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

***Results as of 8-26-2021, 5pm***

## PURPOSE OF THIS RAPID STATUS UPDATE

Because of the ongoing COVID-19 surge, the Oregon Health Authority (OHA) wanted to provide an update to last week's epidemic trends and scenario projections more quickly than the typical 3-4 weeks between reports. This Rapid Status Update focuses more narrowly on modeling results than our previous reports, 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.

## RESULTS UPDATED REGULARLY

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.) The results in this report will continue to be updated at least every four weeks as more data become available, the science to inform the model assumptions expands, and modeling methods continue to be refined. The model serves as a useful tool for summarizing trends in COVID-19 transmission in Oregon and for understanding the potential impact of different future scenarios. Point estimates should be interpreted with caution, however, 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. For this status update, Niket Thakkar at IDM provided the 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 the Institute for Disease Modeling (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 August 25 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 August 17 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 2 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 3 and August 17. 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 August 17 reflect exposures that occurred around August 11.

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 increasing sharply starting in late June, the best-estimate $R_e$ has declined somewhat since late July but remains above 1 (indicating continued exponential growth in infections). Over the week ending August 11, the best estimate $R_e$ averaged 1.29. On the date of August 11, the statewide $R_e$ was likely between 1.15 and 1.28, with a best estimate of 1.21.

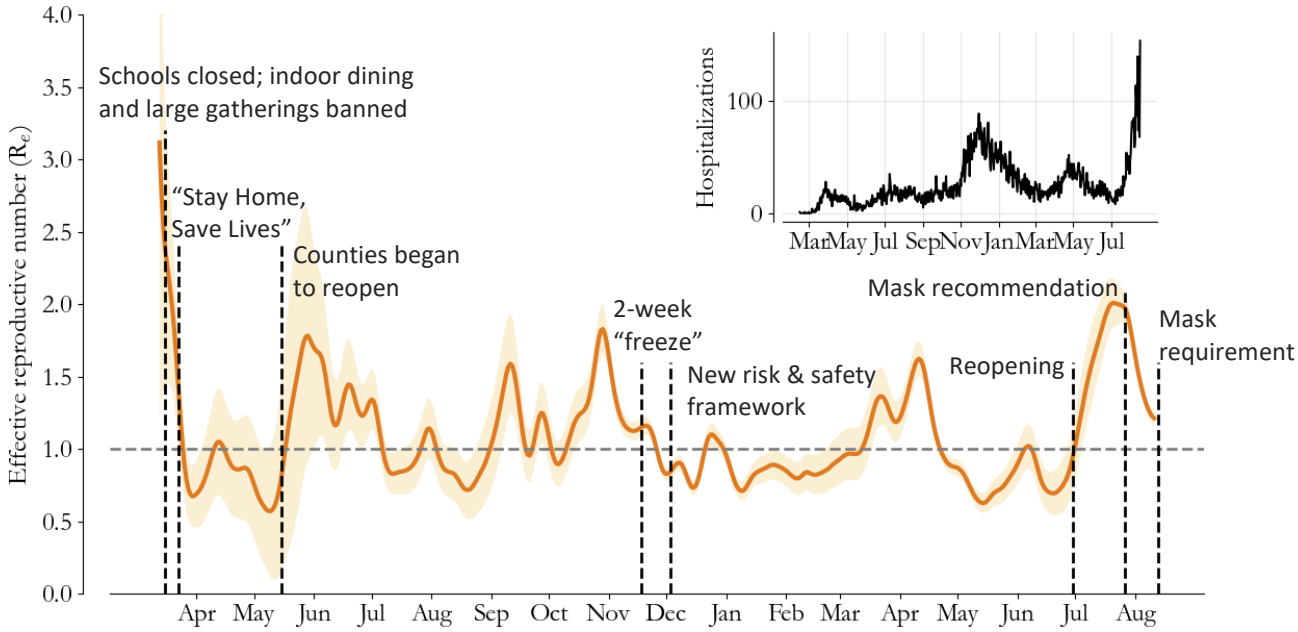


***Figure 1:*** *$R_e$ estimates over time for Oregon, with shaded 95% confidence interval.* [3] *Graph insert is the number of new hospitalizations over time in Oregon, a key input for the estimates. $R_e$ = 1 is the threshold for declining transmission.*

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

[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.

increase in the Delta variants (B.1.617.2 and AY.3) among cases in Oregon (OHA Variant Dashboard)[4], as well as state reopening on June 30th. The recent decline in $R_e$ suggests people might be starting to adopt more protective behaviors after the news of the surge and preventive recommendations. Indeed, data from a survey of Facebook users suggest mask wearing in public has been increasing since late July in Oregon (CMU survey).

It is important to note that these estimates are based on statewide averages, yet the rate of increasing 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 August 11 (1.21) is slightly lower than recent estimates[5] from Harvard, Yale, and Stanford (1.27) and Covid Act Now (1.23).

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## 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.

[4] By the week ending August 8, the highly-infectious Delta variants (B.1.617.2 and AY.3) comprised 99% of genetically-sequenced viral samples in Oregon (OHA Variant Dashboard).

[5] Model $R_e$ estimates are dated August 11, 2021. All were accessed on August 24, 2021. An exact estimate from CMMID was not available, but it appeared to be approximately 1.2. The latest estimate from Institute for Health Metrics and Evaluation, 1.23, is for August 5.

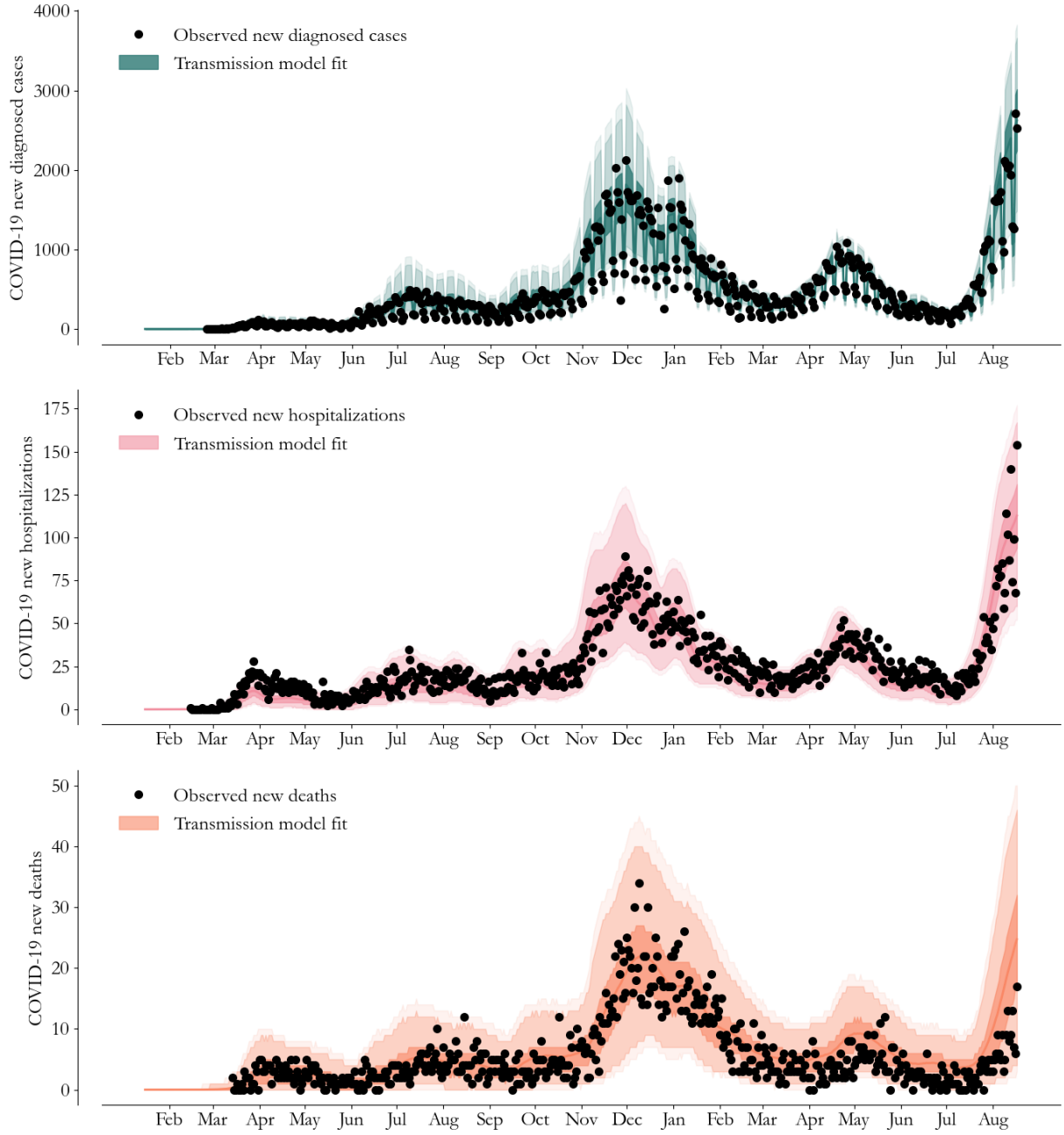


***Figure 2:*** *Fitting the transmission model to Oregon's COVID-19 data on diagnosed cases, hospitalizations, and deaths. The lines represent the mean of 10,000 runs; the 25th-75th percentiles are given in dark shaded areas, 2.5th-97.5th percentiles in the lighter shade, and 1st-99th percentiles the 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.

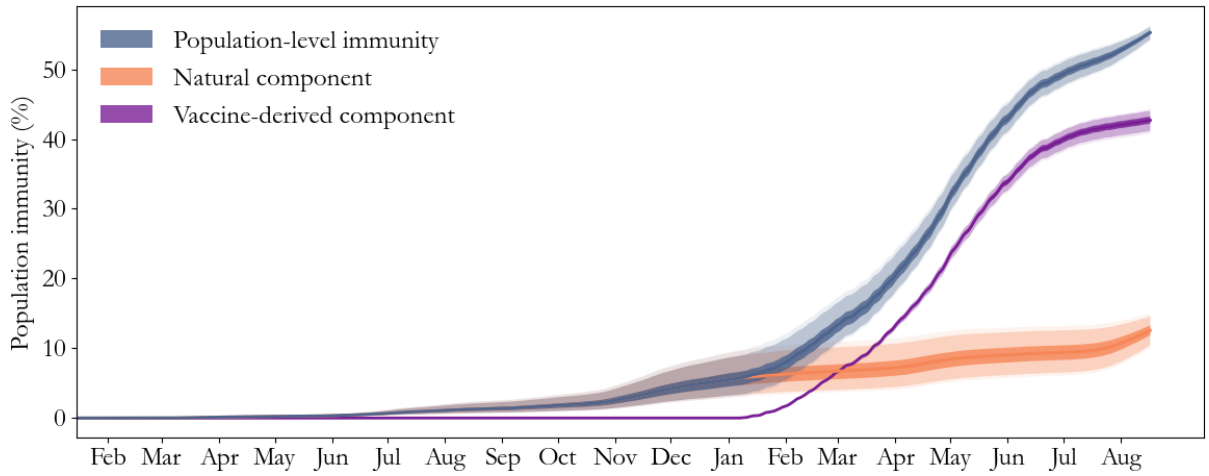


***Figure 3:*** *Estimated population-level immunity to SARS-CoV-2 infection over time. The "natural component" consists of people who developed and then recovered from COVID-19. The "vaccine-derived component" consists of people who were not previously infected, but who achieved immunity from a vaccination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

Rainier estimates that as of August 17, the population-level immunity to SARS-CoV-2 was 55.3% (95% confidence interval: 54.3% - 56.1%). The actual population-level immunity to the Delta variants is unclear, but our immunity estimate (55.3%) is slightly above that from IHME and below that from OHSU. The estimated immunity from vaccination (42.5%) is over three times the estimate for natural immunity.

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 2.65 new people as of August 11. That is to say, without any immunity (largely due to vaccination), our estimated population $R_e$ would be 2.65 instead of 1.21, and new infections would be increasing at a much faster rate.

## COVID-19 trends after the data cutoff

Since we did not include COVID-19 data occurring after August 17 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 hospital occupancy increased by 247 COVID-19 patients between August 17 and August 26. Of note, a particularly large increase in occupancy occurred on August 25, but this was followed by a small increase on August 26.

## 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, Oregon Health and Science University, and Institute for Health Metrics and Evaluation have COVID-19 forecasts.

For the current report, we modeled two scenarios. Both assume recent vaccination levels will continue in the upcoming weeks. These scenarios assume that school reopening will not cause an increase in cases or hospitalizations in our state, but we could possibly see such an increase with school reopening with high baseline rates of hospitalization (CDC; Study from REACH).

Recent transmission continues scenario: We modeled what would happen to trends of cases and people requiring hospitalization if the recent (August 11) transmission rate continued. Under this scenario:

- We would see a continued exponential increase in diagnosed cases (Figure 4). For the two-week period between August 25 and September 7, the projected number of new diagnosed cases would increase to 1,000 per 100,000 people. This rate translates to a daily average of 3,000 cases.
- By September 7, there would be 165 people per day requiring hospital admission (Figure 5).

Mask-wearing increases scenario: We modeled what would happen to the COVID-19 trends if mask wearing increased from 49% to 80% between August 11 and August 31, including among the susceptible population. This is consistent with recent trends from Facebook survey data (CMU survey), though the mask-wearing question is somewhat non-specific and the survey population may not be representative of all Oregonians. Consistent with IHME, we assumed a 30% reduction in transmission among those taking additional protective measures. Under this scenario:

- Diagnosed cases would increase more slowly (Figure 4). For the two-week period between August 25 and September 7, the projected number of new diagnosed cases would increase to 850 per 100,000 people. This rate translates to a daily average of 2,550 cases.
- By September 7, there would be 135 people per day requiring hospital admission (Figure 5).

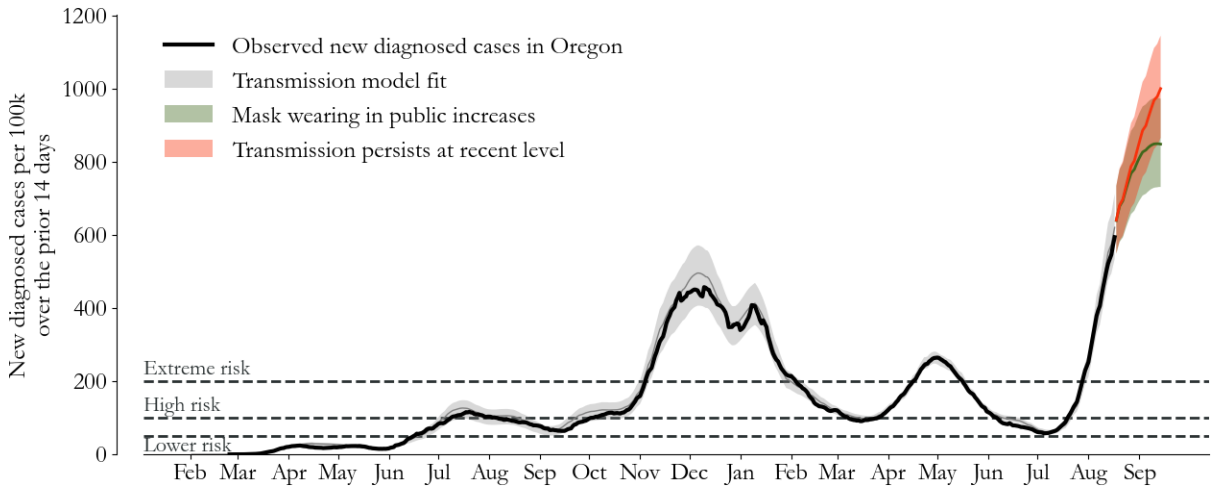


***Figure 4:*** *Observed diagnosed cases (per 100k population over the previous 14 days) for Oregon and projection scenario. The black line shows observed cases, while the colored lines show diagnosed cases projected if the transmission rate estimated for August 11 persists (red) or improves due to increased mask wearing (green). Shaded areas: 25th-75th percentile ranges of the model fit. The dashed horizontal lines correspond to levels of Oregon Community Spread.*

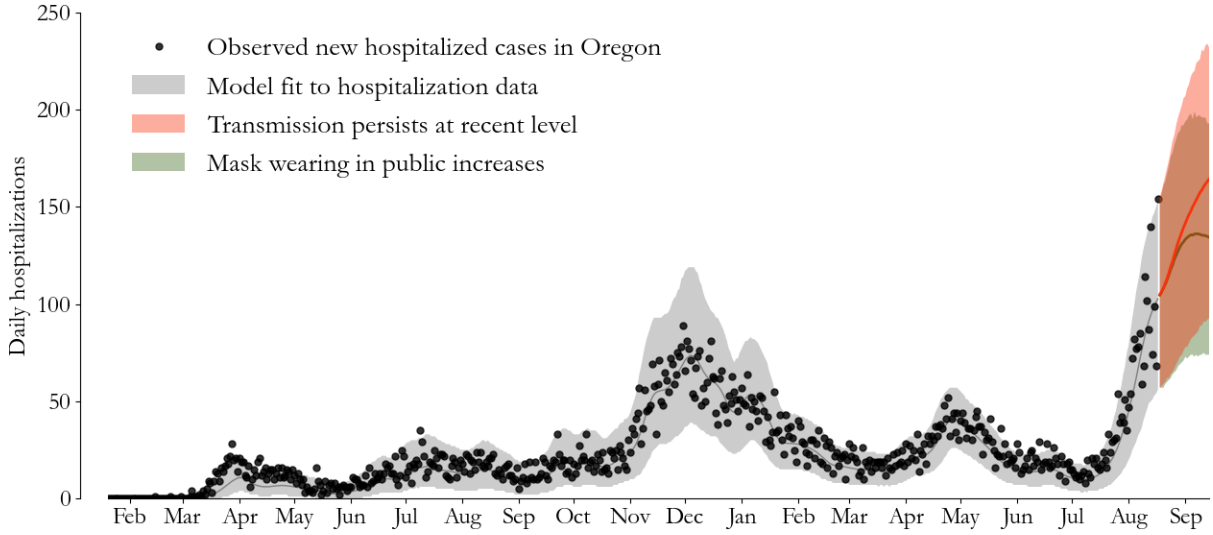


***Figure 5:*** *Observed hospitalized cases for Oregon and projection scenario. Black dots show observed daily counts, while the grey line shows model fit. The colored lines shows hospitalizations projected if the transmission rate estimated for August 11 persists (red) or improves due to increased mask wearing (green). Shaded areas: 2.5th-97.5th percentile ranges.*