

COVID-19 Iowa Situation Update – 05/04/2020

Whitepaper Prepared for the Iowa Department of Public Health

by the University of Iowa College of Public Health COVID-19 Response Group

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Executive Summary

- Updated data has improved the precision of model estimates and has reinforced the corresponding recommendations of our previous whitepaper.
- Social distancing policies in Iowa slowed the spread of COVID-19.
- Estimates show that the reproductive number has been declining but likely remains above one for Iowa.
- The relaxation of policies aimed to promote social distancing, effective May 1st, 2020, is likely to weaken the decline in the reproductive number and could possibly lead to an increase; however, the full effects of reopening are not expected to be observed for several weeks.
- Evidence shows that COVID-19 will continue to spread in Iowa, likely at an increasing rate.

Introduction

This brief document provides an update concerning the Iowa-specific results given by model M2 from the whitepaper submitted to IDPH on April 20th, 2020. The update uses both IDPH data and updated publicly available Iowa data for new Iowa-specific projections. The update provides the current estimate of Iowa's COVID19 epidemic curve, not including the expected impact of the lifting of restrictions in 77 counties on May 1st, 2020. Future work will include improving the projections through the incorporation of additional geographic and demographic complexity and adaptations to the changing policy landscape in the state. Further updates will also include interactive tools for IDPH and Iowa policymakers to assist with rapid assessment of the impact of various containment and mitigation strategies for the state.

Reproductive Number Estimates

Interventions to control infectious diseases strive to drive the “reproductive number” below one. There are many different types of reproductive numbers (e.g., R_0 , R_t , R_{eff}) and approaches for constructing estimates, which often depend on the type of mathematical or statistical model used. In general, these quantities capture the number of secondary infections expected per single infectious individual. When the reproductive number falls below one, the spread of the disease is expected to slow down and eventually stop, while values greater than one indicate that the disease is likely to continue to spread exponentially until some other phenomenon interrupts transmission. For example, spread could be curtailed through additional interventions, natural behavioral changes, or a lack of susceptible individuals.

The latest data available from IDPH contains recorded deaths through 04/26/2020. Using our statewide models and this mortality data, we estimate a 65.6% chance that the reproductive number remains above one. Using publicly available mortality data through 04/30/2020, this probability has risen to 91%. Importantly, the models used to generate these estimates don't account for any loosening of social distancing or business closures occurring in the state. This means that these values are likely to rise as contacts and therefore secondary infections increase for the currently infectious class (especially asymptomatic persons). These status-quo estimates and projections are presented in Figure 1.

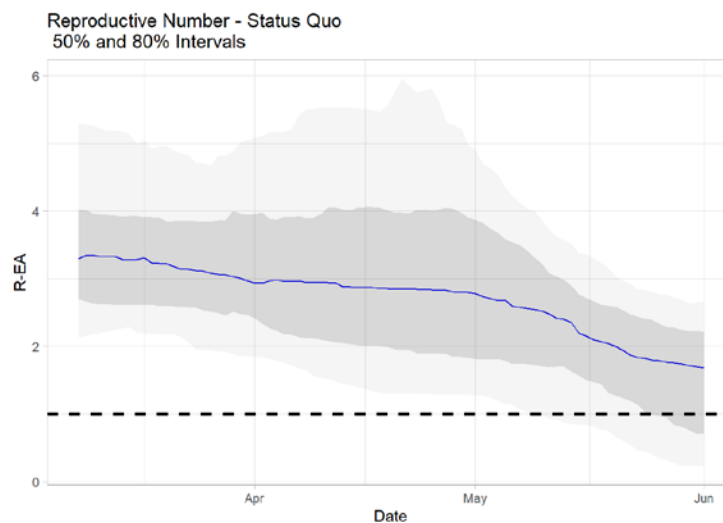


Figure 1: Estimated and projected empirically adjusted reproductive numbers* for COVID-19 in Iowa based on an average of four Iowa-specific models. As the epidemic has progressed, the evidence that this value remains above one has increased in strength. This results in this figure do not include the effects of any relaxation of social distancing or other mitigation policies.

When the estimate or projection is above one, the implication is that measures currently taken to combat the infection have not been sufficient to stop the epidemic from continuing to accelerate. To be clear, our models continue to show strong evidence that social distancing policies and the emergency declaration have strongly slowed the spread of the infection in Iowa, but not that these measures have been sufficient to prevent uncontained spread. The State of Iowa is sufficiently interconnected that we expect continued growth of COVID-19, even in the absence of any measures to relax social distancing or to reopen previously closed businesses and religious institutions. Importantly, even though much of the recent spread in Iowa has been attributed to clusters (e.g., workplaces, long term care facilities), continued increase in community spread is expected.

Status Quo Predictions

Given that the reproductive number estimates remain above one, predictions made based on the status quo of social distancing and statewide closures and restrictions predict continued growth in cases and deaths. In Figure 2, projections for cumulative mortality for May 2020 are given along with 50% and 80% credible intervals. These percentages are chosen to give a reasonable predictive window of possible scenarios where we believe that the actual trajectory is most likely to go over the next two months. These models do not take into account any new efforts to curtail the spread of COVID-19, but neither do they account for any increased contact resulting from the expiration of the emergency declaration in 77 counties. Observed mortality has thus far closely followed the median mortality prediction of the April 20th, 2020 whitepaper. While the models are capable of producing longer term forecasts, we feel that the situation is so dynamic that a focus on the immediate future is more useful and less subject to misinterpretation.

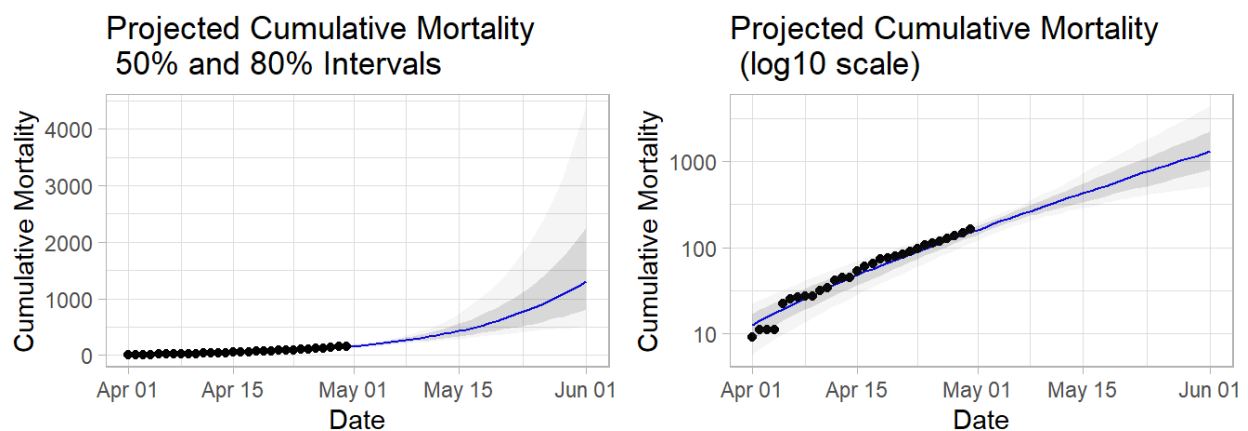


Figure 2: Linear and log scale cumulative mortality predictions for the month of May 2020 based on the pre-reopening status quo. Enough data has now been observed in Iowa that appealing to the experience of other states is no longer necessary to obtain usefully precise state-specific fits. These projections are based on the observed counts shown in black, and constitute the averaged predictions of four different Iowa-specific epidemic models, along with 50% and 80% credible intervals. The darker interval indicates 50% certainty that observed cumulative mortality will fall within the displayed range, while the lighter interval captures 80%.

Possible Reopening Impacts

On Friday, May 1st, 2020, policies concerning the closure of businesses and social distancing were partially relaxed in 77 of Iowa's 99 counties. Work is still underway to develop, test, and validate models of this change, however the effect is expected to slow the observed decline in the reproductive number, as epidemiologically significant contacts are expected to increase in much of the state. The full effects of reopening are not expected to be observed for several weeks; however, the predictions presented here should provide some context with which to interpret newly available case and mortality data.

*The empirically adjusted reproductive number is related to the "effective reproductive number", and attempts to account for changing intensity over time, the nonlinear effect of increasing infectious individuals on future spread, and potential model misspecification. It can be compared to one just like traditional R_0