SitRep 12: COVID-19 transmission across Washington State

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Results as of August 7 2020 10 a.m. Incidence data through July 22 2020.

From week to week, we highlight 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.

Summary and highlights

Data through July 22 for Washington show very early signs of a possible deceleration in the growth of new cases overall. Using data from the Washington Disease Reporting System (WDRS), we estimate that in western WA, R_e was likely between 0.94 and 1.29 on July 17, with a best estimate of 1.12 (similar to the estimate of 1.19 in our last report). In eastern WA, our best estimate is that R_e on July 15 was likely between 0.63 and 0.92, with a best estimate of 0.78 (down from 1.08 in our last report). This is the first time our R_e estimate has been confidently less than 1 for eastern WA.

While growth in new cases may be slowing overall, aggregated data masks diverging trends in older and younger populations. In both eastern and western WA, cases are flat or decreasing in the 0 to 39-year age group while increasing in the 40-69 and 70+ age groups. It is important to assess trends by age because the risk of hospitalization and death is markedly higher for older individuals.

To better contextualize the estimated change in R_e, we also visualize cell-phone mobility data from Google. The mobility rate in both eastern and western WA has been monotonically increasing since early April but has since flattened below baseline levels in some categories including retail and recreation (15% below baseline), workplaces, and public transportation (40% below baseline). Recent reductions in R_e do not appear to be correlated with mobility trends; the level of mobility we observe is significantly higher than in June. This suggests that any flattening of new cases is due to non-mobility-related changes in behavior like vigilant masking and physical distancing when out.

Implications for public health practice

The slight deceleration in the growth of new cases is an improvement over the rate of increase noted in our last few reports. However, it is too early to know with certainty whether this represents a real turnaround. Further, the observation at the state level that cases continue to increase in the older age groups and particularly in those 70 and older is concerning. We expect that if the increase in cases in these older age groups continues unabated this will result in an increase in hospitalization and deaths.

The decline in R_e correlates with the statewide order to wear masks followed by a no-mask, no-service announcement and restrictions pausing the Safe Start program. We cannot definitively attribute this trend to the mask mandates because mask wearing is generally accompanied by heightened awareness and physical distancing, but a preponderance of evidence indicates that widespread use of masks significantly reduces transmission. Strict adherence to masking and physical distancing policies and limits on social contacts remain necessary to further suppress COVID-19 transmission in Washington state and protect groups at higher risk for severe disease.

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. 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, hospitalization, and death data compiled on August 4th , and to hedge against delays in reporting, we analyze data up to July 22 in western Washington and July 20 eastern Washington.** 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 and the Fred Hutchinson Cancer Research Center are working with WA DoH 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 WA DoH 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.

We estimate that the effective reproductive number in eastern WA is now confidently under one overall, while in western Washington it remains above one with high probability. In both regions, transmission has slowed relative to mid-June levels, with timing consistent with state-wide masking policies.

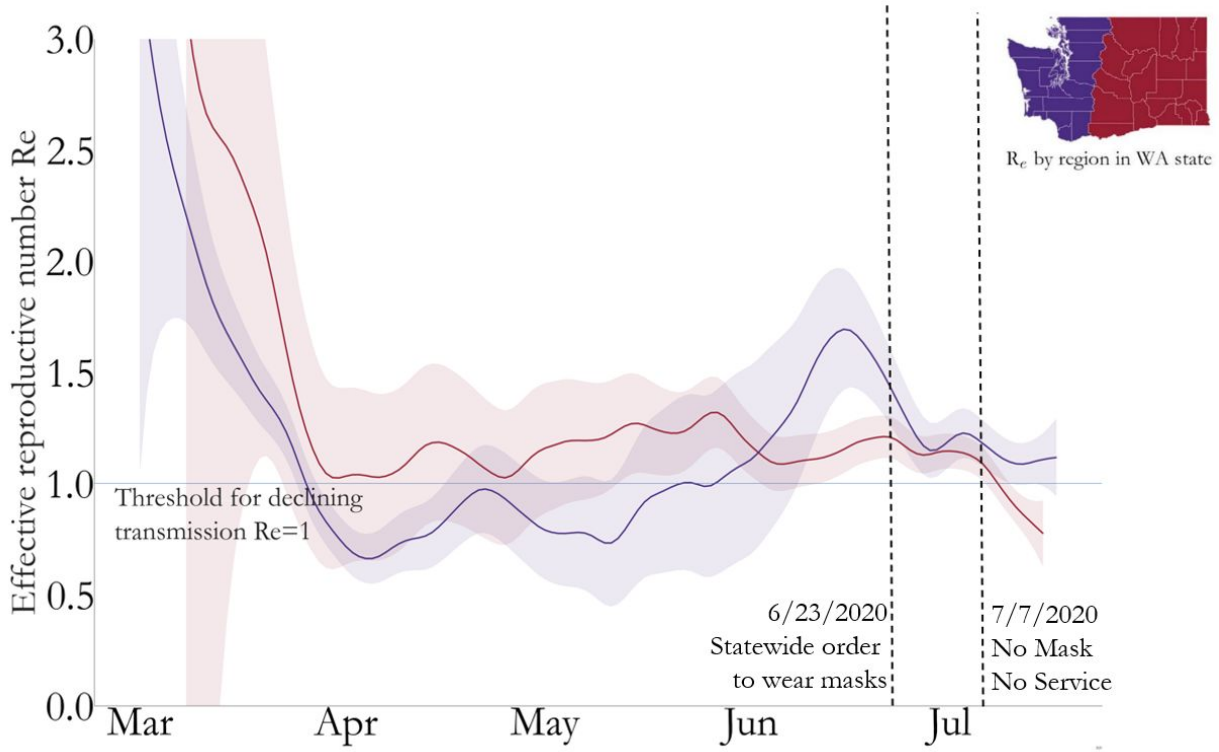

***Figure 1**: The effective reproductive number is estimated for eastern (red) and western (purple) WA, with the 95% confidence interval shaded. Our estimates suggest that R_e recently fell below 1 in eastern WA for the first time, but has likely remained above 1 in western WA. Overlaid on the plot are the timings of recent masking policy changes. While we cannot from this region-level data definitively attribute decelerating transmission to these policies, the timing of changes, particularly in eastern WA, suggests that masking and related physical distancing behaviors are having a positive effect across the state. For details on how these estimates are generated, see our technical report.*

Cell phone mobility data, in this case from Google, helps us better understand the drivers of overall declines in the effective reproductive number. Since late June, mobility metrics have plateaued across categories, suggesting that recent changes in transmission rates are due to other changes in behavior not captured by cell-phone location data.

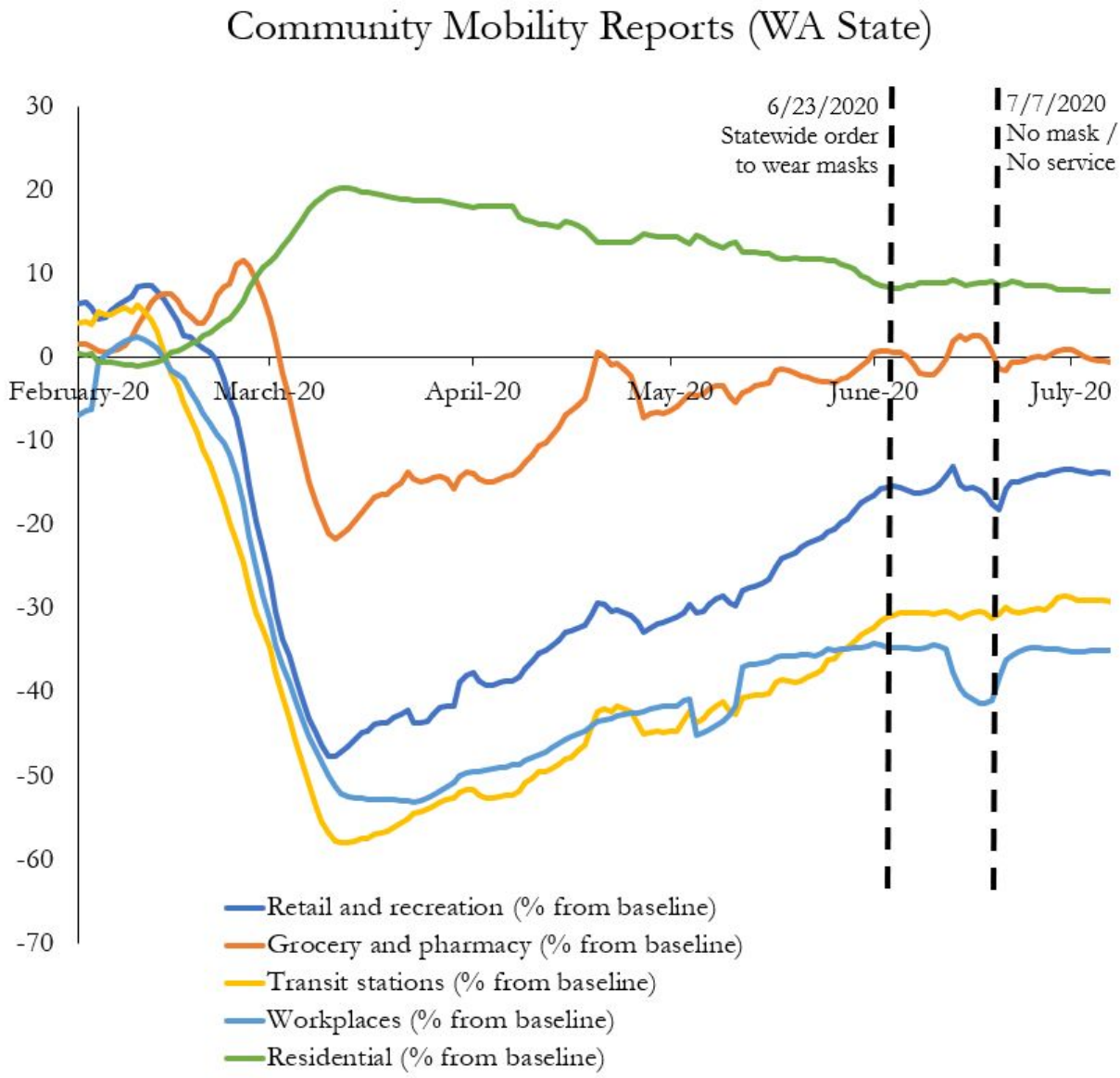

***Figure 2**: Mobility data from [Google's community mobility reports](#) is collected and aggregated by Google from users who have turned on the location history setting. The baseline is the median value from January 3 to February 6, 2020. Overall, mobility declined significantly through March and into April as more people stayed at home (green line). Since then, mobility steadily increased until mid-June, when the metrics plateaued across categories (colors). This further suggests that recent transmission declines are due to increased masking and other non-mobility-related forms of physical distancing, like staying 6ft apart when going out.*

Case data disaggregated by county further contextualizes our effective reproductive number estimates. In western WA, overall rises in the Puget Sound area, particularly in Pierce county, point to increasing transmission. In eastern WA, rises in Okanogan, Chelan, and Douglas are offset by encouraging declines in Yakima, Benton, and Franklin.

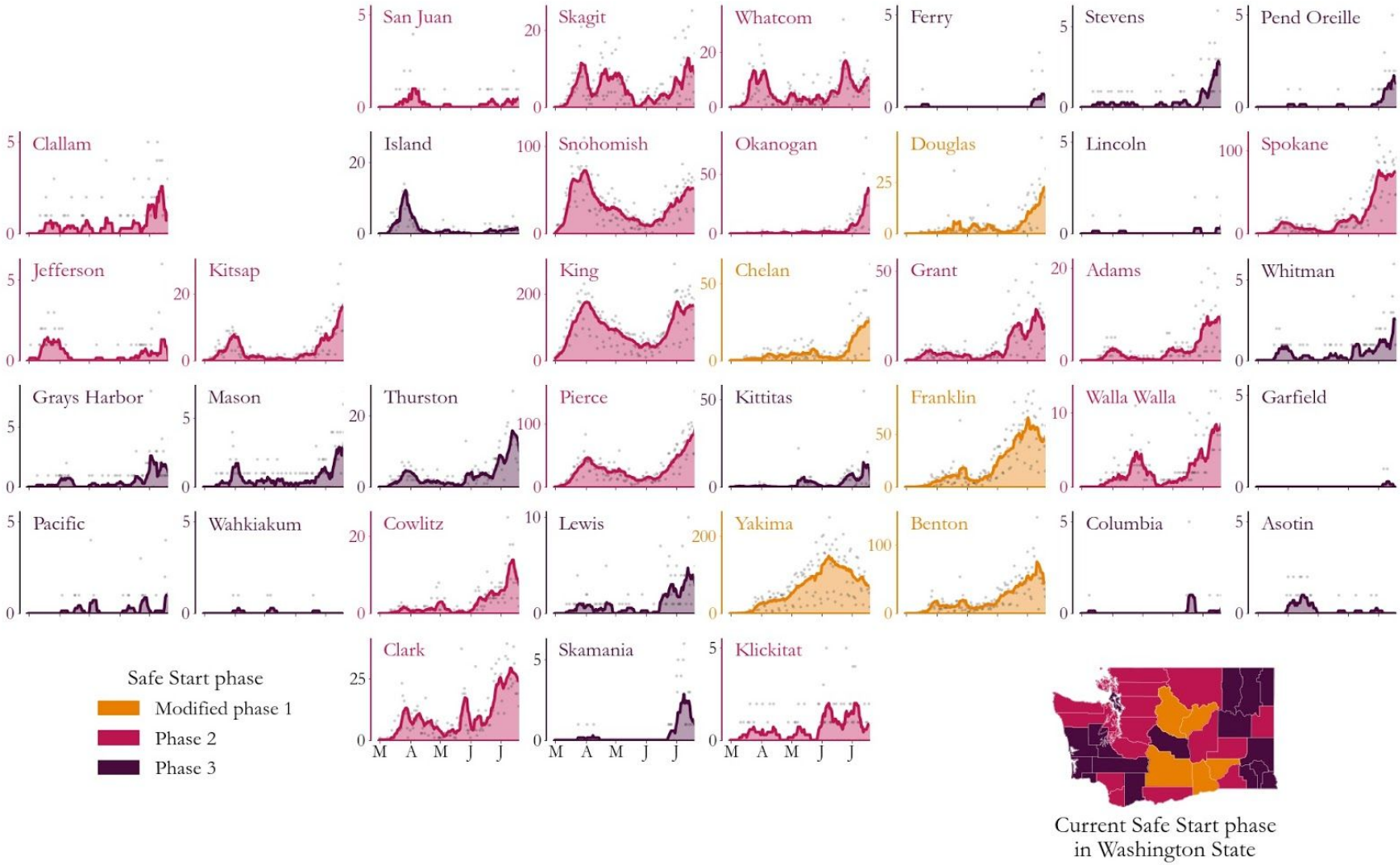

***Figure 3**: Daily COVID-19 positives (dots) and 7-day moving averages (curves) arranged geographically (inspired by this) and colored by Safe Start phase as of July 23. Case trends across counties highlight geographic correlations, and help us better understand the region-level estimates of the transmission rate (see Figure 1).*

Trends across age-groups also vary widely by county. In King and Spokane, overall flat trends hide increases in the oldest age groups while hospitalizations rise. Meanwhile, in Pierce county, rapidly rising cases across groups with hospitalizations approaching late-March levels raises serious cause for concern.

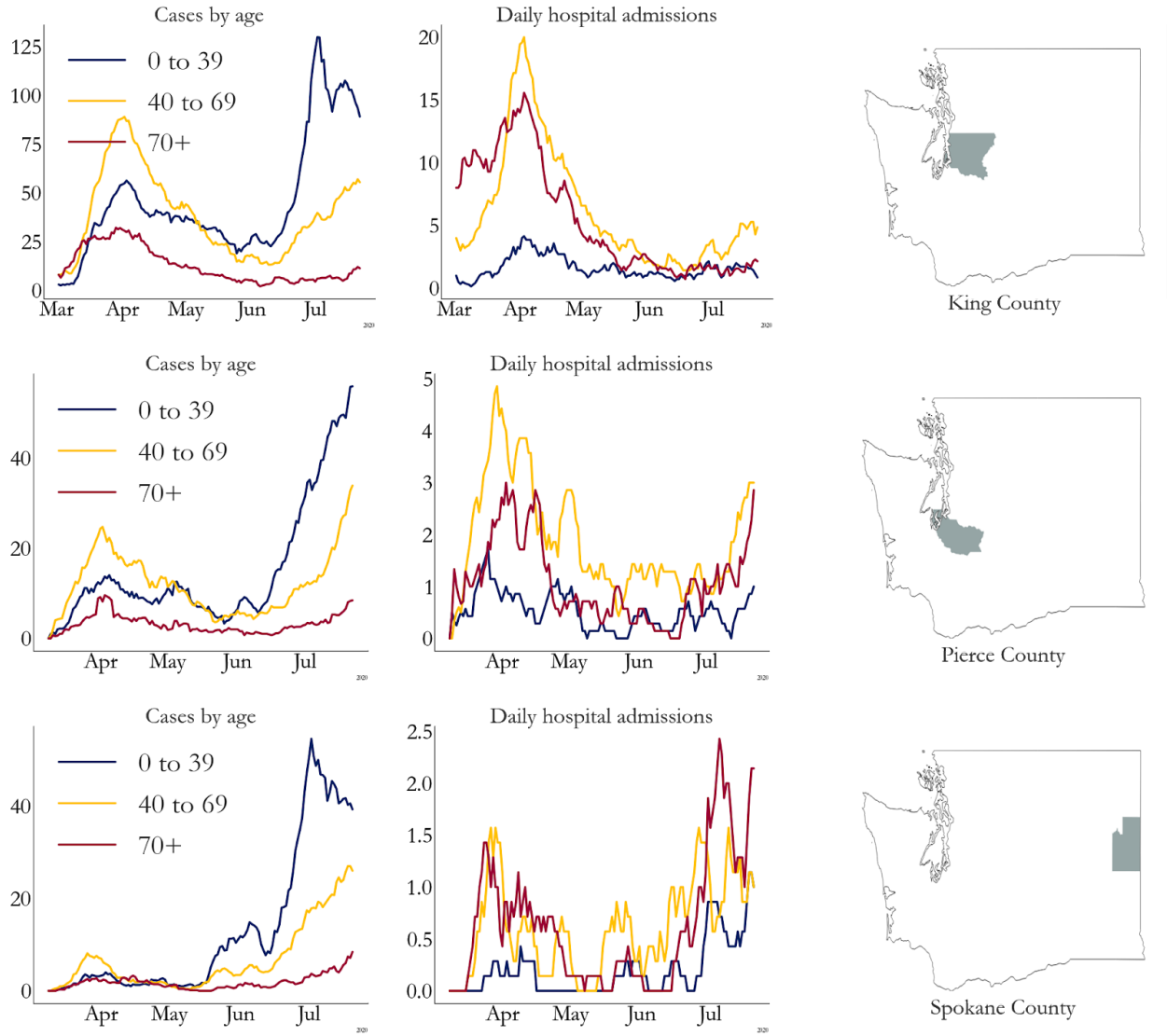

***Figure 4**: Disaggregating cases and hospitalizations by age group helps us better understand the epidemiology. While the growth in COVID-19 cases may be slowing overall, in Spokane and King county, the decrease is driven by the 0 to 39 year-old age group (blue), masking increases in cases in older age groups (yellow and red). Since older individuals are more likely to have severe outcomes, we expect hospital admissions to continue to grow. Meanwhile, in Pierce county, cases and hospitalizations are growing across groups, highlighting serious cause for concern.*

In both eastern and western WA, while cases may be flattening or decreasing in the 0 to 39 year-old age group, they are generally rising in the 40 to 69 and 70+ age groups. As a result, especially since COVID severity is correlated with age, we expect hospitalization to continue to increase in these age groups across the state.

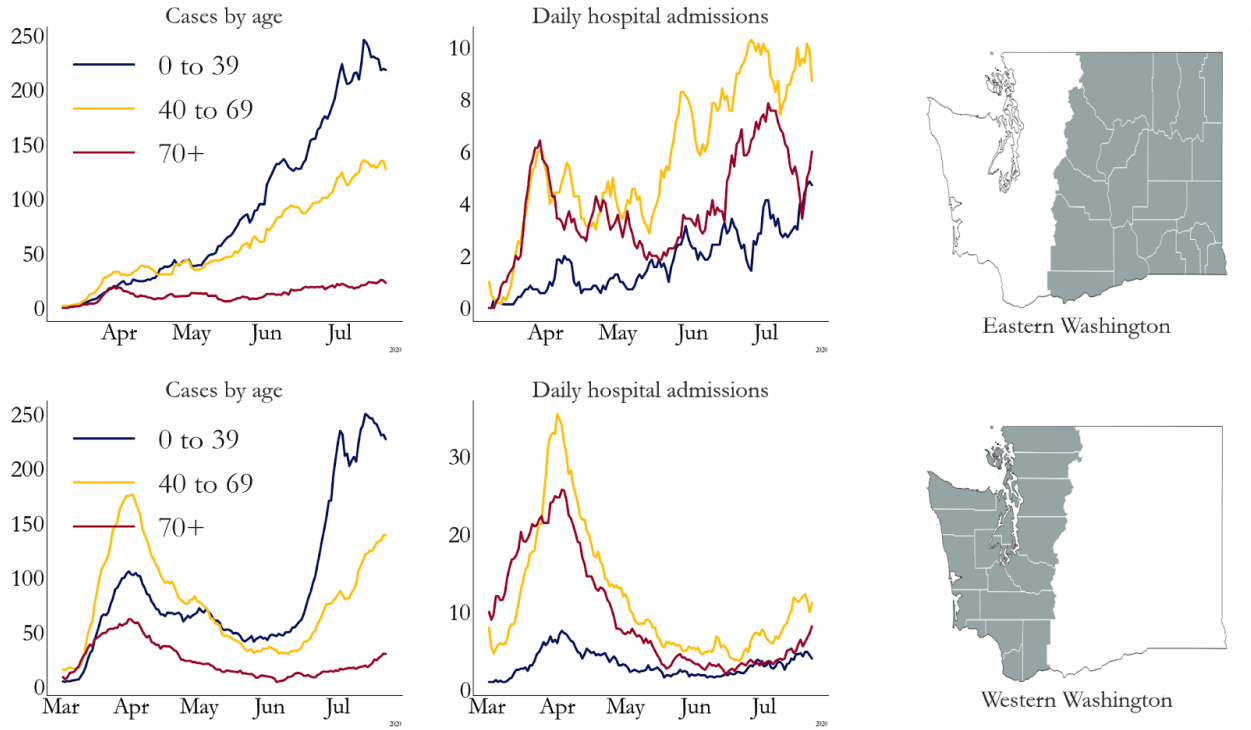

Figure 5. *Cases and hospitalizations by age group smoothed with a 7-day rolling average (curves) to highlight trends. In eastern WA, daily COVID-19 hospital admissions are near their historical peak. In western WA, total hospitalizations remain lower than in March, but trends are increasing. This disaggregation by age shows that our estimate of* R_e *in eastern WA is driven by declining trends in the youngest age-group. Increasing trends in older age-groups, despite being a smaller fraction of total cases, are alarming since older individuals are more likely to experience severe COVID symptoms.*

Comparing trends side-by-side highlights the cause for concern. Across Washington as a whole, we are seeing a flattening in cases in the 0 to 39 year-old group, but cases are rising in older age groups, particularly in the population over 70. Tabulated outcomes by age through June in Washington show that severe disease requiring hospitalization is significantly more likely in older individuals.

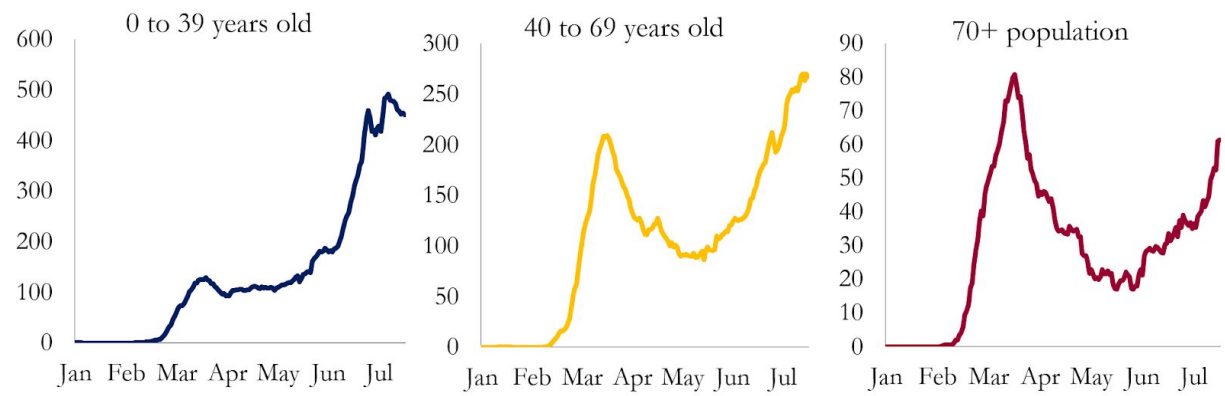

***Figure 6**: Daily COVID-19 cases by age across the whole state, side-by-side. The dramatic rise in cases in the youngest age group through June may be starting to flatten. However, trends in older age-groups are less encouraging, with levels near or above those seen at the late-March peak.*

	0 to 39	**40 to 69**	**70+**
Cases	8074	4567	877
Hospitalizations	167	460	266
Deaths	5	44	137
Case hospitalization rate	2%	10%	30%

***Table 1**: COVID-19 cases, hospitalizations and deaths for WA state based on data by specimen collection date, admission date, and death date respectively from June 1st to June 30th to account for right censoring. Consistent with findings from other researchers, we see that severity is a rapidly increasing function of age, with hospital admissions accounting for 2% of cases in the youngest age group but 30% of cases in the oldest age group. As a result, despite potentially encouraging signs overall, trends in these more vulnerable populations highlight the need to further suppress COVID-19 transmission.*