

Contact Tracing Apps

Douglas Stebila



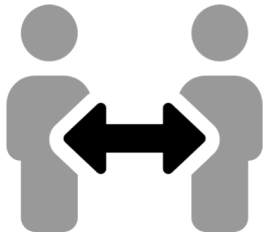
**I am a technologist,
not a public health
expert.**

**Would the
proposal
work?**

**Would it
excessively
intrude
on our
freedoms?**

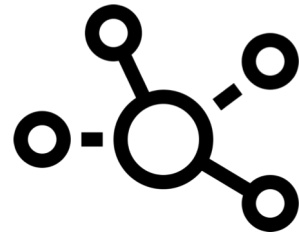
**Are there
sufficient
safeguards?**

Goals



Exposure notification

Have *I* been near anyone who tests positive?



Automated contact tracing

Who has been near whom?



Symptom monitoring

Self-reported data collection

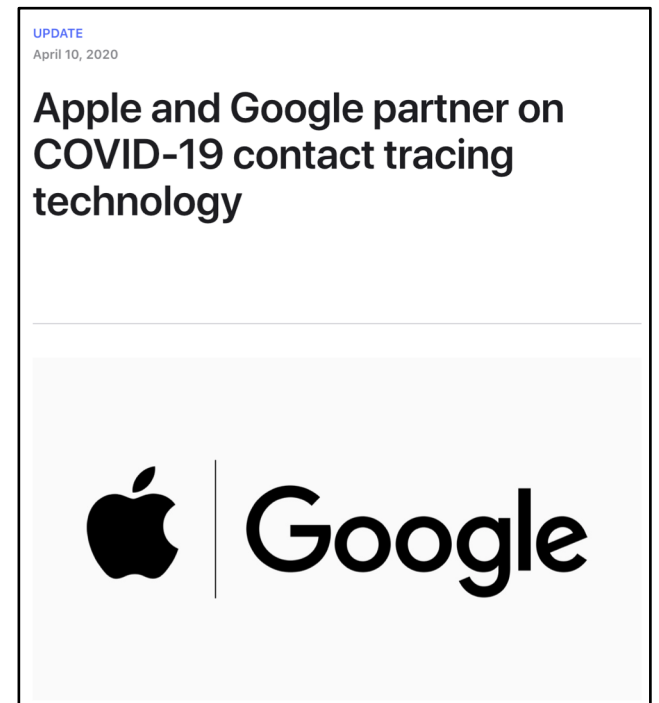
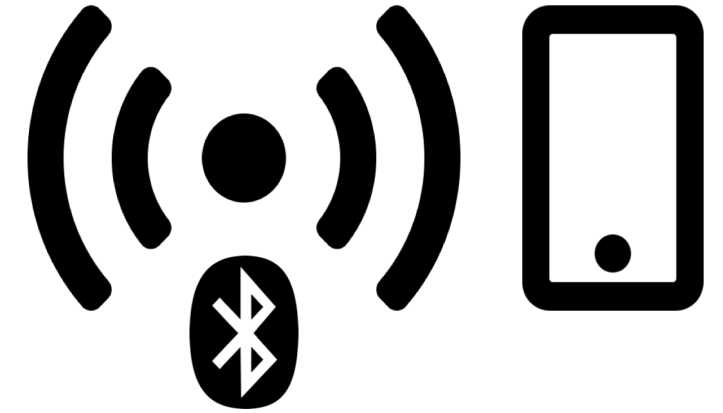


Epidemiological analysis

Identify hotspots
Make public health predictions

Technologies – Bluetooth

1. Mobile phones broadcast anonymous temporary identifiers.
2. Mobile phones record identifiers they hear.
3. If a person tests positive, their anonymous temporary identifiers are uploaded to a public health server.
4. My phone periodically downloads listed identifiers from public health server to see if I've been near someone infected.



Technologies – GPS

1. Mobile phone apps record their latitude/longitude throughout the day.
2. Mobile phones upload position data to central servers.
3. Algorithms run on central servers to identify exposures, do epidemiological analysis, etc.



Technologies – Data collation / panopticon

South Korea combines:

Manual contact tracing



CCTV records



Mandatory GPS phone tracking



Credit card transactions



Spectrum of privacy risks

Decentralized data storage
Bluetooth

Centralized data storage
GPS
Panopticon

Lower privacy risks

Higher privacy risks

Exposure notification

Automated contact tracing
Symptom monitoring
Epidemiological analysis

Can be done in ways that
increase privacy risks

Can be done in ways that
reduce privacy risks

Security risk

Easy to make mistakes Lucrative hacking target



FAST COMPANY FOLLOW

05-21-20

North Dakota's COVID-19 app has been sending data to Foursquare and Google

A new report from Jumbo Privacy finds that a coronavirus contact-tracing app is sharing location data with Foursquare and an advertising ID with Google.



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Qatar

Qatari contact-tracing app 'put 1m people's sensitive data at risk'

Hackers allowed access to names, national ID, health status and location data of users, says Amnesty

- Coronavirus - latest updates
- See all our coronavirus coverage



ZDNet MENU US

Contact tracing apps unsafe if Bluetooth vulnerabilities not fixed

With governments increasingly looking to use contact tracing apps to help contain COVID-19, such initiatives are likely to spark renewed interest in Bluetooth attacks which means there is a need for assurance that these apps are regularly tested and vulnerabilities patched.

By Eileen Yu for By The Way | April 25, 2020 -- 10:51 GMT (03:51 PDT) | Topic: Coronavirus: Business and technology in a pandemic

As more governments turn to contact tracing apps to aid in their efforts to contain the coronavirus outbreak, cybersecurity experts

<https://www.fastcompany.com/90508044/north-dakotas-covid-19-app-has-been-sending-data-to-foursquare-and-google>
<https://www.theguardian.com/world/2020/may/27/qatar-contact-tracing-app-1m-people-sensitive-data-at-risk-coronavirus-covid-19>
<https://www.zdnet.com/article/contact-tracing-apps-unsafe-if-bluetooth-vulnerabilities-not-fixed/>

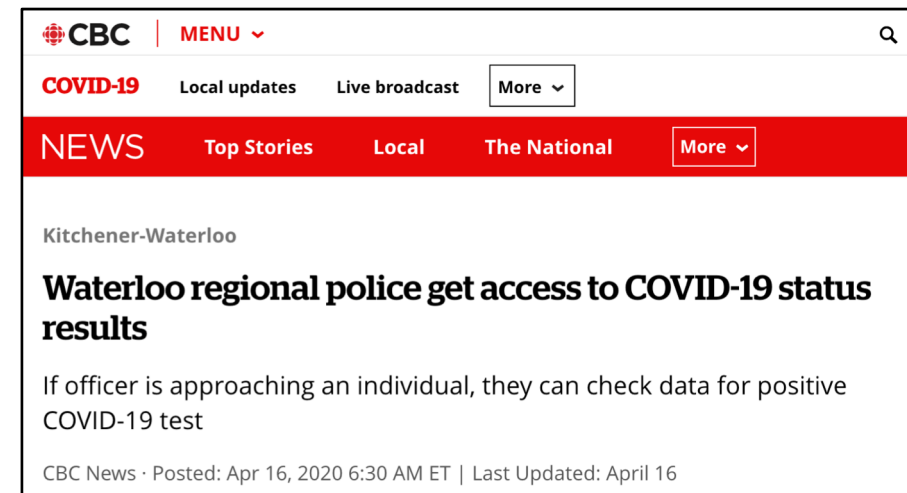
Legal privacy framework

PIPEDA, ...
data usage in
accordance with
informed consent

Truly informed consent:

- Does anyone read terms of service and privacy policies?
- In the time of a global pandemic?

Mission creep:



<https://www.cbc.ca/news/canada/kitchener-waterloo/waterloo-regional-police-covid-19-status-information-1.5533611>

Effectiveness

How many people
have to be using the
app for it to be
effective?

If **30%** of people have it installed,
it will detect approximately

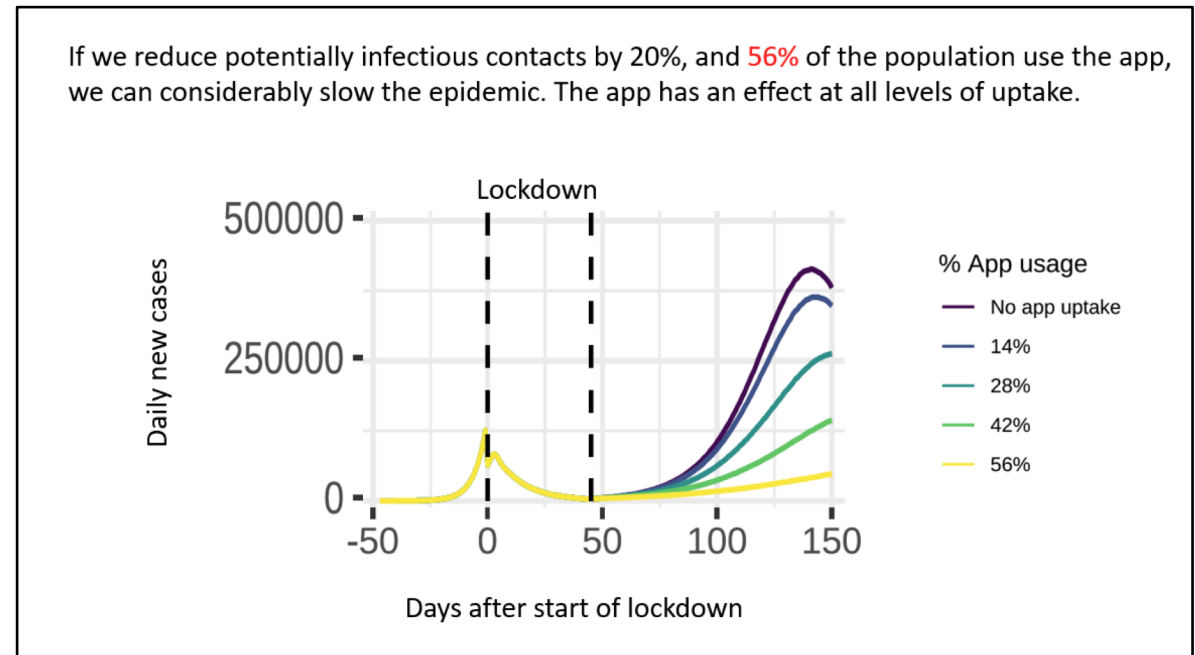
$$(0.30)^2 = \mathbf{9\%}$$

of interactions.

How many people
have to be using the
app for it to be
effective?

Estimates of required
uptake vary substantially:
30–80%.

Lots of confusion.



<https://www.research.ox.ac.uk/Article/2020-04-16-digital-contact-tracing-can-slow-or-even-stop-coronavirus-transmission-and-ease-us-out-of-lockdown>

<https://www.technologyreview.com/2020/06/05/1002775/covid-apps-effective-at-less-than-60-percent-download/>

**How many people
have to be using the
app for it to be
effective?**

**Largest voluntary
deployments to date:**

Iceland 40% after 1 month

Singapore 28% after 2 months

Australia 25% after 1 month

...

Alberta 11% after 1 month

<https://www.technologyreview.com/2020/05/11/1001541/iceland-rakning-c19-covid-contact-tracing/>

<https://www.tracetoegether.gov.sg>

<https://www.theguardian.com/world/2020/may/24/how-did-the-covidsafe-app-go-from-being-vital-to-almost-irrelevant>

<https://www.cp24.com/news/ford-government-willing-to-participate-in-nationwide-contact-tracing-app-1.4950543>

Effectiveness?

Iceland

“The technology is more or less [...] I wouldn't say useless [...] but it's the integration of [manual contact tracing and the app] that gives you results. I would say it [...] has proven useful in a few cases, but it wasn't a game-changer for us” [1]

Australia

“Yet nearly a month since launch, [...] just one person has been reported to have been identified using data from it.” [2]

[1] <https://www.businessinsider.com/iceland-contact-tracing-not-gamechanger-2020-5>

[2] <https://www.theguardian.com/world/2020/may/24/how-did-the-covidsafe-app-go-from-being-vital-to-almost-irrelevant>

Effectiveness in Canada

I couldn't find any public information about effectiveness of Alberta's app ABTraceTogether.

Data fragmented over multiple apps across or within jurisdictions further reduces effectiveness.

Some interest in nationwide app [1].

Public trust and effectiveness

- Hard for general public to understand subtleties of what the apps do
- Misinformation spreads easily
- Expect less uptake for more privacy invasive options
- Half of Americans say they wouldn't install it [1]
- Vulnerable populations may disproportionately avoid it [2,3]
- Will people think there's less of a need to install as society already reopens?

[1] <https://arstechnica.com/tech-policy/2020/04/half-of-americans-wont-trust-contact-tracing-apps-new-poll-finds/>

[2] <https://www.eff.org/deeplinks/2020/06/dont-mix-policing-covid-19-contact-tracing>

[3] <https://www.eff.org/deeplinks/2020/04/telling-police-where-people-covid-19-live-erodes-public-health>

My thoughts

- Demand highest level of transparency
 - Public specifications, open source code
- Privacy by design that minimizes data collection
- Decentralized architecture
- Voluntary installation
- Add “data fiduciary” principles on top of informed consent
- Automatic sunseting and data deletion
- No mission creep

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freedoms?**

**Are there
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Reading

Opinion pieces

- The Economist
<https://www.economist.com/leaders/2020/05/16/dont-rely-on-contact-tracing-apps>

Policy articles

- Privacy Commissioner of Canada framework
https://www.priv.gc.ca/en/privacy-topics/health-genetic-and-other-body-information/health-emergencies/fw_covid/
- Health and ethics
<https://science.sciencemag.org/content/368/6494/951>
- Electronic Frontier Foundation
<https://www.eff.org/issues/covid-19>

Public statements

- <https://drive.google.com/file/d/1OQg2dxPu-x-RZzETIpV3IFa259NrpK1J/view>
- <https://exposurenotification.org>
- <https://uwaterloo.ca/cybersecurity-privacy-institute/news/coronavirus-statement>

Excellent overview article in Canadian context

- Race To Trace
<https://www.cybersecurepolicy.ca/racetotrace>

Surveys of contact tracing apps

- <https://www.technologyreview.com/2020/05/07/1000961/launching-mittr-covid-tracing-tracker/>
- <https://www.top10vpn.com/research/investigations/covid-19-digital-rights-tracker/>
- A survey of automated contact tracing approaches <https://eprint.iacr.org/2020/672>

Technical designs

- DP3T [https://github.com/DP-3T/documents/blob/master/DP3T White Paper.pdf](https://github.com/DP-3T/documents/blob/master/DP3T%20White%20Paper.pdf)
- Google-Apple Exposure Notification API
<https://www.apple.com/covid19/contacttracing>



The Economist

Menu

Leaders

May 16th 2020 edition >



Escaping the lockdown

Don't rely on contact-tracing apps

Governments are pinning their hopes on a technology that could prove ineffective—and dangerous

May 16th 2020

The screenshot shows the top of a web page from The Economist. The page title is "Leaders" and the date is "May 16th 2020 edition". Below the header is a large image of a person wearing a white face mask, holding a smartphone. The phone screen displays a contact tracing app interface with a "Reports" section showing "NO REPORTS" and a message "You will be informed in case of a possible infection." Below this are two sections: "Was tun bei Krankheitssymptomen" and "Was tun bei einem positiven Testresultat". The article title "Escaping the lockdown" is in red, and the main headline "Don't rely on contact-tracing apps" is in large black font. Below the headline is a sub-headline "Governments are pinning their hopes on a technology that could prove ineffective—and dangerous". The date "May 16th 2020" is at the bottom left, and a WhatsApp icon is at the bottom right.