

Interlocking Decision Systems and Disparity

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The pandemic exacerbates inequalities in part due to public health mandates that forced independent decision systems to tightly interconnect. Systems that suddenly become closely dependent on each other can collide in unforeseen ways. Organizational scholars call the cascade of undesired results a "normal accident". We argue that the pandemic is accelerating decision system collisions creating normal accidents throughout the society. Everyone is susceptible to the virus however individual outcomes depend on interlocking choices across institutions. In this article, we focus on cascading decisions systems that create negative outcomes for essential workers. We equate increased exposure to the virus to augmented data privacy exposure.

Tightly Coupled Decision Systems

Charles Perrow in his 1999 book defined a "normal accident"¹ as the unlikely cascade of multiple assumptions towards a massive interconnected failure. No one error is uniquely notable but together they can create a disaster. Someone experiencing the accumulated impact of tightly coupled decisions systems may face a series of negative outcomes. Limiting the spread of infection demands the interconnection of algorithmic and data systems that normally do not closely integrate.

The pandemic requires institutions to make quick decisions over millions of patterns. Business, hospital, transportation, state regulatory, and local systems that are rarely entangled become interdependent in a public health crisis. The decision systems, that contribute to the unequal impact of the pandemic, tightly coupled unexpectedly. Far from a great equalizing disease, the coronavirus pandemic revealed disproportionate negative effects².

To show how these systems interconnect, we consider the plight of an essential worker trying to get assistance in March 2020. This case builds on the experiences of Jason Hargrove³, a

¹ Charles Perrow developed the concept of normal accidents to understand what happened in the Three Mile Island nuclear accident. The book describes how a series of small problems triggered the nuclear reactor meltdown. The closer systems were interconnected or "tightly coupled" the more likely the failure would propagate to another system. See Chapter 3 "Coupling, Complexity and Catastrophe." In *Normal accidents : living with high-risk technologies*.

² In early April 2020, Akilah Johnson and Talia Buford of ProPublica reported that 81% of the deaths in Milwaukee County were African American people, although they represent 26% of the population. See also *What the COVID-19 Pandemic Means for Black Americans - Scientific American Blog*. By Uché Blackstock on April 7, 2020. *The Importance of Equity in Contact Tracing* By Susan Landau, Christy E. Lopez, Laura Moy May 1 *Lawfare Blog*

³ On March 21, Jason Hargrove posted a video documenting his work conditions driving a public bus in Detroit

Detroit bus driver, who documented his work conditions in a widely-viewed video. As a frontline or essential worker, Hargrove had to interact with the public and could not deny service based on -- or even request information about -- the health of his passengers.

The definition of essential workers⁴ varies but what is clear is that these workers must interact with everyone who presents themselves at their workplace. Good service precludes them from even inquiring about whether a customer has the virus. In contrast, knowledge workers⁵ engage in technology intermediated work and exert control over their physical environment, including either working remotely or restricting their interactions with strangers. Many essential workers are employed in front line positions in the service sector.

We consider how decision patterns for COVID19 tests, medical triage, and contact tracing interconnect in ways that put the privacy and health of essential workers at risk.

Test Rationing

Tests for COVID19 were not widely available in early 2020, so testing⁶ was reserved for people who were older, traveled recently, or could verify they had been exposed. While all of these are neutral and reasonable positions, in concert these excluded people most likely to have contracted the disease through essential work.

Older people who had increased vulnerability to the regular flu were given priority, but this priority excludes frontline workers under retirement age. International travelers received tests, especially if they had visited certain locations. This restriction prioritizes people who could travel outside the United States. Another early hurdle for testing was access to a specialist through a primary care physician as mandated by the CDC. People with limited or basic health care may not have a primary care physician. Finally, people who could verify close contact with a coronavirus case received tests. This restriction again privileged workers who can control the people that enter their immediate vicinity. Furthermore, workers would need the power to compel identifying information from anyone in their workplace.

The transit worker may have been in close contact with a positive case but would not be able to verify that confirmed case. According to this testing scheme, the person who spent 10 hours flying from Europe on a private jet received a test instead of a bus driver who has spent 40

before shutdowns, masks, and screen shields were accepted public policy choices. Mr. Hargrove died three weeks after filming his video. <https://www.freep.com/story/news/local/michigan/detroit/2020/04/02/detroit-bus-drivers-dead-covid-19/5115450002/> <https://www.nytimes.com/2020/04/04/us/detroit-bus-driver-coronavirus.html>

⁴ Although each jurisdiction defined essential workers differently, they in general include grocery, transit, and health care workers. <https://www.washingtonpost.com/business/2020/04/12/grocery-worker-fear-death-coronavirus>

⁵ Essential workers are more likely to be Black and Hispanic people and have less access to working from home. <https://www.epi.org/blog/black-and-hispanic-workers-are-much-less-likely-to-be-able-to-work-from-home/>

⁶ This testing criteria is based on Verily the Google Risk Screening initiated March 16, 2020 that were based on CDC guidelines of the time. See Google site might get you a coronavirus test -- if you aren't sick - Los Angeles Times . <https://www.latimes.com/business/technology/story/2020-03-16/google-verily-website-tested-for-coronavirus> Verily's COVID-19 screening site goes live Ars Technica . Ron Amadeo Mar 16, 2020 <https://arstechnica.com/gadgets/2020/03/verilys-covid-19-screening-site-goes-live-is-already-over-capacity/>

hours a week driving the public.

Triage

Triage, the medical process of determining the allocation of scarce healthcare resources, ideally comprises straightforward calculations based on the condition of the patient; however, other factors can affect prioritization. Importantly, health care systems provide financial incentives for establishing multiple tiers of medical care in for-profit medicine which can skew algorithmic decisions. One health care algorithm⁷ equated spending as a proxy for severity of illness, inadvertently prioritizing more affluent patients.

Triage decisions based on the perceived or actual health of the patient can also be controversial. Some states planned to distribute ventilators based on quality of life which penalized those with chronic health conditions. The disability rights movement⁸ fought these triage plans since it would deny them access to ventilators and other emergency interventions.

In March, people with symptoms were not admitted to hospital⁹ to limit spread of infection. An essential worker may have received lower priority for a health care despite increased exposure and risk.

Contact Tracing

Contact tracing apps, based on the Google/ Apple Bluetooth standard¹⁰, track phones that have been within the same Bluetooth vicinity. Automated technologies, like phone-to-phone contact, assume that workers control their workplace environment and have access to their devices. Essential workers have greater exposure to a possible positive contact trace but also the least incentive to isolate after a positive contact trace. It also exposes their professional networks to their personal networks.

Contact tracing exercises an abundance of caution. This favors knowledge workers who can easily isolate while simultaneously penalizing service workers. If an essential worker does not have health insurance or sick leave, a forced quarantine means lost income. Contact tracing systems will overwhelm essential workers who serve an anonymous public in addition to exposing their personal privacy.

⁷ During the pandemic, affluent patients may have been more likely to be able to work from home and avoid exposure yet would have greater priority for care. Ziad Obermeyer et al., Dissecting racial bias in an algorithm used to manage the health of populations, *Science* 366, 447 (2019)

⁸ This also would have violated Americans with Disabilities Act of 1990 (ADA), 42 U.S.C. § 12101 National Council on Disability <https://www.ncd.gov/publications/2019/bioethics-report-series>. See also <https://www.washingtonpost.com/outlook/2020/04/06/coronavirus-ventilators-disabled-people/> Fair Allocation of Scarce Medical Resources in the Time of Covid-19. Ezekiel J. Emanuel et al. *New England Journal of Medicine* <https://www.nejm.org/doi/10.1056/NEJMs2005114>

⁹ The Baltimore Sun reported that a Detroit essential worker was unable to receive treatment or testing from four hospitals and was sent home despite symptoms. April 25 2020 Baltimore Sun <https://www.baltimoresun.com/ny-coronavirus-hospital-worker-died-denied-testing-20200425-wztp2n3djegbifukfb7edlapm-story.html>

¹⁰ Apple Specification Privacy-Preserving Contact Tracing www.apple.com/covid19/contacttracing Contact Tracing in the Real World. Ross Anderson. <https://www.lightbluetouchpaper.org/author/rja14/>

Summary

We outlined the disparate outcomes to essential workers of three decisions systems related to the pandemic. Each rule and convention are objective logical tests; however, when taken together from the perspective of someone who experiences multiple systems as a whole, these decision points accumulate to create unequal distribution of harms.

For this workshop, we invite participants in the Pandemic and Privacy workshop to reflect on how decisions systems interact. As more pandemic-related decisions become automated, Perrow's normal accident theory reminds us to watch for tightly coupled systems. The pandemic has shown the importance of having a single user's perspective in an attempt to evaluate the lived experience of multiple decision systems.

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