COVID-19 Iowa Situation Assessment – 05/26/2020

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

- The social distancing policies that were enacted on March 17th in the State of Iowa, when a Public Health Disaster Emergency was declared by the Governor, substantially slowed the spread of COVID-19.
- Had the same social distancing policies been enacted one or two weeks later, assuming a comparable degree of adherence, the incidence of reported and unreported cases of COVID-19 would have been accelerated.
- Implementing the widespread use of face shields provides a recourse for safely relaxing social distancing measures during "reopening," even if the face shields offer small levels of protection.
- Hypothetically, if universal face shields had accompanied the enaction of social distancing policies, either the rate of increase in COVID-19 incidence would have been slowed, or a steady decrease in incidence would have materialized.
- If universal face shields offer high levels of protection, implementing them could rapidly and dramatically reduce the number of infections across the state, allowing society to reopen safely while continuing to decrease the number of new infections.

Introduction

This brief report provides an assessment of the efficacy of public health mitigation measures in slowing the spread of COVID-19 in the State of Iowa. Our analytical approach yields estimates of the epidemic trajectories for both reported and non-reported cases of COVID-19 for the first 35 days of the outbreak. We employ counterfactual reasoning, by comparing a scenario that

resembles what actually transpired during these initial 35 days to various hypothetical scenarios of potential interest.

We use model M3 (see our second report) trained on the data provided by IDPH on April 27th to evaluate the potential effects of the adoption of social distancing policies with or without the concurrent implementation of PPE in the form of universal face shields. We assess the impact of these measures at different dates, relative to the diagnosis of the first cases in the state.

Universal Face Shields

While testing in Iowa is increasing due to the TestIowa initiative, the joint testing and contact tracing capacity needed to safely reopen society requires considerable monetary and personnel resources and may not be available for some weeks to months. Further, as indicated by Perencevich et al. (2020, pE1), "countries where testing was not limited and containment was achieved, e.g., Singapore, have seen substantial second waves of infection and mandated extreme distancing interventions that the US and other countries are trying to scale back." Face shields are durable, easily cleaned, reduce the potential for autoinoculation by preventing the wearer from touching their face, and most importantly significantly reduce the amount of inhalation exposure to viruses (Perencevich et al., 2020; Lindsley et al., 2014).

We retrospectively assess the potential impact of implementing universal face shields in the State of Iowa under various scenarios. First, we consider the effect on incidence assuming that the adoption of face shields had occurred either (1) without the enaction of social distancing measures, or (2) concurrently with the enaction. Second, we consider the potential impact on incidence based on different efficacies from wearing a face shield. Here, efficacy is quantified in terms of the reduction in the probability that a susceptible-infective contact leads to a new transmission event. The values we report here reflect a conservative but plausible spectrum of effectiveness based on data from prior studies on face shields, in addition to assuming compliance ranges from 30% to 90%.

Social Distancing

Social distancing policies for the State of Iowa were enacted on March 17th when a Public Health Disaster Emergency was declared by the Governor. The first cases of COVID-19 in the state had been reported on March 8th. In modeling the incidence of COVID-19, the effects of social distancing policies on limiting social mixing are quantified in terms of the daily probability that an individual will self-quarantine.

Public health officials and scientists have hypothesized that the spread of COVID-19 would have been greatly accelerated if either (1) these social distancing policies had not been enacted, or (2) these policies had been enacted later. We attempt to retrospectively assess these scenarios, both with and without the adoption of universal face shields.

Results

Below, Figures 1-3 provide the estimated epidemic trajectories for both reported and non-reported cases for the first 35 days of the outbreak, beginning on the day that the first cases were reported in the State of Iowa (March 8th). Solid lines represent the estimated curve assuming no universal face shields (PPE), while dashed lines are based on the assumption that PPE is implemented universally. Black lines correspond to the assumption of no social distancing, while orange lines are based on the condition that social distancing is implemented at the same level that resulted

after the enaction of the March 17th policies. The left plots illustrate the effects of weak PPE efficacy of 25%; the right plots depict the effects of strong PPE efficacy at 75%. Figure 1 is based on the assumption that intervention measures were implemented one week after the report of the first cases, whereas Figures 2 and 3 consider two and three weeks afterwards, respectively. Thus, the solid orange curve in Figure 1 roughly approximates the estimated epidemic trajectory based on what actually transpired in the State of Iowa. ***It is important to note that these figures include both reported (i.e., lab-confirmed cases) and unreported cases as estimated from the mortality data.***

Conclusions

Our analyses lead to the following conclusions. First, the social distancing policies that were enacted statewide substantially slowed the spread of COVID-19. Second, if the same social distancing policies had been enacted one or two weeks later, assuming a comparable degree of adherence, the incidence of COVID-19 would have been accelerated. Third, if universal face shields had accompanied the enaction of social distancing policies, either the rate of increase in COVID-19 incidence would have been slowed, or a steady decrease in incidence would have resulted. Fourth, although the absence of social distancing measures would have led to a rapid acceleration of COVID-19 incidence, the use of face shields would have substantially slowed this acceleration. We thereby conclude that the widespread use of face shields provides a recourse for safely relaxing social distancing measures.

The relaxation of interventions to contain COVID-19 too early is expected to lead to a large increase in daily infections. Absent any additional measures to keep the outbreak from spreading, such an approach is still expected to yield more infections and hence deaths than more intensive interventions. Another “reopening” strategy would involve Iowans wearing universal face shields. If implemented statewide, this approach could allow interventions to be relaxed with marginal increases in infections even if face shields perform far worse than expected and are only 25% effective. If implementing face shields universally has an efficacy at the higher end of our plausible range, we could potentially return to a mostly pre-COVID policy status while still continuing to reduce the number of new infections.

We have implemented a publicly available web application that will allow IDPH and others to explore the impact of relaxing social distancing to various degrees on various dates, as well as implementing universal PPE with various efficacy at various dates. While the results in this report are based on the data provided to us by IDPH on April 27th, this web app is based on publicly available data in order to allow us a daily updated data stream. The web app will soon be available at https://covid-19.public-health.uiowa.edu.

References

Perencevich EN, Diekema DJ, Edmond MB. Moving personal protective equipment into the community: Face Shields and Containment of COVID-19. JAMA. Published online April 29, 2020. doi:10.1001/jama.2020.7477

Lindsley WG, Noti JD, Blachere FM, Szalajda JV, Beezhold DH. Efficacy of face shields against cough aerosol droplets from a cough simulator. J Occup Environ Hyg. 2014;11(8):509-518.

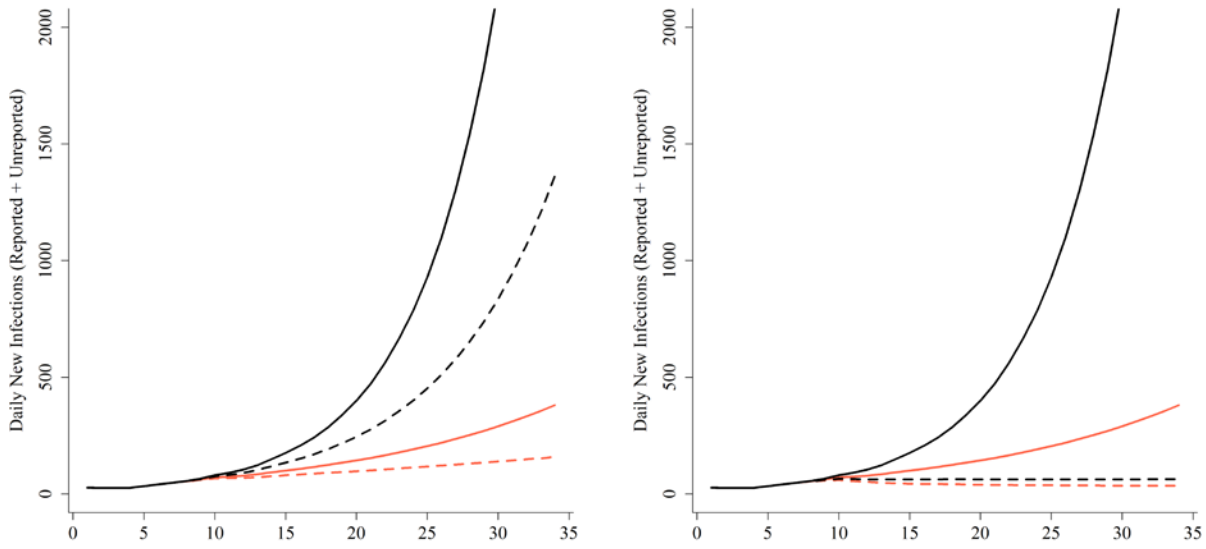

Figure 1. Initial epidemic trajectory for the State of Iowa under various mitigation strategies enacted one week after the first infection occurred. Solid lines correspond to no universal PPE, while dashed lines indicate that PPE is implemented universally. Black lines correspond to no social distancing, while orange lines correspond to implementing the post-March 17th level of social distancing in Iowa. The left (right) plot shows weak (strong) PPE efficacy of 25% (75%).

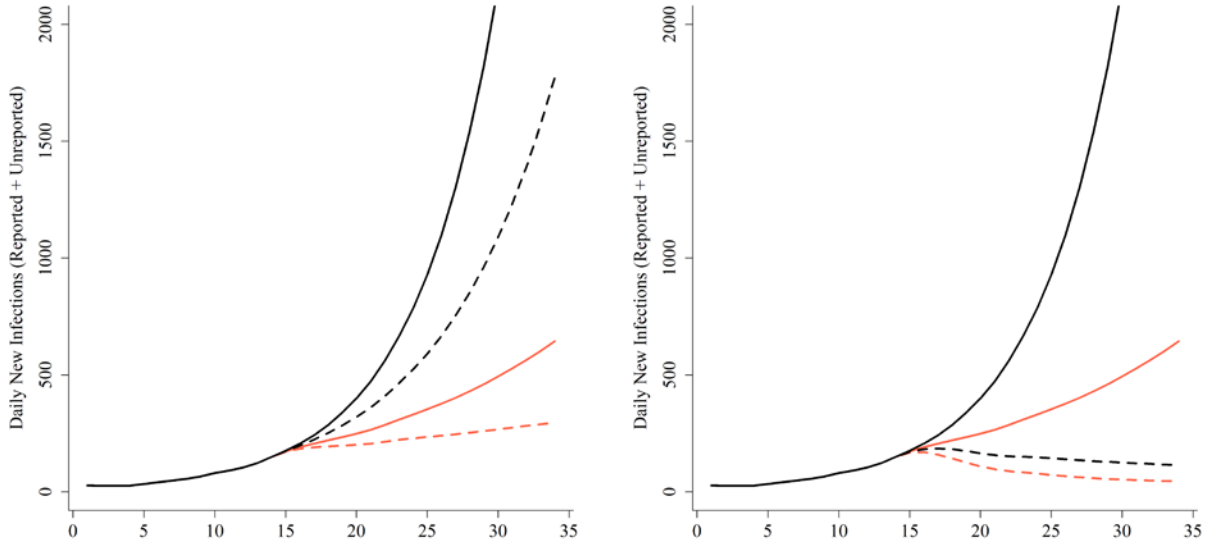

Figure 2. Initial epidemic trajectory for the State of Iowa under various mitigation strategies enacted two weeks after the first infection occurred. Solid lines correspond to no universal PPE, while dashed lines indicate that PPE is implemented universally. Black lines correspond to no social distancing, while orange lines correspond to implementing the post-March 17th level of social distancing in Iowa. The left (right) plot shows weak (strong) PPE efficacy of 25% (75%).

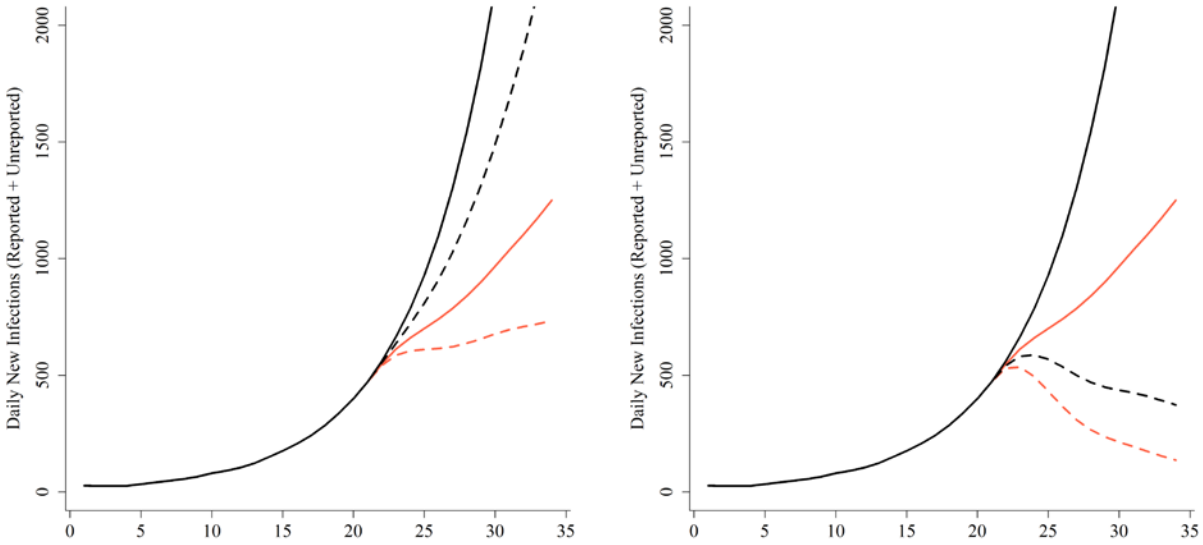

Figure 3. Initial epidemic trajectory for the State of Iowa under various mitigation strategies enacted three weeks after the first infection occurred. Solid lines correspond to no universal PPE, while dashed lines indicate that PPE is implemented universally. Black lines correspond to no social distancing, while orange lines correspond to implementing the post-March 17th level of social distancing in Iowa. The left (right) plot shows weak (strong) PPE efficacy of 25% (75%).