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## Research That Matters Column (March 2021)

### *'Building a better virus trap with AI'*

**By Jim Meek**

Canada's vaccine rollout has turned the nation's provinces into a series of living laboratories.

British Columbia wants to quickly vaccinate close-talkers (teachers, child-care staff, first responders) and chronic travellers (people who journey to-and-fro across Canada to work in remote industrial jobs.)

Quebec, a province *pas comme les autres* as a fact of history and matter of principle, led the country in taking two decisions that are now widely imitated – giving the AstraZeneca vaccine to seniors, and administering single doses to as many people as soon as possible.

The four Atlantic provinces, stars in the COVID-19 firmament, have achieved the lowest rates of infection among Canadian provinces. In rolling out vaccines, each province in the region is acting on variations of the same principle: Vaccinate the population from old and virus-vulnerable to young and virus-manacled.

James Hughes, a 30-something professor of computer science, watches these science experiments from his posting at Saint Francis Xavier University, and says everyone is acting on firm principles: Protect the vulnerable, vaccinate the peripatetic (potential super-spreaders), protect those whose job it is to protect us, and jab as many arms as possible to achieve herd immunity.

Still, Hughes believes the nation's public health leaders, the curious clique of celebrities created by COVID-19, might just build themselves a better virus trap if they deployed a little Artificial Intelligence (AI) in the rollout of vaccinations across Canada.

Last summer, Hughes decided to research the application of AI to COVID-19 vaccination programs, on the assumption that Canada might not have enough vaccine to go around. The hunch proved prophetic. We're short on supply, so much so that jingoistic Canadians (too numerous a species) have to concede defeat to the southern neighbour they love to scorn. As of March 22, the U.S. had delivered vaccine doses at a rate of more than one jab for every three people; the ratio in Canada was closer to one to eight.

Canada, then, must figure out who gets the vaccine first. Hughes thinks AI can help. “Our premise is that you could make more intelligent decisions by using AI to come up with vaccination strategies. Nothing that we would do is intended to replace the knowledge strategies that are in place. But we could advise further decision making.”

What’s missing today is “a full understanding of the social networks through which the virus spreads in a community.” Dr. Hughes and his team have simulated those networks to understand the contagion. The research has yielded some response strategies that are conventional enough – vaccinate people who meet a lot of other people, and travellers. Other results have been more surprising. Vaccines should not be offered first to people surrounded by virus spreaders. “Given how contagious the virus is, and its long incubation period, they have COVID-19 already or are about to get it. Vaccinate that person and you protect that person only. Vaccinate the right people and you protect numerous people.” Another important finding: If social distancing rules are ignored, the virus takes control no matter what strategy is deployed. (Anarchy, alas, is not the solution.)

Hughes and his SFX team write programs which create vaccine strategies to fight the contagion. “I write programs that write programs to solve problems,” he explained. Sounds complicated, but when you consider that Google maps can analyze traffic patterns in real time by tracking smart phones on the move, and tell you the best route to the Halifax airport from downtown, you start to understand how effective and dynamic AI can be. AI can get you to your airplane - or your vaccination appointment - on time if the data input is rich enough. AI could also zero in on transmission vectors (potential super spreaders), uncover neighbourhoods with clusters of COVID-19 cases, identify the vulnerable and come up with strategies to administer vaccines more nimbly than the virus itself finds its hosts.

AI is not likely to be widely used in combatting this COVID virus, but Hughes believes it can be effective the next time around. He also says privacy concerns raised by an AI-intensive approach to virus response efforts can be addressed. For my part, I’d wager many Canadians – a year into a pandemic that won’t go away - would trade some privacy rights in exchange for an efficient vaccine rollout program and some freedom to roam. After all, we’ve already yielded a few Charter rights to fight COVID-19 – starting with mobility rights and rights of assembly – and no one even bothers to complain that they’ve gone missing.

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