# WA Situation Report 2: COVID-19 transmission across Washington State

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***Results as of May 20, 2020 5 p.m.***

*This situation report is a concise presentation of results based on the latest data. For a thorough description of how these estimates are generated, see* [this earlier detailed report.](.)

## What do we already know?

The [previous IDM report](.) showed the average effective reproductive numbers ( $R_e$ ) in Eastern and Western WA was hovering near the critical $R_e$ = 1 threshold in both regions, with transmission persisting in Western WA ( $R_e$ not below 1 since April 16) and slowly increasing in Eastern WA ( $R_e$ greater than 1 through April 26).

## What does this report add?

With updated data from the Washington State Disease Reporting System through May 12, we find that the trends in $R_e$ are diverging between Western and Eastern WA. We estimate that in Western WA, $R_e$ is no longer increasing and is likely trending downwards below 1 since April 30, and on May 7 we infer $R_e$ was likely between 0.09 and 1.05, with best estimate 0.57. In Eastern WA, our best estimate is that $R_e$ has been at or above 1 since April 27,and we infer on May 3 that $R_e$ was likely between 1.12 and 1.52 with best estimate 1.32. Our $R_e$ estimates reflect the observed trends in weekly case counts observed on both sides of the Cascades; weekly case counts are falling in Western WA but slowly increasing in Eastern WA.

On a county level, we note there is significant geographical heterogeneity in the number of reported cases. During the week from May 10 to May 16, the majority of cases were reported in King and Yakima counties; while new case counts are trending downwards in King County, they are steadily increasing in Yakima County. Relative to population, we observe that Yakima and Chelan counties, both within Eastern WA, have the highest number of cases per capita. Skagit county has the highest cases per capita within Western Washington. The observed geographical heterogeneity likely has multiple causes, including variations in testing and differences in underlying infection rates due to behavioral and socioeconomic factors that influence COVID exposure risk. Untangling these factors is a subject of ongoing research not addressed by this report.

## What are the implications for public health practice?

Our estimates indicate that transmission is likely declining in Western WA but continues to increase overall in Eastern WA. Within each region, geographical heterogeneity in reported cases supports the need to identify specific activities that lead to significant transmission and to develop tailored policies that balance reducing COVID spread with supporting the social and economic needs of the people affected.

## Key inputs, assumptions, and limitations of our modeling approach

We use a COVID-specific transmission model fit to testing and mortality data to estimate the effective reproductive number over time and the associated COVID-19 prevalence and incidence. 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 and its assumptions and limitations, see this earlier 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 and death data compiled on May 17, and to hedge against delays in reporting, we analyze data up to May 12 for Western Washington and up to May 8 for Eastern Washington.**
- 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 derive 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. Ongoing research is focused on incorporating other data streams, including covid-like-illness reports and hospitalization data.
- 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 is not addressed herein.

## Collaboration Update

The Institute for Disease Modeling (IDM) and Microsoft are working with WADoH to provide 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. This report is based on models developed by IDM that are being advanced to better represent the state by Microsoft, and both together volunteer to support WADoH in its public health mission. 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.  This collaboration and its outputs will continue to evolve as scientific frontiers and policy needs change over time.

# Models of Eastern and Western WA highlight differences in trends for transmission across the state.
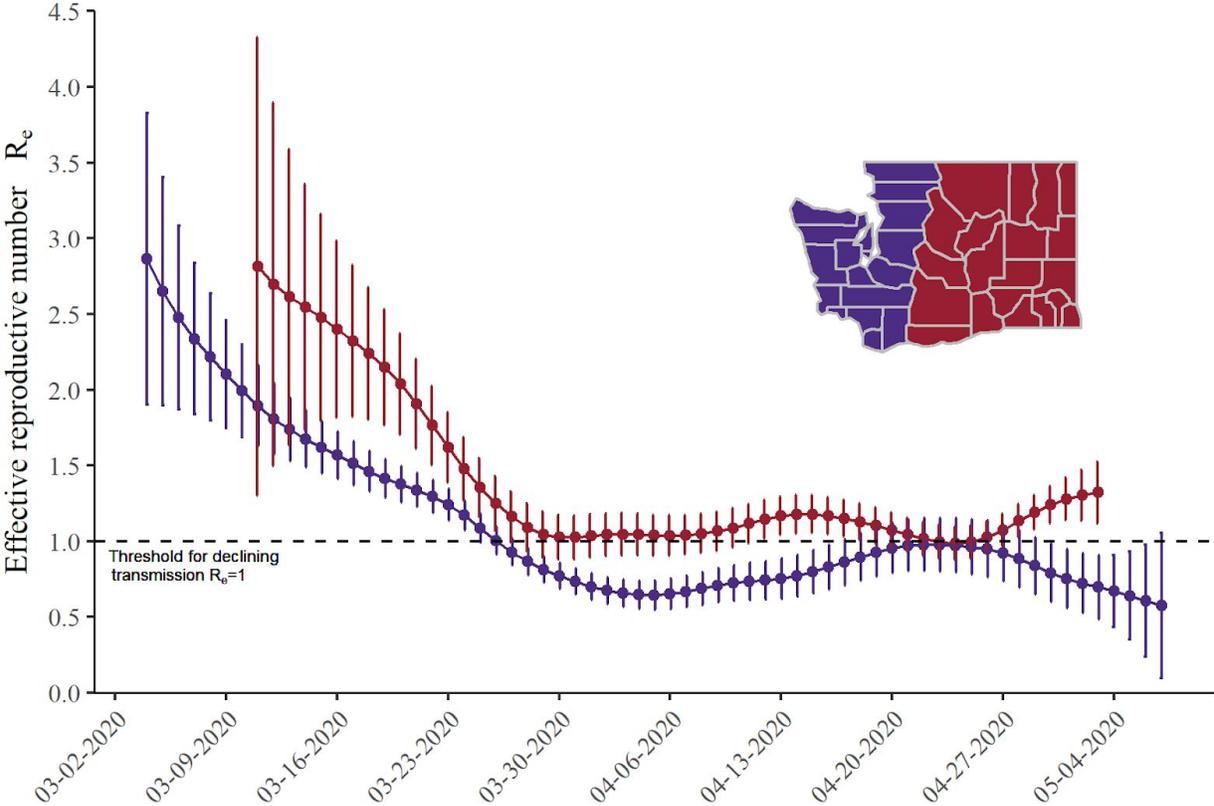


**Figure 1**: $R_e$ estimates for Eastern (red) and Western (purple) WA, with 2 standard deviation error bars. Our most recent estimates suggest that $R_e$ was below 1 and likely declining through May 7 in Western WA, but was above 1 and likely increasing in Eastern WA through May 3.

## The diverging trends in $R_e$ reflect underlying differences in new case counts and test positive rate over time.
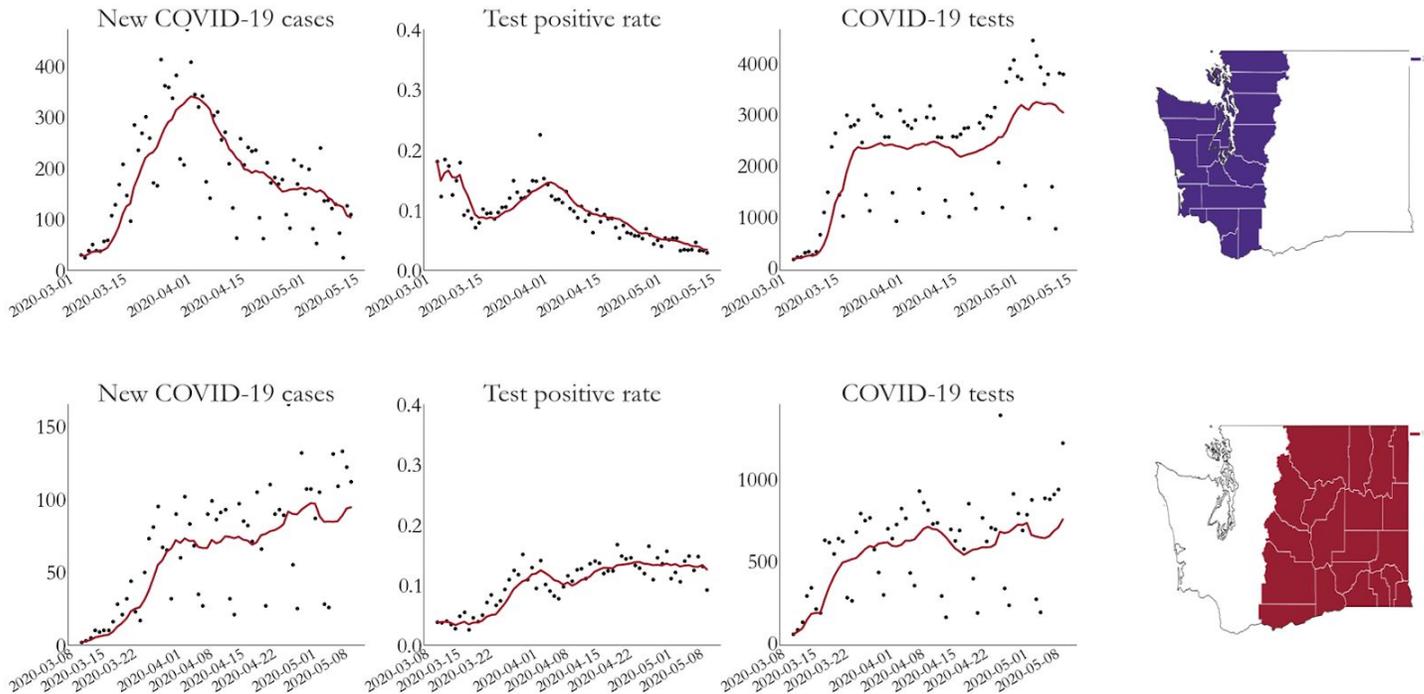


**Figure 2**: (Left) The daily new case counts (dots) and 7-day smoothed trend (lines) for Eastern and Western WA, (middle) the daily test positive rate (dots) and 7-day smoothed trend (lines), and the daily number of tests (dots) and 7-day smoothed trend (lines). The most recent estimates suggest that new cases have been declining in Western WA, but increasing in Eastern WA.

**Estimated prevalence in Eastern WA through May 15 is comparable to peak prevalence in Western WA at the end of March.**
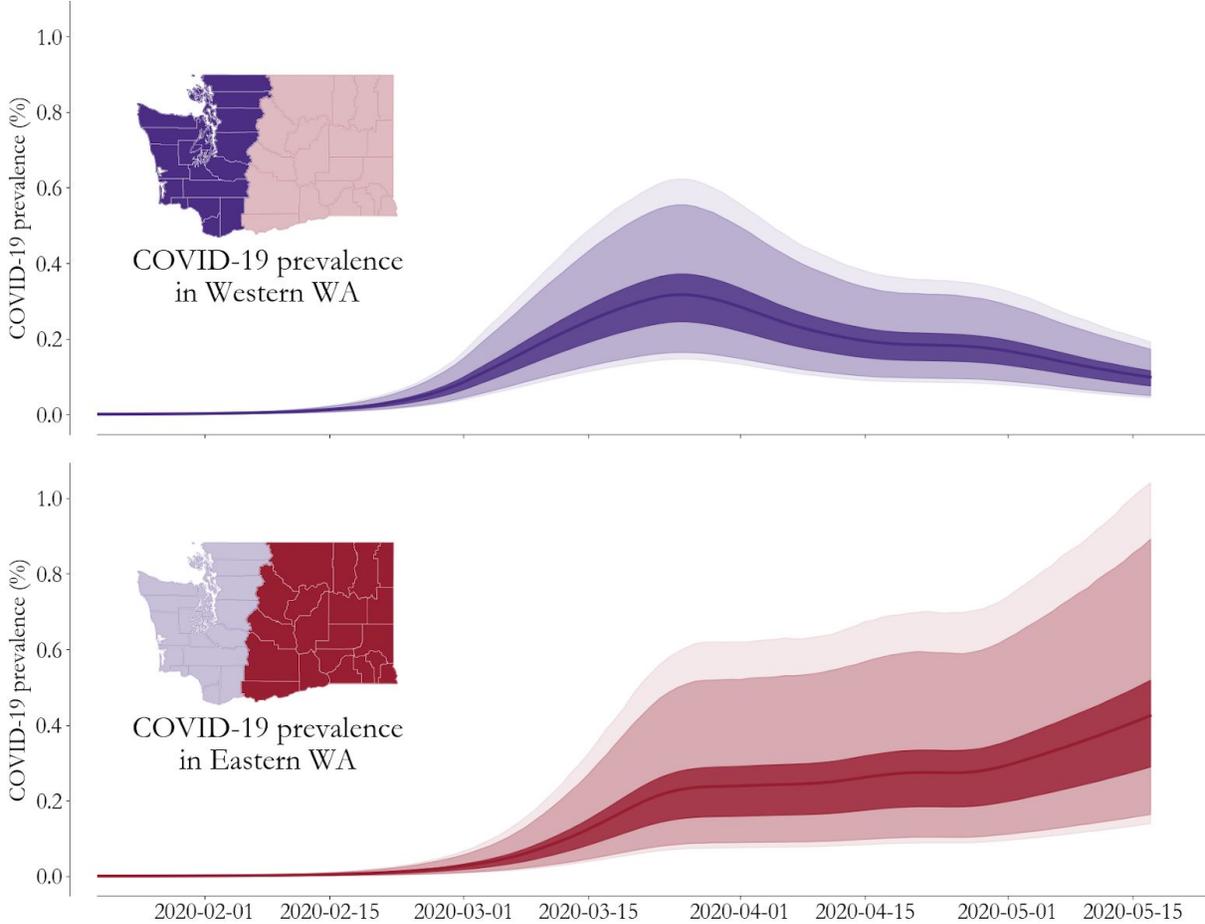
*Figure 3: Modeled prevalence of active infections per capita for Eastern and Western WA. Line shows best estimate and ribbons show 50%, 95%, and 99% credible intervals. Mirroring the trends in cases and deaths, inferred prevalence was declining in Western WA through May 15, but increasing in Eastern WA. Recent prevalence in Eastern WA is now comparable to peak prevalence in Western WA at the end of March, albeit with broad uncertainty.*

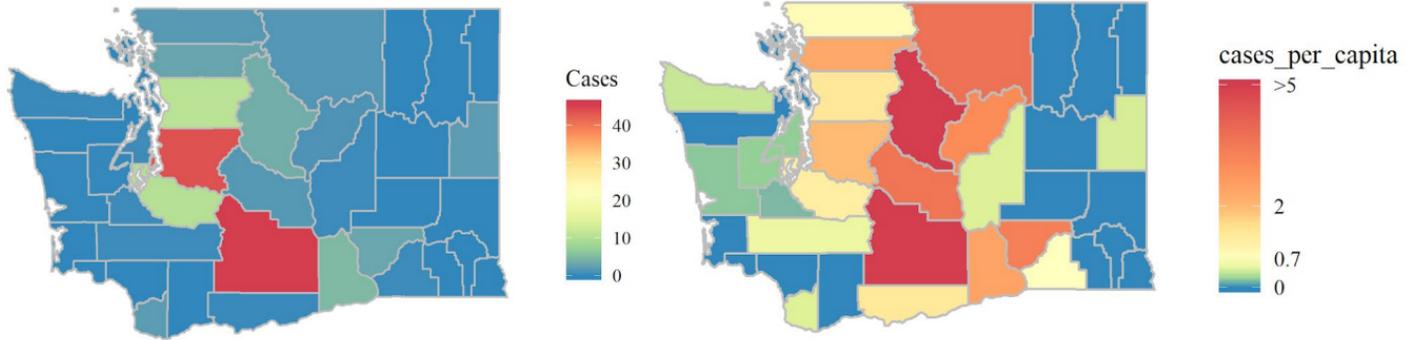# Geographic heterogeneity in cases by county within Washington



**Figure 4**: *Average of total cases per county per day and total cases per county per day per 100k population using data from May 10-May 16. The majority of cases were reported in King County and Yakima County. Cases per capita were highest in Yakima and Chelan counties. Skagit county had the highest cases per capita within Western WA.*

# Trends in new case counts for King County, Yakima County and Eastern WA without Yakima County
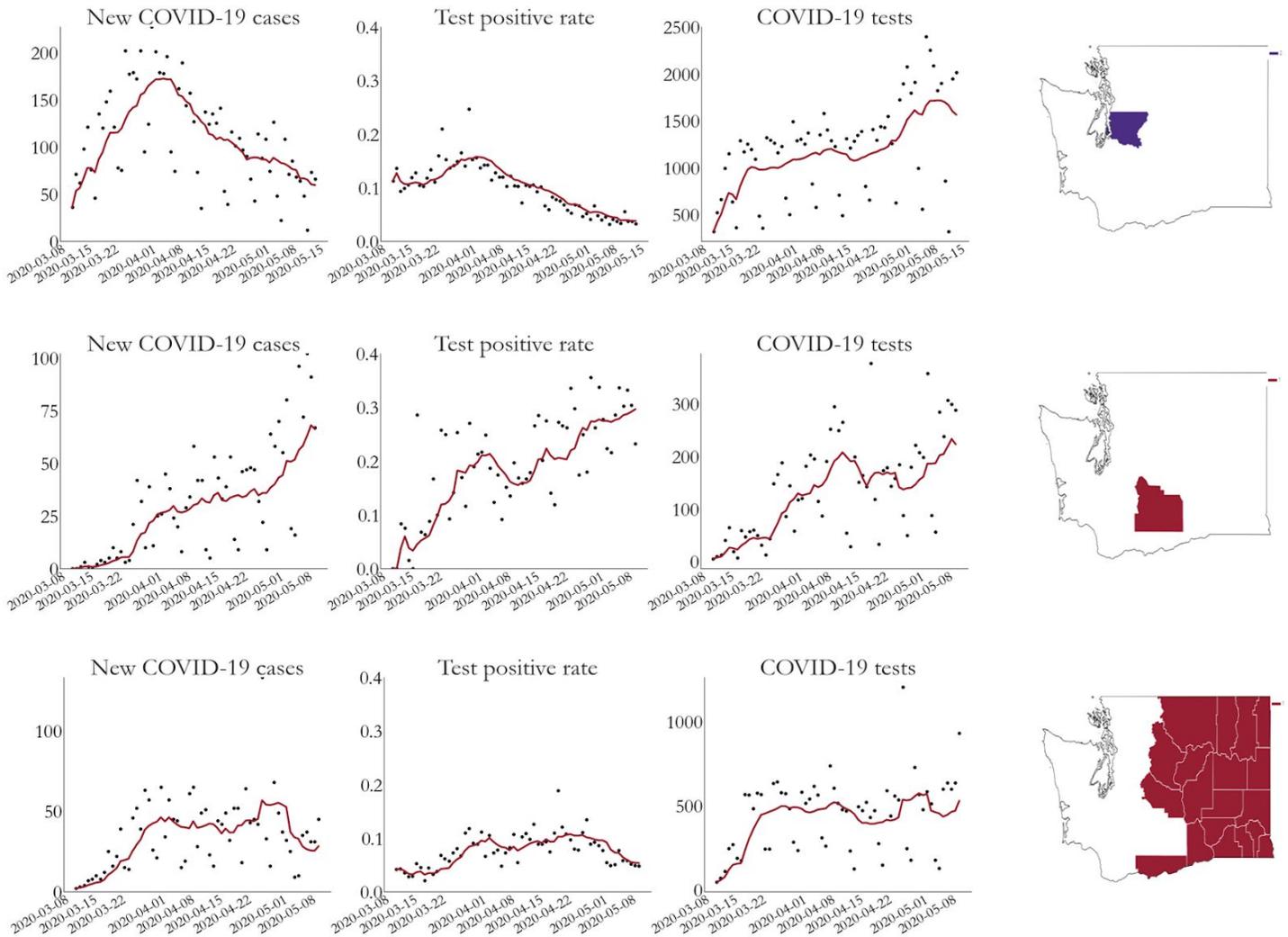


*Figure 5*: King County and Yakima County reported the two highest average weekly case counts from May 3-May 16. In King county, the trend in new case counts and the test positive rate has been declining, while in Yakima County the trend in new case counts and test positive rate have been increasing steadily. Eastern WA without Yakima, in comparison to all of Eastern WA, has a flatter trend in new case counts, with a declining test positive rate. (Left) The daily new case counts (dots) and 7-day smoothed trend (lines), (middle) the daily test positive rate (dots) and 7-day smoothed trend (lines), and the daily number of tests (dots) and 7-day smoothed trend (lines).