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Democracy Dies in Darkness

How digital data collection can help track covid-19 cases in real time

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Just as a downturn of confirmed cases of covid-19 and related hospitalizations is being seen in New York, there are increasing signs of new outbreaks in Philadelphia, Baltimore and the District of Columbia. That's a foreshadowing of the challenges for gaining control of the pandemic.

Americans can't stay in lockdown indefinitely. We need a plan to reopen the country, an exit ramp from our immobility and our severely injured economy. And we can get closer to finding one, if we take advantage of already available digital data.

Most of the plans for recovery hinge upon testing — both for the virus, to determine who has an infection, and for the antibodies to the virus, to determine who has recovered from it. But these important tests have major limitations. The test for the virus can produce false negative results. The antibody test is challenging because there is considerably cross-reactivity between covid-19 and four other coronaviruses, some of which cause common colds. Moreover, antibodies may or may not protect a person from spreading the virus or getting a second infection, and we have no idea how long they last. Finally, the logistics of getting a large proportion of 330 million Americans tested are obviously very difficult.

Consider another approach. This year our team at Scripps Research published a paper demonstrating the ability to predict hot spots for flu by means of a smartwatch or fitness band. For our study, we looked at data from more than 47,000 consistent Fitbit users in five states recorded over a two-year period. (The users' identities were not revealed to us.) The most important information was the resting heart rate, which we know is generally elevated before a fever as the body begins to mount a defense to infection. We found that when a cluster of people in one region showed heart-rate elevation, it predicted a subsequent rise in flu-like infections faster and better than models the Centers for Disease Control and Prevention currently use.

On another front, the makers of a smart thermometer owned by more than 1 million Americans have reported that their temperature data, automatically relayed to the Internet, can indicate where clusters of people with flu, and more recently covid-19 infections, are occurring.

Beyond that, Apple and Google are working on a contact-tracing app to alert people — on an opt-in basis — if they've been in touch with someone known to have the novel coronavirus. An active symptom-checker app is in development. Even data such as Google searches for "I can't smell" help to identify infection localities. Collectively, such measurements have the potential to achieve digital surveillance for most Americans because these strategies do not require everyone to participate. Like our traffic maps for driving, all we need are enough people's smartphone signals to give accurate guidance to all.

A couple of weeks ago, we launched an initiative called the DETECT study to capture smartwatch data — from almost any brand — to determine whether we'll be able to predict an emerging risk zone for covid-19 infections. Recently, inspired by our publication of the heart rate and flu detection study, Germany launched a smartwatch app backed by their national Robert Koch Institute; more than 160,000 people have already enrolled. A plan to capture body temperature is in the works.

The German case is noteworthy because of that country's strong privacy concerns and position on limiting digital data collection. In facing the pandemic, however, the trade-offs for digital tracking were seen as worthwhile. Americans, too, have good reason to be wary of tech companies obtaining or sharing their data. But with digital tracking, we could zoom in on a small cluster or community emitting a signal suggesting an early but emerging covid-19 outbreak and begin extensive screening. We could trace what happens when individuals who test positive for antibodies return to work and re-circulate. Tech companies can be forced to ensure that only users who choose to participate will share their data, and that the data will be anonymized and used only for coronavirus research. There is a risk that this trust will be violated — but Americans who willingly share their location so their phone apps can help them avoid a traffic jam might well think the risk, and the trade-offs, are worth it to halt a pandemic.

This year, some countries, such as South Korea, Taiwan, Singapore, Hong Kong and Iceland, successfully got ahead of the virus and contained their covid-19 outbreak. There has yet to be a precedent for any country preventing what is called the “second wave” — the expected reappearance of infections after the initial outbreaks subside.

No other method provides continuous, real-time monitoring of people besides digital technologies. In the United States we appear to be several weeks from a point of stability in the pandemic. To contemplate reopening our economy without putting public health at unnecessary risk, we need a practical strategy that exploits our digital infrastructure.