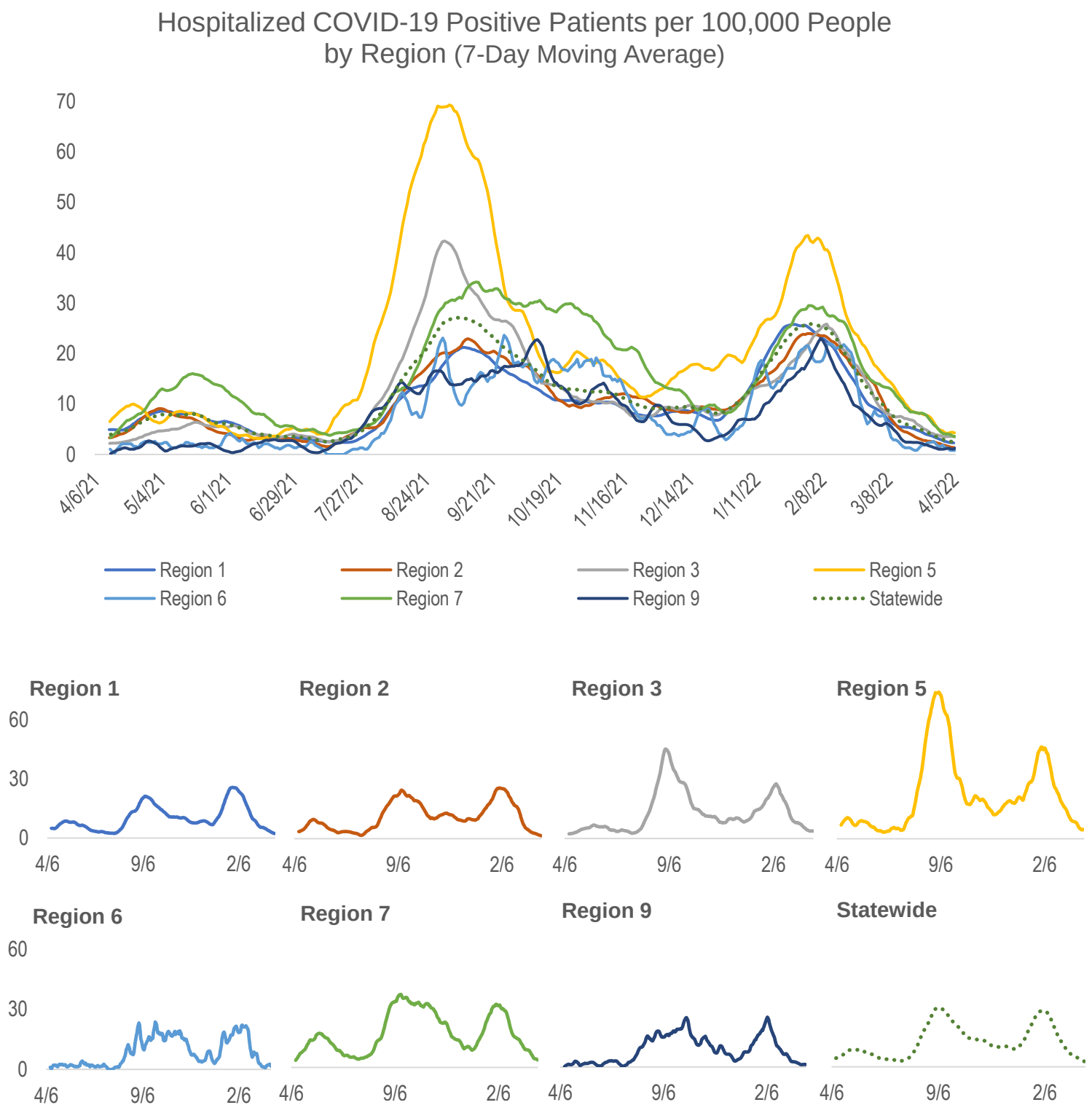


Figure 6. The number of hospitalized COVID-19 positive patients per 100,000 residents is shown for each region and statewide, as a seven-day moving average. Hospitalization rates in Regions 3, 5, and 7 typically exceeded those in regions with greater populations. Trendlines are also displayed separately to allow for a closer look at each individual region's hospitalization rate over time.

Hospital Capacity Trends in Oregon

Hospitals use bed capacity data to plan their operations and measure efficiency. These sections review ICU and non-ICU bed capacity trends in Oregon during the second year of HOSCAP COVID-19 data collection. A vacant hospital bed is considered available only if it is staffed, meaning the necessary healthcare staff and equipment are also available to care for a patient who might use the bed. OHA uses counts of available and total staffed beds reported in HOSCAP to calculate how many ICU and non-ICU beds are occupied.[5]

Statewide trends

The second year of HOSCAP COVID-19 data collection began with 77% of Oregon's adult ICU beds and 86% of adult non-ICU beds occupied on April 6, 2021. This represented 85% overall occupancy of adult beds (combining ICU and non-ICU beds). Overall adult bed occupancy dropped slightly to 83% less than one week later (on April 11, 2021), reaching the lowest level recorded that year. The subsequent spring, summer, and winter surges in hospitalizations led to rising occupancy rates for hospital beds, with little reprieve between waves.

Hospitals faced growing strains on their capacity and resources throughout the year, including staffing challenges that persisted even when COVID-19 positive patient counts decreased. Overall adult bed occupancy reached 95% – the highest recorded during the first two years of data collection – on January 5, 2022, approximately three weeks before COVID-19 positive hospitalizations peaked in the winter surge. The reporting year concluded with 91% of Oregon's adult ICU and non-ICU hospital beds occupied on April 5, 2022.

To show the percentage of occupied hospital beds in use by COVID-19 positive patients, Figure 7 combines adult and pediatric bed counts (because HOSCAP does not collect data indicating whether COVID-19 positive patients are in adult or pediatric beds).[6] A 14-day moving average is displayed to better visualize trends in bed occupancy over time, as fluctuations in occupancy data can obscure these trends when observing daily counts or even a 7-day moving average.

The percentage of staffed adult and pediatric non-ICU beds that were occupied in Oregon increased fairly steadily from 86% at the beginning of the reporting year, reaching 94% in the fall and winter, followed by slight decreases in the spring (dropping to as low as 88%). COVID-19 positive patients occupied as many as

[5] Non-ICU beds are defined as Medical/Surgical and Other bed counts, as reported in HOSCAP.
[6] This analysis assumes all hospitalized COVID-19 positive patients occupied one of the following bed categories: Medical/Surgical, Pediatric, Adult ICU, Pediatric ICU (PICU), or Other.

26% of staffed adult and pediatric non-ICU beds during the summer surge, and 25% during the winter surge.

Of Oregon's staffed adult ICU and pediatric ICU (PICU) beds, 77% were occupied at the start of the reporting year. This rose sharply during the summer surge, reaching 94%, and remained high through the winter surge when it peaked at 95%. ICU bed occupancy showed some decline in the spring following the winter surge, reaching as low as 79%. COVID-19 patients occupied a greater share of ICU beds than non-ICU beds, with as many as 46% of staffed ICU beds in use by COVID-19 positive patients during the summer surge. The subsequent winter surge saw up to 30% of staffed ICU beds occupied by COVID-19 positive patients.

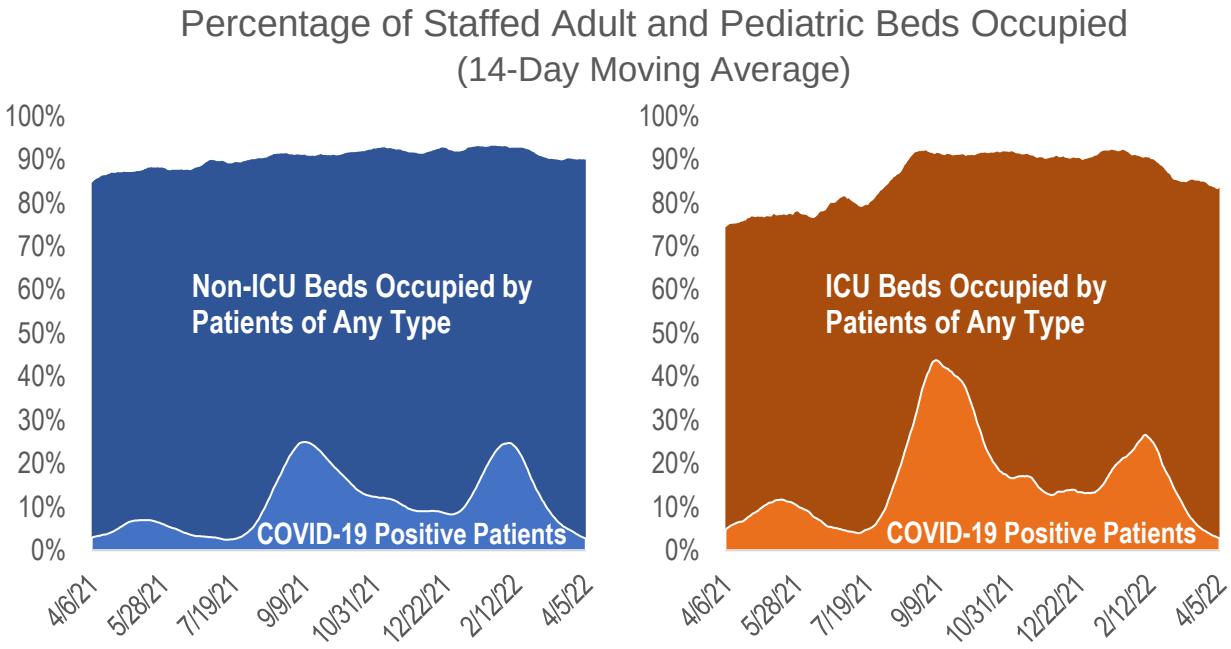


Figure 7. Trends in occupied ICU and non-ICU beds are shown as a 14-day moving average, highlighting beds occupied by COVID-19 positive patients. Non-ICU bed occupancy increased steadily during the year, with COVID-19 positive patients occupying as many as 26% of staffed non-ICU hospital beds. ICU bed occupancy rose sharply during the summer surge and remained high through the winter surge. COVID-19 positive patients occupied up to 46% of staffed ICU beds during the summer.

Pediatric non-ICU and PICU bed occupancy peaked during the year at 88% and 96%, respectively. Both adult ICU bed occupancy and adult non-ICU bed occupancy peaked at 95%. Stress on adult bed capacity was persistent, particularly for non-ICU beds. Reported statewide adult non-ICU bed occupancy was over 90% on 266 days during the year (median: 91%), and adult ICU occupancy registered above 90% on 155 of these days (median: 89%).

These trends in bed occupancy were in part driven by changes in the number of staffed beds. Figure 8 presents statewide counts of staffed adult ICU and non-ICU

beds over time, as a 14-day moving average. Oregon hospitals began the reporting year with 4,500 staffed adult non-ICU beds. This number increased slightly to a peak of 4,586 beds on June 26, 2021, before dropping to 4,035 beds (the lowest reported level of the year) on November 21. Following this decline, staffed adult non-ICU bed counts only partially recovered, reaching as high as 4,352 beds on February 23, 2022.

Staffed adult ICU beds followed largely similar trends, peaking at 716 beds on May 29, 2021 (approximately one month earlier than non-ICU beds). This number subsequently dropped and partially recovered before dropping again, to a low of 614 staffed adult ICU beds on February 6, 2022.

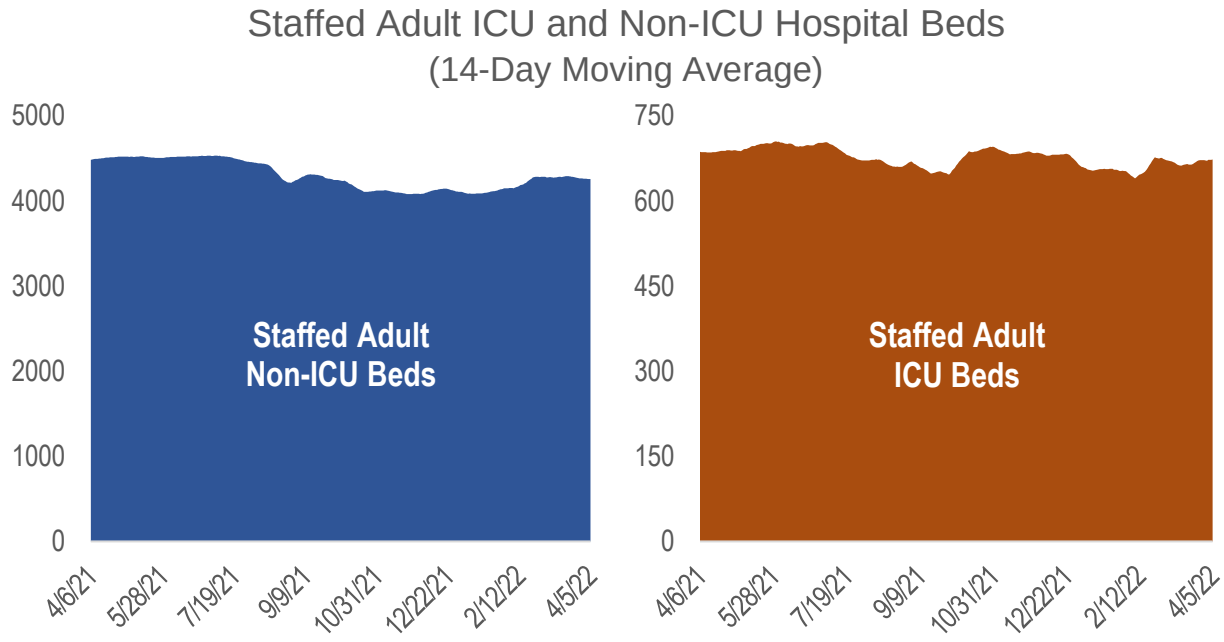


Figure 8. Trends in staffed adult bed counts are shown as a 14-day moving average. Counts of staffed adult ICU and non-ICU beds peaked in May and June 2021, respectively, followed by declines (to a low of 614 ICU and 4,035 non-ICU beds). These counts only partially recovered prior to the end of the reporting year.

Most facilities reached their maximum occupancy for adult ICU or adult non-ICU beds at some point. Figure 9 displays the number of hospitals reporting full occupancy of their adult ICU or non-ICU beds over time, as a 14-day moving average. Increasing numbers of hospitals reported having no available adult ICU beds during the summer surge, and this number only decreased slightly before rising again during the winter surge. As many as 28 hospitals at a time reported full ICUs at various points during these two surges (of the 49 hospitals with staffed adult ICU beds).

The number of hospitals reporting no available adult non-ICU beds also increased during the summer surge but rose even higher during the winter surge. Up to 27 of Oregon's 61 hospitals reported no available adult non-ICU beds at a time.

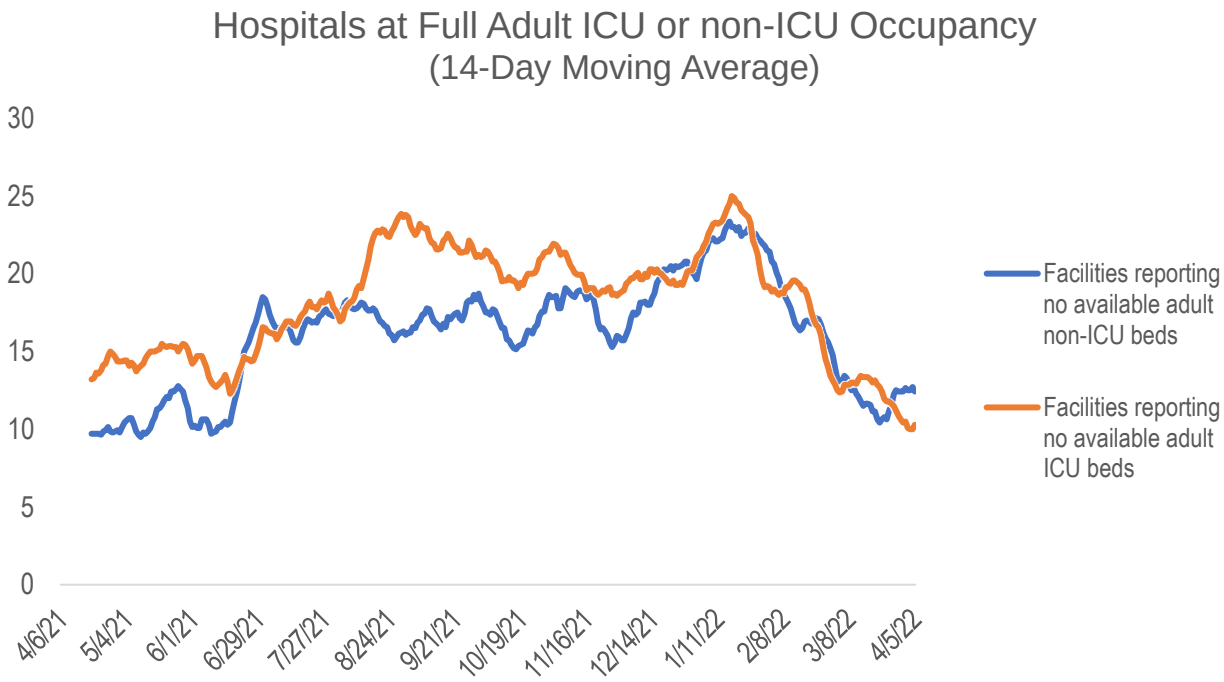


Figure 9. The number of hospitals reporting no available adult ICU or non-ICU beds is displayed as a 14-day moving average. As many as 28 hospitals reported reaching maximum ICU occupancy at various points during the summer and winter surges. Hospitals reporting no available non-ICU beds reached a peak (27 hospitals) during the winter surge.

Regional trends

Similar to statewide trends, each region experienced increases in hospital bed occupancy during the summer surge that largely persisted through the winter surge. While hospitals across the state experienced strains on their capacity, the greatest constraints were seen in western Oregon, followed by central-southern Oregon. Maps in Figure 10 depict the overall occupancy of adult hospital beds (ICU and non-ICU combined) in each region of the state at three points during the year: when statewide adult bed occupancy was at its lowest, when it was at its highest, and when the second year of data collection concluded.

April 11, 2021, marked the lowest overall occupancy of adult hospital beds for the year, at 83% statewide. On this day, both Regions 1 and 7 counted 88% of their adult hospital beds as occupied. When overall adult bed occupancy peaked at 95% on January 5, 2022, all regions in western Oregon (as well as Region 6) were reporting at least 90% occupancy, and Region 7 came close at 89%.

The final map, which depicts April 5, 2022, reveals how little adult bed occupancy decreased between the winter surge's peak and the end of the second year of data collection. When the year concluded, 91% of Oregon's adult hospital beds were occupied. Only Region 6 had reported a decrease of more than 5% since January 5.

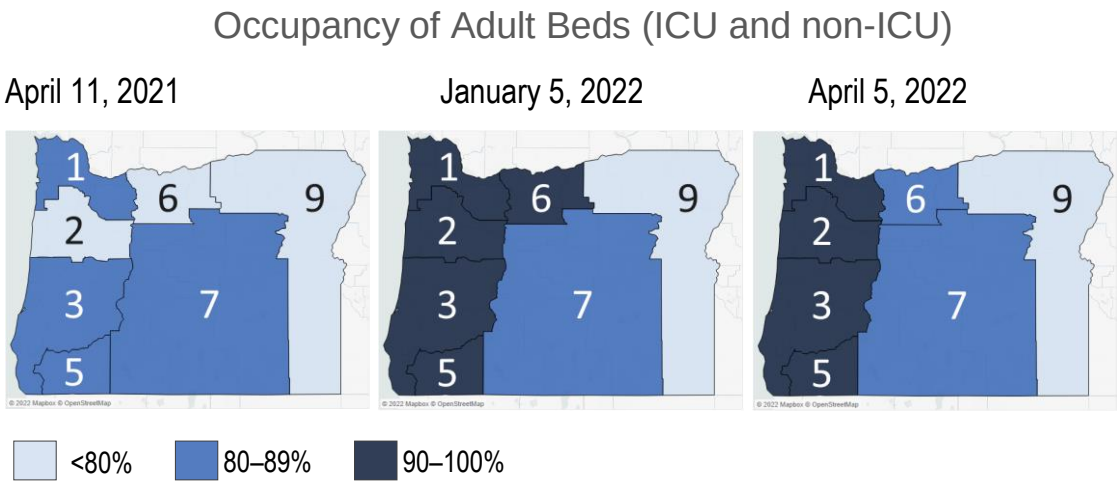


Figure 10. Maps depict the percentage of staffed adult hospital beds (ICU and non-ICU combined) occupied in each region of Oregon on three dates: when statewide occupancy reached its lowest recorded level for the year (4/7/21), when it reached its highest level for the year (1/5/22), and when the second year of data collection concluded (4/5/22). Hospitals in all regions faced strains on their capacity, with the greatest capacity demands occurring primarily in western Oregon, followed by central-southern Oregon. Only small decreases in occupancy were reported between the January peak and April 2022.

Surges Compared

The following sections provide further details about the waves of COVID-19 positive hospitalizations between April 2020 and April 2022, comparing trends reported during the time periods surrounding each peak in hospitalizations.

Comparing hospitalization peaks during April 2020–April 2022

Figure 11 displays trends in COVID-19 positive patient counts during the first two years of HOSCAP COVID-19 data collection, where each surge in hospitalizations is superimposed to align the five recorded peaks in patient numbers. As previously noted, the September 2021 and January 2022 peak patient census numbers were substantially higher than previous waves. Patient numbers also rose and fell more steeply in the weeks surrounding these two peaks, relative to previous surges.

Figure 11 also reveals that the November 2020 surge occurred during the longest span of time recorded between low points in the COVID-19 positive patient census. The January 2022 peak occurred after the shortest period of increasing

patient numbers, and these increases started from a higher census than any other surge (a "low point" of 338 patients).

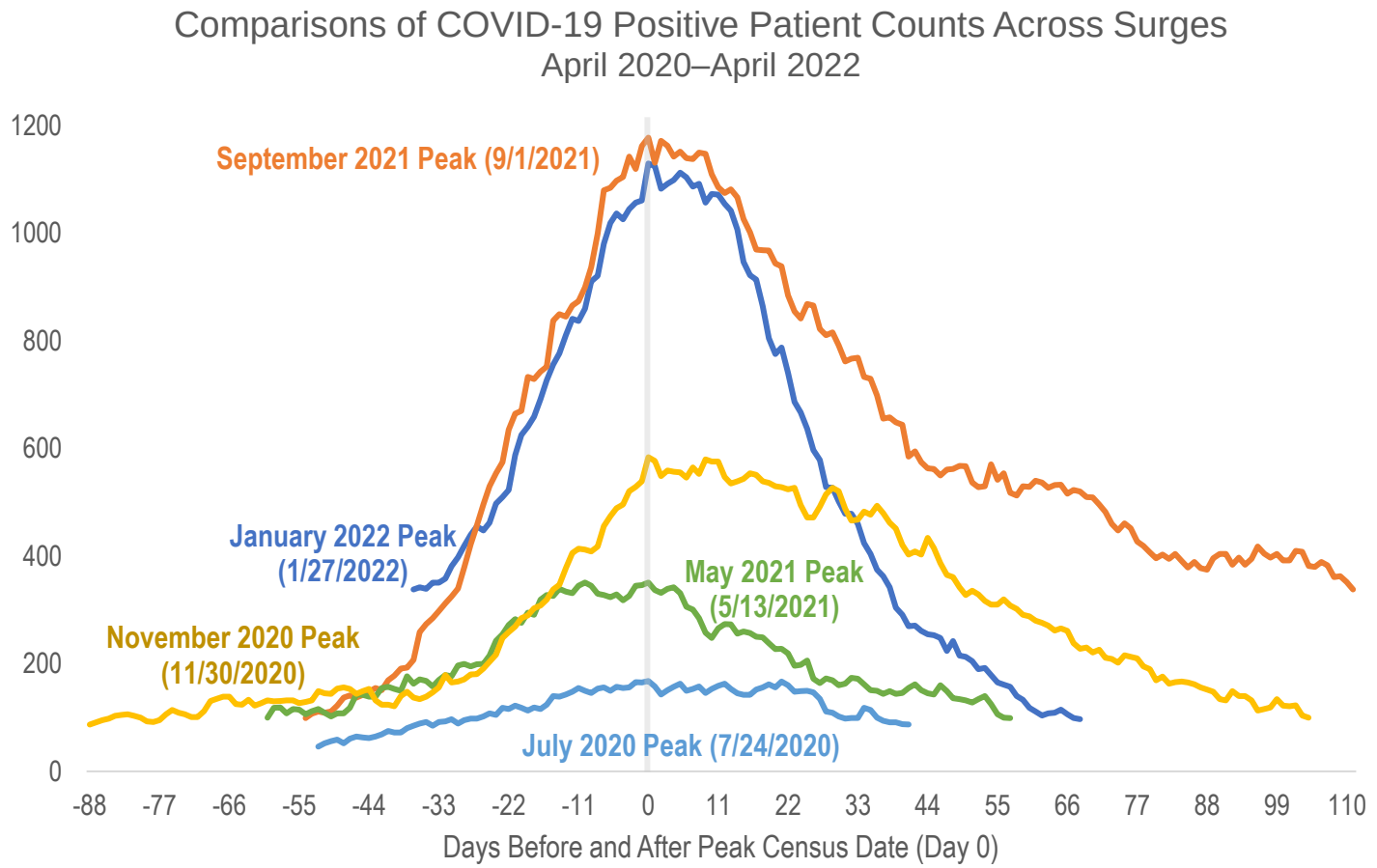


Figure 11. Each surge in COVID-19 positive hospitalizations between April 2020 and April 2022 is represented by a separate line, with the peak of each surge aligned at day 0. Each line begins with the lowest census recorded prior to a surge and includes the peak and subsequent decreases in patients. The September 2021 and January 2022 peak patient census numbers were substantially higher than previous waves. Patient numbers also rose and fell more steeply in the weeks surrounding these two peaks, relative to previous surges.

Figure 12 compares counts of COVID-19 positive patients in ICU beds during each surge, again centered around the dates when the overall COVID-19 positive patient census peaked. The September 2021 surge had a higher peak census (330 ICU patients with COVID-19) than any other surge during the initial two years of HOSCAP COVID-19 data collection. This surge also saw COVID-19 positive ICU hospitalizations decrease over a relatively long period of time and only reached as low as 86 COVID-19 positive ICU patients before this number began to rise again.

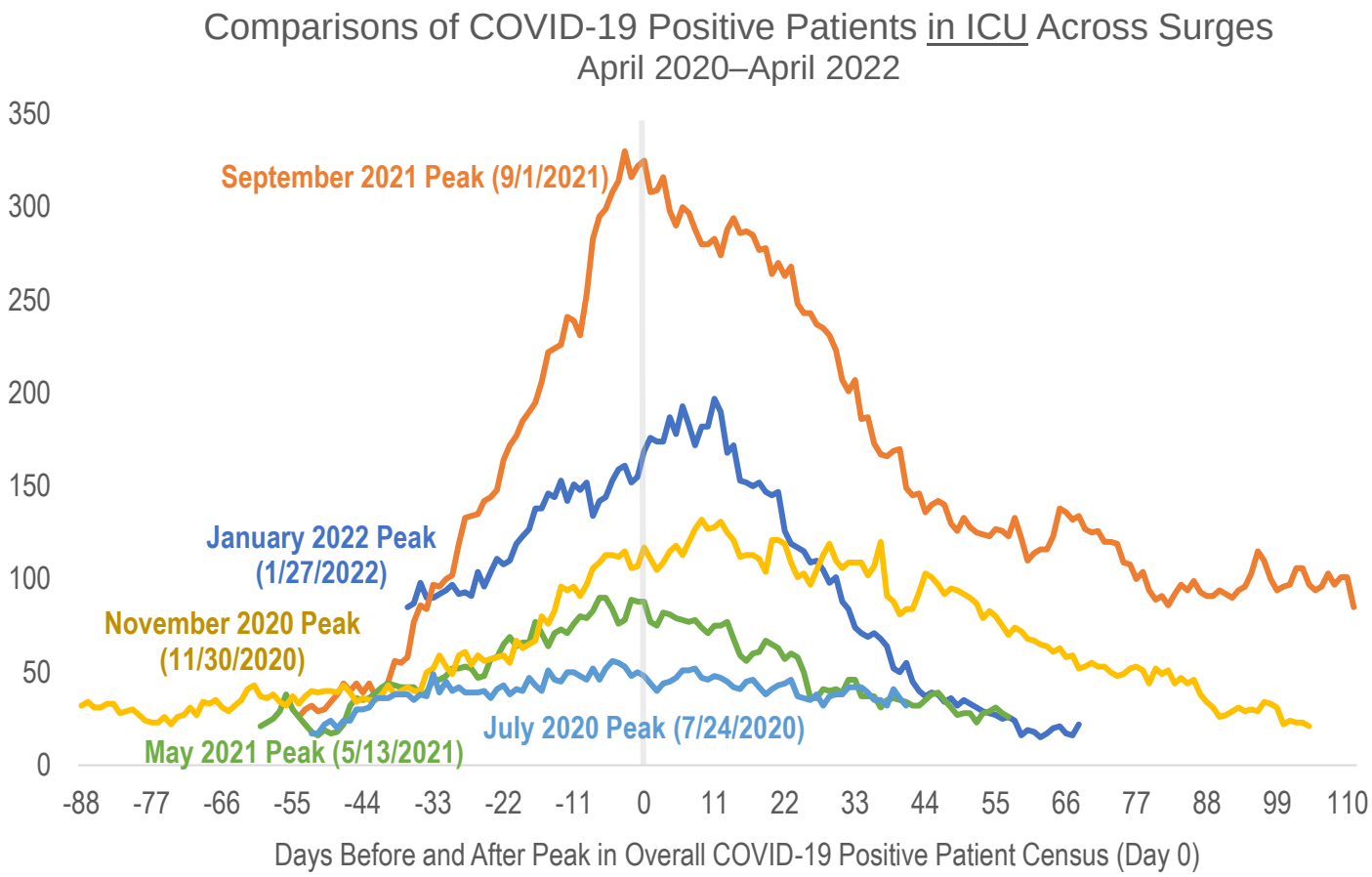


Figure 12. Each surge in COVID-19 positive ICU hospitalizations between April 2020 and April 2022 is represented by a separate line, with the peak of each surge aligned at the same "day 0" as in Figure 10. Each line begins with the lowest ICU census recorded prior to a surge and includes the peak and subsequent decreases in ICU patients. The September 2021 surge had a higher peak ICU census than any other surge during this period. COVID-19 positive ICU hospitalizations decreased over a relatively long period of time after this surge and only reached as low as 86 COVID-19 positive ICU patients before rising again.

Figure 13 displays the percentage of COVID-19 positive patients in ICU beds on the date of each peak in the overall COVID-19 positive patient census. The proportion of COVID-19 positive patients who were in ICU beds was greatest during the July 2020 surge, at 29%. The proportion of hospitalized COVID-19 positive patients who were in ICU beds was relatively lower during the subsequent two surges. On the September 2021 peak, ICU patients made up 28% of the overall COVID-19 positive patient census. This was a higher proportion than seen at any other peak during the second year, likely driven by the relative severity of the Delta variant. The January 2022 peak yielded the lowest proportion of ICU patients, at 15%.

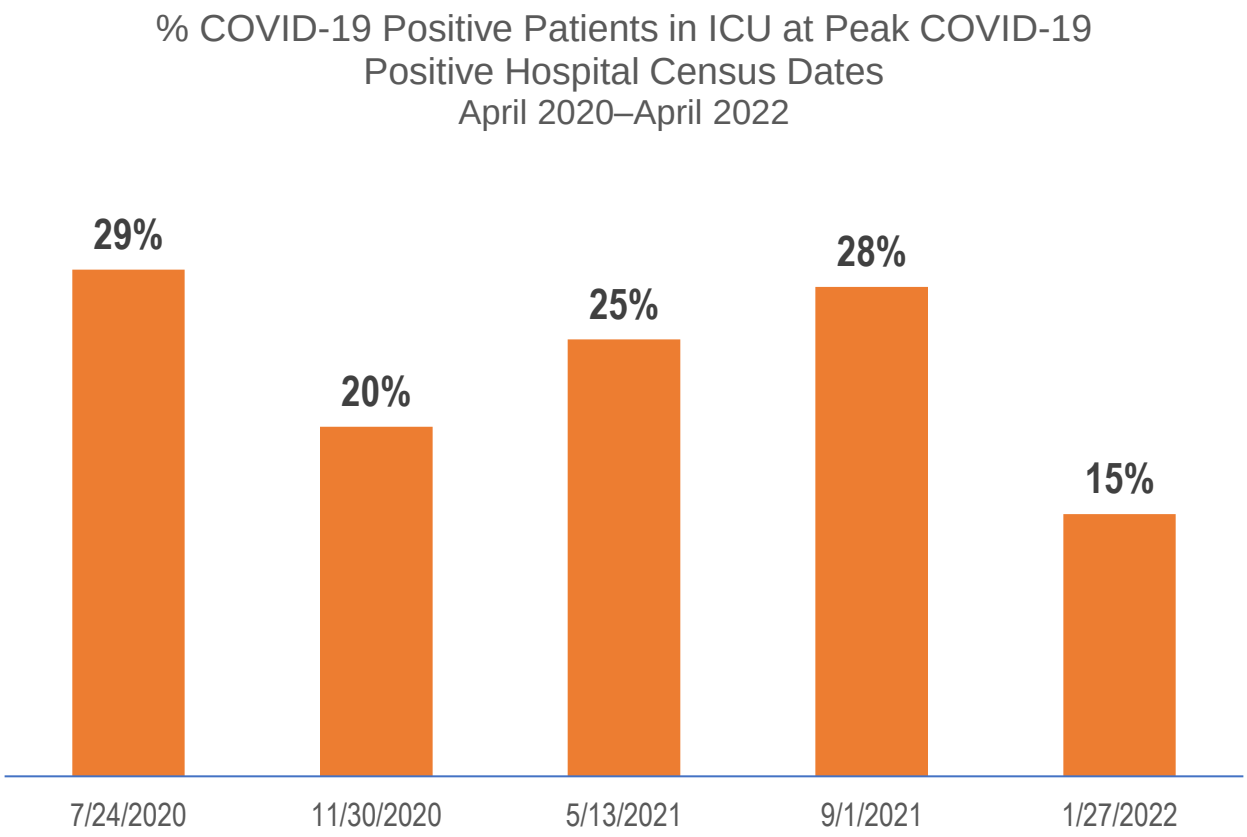


Figure 13. Each bar displays the proportion of hospitalized COVID-19 positive patients who were in ICU beds on the date of each peak in the overall COVID-19 positive census. The highest proportion was seen on the July 2020 peak (29%), followed closely by the September 2021 peak (28%). The lowest proportion was seen on the January 2022 peak (15%).

Lag between peaks in cases and hospitalizations

Early in the pandemic, the CDC reported a median lag of 9.5–12 days between the onset of illness and admission to an ICU for COVID-19 patients who required ICU treatment, based on studies of COVID-19 patients in Wuhan, China. To investigate the timing between COVID-19 case and hospitalization trends in Oregon, we compared hospitalization data from HOSCAP to reported case data from the Oregon Pandemic Emergency Response Application (Opera). Opera is used to collect data about Oregonians with COVID-19 through case investigations, providing information that includes the date when COVID-19 symptoms began.

Figure 14 overlays COVID-19 case data from Opera and hospitalization data from HOSCAP, each shown as a 14-day moving average in order to reveal clearly defined peaks. The lag between peaks in new cases and hospitalizations increased with each subsequent surge, from 11 days during the summer 2020 surge to 20 days during the winter 2021–2022 surge.

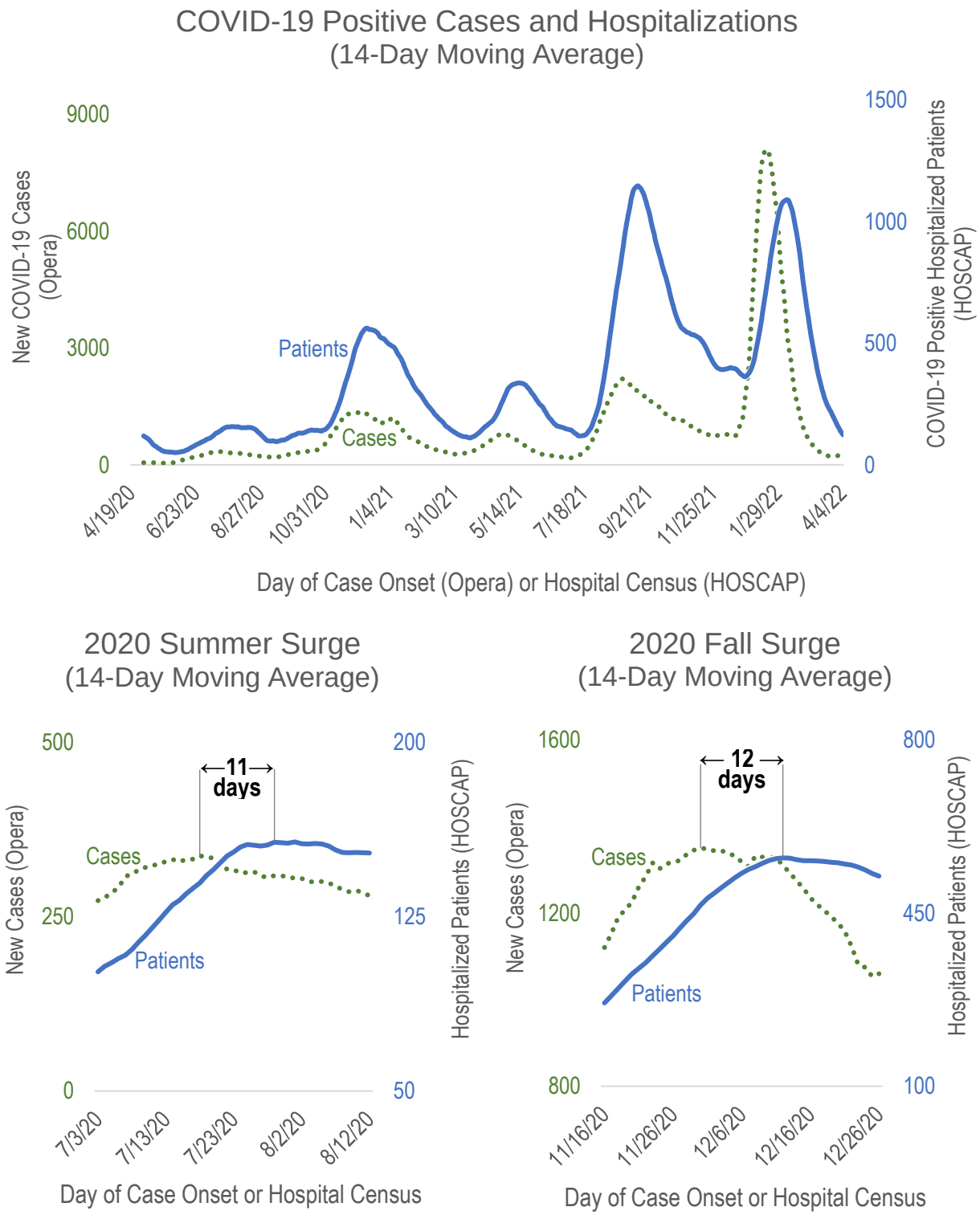


Figure 14. Increases in statewide hospitalized COVID-19 positive patients generally followed rises in new cases. Comparing the 14-day moving average of these metrics reveals a lag of 11 days between peaks in cases and hospitalizations during the summer 2020 surge, and 12 days for the fall 2020 surge. Note that cases and hospitalizations are plotted on different scales, due to greater numbers of cases.

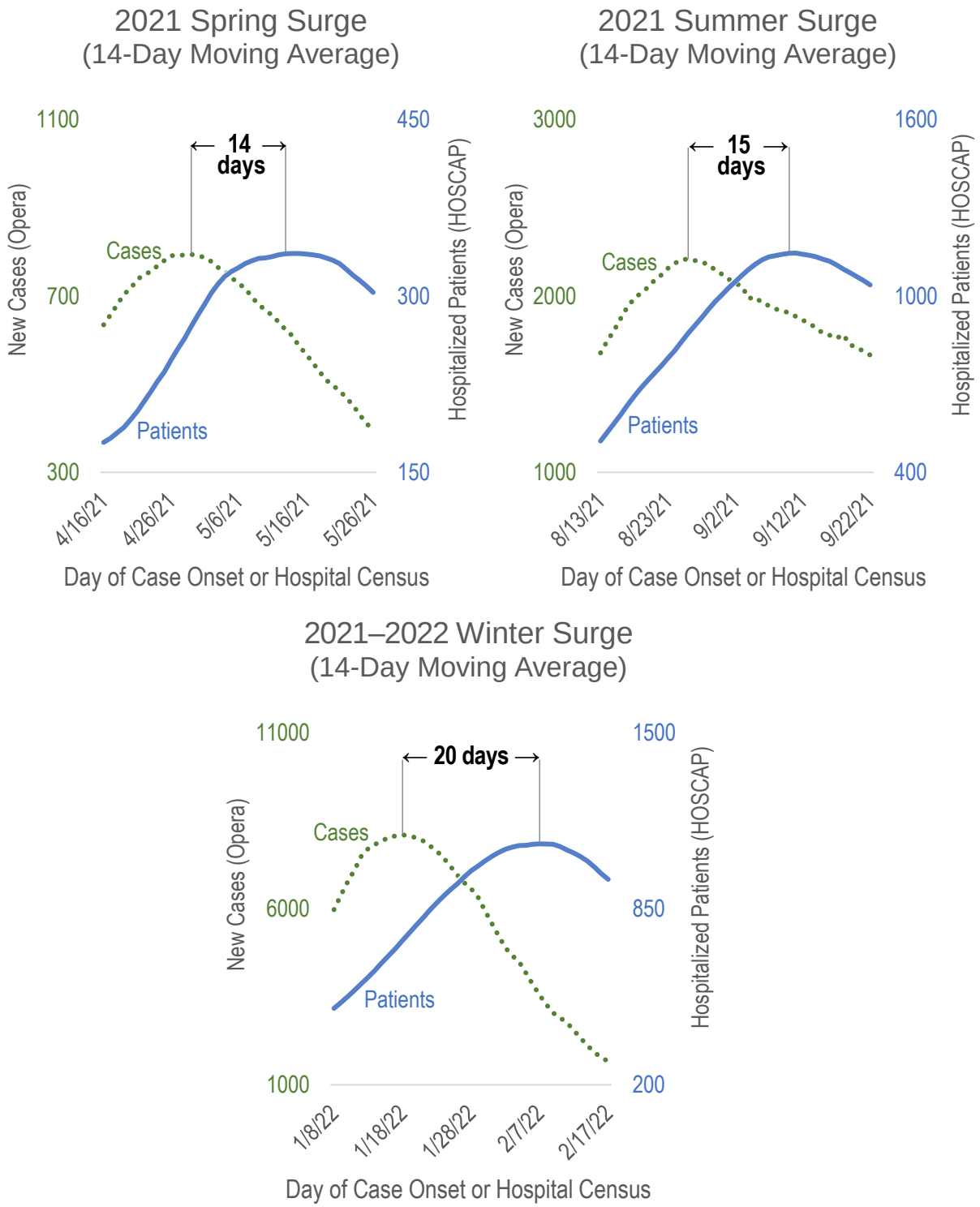


Figure 14, continued. The lag between peaks in new COVID-19 cases and COVID-19 positive hospitalizations continued to increase during the subsequent three surges. Using a 14-day moving average for each metric, the lag was 14 days during the spring 2021 surge, 15 days in the summer 2021 surge, and 20 days in the winter 2021–2022 surge.

Conclusion

The second year of HOSCAP COVID-19 data collection demonstrated shifting trends in COVID-19 positive hospitalizations and hospital capacity, providing insight into the enormous medical burden of COVID-19. While the data reported each day by hospital staff most immediately informed hospital operations and pandemic response efforts, these and other datasets enable increasingly wide-ranging analyses. Oregon experienced three waves of COVID-19 positive hospitalizations between April 2021 and April 2022, reaching a high of 1,178 COVID-19 positive patients on September 1. Adult bed occupancy peaked with 95% of staffed adult ICU and non-ICU beds full on January 5, and hospitals continued to report capacity constraints even when COVID-19 positive hospitalizations decreased. Looking back at the second year of data collection and comparing key metrics across the first two years can add useful context and insight to our understanding of COVID-19 and potential future pandemics. Hospitals continue to report information that includes capacity data and counts of patients with COVID-19, as Oregon continues to see COVID-19 hospitalizations into the third year of data collection.