OHSU COVID Forecast
Edition: 12/2/2021

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Key Outcomes
As of 12/2/2021, the statewide census was 384.

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

All regions are flat or declining.

Source: https://public.tableau.com/profile/oregon.health.authority.covid.19#!/vizhome/OregonCOVID-19HospitalCapacity/BedAvailabilitybyRegion
The Midwest and Northeast are experiencing modest increases. The West and South are decreasing or flat.
Hospitalizations in Europe

The hospitalization rate across Western European countries is up. The list of countries includes: France, Spain, Italy, Belgium, Portugal, Austria, Netherlands, Sweden, Ireland, Finland, Denmark, Norway, Luxembourg, Iceland.

While this is concerning and closely watched for implications in Oregon, it appears to be a delayed Delta surge, similar to the Midwest states. The initial surge in Europe does not appear to have been high enough to achieve the natural immunity levels Oregon obtained during the Delta wave.

As of 11/30, 15% of occupied ICU beds are filled with COVID patients.
Oregon Hospital Capacity

These data are based on HOSCAP reports of individuals infected with COVID.
Case rates continue to decline. Some increase in cases is expected following Thanksgiving.

Oregon is the 12th lowest in the US in the number of new cases per day.

As of 11/24, general declines in case rates in both populations are evident.

Observed vaccine effectiveness remains steady.

Note: The vaccine effectiveness chart reflects revisions to data in the breakthrough report.

The most recent complete week (11/20/21-11/26/2021) had a test positivity of 5.6%.

With lower test volume during Thanksgiving some increase in positivity is expected as more severe cases are likely to be tested.

Total Tests

Testing dropped during Thanksgiving week but is expected to rebound subsequently.

Review of Leading Indicators
Higher Risk Behaviors

Time with others indoors increased sharply during Thanksgiving and to a greater extent than last year.

Source: https://covidcast.cmu.edu/
Thanksgiving Effects on Time Indoors

Time with others indoors increased sharply in Oregon and other states during Thanksgiving.

Oregon’s increase was larger than neighboring states (WA, CA), hard hit Midwest states (MN, MI, WI), and low case count early delta states (MA, AR, FL)

Google Mobility Metrics

Grocery trips increased during Thanksgiving week. Other metrics continue a seasonal decline.

Source: Google mobility reports from https://www.google.com/covid19/mobility/
Symptoms continue a general decrease.

Note: “Symptoms” refer to community reports of COVID-like symptoms through Facebook surveys.

Source: https://covidcast.cmu.edu/
Mask Wearing

Mask wearing dipped slightly in the last week.

Source: https://covidcast.cmu.edu/
Statewide Forecast
Model Assumption-Waning Immunity

In order for the model to account for waning immunity of previous infection or vaccine, certain assumptions are needed. This model uses a basic structure which indicates:

1) Wane Starts: How many months after infection/vaccine waning begins.

2) Wane Duration: How long until waning is complete.

3) Wane Share: Percent of people who will not get boosters to prevent waning.

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Standard</th>
<th>Short</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parameter</td>
<td>Vaccine</td>
<td>Infection</td>
</tr>
<tr>
<td>Wane Start (months)</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Wane Duration (months)</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>Wane Share</td>
<td>35%</td>
<td>50%</td>
</tr>
</tbody>
</table>

Model Assumption-Vaccine Volume

First dose vaccinations decreased after peaking at 40k per week.

First dose vaccination are expected to decline as the newly eligible age group (ages 5-11) reaches the 55% expected level of vaccination.

Model Assumption-Virus Spread Rate

With no new variants measured in Oregon, the transmission rate is driven by the estimated transmission rate of the Delta variant.

The “Fast” scenario assumes delta variant has an R0 of 8.0.

The “Slow” scenario assume R0=6.5

Source: Actuals from https://outbreak.info/location-reports?loc=USA_US-OR, Projections by Simulation by OHSU
Model Assumption- Policy/Behavior

The most recent week shows a continuing fatigue pattern of declining effectiveness. Four scenarios are constructed to show possible paths.

1) Fear and Fatigue: this is a full cycling through forecast period.
2) Fatigue without Fear: this shows what happens if no new fear cycle begins
3) Full Fatigue: This shows what happens if fatigue continues
4) No Fatigue: maintains recent effect level

Source: OHSU COVID Forecast Model
The forecast shows a flatter period before further declines in census.

The primary scenario is:

- “Fatigue w/o Fear” intervention effect
- Slow Variant (Delta R₀=6.5)
- High hospitalization rate for Delta (2X original)
- Vaccine efficacy=90%
- Waning immunity follows standard assumptions

Model: The OHSU state hospital census forecast is an SIR model that includes traditional assumptions about first transmission (2/1/2020), doubling rate (5 days), days from exposure to admissions (12 days), length of stay (7 days, 13 days for ICU), and recovery period (14 days). It has an innovative feature which is that it includes a factor that moderates transmission rates which is called policy effectiveness. The factor is estimated historically for key policy dates and/or weekly intervals. It also allows future policies to be projected.
The Scenarios for combinations of waning and policy/behavior assumptions are shown.

The primary specification is Fatigue w/o Fear with Standard Waning.
The last 17 weeks of forecasts are shown.
As of 11/30, the estimated population proportions are:
Susceptible: 18%
Vaccinated: 44%
Vaccinated & Infected: 12%
Infected: 26%

Source: OHSU COVID Forecast Model
The OHSU COVID Forecast model has been updated to accept new parameters about Omicron.

Unfortunately the key parameters are not yet known and there is very little consensus of likely values.

We expect real data about the parameters in the next week or two and will update the model.

Source: OHSU COVID Forecast Model
Local Forecasts

The regional forecasts have not yet been updated and are still the same as the 11/24 edition. They will be updated online tomorrow.
Regional Forecasts

Confirmed COVID-Positive Cases

Source: OHSU COVID Forecast Model, OHA
Regional Herd Charts

Source: OHSU COVID Forecast Model, OHA
Policy Issues
16.6% of the total population has received an extra dose (sometimes called a “booster”)

Source: https://public.tableau.com/app/profile/oregon.health.authority.covid.19/viz/OregonCOVID-19VaccineEffortMetrics/StatewideProgress
High Risk Conditions by Immunity Type

In Oregon, those who have not been vaccinated or previously infected (“Neither”) are somewhat less likely to have conditions that make them at high risk for severe disease from COVID.

Not shown but they are also less likely to be older, which carries its own risk.

The pediatric census level in Oregon for confirmed positive patients under age 18 is 2 as of 11/30.
The recent week of data by date of death showed an increase. This is expected to decrease and follow the hospitalization pattern.

Assumptions to project deaths from infections/hospitalizations:

1) Deaths lag infections by an average of 21 days.

2) There are 4.0 COVID hospitalizations per death from COVID.

Source: OHSU COVID Forecast Model, OHA
Influenza in Oregon

The most recent week had 14 positive tests for influenza.

During the 2019-2020 season this week had 195 positive cases.

Influenza Trends

Across the globe the amount of influenza has been low when measured against previous seasons where as many as 30k infections per week were detected.

Figure from EW46, Nov 30.

Appendix
CDC Forecast-Ensemble

CDC forecasts flat number of admissions over the next 3 weeks.

As of 11/18, IHME shows the hospital flat and then increasing after new year.

**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. Brand- and variant-specific vaccine efficacy is updated using the latest available information from peer-reviewed publications and other reports.
- Future mask use is the mean of mask use over the last 7 days.
- Mobility increases as vaccine coverage increases.
- 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 reference scenario assumes that mandates are re-imposed when daily deaths reach 15 per million.
- Variants Alpha, Beta, Gamma, and Delta continue to spread regionally and globally from locations with sufficient transmission.

The **worse scenario** modifies the reference scenario assumption in four ways:

- 100% of vaccinated individuals stop using masks.
- Mobility increases in all locations to 25% above the pre-pandemic winter baseline, irrespective of vaccine coverage.
- Governments are more reluctant to re-impose social distancing mandates, waiting until the daily death rate reaches 15 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 reference scenario assumes that mandates are re-imposed when daily deaths reach 38 per million. In either case, we assume social distancing mandates remain in effect for 6 weeks.
- Variants Alpha, Beta, Gamma, and Delta spread between locations twice as fast when compared with our reference scenario.

The **universal mask use scenario** makes all the same assumptions as the reference scenario but assumes all locations reach 95% mask use within 7 days.

Effective R Estimate

Model: The OHSU state hospital census forecast is an SIR model that includes traditional assumptions about first transmission (2/1/2020), doubling rate (5 days), days from exposure to admissions (12 days), length of stay (7 days, 13 days for ICU), and recovery period (14 days). It has an innovative feature which is that it includes a factor that moderates transmission rates which is called policy effectiveness. The factor is estimated historically for key policy dates and/or weekly intervals. It also allows future policies to be projected.

Source: OHSU COVID Forecast Model
Vaccine Projections

Younger age groups are expected to increase but reaching levels lower than adults. (50% for <9 and 55% for 10-19).
Each week this model requires updates, input and expertise from many people.

I would like to thank Dr. William Messer for his assistance in understanding waning dynamics, 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!