

Can We Create Strategic Lockdowns?



By *Chuck Dinerstein, MD, MBA* — November 20, 2020

There's no doubt that COVID-19 infections are spiking. State and local governments are introducing a range of lockdown strategies. Super spread is real, but it varies from place to place. So how do we decide where to draw the line? Are our leaders making this up as they go? A new paper may help science lead the way.



The Spanish Steps in Rome Image
courtesy of Bradiporap on Pixabay [1]

Lockdowns are nothing more than widespread, complete social distancing. The science here is clear that eliminating direct contacts significantly reduces disease transmission. But wholesale lockdowns based on geography, either citywide or by zip codes, result in a great deal of "collateral" damage to businesses who employ tight regulation and subsequently have lower transmission. Perhaps if we knew where people went and how long they spent, we might get a more nuanced understanding. That was the goal of this study reported in *Nature*.

The study combined two datasets. The first was census block groups (CBG), which provides location and income data at a very small, granular level, usually 3000 individuals. In contrast, zip code data involves a greater area and double the population. So, CBG is better, not best, in removing some variation. The second was mobile phone data, that voluntary track and trace system we have all signed onto. The researchers were able to consider 98 million users in 10 large cities throughout March to May 2020. They identified where they went, what they termed points of interest (POI), and those sites could be further identified as to the type of business and

their relative square footage. As an aside to the privacy concerned, that is a lot of information to have at one's fingertips.

They overlaid a SEIR infection model onto those census blocks, seeding the model with a uniform number of exposed individuals. The results of the model compared well to the observed data in each of those cities. That said, it is a model, and the relationships uncovered are more critical than the actual numbers.

Findings

- There were significant mobility reductions across all the cities.
- Earlier and greater mobility reductions reduced infections. For those requiring a political lens, closing travel to China was good; closing travel to Europe would have been better.

"if the mobility reduction in the Chicago metro area had been only one quarter as large, predicted infections would have increased by 3.3x, compared to a 1.5x increase had people begun reducing their mobility one full week later."

- Point of Interest (POI) destinations followed the Pareto Principle, where only a small number of venues accounted for most cases. Of course, the mix varied over time, as lesser transmitters replaced some super spreading closed businesses. But specific categories of businesses were the most problematic. The super-spreaders were those with the highest number of visitors per square foot and more extended stays – in essence, more and more prolonged direct contact. Restaurants led the way, along with fitness centers, cafes, hotels, and religious organizations.
- Targeted closure of high-transmission POI resulted in both reduced visits and infections. But here is the interesting finding, those changes were not linear, 1:1. Reduction in capacity to 20% yielded 80% fewer infections, and only 42% fewer visits. Reduced capacity decreases what we might term throughput; fewer people are there for shorter time periods. The other means of throughput reduction is to decrease hours – a reason for introducing curfews. [1]

"These results support earlier findings that precise interventions, like reducing maximum occupancy, may be more effective than less targeted measures, while incurring substantially lower economic costs."

- The researchers also looked at the effect of income on the transmission of infection. Even when the model began with equal numbers of infections, those census block groups at the lowest income levels developed more infections than those at the highest income levels. While we may posit many causes for this, the model only considered where we went and how long we stayed. Low-income individuals' mobility was not as reduced as those with higher income.
- It was more nuanced than simply not being able to work at home or have frontline jobs. Low-income individuals made more trips to grocery stores. Like restaurants, they are super spreader sites - perhaps because of transportation, an acknowledged difference in grocery shopping when stratified by income in studies that far preceded COVID-19. Additionally, their destinations, those points of interest, were more likely to be greater super spreaders than other businesses in the same category. Those aforementioned grocery stores in low-income

neighborhoods were smaller, with 59% more hourly visits per square foot, and customers stayed 17% longer.

"These findings highlight how fine-grain differences in mobility patterns—how often people go out and which POIs they go to—can ultimately contribute to dramatic disparities in predicted infection outcomes."

For those decrying the lack of transparency and science in lockdown decisions, here is science-based information. But applying it in a useful way is going to be more difficult. Targeted lockdowns may well save some businesses. But the ones at greatest financial risk often are super-spreaders – gym owners yelling more loudly and opening in defiance of government regulation doesn't make the science change, gyms have greater transmission rates. Same for religious centers, not everyone has the square footage of St. Peters. Many of our religious institutions are small and crowded on Sundays and holidays. Following the science says that they are super-spreaders despite the spiritual lift they provide.

Could Governor Cuomo, Mayor De Blasio, and a rising tide of governors have done a better job of communicating what they based their decision upon? Absolutely. But as much as I would like lockdowns to be more strategic, that requires policy fraught with nuance, and I am unsure whether central government can deliver on that or that local government has the information and resources to make those decisions wisely.

[1] Of course reduction in hours may result in more individuals trying to fill the remaining hours with no net improvement or even a worsening of transmission rates

Source: Mobility network models of COVID-19 explain inequities and inform reopening Nature
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