Situation Report 7: COVID-19 transmission across Washington State

Niket Thakkar[1], Grace H Huynh[2], Ruth Etzioni[3], Ian Painter[4], Juan M. Lavista Ferres[1], and Mike Famulare[2]
[1]Institute for Disease Modeling; [2]Microsoft; [3]Fred Hutchinson Cancer Research Center; [4]Washington State Department of Health

Results as of July 2 2020 5 p.m.

From week to week, we will be highlighting situations around the state that we think warrant special attention. 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.

What do we already know?

Our previous situation report indicated that transmission has been increasing generally across the state. We highlighted a trend of increasing cases within Puget Sound and initial evidence that recent public health efforts in Yakima County were having some success in reducing COVID-19 burden.

What does this report add?

With data from the Washington State Disease Reporting System through June 28, we have increased certainty that transmission is accelerating across the state. We estimate that in Western WA on June 18, R_e was likely between 1.16 and 1.91, with best estimate 1.54, definitely above the $R_e = 1$ threshold for declining transmission. In Eastern WA, we infer on June 15 that R_e was likely between 0.94 and 1.22 with best estimate 1.08. These estimates suggest COVID-19 burden will continue to grow across the state. The most recent estimates for R_e in Eastern and Western WA now appear on the WA State COVID-19 Risk Assessment dashboard.

Looking across the state, we see a rise in cases in many counties, including those that are in Phase 2 and Phase 1 of the Safe Start program. While we do not see a significant rise in cases for most of the Phase 3 counties, the majority of these counties have a smaller total population and smaller overall case counts. Soberingly, while rising trends in cases were primarily restricted to a few hotspots in the recent past, we are now observing a more diffuse outbreak in the surrounding areas.

Specifically, in Puget Sound, we note an increase in the test positive rate and the case counts across the region, suggesting that transmission is increasing. In the counties surrounding Puget Sound, we see a similar trend overall, suggesting that COVID-19 transmission is spreading to these areas as well.

Meanwhile, in Eastern WA, transmission is increasing in Spokane and Benton, and Franklin counties, previously noted hotspots where case counts and the test positive rate are still growing. In counties adjacent to these outbreaks, cases have also been rapidly increasing, with a parallel trend in the test positive rate, suggesting transmission is also increasing in these regions.

What are the implications for public health practice?

Our analysis indicates that transmission continues to increase across the state. Not only are cases rising in known hotspots, but transmission is now likely increasing in neighboring areas. **Continuing along this trajectory will lead to catastrophic outcomes for health and economic wellbeing in Washington.** There is an urgent need to increase adherence to masking, to maintain physical distance from people you don't live with, to be tested when exposed, to support contact tracing, and to isolate when infected.

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. 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 June 28, and to hedge against delays in reporting, we analyze data up to June 23 for Western Washington and up to June 20 for Eastern Washington.**
- This week we include an analysis of syndromic surveillance data, i.e. visits to emergency departments due to COVID-like illness (defined as either a COVID-19 diagnosis or fever and shortness of breath with influenza ruled out). This data set was updated by the WADoH RHINO team on July 1, and it contains records up to June 27.
- 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. **In particular, situations with large, rapid testing volume increases introduce additional uncertainties that can only be fully resolved with longer time series. We emphasize however that increased testing volume is an overwhelmingly positive thing. Despite the short term uncertainty test volume changes introduce into metrics of COVID-19 transmission, increased testing is essential to identifying high-risk settings, preventing onward transmission, and linking people to care.**
- 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 Notes

The Institute for Disease Modeling (IDM), Microsoft and the Fred Hutchinson Cancer Research Center 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.

COVID-19 burden is growing across the state, and transmission was recently accelerating in Western WA, where recent testing data places our latest effective reproductive number estimate confidently above one.

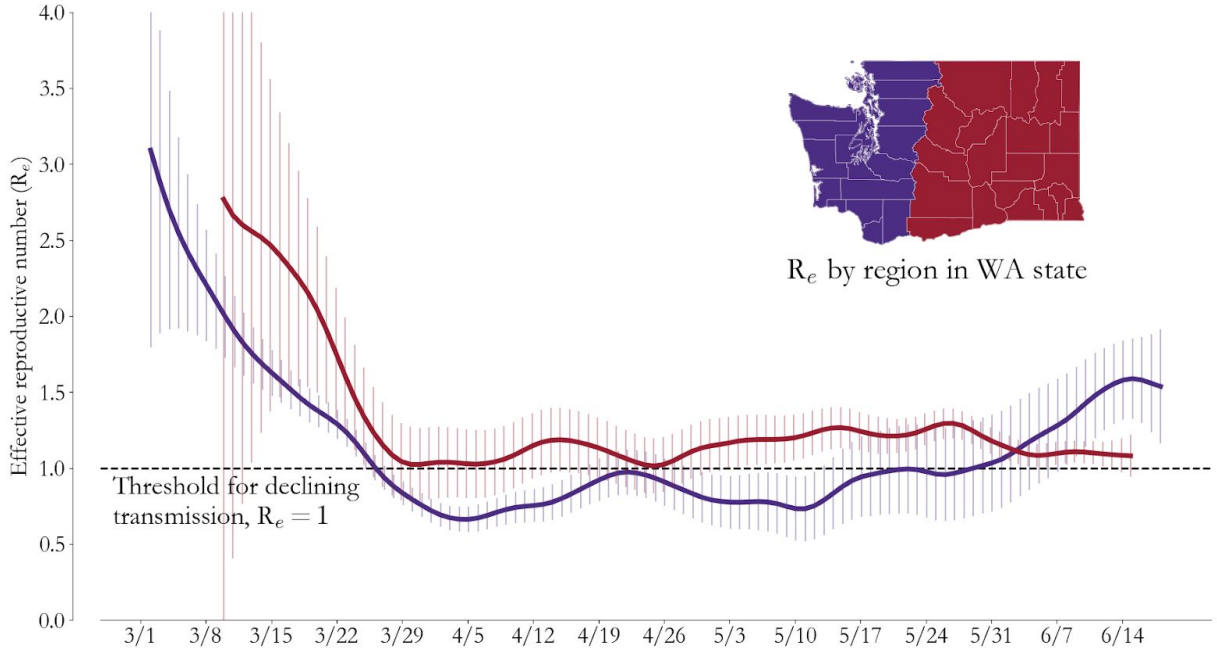

***Figure 1**: R_e estimates for Eastern (red) and Western (purple) WA, with 2 standard deviation error bars. Our most recent estimates suggest that R_e is above 1 in both Eastern and Western WA, with increased confidence relative to past situation reports. For details on how these estimates are generated, see our [technical report](#).*

Case counts are rising across Washington and in counties at every Safe Start phase. This suggests that COVID-19 transmission has spread from specific hotspots and is now increasingly distributed throughout the state.

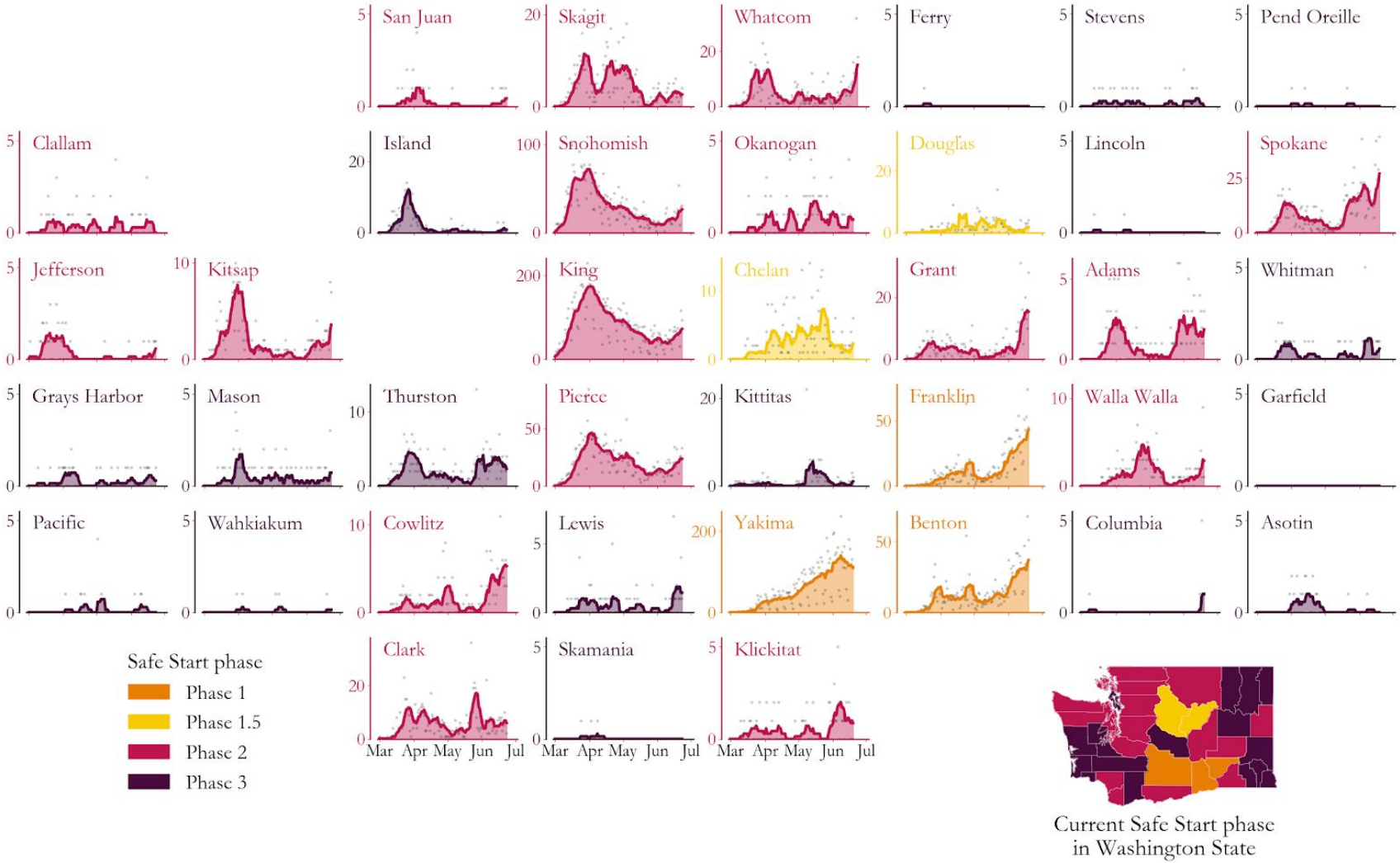

***Figure 2**: Daily COVID-19 positives (dots) and 7-day moving averages (curves) arranged geographically (inspired by this) and colored by Safe Start phase as of July 1. In previous reports, we've highlighted growing outbreaks in Benton and Franklin counties, Spokane County, and King, Snohomish, and Pierce counties. Case data suggests that these outbreaks have spurred growth in a number of neighboring Phase 2 counties, such as Kitsap, Cowlitz, Grant, and Walla Walla. Many phase 3 counties, with generally lower population, have not yet seen substantial growth, but risk is currently very high given the situation in surrounding areas.*

The daily number of confirmed cases is growing faster than the number of tests, as illustrated by test-positivity rates across the state. This gives confidence that the epidemic is growing and the cases are not an artifact of increased testing.

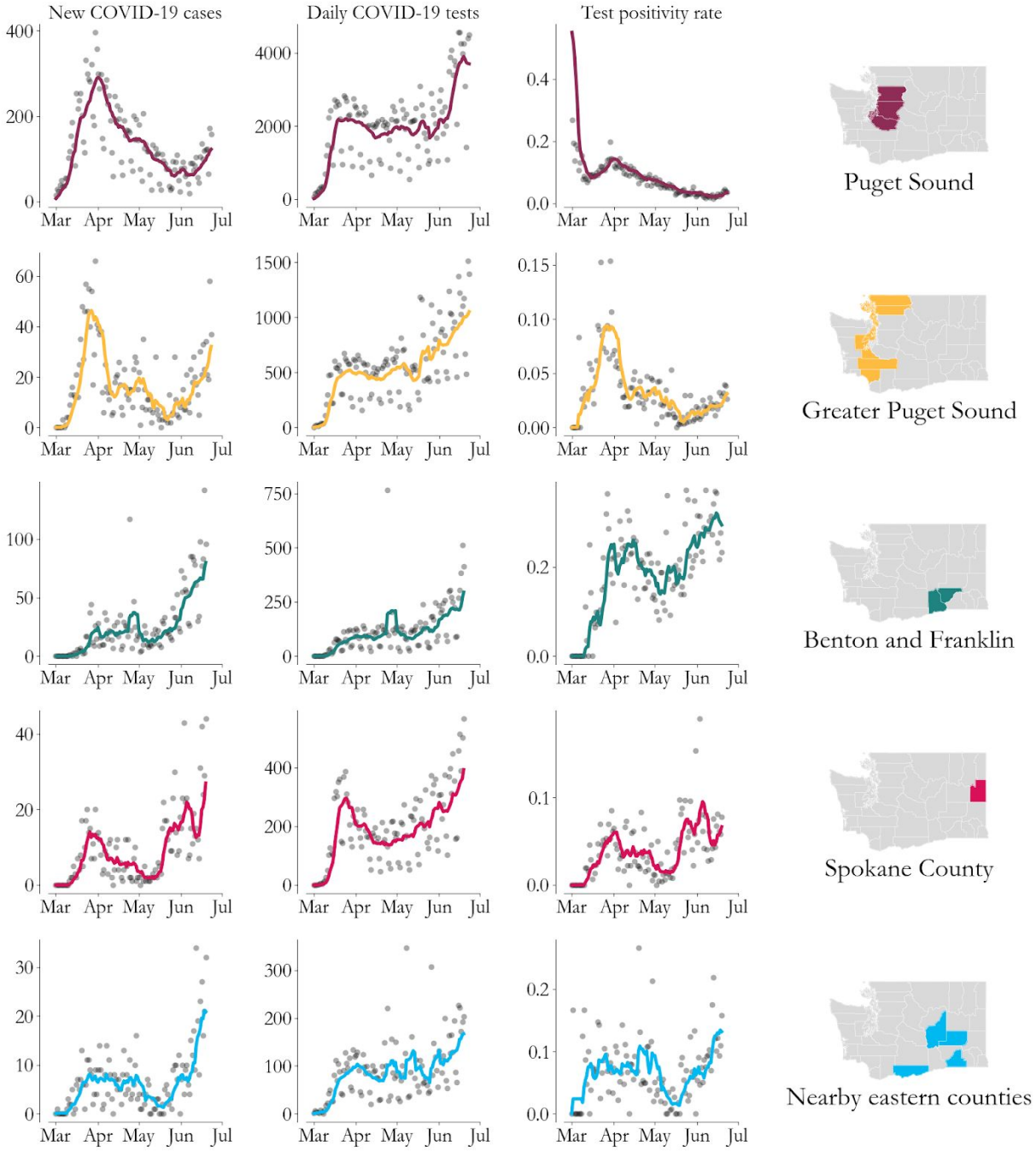

***Figure 3**: Cases (left), tests (middle), and test-positivity (right) are smoothed with a 7-day rolling average (curves) to highlight trends. From top to bottom, rises in the Puget Sound area (burgundy) are concurrent with rises in neighboring counties (yellow). Similarly, outbreaks in Benton and Franklin (green) and in Spokane (red) are concurrent with growing outbreaks in a number of nearby eastern counties (blue).*

Growth in COVID-like illness (CLI) visits to emergency rooms is likely just beginning, since positive tests are currently more likely to come from younger individuals with lower infection severity. Over time, without widespread change in behavior, we expect CLI visits to rise as younger people pass their infections onto more vulnerable populations.

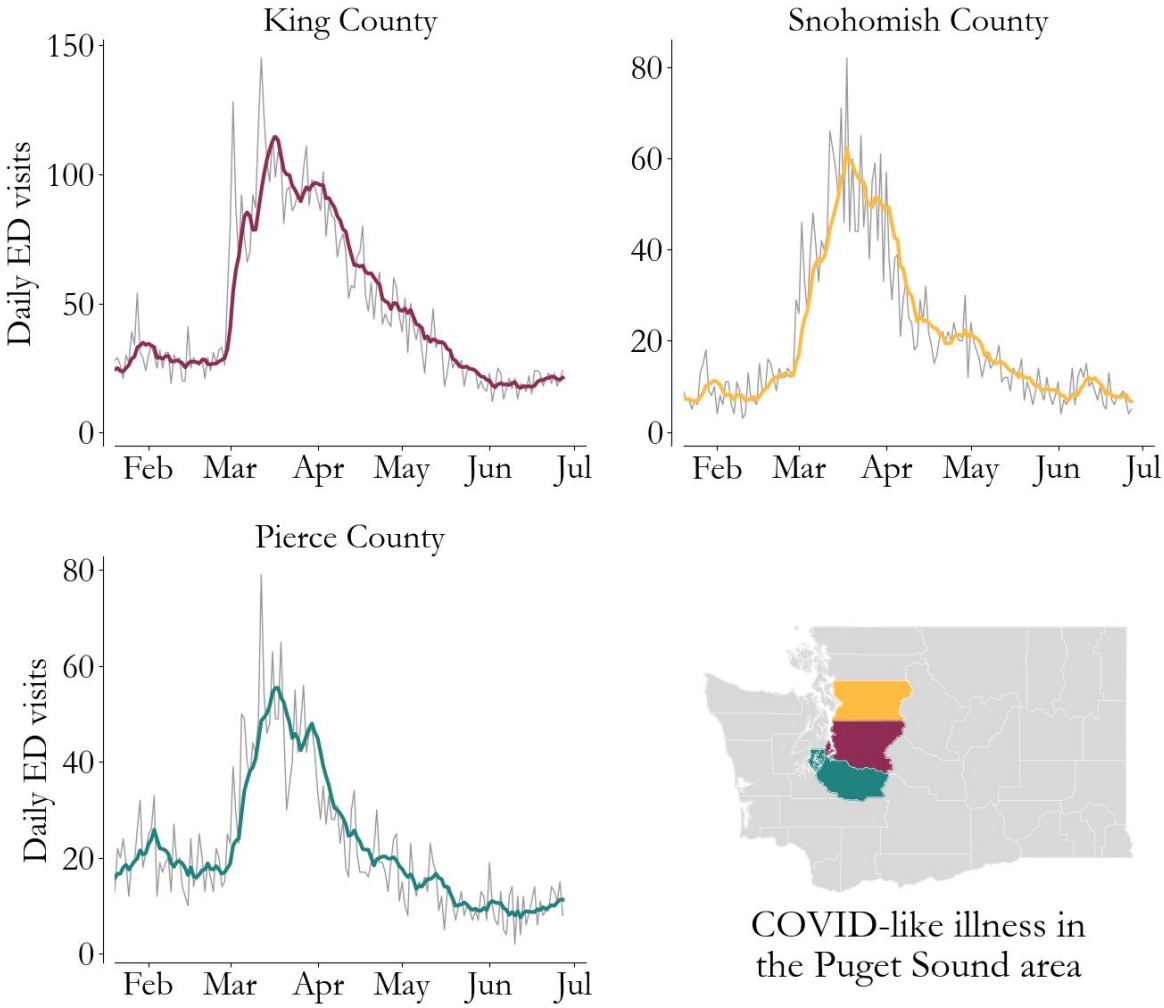

***Figure 4**: Syndromic surveillance data (grey curves), compiled by the [WADoH RHINO team](), records the number of visits to emergency departments due to COVID-like illness (CLI). This measure of severe COVID-19 infections is independent of testing availability, and in King, Snohomish, and Pierce counties recent trends (7 day rolling average in color) are either stagnant or just beginning to rise. [More detailed analysis of the case data](), tells us that Washington's COVID-19 epidemic is currently concentrated in younger populations. As a result, we expect a delay in rising CLI, since younger individuals are less likely to experience severe COVID symptoms and seek care. With rising trends in cases across the state, CLI and the burden on emergency rooms will grow unless community behavior changes. For more information about our interpretation of syndromic data, see our [blog post on the topic]().*

Mask usage in the Puget Sound area, as measured by visual survey at grocery stores, needs to improve. Since COVID transmission is sustained by a small number of people passing their infections to many, adherence to mitigation efforts like mask usage has to be very high to suppress transmission.

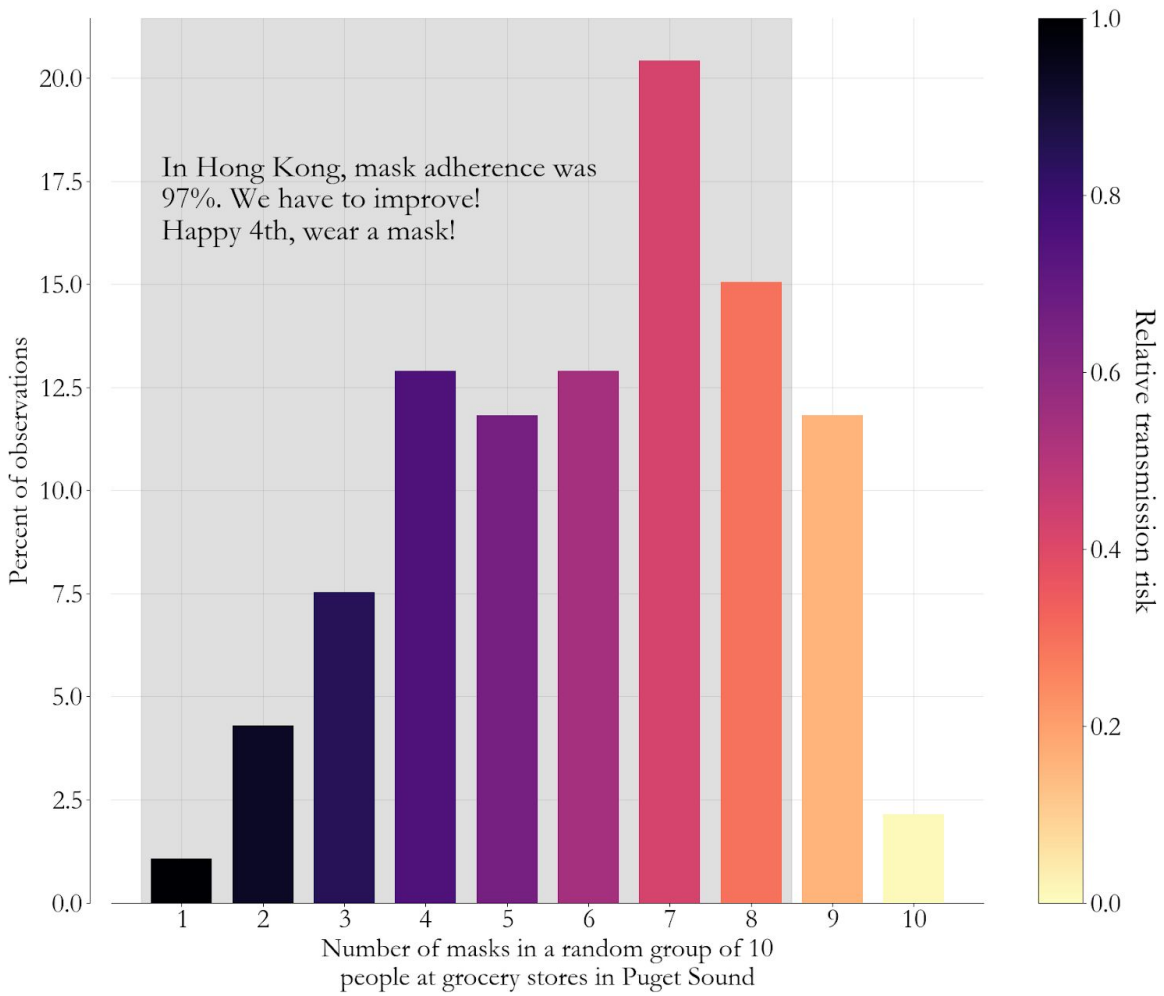

***Figure 5**: Mask wearing at 89 grocery stores in the Puget Sound area measured by visual survey between June 24 and June 29. Store employees were asked on the phone to count the number of customers wearing a mask out of a group of 10, and the bars represent the percent of groups surveyed wearing a given number of masks (out of 93 total observations). Adherence to mitigation measures needs to be very high to successfully suppress transmission, since transmission risk (colors) is only sharply reduced when almost all people are wearing masks. In Hong Kong for example, mask usage was 97%.*

Relative transmission risk is illustrated here by computing the number of masked, 1 mask, and unmasked pairs drawn at random from a group of 10 and further assuming that transmission drops by 30% in 1 mask pairs and 99% in two mask pairs.