Voluntary Smartphone Apps for COVID-19 Contact Tracing

Disclaimer:
This Quick Response Report was published on June 8, 2020. Given the rapidly changing nature of the coronavirus pandemic, some of the references included in this report may quickly become out-of-date. We further caution readers that researchers at the Newfoundland & Labrador Centre for Applied Health Research are not experts on infectious diseases and are relaying work produced by others. This report has been produced quickly and it is not exhaustive, nor have the included studies been critically appraised.

Original Inquiry
What information and guidance can be provided about the use of voluntary smartphone apps for COVID-19 contact tracing?

Summary
The first section of this report provides information about smartphone apps for contact tracing. In Canada, Alberta is the only province currently using a smartphone app for COVID-19 contact tracing. The second section of this report contains links to nine guidance documents, one pre-print systematic review, two systematic reviews that are currently in progress, four other evidence reviews, six expert opinion pieces, fifteen primary research studies, and eleven news articles.

Note: In 2017, 78% of all Canadians owned a smartphone as did 76% of Atlantic Canadians. Specific data for NL were not available. LINK

COVID-19 Contact Tracing Apps by Jurisdiction

Canada
Government of Alberta. ABTraceTogether. LINK
- If a user tests positive for COVID-19, sharing of data with contact tracers is voluntary.
- Related:
  - FAQ page: LINK
Australia

Australian Government. COVIDSafe App. [LINK]
- The COVIDSafe App uses Bluetooth signal to record when two users of the app are in close contact. State and Territory health officials can contact app users who have been in close contact with someone who tests positive for COVID-19.
- Related:
  - Prime Minister of Australia. COVIDSafe: New App to Slow the Spread of Coronavirus. April 26, 2020. [LINK]
  - Detailed FAQ Page: [LINK].
  - More information: [LINK].

France

- Related:
  - Inria. The StopCovid project-team and the ecosystem of contributors are working together to develop a mobile contact tracing app for France. April 26, 2020. [LINK]; Press release: [LINK]
  - BBC. Coronavirus: France's virus-tracing app 'off to a good start'. June 3, 2020. [LINK]

Germany

- Related:
  - Foreign Policy. Germany’s Angst Is Killing Its Coronavirus Tracing App. May 8, 2020. [LINK]
  - Reuters. Germany flips to Apple-Google approach on smartphone contact tracing. April 26, 2020. [LINK]
  - NPR. In Germany, High Hopes For New COVID-19 Contact Tracing App That Protects Privacy. April 2, 2020. [LINK]

Iceland

Director of Public Health. Trace C-19 (or Rakning C-19). [LINK]
- Related:
  - MIT Technology Review. Nearly 40% of Icelanders are using a COVID app—and it hasn’t helped much. May 11, 2020. [LINK]
    - The app gained traction quickly being downloaded by 38% of the population (according to MIT Technology Review’s COVID Tracing Tracker), however, its impact has been limited.

New Zealand

Ministry of Health. NZ COVID Tracer app. [LINK]
- Related:
  - RNZ. COVID-19 tracing app launched earlier than expected. May 19, 2020. [LINK]
NZ Herald. COVID-19 coronavirus: 'Digital diary' tracing app trips up; users unable to log on, 'can't use it'. May 20, 2020. LINK

Singapore
TraceTogether. LINK; FAQ Page: LINK; Privacy Information: LINK

- Related:
  - Straits Times. About 1 million people have downloaded TraceTogether app, but more need to do so for it to be effective: Lawrence Wong. April 1, 2020. LINK

Switzerland

- Related:
  - A public security test for the SwissCovid app is currently ongoing prior to launch: LINK

United States
CDC. Health Departments: Interim guidance on developing a COVID-19 case investigation & contact tracing plan. May 15, 2020. LINK


Related: Applications currently in development
- PACT: Private Automated Contact Tracing. LINK
- CoEpi: Community Epidemiology in Action. LINK
- Covid Watch. LINK

Guidance Documents
International
- WHO. Ethical considerations to guide the use of digital proximity tracking technologies for COVID-19 contact tracing. May 28, 2020. LINK
  - Related: COVID-19 Apps Pose Serious Human Rights Risks LINK
European Union

- Vokinger et al. (Switzerland). Digital health and the COVID-19 epidemic: an assessment framework for apps from an epidemiological and legal perspective. May 17, 2020. LINK

United States

- American Civil Liberties Union. The Limits of Location Tracking in an Epidemic. April 8, 2020. LINK

Systematic Reviews

- Preprint- not yet peer-reviewed
- Lack of evidence for effectiveness (i.e., contact identification, transmission reduction).
- Some studies suggest “controlling COVID-19 requires high population uptake of automated contact-tracing apps (estimates from 56% to 95%), typically alongside other control measures.”

In Progress


Other Evidence Reviews

- “Potential to address traditional contact tracing’s limitations of scalability, notification delays, recall errors and contact identification in public spaces.”
- “Depends on widespread use of individual apps and the ability of their underlying technologies to identify nearby phones.”
- “Use of contact-tracing apps brings inherent trade-offs between privacy and effectiveness.”

• “Key findings: There is an absence of evidence to support the immediate national deployment of symptom tracking applications, digital contact tracing applications and digital immunity certificates.”

• Provides a brief overview of contact tracing apps from China, Korea, Singapore, Europe, and the United States.

• “Proactive use of intentionally designed technology can support voluntary participation from the public toward the goals of smart testing, effective resource allocation, and relaxing some of physical distancing measures, but only when it guarantees and assures an individual’s complete control over disclosure, and use of data in the way that protects individual rights.”

Expert Opinion
• “Leveraging digital contact tracing technologies can change the course of the COVID-19 pandemic. Such technologies must robustly support democratic principles of privacy to maintain public trust and to enable individuals to make informed choices.”


Nature. Show evidence that apps for COVID-19 contact-tracing are secure and effective. April 29, 2020. LINK
• “Another cause for concern is the fact that there is scant published evidence on how effective these apps will be at either identifying infected people who have not been tested or, if widely used, stopping the spread of the disease.”

• “Although contact tracing may seem challenging, previous epidemics have been effectively controlled through contact tracing and isolation initiatives [3,42].”

Abeler et al. COVID-19 Contact Tracing and Data Protection Can Go Together. April 20, 2020. LINK

• “Digital interventions provide many opportunities for strengthening health systems and could be vital resources in the current public health emergency.”
Primary Research

- Preprint- not yet peer reviewed
- Results indicate that: isolation and tracing alone are not sufficient to control an outbreak; high levels of app use are needed for digital contact tracing to be successful; and strategies focusing on long exposure times rather than close-range contacts for shorter periods are more effective.

Bradford, Aboy, & Liddell. COVID-19 Contact Tracing Apps: A Stress Test for Privacy, the GDPR and Data Protection Regimes. May 28, 2020. LINK
- “In this article we look at the compatibility of the proposed Apple/Google Bluetooth exposure notification system with Western privacy and data protection regimes and principles...”

- Preprint- not yet peer reviewed
- “We present and study a simple branching-process model for COVID-19 and show that digital immunity is possible regardless of the proportion of non-symptomatic transmission.”

- Preprint- not yet peer reviewed
- “In cases with moderate and low values for these parameters, the tracing devices can provide a slightly better performance but only if a large fraction of the agents carry the device. Otherwise, the impact of these devices is found to be negligible in comparison with other strategies not using them.”

Ferrari et al. Reproducing SARS-CoV-2 epidemics by region-specific variables and modeling contact tracing App containment. May 19, 2020. LINK
- Preprint-not yet peer reviewed
- “This work corroborates previous results in favor of app-mediated contact-tracing as mitigation measure for COVID-19 and draws attention to the importance of region-specific demographic and mobility factors to achieve maximum efficacy in containment policies.”

- Preprint- not yet peer reviewed
- “One of the most common misconceptions about the app was that it could allow users to specifically identify and map COVID-19 cases amongst their contacts and in their vicinity.”
Bidirectional contact tracing is required for reliable COVID-19 control. May 10, 2020. [LINK]

- Preprint- not yet peer reviewed
- Abstract: The addition of rapid smartphone-based exposure notification offers few benefits over conventional manual tracing alone unless uptake of the digital system is near-universal. However, as long as exposure events can be detected by nearly all smartphones, the combination of manual and digital with bidirectional tracing more than doubles the probability of controlling outbreaks across three epidemiological scenarios.”

Quantifying SARS-CoV-2 transmission suggests epidemic control with digital contact tracing. May 8, 2020. [LINK]

- Although SARS-CoV-2 is spreading too fast to be contained by manual contact tracing, it could be controlled if this process were faster, more efficient, and happened at scale. A contact-tracing app that builds a memory of proximity contacts and immediately notifies contacts of positive cases can achieve epidemic control if used by enough people.”


STeCC: Smart Testing with Contact Counting Enhances Covid-19 Mitigation by Bluetooth App Based Contact Tracing. May 7, 2020. [LINK]

- Preprint- not yet peer reviewed
- “A mitigation strategy combining smart testing with contact counting (STeCC) and contact tracing in one app would reduce R0 by 2.4-fold (e.g. from R0=2.4 to R0=1) with realistic test numbers (≈166 per 100'000 people per day) when a realistic fraction of smartphone owners use the app (≈72%, i.e. ≈50% in total population)..”

Coronavirus Contact Tracing: Evaluating The Potential of Using Bluetooth Received Signal Strength For Proximity Detection. May 6, 2020. [LINK]

- Preprint- not yet peer reviewed
- “In summary, we find that the Bluetooth LE received signal strength can vary substantially depending on the relative orientation of handsets, on absorption by the human body, reflection/absorption of radio signals in buildings and trains.”
- “Our measurements also suggest that combining use of Bluetooth LE contact tracing apps with adoption of new social protocols may yield benefits but this requires further investigation. For example, placing phones on the table during meetings is likely to simplify proximity detection using received signal strength.”


- Preprint- not yet peer reviewed
- “Results: We found strong support for the app under both regimes, in all countries, across all sub-groups of the population, and irrespective of regional-level COVID-19 mortality rates. We investigated the main factors that may hinder or facilitate take-up
and found that concerns about cyber security and privacy, together with lack of trust in government, are the main barriers to adoption.”

- Preprint- not yet peer reviewed
- “In this paper, we propose an extension of the epidemiological SEIR model to enable a detailed analysis of commonly discussed tailored measures of epidemic control - among them group-specific protection and the use of tracing apps. We introduce groups into the SEIR model that may differ both, in their underlying parameters as well as in their behavioral response to public health interventions. We allow for different infectiousness parameters within and across groups, different asymptomatic, hospitalization, and lethality rates, as well as different take-up rates of tracing apps. Our results visualize the sharp trade-offs between different goals of epidemic control, namely a low death toll, avoiding overload of the health system, and a short duration of the epidemic.”

- Preprint- not yet peer reviewed
- “We highlight the infrastructure and social structures required for automated contact tracing to work for the current pandemic. We display the vulnerabilities of the strategy to inadequately sample the population, which results in the inability to sufficiently determine significant contact with infected individuals. Of crucial importance will be the participation of a significant fraction of the population for which we derive a minimum threshold.”

- Preprint- not yet peer reviewed
- “In this scheme, every individual has a risk factor based on their contact history. We demonstrate via simulations that this method strongly outperforms a naive method based only on direct contacts. Given some epidemiological assumptions and approximations, our calculation is rigorous but can be performed locally on a mobile phone using only the owner’s risk factor and the risk factor of the contact. Contact history, too, can be stored on the mobile phone and need not be shared with a server.”

- “Results: Our proof-of-concept smartphone app allows users to create “checkpoints” for contact tracing, check their risk level based on their past interactions, and anonymously self-report a positive status to their peer network. Our simulation results suggest that higher adoption rates of such an app may result in a better controlled epidemic or pandemic outbreak.”
News Articles


- “The B.C. government has not decided whether it will use an app. The use of the technology raises privacy and cybersecurity concerns.”
- “A Leger poll conducted for The Vancouver Sun and The Province found four in 10 people would be willing to use a smartphone tracing app. Another three in 10 said maybe or it depends.”

Science. COVID-19 contact tracing apps are coming to a phone near you. How will we know whether they work? May 21, 2020. [LINK]


- “… there is no guarantee that any app will work as intended to help curb the pandemic. And without widespread testing for the virus and high levels of uptake, their efficacy will be muted.”

MIT Technology Review. A flood of coronavirus apps are tracking us. Now it’s time to keep track of them. May 7, 2020. [LINK]

- “When we began comparing apps around the world, we realized there was no central repository of information; just incomplete, constantly changing data spread across a wide range of sources. Nor was there a single, standard approach being taken by developers and policymakers: citizens of different countries were seeing radically different levels of surveillance and transparency.”


- “Contact tracing apps are also not foolproof, tech and biology experts have warned. GPS or cell tower location data can wrongly record everyone on a busy city block as contacts. Similarly, Bluetooth can log phones that are near each other but separated by walls, although developers have been working on ways to better define “contacts” based on the length and strength of the handshakes between devices.”
- “Another challenge is take up, with some epidemiologists saying at least 40% of a country’s population needs to activate digital contact tracing for the system to be effective.”

Vox. What good digital contact tracing might look like. April 22, 2020. [LINK]

- Includes a summary of the Center for American Progress’ list of recommendations for digital contact tracing.

The Guardian. Digital contact tracing will fail unless privacy is respected, experts warn. April 20, 2020. [LINK]
BBC News. **Coronavirus: NHS contact tracing app to target 80% of smartphone users.** April 16, 2020. [LINK](#)

- “A contact-tracing app could help stop the coronavirus pandemic, but 80% of current smartphone owners would need to use it, say experts advising the NHS.”
- “If there is lower uptake, academics say the app would still help slow the spread of Covid-19.”

BBC Future. **Can mobile contact-tracing apps help lift lockdown?** April 15, 2020. [LINK](#)

- “Apps are suggested and understood by many people as the magical silver bullet to opening up society again, which they’re not. We don’t know how effective they are, we don’t know what the side effects are, and we know apps alone can’t be a solution to this.”
- “Gaining the public’s trust is important to reach the threshold for efficiency of contact-tracing apps. In many countries, uptake is going to be hindered by public scepticism about being tracked. But there’s also a more fundamental issue, too: [only 15 countries](#) in the world have smartphone penetration that would allow them to meet that level, even if everyone who owned a smartphone installed such apps.”

Tech Crunch. **EU privacy experts push a decentralized approach to COVID-19 contacts tracing.** April 6, 2020. [LINK](#)

The Guardian. **South Korea took rapid, intrusive measures against Covid-19 – and they worked.** March 20, 2020. [LINK](#)

**Methodology**

Newfoundland and Labrador Centre for Applied Health Research (NLCAHR) COVID-19 Quick Response reports are initiated by, and shared with, our partners in the provincial health system, including the four Regional Health Authorities, the Departments of Health and Community Services and Children, Seniors and Social Development, and public health officials.

NLCAHR staff work with topic submitters to clarify the research question. We then search for related systematic reviews, meta-analyses, other reviews, interim and other guidance statements, primary research, expert opinion and health and science reporting.

We use several search strategies, with a focus on the following databases:

- [Alberta Health Services](#)
- [CADTH](#)
- [Canadian Pharmacists Association](#)
- [Campbell Collaboration](#)
- [Cochrane Collaboration](#)
- [Centre for Disease Control](#) (CDC)
- [Centre for Evidence Based Medicine](#) (CEBM)
• Evidence for Policy and Practice Information and Co-ordinating Centre
• European Centre for Disease Prevention and Control
• Health Canada
• Joanna Briggs Institute
• Johns Hopkins
• MedRxiv
• National Institutes of Health (NIH)
• National Institute of Allergy and Infectious Diseases (NIAID)
• National Library of Medicine
• Public Health Agency of Canada
• Trip Database
• World Health Organization

This report was prepared by Sarah Williams.

For more information, contact pnavarro@mun.ca.