SitRep 21: COVID-19 transmission across Washington State

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Results as of November 23th 2020.

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

We are presenting estimates based on an updated prevalence model which considers cases as a leading indicator of hospitalizations in the recent past. This results in better fits to both hospitalizations and case counts and more certainty in transmission acceleration in the second half of October. Using data from the Washington Disease Reporting System (WDRS) through November 13, we estimate the effective reproductive number (R_e) in western Washington on November 8 was likely between 1.38 and 1.58, with a best estimate of 1.48. Meanwhile, we estimate that in eastern Washington, R_e was likely between 1.34 and 1.67, with a best estimate of 1.51.

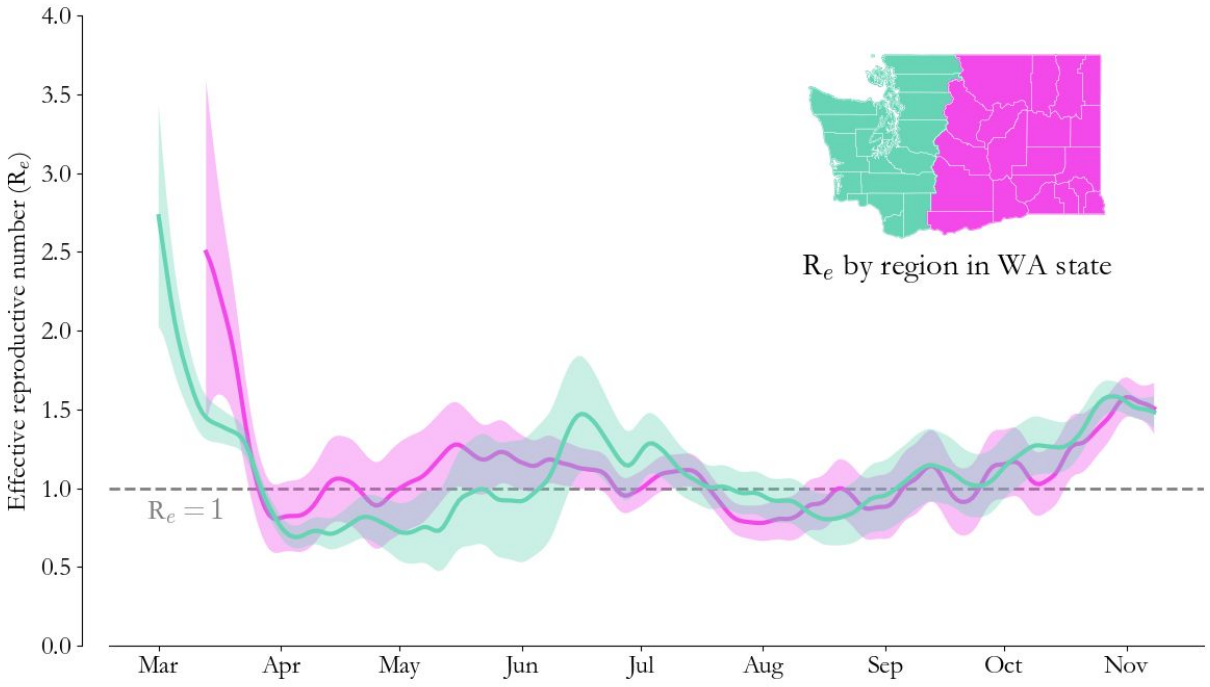

***Figure 1**: R_e estimates for eastern (pink) and western (green) WA, with 2 standard deviation error bars. Although our latest estimates of R_e are slightly lower than those released last week, our most recent estimates show substantial increases in R_e since mid October in both eastern and western Washington. The sustained period of time since late October where R_e has been substantially above one shows that the increases in cases and hospitalizations represent exponential growth in infection.*

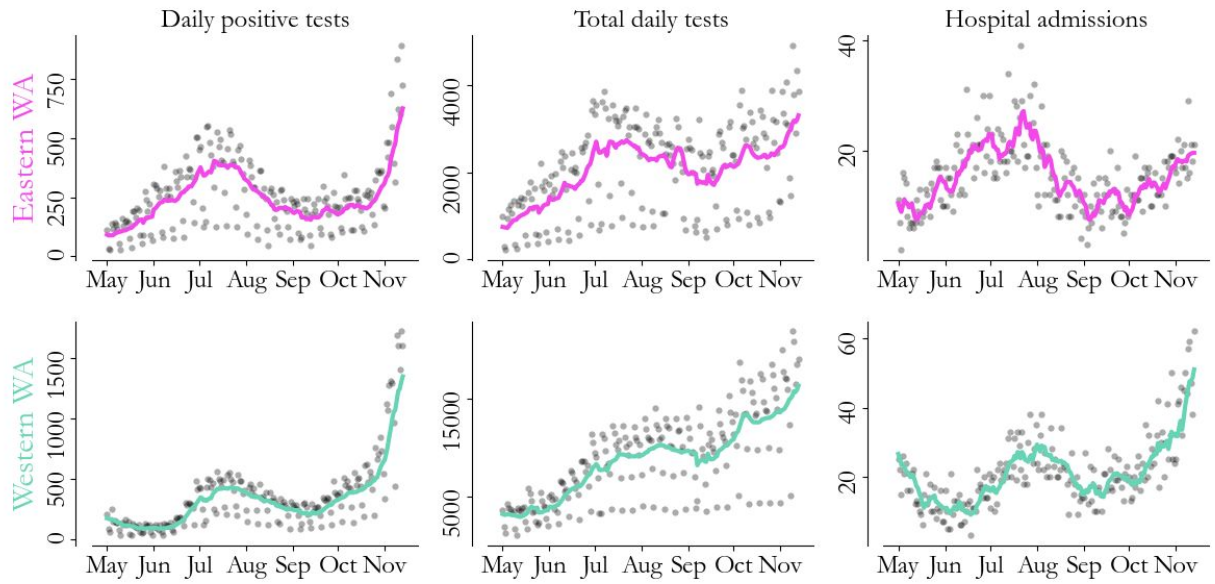

Figure 2*: Seven-day rolling case counts (left panels), total tests (middle panels) and hospitalizations (right panels) for eastern Washington (top) and western Washington (bottom). Increases in case counts have accelerated in both eastern and western Washington since mid-October, and represent a period of exponential growth in infection. Substantial increases in daily hospital admissions have been seen since the start of October. Since growth in hospitalizations typically lags growth in cases, we expect to see hospitalizations continue to increase through the end of November.*

Details

Both eastern and western Washington are seeing exponential growth in cases.

The seven-day rolling average case count in eastern Washington has increased from 153 cases per day on September 13 to 597 on November 13. This growing trend has been mirrored in an almost three-fold increase in daily hospital admissions since the start of September.

Case counts in western Washington have been steadily increasing since September 12, and this increase has accelerated since October 24, increasing from a seven-day moving average of 202 cases per day on September 12 to 488 cases on October 24 to 1283 cases on November 13. Daily hospitalizations in western Washington have been increasing since the beginning of October, increasing from a seven-day rolling average of 15 admissions per day on October 3 to 50 on November 13.

Testing volume is increasing in both eastern and western Washington but at a slower rate than the number of positives, consistent with an effective reproductive number above 1 across the state.

Growth in cases is now widely distributed across Washington, with the majority of counties showing accelerating growth and 22 of 34 counties showing 14 day per capita rates above 200 .

- Our five largest counties (Clark, King, Pierce, Snohomish and Spokane) are seeing steep increases in case counts through November 13. These counties are also among those with the highest per capita case rates.

- Several medium sized counties (Cowlitz, Franklin, Skagit, Thurston, Whatcom and Yakima) are seeing similar increasing trends.

- Benton, Kitsap and Walla Walla counties have seen steep increases in cases through November 5, with cases subsequently flat through November 13.

- Several small counties (Adams, Asotin, Grant, Lewis, Stevens and Whitman) are seeing steeply increasing trends, with seven day average case counts now above 10 cases per day.

- Several small counties (Chelan, Clallam, Garfield, Grays Harbor, Island, Jefferson, Klickitat, Lincoln, Mason, Okanogan, Pacific ,and San Juan) are also seeing increases however absolute numbers of cases are still low.

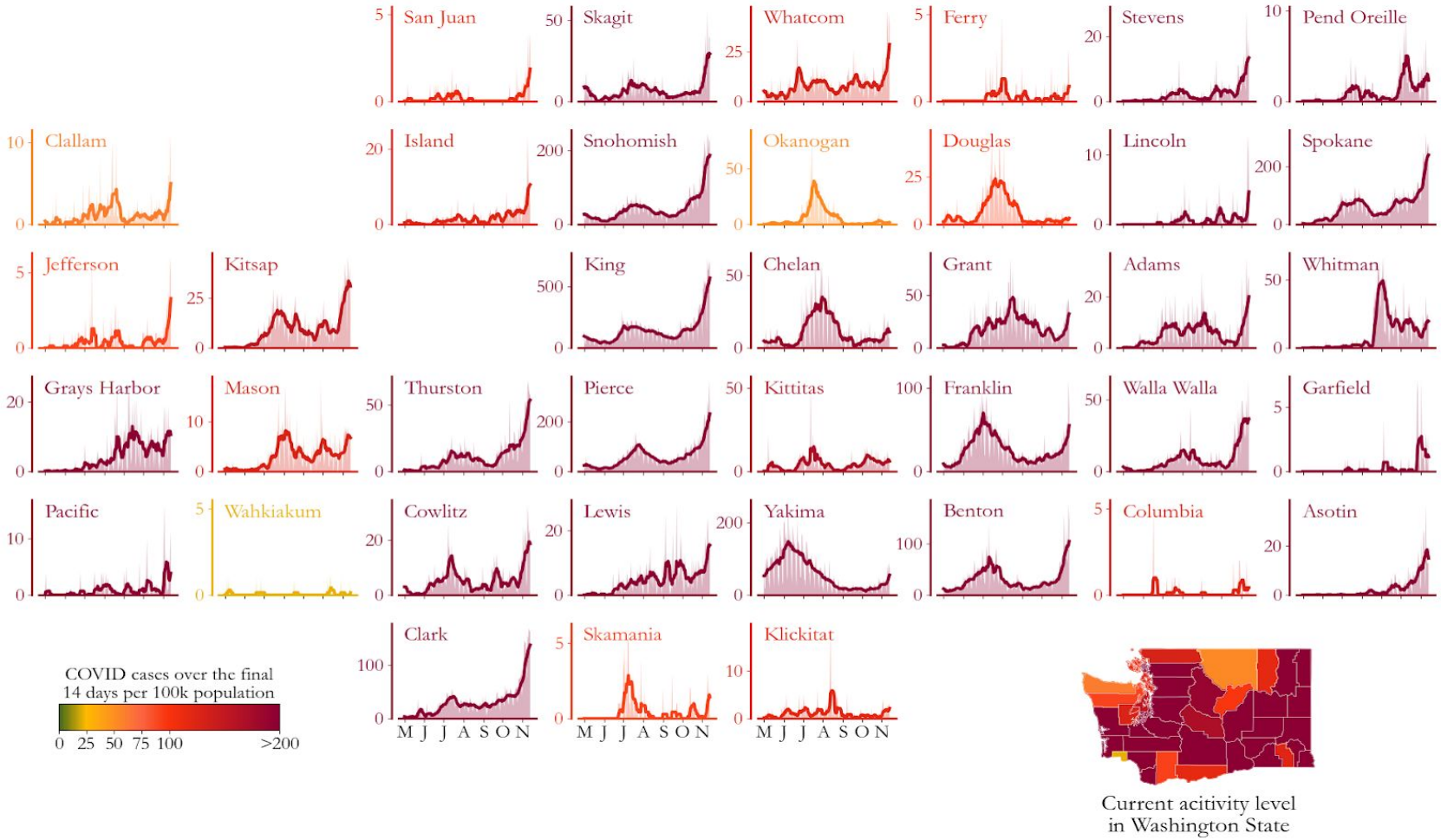

***Figure 3**: Daily COVID-19 positives (shaded areas) and 7-day moving averages (curves) arranged geographically and colored by COVID-19 activity level (total cases from October 30 to November 13 per 100,000 people). Case trends across counties highlight geographic correlations and help us better understand region-level estimates of the transmission rate (see Figure 1). With R_e considerably higher than 1 in both eastern and western WA, case counts are increasing in the majority of counties across the state.*

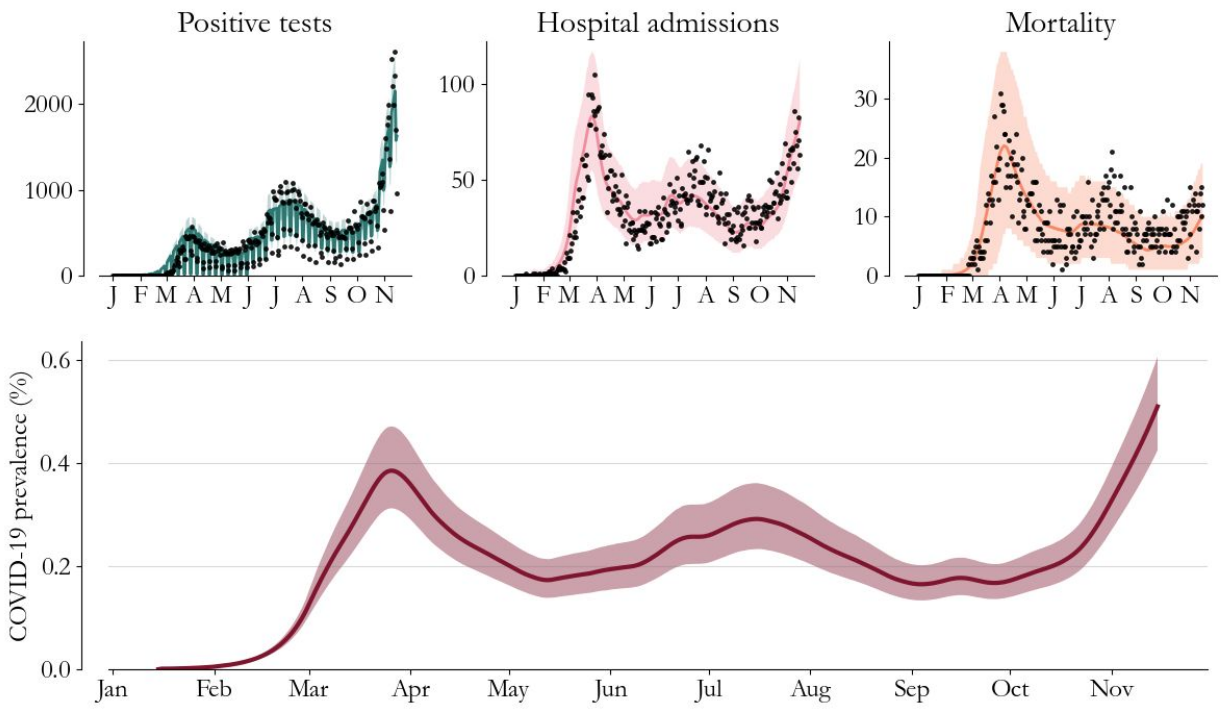

***Figure 4**: Model based prevalence estimates (bottom, 95% CI shaded) and model fit to cases (top left), hospitalizations (top middle) and deaths (top right) for Washington State. Prevalence is the percentage of Washington state residents with active COVID-19 infection.*

On November 13, overall prevalence (the percentage of Washington state residents with active COVID-19 infection) in Washington state was likely between 0.40% and 0.57%, with a best estimate of 0.48%. This estimate is now higher than the peak estimate in late March, however hospital admissions remain slightly below peak March levels, and deaths are substantially lower at present. Higher prevalence today than mid-March with fewer severe outcomes is consistent with evidence that the infected population is generally younger than in mid-March and that advances in treatment have improved survival, but because hospitalizations and deaths generally occur some time after initial infection, hospitalization admission rates today reflect exposures that occured at least 4 or 5 days ago.

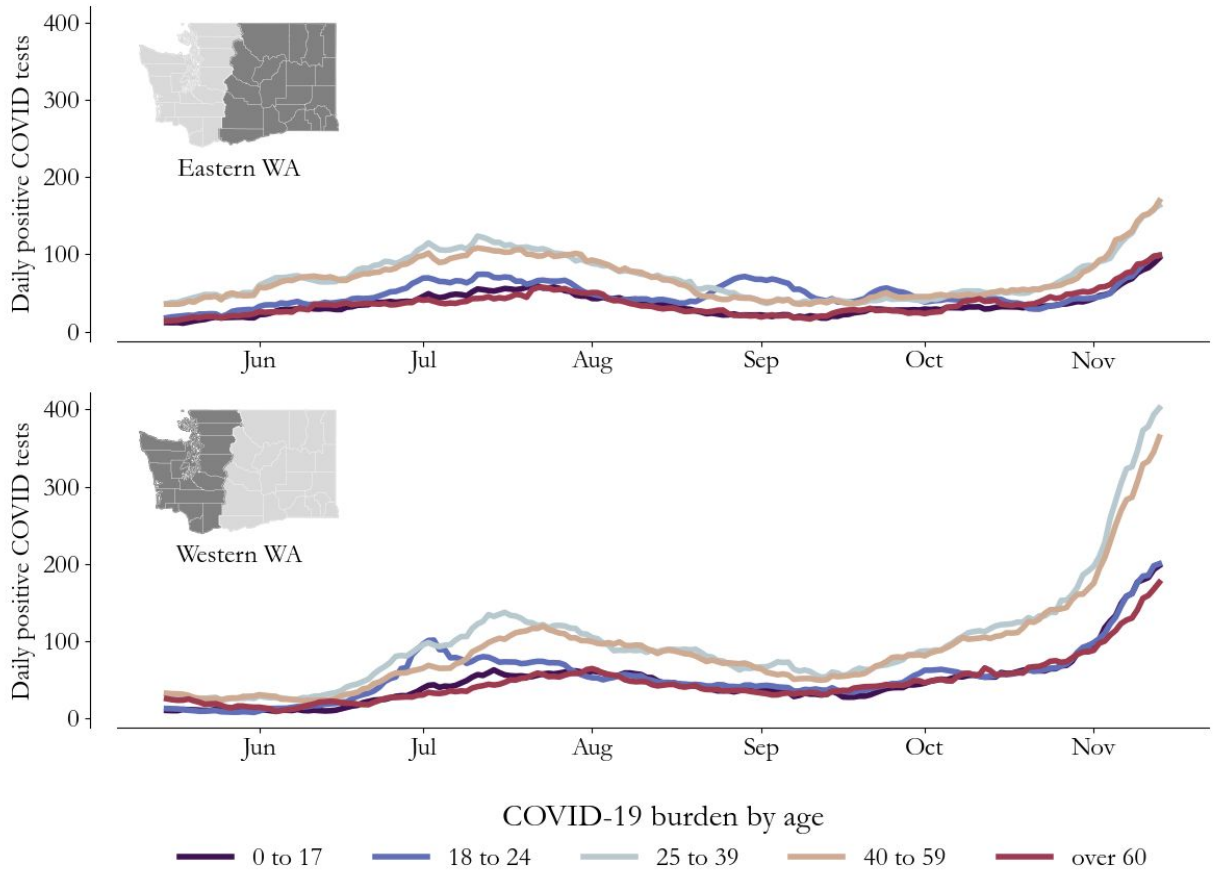

Figure 5. *Seven-day rolling average case counts by age group for eastern Washington (top) and western Washington (bottom) showing that increasing trends are widely distributed across age groups, and the rate of increase is accelerating in all age groups.*

The rate of increase in cases is accelerating across all age groups in both eastern and western Washington. The largest increases are occurring in those ages 25 to 39 and 40 to 59. Rising trends in those over 60 (red lines in Figure 4) are particularly concerning, since the likelihood of severe outcomes grows significantly with age. Increases in infections in older age groups also have an outsized impact on hospital capacity as older adults are much more likely to be hospitalized and generally will have longer hospitalization stays than younger age groups.

Figure 6. *Hospital beds occupied by confirmed COVID-19 patients (top, western Washington hospitals green line, eastern Washington hospitals pink line) and ICU beds occupied by COVID-19 patients (bottom). Data collection for ICU beds occupied by COVID-19 patients started September 17.*

The number of hospital beds occupied by patients with COVID-19 has risen steeply since November 1 in both eastern and western Washington. ICU beds occupied with patients with COVID-19 show a similar trend, with the increase being particularly steep in western Washington. When hospital admissions are rising, hospital bed occupancy will rise faster than admissions as COVID-19 patients generally stay in hospital longer than one day. As of November 23 there were 248 staffed ICU beds available in western Washington and 89 staffed ICU beds available in eastern Washington. Overall, 17.5% of occupied ICU beds consisted of confirmed or suspected COVID-19 patients.

Implications for public health practice

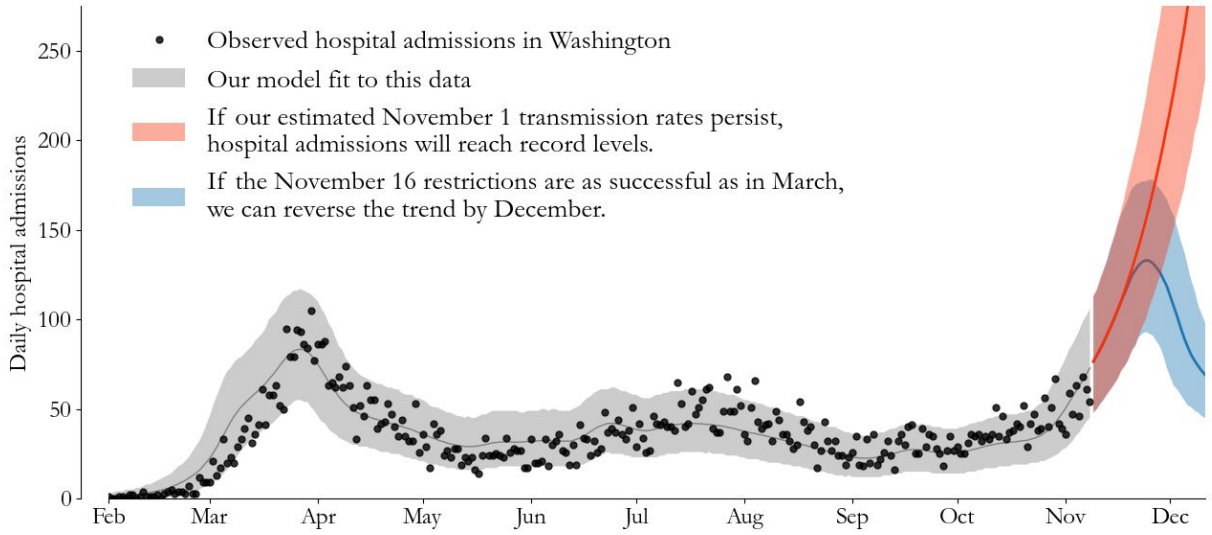

Figure 7. *Observed and projected hospital admissions for Washington state under two scenarios . Black dots show observed hospital admissions and the grey region is the model based 95% confidence interval. The red line shows projected hospital admissions (shaded area 95% CI) if transmission rates estimated using data to November 6 persist through December. The blue line shows hospital admissions (shaded area 95% CI) that are projected to occur if transmission declines that occur after November 16 are similar to the declines that occurred between the start of the Stay Home Stay Healthy restrictions on March 23 and April 4, when transmission rates reach a local minimum. [(Institute for Disease Modeling estimates, Nov 17)]*

Drastic action to reduce transmission of COVID-19, maintain adequate hospital capacity and avoid deaths is clearly warranted given the latest estimates of R_e **,** rising hospitalizations , and potential for upcoming gatherings over the holiday season.

Due to increased numbers of critical care beds needed for COVID-19 patients, some hospitals in Washington State have started to postpone non-urgent surgeries to ensure adequate capacity remains. Postponing non-urgent surgeries can have detrimental effects on the long term wellbeing of individuals requiring surgery, and on the costs associated with surgeries being conducted on individuals at a more advanced stage of disease. Further reductions in hospital capacity beyond what can be countered by reducing non-urgent surgeries will impact the ability of hospitals to care for critically ill patients. If this occurs, we can expect increases in mortality and morbidity associated with both COVID-19 and non COVID-19 related health emergencies.

Figure 7 shows two potential scenarios in Washington. If actions taken on November 16 result in a similar size effect on transmission as did the actions taken in March, we can expect to start to see a turn

around in case counts and hospitalizations by the end of November. This lag between reductions in transmission and changes in case and hospitalization trends demonstrates the need to reduce transmission before hospital capacity reaches critical levels. Alternatively, if actions taken on November 16 have no impact on transmission rates, by early December daily COVID-19 hospital admissions could be double the peak numbers seen in late March.

Reductions in transmission ultimately depend on changes in individual behaviors, and in particular on reductions in indoor gatherings where most transmission is currently occurring. The risk of being exposed to someone with COVID-19 increases with gathering size and with prevalence of COVID-19 in the community. If transmission has continued at the rate estimated for November 1, the average chance that someone in a group of 15 on Thanksgiving is infected with COVID-19 will be around 18%.

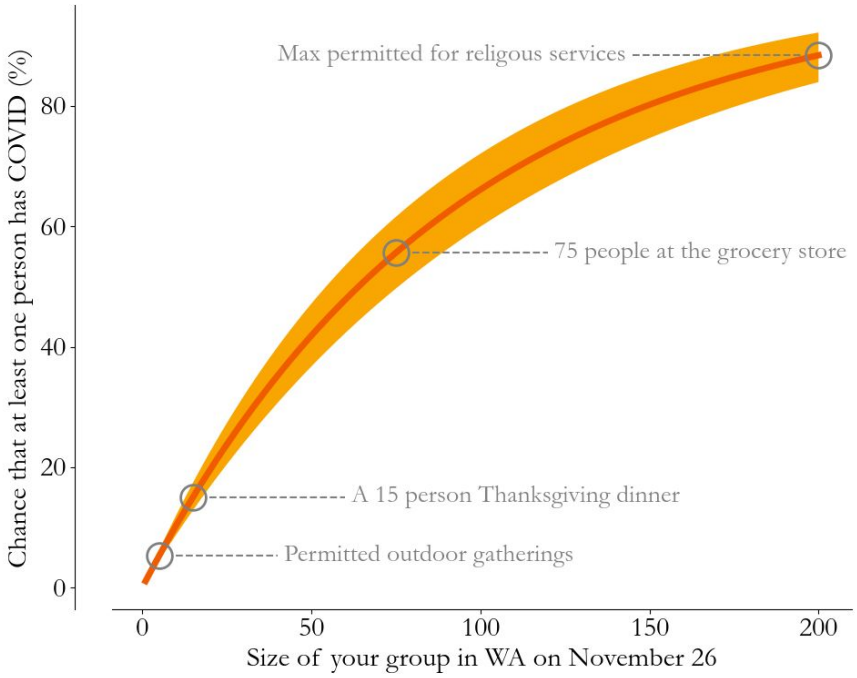

Figure 8. *Average chance that someone in a group of individuals has COVID-19 as group size varies, based on projected prevalence for Thanksgiving day under the assumption of no change in transmission, using transmission estimates for November 1 calculated using data to November 6.* *(Institute for Disease Modeling estimates, Nov 17)*

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 November 21, and to hedge against delays in reporting, we analyze data as recent as November 13 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. 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.