

# Covid-19 Disease Outbreak Outlook

## Arizona State and Pima County

Updated April 23, 2021

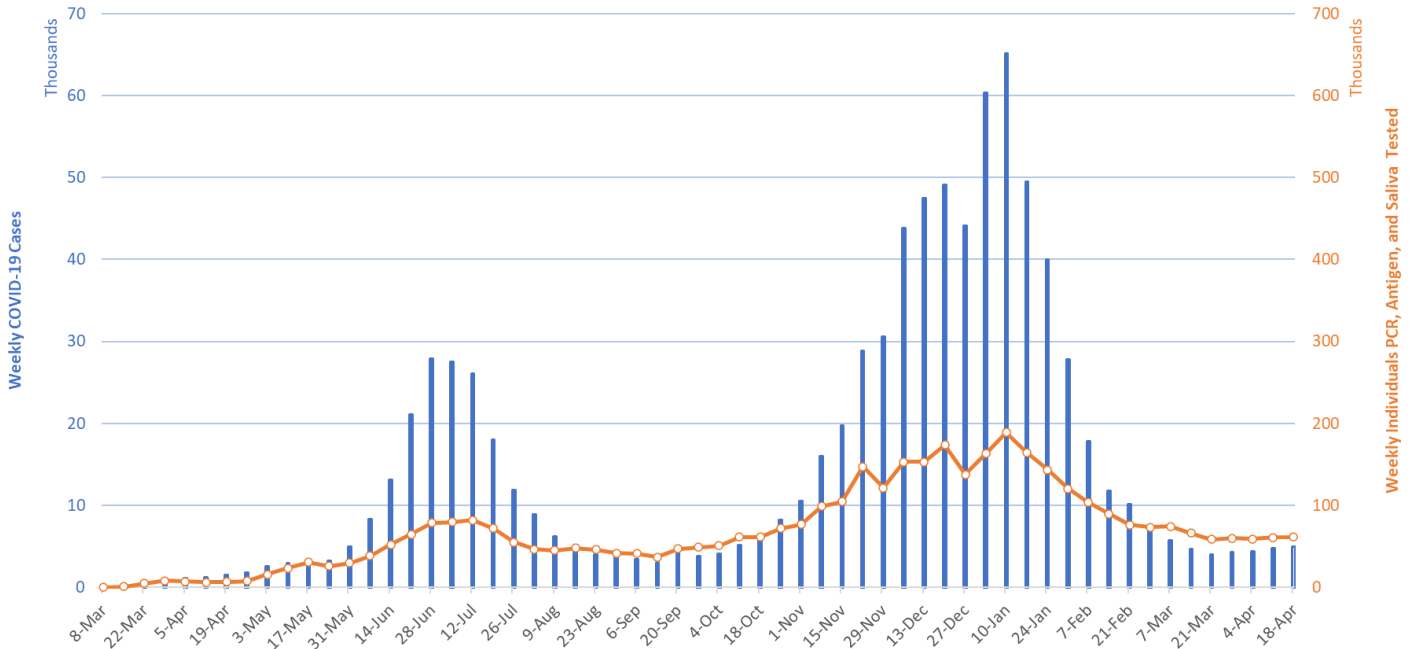
Disclaimer: This information represents my personal views and not those of The University of Arizona, the Zuckerman College of Public Health, or any other government entity. Any opinions, forecasts, or recommendations should be considered in conjunction with other corroborating and conflicting data. Past updates can be accessed at <https://publichealth.arizona.edu/news/2020/covid-19-forecast-model>.

For the week ending April 18th, 5014 Covid-19 cases were diagnosed in Arizona (Figure 1). This represents a 6% increase from last week’s initial tally of 4726 cases and marks the fourth week of slowly increasing rates. The prior week’s tally was upwardly revised by <1% (31 cases) to 4757 cases this week. Case rates among those ≥65 years of age remain below those of children, 28 versus 49 cases per 100K residents per week, respectively (Figure 2 following page). The highest rates are among those 15 – 24 years and 25 – 64 years of age, 116 and 81 cases per 100K residents per week, respectively.

Arizona case rates remain “stuck” just above the threshold differentiating substantial and moderate risk owing to more transmissible variants (e.g., [B.1.1.7](#)) and normalization of business and social activities (e.g., [EO 2021-06](#)). [According to the CDC](#), vaccination rates continue to increase with 34% of Arizona’s adult population being fully vaccinated and another 15% having received one dose (49% with ≥1 dose). With 78% of the ≥65 population having received ≥1 dose, Arizona ranks in the bottom half of states.

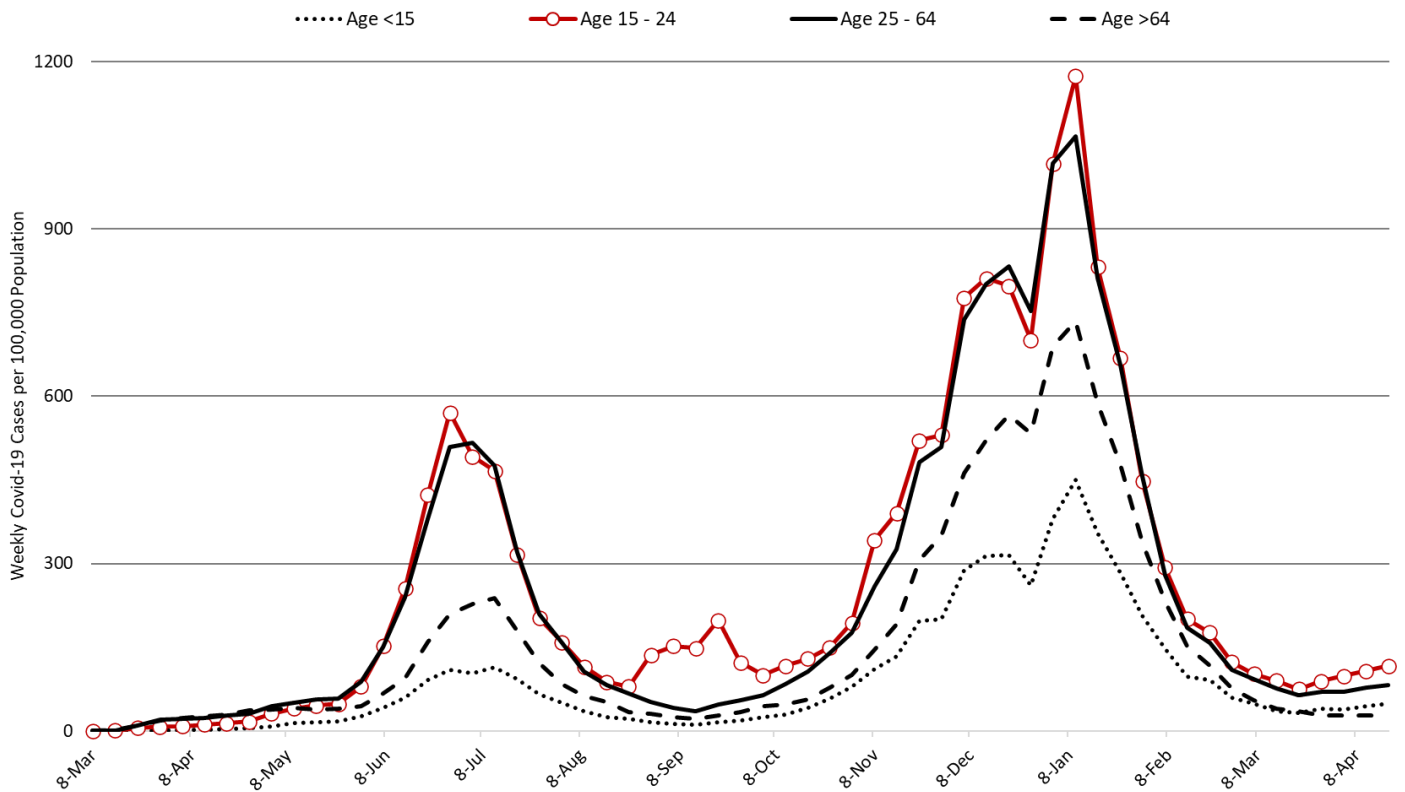
New cases are now being diagnosed at a rate of 70 per 100K residents per week; this rate is slowly increasing. For reference, September 8<sup>th</sup> marked the fall nadir between the summer and winter outbreaks at 38 cases per 100K residents per week. The post-holiday nadir was 53 cases per 100K residents on March 23, 2021.

Unvaccinated Arizonans who are at risk of developing severe disease (e.g., age or comorbid conditions) or who simply wish to remain uninfected should continue to shelter as much as feasible because viral activity remains widespread.



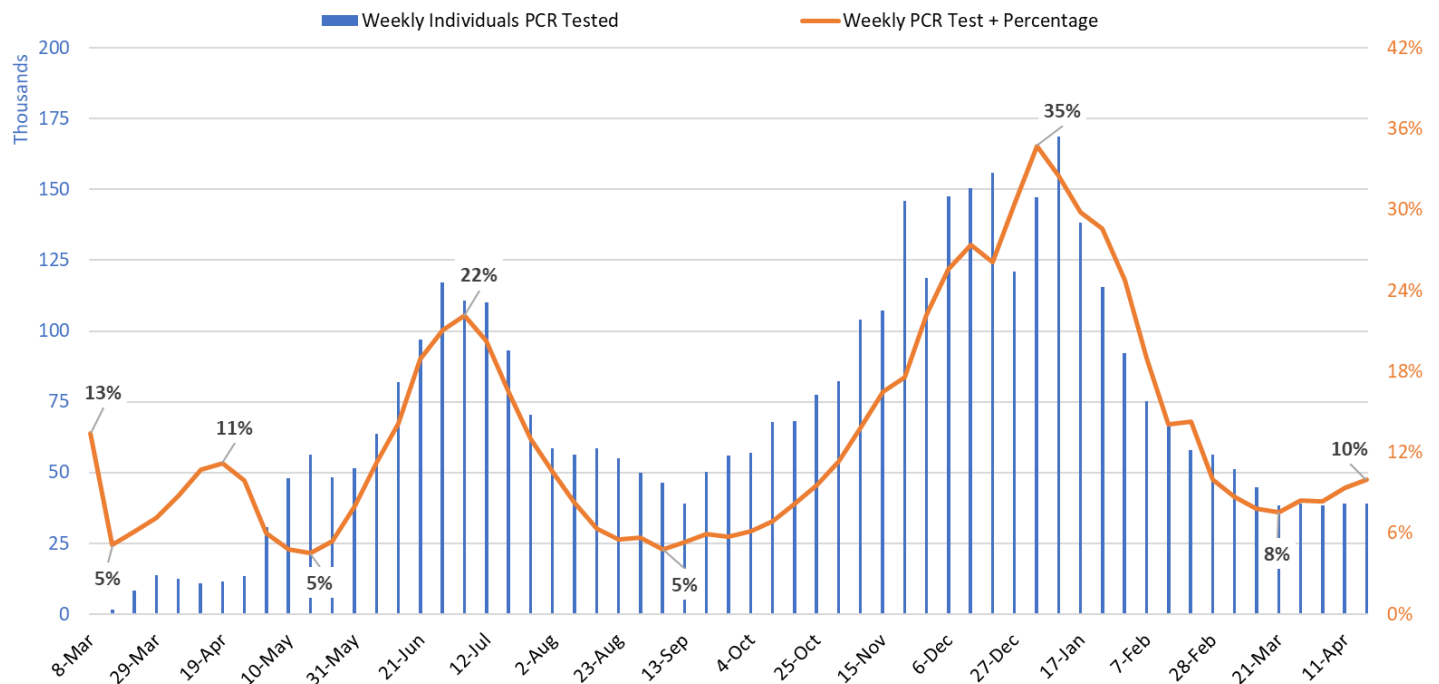
**Figure 1. Newly Diagnosed Covid-19 Cases in Arizona and Number of Individuals Undergoing Covid-19 Diagnostic Testing March 1, 2020 through April 18, 2021.**

Note: Data for this report was updated Friday, April 23 allowing 4 full days to adjudicate cases and keep week-over-week backfill low. All comparisons are week-over-week changes.

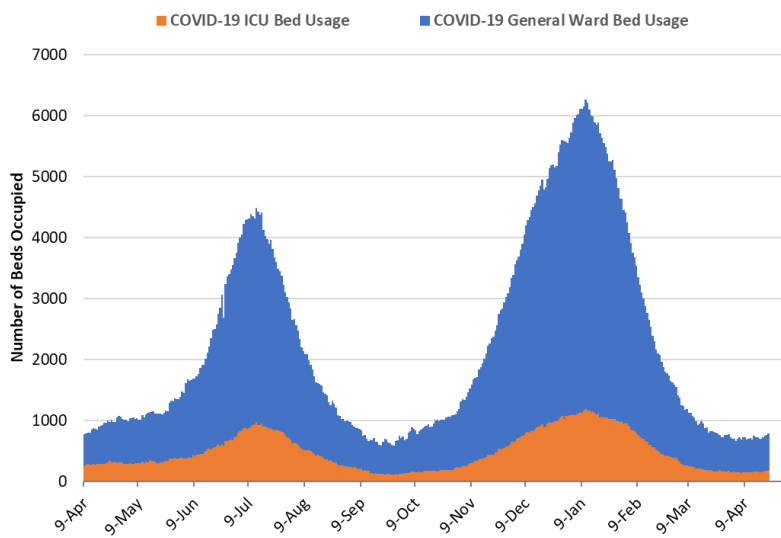


**Figure 2. Newly Diagnosed Covid-19 Cases in Arizona by Age Group March 1, 2020 through April 18, 2021.**

Test positivity among those undergoing traditional nasopharyngeal PCR testing is slowly increasing; positivity was 10% this week (Figure 3). Positivity remains within the 5 – 10% window for optimal public health practice.



**Figure 3. Weekly Number Patients Undergoing Traditional Nasopharyngeal PCR Testing and Associated Percent Positivity March 1, 2020 – April 18, 2021.**



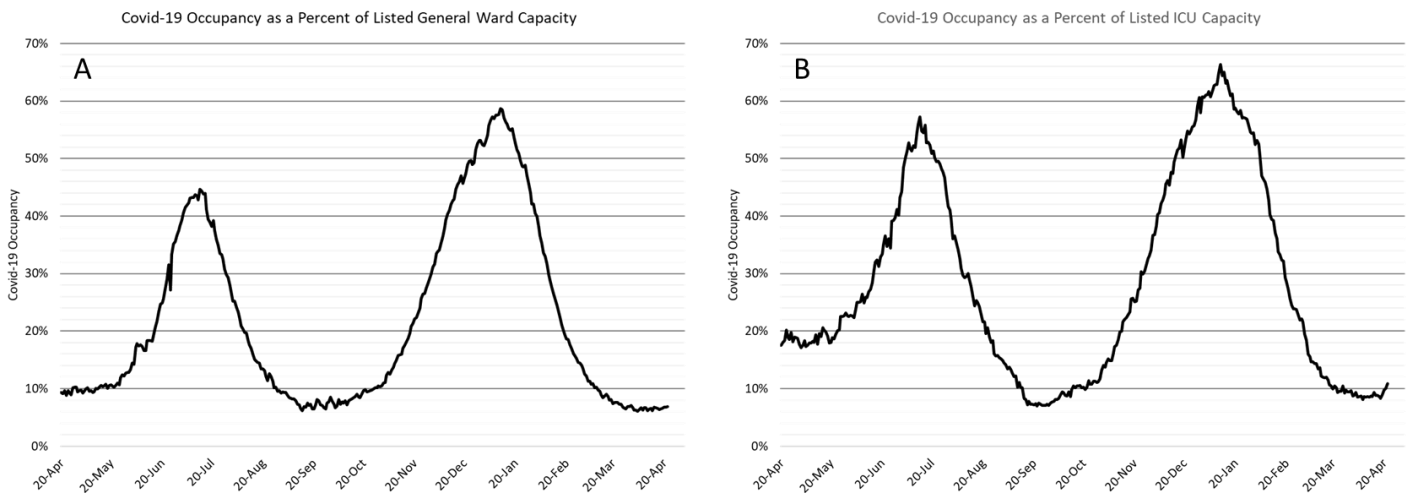
**Figure 4. Arizona Daily Covid-19 General Ward and ICU Census April 20, 2020 – April 22, 2021.**

ICU beds remained available for use. This is similar to the prior week’s 254 available beds. ICU occupancy has fallen 84% from its January 11<sup>th</sup> peak of 1183 occupied beds. The summer-fall nadir was 114 occupied beds on September 22<sup>nd</sup>. The post-holiday nadir was 140 beds on April 7.

As of April 22<sup>nd</sup>, 594 (7%) of Arizona’s 8605 general ward beds were occupied by Covid-19 patients, a 4% increase from the previous week’s 569 occupied beds (Figure 4 and Figure 5 Panel A). Another 912 (11%) beds remained available for use. The number of available beds is lower than the previous week’s 1025 beds.

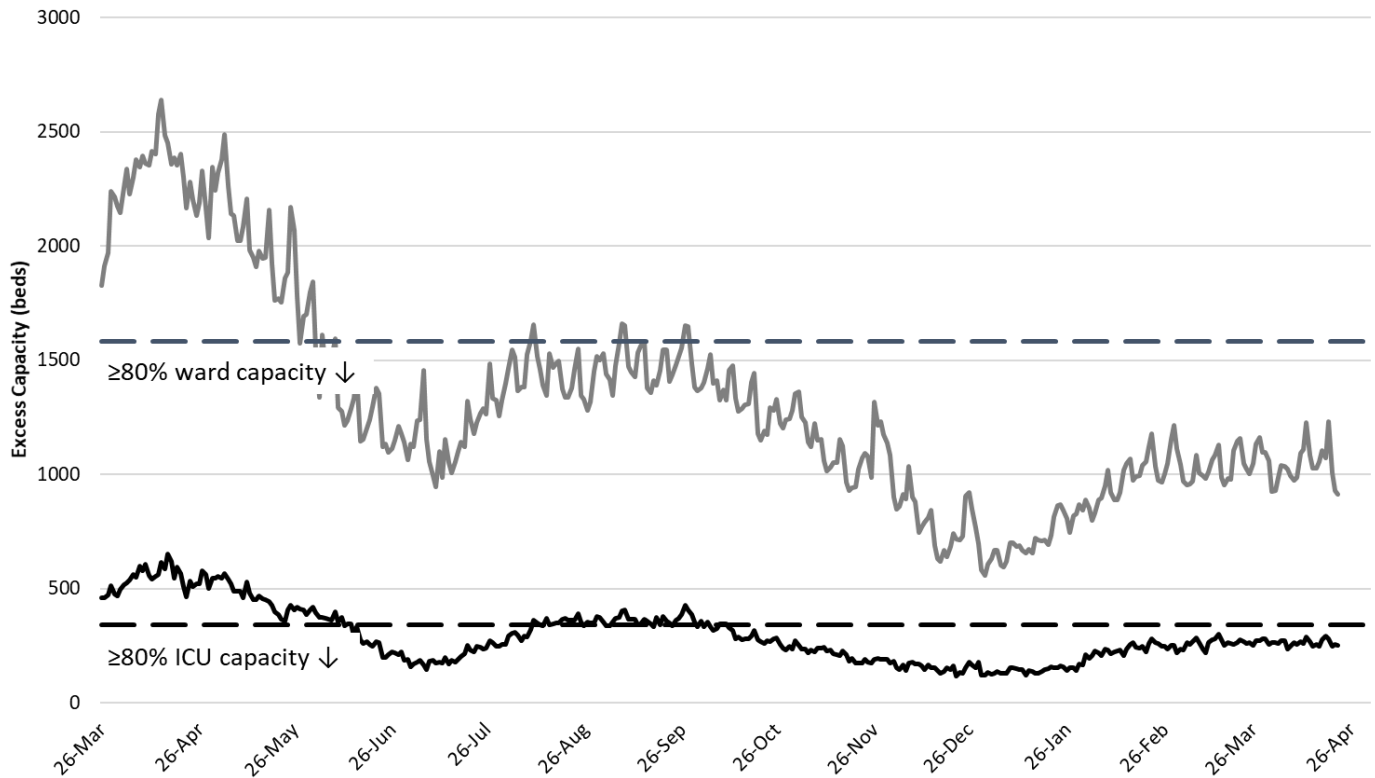
Covid-19 occupancy has dropped by 88% from its January 11<sup>th</sup> peak of 5082 ward patients. The summer-fall nadir was 468 occupied beds on September 27<sup>th</sup>. The post-holiday nadir was 516 beds on April 4.

As of April 22<sup>nd</sup>, 187 (11%) of Arizona’s 1727 ICU beds were occupied with Covid-19 patients, a 21% increase from the prior week’s count of 154 patients (Figure 4 and Figure 5 Panel B). An additional 253 (15%)



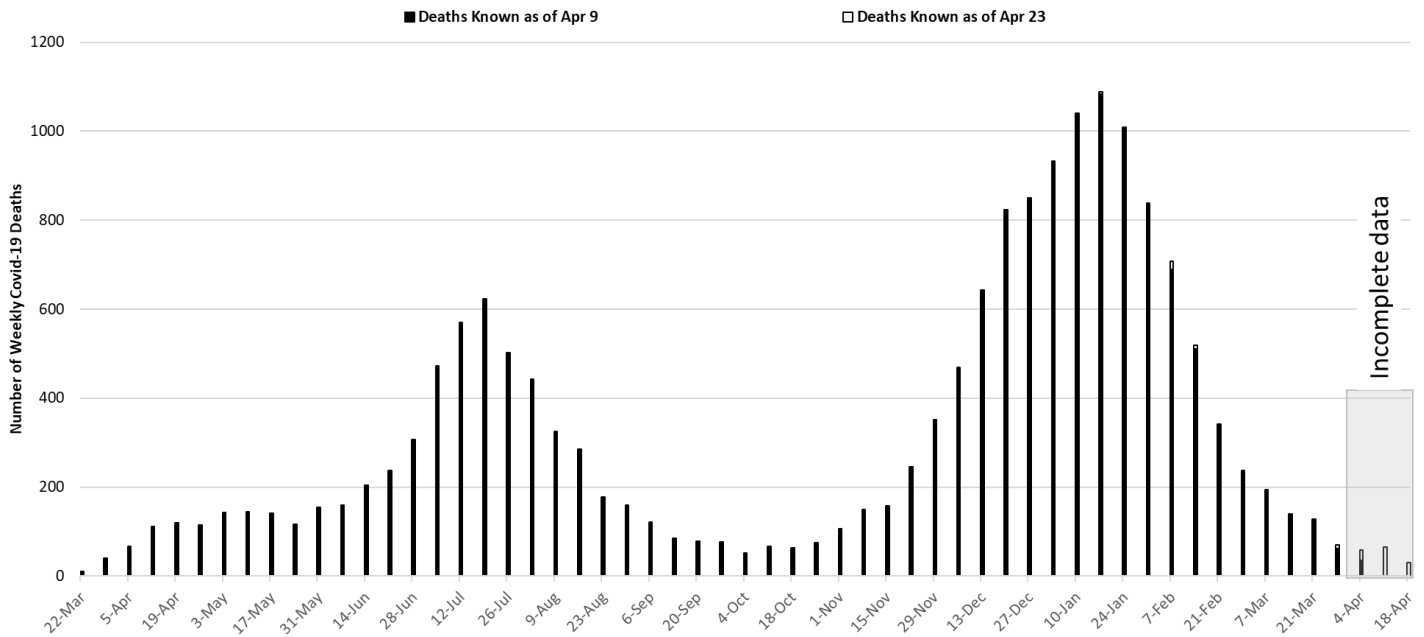
**Figure 5. Covid-19 Occupancy as a Percent of Listed General Ward (A, left) and ICU (B, right) Capacity in Arizona April 20, 2020 – April 22, 2021.**

Arizona hospital occupancy remains above seasonal trends. Improvements in ward and ICU occupancy remain stalled at  $\geq 85\%$  occupancy (Figure 6, following page). This indicates that medically necessary procedures that were previously postponed are being scheduled at higher than seasonal amounts to address the backlog of care. It will still take several more months to resolve. Occupancy will need to fall  $< 70\text{-}75\%$  before conditions will be back to “normal.” As capacity constraints are lessened, care practices should return to those prior to the outbreak ensuring all patients will receive optimal care. Hospitals will remain crowded through May before returning to pre-outbreak levels.



**Figure 6. Observed Excess Non-Surge General Ward and ICU Capacity April 20, 2020 – April 22, 2021.**

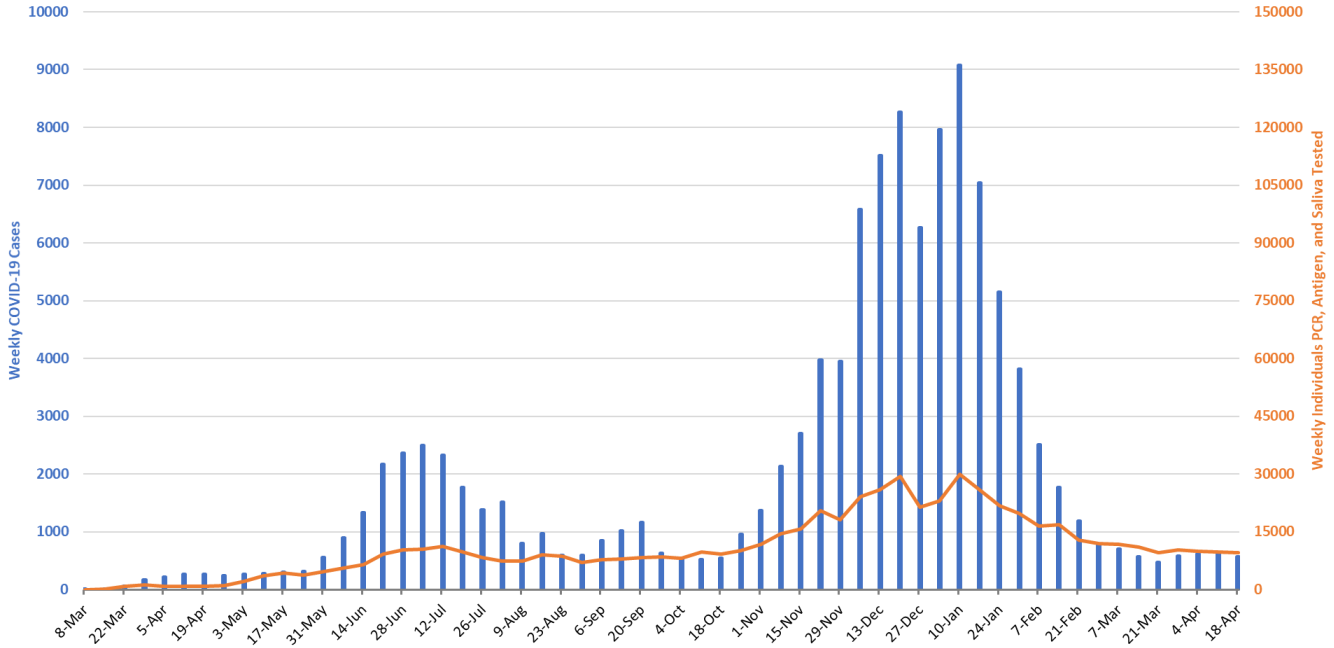
The week ending January 17th remains Arizona’s deadliest with 1089 deaths (Figure 7). With 193 deaths recorded, March 7<sup>th</sup> may become the first week with <200 Covid-19 deaths since November. The summer – fall nadir was 51 deaths the week ending October 4<sup>th</sup>.



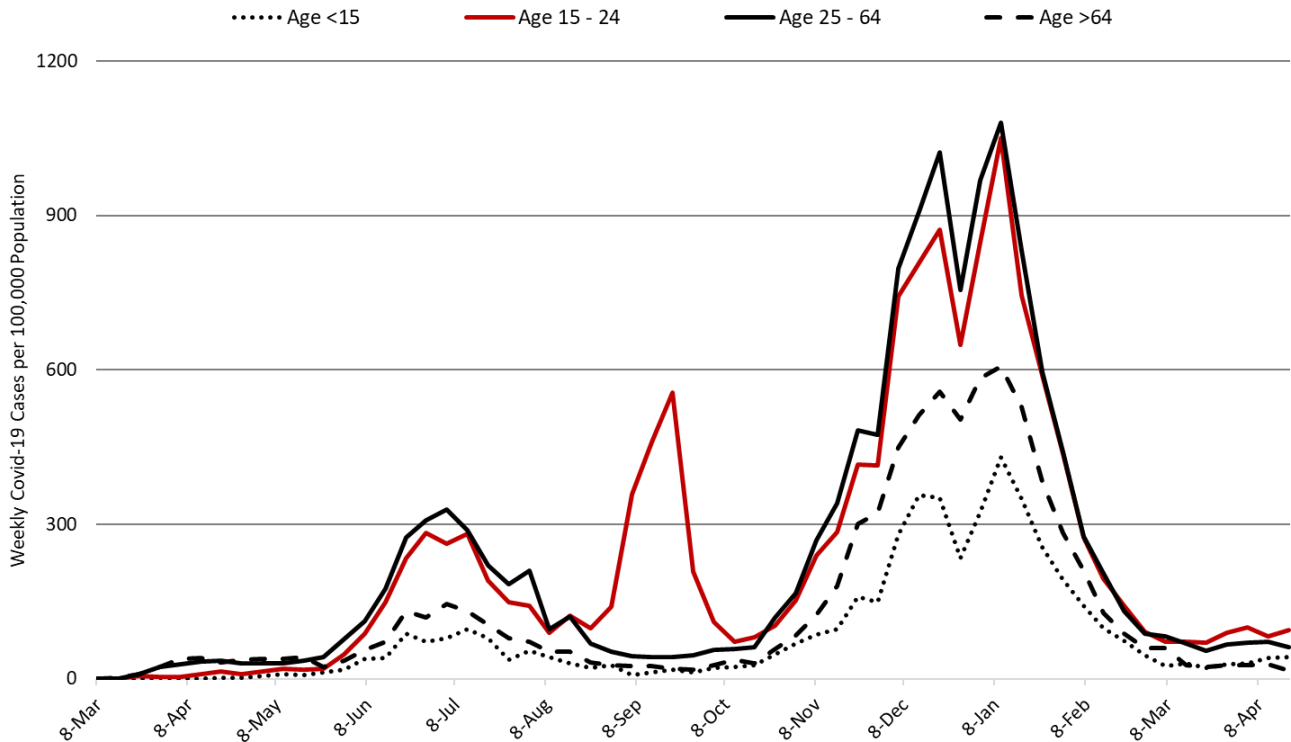
**Figure 7. Weekly Arizona Covid-19 Deaths March 1, 2020 – April 22, 2021.**

## Pima County Outlook

For the week ending April 18th, 569 Pima County residents were diagnosed with Covid-19. This is a 7% decline from the 609 cases initially reported last week (Figure 8). Last week's initial tally was upwardly revised by 2% (11 cases) to 620 cases. New cases are being diagnosed at a rate of 55 cases per 100K residents per week and is slowly decreasing. For reference, October 9<sup>th</sup> marked a nadir between the summer and winter outbreak at 46 cases per 100K residents per week. Case rates reached their lowest post-holiday level at 44 cases per 100K residents per week on March 20<sup>th</sup>. Trends across the various age groups appear in Figure 9.



**Fig 8. Covid-19 Cases and Individuals Undergoing Testing in Pima County Mar 1, 2020 – Apr 18, 2021**



**Figure 9. Covid-19 Cases by Age Group in Pima County from March 1, 2020 – April 18, 2021.**

Created by: Joe K. Gerald, MD, PhD (Associate Professor, Zuckerman College of Public Health, [geraldj@email.arizona.edu](mailto:geraldj@email.arizona.edu)) with assistance from Patrick Wightman, PhD from the UA Center for Population Health Sciences.

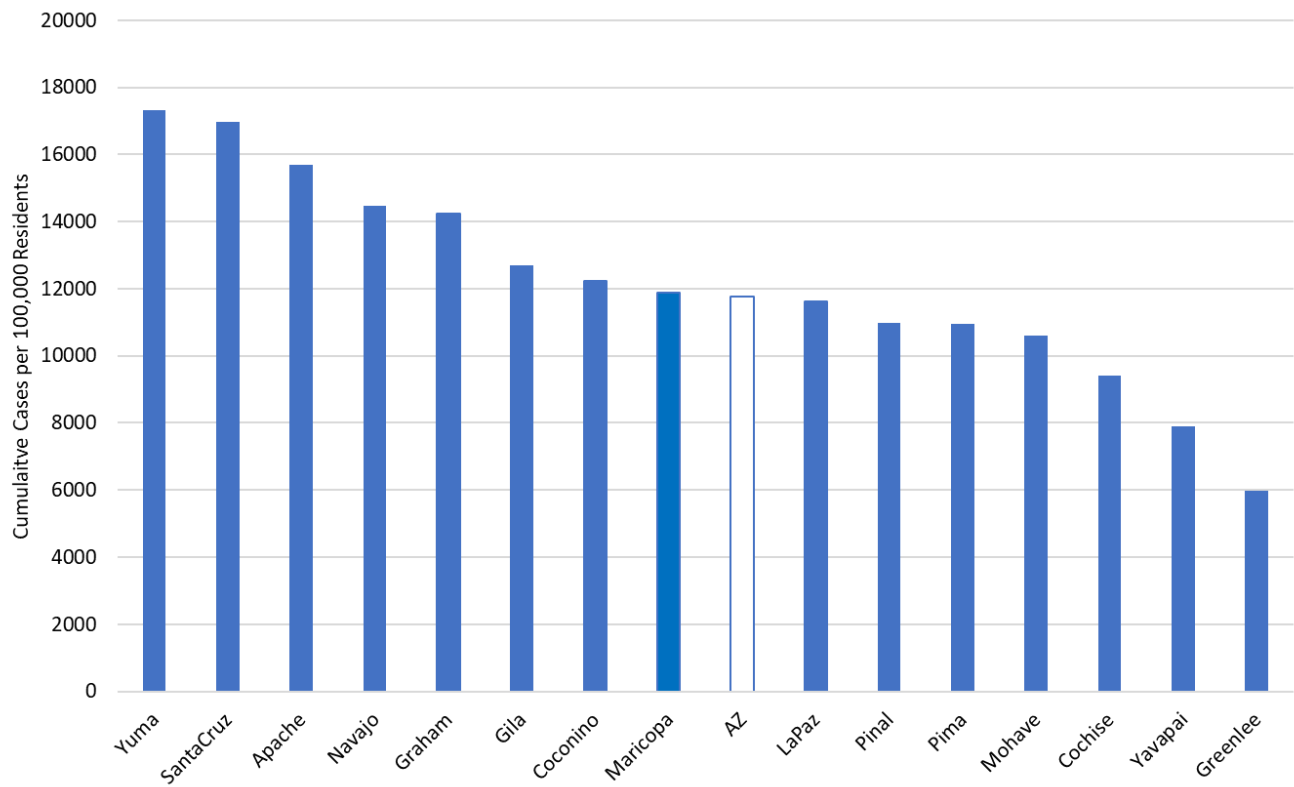
## Summary:

- This week saw another small increase in Covid-19 cases and hospitalizations, particularly in the ICU. Arizona's most populous counties now have absolute levels of SARS-CoV-2 viral transmission >50 cases per 100,000 residents per week which demarcates substantial and moderate risk (see [CDC Recommended Mitigation Strategies for K – 12 Learning Modes](#)).
  - As of April 18th, new cases were being diagnosed at a rate of 70 cases per 100,000 residents per week. This rate is slowly increasing by approximately 6 cases per 100,000 residents per week.
  - All unvaccinated residents should continue to wear a mask in public, avoid large social gatherings, maintain physical distance from non-household contacts, avoid >15 minutes contact in indoor spaces, especially if physical distancing is inadequate and adherence to face masks is low.
  - Fully vaccinated residents (2 weeks post final dose) are now being afforded a greater freedom of movement and the ability to gather in small, low-risk groups, by the [CDC](#).
  - Test positivity for traditional nasopharyngeal PCR testing is now 10% which is within the recommended 5 – 10% range for optimal public health practice.
- Hospital Covid-19 occupancy is increasing slightly in the ward and ICU. Access to care remains somewhat restricted as occupancy remains unseasonably high while the backlog of medically necessary non-Covid procedures is being addressed.
- Arizona Covid-19 fatality count should fall below 100 deaths per week soon and then hold steady. With about 5000 weekly cases and a 1.5% case fatality rate, there should be approximately 75 deaths 3 – 4 weeks from now. Worrisomely, the post-recovery sequela of SARS-CoV-2 includes a 50% higher risk of death through 3 – 6 months along with higher rates of illness and health care use (See Al-Aly below).
- According to the [CDC](#), 34% of Arizona adults have received at least 2-doses of vaccine while another 15% have received 1-dose. So far, the vast majority who start the vaccination process complete it. However, Arizona passed peak vaccination rates several weeks ago indicated progress towards our goal is slowing.

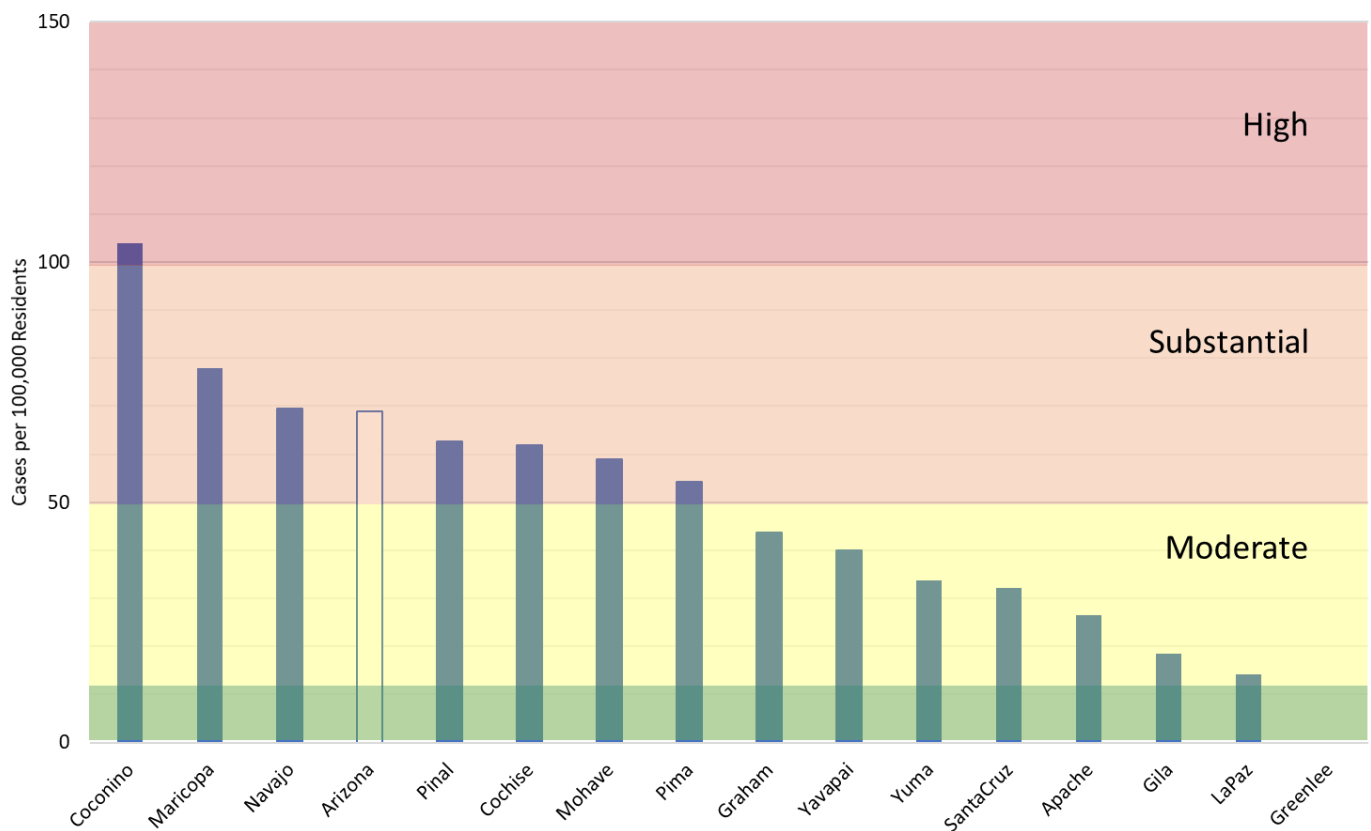
## Reading of Interest this Week:

- Al-Aly Z. High-Dimensional Characterization of Post-Acute Sequelae of COVID-19. *Nature*. 2021; e-pub ahead of print. DOI:10.1038/s41586-021-03553-9. (See [link](#))
- Haffner MR. Postoperative In-Hospital Morbidity and Mortality of Patients with COVID-19 Infection Compared with Patients without COVID-19 Infection. *JAMA Netw Open*. 2021;4(4):e215967. DOI: 10.1001/jamanetworkopen.2021.5697. (See [link](#))
- Villar J. Maternal and Neonatal Morbidity and Mortality among Pregnant Women with and without COVID-19 Infection: The INTERCOVID Multinational Cohort Study. *JAMA Pediatrics*. 2021; e-pub ahead of print. (See [link](#))
- Callison K. Associations between Individual Demographic Characteristics and Involuntary Health Care Delays as a Result of COVID-19. *Health Aff (Millwood)*. 2021; 40(5): e-pub ahead of print. (See [link](#)).
- Teran RA. Postvaccination SARS-CoV-2 Infections among Skilled Nursing Facility Residents and Staff Members – Chicago, Illinois, December 2020 – March 2021. *MMWR*. 2021; 70 (April 21) early release. (See [link](#)).
- Cavanaugh AM. COVID-19 Outbreak Associated with a SARS-CoV-2 R.1 Lineage Variant in a Skilled Nursing Facility after Vaccination Program – Kentucky, March 2021. *MMWR*. 2021; 70 (April 21) early release. (See [link](#))

Next update scheduled for May 7th. County data appear in the Appendix.



**Figure 1A. Cumulative Covid-19 Incidence in Arizona by County March 1, 2020 – April 18, 2021.**



**Figure 2A. Covid-19 Weekly Cumulative Incidence in Arizona by County March 7 – April 18, 2021** (Risk bands coincide with CDC recommendations for K – 12 schools’ instructional mode).

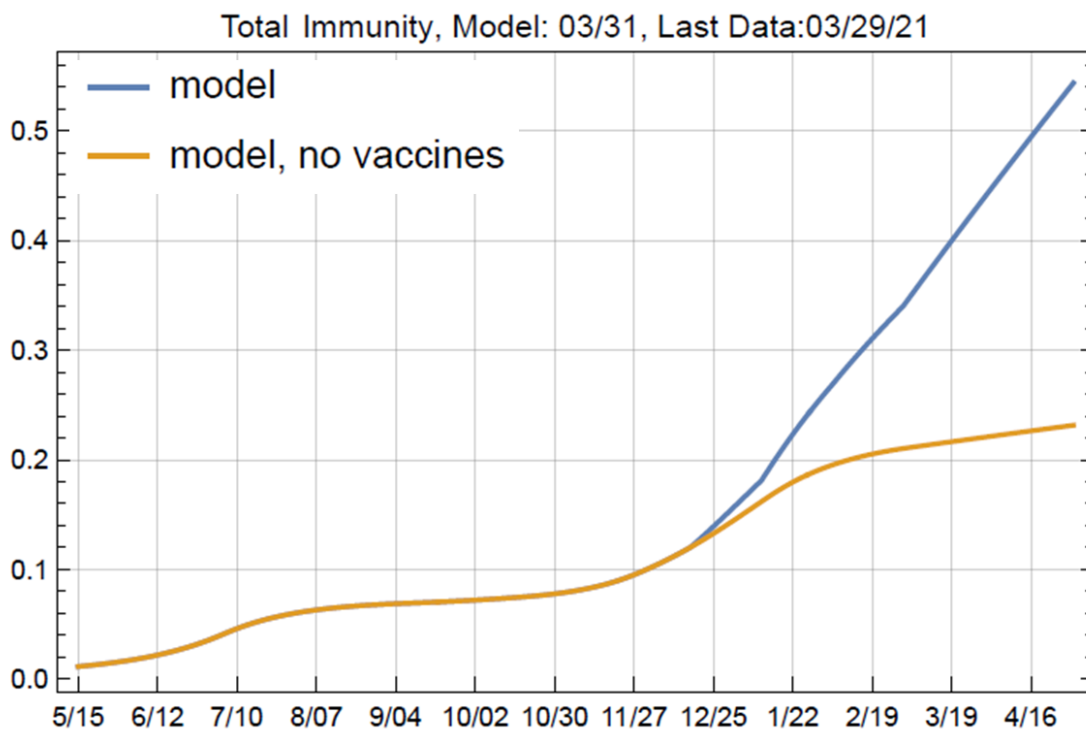
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## Early Evidence of a Vaccination Effect in Arizona – The ASU COVID-19 Modeling Group

The ASU COVID-19 Modeling Group recently produced an updated model that incorporates the impact of Arizona's vaccination effort. This model is based on their prior work charting the course of the COVID-19 outbreak based on a traditional SEIR epidemiological model. To incorporate the impact of vaccines, the model accounts for a differential effectiveness attributable to the first and second dose, 50% and 95% respectively. Vaccination data are derived from the ADHS dashboard at the state-level and does not account for differential rates or outcomes by age. The model assumes a single homogenous risk pool throughout the state.

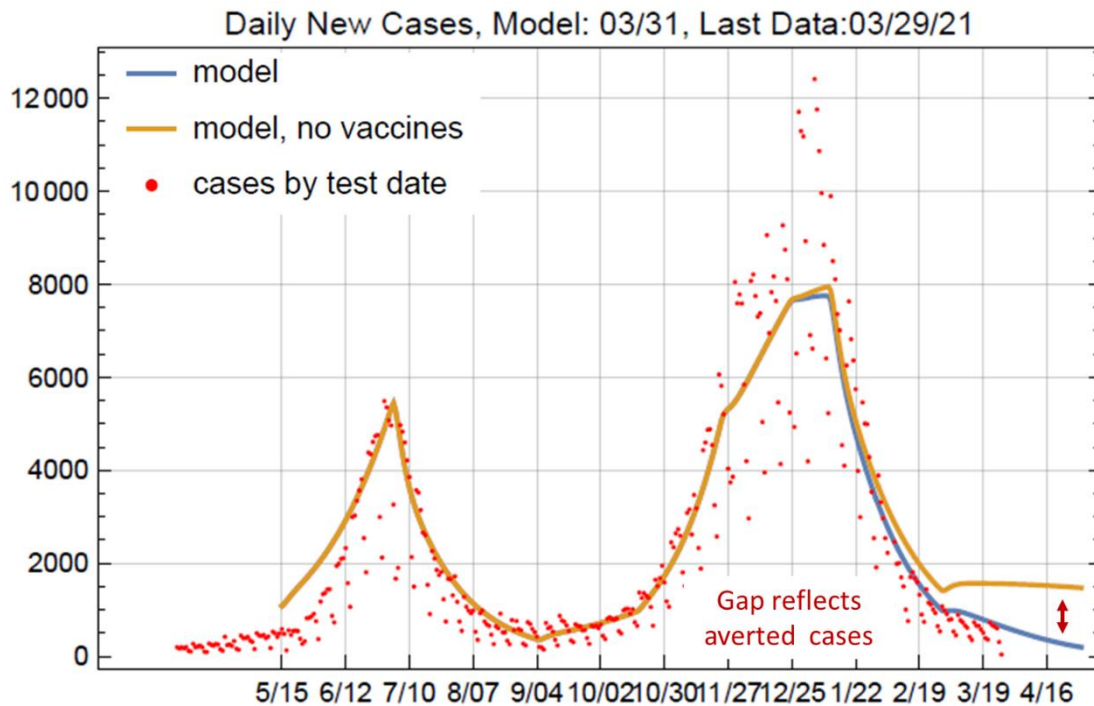
Figure 1B shows their estimated level of natural immunity from past COVID-19 infection (gold line) and total immunity (blue line). The difference between natural immunity and total immunity is attributable to vaccine administration. Their model suggests by May 1<sup>st</sup>, more than 50% of Arizonans will have immunity to Covid-19 infection. These estimates also take into consideration the fact that some Arizonans who have previously been infected will also be vaccinated. Therefore, total immunity is not the simple sum of previous infection plus vaccinations.



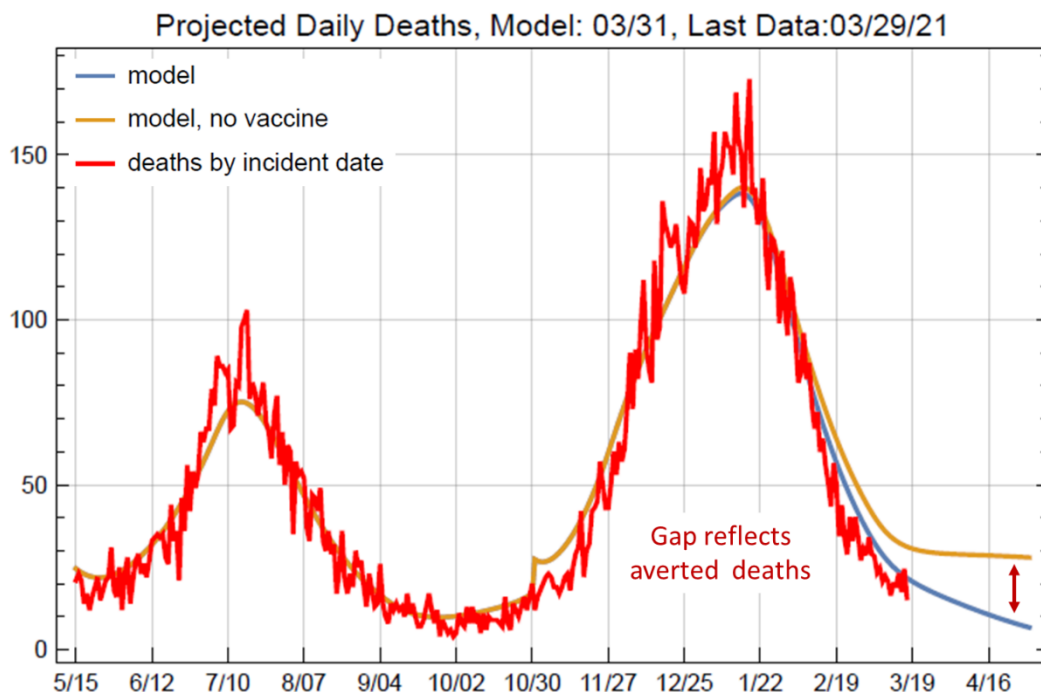
**Figure 1B. Projected Total (blue), Natural (gold) and Vaccine Induced COVID-19 Immunity in Arizona through May 1, 2021.** Data graciously provided by the ASU COVID-19 Modeling Group (Esmá Gel, PhD; Megan Jehn, PhD; Anna Muldoon, MPH; Samantha Sokol, Jordy Rodriguez, Heather Ross, PhD, NDP, ANP-BC, and Tim Lant, PhD, MAS).

Figures 2B and 3B on the following page shows the projected impact of the state's vaccination effort on COVID-19 cases and deaths. Beginning in late January, a gap emerged between the projected number of cases and deaths with and without the vaccine (difference between gold and blue lines; actual data represented by orange dots). This gap continued to increase, reaching a maximum at the end of the model period, May 1.



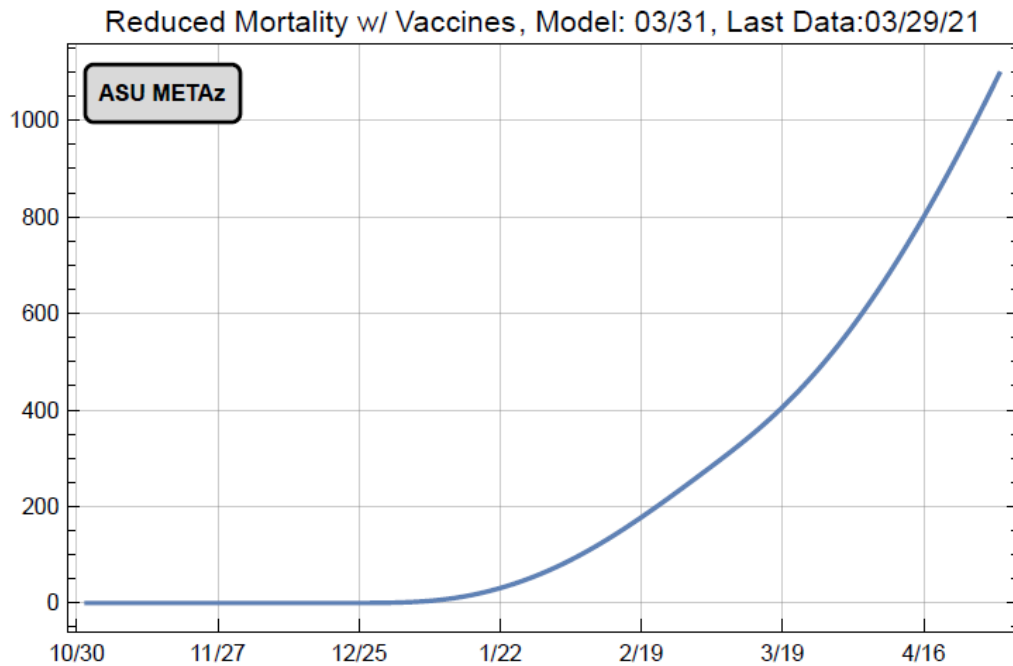


**Figure 2B. Projected COVID-19 Cases in Arizona with (blue) and without (gold) Vaccination through May 1, 2021.** Data graciously provided by the ASU COVID-19 Modeling Group (Esma Gel, PhD; Megan Jehn, PhD; Anna Muldoon, MPH; Samantha Sokol, Jordy Rodriguez, Heather Ross, PhD, NDP, ANP-BC, and Tim Lant, PhD, MAS).



**Figure 3B. Projected COVID-19 Deaths in Arizona with (blue) and without (gold) Vaccination through May 1, 2021.** Data graciously provided by the ASU COVID-19 Modeling Group (Esma Gel, PhD; Megan Jehn, PhD; Anna Muldoon, MPH; Samantha Sokol, Jordy Rodriguez, Heather Ross, PhD, NDP, ANP-BC, and Tim Lant, PhD, MAS).

Overall, the group estimates that the vaccination program will result in >1000 fewer COVID-19 deaths by May 1, 2021 (Figure 4B).



**Figure 3B. Projected COVID-19 Averted Deaths in Arizona Attributable to Vaccination through May 1, 2021.** Data graciously provided by the ASU COVID-19 Modeling Group (Esmá Gel, PhD; Megan Jehn, PhD; Anna Muldoon, MPH; Samantha Sokol, Jordy Rodriguez, Heather Ross, PhD, NDP, ANP-BC, and Tim Lant, PhD, MAS).