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rapidly changing nature of the coronavirus pandemic, some of the references included in this report may quickly become out-of-date.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
    - Globe and Mail. **Alberta launches Canada's first COVID-19 mobile contact-tracing app.** Updated May 3, 2020. LINK

COVID-19 *Quick Response Reports*
Evidence for the Newfoundland & Labrador Health System
Newfoundland and Labrador Centre for Applied Health Research
June 2020 | page 1

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

Government of France. **StopCovid.** June 2, 2020. LINK

- 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

Federal Government of Germany. **Measures by the Federal Government to contain the spread of the COVID-19 pandemic and address its impacts.** May 18, 2020. LINK; Press release: LINK

- 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](LINK)), 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

- o 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:
  - o 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](#)
  - o Computer Weekly. **Singapore government to open source contact-tracing protocol.** March 24, 2020. [LINK](#)

Switzerland

Federal Office of Public Health. **SwissCovid.** Updated May 28, 2020. [LINK](#)
- Related:
  - o A public security test for the SwissCovid app is currently ongoing prior to launch: [LINK](#)
  - o Swiss Info. **Swiss Covid-19 contact tracing app ready for privacy testing.** May 29, 2020. [LINK](#)

United States

CDC. **Health Departments: Interim guidance on developing a COVID-19 case investigation & contact tracing plan.** May 15, 2020. [LINK](#)

Johns Hopkins. **A National Plan to Enable Comprehensive COVID-19 Case Finding and Contact Tracing in the US.** April 10, 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

- UNICEF. **Digital contact tracing and surveillance during COVID-19. General and child-specific ethical issues.** June 3, 2020. [LINK](#)
- WHO. **Ethical considerations to guide the use of digital proximity tracking technologies for COVID-19 contact tracing.** May 28, 2020. [LINK](#)
- Amnesty International. **Joint civil society statement: States use of digital surveillance technologies to fight pandemic must respect human rights.** April 2, 2020. [LINK](#)
- Human Rights Watch. **Mobile Location Data and Covid-19: Q&A.** May 13, 2020. [LINK](#)
  - o 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
- Public Health England. **Rapid evaluation of digital health products during the COVID-19 pandemic.** May 13, 2020. LINK

United States

- Johns Hopkins Project on Ethics and Governance of Digital Contact Tracing Technologies. **Digital Contact Tracing for Pandemic Response: Ethics and Governance Guidance.** May 25, 2020. LINK
- American Civil Liberties Union. **Principles for Technology-Assisted Contact-Tracing.** April 16, 2020. LINK
- American Civil Liberties Union. **The Limits of Location Tracking in an Epidemic.** April 8, 2020. LINK

Systematic Reviews

Braithwaite et al. **Automated and partially-automated contact tracing: a rapid systematic review to inform the control of COVID-19.** May 28, 2020. LINK

- 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

- Cochrane Collaboration: Coronavirus (COVID-19). **Contact tracing technologies in epidemics.** Update May 28, 2020. LINK
- Shah et al. **Effect of various public health interventions like social distancing, contact tracing, containment methods and IT based tools assisting in public health interventions for prevention and control of COVID-19: systematic review and meta-analysis.** April 20, 2020. LINK

Other Evidence Reviews

CMAJ. **Digital contact tracing for COVID-19.** May 27, 2020. LINK

- "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."

Ada Lovelace Institute. **Exit through the App Store? A rapid evidence review on the technical considerations and societal implications of using technology to transition from the COVID-19 crisis.** April 20, 2020. LINK; Summary LINK

- "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."

Johns Hopkins. **Review of Mobile Application Technology to Enhance Contact Tracing Capacity for COVID-19.** April 8, 2020. LINK
- Provides a brief overview of contact tracing apps from China, Korea, Singapore, Europe, and the United States.

Hart et al. **Outpacing the Virus: Digital Response to Containing the Spread of COVID-19 while Mitigating Privacy Risks.** April 3, 2020. LINK
- "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

Bengio et al. **The need for privacy with public digital contact tracing during the COVID-19 pandemic.** June 2, 2020. LINK
- "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."

Centre for Evidence Based Medicine. **COVID-19: Health Security.** May 5, 2020. LINK

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."

Alwashmi. **The Use of Digital Health in the Detection and Management of COVID-19.** April 23, 2020. LINK
- "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

Mahmood et al. **Global Preparedness Against COVID-19: We Must Leverage the Power of Digital Health.** April 16, 2020. LINK
- "Digital interventions provide many opportunities for strengthening health systems and could be vital resources in the current public health emergency."

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COVID19 *Quick Response Reports*
Newfoundland and Labrador Centre for Applied Health Research | June 2020 | page 5

Primary Research

Cencetti et al. **Using real-world contact networks to quantify the effectiveness of digital contact tracing and isolation strategies for Covid-19 pandemic.** May 30, 2020. LINK

- 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…"

Bulchandani et al. **Digital Herd Immunity and COVID-19.** May 26, 2020. LINK

- 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."

Martinez Ruiz del Arbol and Iglesias. **Comparison of epidemic control strategies using agent-based simulations.** May 24, 2020. LINK

- 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."

Williams et al. **Public attitudes towards COVID-19 contact tracing apps: A UK-based focus group study.** May 18, 2020. LINK

- 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."

Bradshaw et al. **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."

Ferretti et al. **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."
- Related article: NIH Directors Blog. **Can Smart Phone Apps Help Beat Pandemics?** April 9, 2020. LINK

Gorji et al. **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).."

Leith & Farrell. **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."

Altmann et al. **Acceptability of app-based contact tracing for COVID-19: Cross-country survey evidence.** May 4, 2020. LINK
- 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."

Grimm, Mengel, & Schmidt. **Extensions of the SEIR Model for the Analysis of Tailored Social Distancing and Tracing Approaches to Cope with COVID-19.** April 29, 2020. LINK
- 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."

Kim and Paul. **Contact Tracing: a game of big numbers in the time of COVID-19.** April 27, 2020. LINK
- 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."

Guttal, Krishna, & Siddharthan. **Risk assessment via layered mobile contact tracing for 2 epidemiological intervention.** April 26, 2020. LINK
- 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."

Yasaka et al. **Peer-to-Peer Contact Tracing: Development of a Privacy-Preserving Smartphone App.** April 7, 2020. LINK
- "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

Vancouver Sun. **COVID-19: Contact tracing apps can fight pandemic and respect privacy, experts say.** May 25, 2020. [LINK](#)
- "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](#)

Nature. **Coronavirus contact-tracing apps: can they slow the spread of COVID-19?** May 19, 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."

Reuters. **Digital handshake: Can contact tracing deliver on its promise in coronavirus battle?** May 5, 2020. [LINK](#)
- "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](#)

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