Diaries After the Lockdown[1]

A Quick Trip Across the Berkshires to Visit our (Pregnant) Daughter

December 11, 2020

Deborah and David are anxious to see their youngest daughter who has moved out of Brooklyn, is now pregnant, and has recently moved a second time. Maybe her new home in Northampton, a short and very pleasant drive across the Berkshires, can finally make a visit possible?

With the holidays upon us, it seems as if everyone has some person(s) that it is especially important to be in touch with. This year, for Deborah and me those persons are our youngest daughter and her family. Madeleine is a first-grade teacher in Brooklyn. Back in March she and her wife and toddler son mover out of Brooklyn to live with her in-laws in Rhode Island. Lots has happened since last March. Madeleine has continued to teach remotely. She has become pregnant, and just last week she and her family moved to Northampton, marking the spot in the Pioneer Valley that has become the target for their final exodus from Brooklyn.

Figure 1 Northampton is the home of Smith College as well as our daughter's new home

Through all these changes, we have not been able to keep in close touch. The move to Northampton opened a new idea. Northampton is a short one and a half hour hop for us over the Berkshires. Maybe we could devote one or our periodic "vagabonding" days to a quick in-and-out visit. Would that be safe? Would that be legal? Can we wait? Should we wait?

As Deborah and I here having these discussions, Ali, Dan, Babak, and I were approaching much the same issue from the point of view of refining some of the scenarios in Ali's model. We had been discussing a small set of equations in the model that depict several scenarios for a population's "natural" response to rising death rates from the COVID-19 pandemic (see the Diary entry of December 1 "What Causes the Shape of the Pandemic?" for more details). In a nutshell, these equations posit that human populations respond to a rising death rate by spontaneously reducing contacts and actions that increase infectivity. These natural responses are what keep the pandemic from exploding to infecting tens or even hundreds of millions of persons and hundreds of thousands or millions of deaths. These dynamic reactions are also basic causes of the repeating peaks in infections that we are now experiencing. Ali's earliest work

[1] You can access all of the "Diaries During Lockdown" here. "Diaries During Lockdown" is a network of professionally trained mathematical modelers (along with some of their friends and colleagues) who are using the tools of system dynamics and systems thinking to explain many of the complex choices facing individuals, organizations, and governments as we collectively grapple with the COVID19 pandemic. The apparent voice of this story is that of David Andersen, a retired Professor of System Dynamics and Public Policy who lives on New Fadum Farm. This voice is actually the synthesis of a number of different analysts and writers.

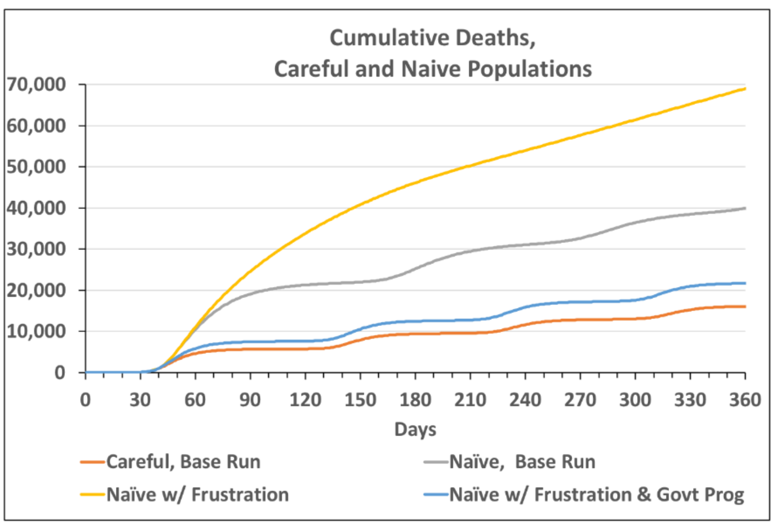
demonstrated how a simple set of assumptions about human behavior, backing off when death rate gets too high and relaxing when the death rate recedes, is a primary driver of recurring waves of the pandemic.

Over several weeks of online Zoom discussions, the four of us had been discussing ways that these original and "natural" responses may be emerging and developing during the pandemic. We discussed three new forces now at play.

(1) Compliance with public health authority directives. As the COVID-19 pandemic continued, public health services have developed a wide range of mandates to guide population behavior, with varying degrees of enforcement. People's compliance with these directives seems to vary from place to place and from time to time in ways that differ from what we had envisioned as the "natural" response.

(2) Development of Long-Term Frustration and Fatigue. Over time people's willingness to observe reasonable restrictions erodes as they seek to return to more "normal" levels and modes of interaction.

(3) Developing Safer Protocol-Driven Behavior. An important result of our reflections on the pandemic has been the development of protocols for managing our home "bubbles" and our social networks (see Diary entry of July 29, "Using the "Egg Club" Protocol to Promote Hospitality"). These complement the community and workplace-wide protocols that are determined by the public health authorities.



The accompanying figure illustrates how the nature of the population's responses to rising and falling death rates could shift the number of persons who die during the course of the pandemic. The lowest curve (red) represents a Careful population that routinely observes social distancing and hygiene protocols. The "Naïve" baseline curve (in gray) represents a population that responds in a laissez-fair or less strong manner to increases in the death rate (in Ali's model that we have been using all along, we referred to this as the "Scenario Two" population). Ali modified this basic scenario by adding some equations meant to simulating the behaviors of this naïve population who get frustrated by the social costs of distancing and hygiene restrictions over time and become less compliant the longer the restrictions persist. In addition, Ali speculated on what would happen if this naïve, frustrated population, were faced with a government (public health) program that vigorously enforces social distancing and hygiene practices. These scenarios are not based on calibrated data, but they do illustrate how the overall nature of a population's response, including compliance with government mandated programs and paying attention to carefully designed safety protocols, can save lives. Conversely, becoming frustrated and hence less diligent than even a naïve population creates a scenario that is very costly in terms of overall deaths. Not shown in this figure is the even better than "Careful" run that might occur if a careful and protocol-abiding population co-existed with a strong public health program of full-population testing and quarantining.

In the end, Deborah and I decided that it would be both legal and prudent to adapt the Egg Club Protocol in service of a fast in-and-out trip across the Berkshires. On a mild and sunny day, we drove 90 minutes across the Berkshires for a one hour walk on the campus of Smith College. We had a picnic lunch at a particularly long outside table that let our two parties stay six feet apart. We wore masks when we used the toilet in Madeleine's apartment. The time we spent together may have been drastically curtailed compared to a "normal" visit, but it was wonderful all the same!

This Story Has a Lesson: *Back in March, Ali's base model described several scenarios that encapsulated a theory of population reactions to rising deaths. These "natural" death-avoiding scenarios are key to understanding both why the pandemic did not explode to encompass the entire population, but also why it continues to present in successive waves of infection. We perceive three classes of population response: (1) Compliance with government regulations, (2) Developing long-term fatigue and frustration, and (3) Developing safer protocol-driven behaviors. In Ali's model, these scenarios can and do change the timing and magnitude of second and subsequent waves of the COVID-19 pandemic.*

***Technical Modeler's Notes**:*

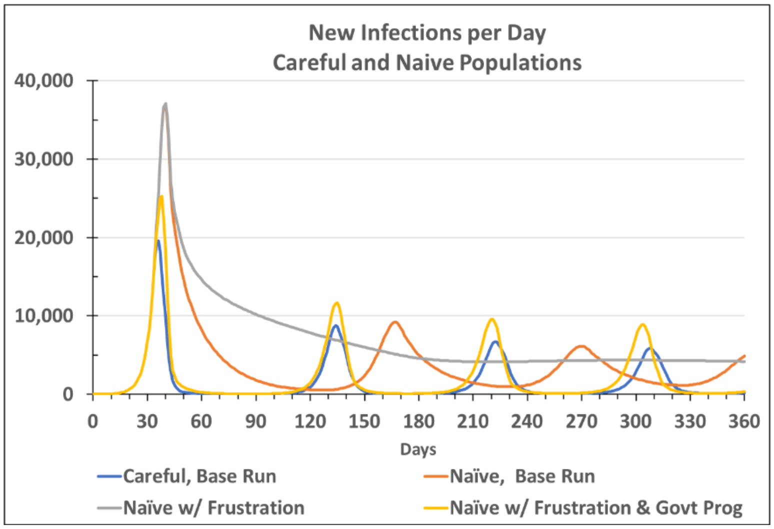
*1. **Ali's CORONA1 Model**. You can download and run Ali's model here:* CORONA1.mdl. Please right-click on the file and select "Save link as …" *You will need to download a free version of the simulation software VENSIMPLE to open and run this model.*

***2. Professional Presentations.** Ali's professional briefings with an introduction to his model and its conclusions can be found at Spread of Corona , Waves of Corona and Policies to control Corona.*

Read More to Dig Deeper

The infection rates, shown in the figure below, explain the large difference in cumulative deaths that are presented above. The base run with the careful population shows successive waves of infection, but they are relatively small and are quickly tamped down. The naïve population also shows waves, but they are higher and, very importantly, broader. That is, the total number of infections (the area under the curve) is a lot higher. Thus, the higher "total infections" manifests itself in the large differences in cumulative deaths. When the naïve population also responds to frustration, the first wave is very large and subsides only slowly. Even after it subsides, infections continue at a nearly constant rate that is quite high. The simulated public health intervention ("govt prog") overcomes the effect of frustration and drives the infection rate down almost to the rate of the careful population. (Disclaimer: that's not a guaranteed effect, of course. It depends on the program and how it's enforced. The simulation model does not specify those details.)

We present these simulation results with a large dose of caution and some major disclaimers. The figure above on cumulative deaths might be interpreted as showing that three quarters of COVID-19 deaths are attributable to a naïve or laissez-faire population's low response which is further diminished by long term frustration over social distancing. This inference is correct for Ali's model (or at least for some of the runs coming from Ali's model). But would it also hold in the world of New Fadum Farm—in Upstate New York in these United States? This is an empirical question that would require an extensive statistical analysis of population responses to the pandemic—a study that we have not done[2].



These simulations are a mathematically precise representation of the behavior of Ali's, Dan's, Babak's, and David's collective "mental models". Our simulation model is based on direct observations as well as on data-based empirical studies, but the model has not been calibrated using specific data from Albany County or New York or the United States or Iran. It would take a large social scientific study of population response—a study that may never happen—to get fully data-grounded answers.

All that said, it's not such a bad thing to rely on mental models that are informed by a complex simulation model that traces out consistently the implications over time of precisely specified scenarios. After all, these are the same mental models—incomplete though they may be—that we rely on each day to keep ourselves safe and well during this pandemic.

[2] When building mathematical models, careful attention to the overall purpose of the effort is key. The Diary entry of April 7, "When will this pandemic end?" points to a carefully calibrated simulation from Imperial College in London (https://www.imperial.ac.uk/media/imperial-college/medicine/sph/ide/gida-fellowships/Imperial-College-COVID19-Europe-estimates-and-NPI-impact-30-03-2020.pdf) that was designed with a purpose of estimating impacts of various policies on cumulative deaths. These researchers were trying to estimate the effectiveness, measured as the number of lives saved in twelve EU countries by a suite of "non pharmacological interventions" such as closing schools, shuttering businesses, maintaining social distance, and more severe 'lock down" policies. There calibrated simulations ran through the end of March and estimated that the total number of lives saved by such non-medical interventions to be around 59,000 by the first of April.