RAPID STATUS UPDATE: COVID-19 EPIDEMIC TRENDS AND SCENARIO PROJECTIONS IN OREGON

Results as of 10-20-2021, 6pm

PURPOSE OF THIS RAPID STATUS UPDATE

This Rapid Status Update focuses more narrowly on modeling results than our typical Status Updates, but still uses numerous measures to create the most accurate picture of past COVID-19 transmission and incidence of infection over time in Oregon and projecting possible trends over the next month assuming different scenarios. This report complements the extensive epidemiologic data (e.g., demographic trends in cases, testing patterns) for Oregon available at the OHA COVID-19 webpage.

DATA UPDATED CONTINUALLY

Please note that the COVID-19 data used for the modeling are continually being updated. (For daily up-to-date information, visit the OHA COVID-19 webpage.) Point estimates should be interpreted with caution due to considerable uncertainty behind COVID-19 model assumptions and limitations to the methods.

ACKNOWLEDGEMENTS

OHA wishes to thank the Institute for Disease Modeling (IDM) for their support. Niket Thakkar at IDM has provided software, programming scripts, and technical assistance. This report is based on aspects of IDM's technical reports (IDM COVID Reports) and Washington State Department of Health's COVID-19 Situation Reports (WA Situation Reports), adapted for Oregon.

METHODS

For this rapid status update, we used the COVID-19 modeling software Rainier. Rainier is software designed by IDM to algorithmically estimate the effective reproduction number (R_e) over time based on local data and to conduct simple projections. Rainier fits a stochastic SEIR (susceptible – exposed – infectious – recovered) model to testing, hospitalization, and mortality time series. This software has been used to generate regular situation updates for the State of Washington overall and by two regions within Washington (Example WA Report).

Results are based on COVID-19 data compiled October 20 from the Oregon Pandemic Emergency Response Application (Opera) on COVID-19 testing, total diagnosed cases,[1] hospitalized cases, and deaths among people living in Oregon, as well as hospital occupancy data from Oregon's Hospital Capacity Web System (HOSCAP). To account for delays in Opera reporting, diagnosed cases with a specimen collection date after October 12 were not used; we used the same cutoff date for deaths. Due to surge-related delays in hospitalizations being reported to Opera, a cutoff date of August 12 was used for hospital admissions in Opera,[2] and we used hospital occupancy data from HOSCAP to estimate the number of daily hospital admissions between August 13 and October 12. These estimates are based on the assumption that the typical relationship between HOSCAP daily occupancy and preceding Opera admissions have stayed consistent, but this assumption would be incorrect if the average patient length-of-stay changed concurrently with the recent surge in hospitalizations.

Of note: in the model, cases tested on October 12 reflect exposures that occurred around October 6.

See the August 19, 2021 Status Update for more detail on methods.

[1] Total diagnosed cases include confirmed (positive test) and presumptive cases (symptoms with epidemiologic link).
[2] These dates reflect the cutoff through when individuals had a test specimen collected, were admitted to a hospital, or died. Any of these events may have been reported to OHA at a later date.

RESULTS

Effective reproduction number (R_e)

From the model results (Figure 1), it is clear the statewide R_e -- the average number of secondary cases that a single case generates -- has fluctuated up and down over time, with dramatic shifts often happening quickly.

After a prolonged decrease following its late-July peak, the best-estimate R_e began to flatten in mid-September and has recently increased. Over the week ending October 6, the best estimate R_e averaged 0.82. On the date of October 6, the statewide R_e was likely between 0.76 and 1.04, with a best estimate of 0.90.

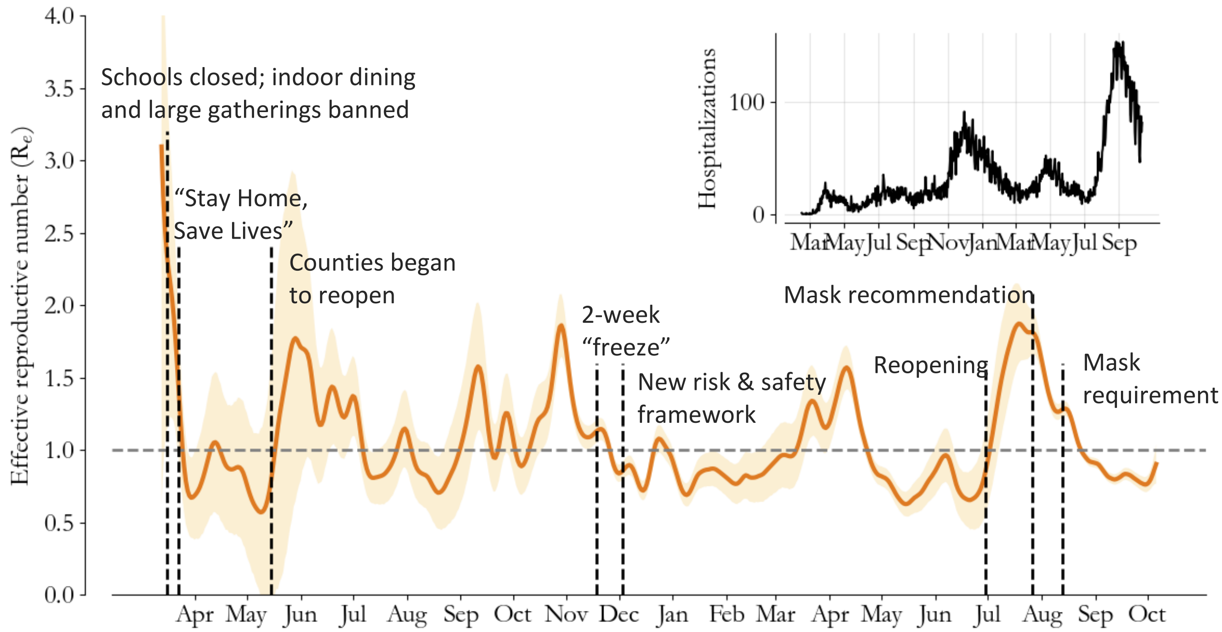

Figure 1: *R_e estimates over time for Oregon, with shaded 95% confidence interval.*[3] *Graph insert is the number of new hospitalizations over time in Oregon, a key input for the estimates. R_e = 1 is the threshold for declining transmission.*

The observed changes in R_e over time may be due to some combination of changing behaviors, changes in opportunities for potential exposure as counties' interventions become more or less stringent, changes in variants, and/or immunity (either from vaccination or recovering from infection). The summer surge in R_e corresponded to the increase in the Delta variants (B.1.617.2 and AY.3) among cases in Oregon (OHA

[3] Our R_e confidence interval may be narrower at times because of how we estimated specimen collection dates for negative tests (and thus positive test rate for each day), as described in Appendix 1.

Variant Dashboard)[4], as well as state reopening on June 30. The decline in R_e that followed suggested that people adopted more protective behaviors after learning of the surge and new recommendations and requirements, including mask requirements that took effect in August. Data from a survey of Facebook users suggest mask wearing in public in Oregon has more than doubled since late July and remains high (CMU survey).

It is important to note that these estimates are based on statewide averages, yet the rate of new cases and hospitalizations vary dramatically by county (OHA County Dashboard), race, ethnicity, age (COVID-19 Weekly Report), and vaccination status (COVID-19 Monthly Report).

Our best estimate of the R_e for October 6 (0.90) is similar to the estimate for that date from Covid Act Now (0.92) and lower than that from Harvard, Yale, and Stanford (0.96).[5]

Model fit to Oregon COVID-19 data

Figure 2 shows how the transmission model captures trends in the daily Oregon COVID-19 outcomes over time. Recent trends in diagnosed cases and occupancy-imputed hospitalizations have been somewhat inconsistent, with both metrics decreasing but at different rates. Because of this, the model fit captures recent diagnoses well, but is high to recent deaths (due in part to reporting lag) and low to recent hospitalizations. While reporting lags and testing shortages likely explain at least some of these differences in model fit by outcome, another contributing factor could be the Delta variant having higher infection hospitalization ratios than earlier variants. For the hospitalization scenario projections in this report, we made a post-model fitting adjustment to better track recent hospitalization counts.

[4] Since the week starting August 1, the highly-infectious Delta variants (B.1.617.2 and AY.3) has comprised over 95% of genetically-sequenced viral samples in Oregon (OHA Variant Dashboard).
[5] Estimates dated October 6, 2021, accessed on October 20, 2021. An exact estimate from CMMID was not available, but it was below 1. The latest estimate from IHME for effective R in Oregon was 0.90 as of September 30.

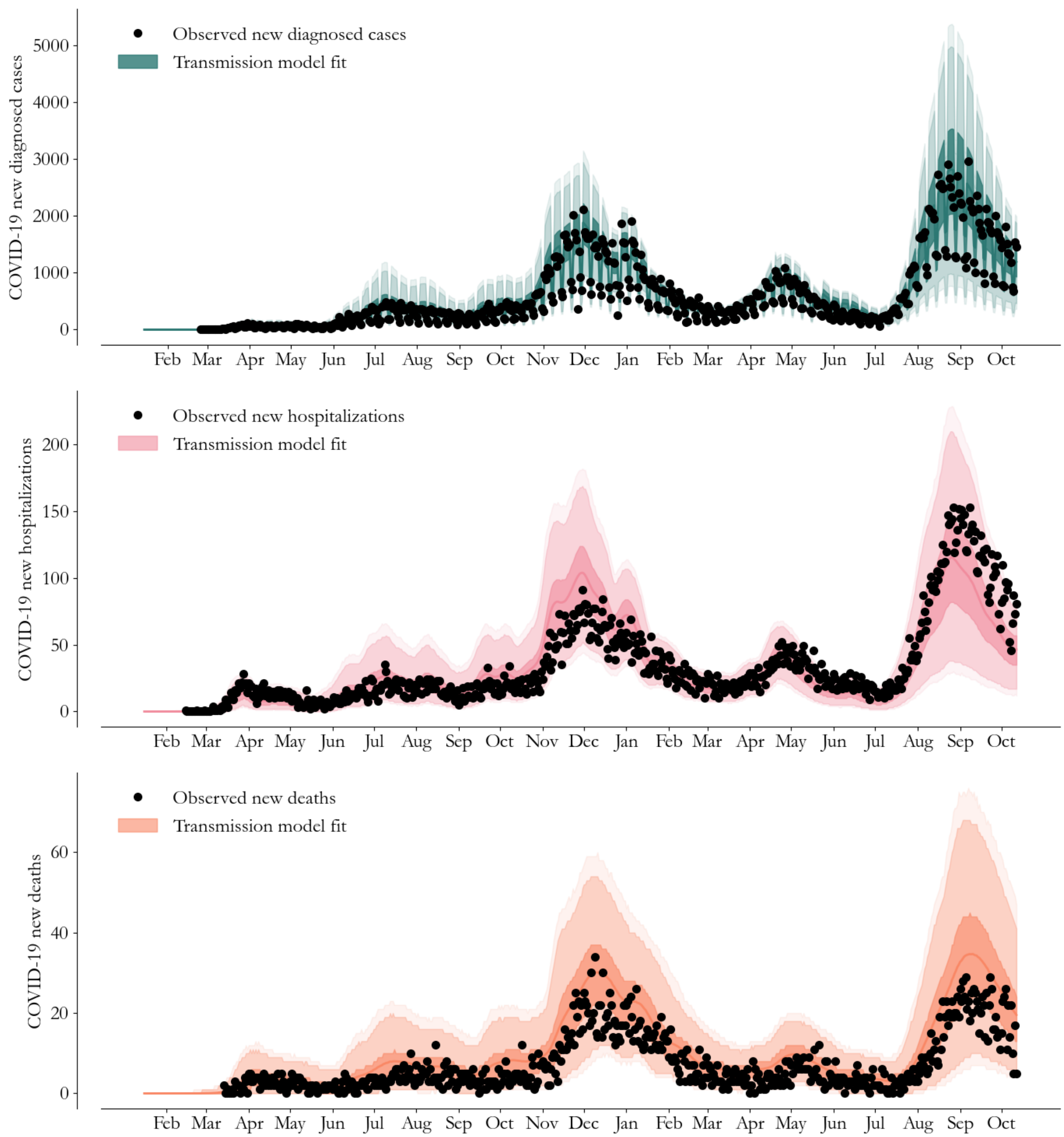

Figure 2: *Fitting the transmission model to Oregon's COVID-19 data on diagnosed cases, hospitalizations, and deaths. The lines represent the mean of 10,000 runs; the 25th-75th percentiles are given in dark shaded areas, 2.5th-97.5th percentiles in the lighter shade, and 1st-99th percentiles the lightest shade. The black dots are observed data. Top panel: Modeled cases (teal) capture the trend in observed, daily new diagnosed cases based on* R_e *estimates and a free number of importations on January 20, 2020 and February 1, 2020. Middle panel: Simultaneously, the model (pink) captures the trend in observed daily new hospitalizations by assuming hospitalizations are independent of testing volume. Bottom panel: With its time-varying infection fatality ratio, the model (orange) captures the observed trend in daily deaths.*

Population-level immunity

Figure 3 includes estimates of population-level immunity from SARS-CoV-2 infection over time.

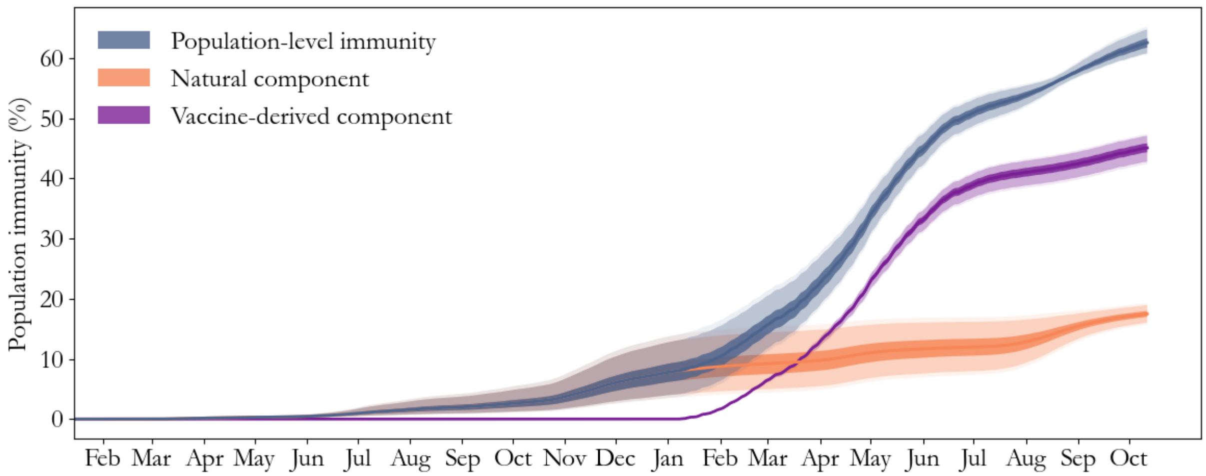

Figure 3: *Estimated population-level immunity to SARS-CoV-2 infection over time. The "natural component" consists of people who developed and then recovered from COVID-19. The "vaccine-derived component" consists of people who were not previously infected, but who achieved immunity from a vaccination dose administered 21 days prior.*

Rainier estimates that as of October 12, the population-level immunity to SARS-CoV-2 was 62.6%. The actual population-level immunity to the Delta variants is unclear, but our immunity estimate (62.6%) is above that from Institute for Health Metrics and Evaluation (IHME) and below that from Oregon Health and Science University (OHSU).

The estimated immunity from vaccination (45.1%) is over double the estimate for natural immunity. This number is below that percentage of Oregonians who have completed a vaccine series because it incorporates vaccine effectiveness using a conservative estimate. Immunity due to vaccinations is helping prevent further spread of COVID-19. If we remove all of those who have immunity from the model calculations and look at the rate of infection, we see each infection spreading on average to 2.38 new people as of October 6. That is to say, without any immunity (largely due to vaccination), our estimated population R_e would be 2.38 instead of 0.90, and new infections would be rapidly increasing.

COVID-19 trends after the data cutoff

Since we did not include COVID-19 data occurring after October 12 in our modeling dataset due to reporting delays in all the COVID-19 outcomes in Opera, we examined counts of Oregon COVID-19 hospital occupancy to see if trends have changed more recently. Data from HOSCAP indicate that COVID-19 hospital occupancy decreased by 17 patients (3%) between October 12 and 20.

Scenario Projections

With the fitted model, we can explore outcomes under future scenarios. That is, we do short-term projections to compare what *would* happen if we assume particular future scenarios, rather than specific forecasting about what *will* happen. More about this distinction is described here. The CDC, OHSU, and IHME have COVID-19 forecasts.

For the current report, we modeled two scenarios. Both assume recent vaccination levels will continue in the upcoming weeks.

<u>Transmission continues at October 6 level:</u> This scenario assumes the estimated transmission level as of October 6, a high point in transmission compared to the preceding week.

- We would see a continued decrease in diagnosed cases (Figure 4). For the two-week period between October 27 and November 9, the projected number of new diagnosed cases would decrease to 255 per 100,000 people. This rate translates to a daily average of 770 cases.
- By November 9, there would be 45 people per day requiring hospital admission (Figure 5).

Transmission continues at the average level over the week of September 30 – October 6: The first scenario might be too conservative because it assumes the estimated transmission level being at the recent high point. Therefore, we ran a scenario assuming the average transmission level over the week of September 30 – October 6.

- Diagnosed cases would decrease at a faster pace (Figure 4). For the two-week period between October 27 and November 9, the projected number of new diagnosed cases would be 185 per 100,000 people. This rate translates to a daily average of 555 cases.
- By November 9, there would be 31 people per day requiring hospital admission (Figure 5).

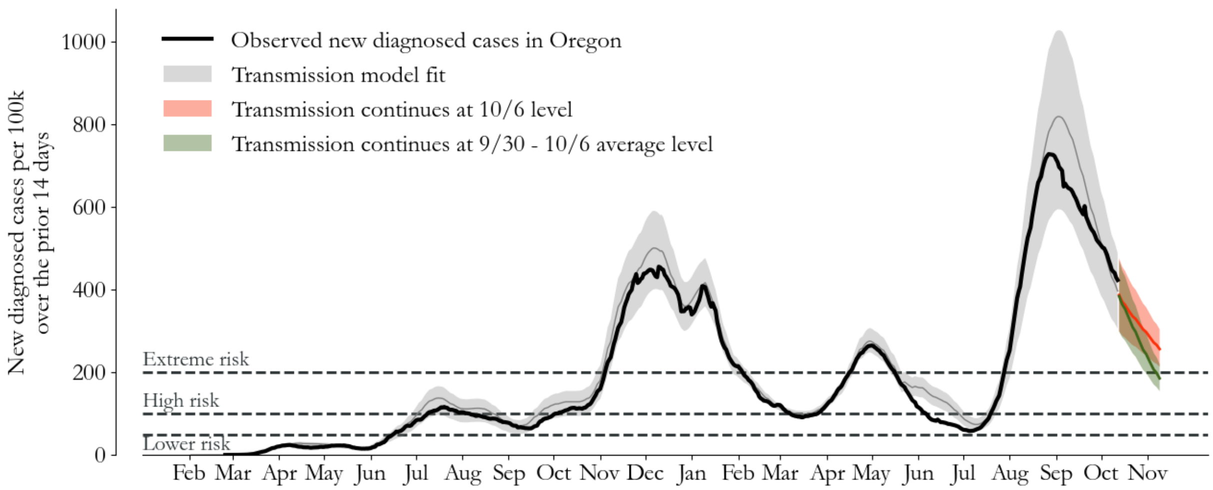

Figure 4: *Observed diagnosed cases (per 100k population over the previous 14 days) for Oregon and projection scenario. The black line shows observed cases, the grey line shows model fit, and the colored lines show diagnosed cases projected assuming the estimated transmission rate of October 6 (red) or the average transmission rate of September 30 – October 6 (green). Shaded areas: 25th-75th percentile ranges of the model fit. The dashed horizontal lines correspond to levels of Oregon Community Spread.*

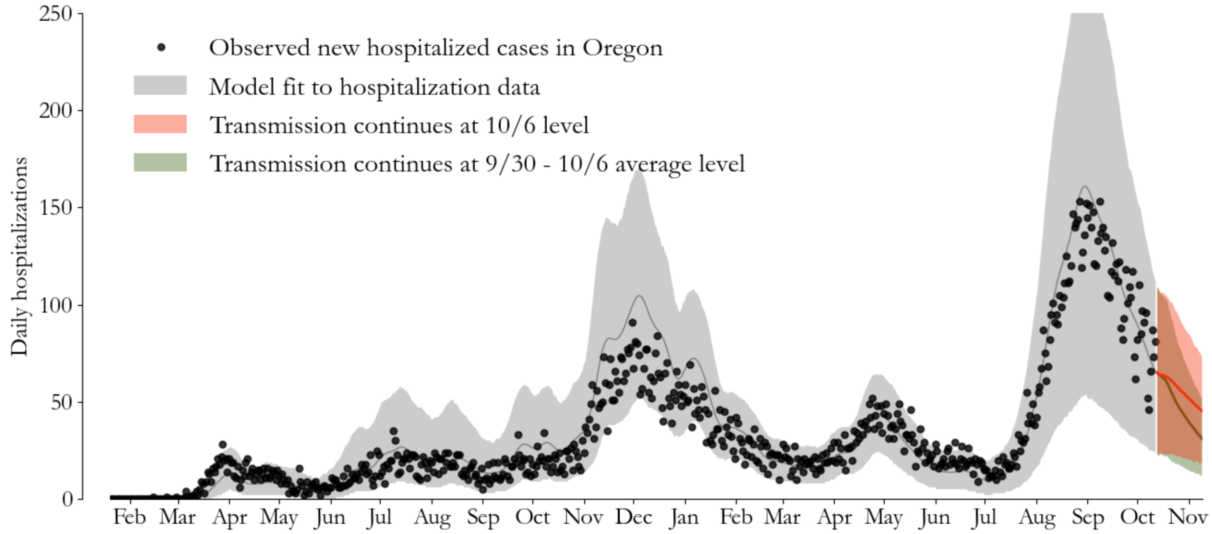

Figure 5: *Observed hospitalized cases for Oregon and projection scenario. Black dots show observed daily counts, while the grey line shows model fit. The colored lines show hospitalizations projected assuming the estimated transmission rate of October 6 (red) or the average transmission rate of September 30 – October 6 (green). Shaded areas: 2.5th-97.5th percentile ranges.*