Fighting
COVID-19
Keeping Canada safe
during a global pandemic

AI and contact tracing: How to protect privacy while fighting the COVID-19 pandemic

Barry Sookman[1]

Introduction

COVID-19 is having a debilitating effect on people's health and their economic well-being. People are being forced by social distancing/isolating edicts and provincial emergency closure orders to stay home. As we slowly look like we may be emerging from the first wave of this health and economic emergency, people are rightly asking how we can gradually start to re-open the economy and resume "semblances of normalcy" without triggering substantial negative health rebounds or violating privacy norms or rights.

Governments, medical practitioners, researchers, policy-makers and others have been feverishly pursuing solutions to this challenge. Medical solutions such as vaccines and treatment methods, including the use of antibodies and experimental medications such as placenta-based cell-therapy (Jaffe-Hoffman 2020) are being pursued with understandable urgency. Testing for COVID-19 and persons with COVID-19 antibodies to identify lower risk groups of individuals for whom the emergency measures could be relaxed is an obvious strategy being debated (Watson 2020). German researchers are planning to introduce "immunity certificates" (Smith 2020), which theoretically could be used to identify some of these individuals. So far these conversations about testing have focused only on voluntary and not mandatory testing for the virus, thus not implicating privacy concerns, at least insofar as the testing results are used only for diagnosing and treating the individuals tested.

Artificial intelligence solutions

Artificial intelligence technologies are being used in varied ways to combat the pandemic (Obeidat 2020). For example, AI has been used to identify and track the spread of the virus. A Canadian company, BlueDot was among the first in the world to identify the emerging risk from COVID-19 in Hubei province (Bowles 2020) and to publish a first scientific paper on COVID-19, accurately predicting its global spread using its proprietary models. AI technologies such as chatbots are being used as virtual assistants to provide information about the virus.

AI is also been used to help diagnose the disease (Naudé 2020), including via the use of diagnostic robots (Singer 2020), to predict which patients will likely develop severe symptoms requiring treatment (Price 2020), to develop drugs (Marr 2020), and find cures including through literature searches for clues to cures buried in heaps of scientific literature (Mazhukhina 2020). Data-mining operations have been conducted on large datasets to build predictive computer models to provide real-time information about health services, showing where demand is rising and where critical equipment needs to be deployed (Lewis, Conn and Pegg 2020). AI has also found uses to monitor for crowd formations to help enforce social distancing rules (Prasad 2020). Some of these uses raise privacy compliance issues as they involve, amongst other things, the collection, use, aggregation, analysis and disclosure to third parties of datasets that may or may not include de-identified or re-identifiable data.

Other uses of AI for tracking and public surveillance purposes also raise privacy compliance issues and, depending on who is conducting these activities and the purposes, issues under the *Canadian Charter of Rights and Freedoms*. Tracking and surveillance such as using location data stored on or generated by smartphone use, scanning public spaces for people potentially affected using fever detecting infrared cameras, facial recognition and other computer vision surveillance technologies, are examples.

Contact tracing solutions

A solution that is increasingly being relied upon is COVID-19 contact tracing. Public Health Ontario defined contact tracing in an online notice linking to a Government of Canada website portal soliciting volunteers for the National COVID-19 Volunteer Recruitment Campaign as "a process that is used to identify, educate and monitor individuals who have had close contact with someone who is infected with a virus. These individuals are at a higher risk of becoming infected and sharing the virus with others. Contact tracing can help the individuals understand their risk and limit further spread of the virus" (Public Health Ontario 2020).

Contact tracing as an epidemic control measure is not new. It is infectious disease control 101 (Groch and Hope 2020), often deployed against other illnesses such as measles, SARS, typhoid, meningococcal disease and sexually transmitted infections like AIDS. The use of smartphone technologies (Farrahi, Emonet, and Cebrian 2014) and various other technologies to help identify and trace individuals with various diseases has also been proposed in connection with other diseases such as Ebola (Sacks et al. 2015).

Contact tracing using location tracking capabilities to combat COVID-19 has already been implemented in other countries such as South Korea and Taiwan (Timberg and Harwell 2020). It has also been deployed in China using a plugin App to the ubiquitous WeChat and Alipay Apps (Ferretti et al. 2020). The use was not compulsory, but its use was compulsory for people to move between certain areas and public spaces. A central database collected user data that was analyzed using AI tools.

Singapore deployed its TraceTogether mobile application to enable community-driven contact tracing, where participating devices exchange proximity information whenever an app detects another device with the TraceTogether app installed (see TraceTogether n.d.). It uses Bluetooth Relative Signal Strength Indicator (RSSI) readings between devices across time to approximate the proximity and duration of an encounter between two users. This proximity and duration information is stored in an encrypted form on a person's phone for 21 days on a rolling basis. No location data is collected. If a person unfortunately falls ill with COVID-19, the Ministry of Health (MOH) would work with the individual to map out 14 days' worth of activity, for contact tracing. And if the person has the TraceTogether app installed, he/she is required by law (TraceTogether 2020) to assist in the activity mapping of his/her movements and interactions and may be asked to produce any document or record in his/her possession including data stored by any apps in the person's phone.

The European Data Protection Supervisor (EDPS) has also called for a pan-European mobile app to track the spread of the virus in EU countries (Chee 2020).

It may not be realistically possible to stem the COVID-19 virus and return to a semblance of normalcy without using a sophisticated contact tracing technology. It would take an army of coronavirus trackers to attempt to curb the spread of the disease using traditional contact tracing techniques (Fox 2020). Further, even if contact tracing technologies would not replace humans, they could speed up the process of tracking down possibly infected contacts and play a vital role in controlling the epidemic. A research article published in *Science* concluded:

> that viral spread is too fast to be contained by manual contact tracing, but could be controlled if this process was faster, more efficient and happened at scale. A contact-tracing App which builds a memory of proximity contacts and immediately notifies contacts of positive cases can achieve epidemic control if used by enough people. By targeting recommendations to only those at risk, epidemics could be contained without need for mass quarantines ('lock-downs') that are harmful to society. (Ferretti et al. 2020)

> "It may not be realistically possible to stem the COVID-19 virus and return to a semblance of normalcy without using a sophisticated contact tracing technology.

Organizations, recognizing the challenges in combatting the pandemic, have started to propose privacy-sensitive mobile phone-based contact tracing solutions that could potentially be used in Canada. MIT researchers, for example, are developing a system that augments "manual" contact tracing by public health officials, while purporting to preserve the privacy of individuals (Foy 2020). The system relies on short-range Bluetooth signals emitted from people's smartphones. These signals represent random strings of numbers, likened to "chirps" that other nearby smartphones can remember hearing. If a person tests positive, he/she can upload the list of chirps the person's phone has put out in the past 14 days to a database. Other people can then scan the database to see if any of those chirps match the ones picked up by their phones. If there's a match, a notification will inform that person that they may have been exposed to the virus, and will include information from public health authorities on next steps to take.

Last week Google and Apple announced they are jointly launching a comprehensive solution that includes application programming interfaces (APIs) and operating system-level technology to assist in enabling contact tracing while reportedly maintaining strong protections for user privacy (Apple and Google 2020a). In May, both companies plan to release APIs that will enable interoperability between Android and iOS devices using apps from public health authorities. These official apps will be available for users to download via their respective

app stores. Later, Apple and Google will work to enable a broader Bluetooth-based contact tracing platform by building this functionality into the underlying platforms "that would allow more individuals to participate, if they choose to opt in, as well as enable interaction with a broader ecosystem of apps and government health authorities." According to Apple and Google "Privacy, transparency, and consent are of utmost importance in this effort, and we look forward to building this functionality in consultation with interested stakeholders. We will openly publish information about our work for others to analyze."

A diagram of how the Apple/Google solution is intended to work is shown below.

As part of the partnership, Google and Apple (2020b) released draft technical documentation including information on how user privacy will be maintained in their Bluetooth and cryptography specifications and framework documentation. The privacy enhancing features are described as "explicit user consent required," the solution "Doesn't collect personally identifiable information or user location data," people you've been in contact with never leave your phone, "People who test positive are not identified to other users, Google or Apple," and the app "Will only be used for contact tracing by public health authorities for COVID-19 pandemic management."

Diagram 1:
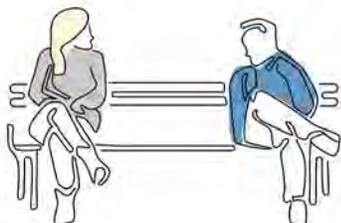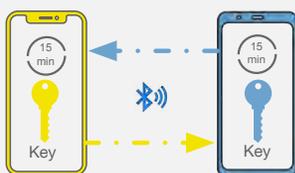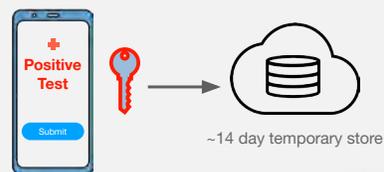
Source: Google, 2020.

The UK Government confirmed that the UK's National Health Service (NHS) is also working on a contact tracing system with two technology companies (Fingas 2020). NHSX, the technological branch of the NHS, has reportedly been working on the software alongside Apple and Google (Phelan 2020). Experts in clinical safety and digital ethics are also involved. Pre-release testing is scheduled for next week. Apple also launched COVID-19 screening tools (Robertson 2020) built in collaboration with the US Centers for Disease Control and Prevention (CDC), Federal Emergency Management Agency (FEMA), and the White House. It promises that the tools include "strong privacy and security protections" and that Apple will "never" sell the data it collects.

It is unclear what technological contact tracing technologies the governments of Canada, the provinces or organizations operating in Canada will deploy (Blackwell 2020). However, as contact tracing solutions using mobile phone technologies all involve at least some collection, use, and disclosure of personal data, their adoption will necessarily be influenced by a variety of factors including who implements the solutions (e.g., governments health authorities and/or private organizations), and whether the operators are subject to privacy laws, or are given any special immunities from liability under emergency orders.

Privacy law issues

Canada has a myriad of federal and provincial laws across the country that could apply to any proposed contact tracing solution. Much would depend on the public or private entities, or combinations of organizations, that would be involved.

Federally, the *Privacy Act* applies to departments and ministries of the Government of Canada. This legislation includes provisions that regulates the uses and disclosures of personal information under the control of the government institution. The *Privacy Act* applies to Health Canada. (Health Canada also regulates medical devices under the *Food and Drugs Act*. Consideration may need to be given as to whether a contract tracing system that can include software (SaMd) and medical device data systems (MDDS) requires Health Canada approval.) Canada's comprehensive privacy legislation *Personal Information Protection and Electronic Documents Act* could also be implicated if, for example, personal information is collected, used or disclosed by an organization in the course of commercial activities.

> " It is unclear what technological contact tracing technologies the governments of Canada, the provinces or organizations operating in Canada will deploy.

There are also a myriad of provincial laws that could apply. There are comprehensive privacy regimes in Quebec, Alberta, and British Columbia and health privacy laws such as those in the provinces of Ontario, New Brunswick, Newfoundland and Labrador and Nova Scotia. There are also privacy statutes that apply to provincial institutions. For example, in Ontario the *Personal Health Information Protection Act* applies to health information custodians that include physicians, hospitals, and medical officers of health. The *Municipal Freedom of Information and Protection of Privacy Act* applies to various institutions including municipalities and boards of health. There are statutory or common invasion of privacy laws across the country.

While there are some similarities between privacy laws across the country, there are also key differences. This includes differences in the standards for obtaining consents from individuals and the types of exemptions federal and provincial authorities and private organizations might look for. There is not, for example, a

common framework like there is in the European Union under the General Data Protection Regulation which contains specific exemptions for processing data (Cosgrave 2020), including when processing is necessary for reasons of substantial public interest (Muncaster 2020) and specific exemptions for health data. (This is one area that may be ripe for reform in Canada.)

There are numerous privacy considerations (Computational Privacy Group 2020) that could be taken into account in evaluating the adoption of technologies to tackle the COVID-19 epidemic. As for contact tracing technologies, the factors may include the architecture and protocols used by the solution, who has access to any data including public authorities and for what purposes, whether the use of the solution is voluntarily or mandatory, whether the data is encrypted, whether users are anonymous, what is revealed by infected users to individuals they come into contact with, whether the system can by exploited by external parties, and how reliable and secure the system is.

Concluding remarks

All Canadians must certainly share a common goal of overcoming this pandemic. Until a vaccine is publicly available, measures to resume at least some of the economic and other activities that have been shut down will need to be considered. It seems likely that innovative new technologies such as artificial intelligence and contact tracing technologies could be deployed to foster this.[2]

Artificial intelligence and contact tracing tools will not be the panacea that alone will solve this crisis. Artificial intelligence can be helpful, but one has to be cautious about evaluating over hyped claims (Heilweil 2020) about what AI can achieve and whether AI firms have the data and expertise to deliver on their promises. Experience with contact tracing such as in Singapore (Ng 2020) has shown shortcomings including the potential for not flagging cases where the virus has spread and producing false positives. Moreover, we won't be able to re-open the country without much more including widespread testing programs (Harris 2020).

Privacy laws should not impede uses of technologies that can help ameliorate this emergency situation and which maintain an appropriate balance of privacy interests. Privacy laws in Canada have always recognized the need for balancing of interests. Privacy, as a moral or legal principle, does not trump all other laws or interests.

Ethical arguments for using mobile phone based contact tracing in privacy sensitive ways were cogently expressly by the University of Oxford researchers of the *Science* research article referred to above:

> Successful and appropriate use of the App relies on it commanding well-founded public trust and confidence. This applies to the use of the App itself and of the data gathered. There are strong, well-established ethical arguments recognizing the importance of achieving health benefits and avoiding harm. These arguments are particularly strong in the context of an epidemic with the potential for loss of life on the scale possible with COVID-19. Requirements for the intervention to be ethical and capable of commanding the trust of the public are likely to comprise the following. i. Oversight by an inclusive and transparent advisory board, which includes members of the public. ii. The agreement and publication of ethical principles by which the intervention will be guided. iii. Guarantees of equity of access and treatment. iv. The use of a transparent and auditable algorithm. v. Integrating evaluation and research in the intervention to inform the effective management of future major outbreaks. vi. Careful oversight of and effective protections around the uses of data. vii. The sharing of knowledge with other countries, especially low- and middle-income countries. viii. Ensuring that the intervention involves the minimum imposition possible and that decisions in policy and practice are guided by three moral values: equal

moral respect, fairness, and the importance of reducing suffering. (Ferretti et al. 2020)

Some have argued that abridgements of privacy and democratic rights even in emergency situations create risks that measures may become permanent or be hard to reverse (Birnbaum and McCoy 2020). However, in a thoughtful article recently published in the *MIT Technology Review* by Genevieve Bell, the director of the Autonomy, Agency, and Assurance Institute at the Australian National University and a senior fellow at Intel, the author concludes that the present circumstances justify a response to this pandemic that should be subject to a sunset clause:

> The speed of the virus and the response it demands shouldn't seduce us into thinking we need to build solutions that last forever. There's a strong argument that much of what we build for this pandemic should have a sunset clause – in particular when it comes to the private, intimate, and community data we might collect. The decisions we make to opt in to data collection and analysis now might not resemble the decisions we would make at other times. Creating frameworks that allow a change in values and trade-off calculations feels important too.

> There will be many answers and many solutions, and none will be easy. We will trial solutions here at the ANU, and I know others will do the same. We will need to work out technical arrangements, update regulations, and even modify some of our long-standing institutions and habits. And perhaps one day, not too long from now, we might be able to meet in public, in a large gathering, and share what we have learned, and what we still need to get right—for treating this pandemic, but also for building just, equitable, and fair societies with no judas holes in sight. (Bell 2020)

About the Author

Barry Sookman is a member of the Macdonald-Laurier Institute's advisory council and senior partner with McCarthy Tétrault Technology Law Group. He is also a former leader of the firm's Intellectual Property Group and recognized as one of Canada's foremost authorities in information technology, copyright, Internet, privacy, data protection and cybersecurity, and anti-spam law. His work includes acting in connection with complex IT/IP transactions, such as outsourcings and in IT/IP litigation. He as argued numerous precedent-setting cases at all levels of courts, including the Supreme Court of Canada. Author of numerous books, including the leading seven-volume treatise *Computer, Internet and Electronic Commerce Law*, *Canadian and International Casebook*, *Copyright: Cases and Commentary on the Canadian and International Law*, and *Computer, Internet and E-Commerce Terms: Judicial, Legislative and Technical Definitions*. He is consistently identified by numerous publications as one of Canada's top information technology and intellectual property lawyers. He serves as an Adjunct Professor of intellectual property at Osgoode Law School and is a member of the PTIC Copyright Committee and on the advisory board of IP Osgoode. He was admitted to the Ontario Bar, 1982. He also blogs on intellectual property issues at barrysookman.com.

References

Apple and Google. 2020a. "Apple and Google partner on COVID-19 contact tracing technology." Apple Newsroom, April 10. Available at https://www.apple.com/newsroom/2020/04/apple-and-google-partner-on-covid-19-contact-tracing-technology/.

Apple and Google. 2020b. "Privacy-Preserving Contact Tracing." Available at https://www.apple.com/covid19/contacttracing/.

Bell, Genevieve. 2020. "We need mass surveillance to fight covid-19—but it doesn't have to be creepy." *MIT Technology Review*, April 12. Available at https://www.technologyreview.com/2020/04/12/999186/covid-19-contact-tracing-surveillance-data-privacy-anonymity/.

Birnbaum, Michael and Terrence McCoy. 2020. "As leaders seize powers to fight coronavirus, fear grows for democracy." *Washington Post*, April 12. Available at https://www.washingtonpost.com/world/the_americas/coronavirus-democracy-orban-hungary-surveillance-israel/2020/04/12/ecdff214-729b-11ea-ad9b-254ec99993bc_story.html.

Blackwell, Tom. 2020. "COVID-19 contact tracing: Canadian company says authorities not interested in app that could help with virus." *National Post*, April 8. Available at https://nationalpost.com/health/covid-19-contact-tracing-canadian-company-says-authorities-not-interested-in-app-that-could-help-with-virus.

Bowles, Jerry. 2020. "How Canadian AI start-up BlueDot spotted Coronavirus before anyone else had a clue." *Diginomica*, March 10. Available at https://diginomica.com/how-canadian-ai-start-bluedot-spotted-coronavirus-anyone-else-had-clue.

Chee, Foo Yun. 2020. "EU privacy watchdog calls for pan-European mobile app for virus tracking." *Reuters*, April 6. Available at https://www.reuters.com/article/us-health-coronavirus-tech-privacy/eu-privacy-watchdog-calls-for-pan-european-mobile-app-for-virus-tracking-idUSKBN21O1KJ.

Computational Privacy Group. 2020. "Evaluating COVID-19 contact tracing apps? Here are 8 privacy questions we think you should ask." Computational Privacy Group. Available at https://cpg.doc.ic.ac.uk/blog/evaluating-contact-tracing-apps-here-are-8-privacy-questions-we-think-you-should-ask/.

Cosgrave, Cathy. 2020. "COVID-19 response and data protection law in the EU and US." International Association of Privacy Professionals, March 11. Available at https://iapp.org/news/a/covid-19-response-and-data-protection-law-in-the-eu-and-us/.

Farrahi, Katayoun, Rémi Emonet, and Manual Cebrian. 2014. "Epidemic Contact Tracing via Communication Traces." *PLoS One*, 9, 5, May 1. Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4006791/.

Ferretti, Luca, Chris Mymant, Michelle Kendall, Lele Zhao, Anel Nurtay, Lucie Abeler-Dörner, Michael Parker, David Bonsall, Christopher Fraser. 2020. "Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing." *Science*, March 31. Available at https://science.sciencemag.org/content/early/2020/04/09/science.abb6936.

Fingas, Jon. 2020. "Apple, Google reportedly team with UK's NHS on COVID-19 tracing app (updated)." Engadget, April 12. Available at https://www.engadget.com/nhs-apple-google-covid-19-app-164752722.html.

Fox, Maggie. 2020. "'We need an army': Hiring of coronavirus trackers seen as key to curbing disease spread." *Stat News*, April 13. Available at https://www.statnews.com/2020/04/13/coronavirus-health-agencies-need-army-of-contact-tracers/.

Foy, Kylie. 2020. "Bluetooth signals from your smartphone could automate Covid-19 contact tracing while preserving privacy." *MIT News*, April 8. Available at http://news.mit.edu/2020/bluetooth-covid-19-contact-tracing-0409.

Google. 2020. "Privacy-safe contact tracing using Bluetooth Low Energy." Google Blog. Available at https://www.blog.google/documents/57/Overview_of_COVID-19_Contact_Tracing_Using_BLE.pdf.

Groch, Sherryn and Zach Hope. 2020. "Contact tracing: How disease detectives are closing in on COVID-19 in Australia." *Sydney Morning Herald*, April 11. Available at https://www.smh.com.au/national/contact-tracing-how-disease-detectives-are-closing-in-on-covid-19-in-australia-20200410-p54itv.html.

Harris, Drew. 2020. "We can't reopen the country without a strong COVID-19 testing program. Here's how to do it." *Philadelphia Inquirer*, April 13. Available at https://www.inquirer.com/health/coronavirus/coronavirus-covid19-antibody-testing-reopen-business-20200413.html.

Heilweil, Rebecca. 2020. "Don't expect AI to solve the coronavirus crisis on its own." *Vox*, April 13. Available at https://www.vox.com/recode/2020/4/13/21214948/coronavirus-covid-cure-treatment-artificial-intelligence.

Jaffe-Hoffman, Maayan. 2020. "Israeli COVID-19 treatment shows 100% survival rate - preliminary data." *Jerusalem Post*, April 12. Available at https://www.jpost.com/HEALTH-SCIENCE/Israeli-COVID-19-treatment-shows-100-percent-survival-rate-preliminary-data-624058.

Lewis, Paul, David Conn and David Pegg. 2020. "UK government using confidential patient data in coronavirus response." *The Guardian*, April 12. Available at https://www.theguardian.com/world/2020/apr/12/uk-government-using-confidential-patient-data-in-coronavirus-response.

Marr, Bernard. 2020. "Coronavirus: How Artificial Intelligence, Data Science And Technology Is Used To Fight The Pandemic." *Forbes*, March 13. Available at https://www.forbes.com/sites/bernardmarr/2020/03/13/coronavirus-how-artificial-intelligence-data-science-and-technology-is-used-to-fight-the-pandemic/#5644653b5f5f.

Mazhukhina, Karina. 2020. "How AI is helping scientists in the fight against COVID-19, from robots to predicting the future." *Geekwire*, April 8. Available at https://www.geekwire.com/2020/ai-helping-scientists-fight-covid-19-robots-predicting-future/amp/.

Muncaster, Phil. 2020. "EU Privacy Tsar Calls for Europe-Wide #COVID19 Tracking App." *Infosecurity*, April 8. Available at https://www.infosecurity-magazine.com/news/eu-privacy-tsar-europe-wide#disqus_thread.

Naudé, Wim. 2020. "Artificial Intelligence against COVID-19: An Early Review." Towards data science, April 1. Available at https://towardsdatascience.com/artificial-intelligence-against-covid-19-an-early-review-92a8360edaba.

Ng, Alfred. 2020. "Tech isn't solution to COVID-19, says Singapore director of contact tracing app." *CNet*, April 13. Available at https://www.cnet.com/news/director-behind-singapores-contact-tracing-app-says-tech-isnt-the-solution-to-covid-19/.

Obeidat, Samer. 2020. "How Artificial Intelligence Is Helping Fight The COVID-19 Pandemic." *Entrepreneur*, March 30. Available at https://www.entrepreneur.com/amphtml/348368.

Robertson, Adi. 2020. "Apple responds to senators' privacy fears over COVID-19 screening tools." *The Verge,* April 13. Available at https://www.theverge.com/2020/4/13/21219786/apple-coronavirus-covid-19-screening-app-site-senate-privacy-questions-letter-response.

Phelan, David. 2020. "COVID-19: U.K. Government Unveils NHS Contact-Tracing Phone App As Next Step In Fighting Disease." *Forbes*, April 12. Available at https://www.forbes.com/sites/davidphelan/2020/04/12/covid-19-uk-government-unveils-contact-tracing-phone-app-as-next-step-in-fighting-disease/#395e722539ac.

Public Health Ontario. 2020. "COVID-19 Contact Tracing Initiative." Public Health Ontario. Available at https://www.publichealthontario.ca/en/diseases-and-conditions/infectious-diseases/respiratory-diseases/novel-coronavirus/contact-tracing-initiative.

Prasad, Rachita. 2020. "L&T uses artificial intelligence to help 20 cities combat Covid-19." *Economic Times*, April 10. Available at https://m.economictimes.com/tech/ites/lt-uses-artificial-intelligence-to-help-20-cities-combat-covid-19/amp_articleshow/75073867.cms.

Price, Stephanie. 2020. "How Artificial Intelligence is helping the fight against COVID-19." *Health Europa*, April 8. Available at https://www.healtheuropa.eu/how-artificial-intelligence-is-helping-the-fight-against-covid-19/99258/.

Sacks, Jillian, Elizabeth Zehe, Cindil Redick, Alhoussaine Bah, Kai Cowger, Mamady Camara, Aboubacar Diallo, Abdel Nasser Iro Gigo, Ranu S Dhillon and Anne Liu. 2015. "Open Access Introduction of Mobile Health Tools to Support Ebola Surveillance and Contact Tracing in Guinea." *Global Health: Science and Practice*, December, 3, 4. Available at https://www.ghspjournal.org/content/3/4/646?utm_source=TrendMD&utm_medium=cpc&utm_campaign=Global_Health%253A_Science_and_Practice_TrendMD_0.

Singer, Wendy. 2020. "Israeli Innovators Harness Artificial Intelligence Technologies To Curb The Global COVID-19 Pandemic." *Forbes*, April 13. Available at https://www.forbes.com/sites/startupnationcentral/2020/04/13/israeli-startups-artificial-intelligence-covid19-coronavirus/#25be80784567.

Smith, Lydia. 2020. "Germany to introduce coronavirus 'immunity certificates' for recovered public." *Newsweek*, March 30. Available at http://www.newsweek.com/germany-antibodies-tests-general-public-immunity-certificates-1494934?amp=1.

Timberg, Craig and Drew Harwell. 2020. "Government efforts to track virus through phone location data complicated by privacy concerns." *Washington Post*, March 19. Available at https://www.washingtonpost.com/technology/2020/03/19/privacy-coronavirus-phone-data/.

TraceTogether. 2020. "Can I say no to uploading my TraceTogether data when contacted by the Ministry of Health?" TraceTogether, March. Available at https://tracetogether.zendesk.com/hc/en-sg/articles/360044860414-Can-I-say-no-to-uploading-my-TraceTogether-data-when-contacted-by-the-Ministry-of-Health-.

TraceTogether. n.d. "How TraceTogether works." TraceTogether. Available at https://www.tracetogether.gov.sg.

Watson, William. 2020. "Economists to world: Assume a cheap, easy COVID-19 test." *National Post*, April 11. Available at https://business.financialpost.com/news/opinion-the-world-must-adopt-a-simple-covid-19-test-and-economists-know-it.

Endnotes

1   This paper first appeared on barrysookman.com.

2   For other posts about COVID-19, I encourage you to visit the McCarthy Tétrault LLP COVID-19 hub at https://www.mccarthy.ca/en/about/news-and-announcements/covid-19-latest-updates-and-legal-considerations-your-business.
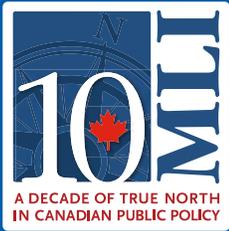
Critically Acclaimed, Award-Winning Institute

The Macdonald-Laurier Institute fills a gap in Canada's democratic infrastructure by focusing our work on the full range of issues that fall under Ottawa's jurisdiction.

- One of the top five think tanks in Canada and No. 1 in Ottawa according to the University of Pennsylvania.

- Cited by five present and former Canadian Prime Ministers, as well as by David Cameron, the British Prime Minister.

- First book, *The Canadian Century: Moving out of America's Shadow*, won the Sir Antony Fisher International Memorial Award in 2011.

- *Hill Times* says Brian Lee Crowley is one of the 100 most influential people in Ottawa.

- The *Wall Street Journal*, the *Economist*, the *Globe and Mail*, the *National Post* and many other leading national and international publications have quoted the Institute's work.

"The study by Brian Lee Crowley and Ken Coates is a 'home run'. The analysis by Douglas Bland will make many uncomfortable but it is a wake up call that must be read."

FORMER CANADIAN PRIME MINISTER PAUL MARTIN ON MLI'S PROJECT ON ABORIGINAL PEOPLE AND THE NATURAL RESOURCE ECONOMY.

Ideas Change the World

Independent and non-partisan, the Macdonald-Laurier Institute is increasingly recognized as the thought leader on national issues in Canada, prodding governments, opinion leaders and the general public to accept nothing but the very best public policy solutions for the challenges Canada faces.

About the Macdonald-Laurier Institute

What Do We Do?

When you change how people think, you change what they want and how they act. That is why thought leadership is essential in every field. At MLI, we strip away the complexity that makes policy issues unintelligible and present them in a way that leads to action, to better quality policy decisions, to more effective government, and to a more focused pursuit of the national interest of all Canadians. MLI is the only non-partisan, independent national public policy think tank based in Ottawa that focuses on the full range of issues that fall under the jurisdiction of the federal government.

What Is in a Name?

The Macdonald-Laurier Institute exists not merely to burnish the splendid legacy of two towering figures in Canadian history – Sir John A. Macdonald and Sir Wilfrid Laurier – but to renew that legacy. A Tory and a Grit, an English speaker and a French speaker – these two men represent the very best of Canada's fine political tradition. As prime minister, each championed the values that led to Canada assuming her place as one of the world's leading democracies. We will continue to vigorously uphold these values, the cornerstones of our nation.

SIR JOHN A. MACDONALD   SIR WILFRID LAURIER

Working for a Better Canada

Good policy doesn't just happen; it requires good ideas, hard work, and being in the right place at the right time. In other words, it requires MLI. We pride ourselves on independence, and accept no funding from the government for our research. If you value our work and if you believe in the possibility of a better Canada, consider making a tax-deductible donation. The Macdonald-Laurier Institute is a registered charity.

Our Issues

The Institute undertakes an impressive program of thought leadership on public policy. Some of the issues we have tackled recently include:

- Aboriginal people and the management of our natural resources;

- Making Canada's justice system more fair and efficient;

- Defending Canada's innovators and creators;

- Controlling government debt at all levels;

- Advancing Canada's interests abroad;

- Ottawa's regulation of foreign investment; and

- How to fix Canadian health care.
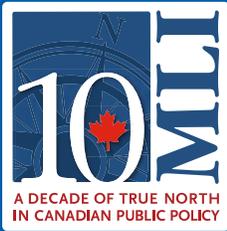
CONTACT US: Macdonald-Laurier Institute
323 Chapel Street, Suite #300
Ottawa, Ontario, Canada
K1N 7Z2

TELEPHONE: (613) 482-8327

WEBSITE: www.MacdonaldLaurier.ca

CONNECT WITH US:

@MLInstitute

www.facebook.com/
MacdonaldLaurierInstitute

www.youtube.com/
MLInstitute

What people are saying about the Macdonald-Laurier Institute

In five short years, the institute has established itself as a steady source of high-quality research and thoughtful policy analysis here in our nation's capital. Inspired by Canada's deep-rooted intellectual tradition of ordered liberty – as exemplified by Macdonald and Laurier – the institute is making unique contributions to federal public policy and discourse. Please accept my best wishes for a memorable anniversary celebration and continued success.

THE RIGHT HONOURABLE STEPHEN HARPER

The Macdonald-Laurier Institute is an important source of fact and opinion for so many, including me. Everything they tackle is accomplished in great depth and furthers the public policy debate in Canada. Happy Anniversary, this is but the beginning.

THE RIGHT HONOURABLE PAUL MARTIN

In its mere five years of existence, the Macdonald-Laurier Institute, under the erudite Brian Lee Crowley's vibrant leadership, has, through its various publications and public events, forged a reputation for brilliance and originality in areas of vital concern to Canadians: from all aspects of the economy to health care reform, aboriginal affairs, justice, and national security.

BARBARA KAY, NATIONAL POST COLUMNIST

Intelligent and informed debate contributes to a stronger, healthier and more competitive Canadian society. In five short years the Macdonald-Laurier Institute has emerged as a significant and respected voice in the shaping of public policy. On a wide range of issues important to our country's future, Brian Lee Crowley and his team are making a difference.

JOHN MANLEY, CEO COUNCIL