Key Outcomes
Hospitalized Patients

Census levels have continued to increase in the last week.

As of 5/3/2021, the census was 351.

Source: https://public.tableau.com/profile/oregon.health.authority.covid.19#!/vizhome/OregonCOVID-19HospitalCapacitySummaryTables_15965754787060/HospitalizationbySeveritySummaryTable
Regional Hospital Census

Region 7 continues to be high and increase.

Other regions are relatively flat.

Source: https://public.tableau.com/profile/oregon.health.authority.covid.19#!/vizhome/OregonCOVID-19HospitalCapacity/BedAvailabilitybyRegion
Oregon Hospital Capacity

As of 5/3, of the 528 occupied ICU beds, 80 (15%) are filled with COVID patients.

Oregon Adult Census
As of: 3-May-21

<table>
<thead>
<tr>
<th>Region</th>
<th>ICU</th>
<th>Non-ICU</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>11%</td>
<td>8%</td>
<td>8%</td>
</tr>
<tr>
<td>2</td>
<td>27%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>3</td>
<td>17%</td>
<td>3%</td>
<td>5%</td>
</tr>
<tr>
<td>5</td>
<td>13%</td>
<td>5%</td>
<td>6%</td>
</tr>
<tr>
<td>6</td>
<td>0%</td>
<td>5%</td>
<td>4%</td>
</tr>
<tr>
<td>7</td>
<td>23%</td>
<td>9%</td>
<td>10%</td>
</tr>
<tr>
<td>9</td>
<td>9%</td>
<td>0%</td>
<td>1%</td>
</tr>
<tr>
<td>Total</td>
<td>15%</td>
<td>7%</td>
<td>8%</td>
</tr>
</tbody>
</table>

Source: https://public.tableau.com/profile/oregon.health.authority.covid.19#!/vizhome/OregonCOVID-19HospitalCapacitySummaryTables_15965754787060/HospitalizationbySeveritySummaryTable
New Cases per Capita

Cases declined slightly in last week

Oregon has the 11th highest current rate of cases in the US.

Source: http://91-divoc.com/pages/covid-visualization/
Hospitalization Rate

For the most recent week (4/18-4/24) of complete data, hospitalization rate is 4.5%.

Note: More recent data are available but the previous two weeks are usually revised upwards so are excluded.

Source: https://public.tableau.com/profile/oregon.health.authority.covid.19#!/vizhome/OregonHealthAuthorityCOVID-19SummaryTable_15889676399110/OregonsEpiCurveSummaryTable
Test Positivity

The most recent complete week (4/25-5/1) had a test positivity of 6.8%.

The current week is showing a slight dip to 6.5%.

Total Tests

Testing volume decreased in the last week.

Statewide Forecast
Vaccine Rates by Age

Older age groups are plateauing in vaccine rates and younger groups are beginning to increase.

As of week of starting 5/2, below are percentages that have received first dose:

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>80+</td>
<td>77%</td>
</tr>
<tr>
<td>70 to 79</td>
<td>80%</td>
</tr>
<tr>
<td>60 to 69</td>
<td>65%</td>
</tr>
<tr>
<td>50 to 59</td>
<td>53%</td>
</tr>
<tr>
<td>40 to 49</td>
<td>51%</td>
</tr>
<tr>
<td>30 to 39</td>
<td>48%</td>
</tr>
<tr>
<td>20 to 29</td>
<td>38%</td>
</tr>
<tr>
<td>10 to 19</td>
<td>11%</td>
</tr>
<tr>
<td>9 and younger</td>
<td>0%</td>
</tr>
</tbody>
</table>

Model Assumption-Vaccine Volume

The “Fast” scenario has been adjusted for the JJ pause and reduction in supply but assumes it will not be fully restricted from use.

The “Slow” scenario reflects a scenario where demand drops off quite quickly.

The two scenarios for strain composition produce different transmission levels for the circulating virus.

As shown, the fast version where the UK variant becomes dominant leads to an increase to 4.5. The slow scenario has UK variant grow at a slower rate of 4.3.

Source: Actuals from https://outbreak.info/location-reports?loc=USA_US-OR, Projections by Simulation by OHSU
Most recent week of estimated policy effect (4/14) showed a significant increase.

This is prior to the announcement of extreme risk. It may be due to unseasonably warm weather allowing outdoor activities to be more comfortable.

Three scenarios are shown:
- The historical pattern of fear and fatigue.
- A modified version where policy strength fades to follow susceptibility.
- No policy increase and then a fade to follow susceptibility.

Note: The estimated intervention effectiveness includes increased transmissibility due to the variant. Thus, if the estimated R is the same but the variant has increased it will mean the intervention effectiveness, shown in the chart, has increased.
The forecast shows a peak census of 410 on 5/18.

As extreme risk is precluded by census growth rate, the decline is due to policy is expected to be slower.

The Primary Scenario is:
• Slow variant (UK R0=4.3)
• Lighter policy framework
• Slow vaccine (JJ delayed, but some gap filled)

Forecast shows peak census of 473 on 5/22.

Source: OHSU COVID Forecast Model
Census Forecast-Alternative Scenarios

**Scenarios:**

**Variant**
- a) Fast (ie. UK grows fast)
- b) Slow (ie. UK grows slower)

**Fatigue:**
- a) Light RLF w/Fade
- b) Strong RLF w/Fade
- c) Historic FF cycle

**Vaccine:**
- a) Fast (Demand follows supply)
- b) Slow (Demand continues to decline)
As of 5/3, the estimated population proportions are:
- Susceptible: 55%
- Vaccinated: 28%
- Infected: 14%
- Vaccinated & Infected: 4%

Projection uses primary scenario.

Source: OHSU COVID Forecast Model
Review of Leading Indicators
Leading Indicators Comparison

While at their highest levels since the stay-home order, the leading indicators appear to be stabilizing.

Source: SDI from: [https://data.covid.umd.edu/](https://data.covid.umd.edu/)
DEX from [https://github.com/COVIDExposureIndices/](https://github.com/COVIDExposureIndices/), Google mobility reports from [https://www.google.com/covid19/mobility/](https://www.google.com/covid19/mobility/)
Recently enacted “Extreme” risk level impacted indoor dining.

Source: https://covidcast.cmu.edu/
Community levels of symptoms have not increased much during the current surge.

Source: https://covidcast.cmu.edu/
Policy Issues
Oregon has provided first dose to 46.2% of population as of 4/27. Oregon ranks 22nd in the US by this metric.

Source: https://covid.cdc.gov/covid-data-tracker/#vaccinations
Oregon Risk Levels

Oregon Counties by COVID-19 Risk Level

8 Lower
4 Moderate
9 High
15 Extreme

COVID-19 Risk Levels
- Lower
- Moderate
- High
- Extreme

The chart shows that after adjusting for variants and vaccine and previous infection, the brown line is how effective our policies need to be to prevent growth in the virus.

Current performance is the orange line which is too low to stop growth.

This scenario shows the modification in the RLF to a lighter path.
Policy Comparison

This chart shows the difference in outcomes for the current “Light RLF w/Fade” vs a “Strong RLF w/Fade”.

Below are total admits and deaths for period between May 1- Aug 31.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Deaths</th>
<th>Admits</th>
</tr>
</thead>
<tbody>
<tr>
<td>A) Light RLF, w/Fade</td>
<td>759</td>
<td>3,075</td>
</tr>
<tr>
<td>B) Strong RLF, w/Fade</td>
<td>632</td>
<td>2,562</td>
</tr>
<tr>
<td>C) Historical Fear and Fatigue</td>
<td>437</td>
<td>1,770</td>
</tr>
</tbody>
</table>

Difference (Scenario B - Scenario A) 127 513

Source: OHSU Forecast Model
India

While the absolute numbers in India are very large, it is important to recognize that the rate per capita is below many countries in Europe, including Sweden, Netherlands, and Turkey.

However, the positivity rate (22%) is roughly 3 times as large as Europe (6.5%). Thus, it is likely that cases counts are 2 or 3 times higher to make accurate comparison.
Previous Forecasts

Source: Primary scenario for each week is used
IDM/OHA Projection

The most recent forecast was issued on 4/22.

The model shows the impact of continued increases.

Figure 5: Observed diagnosed cases (per 100k population over the previous 14 days) for Oregon and projected cases under two scenarios. The black line shows observed cases, while the colored lines show diagnosed cases projected if the transmission rate estimated for April 7 persists (blue) or increases by 20% starting April 8 (red). Shaded areas: 25th-75th percentile ranges of the model fit. The risk levels of COVID activity (dashed horizontal lines) are defined by the Oregon Framework for County Risk Levels.
To the right is the ensemble forecast (similar to average) of multiple models with shaded 95% confidence interval.

Below are the specific models that are averaged.

Source: https://covid.cdc.gov/covid-data-tracker/#forecasting_weeklycases
As of 4/23, the IHME model is only showing increases in infections under their “worse” case scenario.

Projections and scenarios

We produce three scenarios when projecting COVID-19. The reference scenario is our forecast of what we think is most likely to happen:

- Vaccines are distributed at the expected pace.
- Governments adapt their response by re-imposing social distancing mandates for 6 weeks whenever daily deaths reach 8 per million, unless a location has already spent at least 7 of the last 14 days with daily deaths above this rate and not yet re-imposed social distancing mandates. In this case, the scenario assumes that mandates are re-imposed when daily deaths reach 15 per million.
- Variants B.1.1.7 (first identified in the UK), B.1.351 (first identified in South Africa), and P1 (first identified in Brazil) continue to spread from locations with (a) more than 5 sequenced variants, and (b) reports of community transmission, to adjacent locations following the speed of variant scale-up observed in the regions of the UK.
- In one-quarter of those vaccinated, mobility increases toward pre-COVID-19 levels.

The worse scenario modifies the reference scenario assumptions in three ways:

- First, it assumes that variants B.1.351 or P1 begin to spread within 3 weeks in adjacent locations that do not already have B.1.351 or P1 community transmission.
- Second, it assumes that all those vaccinated increase their mobility toward pre-COVID-19 levels.
- Third, it assumes that among those vaccinated, mask use starts to decline exponentially one month after completed vaccination.

The universal masks scenario makes all the same assumptions as the reference scenario but also assumes 95% of the population wear masks in public in every location.

Other Models

From the IHME report, other forecasts are provided in Figure 22.

**Figure 22.** Comparison of reference model projections with other COVID modeling groups. For this comparison, we are including projections of daily COVID-19 deaths from other modeling groups when available: Delphi from the Massachusetts Institute of Technology (Delphi; https://www.covidanalytics.io/harmon), Imperial College London (Imperial; https://www.covidsim.org), The Los Alamos National Laboratory (LANL; https://covid-19.brugateway.org/), and the SI-Kappa model from the University of Southern California (SI-Kappa; https://gitlab.com/scr-use/reCOVER-COVID-10). Daily deaths from other modeling groups are smoothed to remove inconsistencies with rounding. Regional values are aggregates from available locations in that region.
Model Assumption: Population w/First Dose

This is the schedule used by the model for the percent of population w/first dose by week and age group.

Source: OHSU COVID Forecast Model
Model Assumption: Hosp Rate

This shows the assumed hospitalization rate projected based on the change in susceptible population from vaccination.

The new projection is lower than previous as it accounts for the likelihood that the vaccinated are more likely to be high risk and thus less likely to be hospitalized than their age would have predicted.

Source: OHSU COVID Forecast Model
Model-Key Parameters

Key Assumptions

1) Vaccine schedule follow “slow” schedule with prioritized age groups
2) Vaccine acceptance rate, varies by age group.
3) Lagged affect on protection (2 weeks until vaccinated have protection)
4) Efficacy of vaccine (54% at first dose, 95% after second dose at 24 days)
5) Policy Scenarios have constructed to account for likely reduction in policy restrictions.
6) Ascertainment rate- True infected are estimated to be 3.5 times larger than cases.
7) Virus strain $R_0$ values (B117=4.62,4.3, B1427/9=3.7, Other=3.08)
8) Hospitalization rate has been adjusted to reflect higher risk individuals being vaccinated within age groups.

Source: OHSU COVID Forecast Model
Acknowledgements

Each week this model requires updates, input and expertise from many people.

I would like to thank Michael Jensen for his volunteer efforts to update our vaccine information, Chris Ellertson for his volunteer efforts to track vaccine projections, Brian O’Roak and Xuan Qin, at OHSU, for their expertise to understand genetic sequencing information, and the hospital forecasting workgroup for their feedback on weekly forecasts, including collaboration with Julie Maher and Erik Everson at Multnomah County PDES.

I would also like to give a special thank you to Michael Johnson from St. Charles Health who helped develop an early version of the model that has proven to be a good structure to handle the many twists and turns the problem has required.

Thank you!