COVID-19 transmission across Washington State

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SitRep 24: COVID-19 transmission across Washington State

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Results as of January 13, 2021.

We are publishing situation reports on a biweekly schedule on Wednesdays to better accommodate news cycles. If, on an off week, we identify a time-sensitive feature in the data, we will produce an updated report that week to ensure that changes in the situation are reported quickly.

For a comprehensive and up-to-date picture of what's happening around the state, see the WA State COVID-19 Risk Assessment and WADoH COVID-19 data dashboards.

Summary of current situation

Using data from the Washington Disease Reporting System (WDRS) through December 30, we estimate the reproductive number (R_e) in western Washington on December 24 was likely between 0.93 and 1.25, with a best estimate of 1.09. Meanwhile, we estimate that in eastern Washington, R_e was likely between 0.90 and 1.36, with a best estimate of 1.13 (Figure 1).

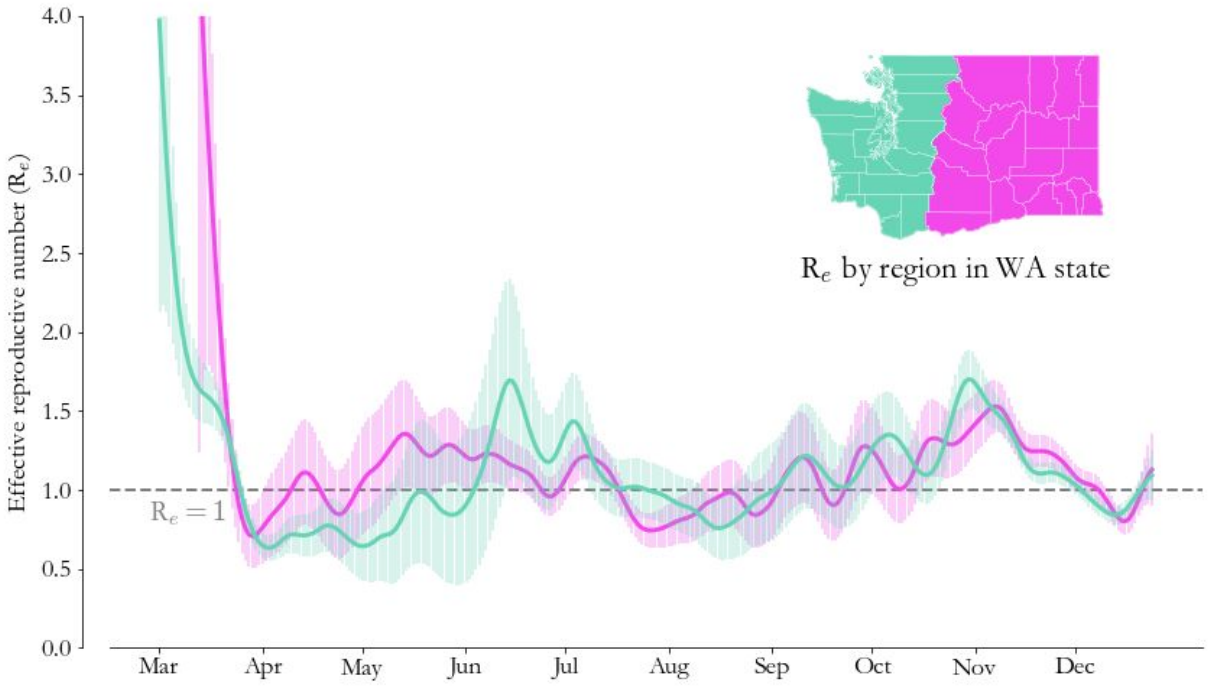

***Figure 1**: R_e estimates for eastern (pink) and western (green) WA, with 2 standard deviation error bars. Our most recent estimates show R_e has decreased in both eastern and western Washington since peaks in late October (western Washington) and early November (eastern Washington) to values at or slightly above 1 . To reduce levels of cases and hospitalizations, R_e needs to drop to a value substantially below 1 for a sustained period of time.*

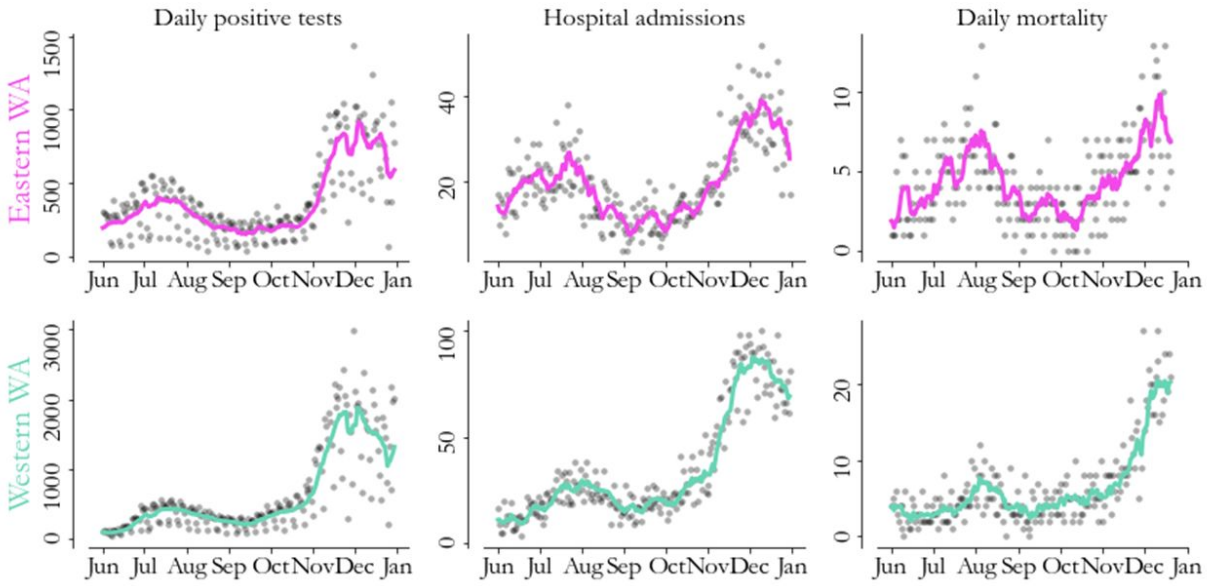

Figure 2*: Seven-day rolling case counts (left panels), hospital admissions (middle panels) and deaths (right panels) for eastern Washington (top) and western Washington (bottom) through December 30 (cases and hospitalizations) and December 20 (deaths). Because of a change in how confirmed deaths are being reported, we are using an earlier cutoff for the mortality panel.*

Details

Although flattening and declines in case counts were apparent in mid-to late-December in both eastern and western Washington, case counts rebounded post-Christmas (Figure 2), with steeper increases observable in the incomplete data. The drop in cases near Christmas was likely due to changes in test-seeking behavior rather than a true decline in prevalence. Through December 30, declines are also apparent in hospital admissions in both eastern and western Washington, although a rebound is apparent in early January in the incomplete data. Deaths in both eastern and western Washington appeared to plateau at peak levels through mid-December.

The seven-day rolling average case count in eastern Washington increased from 168 cases per day on September 13 to 1023 on December 4, and declined to 684 as of December 30, although a rebound in case counts is evident in the incomplete data. Similarly, daily hospital admissions in eastern Washington showed a three-fold increase from early September through early December, with the seven-day rolling average hospital admissions flattening at around 36 thereafter, and declining slightly to 27 admissions per day as of Dec. 30, with indications of a rebound in the incomplete data.

Case counts in western Washington rose steadily after September 12, increasing from a seven-day rolling average of 209 cases per day on September 12, to 1923 on December 4, followed by a decline around December 25 and rebound to 1349 as of December 30. Further rebound is apparent in the incomplete data. Daily hospital admissions in western Washington increased after the beginning of October, from a seven-day rolling average of 16 admissions per day on October 3 to 81 on December 4, with recent declines to seven-day rolling average daily admissions of 67 as of December 30, with a rebound evident in early January in the incomplete data.

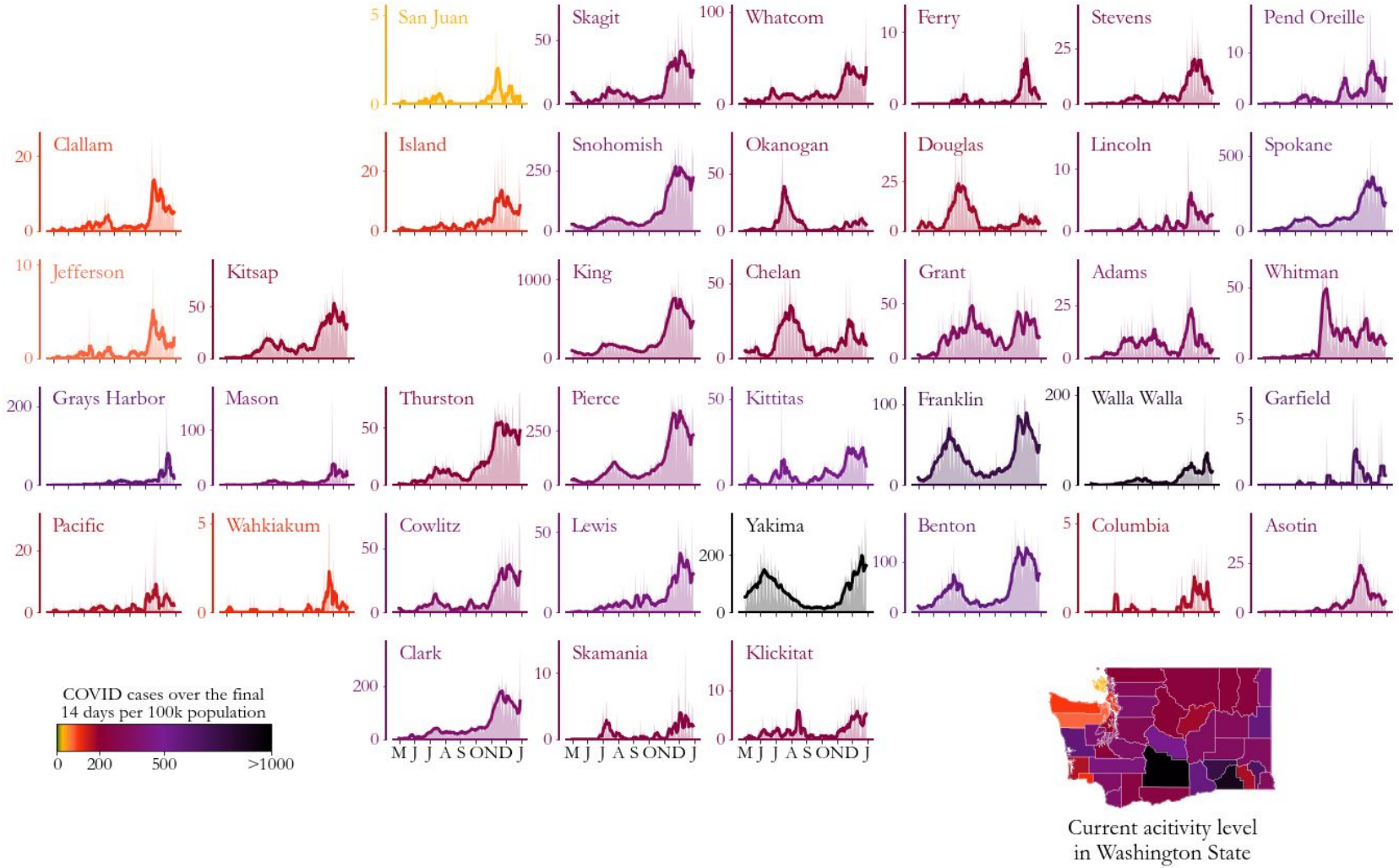

***Figure 3**: Daily COVID-19 positives (shaded areas) and 7-day moving averages (curves) arranged geographically and colored by COVID-19 activity level (total cases from December 17 to December 30 per 100,000 people). Case trends across counties highlight geographic correlations and help us better understand region-level estimates of the transmission rate (see Figure 1). A temporary reduction in case counts was observed on Christmas in many counties, with subsequent rebounds evident in most counties. Cases per 100,000 people remain high in most counties as of December 30.*

Absolute case rates remain high across Washington state, with 31 of 39 counties showing 14-day average rates of new cases above 200 per 100,000 population, and 11 of 39 counties above 500 per 100,000 population (Figure 3).

- Though declines in case counts were evident in the five largest counties (Clark, King, Pierce, Snohomish, and Spokane) through late December, all show post-Christmas rebounds in case counts, with particularly steep rebounds evident for Clark, Pierce, and Snohomish counties. The incomplete data for Clark county suggest returns to case counts similar to peak November levels by early January.

- Most medium-sized counties also show a pattern of declining case counts through Christmas, with rebounds in growth thereafter. Cowlitz, Kitsap, Thurston, and Benton counties show rebounds in counts approaching peak November levels in the incomplete data. Whatcom County shows especially sharp increases in the incomplete data, potentially far exceeding peak November levels. A sharp rebound in counts is also evident in the incomplete data for Yakima, approaching its peak levels in late December. Conversely, Grant county shows a plateau in counts post-Christmas.

- Several small counties (Chelan, Douglas, Kittitas, and Lewis) also show declines through Christmas, followed by rebounds thereafter. Other small counties show flattening in case counts post-Christmas (Grays Harbor, Mason, Okanogan, Walla Walla, and Whitman).

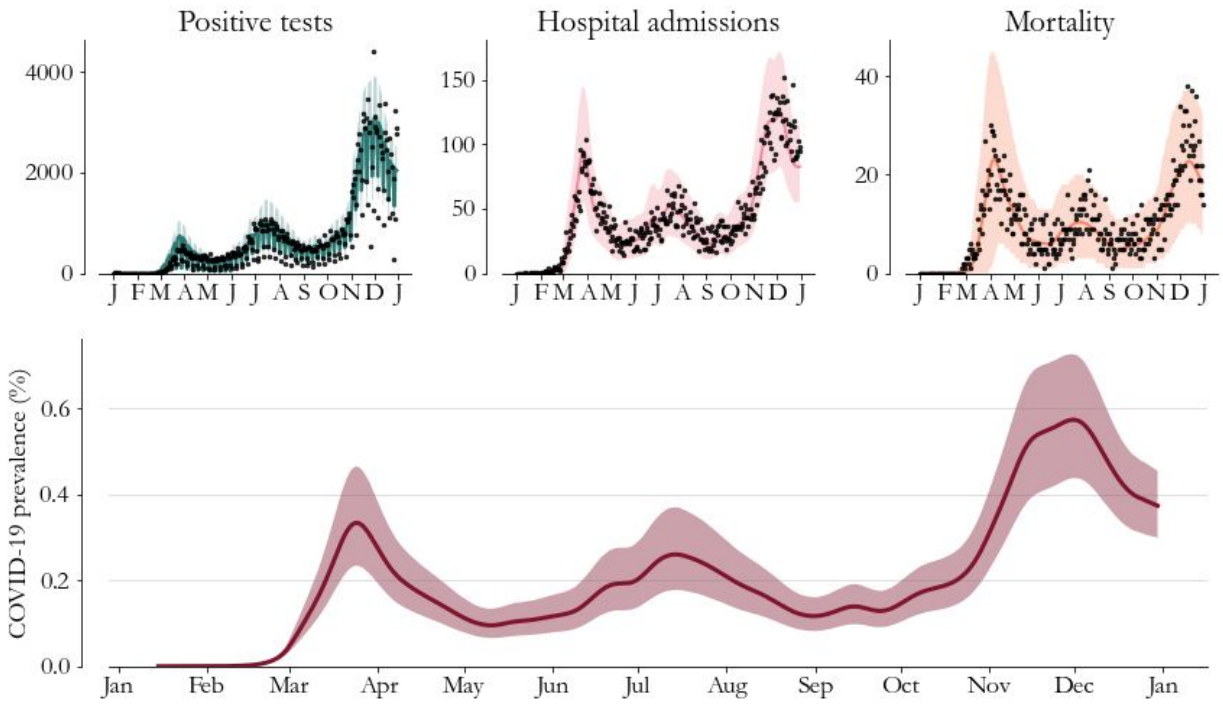

***Figure 4**: Model-based prevalence estimates (bottom, 95% CI shaded) and model fit to cases (top left), hospitalizations (top middle) and deaths (top right) for Washington state. Prevalence is the percentage of Washington state residents with active COVID-19 infection.*

On December 24, overall prevalence (the percentage of Washington state residents with active COVID-19 infection) in Washington state was likely between 0.30% and 0.46%, with a best estimate of 0.37% (Figure 4). This estimate is close to the peak prevalence estimate in late March, and hospital admissions in late December are similar to late-March levels. Prevalence estimates started to flatten in mid-November, and decline in early December, however, consistent with an R_e staying near or slightly above 1, prevalence remains several times higher than it was at the start of October. The drop in the prevalence estimate in late December may be related to changes in healthcare-seeking behavior around the December holidays rather than actual drops in population prevalence. Hospitalizations and deaths occur some time after initial infection, so the most recent hospital admission rates reflect exposure that occured at least 4 or 5 days earlier.

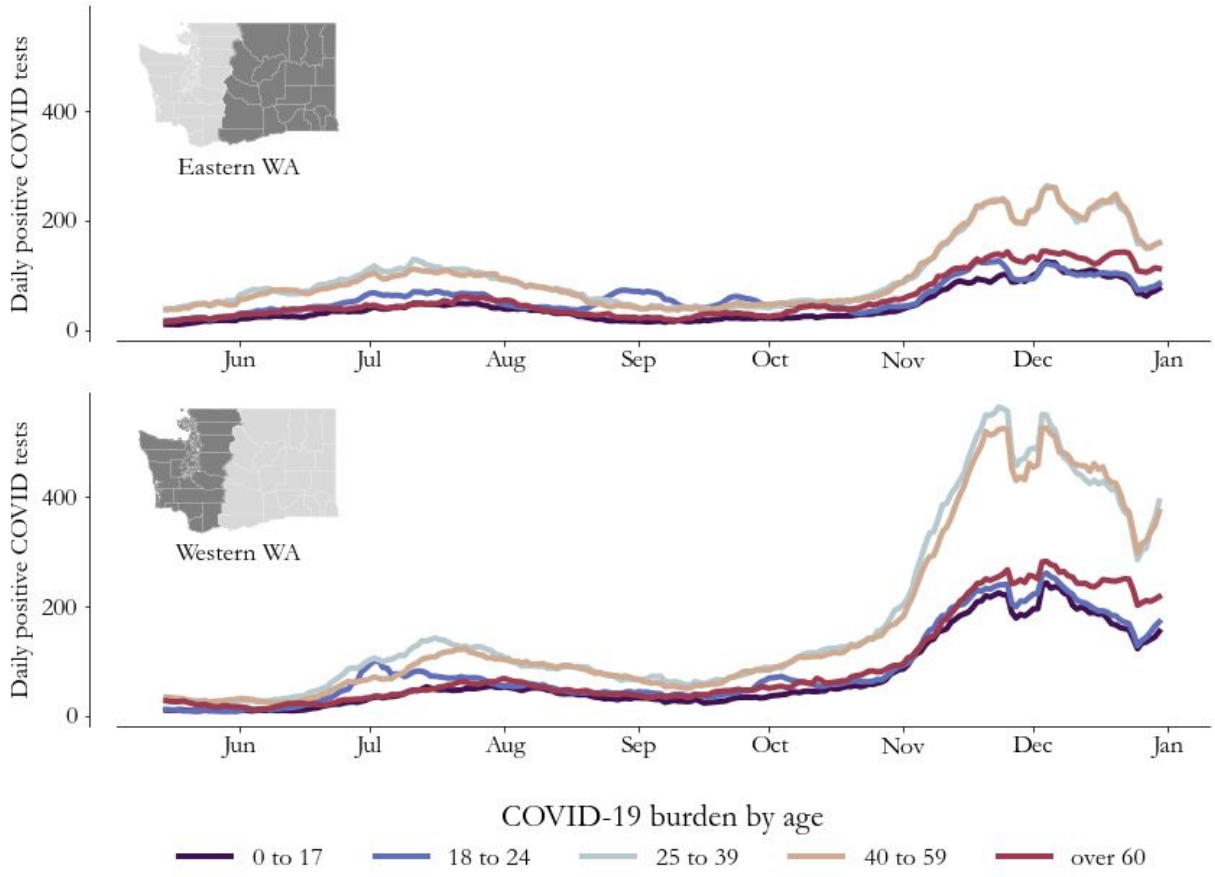

Figure 5. *Seven-day rolling average case counts by age group for eastern Washington (top) and western Washington (bottom) showing recent decreasing trends in December followed by rebounds across age groups.*

In eastern Washington, case counts declined among ages 25-59 and plateaued for the youngest and oldest age groups through Christmas, with slight post-Christmas rebounds evident in all age groups. In western Washington, all age groups except those over 60 showed declines through Christmas, followed by sharp rebounds. However, cases among those aged 60 and over in western Washington plateaued through December and then dropped post-Christmas with slight indications of rebounding.

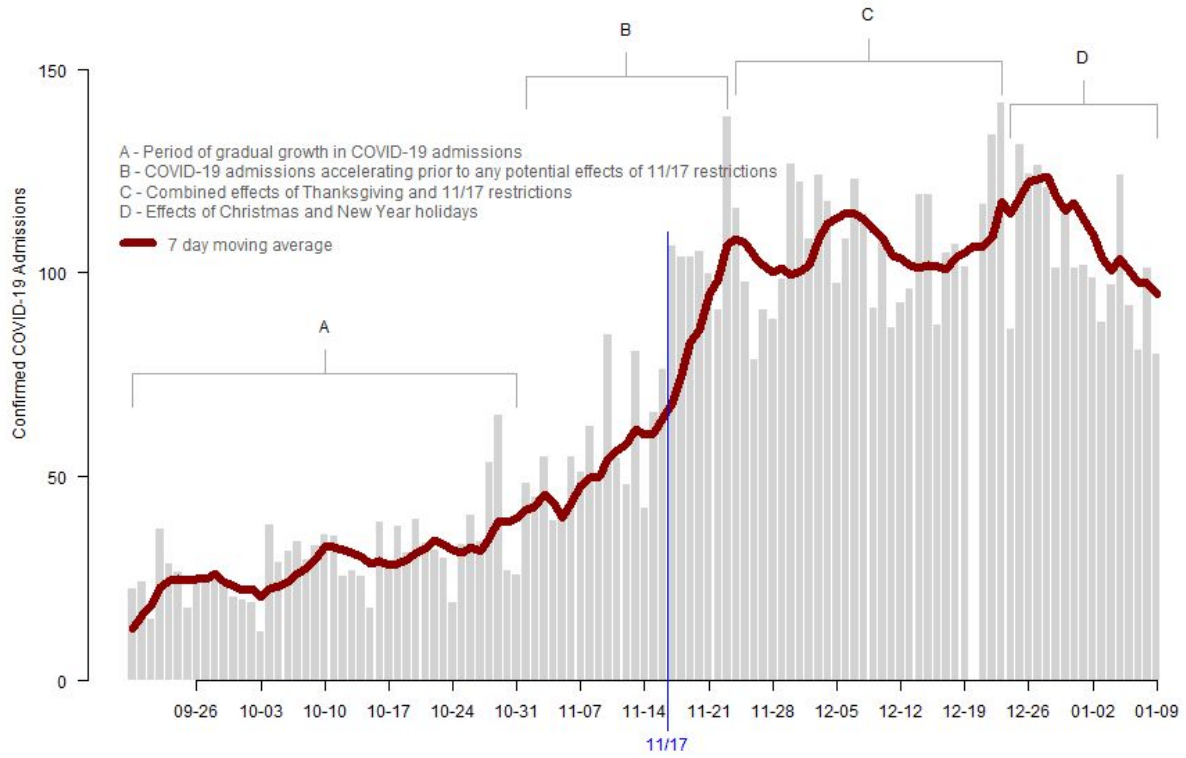

Figure 6. *Hospital admissions for patients with confirmed COVID-19 infections reported by hospitals through the WA Health system from October 19 to January 9. Through the WA Health system, hospitals report the daily numbers of admissions for confirmed COVID-19 the previous day, as well as the number of staffed acute-care ICU beds currently occupied by confirmed and suspected COVID-19 patients. The blue line indicates the renewed restrictions that went into effect on November 17. As part of data quality assurance, only dates on which over 75% of hospitals reported data to the WA Health system are included in this graph, hence December 20 has been excluded from the timeseries.*

Figure 6 highlights recent trends in hospital admissions in Washington state using aggregate daily hospital admissions data reported through the WA Health system. These data are more timely than the hospitalization data used to estimate R_e and prevalence, however, the WA Health data do not distinguish between patients with confirmed COVID-19 who require hospitalization because of COVID-19 symptoms and patients admitted for other reasons who test positive for COVID-19. This makes it less suitable for model-based estimation of R_e and prevalence as our model is based on severe COVID-19 infections requiring hospitalizations. Four distinct time periods are apparent in these data: (A) a gradual increase in hospital admissions through October 31, (B) a period of accelerating admissions through November 23, (C) a time period that includes the combined effects of Thanksgiving and reductions in transmission (R_e) that started in mid-November, and (D) the time period including the combined effects of the Christmas and New Year's holidays. Because COVID-19 symptoms do not manifest until several days after infection, and because hospitalizations tend to occur several days after the onset of symptoms, hospital admissions continued to climb through November 23 despite the reduction in transmission that occured in mid-November. A drop in hospital admissions can be observed over the week of Thanksgiving, followed by a post-Thanksgiving rebound. Hospital admissions have been relatively flat since late November, with some fluctuation, and it is not possible to distinguish patterns related to true changes in transmission from effects of changes in healthcare seeking around the December holidays.

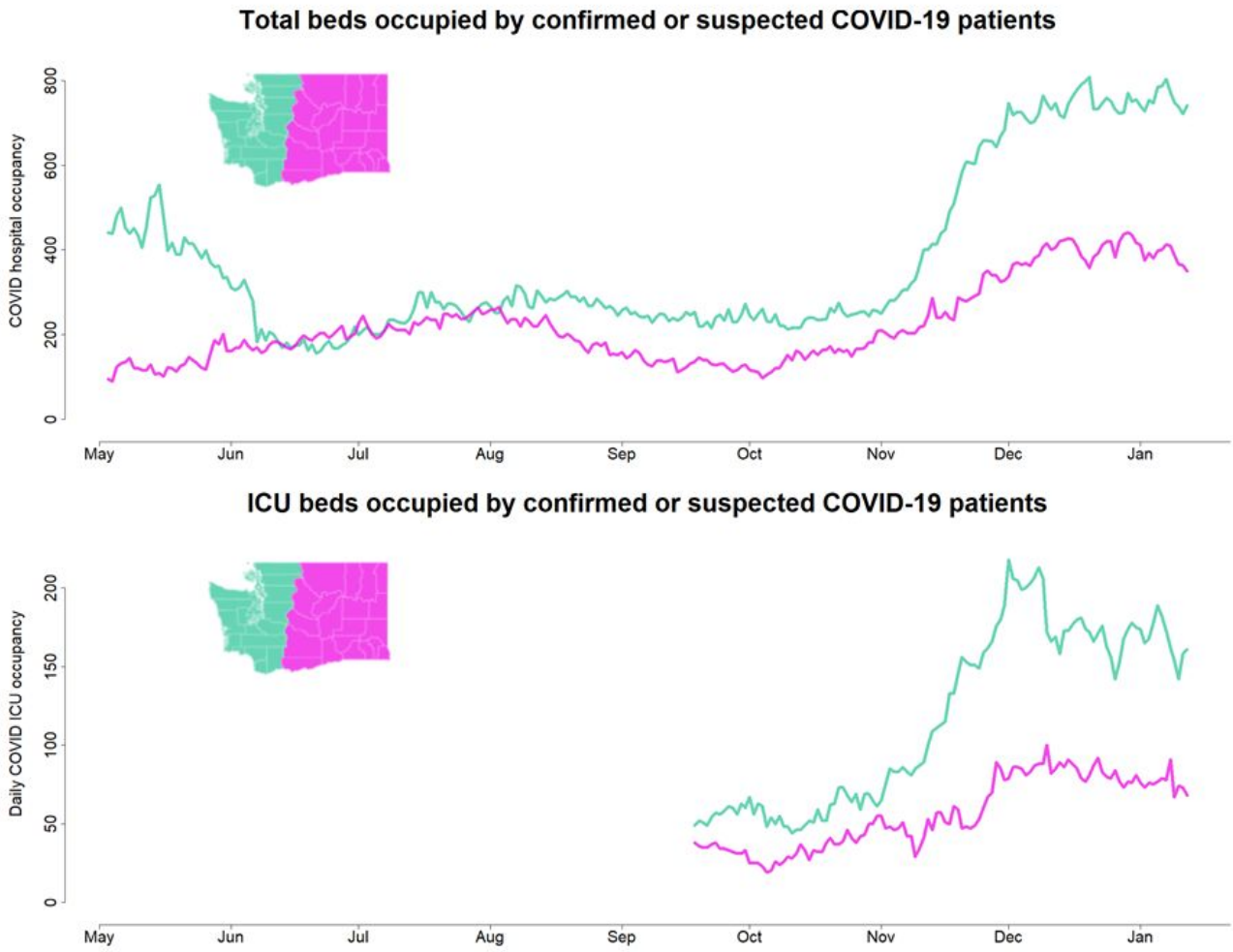

Figure 7. *Hospital beds occupied by confirmed or suspected COVID-19 patients (top, western Washington hospitals indicated by the green line, eastern Washington hospitals indicated by the pink line) and ICU beds occupied by COVID-19 patients (bottom) reported through the WA Health system. Data collection for ICU beds occupied by COVID-19 patients started September 17. Hospital occupancy data has minimal reporting lag, and is shown here using data up to January 9. Both confirmed and suspected cases are included, rather than just confirmed cases, since this best reflects total resources being used. Note that bed occupancy will continue to increase for a period of time even after admissions level off since patients being treated for COVID-19 generally stay in the hospital for several days.*

In western Washington the rapid increase in the number of occupied hospital beds that started in early November slowed substantially in early December and has remained fairly flat thereafter (Figure 7). The slower increase that was occurring eastern Washington remained unabated until mid-December and then remained flat subsequently. ICU beds occupied by confirmed or suspected COVID-19 patients flattened in western Washington at the start of December, followed by a drop in mid-December and a plateau, with some variability, through January. In eastern Washington the number of ICU beds occupied has remained fairly flat since early December.

Implications for public health practice

Although declines in transmission are apparent from mid-November through mid-December in Washington state, and case counts and hospital admissions show flattening or declining trends through late December, it is not possible to distinguish a true decline in these trends from changes in health-seeking behaviors around the holidays. Furthermore, post-Christmas rebounds in case counts, which are particularly steep in certain counties, warrant concern.

At this stage there is insufficient complete data to determine whether the post-Christmas rebounds in cases and hospital admissions represent an increase in transmission or whether they reflect delays in health-seeking behaviors. We are only just entering the time period where increases in transmission that may have resulted from December holiday gatherings would be expected to manifest in the data.

As of December 30, Washington state remains in a precarious situation, with prevalence at the same level as it was in early November, and daily hospital admissions at similar levels to mid-November. Although both total bed and ICU bed occupancy have stabilized over December, they have plateaued at levels much higher than in the fall.

Additional studies of the new strain of COVID-19 (B.1.1.7, also called VOC 202012/01) that is prevalent in the United Kingdom have solidified the evidence that this strain is substantially more infectious than prior strains, with estimates of a 1.5 - 1.7 fold increase in transmissibility relative to other strains. This strain has been detected at low levels in multiple states, but has not been detected yet in Washington. However, because most samples are not sequenced, we cannot rule out presence in Washington State at low levels. Currently B.1.1.7 does not appear to differ from other strains in terms of severity of symptoms, and there is no indication that approved vaccines will be less effective against this strain. If this strain were to become prevalent in Washington State, with a 1.5 fold increase in transmissibility over current strains, prevention of exponential growth in hospitalizations and cases would become substantially more challenging.

There are additional variants of concern first detected in South Africa and Brazil and since found in other countries but not yet the US. We can now expect new variants to continue to emerge. SARS-CoV-2, the virus that causes COVID-19, will continue to evolve as it circulates, and we must adapt as the virus adapts. Reducing prevalence through distancing, masks, and now vaccines will also serve to reduce the chance that strains with higher infectiousness or severity will emerge going forward.

Key inputs, assumptions, and limitations of the IDM modeling approach

We use a COVID-specific transmission model fit to testing and mortality data to estimate the effective reproductive number over time. The key modeling assumption is that individuals can be grouped into one of four disease states: susceptible, exposed (latent) but non-infectious, infectious, and recovered.

- For an in-depth description of our approach to estimating R_e and its assumptions and limitations, see the most recent technical report on the modeling methods. The estimates this week and going forward use the updated method in that report, which results in some statistically-insignificant retrospective changes to R_e relative to our previous report.
- In this situation report, we use data provided by Washington State Department of Health through the Washington Disease Reporting System (WDRS). **We use the WDRS test, hospitalization, and death data compiled on January 10, and to hedge against delays in reporting, we analyze data as recent as December 30 across the state.** This relatively conservative hedge against lags is in response to reports of increasing test delays.
- Estimates of R_e describe average transmission rates across large regions, and **our current work does not separate case clusters associated with known super-spreading events from diffuse community transmission.**
- Results in this report come from data on testing, confirmed COVID-19 cases, and deaths (see previous WA State report for more details). Also as described previously, estimates of R_e are based on an adjusted epi curve that accounts for changing test availability, test-positivity rates, and weekend effects, but all biases may not be accounted for.
- This report describes patterns of COVID transmission across Washington state, but it does not examine factors that may cause differences to occur. The relationships between specific causal factors and policies are topics of ongoing research and are not addressed herein.

Collaboration notes

The Institute for Disease Modeling (IDM), Microsoft AI For Health, the University of Washington, and the Fred Hutchinson Cancer Research Center are working with WA DoH to provide support for regional modeling of case, testing, and mortality data across Washington State to infer effective reproduction numbers, prevalence, and incidence from data in the Washington Disease Reporting System. Modeling and analysis for the report are led by WA DoH and are based on models developed by IDM and advanced by Microsoft to better represent the state. The WA DoH wishes to thank IDM for their support in model development and implementation for this report, in particular, Niket Thakkar of IDM developed and shared software and programming scripts and provided technical and scientific advice to the WA DoH. This collaboration has evolved alongside the science, data systems, and analysis behind the models, and it reflects the ongoing commitment of all parties involved to improve our understanding of COVID-19 transmission and to support WA DoH in its public health mission. This collaboration and its outputs will continue to evolve as scientific frontiers and policy needs change over time.
These reports were previously published on the IDM InfoHub. Going forward, as of December, 9, 2020, new reports will be published on the DOH website. IDM will continue to provide technical assistance for the reports, as part of this collaboration.