
Targeted Social Distancing Design for Pandemic Influenza

Robert J. Glass,* Laura M. Glass,† Walter E. Beyeler,* and H. Jason Min*

Targeted social distancing to mitigate pandemic influenza can be designed through simulation of influenza's spread within local community social contact networks. We demonstrate this design for a stylized community representative of a small town in the United States. The critical importance of children and teenagers in transmission of influenza is first identified and targeted. For influenza as infectious as 1957-58 Asian flu ($\approx 50\%$ infected), closing schools and keeping children and teenagers at home reduced the attack rate by $>90\%$. For more infectious strains, or transmission that is less focused on the young, adults and the work environment must also be targeted. Tailored to specific communities across the world, such design would yield local defenses against a highly virulent strain in the absence of vaccine and antiviral drugs.

At the start of an influenza pandemic, effective vaccine and antiviral drugs may not be available to the general population (1,2). If the accompanying illness and death rates of the virus strain are high, how might a community respond to protect itself? Closing roads, restricting travel, and community-level quarantine will enter discussions (3,4). However, within a community, influenza spreads from person to person through the social contact network. Therefore, understanding and strategically controlling this network during a period of pandemic is critical.

We describe how social contact network-focused mitigation can be designed. At the foundation of the design process is a network-based simulation model for the spread of influenza. We apply this model to a community of 10,000 persons connected within an overlapping, stylized, social network representative of a small US town. After study of the unmitigated transmission of influenza within the community, we change the frequency of contact within targeted groups and build combinations of strategies that

can contain the epidemic. Finally, we show how infectivity of the strain and underlying structure of the infectious contact network influence the design of social distancing strategies. In the absence of vaccine and antiviral drugs, design for specific communities would defend against highly virulent influenza.

Methods

The design process first creates an explicit social contact network in which persons are linked to others in a community. Spread of influenza within the network is then simulated by imposing behavioral rules for persons, their links, and the disease. These rules are modified to implement targeted mitigation strategies within the community, the effectiveness of which is evaluated (5).

Contact Network

A network is created by specifying groups of given sizes (or range of sizes) within which persons of specified ages interact (e.g., school classes, households, clubs). The average number of links per person within the group is also specified because cliques form or are imposed (e.g., seating in a classroom). This number is used to construct a within-group network that can take various forms. We used fully connected, random, or ring networks for each group. Random networks are formed by randomly choosing 2 persons within the group and linking them. This process is repeated until the number of links within the group yields the specified average (each person will have a different number of links). The ring is formed by first placing persons next to neighbors and linking them to form a complete circle. Additional links are then made to next nearest neighbors symmetrically around the ring. Finally, links within a group are given an average frequency of contact per day. With this approach, a network can be built from the experience of community members to exhibit the clustered yet small-world characteristics (6) and overlapping quality of a structured community (7,8).

*Sandia National Laboratories, Albuquerque, New Mexico, USA; and †Albuquerque Public High School, Albuquerque, New Mexico, USA



Interim Pre-pandemic Planning Guidance: Community Strategy for Pandemic Influenza Mitigation in the United States—

Early, Targeted, Layered Use of Nonpharmaceutical Interventions



The 2007 Origins of Forced School Closings and Mandatory Human Separation

aier.org/article/the-2007-origins-of-forced-school-closings-and-mandatory-human-separation

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Jeffrey A. Tucker

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The idea of a full lockdown of society in the event of a pandemic first emerged as an extremist proposal in 2006, issued by a computer scientist as part of George W. Bush's preparations for biowarfare. It provoked a fierce response by the world's leading epidemiologist Donald Henderson and his colleagues. That proposal, issued by Robert Glass under the influence of his daughter's high school science fair project (yes, it thanks Neil Ferguson for comments), would sit for 14 years before being deployed in some form during the political panic of March 2020.

The blueprint document – more moderate than the Glass paper but still draconian – that sat lying in wait in the intervening years was issued in February 2007: Interim Pre-pandemic Planning Guidance: Community Strategy for Pandemic Influenza Mitigation in the United States— Early, Targeted, Layered Use of Nonpharmaceutical Interventions.

This document introduced the new lexicon: Targeted Layered Containment (TLC), Non-Pharmaceutical Interventions (NPIs), Social Distancing, Flatten the Curve. By the middle of March 2020, all of these strange phrases were on the lips of every news broadcaster and politician.

It was new vocabulary for new times which rejected the non-government solutions used in every pandemic since World War II. Hereafter, government would be hands-on with precision policies that infringe on liberties and property, with the presumption that under emergency conditions, government can do essentially anything that it wants.

This document did not push a hard lockdown but it did call for closures of all schools and large events, in addition to:

Voluntary home quarantine of members of households with confirmed or probable influenza case(s) and consideration of combining this intervention with the prophylactic use of antiviral medications, providing sufficient quantities of effective medications exist and that a feasible means of distributing them is in place.

On its face, there is nothing inherently threatening about a voluntary home quarantine of the sick. All of this happens in any case, normally and naturally, in all seasons in which viruses and bacteria threaten health, which is to say always. It requires no governing directives. There is no reason for government to weigh in on the matter at all.

However, matters are different with other directives from this 2007 document, including:

* Dismissal of students from school (including public and private schools as well as colleges and universities) and school-based activities and closure of childcare programs, coupled with protecting children and teenagers through social distancing in the community to achieve reductions of out-of-school social contacts and community mixing.

* Use of social distancing measures to reduce contact between adults in the community and workplace, including, for example, cancellation of large public gatherings and alteration of workplace environments and schedules to decrease social density and preserve a healthy workplace to the greatest extent possible without disrupting essential services. Enable institution of workplace leave policies that align incentives and facilitate adherence with the nonpharmaceutical interventions (NPIs) outlined above.

While these measures might seem moderate by comparison to what happened in March 2020, these directives arguably led to lockdown just by the logic of intervention and the general theory that viruses should be defeated by overriding private decision-making and forced human separation.

In a market-based free society, everything is connected and one closure leads to another. Dismiss the schools and the kids hang out in malls, beaches, and parks. You have to close them to maintain distancing. If they stay home, they need a parent home, which puts pressure on businesses to close. If you are closing “large public gatherings” you still have a problem with churches, picnics, conventions of any size, and even large dinner parties. Transportation has to shut down, including flights, trains, and subways. A consistent application of the logic here – that the way to mitigate disease is to stay away from people – requires a complete shutdown of society.

And to what end? Epidemiologists will tell you that viruses don’t just get bored and go away. Natural immunity requires the building of antibodies to the virus. Then there is the option of vaccines, which have historically been long in the discovery, distribution, and administration. The first smallpox vaccine appeared in 1796; the disease wasn’t declared eradicated until 1980. But to the authors of the 2007 CDC directive, vaccines are the end game, even without evidence that they are possible in the case of new viruses such as COVID-19.

The point of closures, said the CDC, is to “delay the exponential growth in incident cases and shift the epidemic curve to the right in order to ‘buy time’ for production and distribution of a well-matched pandemic strain vaccine.”

To be sure, back in 2006 and 2007, there were plenty of serious protests against this whole line of thinking. Some experts called it disruptive, dangerous, and potentially calamitous, and pushed instead the old wisdom we had learned after World War II: disease mitigation efforts should be handled by medical professionals, not politicians. When the 1957-58 Asian flu broke out (eventually killing 116,000 Americans), for example, the *New York Times* expressed the common wisdom: “Let us all keep a cool head about Asian influenza as the statistics on the spread and the virulence of the disease begin to accumulate.” That was the one editorial the paper ran on the topic. It was the opposite of a media frenzy.

Lockdowns, as well as all this language and apparatus that amount to a primal scream to run and hide from the virus, were once considered bad law and bad medicine, and thus completely out of the question. The general rule was to stay calm, get immunities, and move forward with life without disruption. And there is where matters stood all these years, just waiting to be deployed by a handful of guardians of the strategy to undertake a great experiment in massive public control.

Beginning in January of this year, as news of COVID-19 was pouring out of Wuhan, China, many of those who were involved in crafting this policy in 2007 began to sense an opportunity. As the *New York Times* explains:

As the coronavirus emerged and headed toward the United States, an extraordinary conversation was hatched among an elite group of infectious disease doctors and medical experts in the federal government and academic institutions around the nation.

Red Dawn — a nod to the 1984 film with Patrick Swayze and Charlie Sheen — was the nickname for the email chain they built. Different threads in the chain were named Red Dawn Breaking, Red Dawn Rising, Red Dawn Breaking Bad and, as the situation grew more dire, Red Dawn Raging. It was hosted by the chief medical officer at the Department of Homeland Security, Dr. Duane C. Caneva, starting in January with a small core of medical experts and friends that gradually grew to dozens.

One of the most active participants on this thread was Carter Mecher, a Chicago physician who has long worked for the Veterans Administration as an advisor. He was actively involved in crafting the 2007 CDC document on school shutdowns and forced human separation.



Dr. Carter Mecher, front center, and the team that helped develop social distancing guidelines. via Carter Mecher

Mecher had been a convert to the ideas of Robert and Sarah Glass and their blueprint for full lockdown. With the Glass father and daughter out of the picture, it was left to Mecher to push hard for a new approach to handling viruses. He more than anyone in the email thread posted often and with rising passion.

On January 28, 2020, he sent the following note.

From: Carter Mecher

Sent: 28 Jan 2020, at 18:04

The chatter on the blogs is that WHO and CDC are behind the curve. I'm seeing comments from people asking why WHO and CDC seem to be downplaying this. I'm certainly no public health expert (just a dufus from the VA), but no matter how I look at this, it looks be bad. If we assume the same case ascertainment rate as the spring wave of 2009 H1N1, this looks nearly as transmissible as flu (but with a longer incubation period and greater R_0). The projected size of the outbreak already seems hard to believe

The following month, he was already talking up Non-Pharmaceutical Interventions, a broad phrase that can mean everything from voluntary self-quarantine all the way to full lockdown.

From: Carter Mecher

Sent: Monday, February 17, 2020 8:57 AM

NPIs are going to be central to our response to this outbreak (assuming our estimates of severity prove accurate). This email group has grown since we began (not quite epidemic-level growth, but getting there). Looking ahead, I anticipate we might encounter pushback over the implementation of NPIs and would expect similar concerns/arguments as were raised back in 2006 when this strategy first emerged.

The same day, Mecher began to promote the pro-lockdown work of Robert Glass:

“Lastly, another person, Bob Glass at Los Alamos, also did work on this separately from the MIDAS group. He actually began this work as part of a science fair project for his daughter (using social contacts of his daughter and her classmates at school to model disease transmission). He knew someone at VA who forwarded his work to us (chain of transmission). Early on (even before the MIDAS group modeled TLC), we had a Eureka moment when we graphed his data in Excel (can share that single graph to anyone interested).

After this, the tone and tenor of the group grew ever more fiery to the point of absolute frenzy. They needed the disease threat as intense as possible in order to kick off their plans, and they were probably sincere in believing it was time. As with any long email chain, there

eventually emerges one tone setting and driver of discussion. In this case, Mecher became the main voice for panic and immediate deployment of the shutting of schools and public events, leading to lockdowns all over the country. .

If you have any doubt that the main push for the lockdown was less about therapy than models, inspired by the fantasies of a computer scientist rather than a genuine expert in viruses, a social experiment conducted with disregard for freedom and the rule of law, a wild and foolhardy central plan hatched without regard to experience or serious medical science, this email chain as passionate demand to implement the 2007 CDC blueprint is the proof.

Now the architects of 2007 are working themselves to socially distance from the lockdowns that have wrought so much damage to the country. I'm not so sure if they can or deserve to be declared free of responsibility. How many terrible atrocities in wartime result from a policy that began with a promise of only surgical strikes and precision bombings with no other casualties? We see something similar taking place here. Culpability belongs to those who unleash violence in the name of peace, or health.

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I

Executive Summary

Purpose

This document provides interim planning guidance for State, territorial, tribal, and local communities that focuses on several measures other than vaccination and drug treatment that might be useful during an influenza pandemic to reduce its harm. Communities, individuals and families, employers, schools, and other organizations will be asked to plan for the use of these interventions to help limit the spread of a pandemic, prevent disease and death, lessen the impact on the economy, and keep society functioning. This interim guidance introduces a Pandemic Severity Index to characterize the severity of a pandemic, provides planning recommendations for specific interventions that communities may use for a given level of pandemic severity, and suggests when these measures should be started and how long they should be used. The interim guidance will be updated when significant new information about the usefulness and feasibility of these approaches emerges.

Introduction

The Centers for Disease Control and Prevention, U.S. Department of Health and Human Services in collaboration with other Federal agencies and partners in the public health, education, business, healthcare, and private sectors, has developed this interim planning guidance on the use of nonpharmaceutical interventions to mitigate an influenza pandemic. These measures may serve as one component of a comprehensive community mitigation strategy that includes both pharmaceutical and nonpharmaceutical

measures, and this interim guidance includes initial discussion of a potential strategy for combining the use of antiviral medications with these interventions. This guidance will be updated as new information becomes available that better defines the epidemiology of influenza transmission, the effectiveness of control measures, and the social, ethical, economic, and logistical costs of mitigation strategies. Over time, exercises at the local, State, regional, and Federal level will help define the feasibility of these recommendations and ways to overcome barriers to successful implementation.

The goals of the Federal Government's response to pandemic influenza are to limit the spread of a pandemic; mitigate disease, suffering, and death; and sustain infrastructure and lessen the impact on the economy and the functioning of society. Without mitigating interventions, even a less severe pandemic would likely result in dramatic increases in the number of hospitalizations and deaths. In addition, an unmitigated severe pandemic would likely overwhelm our nation's critical healthcare services and impose significant stress on our nation's critical infrastructure. This guidance introduces, for the first time, a Pandemic Severity Index in which the case fatality ratio (the proportion of deaths among clinically ill persons) serves as the critical driver for categorizing the severity of a pandemic. The severity index is designed to enable better prediction of the impact of a pandemic and to provide local decision-makers with recommendations that are matched to the severity of future influenza pandemics.

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Jeffrey A. Tucker