Providence St. Joseph Health COVID-19 Epidemiology and Census Analytics

In many ways, the COVID-19 pandemic stretched the limits of existing analytics tools most organizations had available. As Dr. Amy Compton-Phillips discussed in her [address at Virtual HIMSS](#), reporting tools from previous outbreaks can be updated for the current situation and new tools may need to be developed. This document describes a real-time example and recommendations for building systemwide monitoring analytics including census for monitoring bed usage, epidemiology for monitoring hot spots, and labs for tracking testing volume and results.

Bluetree is working with Providence to share these helpful dashboards with the greater healthcare community, in three phases:

- This whitepaper, which provides examples and build recommendations.
- An actual working dashboard that can be mapped to your data structures. Expected delivery around 4/10/2020.

Providence delivers 3 dashboards in Tableau via a portal called My Hiway:

- CoVERED Census
- CoVERED Epidemiology
- CoVERED Labs

Clinicians and administrators can open each of these and drill in to slice and dice.
Most data in the dashboards are from either the Epic or the Meditech electronic medical record (EMR). EMR data is extracted to Clarity and Caboodle for trends, and a 15 minute “ping” updates real-time census information from Chronicles.

First, we’ll describe each dashboard’s capabilities and information set. Then we’ll zoom in to describe the underlying data architecture.

### CoVERED Census
### Current Census Tab

The CoVERED Census is a league type chart that shows all ministry/hospital locations’ count of currently admitted patients in total, broken down by each patient’s status. Summaries for each hospital area – ICU, Mech Vent, non-ICU, Telemetry, are at the top of the report, followed by a detailed breakdown by facility. Users have the option to add filtering criteria for “Display Level,” “State,” “Region,” “Facility,” and “COVID Status.” The Current Census tab is updated every 15 minutes directly from Epic Chronicles.

When a user selects a facility from the chart, a sidebar report opens displaying a breakdown of that facility’s ICU and floors for each COVID Status.

**COVID Status category list:**

- “Positive” – confirmed cases of COVID-19
- “PUI” – patient under investigation for infection
- “NON COVID” – those who are not under investigation and who don’t have a confirmed case
Census Trend Tab

The Census Trend tab uses the count of COVID Status category lists for each patient on each day to create a Positive and PUI trend line. Beneath the trend line report is a detailed report displaying the daily count of both statuses, broken out by ICU or other department. The statuses correspond to badges on the far left indicating the current count of patients in each status.
COVID Status by Location Tab

The COVID Status by Location tab displays the data feeding the previous two tabs and allows users to download the data to use it for other operational or analytical reports.
This is a graphical view of the volume of positive COVID cases organized by the zip code of the patient’s home address. The size of the circle is relative to the number of people that are positive in each zip code. The line graph below the map shows the number of new positive tests obtained anywhere in the health system – not just the hospitalized patients. (The Census reports are only for currently admitted patients.)

If you would like to see this information over time for a certain area, such as the Seattle area, you could select all of the zip codes for that area on the map, and then review the trend line graph below the map to see the New Positive Tests Each Day specifically for that area.

It is possible to configure the report in a way that allows you to click through certain timeframes to show the change in size of the circles, which may inform when positive patient “spikes” will occur in other areas. You may choose to mobilize staff and resources to these areas, accordingly.
The League Chart by Location tab displays a report much like the Current Census tab but is far more flexible in the data it displays. One sees hospital locations running vertically along the left side, with bars for each that visualize the count of selected metrics. For instance, one could show how many new COVID-19 panel tests were ordered in the last two weeks, with the location that ordered the highest number sorted to the top of the chart. Filters available on the right side of the window also allow the user to filter to only outpatient clinics, or to only those locations in Washington state.

Criteria for clinical features of the symptoms that comprise the syndrome indicative of COVID-19.
The Site Statistics tab compares the number and percentage of patients with certain attributes and symptoms for a location at two different time periods. Use Encounter Setting and Age Group filter criteria to further narrow down to a population of interest. The symptoms shown on the Site Statistics page are the same as those that are evaluated for the COVID-19.
The Rate by Patient Zip displays a heat map of patients with a selected symptom that have come to Providence for care. The visualization highlights concentrations of patients that displayed the set of symptoms in question starting with blue and moving to deepening shades of orange, which allows leadership to predict how busy hospitals located in those areas are likely to get. Zoom in and hover over a zip code to see the COVID statistics for number of labs ordered, number of confirmed cases of infection, and the number of patients under investigation.
The Rate Ratio by Site of Care tab visualizes the trending of positive COVID-19 cases in a geographic area over time. This is useful to determine where the relative rate of cases in each geographic area is growing or shrinking. The user is able to select specific states, facilities, departments, age groups, etc., as well as the user’s time period of interest.

The report compares the specified time period and performs statistical analysis on the returned data to determine how to color code the circles. The user can define the Alpha cutoff.

In the pictured example, the “Den” (Denominator) column in the tooltip shows the emergency department saw 1686 patients and 16 of them presented with the symptoms of interest. Whereas in the more recent two-week period (Time Period 2), the department saw 1205 patients and 18 of them had the symptoms of interest. That isn’t a statistically significant difference. However, if you examine an area that appears to be harder hit, you can see that there were 26 patients out of 3314 in Time Period 1, and in the next period that rose to 81 patients out of 2554. It suggests a statistically significant uptick in COVID-19 activity is occurring in that region.
The CoVERED Labs report is a filterable dashboard of all Positive, Negative, and Pending COVID-19 lab tests. About 20% of the tests in this example have a result of “Unknown” because the workflow to interpret the tests wasn’t rolled out at the beginning of the specified time period. In the bar graph below the Unknown badge, you can see that the number resulted per day with that value has dropped off to almost zero. A lab data view that will allow users to see the turnaround time by site, by day of week, etc., is coming soon.

If you need additional help, Bluetree is available to support any healthcare organization with implementing and customizing these tools.

Here’s how:

1. Contact Bluetree’s team at covid-19response@bluetreenetwork.com
2. We will schedule a 1-hour consultation to walk through the technical requirements and how you can set the reports up on your own.
3. If your analytics team needs additional support with implementing the dashboards, we will also discuss details on how we can help.