COVID-19 Disease Outbreak Outlook
## Arizona State and Pima County
Updated April 18, 2020

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.

As of April 18th, 4719 COVID-19 cases and 177 deaths have been reported on the Arizona Department of Health Services (ADHS) website. Thanks to a colleague, I am now able to report cases according to the test collection date thereby eliminating variability due to reporting lag. This reveals that most tests are obtained on weekdays (Figure 1). Because of this change, counts in this and future updates will not match those in past updates (Table 1). However, the general trends remain consistent, just offset by several days.

For now, I am still reporting deaths by the date they are announced. Like reported cases, the doubling time for reported deaths continues to slow (Table 2).
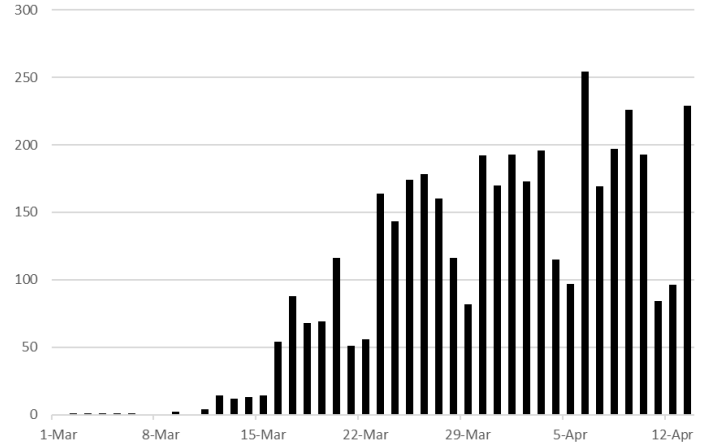
Figure 1. Arizona COVID-19 Cases by Test Collection Date through April 13.

Table 1. Arizona COVID-19 Cases by Date of Test Collection for April 4 – Apr 13.

	Apr 4	Apr 5	Apr 6	Apr 7	Apr 8	Apr 9	Apr 10	Apr 11	Apr 12	Apr 13
Total Reported Cases	2622	2719	2973	3142	3339	3565	3758	3842	3938	4167
Newly Reported Cases	115	97	254	169	197	226	193	84	96	229
Doubling Time (days)*	8.4	8.7	9.1	9.8	10.6	10.9	11.7	12.4	12.8	14.1

*7-day moving average of doubling time based on day-to-day increases in cumulative cases.

Table 2. COVID-19 Deaths by Date of Announcement for April 8 – 17.

	Apr 9	Apr 10	Apr 11	Apr 12	Apr 13	Apr 14	Apr 15	Apr 16	Apr 17	Apr 18
Total Reported Deaths	89	97	108	115	122	131	142	150	169	177
Newly Reported Deaths	9	8	11	7	7	9	11	8	19	8
Doubling Time (days)*	4.4	5.2	6.3	8.0	7.4	8.0	8.2	9.0	8.5	9.5

*7-day moving average of doubling time based on day-to-day increases in cumulative deaths.

Pima County

As of April 18th, 856 COVID-19 cases have been reported on the ADHS website for Pima County (Table 3). I am now able to report Pima County cases by test collection date as well. For this reason, reported counts in this update will not match those in past updates. However, general trends remain consistent such that the pace of newly reported cases in Pima County generally follow those of Arizona as a whole.

Table 3. Pima County COVID-19 Cases by Date of Test Collection for April 4 – Apr 13.

	Apr 4	Apr 5	Apr 6	Apr 7	Apr 8	Apr 9	Apr 10	Apr 11	Apr 12	Apr 13
Total Reported Cases	447	469	515	548	582	625	678	694	714	754
Newly Reported Cases	16	22	46	33	34	43	53	16	20	40
Doubling Time (days)*	7.3	7.5	7.6	8.6	9.3	9.9	10.4	10.8	11.3	12.5

*7-day moving average of doubling time based on day-to-day increase in cumulatives cases.

Institute for Health Metrics and Evaluation (IHME) Models

On April 16, the IHME made another major revision to their [estimates](). Hospitalizations and ICU usage have been adjusted significantly downward and the peak moved earlier. In fact, the IHME now predicts that hospitalization demand peaked on April 10th with 313 needed beds (Figure 2). Similarly, the IHME now predicts that ICU demand peaked on April 14th with 77 needed beds (Figure 3). IHME now predicts 267 total deaths by August 4th, down from approximately 1000 deaths from their April 9 update.
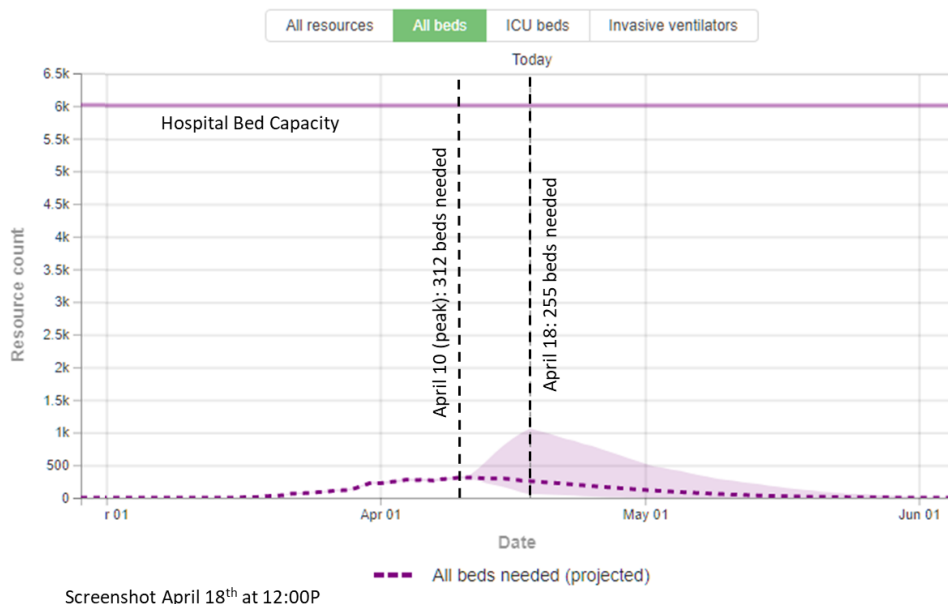

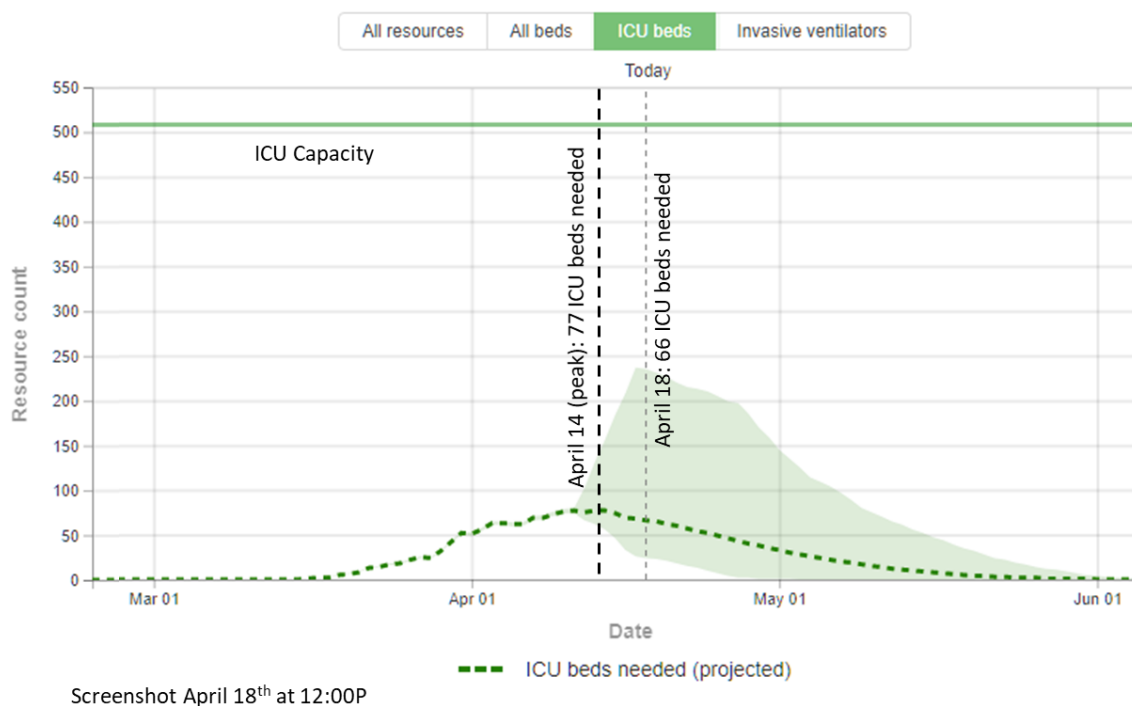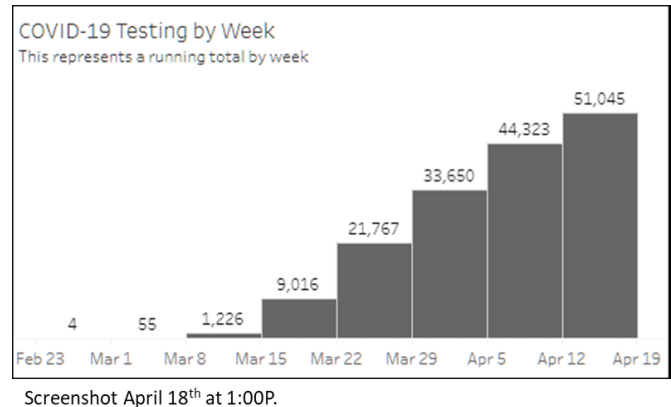**Figure 2. IHME Estimated COVID-19 Hospitalizations and Capacity (from** https://covid19.healthdata.org**).**

Figure 3. IHME Estimated COVID-19 ICU Utilization and Capacity (from https://covid19.healthdata.org**).**

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In summary,

- Evidence indicates that social distancing has slowing viral transmission; however, community-driven viral transmission remains high as evidenced by substantial numbers of newly reported cases. For this reason, maintaining or increasing social distancing should remain our highest priority or we risk a resurgence fueled by these active cases.

- ADHS reports continue expansion of testing, with increases observed in each of the past 6-weeks (Figure 4). Increased testing can be expected to identify milder cases, changing the relationship between newly reported cases and future demand for hospital and critical care. This could help explain why newly reported case counts and hospital/critical care demand appear to be peaking simultaneously.

Screenshot April 18th at 1:00P.

Figure 4. Weekly COVID-19 Tests as Reported by ADHS.

- Over the coming weeks, serologic testing for antibodies against COVID-19 will become available in Arizona. Testing a representative sample of Arizonans should be a high priority to estimate the burden of unrecognized infections.

  o Such a study, was recently conducted in Santa Clara County, California where 1870 cases and 73 deaths have been reported among its 1.7 million residents. The study estimated that 2.5% – 4.2% of county residents have been infected, yielding 48,000 – 81,000 total infections. These estimates exceed the 1870 known cases by a factor of 25 – 50. If confirmed, this would suggest the infection fatality rate would be approximately 0.1 – 0.2%, much lower than currently estimated.

- With its latest update, the IHME now predicts that we have already reached our peak hospital (April 10) and ICU (April 14) demand. Future demand is predicted decline slowly over the next 4 weeks. There are no longer any scenarios in which capacity is likely to be exceeded in the short-term.

  o This begs the question, "How much faith should we place in IHME estimates?" An article in the Annals of Internal Medicine urged caution in the reliance on any one model. Despite these cautions, the IHME model seems to be reasonably consistent with conditions on the ground and due to its continued updates is likely to improve over time.

  o For example, the ADHS Hospital Reporting Dashboard estimates about 500 beds are currently in use for COVID-19 which is not appreciably higher than the 300 estimated by IHME. Both are well below capacity. In addition, new data, like that from Santa Clara County above, are upending our current assumptions. In short, it is easier to critique a model than build one.

Next update scheduled for April 23. I hope to be able to discuss two important studies related to post-social distancing control of viral transmission: one by Xi He which estimates the amount of transmission that occurs before symptoms are noticed and another by Stephen Kissler which models subsequent outbreak potential following this initial wave.

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