

0.1 COVID-19 Model Update - June 18, 2020

0.1.1 General Observations about COVID-19

It was only on March 11 that WHO declared COVID-19 a global pandemic. Three months later, COVID-19 has become a deadly American disaster. By number of deaths, it trails only World War II, the Civil War, and the 1918-19 flu pandemic.

- COVID-19 deaths as of June 18: 120,000.
- World War II deaths: 405,399.
- Civil War deaths: 620,000.
- 1918-19 flu pandemic deaths: 675,000.

The number of COVID-19 cases was expected to decrease as we approach the summer months. However, cases are increasing. We have yet to experience COVID-19 during a full winter season. As a frame of reference, the second wave of the flu pandemic of 1918-19 was five times deadlier than the first wave; it started around November of 1918. The analogy is imperfect, as we have learned that COVID-19 is not the flu. Nevertheless, we must heed the call of this warning that ripples through the pages of history.

Only an uninterrupted chain of fortunate events could yield a vaccine by the end of 2020. Although it is possible, and it would be a cause global celebration, it is a highly improbable outcome. The most likely situation is that a vaccine arrives by the end of 2021, or later... or it might never be found. A cautionary tale is Dengvaxia, a dengue vaccine approved with reckless haste and deployed to over 830,000 children in the Philippines in 2016. Shortly after a massive vaccination campaign, the French pharmaceutical giant Sanofi declared that the vaccine was unsafe. It had the potential to cause lethal complications in children who had never had dengue before. But it was too late. To date, 900 children vaccinated with Dengvaxia have died, and criminal charges have been pressed against scientists and executives of Sanofi. A COVID-19 vaccine should not be rushed, given the very large population who might take it (billions of people).

Given the current trajectory of community transmission, COVID-19 could become the deadliest catastrophe in American history. To prevent this trend from becoming a reality, we need decisive action.

0.1.2 Critical Needs

Forecasting is possible, but it requires a strong data management strategy.

Currently there is a serial model for data entry based on Excel at San Antonio Metro Health Department. This method is unsustainable, is not scalable, and is error prone.

Because this pandemic could last for several years, Electronic Data Capture (EDC) technologies and methods should be implemented. EDC has several benefits over data collection onto paper forms and/or spreadsheets including: (1) reducing

the risk of lost paper records or overwriting spreadsheet records, (2) eliminating the delay to enter data from paper forms, or consolidating multiple sources of spreadsheets, (3) reducing the number of staff required for data entry, (4) enabling immediate data quality checks and preliminary analyses, (5) enabling immediate redundant data backups when entered into enabled databases, and (6) providing state-of-the-art training to field and data staff.

The effort required to implement EDC is minimal. If suitable hardware is available, it takes one day to setup a Web server with an information system for EDC and one day of training. This level of effort has been observed in low-resource settings around the world.

An EDC operation allows multiple personnel entering data in parallel, even editing the same record without risk of overwriting data. EDC offers audit trail mechanisms, it only allows consistent data to enter the database, it eases the process of importing data dumps from multiple providers, and it makes transparent the effort of exporting data for analysis.

Without EDC, as the number of cases increase, the City of San Antonio will lose the ability to forecast.

0.1.3 Modeling Characteristics

Modeling can inform the likely future outcomes given present conditions. The model presented in this report has the following traits:

- *A calibration period of one week:* This means that after a major event, it takes about one week of data to have a reliable prediction.
- *A window of predictability of two months:* This means that once the model is calibrated, the trajectories of case numbers are very unlikely to change for about eight weeks unless a major event occurs.

The fact that cases are not growing comparably in other parts of the country begs the question: What is different about San Antonio that has caused a large increase in cases?

The culprit of the increase in the number of cases does not seem to be protests, or bars, or H-E-B allowing customers without masks, etc. Other metropolitan areas such as Boston and Philadelphia saw large protests, but they did not experience an increase in cases. It might be that people in Texas trust their government.

Government declarations emerged as the events that dictate the course of the local epidemics. An exploration of multiple possible causes for the surge in cases resulted in a set of simplest explanations that matches the data nearly perfectly (this is called a parsimonious model, making the minimum number of assumptions). Considering only government declarations, the model and data coincide remarkably.

The major events that have defined the COVID-19 epidemic in San Antonio are:

- **Date of event:** Feb 13. **Date of observed effect:** February 18. This date was found computationally. A retrospective analysis revealed that the only reported event on February 13 was a positive test from an evacuee at JBSA-Lackland in San Antonio.
- **Date of event:** March 13: Declaration of local disaster and public health emergency by the County Judge.
- **Date of event:** May 1. **Date of observed effect:** May 6. Businesses open at 25
- **Date of event:** May 18: **Date of observed effect:** May 23. Businesses open at 50
- **Date of event:** June 3. **Date of observed effect:** June 8. Governor Abbott Announces Phase III.

ABRIDGED REPORT

IMPORTANT: 875 congregated cases were removed from analysis on 18-Jun-2020. These cases are not included in projections.

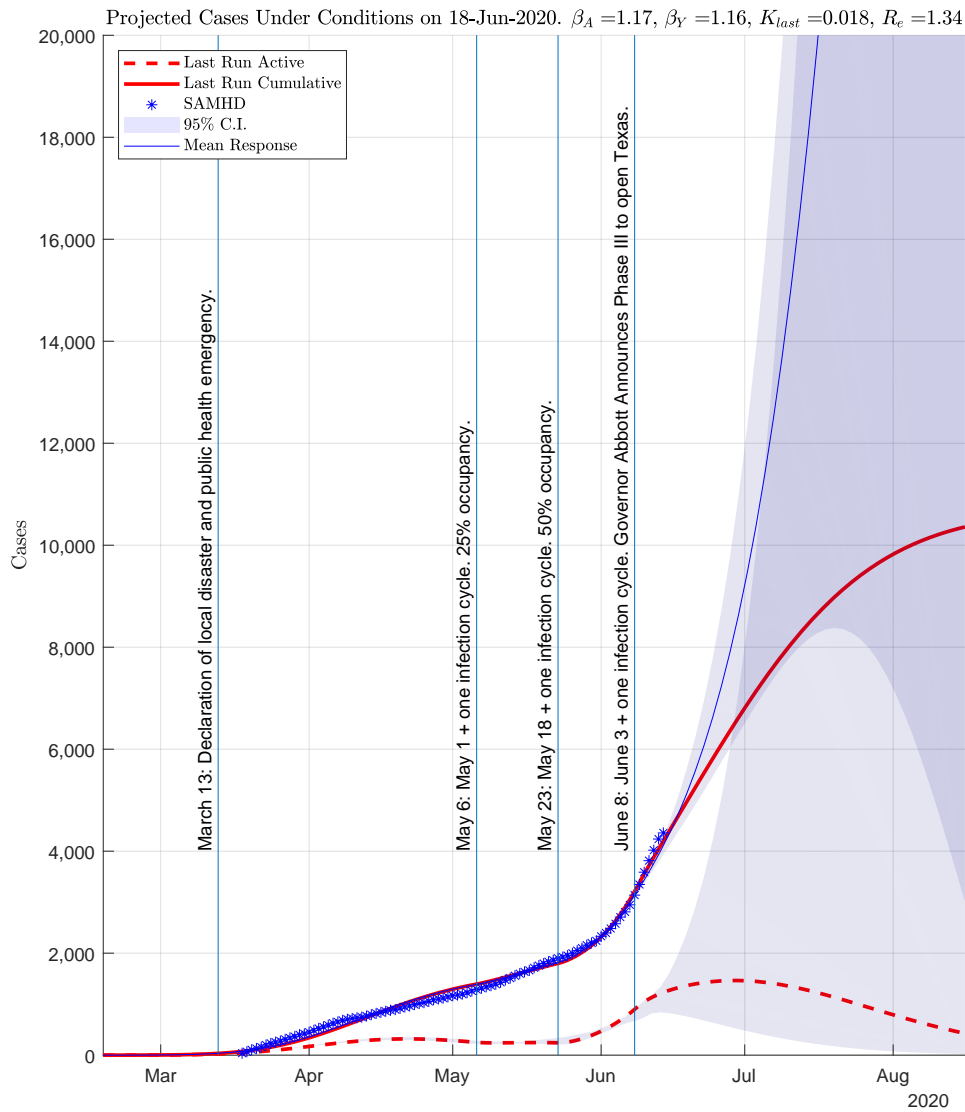
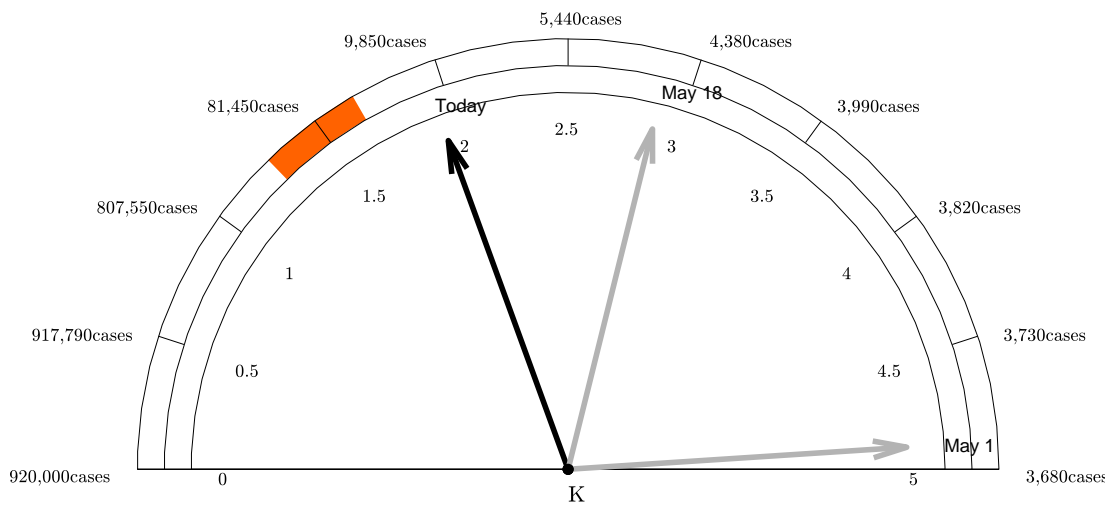


Figure 0.1-1: IMPORTANT: 875 congregated cases were removed from analysis on 18-Jun-2020. These cases are not included in projections. File: SanAntonio18-Jun-2020-EVOLUTION

Case Projection by Risk Mitigation Coefficient. $K = 1.9\%$, $R_e = 1.62$



Colored annular wedge represents confidence interval for projected number of cases. Color represents hazard.

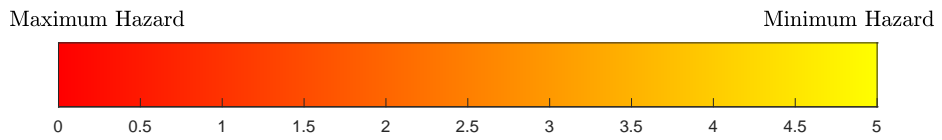


Figure 0.1-2: File: SanAntonio18-Jun-2020-INDICATOR-K3