SitRep 10: COVID-19 transmission across Washington State

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

Results as of July 23 2020 1 p.m. Incidence data through July 13 2020.

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.

Summary and highlights

In this situation report, we cover broad trends in the COVID-19 epidemic across Washington. Overall, burden remains at or near local peak levels in the majority of counties across the state.

Using data from the Washington Disease Reporting System (WDRS) compiled on July 23, we estimate that the effective reproduction number likely remains above one, with estimates for eastern WA ranging from 1.06 to 1.32 (best estimate 1.19) as of July 5 and for western WA from 0.97 to 1.35 (best estimate 1.16) as of July 8. It is a potentially encouraging sign that these estimates are generally lower than those in our [previous situation report](#). However, with R_e above 1 overall, we expect COVID-19 burden continues to grow.

While the trend in new cases continues to rise in many counties, there may be recent decreases or plateaus in King, Spokane, Clark, and Franklin counties; this hopefully reflects improved adherence to masking and distancing guidelines, but we cannot entirely rule out impacts from [delays in testing](#) at this time. Meanwhile, test positivity remains high in eastern WA and has recently been rising in western WA, reflecting the continued growth of the epidemic independent of changes in testing volume. As a result, we recommend caution when interpreting downwards or flattening trends in recent cases in some counties.

The age distribution of cases continues to spread from its [recent concentration in young adults](#), with increasing burden detected in older adults and children. This pattern in cases is now clearly mirrored in new hospitalizations, which are increasing across most age groups, with the possible exception of declining hospitalization among 40-59 year olds in eastern WA and persistent lack of hospitalization among 0-19 year olds in western WA. Deaths continue to rise in eastern WA, and, for the first time since March, appear to be starting to increase in western WA.

Implications for public health practice

The consistent picture across all observations in this report is that recent community behavior is insufficient to limit continued growth of COVID-19 burden in Washington. Changes in masking mandates in late June may be starting to slow transmission, but current rates suggest continued growth, and a widening age-distribution of cases suggests increased burden in more vulnerable populations. Strict adherence to masking and physical distancing policies will be necessary to suppress COVID-19 transmission in Washington.

## 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 and death data compiled on July 23, and to hedge against delays in reporting, we analyze data up to July 13 in western Washington and July 10 in eastern Washington.** This more 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. **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 introduced 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 are not addressed herein.

Collaboration Notes

The Institute for Disease Modeling (IDM), Microsoft 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.

Our estimates of the effective reproductive number remain above 1 across the state into early July. While the declines through late June, especially in western WA are encouraging, COVID-19 burden will continue to grow if transmission rates persist at this level.
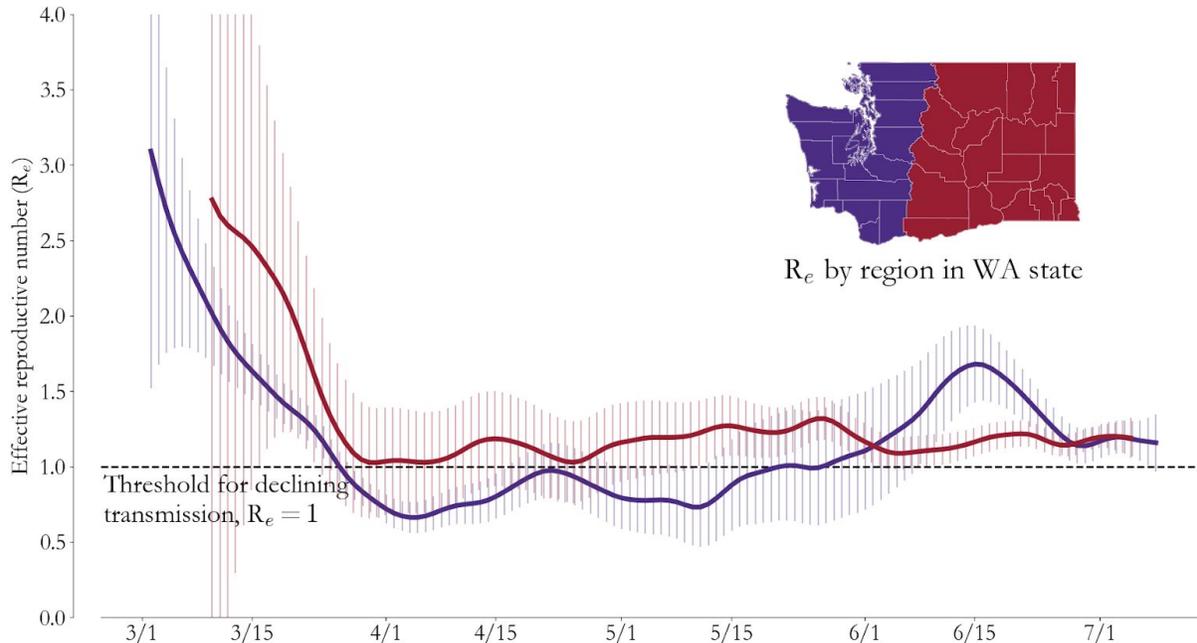

Figure 1: R_e estimates for eastern (red) and western (purple) WA, with two-standard deviation confidence intervals. In late June, case and testing data are consistent with decreasing growth rates on both sides of the Cascades. Still, our most recent estimates suggest that R_e is above 1 in both regions, indicating that the epidemic has continued to grow but at a slower rate. Continued transmission at this level will again lead to exponential growth in COVID-19 burden. For details on how these estimates are generated, see our technical report.

A detailed look at cases by county shows that recent trends in cases are mixed across the state. There are recent indications of declining trends in Spokane, Franklin, and Yakima and flat trends in King and Clark, but these are counterbalanced by rising trends in Chelan, Douglas, Snohomish, Pierce, and others.
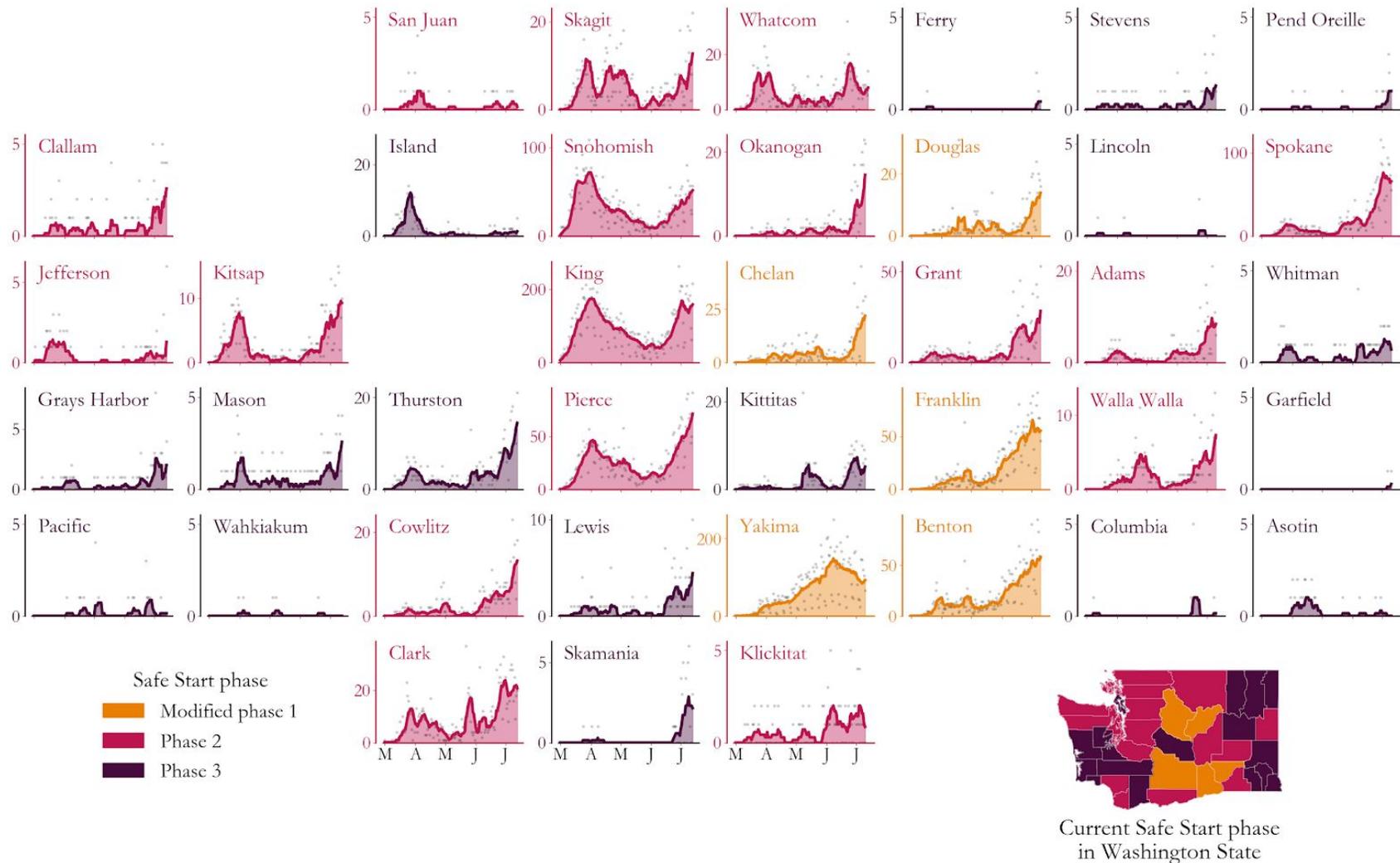

Figure 2: *Daily COVID-19 positives (dots) and 7-day moving averages (curves) arranged geographically (inspired by [this](#)) and colored by [Safe Start phase](#) as of July 23. The majority of counties have daily case counts at or near the highest levels to date, with the exception of Yakima and some with small populations. In particular, many Phase III counties have not yet seen substantial COVID-19 burden, but risk is currently very high given the situation in surrounding areas.*

The test positivity rate in eastern WA remains high and is rising in western WA. This is expected when COVID-19 exposure is driving case counts more than changes in test availability.
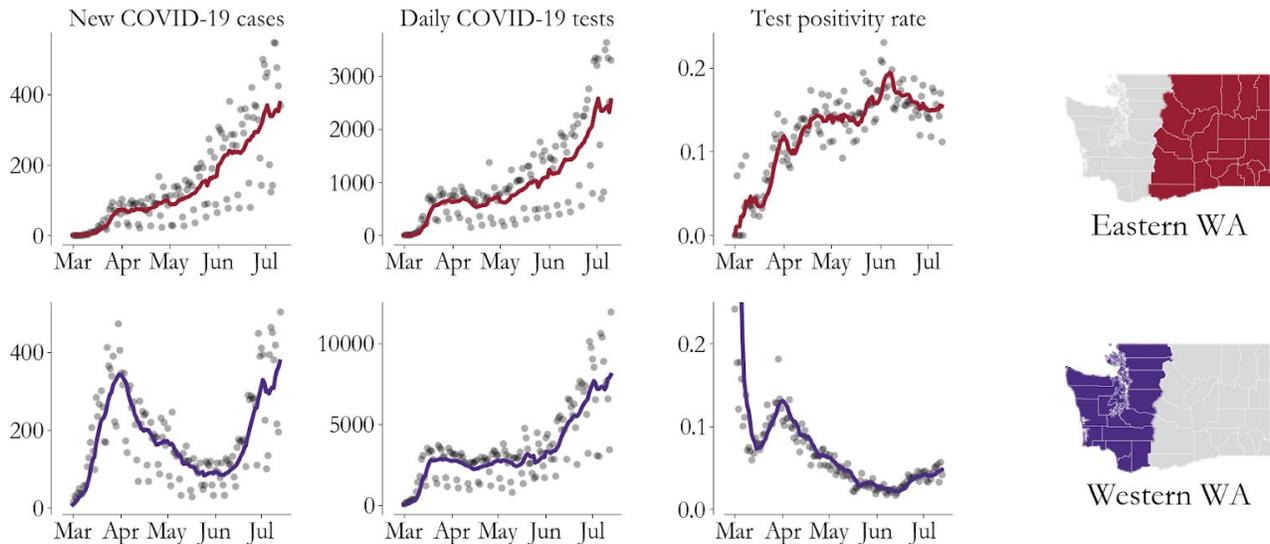

Figure 3: Cases, total tests performed, and test-positivity (daily data, dots) are smoothed with a 7-day rolling average (curves) to highlight trends. In eastern WA, persistently high test positivity suggests that rising COVID-19 burden and suspicion of exposure is driving much of the increase in testing. In western WA, where test positivity rates have been much lower, the recent rise is consistent with growing disease burden in the community concurrent with recent increases in test availability in Puget Sound.

The age distribution of new cases continued to broaden through July 12, mirroring the pattern seen previously in Florida and other states of a return to increasing COVID-19 burden in older adults and children as the epidemic grows again.
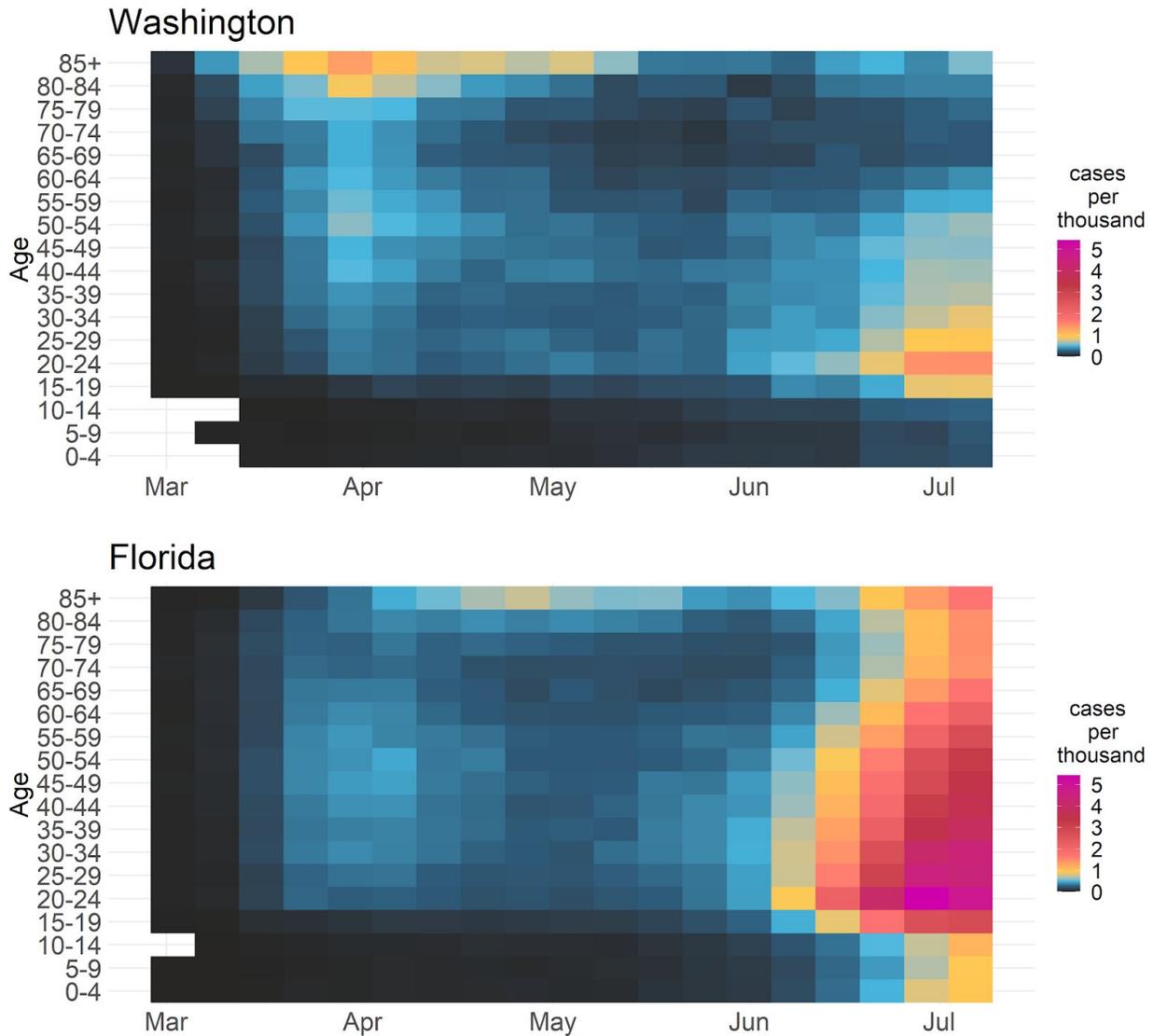
Figure 4: Cases per 1000 residents (2018 estimate) by age and week since the start of the COVID-19 epidemic in Washington (top) and Florida (bottom). The rate of growth in Washington State may be slower than in Florida, possibly as a consequence of adherence to masking and physical distancing policies. But exponential growth across a broad age range will continue if transmission remains at the levels seen in early July (Figure 1). While this figure displays raw case counts and is not adjusted for effects of increased testing over time, which likely differ between the states, the pattern of increasing burden across a wider age range is paralleled in the hospitalization data shown below. (Florida data publicly available from FDOH.)

In eastern WA, the trend of increasing new hospitalizations and deaths continues except for a possible recent decline in hospitalizations among 40-59 year olds. In western WA, hospitalizations continue to rise among all adult ages, and daily deaths have begun to increase again for the first time since March.
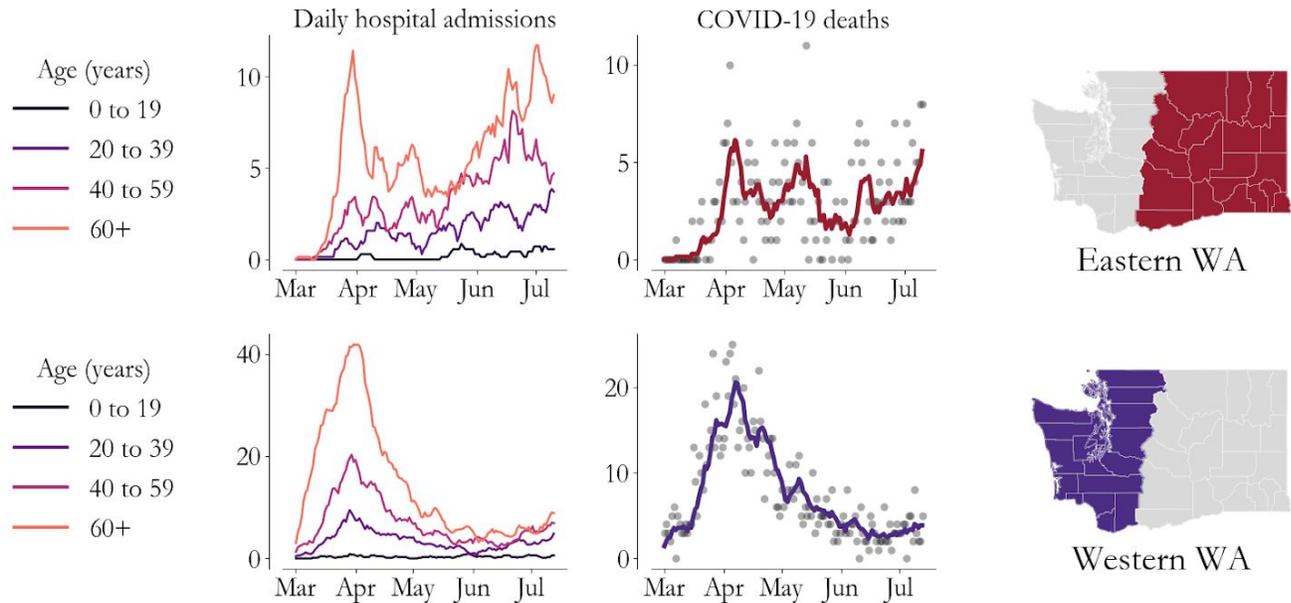
Figure 5. Hospitalizations by age group smoothed with a 7-day rolling average (curves) to highlight trends, and total daily deaths (dots) and smoothed (curves). Consistent with the growing case load across all ages shown in Figure 4, hospitalizations are increasing across most age groups and deaths are following. In eastern WA, hospitalization continues to increase except possibly among 40-59 year olds. In western WA, recent hospitalizations among 20-39 year olds are approaching the peak levels seen at the end of March, but hospitalization among older adults is much lower. This reflects the recent concentration of the epidemic in young adults. Total hospitalization is thus much lower than it was in March, but continued spread into older ages will lead to high hospitalization rates again if not curtailed.