Executive Summary

COVID-19 has presented unprecedented challenges to governments, economies, and communities at the local, domestic, and global scales. Within the United States alone, over 33 million cases have been reported, along with over 580,000 deaths.[1] Social distancing, mask-mandates, and school closures are just a few of the protective measures that have been put in place by the State of Oregon and other governments. The objective of this report is to provide a detailed report on the current status of the COVID-19 pandemic in Oregon, with a focus on measures of incidence, hospitalization, mortality, and vaccination. In particular, we address inequities in these measures across age, race and ethnicity, gender and geographic region. This report draws exclusively on Oregon Health Authority (OHA) data in order to highlight current COVID-19 inequities within our state.

Our analysis found major inequities in COVID-19 when evaluating incidence, hospitalization, mortality, and vaccination. Incidence, or rate of new infection, is substantially higher within Hispanic, Black, American Indian/Alaska Native, and Pacific Islander populations relative to White populations in Oregon. Similarly, these historically marginalized racial and ethnic groups have higher hospitalization rates, and lower vaccination rates relative to White populations. Hospitalization rates and mortality rates are significantly higher in older age groups relative to youth and young-adult populations, while males experience higher hospitalization rates and mortality rates relative to females. Infection rates and mortality rates vary widely by region, with infection and mortality rates generally being higher in more rural counties in Central and Eastern Oregon. Vaccination rates are substantially lower in rural counties of Oregon relative to more urbanized regions in the western portion of the state.

Based on these inequities, we suggest that Governor Brown and the state maintain a County Risk Level framework moving forward while maintaining mask-mandates and enforcing social distancing measures in order to protect historically marginalized communities in Oregon while mass-vaccination efforts continue. Our second recommended approach for the Governor and the state is to enhance vaccine outreach in historically underserved communities in a culturally-responsive manner. Given the disproportionately high rates of infection and hospitalization within these groups, it is essential that efforts are made to improve vaccine access for Black, Hispanic/Latinx, and Indigenous communities within our state. OHA and the state of Oregon can prioritize establishing trusted messengers within minoritized communities, elderly populations, and rural communities in order to provide accurate vaccine information delivered from trusted community members. By adopting culturally-relevant and responsive vaccine messaging and removing existing barriers to becoming vaccinated, it is possible that our state can work to mitigate some of the inequities we are currently seeing within our state.

Introduction

COVID-19, the respiratory disease caused by SARS-CoV-2, has presented unparalleled challenges to public health officials, government, and communities both internationally and within the United States. We know that the burden and overall impact of COVID-19 has been substantial. Globally, nearly 162 million cases and over 3.3 million deaths from COVD-19 have been recorded, as reported by the World Health Organization (WHO).[2] The Center for Disease Control (CDC) reports that since the onset of the COVID-19 pandemic, the US has experienced nearly 33 million cases, and over 580,000 deaths attributed to COVID-19.[1]

This is an ongoing public health crisis, and a challenge that we will be recovering from for years to come. Under state leadership, Oregon has been working diligently to address COVID-19 with various policy-level and community-level interventions. Clear progress has been made, particularly as mass-vaccination efforts have been implemented to add protection to populations across the state. However, in Oregon, we are continuing to see cases and hospitalizations strain our healthcare system and limit available resources. We are also seeing a rise in variants that are suspected to be more transmissible than previous variants that were more prevalent in our state. As we reach new milestones in vaccination efforts against COVID-19, we also must address vaccine disparities and vaccine hesitancy, which will be discussed in this report.

Most importantly, we must continue to acknowledge that COVID-19 has a disproportionately high impact on historically marginalized and underserved communities, as well as older populations and rural communities. Recent literature reviews reveal racial and ethnic disparities in incidence, hospitalization, and death attributed to COVID-19.[3,4] These studies find that Black and Hispanic populations experience a higher risk for hospitalization due to COVID-19 relative to White populations.[3] Prior literature suggests that mortality rates are disproportionately high across Black populations and Latinx populations when compared to White populations, while American Indian/Alaska Native, and Pacific Islander populations also appear to experience excess mortality from COVID-19.[3] Recent meta-analyses have identified that men have a higher risk of COVID-19 infection, as well as a higher likelihood of severe infection resulting in ICU admission relative to women.[4] This same meta-analyses found that older than 70 had a higher risk of infection, severe disease, ICU and death.[4] On an individual level, recent literature has found that chronic immunosuppression and diabetes were strongly associated with severe COVID-19 cases, while diabetes and hypertension also elevate the risk of death.[5] Recent studies also highlight some important community-level protective factors from COVID-19 infection and death. A systematic review and meta-analyses found evidence of the efficacy of social distancing of greater than 1 meter, in addition to the efficacy of community usage of facial coverings.[6] This same study concluded that increased distance resulted in enhanced protection from COVID-19 infection and severe disease.[6]

In this report, we will provide an Oregon-specific overview of the current status of the COVID-19 pandemic, focusing on incidence, hospitalization, mortality, and vaccination. In particular, we aim to address disparities in COVID-19 across age, race, gender and geographic region. This report will draw exclusively on the OHA COVID-19 Tableau data dashboards in order to highlight these inequities.

Results[1]

Overall Trends in COVID-19 in Oregon

We first analyzed overall trends in COVID-19 incidence, hospitalization, mortality, and vaccination since the onset of the pandemic. Figure 1 displays distinct peaks in cases at different time points during the pandemic. A 7-day rolling average line is added to allow us to focus on major trends in cases and smooth peaks that may be attributed to reporting changes or reporting error. From Figure 1, we see that the number of new cases per day was at an overall peak in December of 2020, though a recent surge in cases occurred from April to early this month. Figure 2 illustrates the total case count stratified by hospitalization status. We see here that COVID-19 hospitalizations have made up a relatively small portion of total cases. However, Figure 3 displays a peak in hospitalizations in Winter of 2020, as well as a recent surge in hospitalizations in April and May of 2021. In recent weeks the hospitalization trend appears to be improving, though we still are in a state of elevated daily hospitalizations.

Figure 4 displays weekly death totals from COVID-19, stratified by hospitalization status. This graphic shows that the majority of cases who have died from COVID-19 have been hospitalized, while also showing that weekly death counts have been substantially lower than peaks during this past December and January. Figure 5 displays daily vaccination counts in Oregon since vaccines first became available in December of 2020. We see a consistent uptick in vaccinations until recently, as a greater proportion of the population has become completely vaccinated.

Inequities in COVID-19 Infection, Hospitalization, Mortality and Vaccination

The following analysis highlights the current state of COVID-19 in Oregon, with a focus on incidence, hospitalization, mortality, and vaccination. In particular, these results and graphics address disparities in COVID-19 across age, race, gender and geographic region.

Incidence

Figure 6 displays the population-adjusted cumulative incidence by race and ethnicity. This graphic shows that rate of infection is highest in minoritized populations in Oregon, particularly in Pacific Islander and Hispanic populations. Relative to White populations, American Indian/Alaska Native and Black populations also have substantially higher rates of infection. Our analysis shows that the 20 to 29 year-old age group has substantially higher rates of COVID-19 infection relative to any other age group. Those 60 and above, as well as adolescents who were 9 and younger have the lowest infection rates (see Figure 7). People identifying as female have only slightly higher infection rates relative to male-identifying populations (see Figure 8). In general, cumulative incidence is higher in rural counties relative to more populous regions in the Western part of the state, as depicted in the cumulative incidence map of Oregon (see Figure 9). Figure 10 displays more recent trends in COVID-19 positive tests, by county, showing that central, south-central, and north-eastern located counties in Oregon have the highest test positivity percentage over the last two weeks (since May 2nd).

[1] All analysis was performed in R version 4.0.0.

Hospitalization

For hospitalization, our analysis focuses on case hospitalization rates, or the proportion of all cases that become hospitalized amongst each subgroup analyzed. All hospitalization data summarized was acquired from the "COVID-19 Case Demographics and Disease Severity Statewide - Summary Table" within the OHA COVID-19 Tableau online data dashboard platform. Figure 11 illustrates slight disparities in case hospitalization rates by race and ethnicity, with Pacific Islander populations, American Indian/Alaska Native, and Black populations having slightly higher rates of hospitalization if diagnosed with COVID-19. Case hospitalization rates are substantially higher with increasing age, with those 80 and older having a 30% hospitalization rate, relative to those from 10 to 19 years of age having a case hospitalization rate of just 0.8% (see Figure 12). In addition, we found that men have slightly higher case hospitalization rates (6.0%) relative to females (5.1%) (see Figure 13).

Mortality

For analysis of mortality, we computed both case fatality rates and mortality rates. Case fatality rates were computed by dividing the total number of deaths by the total number of cases in each subgroup or region. Mortality rates were calculated by dividing the number of deaths by the total population in each subgroup or region. All mortality data analyzed was acquired from the "COVID-19 Case Demographics and Disease Severity Statewide - Summary Table" within the OHA COVID-19 Dashboard Tableau data dashboard platform. Overall, we observe similar case fatality rates across racial subgroups (see Figure 14). White populations have the highest case fatality rate across any racial or ethnic subgroup, at 1.75% (see Figure 14). Hispanic populations have substantially lower case fatality rates relative to other demographic subgroups, despite having relatively high cumulative incidence. Analyzing fatality across age group, those who are 80 or older have a 20% chance of dying if diagnosed by COVID, a proportion that declines with decreasing age (see Figure 15). Males have a slightly higher case fatality rate relative to females (see Figure 16). When looking at geographic comparisons of mortality across the state of Oregon, we see that rural regions in the state appear to generally have higher case fatality rates relative to more populous regions (see Figure 17). Similarly, overall mortality rates were generally higher in more rural counties in Central and Eastern Oregon, relative to the western part of the state (see Figure 18).

Vaccination

Vaccination data highlighted was primarily acquired from the "Oregon COVID-19 Vaccine Effort Metrics" summary table within the OHA COVID-19 Tableau online data dashboard platform. In our analysis we found substantial disparities in the percentage of population completely vaccinated across racial subgroups (see Figure 19). We see that Black and Hispanic/Latinx populations have the lowest current vaccination rates, while simultaneously having the highest case rates of any racial or ethnic group analyzed (see Figure 19). We also found disparities in the proportion of population fully vaccinated across age group, with older populations having higher vaccination rates, likely attributed to vaccine eligibility regulations (see Figure 20). By gender, females had higher rates of being either partially or completely vaccinated relative to males (see Figure 21). Geographically, vaccination rates also varied widely. We see that areas in the center and northwest portions of the state have higher vaccination rates (both completed and partial vaccination) relative to more rural, eastern counties within the state (see Figure 22).

Discussion

Summary of Results

Our analysis highlights that COVID-19 incidence, hospitalization, and mortality rates are currently subsiding relative to previous peaks in the pandemic. It is clear, however, that we need to continue to focus interventions in priority areas across the state. In particular, we need to address disparities within historically underserved and minoritized populations, support elderly populations, and enhance resources and vaccine outreach in rural communities in Oregon.

In our analysis, we found inequities in incidence within historically marginalized populations including Black, American Indian/Alaska Native, and Hispanic populations relative to White populations. These disparities in cumulative incidence are consistent with previously cited literature.[3] Additionally, our finding that cumulative incidence in Oregon is higher in men relative to women aligns with the findings released in multiple systematic-reviews published in late 2020.[4,7] Rural counties in Oregon generally have higher cumulative incidence and higher test positivity rates over the last two weeks, relative to urbanized, metropolitan counties in the west-central and northwest portions of the state. This observation is consistent with a recent report by the CDC, which shows that as the COVID-19 pandemic has progressed, incidence has become greatest in smaller, rural counties relative to larger metro areas that previously had the highest rates of infection.[8]

Our report highlights inequities in case hospitalization rates across age, race, and gender. We found that older populations have substantially higher hospitalization rates from COVID-19 in Oregon, which aligns with a previously cited meta-analyses conducted by Pijls and others which found that individuals age 70 and older had significantly higher risk of severe COVID-19 infection resulting in hospitalization. The disparities in hospitalization rates by race and ethnicity in Oregon are consistent with systematic reviews drawing from studies conducted in various regions of the United States.[3] In addition, our finding that men have higher case hospitalization rates relative to females is consistent with findings from other scientific reporting on COVID-19.[4] We could not locate geographical hospitalization data from OHA's COVID-19 data dashboards.

Our analysis identified substantial disparities in mortality when stratifying statewide case fatality rate by age group, finding that those who are 60 and older have significantly higher case fatality rates relative to younger age groups of the state population. This is consistent with previously cited literature finding by Pijls and others. We found that there was little difference in case fatality rate, or the proportion of cases that died, when separating groups by race and ethnicity. Mackey and others came to a similar conclusion in their meta-analyses, citing that case fatality rates were likely similar due to a disproportionate diagnosis of COVID-19 in White populations due to access to care.[3] The higher case fatality rate amongst males versus females in Oregon is supported in recent literature, as well.[4] Our analysis showed that wide inequities exist in COVID-19 mortality across geographic region, with higher case fatality rates and mortality rates observed in rural counties.

The stark disparities in vaccination rates between urban and rural counties are consistent with recently published survey literature, which reported that place of residence and rural dwelling status was correlated with vaccine uptake, and vaccine hesitancy.[9] As noted in our results, vaccination rates are

highly variable across racial and ethnic subgroup in Oregon, a trend that is supported by a study following the H1N1 pandemic.[10] A systematic review by Ayers and others found evidence of lower vaccination rates in Black and Latinx communities.[10] Interestingly, this review reported that Black and Latinx communities had the same levels of intention to become vaccinated as White populations. The lower likelihood of vaccination in males relative to females in Oregon is also concerning, considering the higher case fatality rates and hospitalization rates observed within male populations.

Several limitations involving data quality should be considered within our report. For incidence, hospitalization, and mortality data stratified by racial and ethnic subgroup, the categorization of "other" was excluded from our analysis. As OHA mentioned within their dashboard footnotes, many folks who identify as Hispanic/Latinx will describe their race as such, and subsequently get placed in the "other" category. A large proportion of patients listed as "other" are Hispanic/Latinx, yet this limits our interpretation as we were unable to pull out the additional portion of the "other" group, which in total makes up over 20% of all COVID-19 cases in Oregon. Additionally, OHA notes that all COVID-19 data is provisional and subject to change. Incidence, hospitalizations, deaths, and vaccination data may be continually modified, which can impact the accuracy of analysis, especially for data reported in the last several weeks. For this reason, it is important to note that this data will contain some reporting errors and an incomplete picture of current counts, despite giving us a sound estimate of the current state in Oregon. Perhaps the biggest limitation is that county-level vaccination data has not been updated since May 10th. This adds a lag-time of nearly a week to our vaccination rate estimates, and likely limits our ability to fully address current inequities in vaccination rates.

Key Reccomendations for Addressing COVID-19 Moving Forward

We provide Governor Brown with two primary approaches to addressing COVID-19 in Oregon stemming from our analysis. Our first recommended approach is to remain in a proactive, County Risk Level framework in order to respond to localized outbreaks, and limit potential opportunities for mass-spreading events. Before we reach the current goal of attaining 70% vaccination amongst eligible individuals, maintaining a mask-mandate in indoor public settings and enforcing social distancing measures will protect historically marginalized communities in Oregon. Our second recommended approach to addressing COVID-19 in Oregon is to enhance vaccine outreach in historically underserved communities in a culturally-responsive manner. As the current data shows, Black, Hispanic/Latinx, and Indigenous communities currently have lower rates of COVID-19 vaccination in our state. As this report's data and previously cited literature show, these historically marginalized communities are more likely to be infected with COVID-19, more likely to become hospitalized, and more likely to die from infection. Past systematic-review literature shows that Black, Latino, and low-SES populations were less likely to be vaccinated during the H1N1 pandemic. Interestingly, these populations had as high or greater intention of being vaccinated.[10] This paradox highlights the systemic barriers that historically marginalized racial and ethnic groups experience when trying to access medical care, or when seeking access to vaccination. It is critically important for Oregon to continue to adopt and improve upon culturally-relevant and responsive messaging in order to distribute vaccination. Moreover, OHA and the state of Oregon should prioritize establishing trusted messengers within minoritized communities, elderly populations, and rural communities in order to provide accurate vaccination information that comes from a community voice.

Tables and Figures

Figures Displaying Overall Trends in COVID-19 in Oregon

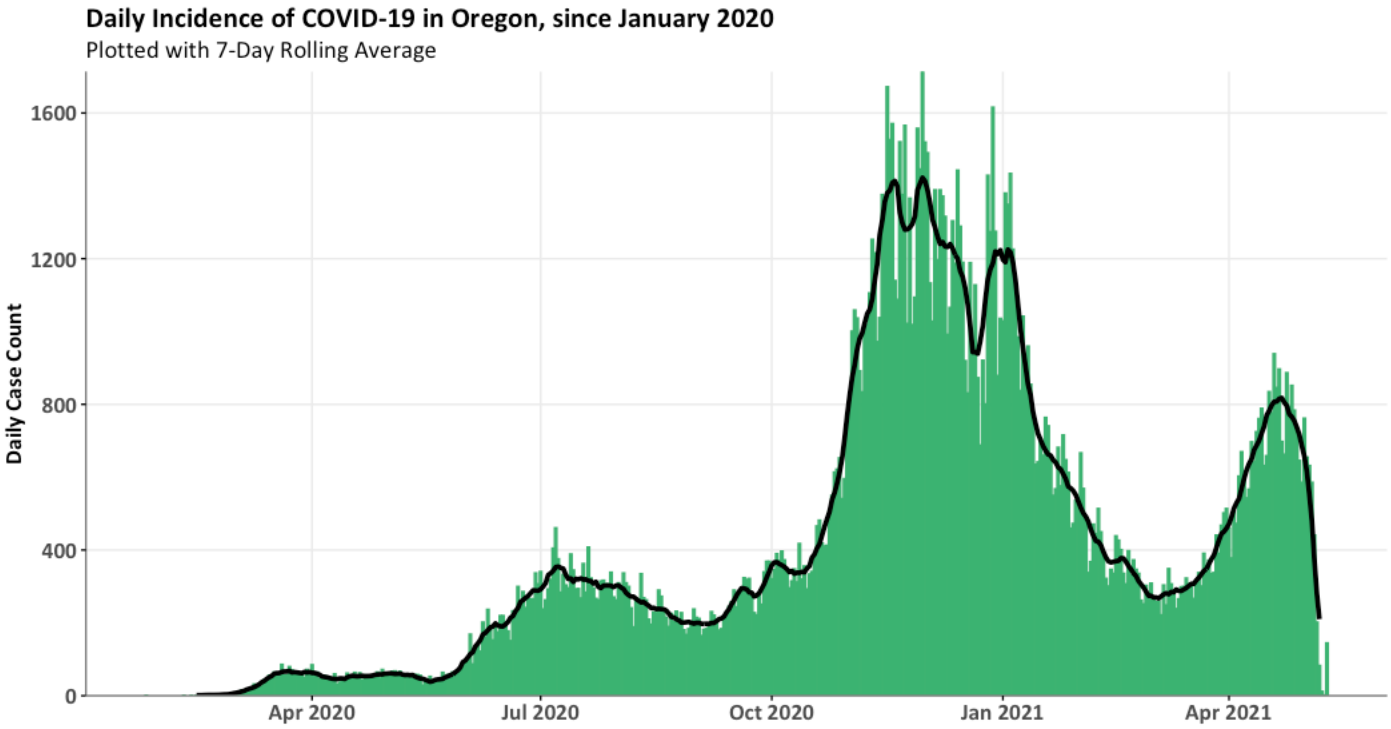

Figure 1: Number of COVID-19 cases reported daily in Oregon from January 2020 through May 2021. The solid black line represents the 7-day rolling average of new cases, which is computed based off of the average amount of new cases reported during the day of, the 3 days prior to, and the 3 days following each individual day included on the graphic. As per OHA, cases are counted from the onset date of symptoms. For asymptomatic cases, the onset date was reported to be 2 days prior to the positive test. All data was acquired from "Oregon's Epi Curve Summary Table" within the OHA COVID-19 Dashboard platform.

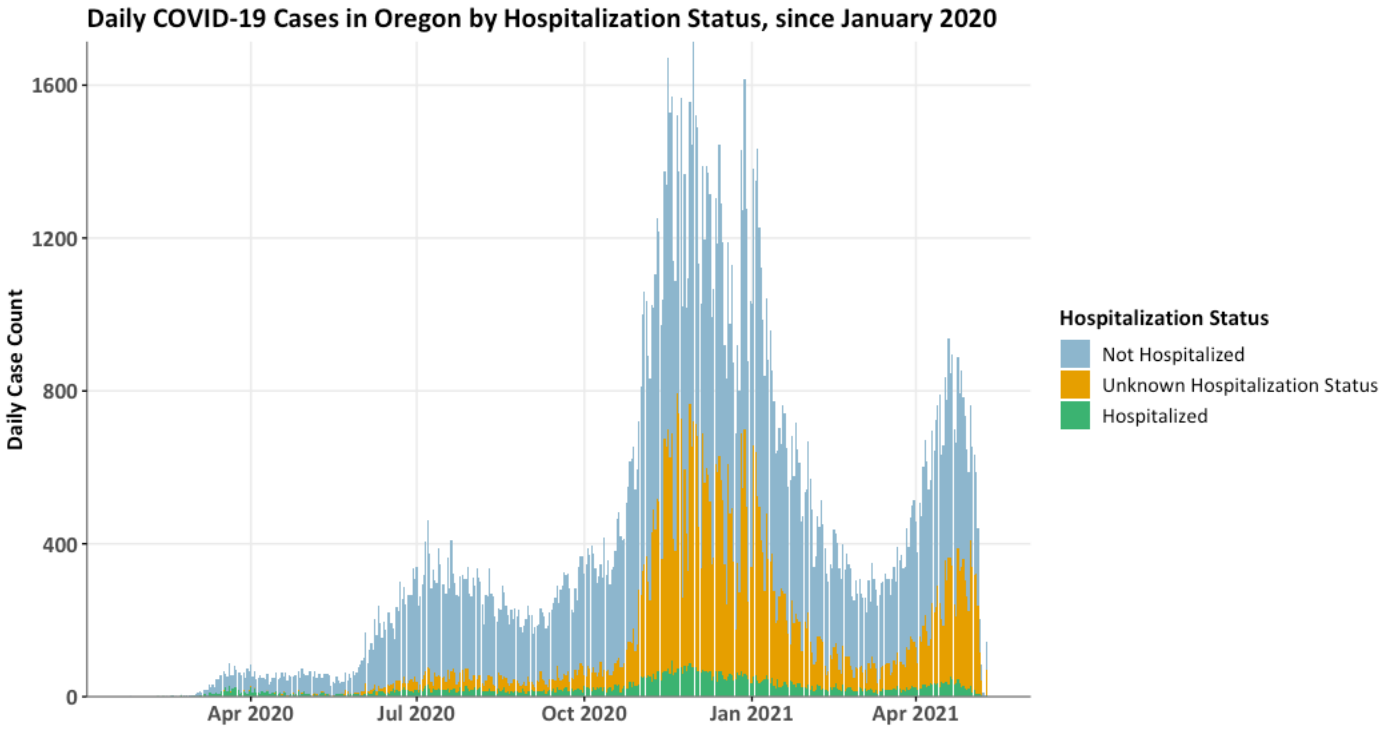

Figure 2: Number of COVID-19 cases reported in Oregon daily, by hospitalization status, from January 2020 through May 2021. Each color encodes whether the case was hospitalized, not hospitalized, or if the hospitalization status was unknown for that given case when submitted via Electronic Records Report (ELR). All data was acquired from "Oregon's Epi Curve Summary Table" within the OHA COVID-19 Dashboard platform.

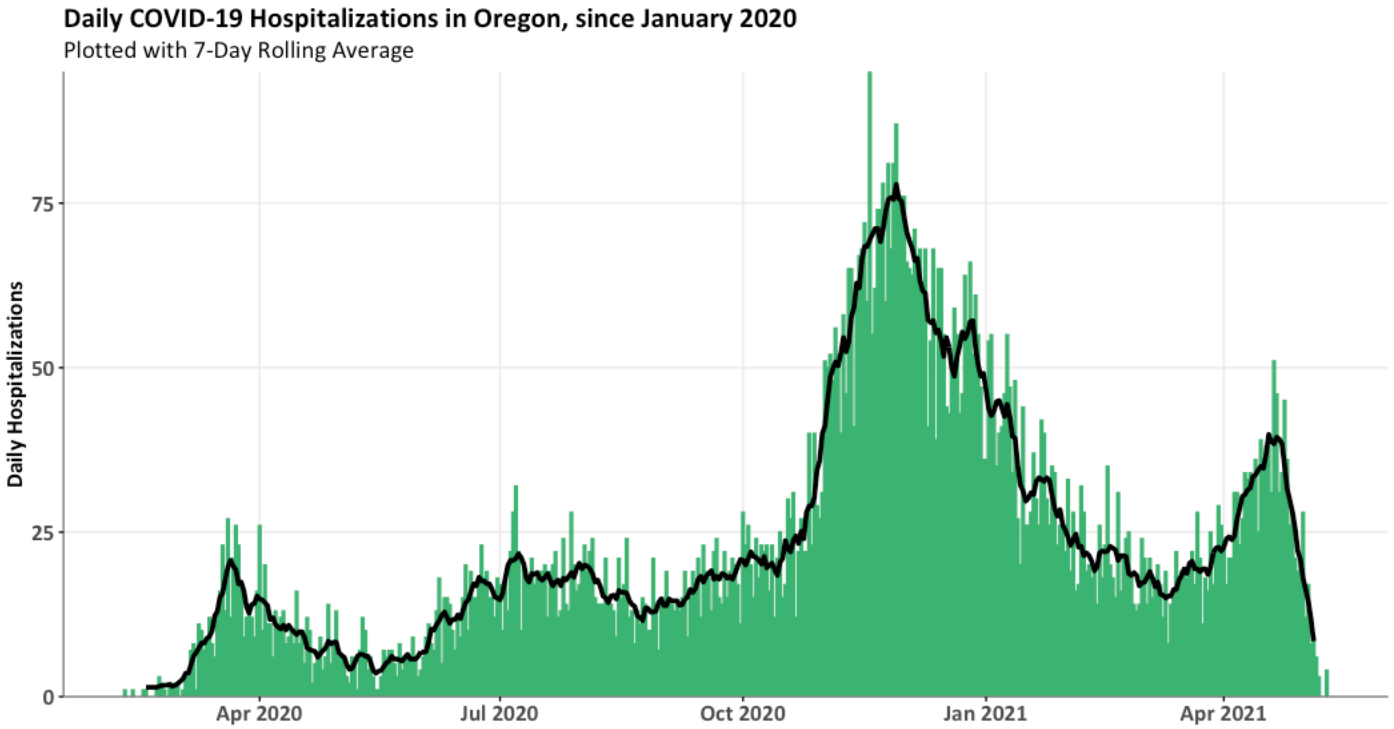

Figure 3: Daily hospitalizations from COVID-19 in Oregon from January 2020 through May 2021. The solid black line represents the 7-day rolling average of new hospitalization, which is computed based off of the average amount of new cases reported during the day of, the 3 days prior to, and the 3 days following each individual day included on the graphic. All data was acquired from "Oregon's Epi Curve Summary Table" within the OHA COVID-19 Dashboard platform.

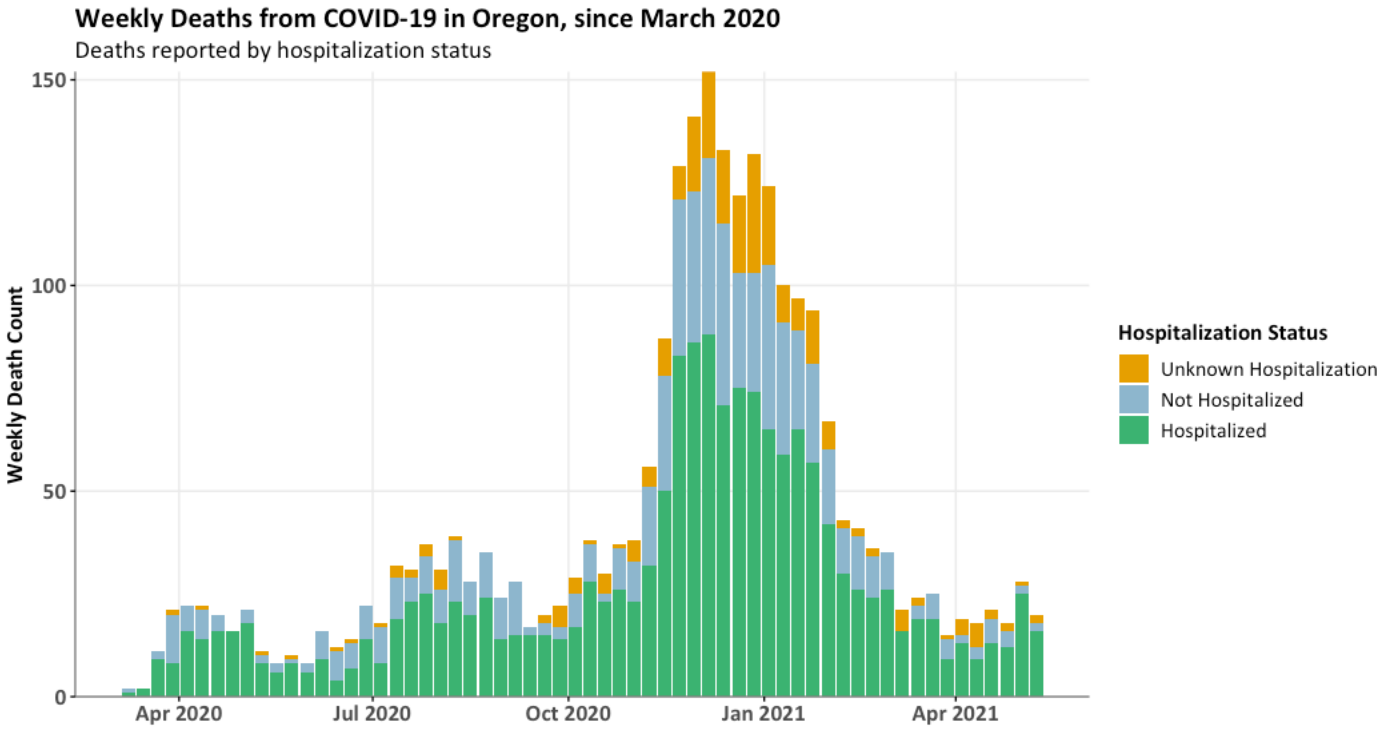

Figure 4: Weekly deaths from COVID-19 in Oregon, by hospitalization status, from March 2020 through May 2021. The data for the final 3 weeks on this graphic (April 18th through May 9th) may include an incomplete tally of deaths, according to OHA. All data was acquired from the "COVID-19 Case Demographics and Disease Severity Statewide - Summary Table" within the OHA COVID-19 Dashboard platform.

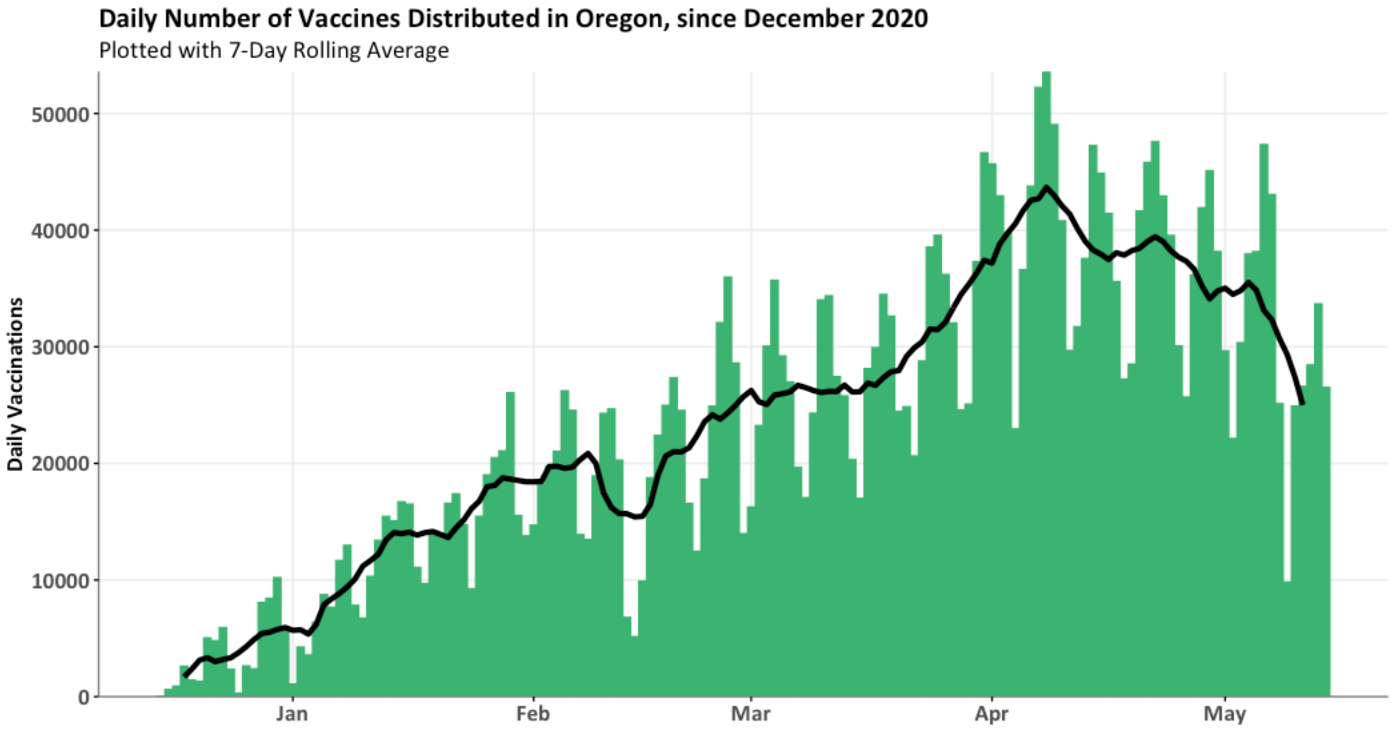

Figure 5: Daily number of COVID-19 vaccines distributed in Oregon, from December 2020 through May 2021. This graphic visualizes vaccinations that are reported through Oregon's ALERT IIS. The data within the final week of this graphic (week of May 9th) may include an incomplete tally of total vaccinations, according to OHA.

Figures Displaying Inequities in COVID-19 Infection, Hospitalization, Mortality and Vaccination

Incidence Figures

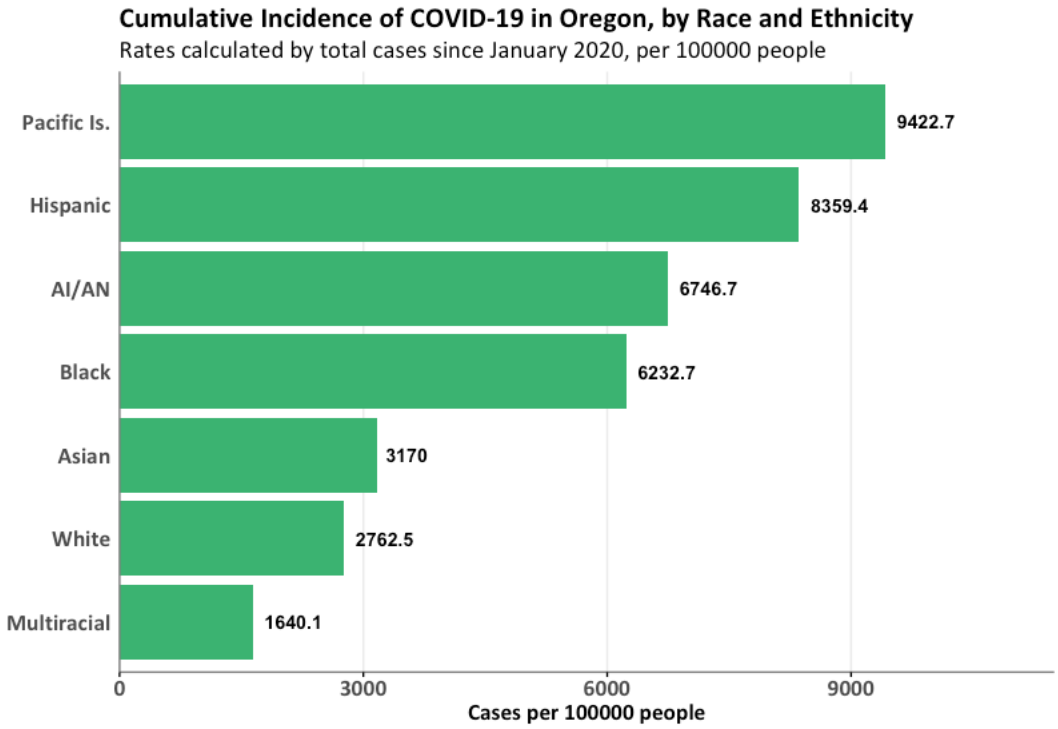

Figure 6: Cumulative incidence of COVID-19 amongst racial and ethnic subgroups in Oregon, from January 2020 through May 2021. Incidence is calculated by dividing the total number of cases reported in each racial and ethnic subgroup since January 2020 by the number of total people in each age category in the state. The subgroups of "Other" and "Non-Hispanic" were excluded from the graphic, as these groups overlapped in population with other subgroups, causing redundancy and inflation of incidence estimates. All data was acquired from the "COVID-19 Case Demographics and Disease Severity Statewide - Summary Table" within the OHA COVID-19 Dashboard platform.

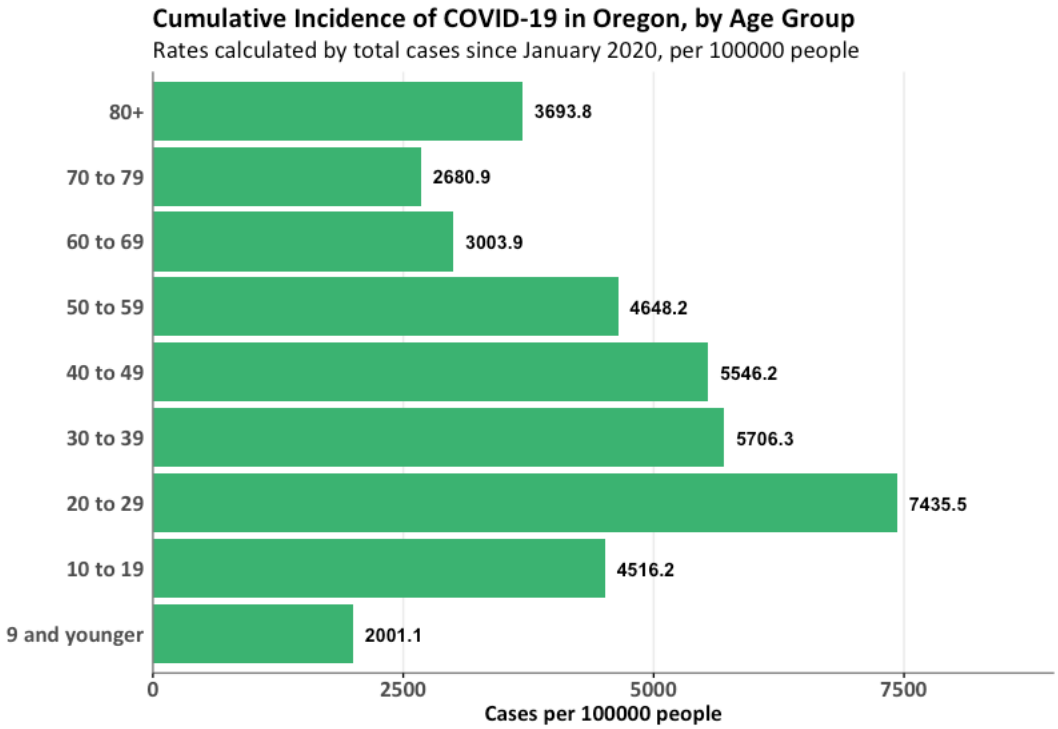

Figure 7: Cumulative incidence of COVID-19 by age group in Oregon, from January 2020 through May 2021. Incidence is calculated by dividing the total number of cases reported in each age group since January 2020 by the number of total people in each age category in the state. All data was acquired from the "COVID-19 Case Demographics and Disease Severity Statewide - Summary Table" within the OHA COVID-19 Dashboard platform.

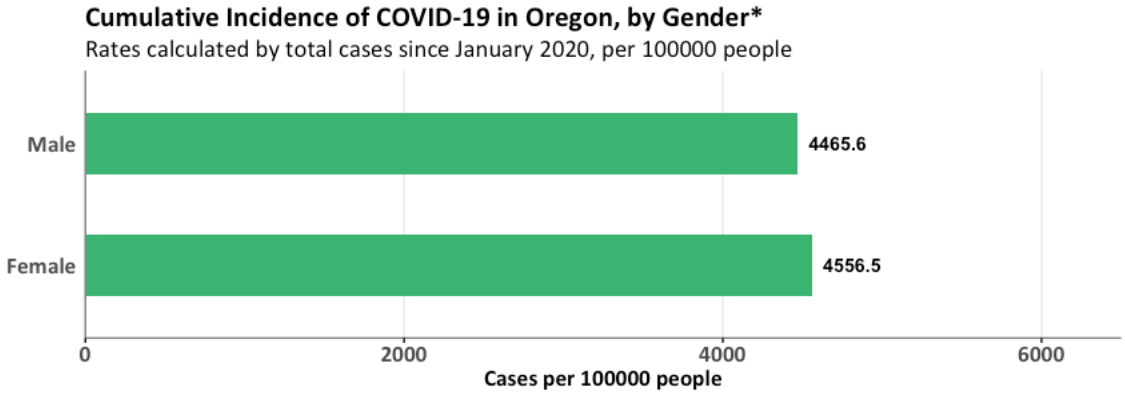

Figure 8: Cumulative incidence of COVID-19 by gender in Oregon, from January 2020 through May 2021. Incidence is calculated by dividing the total number of cases reported in each gender since January 2020 by the number of total population identifying as each gender in the state. All data was acquired from the "COVID-19 Case Demographics and Disease Severity Statewide - Summary Table" within the OHA COVID-19 Dashboard platform.

*No data was available for individuals who identified as non-binary.

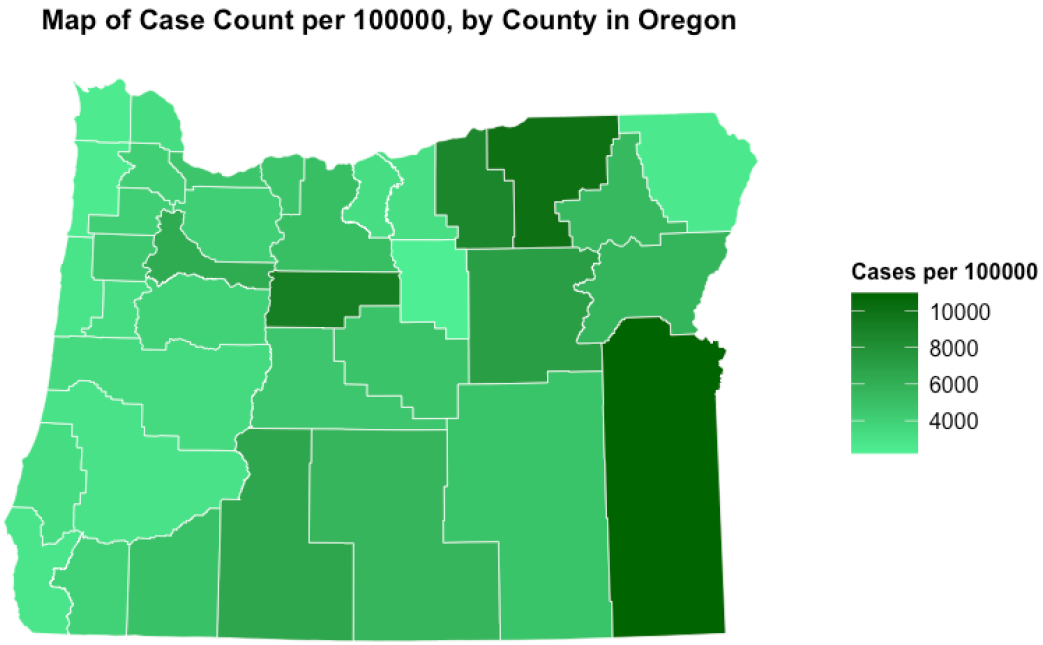

Figure 9: Cumulative incidence of COVID-19 across Oregon counties, measured from January 2020 through May 2021. The darker green color encodes higher case rates per 100000 population, whereas lighter shades represent lower cumulative incidence of COVID-19. All data was acquired from the "Oregon COVID-19 Testing and Outcomes by County" summary table within the OHA COVID-19 Dashboard platform.

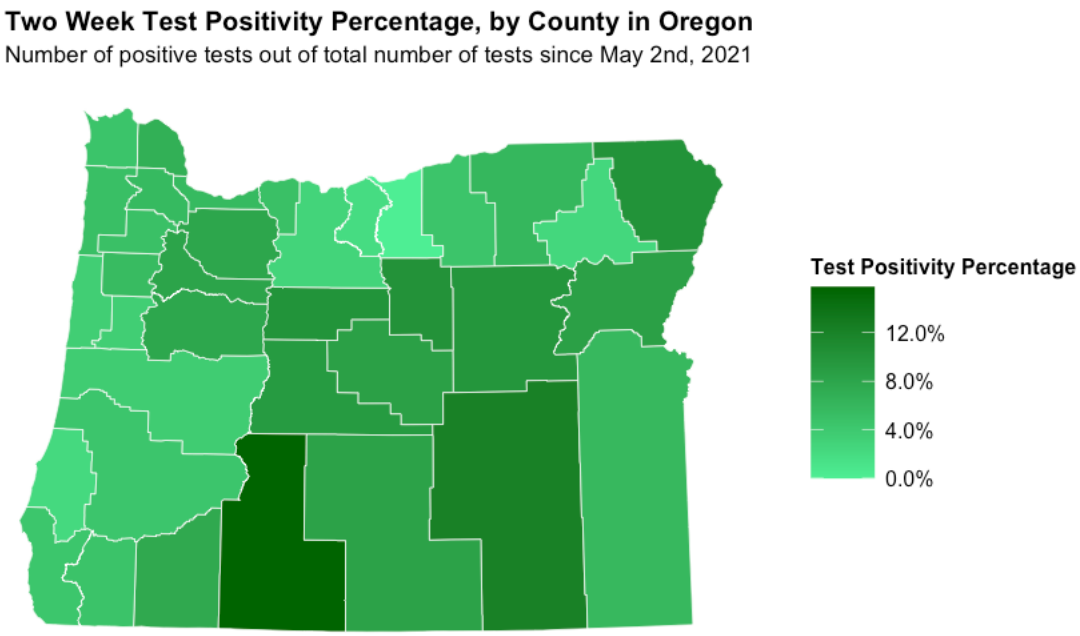

Figure 10: Two-week COVID-19 test positivity rates across Oregon counties, measured since May 2nd, 2021. Test positivity rates are computed by dividing the number of positive tests by the total amount of tests administered in the past 2 weeks. The darker green color shade encodes higher test positivity rates, whereas lighter shades represent lower test positivity rates. All data was acquired from the "Oregon COVID-19 Testing and Outcomes by County" summary table within the OHA COVID-19 Dashboard platform, which draws from electronic laboratory reports (ELRs) or other electronic test reports.

Hospitalization Figures

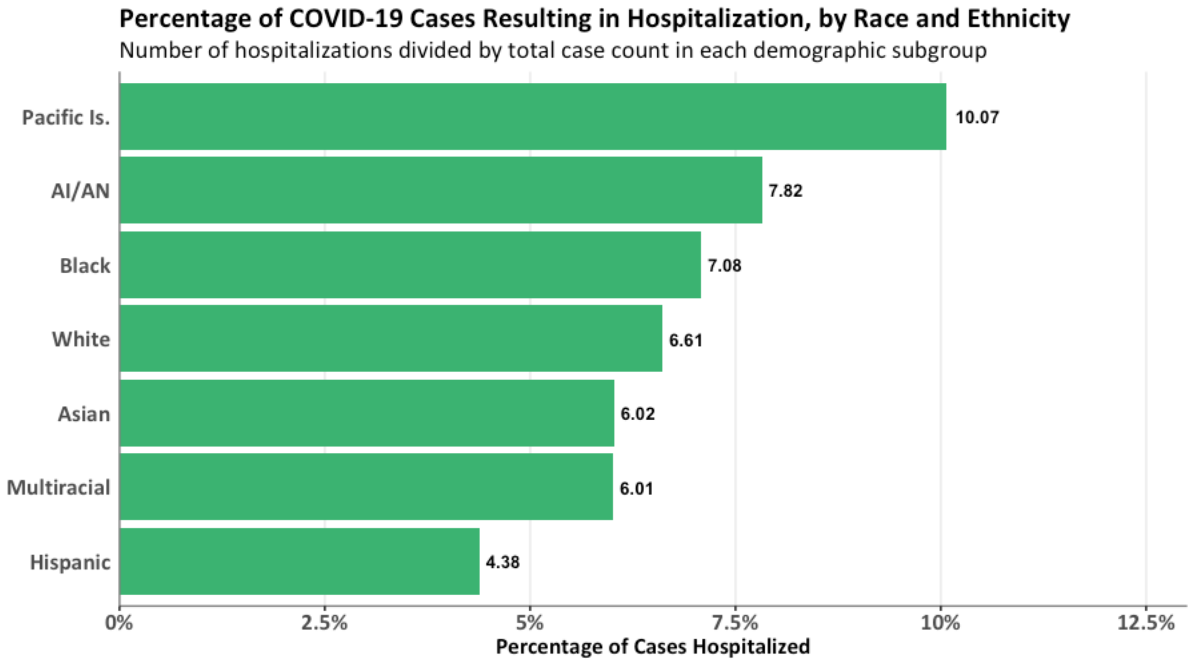

Figure 11: COVID-19 case hospitalization rate (percentage of cases hospitalized) by racial and ethnic subgroups in Oregon, from January 2020 through May 2021. Case hospitalization rate is calculated by dividing the total number of hospitalized cases by the total number of cases reported in each racial and ethnic subgroup in the state. The subgroups of "Refused/Unknown" and "Non-Hispanic" were excluded from the graphic, as these groups overlapped in population with other subgroups, causing redundancy and inflation of rate estimates. All data was acquired from the "COVID-19 Case Demographics and Disease Severity Statewide - Summary Table" within the OHA COVID-19 Tableau Dashboard platform.

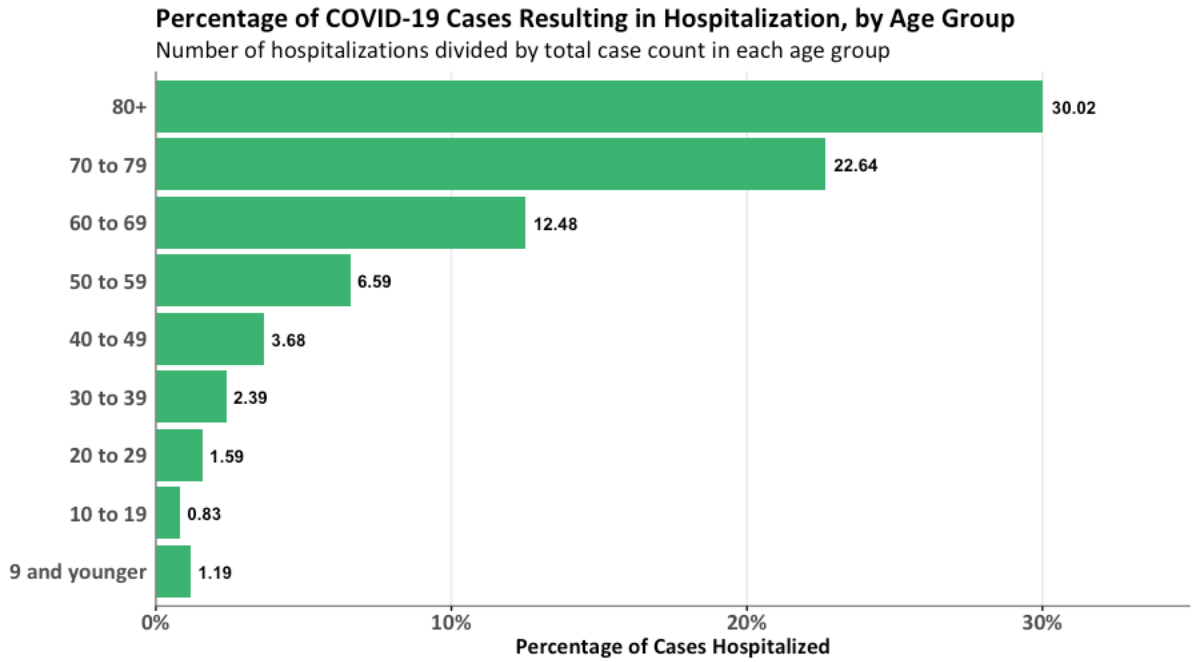

Figure 12: COVID-19 case hospitalization rate (percentage of cases hospitalized) by age group in Oregon, from January 2020 through May 2021. Case hospitalization rate is calculated by dividing the total number of hospitalized cases by the total number of cases reported in each age group in the state. All data was acquired from the "COVID-19 Case Demographics and Disease Severity Statewide - Summary Table" within the OHA COVID-19 Dashboard platform.

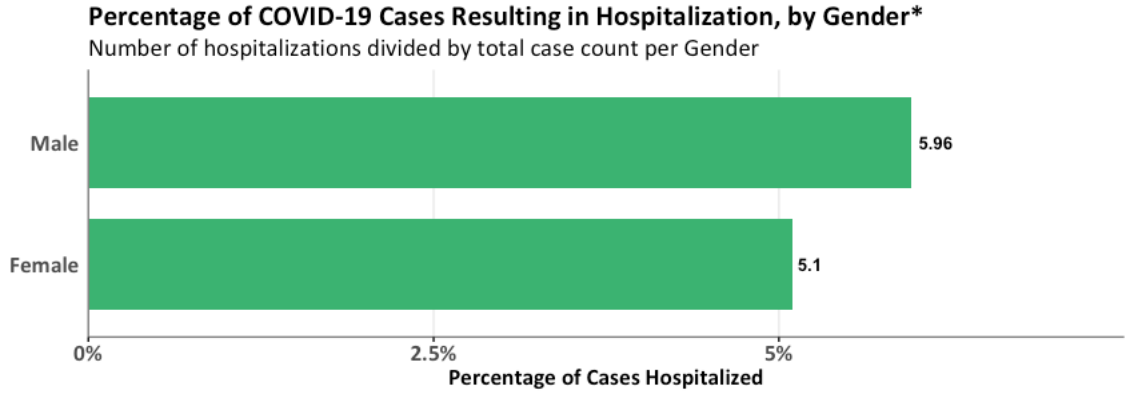

Figure 13: COVID-19 case hospitalization rate (percentage of cases hospitalized) by gender in Oregon, from January 2020 through May 2021. Case hospitalization rate is calculated by dividing the total number of hospitalized cases by the total number of cases reported in each age group in the state. All data was acquired from the "COVID-19 Case Demographics and Disease Severity Statewide - Summary Table" within the OHA COVID-19 Dashboard platform.
*Data was incomplete for individuals who identified as non-binary, and cases entered as refused/unknown were excluded from analysis.

Mortality Figures

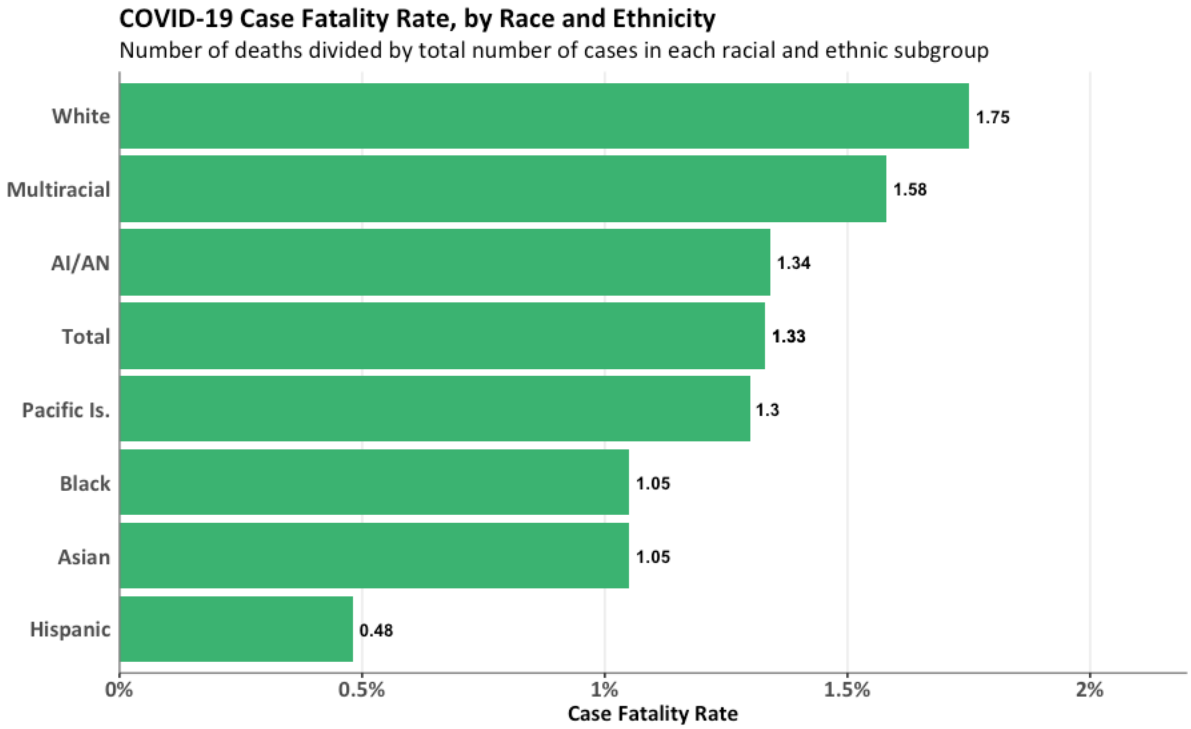

Figure 14: COVID-19 case fatality rate by racial and ethnic subgroup in Oregon, from January 2020 through May 2021. Case fatality rate is calculated by dividing the total number of deaths by the total number of cases reported in each racial and ethnic group in the state. The subgroups of "Refused/Unknown", "Other, and "Non-Hispanic" were excluded from the graphic, as these groups overlapped in population with other subgroups, causing redundancy and inflation of rate estimates. All data was acquired from the "COVID-19 Case Demographics and Disease Severity Statewide - Summary Table" within the OHA COVID-19 Dashboard platform.

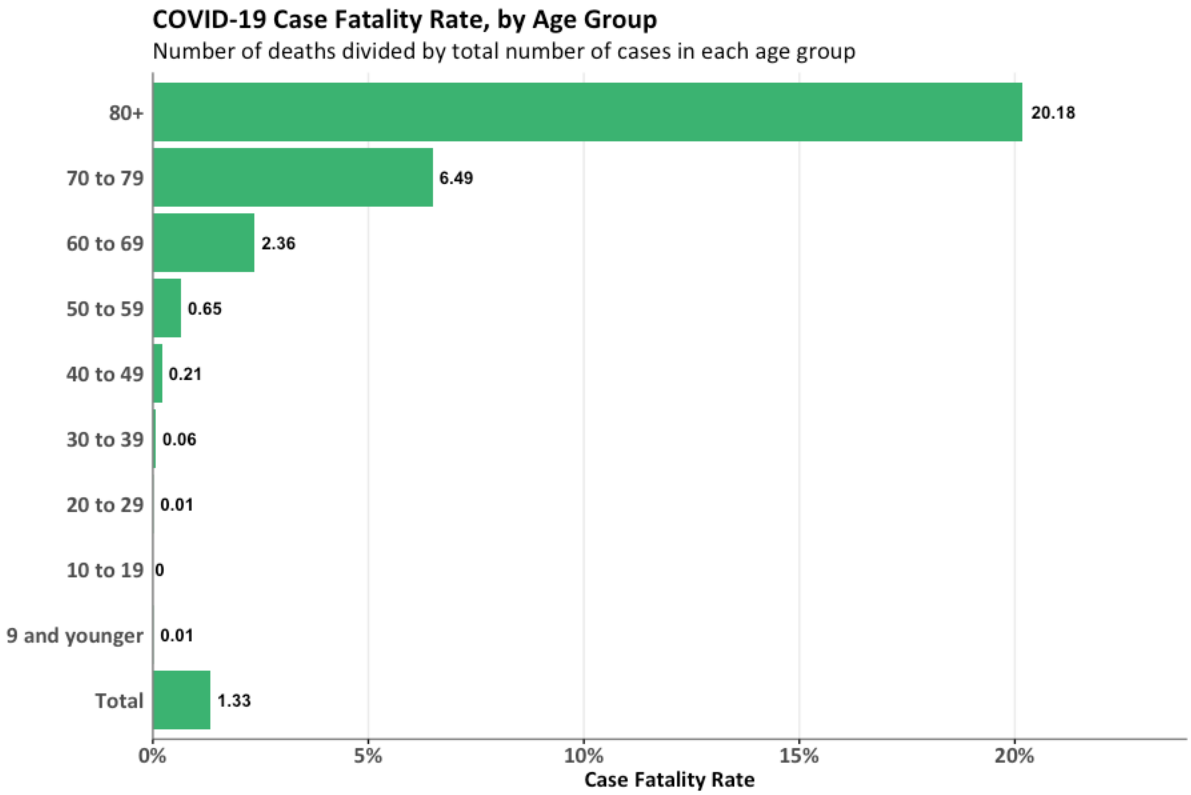

Figure 15: COVID-19 case fatality rate by age group in Oregon, from January 2020 through May 2021. Case fatality rate is calculated by dividing the total number of deaths by the total number of cases reported in each age group in the state. All data was acquired from the "COVID-19 Case Demographics and Disease Severity Statewide - Summary Table" within the OHA COVID-19 Dashboard platform.

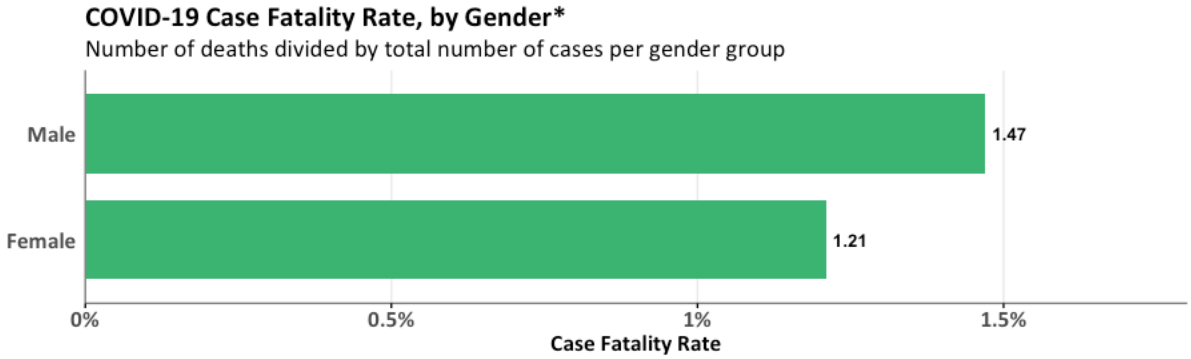

Figure 16: COVID-19 case fatality rate by gender in Oregon, from January 2020 through May 2021. Case fatality rate is calculated by dividing the total number of deaths by the total number of cases reported in each gender in the state. All data was acquired from the "COVID-19 Case Demographics and Disease Severity Statewide - Summary Table" within the OHA COVID-19 Dashboard platform.
*Data was incomplete for individuals who identified as non-binary, and cases entered as refused/unknown were excluded from analysis.

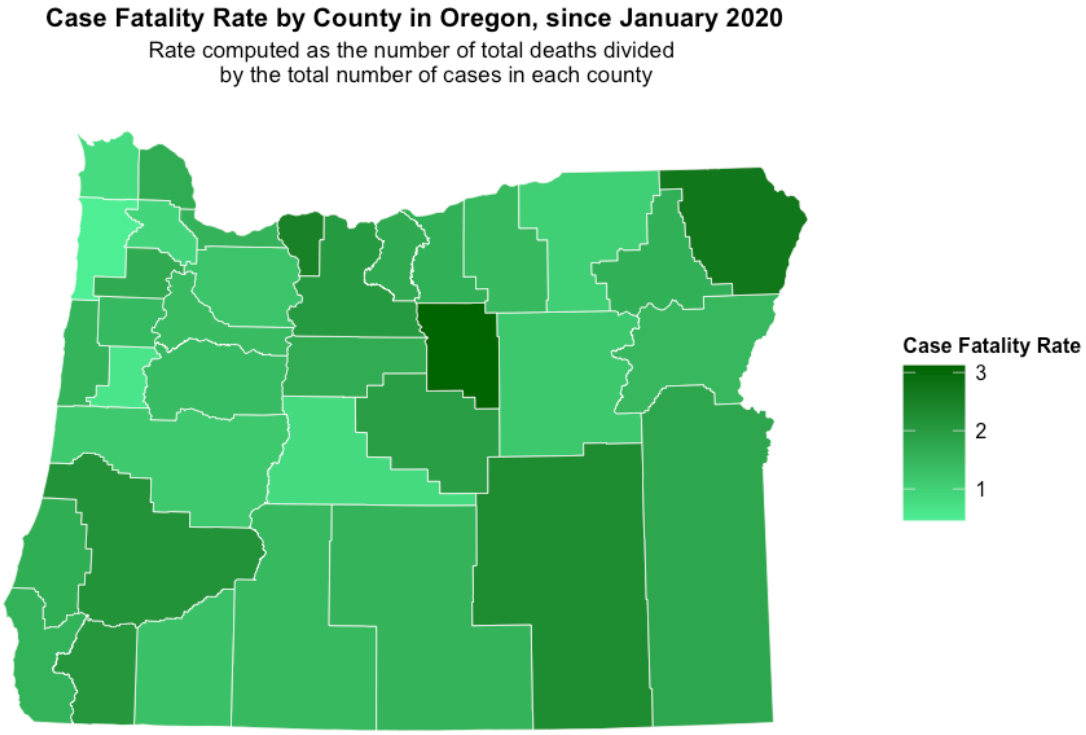

Figure 17: COVID-19 case fatality rates (CFR) across Oregon counties, measured from January 2020 through May 2021. Case fatality rate is calculated by dividing the total number of deaths by the total number of cases reported in each county within the state. The darker green color encodes higher case fatality rates, whereas lighter shades represent lower mortality rates. All data was acquired from the "Oregon COVID-19 Testing and Outcomes by County" summary table within the OHA COVID-19 Dashboard platform.

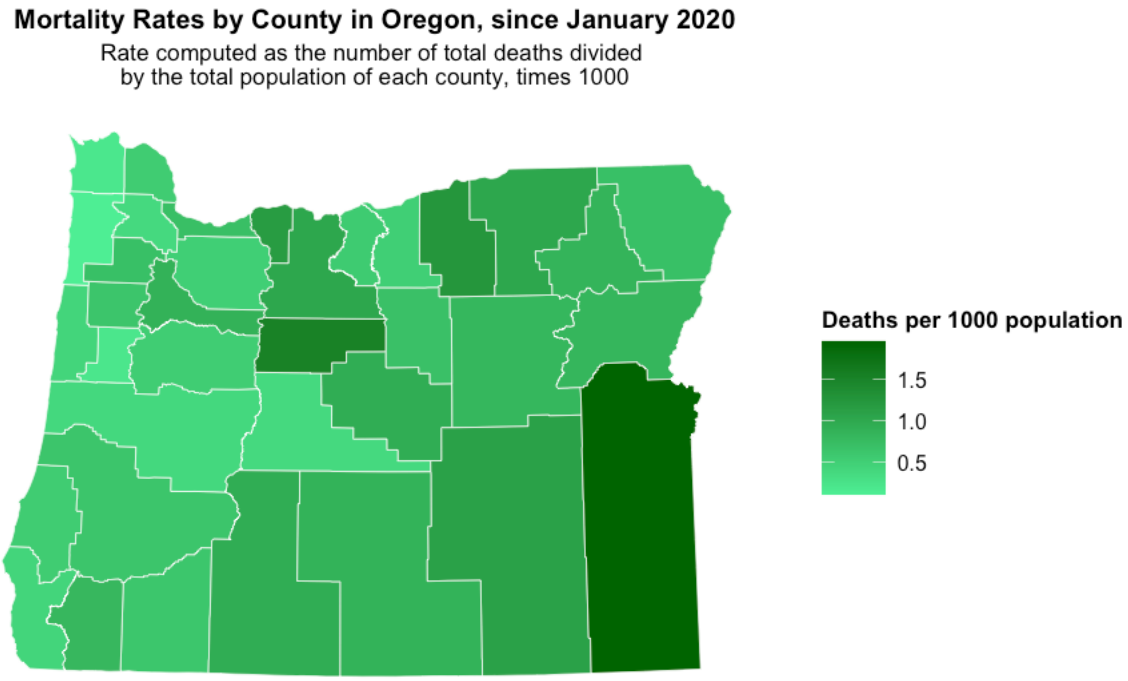

Figure 18: Mortality rates from COVID-19 across Oregon Counties, measured from January 2020 through May 2021. Mortality rates were computed by dividing the total number of deaths in each county by the population of each county, which was gathered from the 2020 Annual Population Report from Portland State University's Population Research Center. The darker green color encodes higher mortality rates per 1000 population, whereas lighter shades represent lower mortality rates. All data was acquired from the "Oregon COVID-19 Testing and Outcomes by County" summary table within the OHA COVID-19 Dashboard platform.

Vaccination Figures

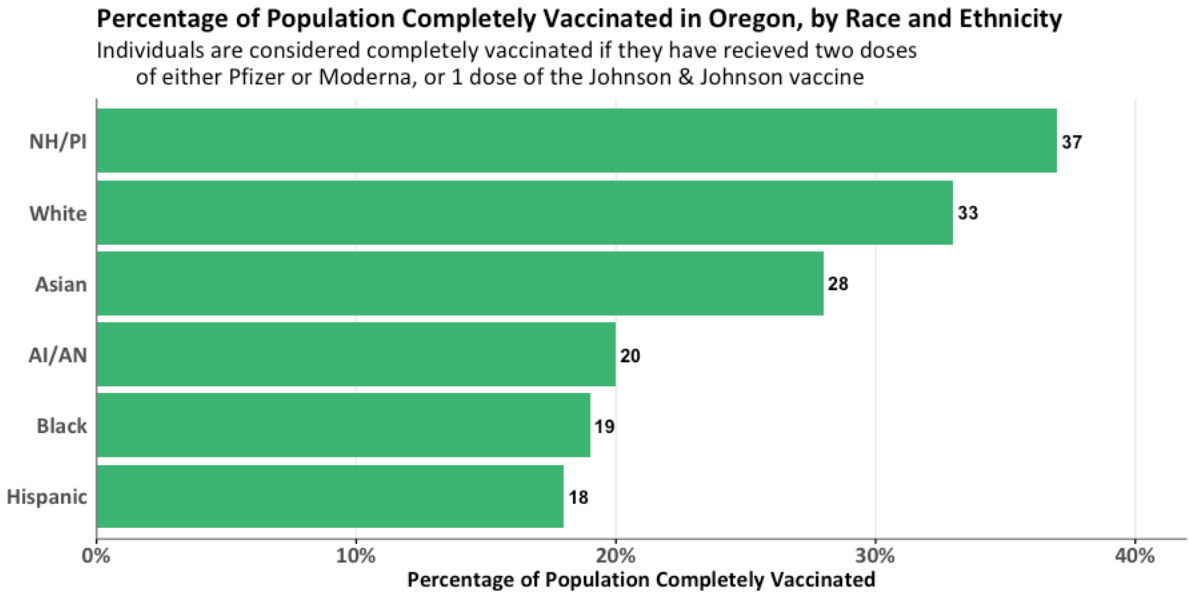

Figure 19: Percentage of population completely vaccinated against COVID-19, sorted by racial and ethnic subgroups in Oregon, measured from December 2020 through May 2021. This graphic depicts the proportion of people having received their full course of vaccination against COVID-19, divided by the total population in each racial and ethnic subgroup in the state. All data was acquired from the "Oregon COVID-19 Vaccine Effort Metrics" summary table within the OHA COVID-19 Tableau Dashboard platform.

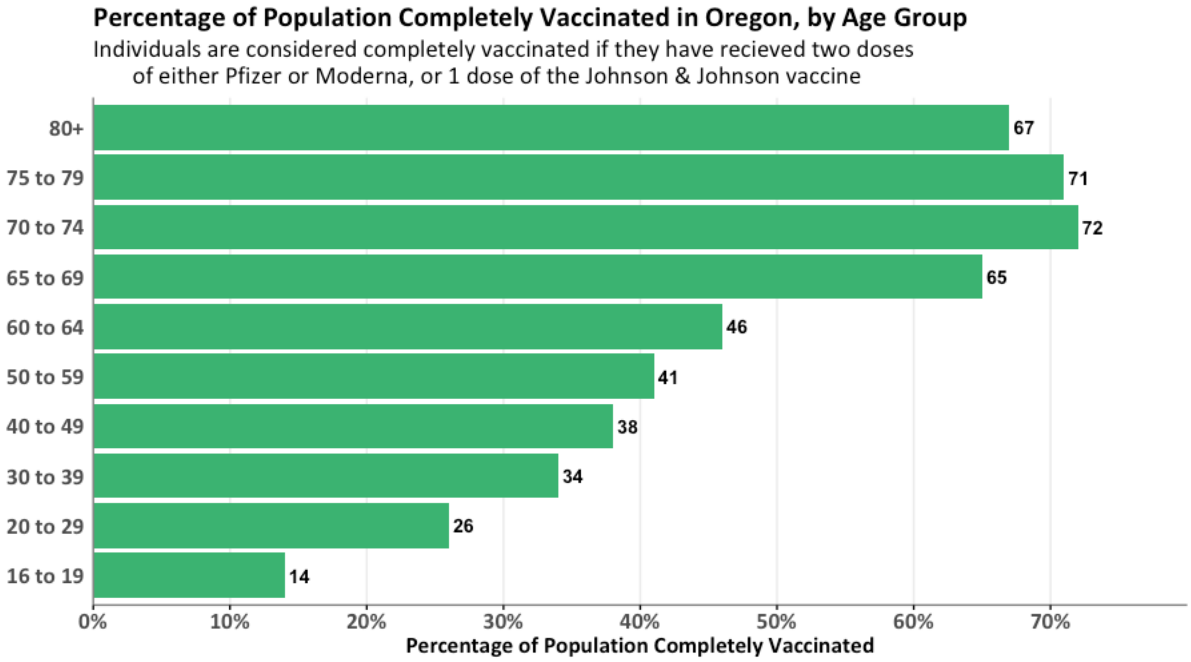

Figure 20: Percentage of population completely vaccinated against COVID-19, sorted by age group in Oregon, measured from December 2020 through May 2021. This graphic depicts the proportion of people having received their full course of vaccination against COVID-19, divided by the total population in each age group in the state. All data was acquired from the "Oregon COVID-19 Vaccine Effort Metrics" summary table within the OHA COVID-19 Tableau Dashboard platform.

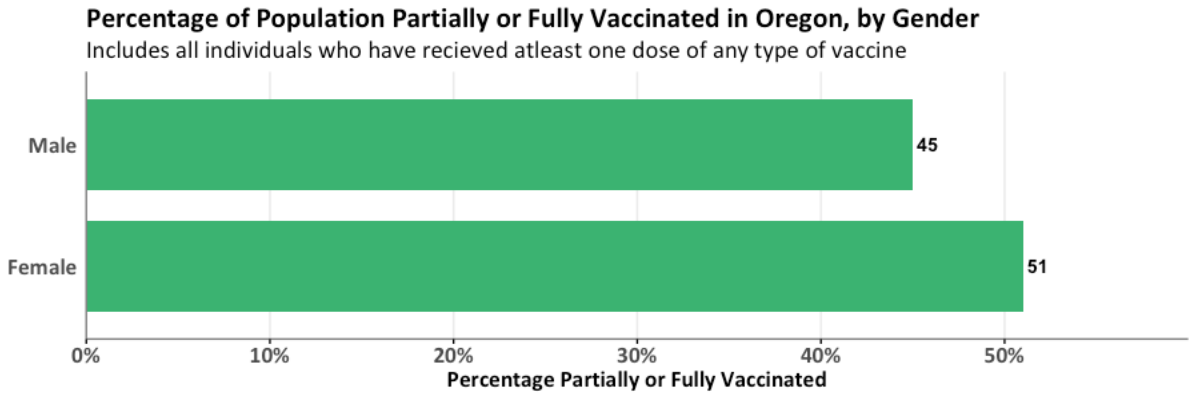

Figure 21: Percentage of population partially or fully vaccinated against COVID-19, sorted by gender in Oregon, measured from December 2020 through May 15th, 2021. This graphic displays the proportion of people having received at least one dose of a COVID-19 vaccine as reported to the Oregon ALERT Immunization Information System (IIS), divided by the total population of each gender. The data was acquired from the "Oregon COVID-19 Vaccination Administration Trends Summary" table within the OHA COVID-19 Tableau Dashboard platform, where it was sources from ALERT IIS. Population estimates for each gender come from the PSU Population Research Center.

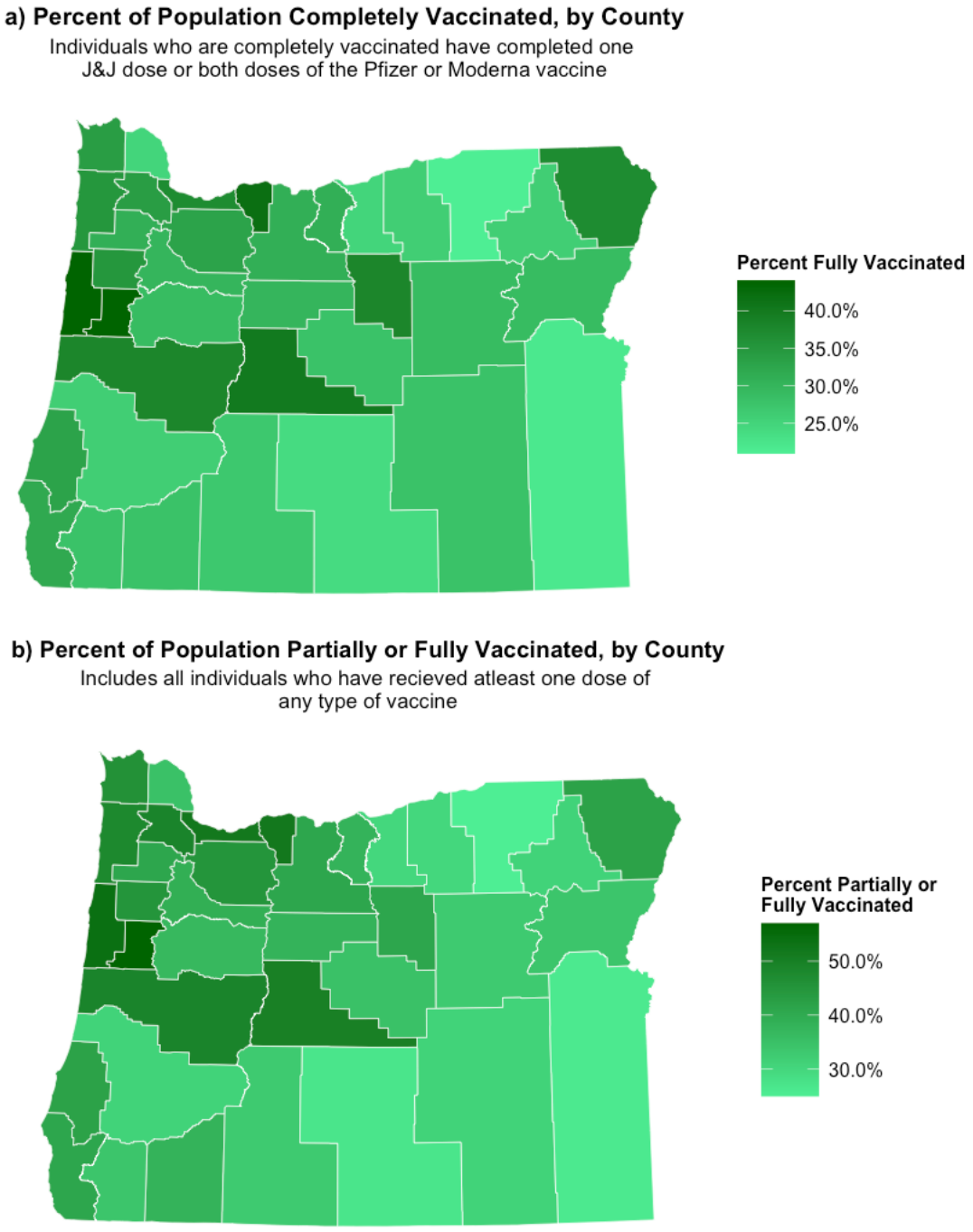

Figure 22: Percentage of population partially or fully vaccinated against COVID-19 across Oregon counties, measured from December 2020 through May 2021. A) Depicts the proportion of people in each county having received their full course of vaccination against COVID-19, divided by the total population in each county. B) Depicts the proportion of people in each county who have received at least 1 dose of any vaccine, divided by the total population in each county. The population of each county was gathered from the 2020 Annual Population Report from Portland State University's Population Research Center. The darker green color encodes higher proportion of population vaccination, whereas lighter shades represent lower proportion of county population vaccinated. All

data was acquired from the “Oregon COVID-19 Vaccine Effort Metrics” summary table within the OHA COVID-19 Tableau Dashboard platform.

References

Oregon Health Authority (2021). Oregon COVID-19 Case Demographics and Disease Severity Statewide [Accessed Virtually by Dashboard]. Location: Oregon Health Authority.

1. CDC. COVID Data Tracker. Centers for Disease Control and Prevention. Published March 28, 2020. Accessed May 15, 2021. https://covid.cdc.gov/covid-data-tracker

2. WHO Coronavirus (COVID-19) Dashboard. Accessed May 11, 2021. https://covid19.who.int

3. Mackey K, Ayers CK, Kondo KK, et al. Racial and Ethnic Disparities in COVID-19–Related Infections, Hospitalizations, and Deaths. *Ann Intern Med*. 2020;174(3):362-373. doi:10.7326/M20-6306

4. Pijls BG, Jolani S, Atherley A, et al. Demographic risk factors for COVID-19 infection, severity, ICU admission and death: a meta-analysis of 59 studies. *BMJ Open*. 2021;11(1). doi:10.1136/bmjopen-2020-044640

5. Li J, Huang DQ, Zou B, et al. Epidemiology of COVID-19: A systematic review and meta-analysis of clinical characteristics, risk factors, and outcomes. *Journal of Medical Virology*. 2021;93(3):1449-1458. doi:https://doi.org/10.1002/jmv.26424

6. Chu DK, Akl EA, Duda S, et al. Physical distancing, face masks, and eye protection to prevent person-to-person transmission of SARS-CoV-2 and COVID-19: a systematic review and meta-analysis. *The Lancet*. 2020;395(10242):1973-1987. doi:10.1016/S0140-6736(20)31142-9

7. Abate BB, Kassie AM, Kassaw MW, Aragie TG, Masresha SA. Sex difference in coronavirus disease (COVID-19): a systematic review and meta-analysis. *BMJ Open*. 2020;10(10). doi:10.1136/bmjopen-2020-040129

8. CDCMMWR. COVID-19 Stats: COVID-19 Incidence, by Urban-Rural Classification — United States, January 22–October 31, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69. doi:10.15585/mmwr.mm6946a6

9. Khubchandani J, Sharma S, Price JH, Wiblishauser MJ, Sharma M, Webb FJ. COVID-19 Vaccination Hesitancy in the United States: A Rapid National Assessment. *J Community Health*. Published online January 3, 2021:1-8. doi:10.1007/s10900-020-00958-x

10. Ayers CK, Kondo KK, Williams BE, et al. Disparities in H1N1 Vaccination Rates: a Systematic Review and Evidence Synthesis to Inform COVID-19 Vaccination Efforts. *J Gen Intern Med*. Published online March 31, 2021:1-12. doi:10.1007/s11606-021-06715-7