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COVID-19 Contact Tracing in a Democracy: Balancing Public Health and Privacy

Striking a balance in a vibrant democracy will require rethinking both privacy and the public health technique of contact tracing legally and technically for the 21st Century.

Rafael V. Baca, Esq. [The Adelante IP Law Group](#)
Mihran Yenikomshian, Vice President, [Analysis Group, Inc.](#)

July 16, 2020

Agenda

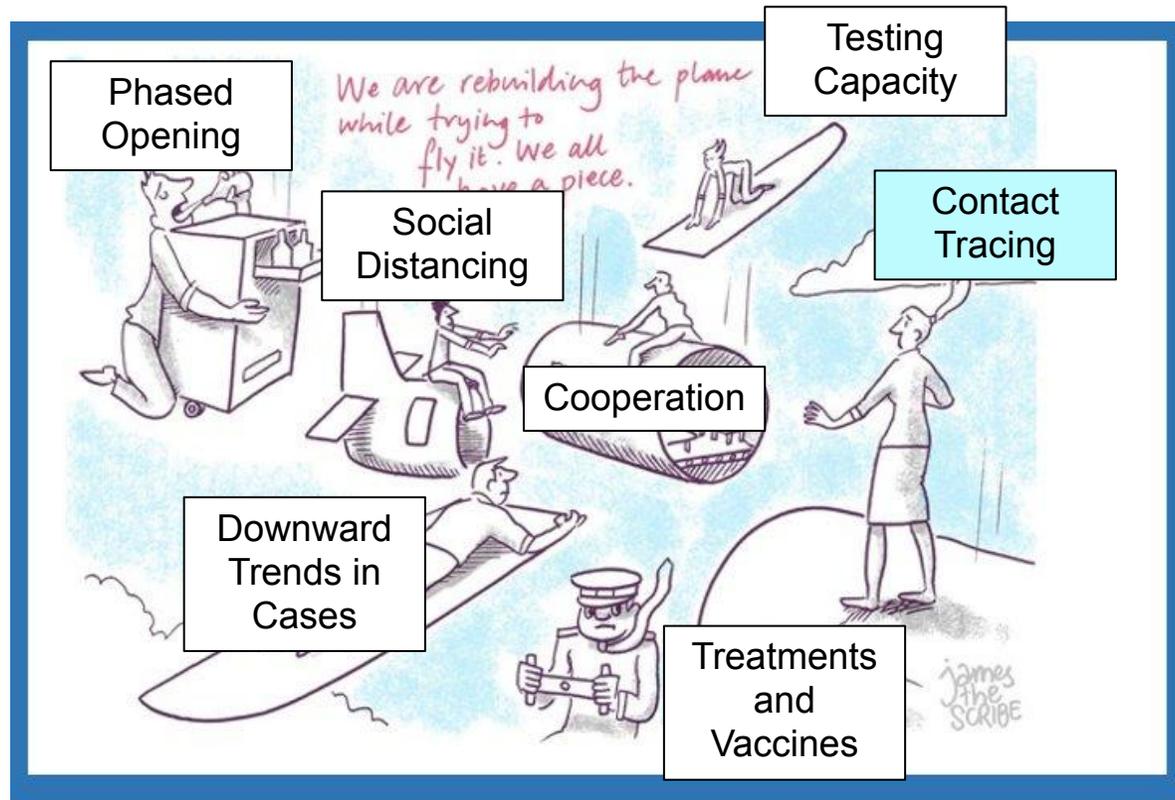
- Overview of COVID situation
- What is contact tracing and how is it done?
- What are the privacy concerns?
- How do data privacy safeguard affect the usefulness of contact tracing?
- What are the proposed uses of contact tracing with AI, machine learning, and big data analytics?

ENTER – COVID 19, Corona Virus Global Pandemic – TO OUR DAILY LIVES

- WHAT: A globally infectious disease caused by severe acute respiratory syndrome, SARS-COV-2
- BIOLOGICAL INFECTION SPREAD – an analogy CAMPFIRE TO WILDFIRE
 - Campfire, fall asleep, embers allowed to drift in the wind, embers look for kindling fuel, starting a flame may not end up in a blaze
- CONTACT TRACING analogy of Wildfire Smoke Jumpers:
Contact Tracers Control and Manage Wildfire Spread – inspecting the path of the spread – testing; setting firebreaks for further COVID infection and directing other health professionals to assist
- <https://youtu.be/Cre1DOpQFx8> - Jeff Bridges (The Dude) Only the Brave 2017 Columbia Pictures



Keys to reopening the economy while balancing public health risk

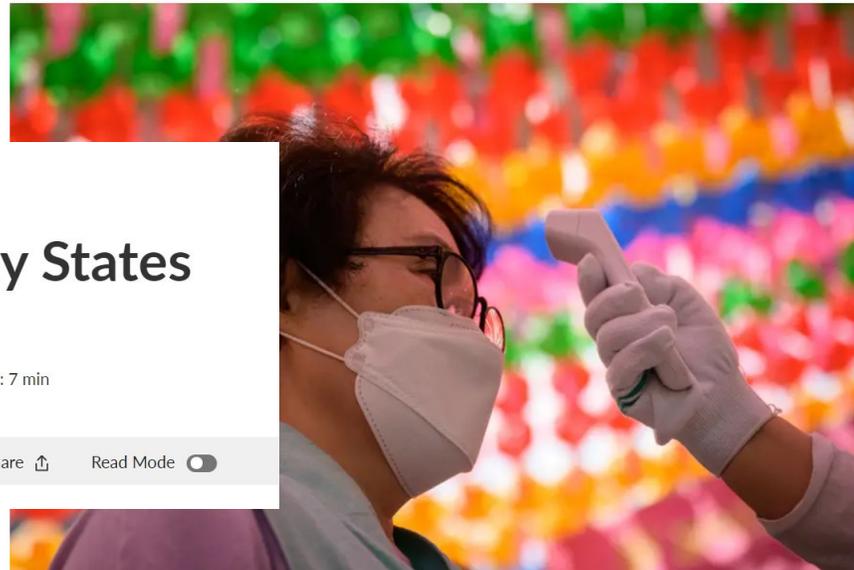


Data and Monitoring

Contact Tracking is a Key Resource to a Safe and Enduring Reopening of the Economy

South Korea just flexed its contact-tracing power: After partiers with the coronavirus went to nightclubs, it found a tested 46,000 exposed people

Aylin Woodward May 22, 2020, 3:42 PM



No network is more reliable.

Stateline

Reopening Means Contact Tracing. Many States Aren't Ready.

STATELINE ARTICLE April 29, 2020 By: Christine Vestal & Michael Ollove Topics: Business of Government & Health Read time: 7 min

Reopening Means Contact Tracing. Many States Aren't Ready.

Share Read Mode

South Korean worshippers at the Jogye Buddhist temple in Seoul on April 30. ED JONES/AFP via Getty Images

What is contact tracing and how is it done?

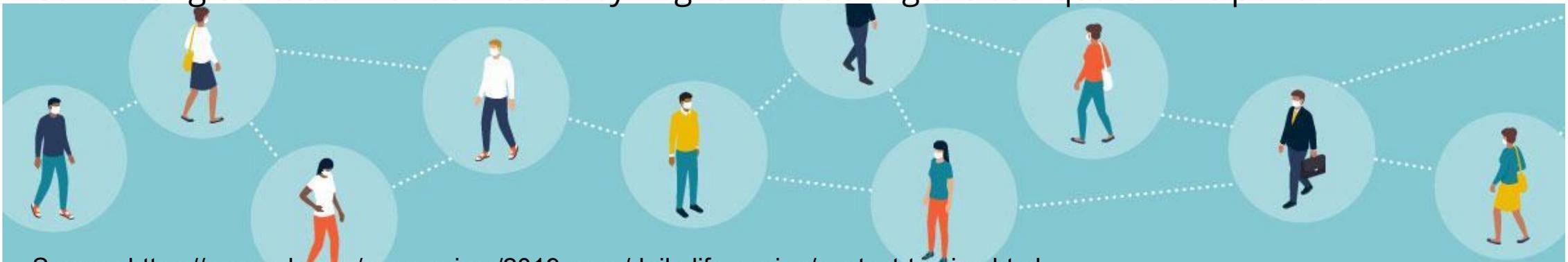
- Overview Contact Tracing
- Approaches to successful Contact Tracing across the globe
- Takeaways – Lessons Learned

What is contact tracing?

- Contact tracing is method to trace and slow the spread of infectious disease.
- It involves identifying people who have an infectious disease and people who they came into contact with.

For COVID-19, contact tracing involves :

- Interviewing people with COVID-19 to identify everyone they had close contact with during the time they may have been infectious
- Notifying contacts of their potential exposure
- Referring contacts for testing
- Monitoring contacts for signs and symptoms of COVID-19
- Connecting contacts with services they might need during the self-quarantine period



Source: <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/contact-tracing.html>

Contract Tracing Steps for COVID-19 Patient

Generally, contact tracing includes the following steps:

Case investigation: Public health staff work with a patient to help them recall everyone they have had close contact with during the time they may have been infectious.

Contact tracing: Public health staff begin contact tracing by notifying exposed people (contacts) of their potential exposure as rapidly and sensitively as possible, not revealing the infected patient's identity.

Contact support: Contacts are provided with education, information, and support to help them understand their risk, what they should do to separate themselves from others who are not exposed, and how to monitor themselves for illness. In addition, they are informed of the possibility that they could spread the infection to others even if they do not feel ill.

Self-quarantine: Contacts are encouraged to stay home, monitor their health, and maintain social distance (at least 6 feet) from others until 14 days after their last exposure to the infected patient, in case they also become ill.

Privacy of COVID-19 patient



If a person is diagnosed with COVID-19, their name will not be revealed to those who they may have exposed, even if they ask.

Approaches to Contact Tracing - Democratic Nation SOUTH KOREA



- Public and Government Consensus Arise from the MERS outbreak
- Used applications relying on GPS data, CCTV, and credit card histories to identify potential exposure to help identify, test, and isolate new infections
- Readiness of public health officials to move rapidly to early testing and the importance of maintaining isolation of new patients to prevent secondary infections as a new lifestyle.
- Additionally, the government strived to increase transparency in the crisis including sending emergency text alerts of whereabouts of new patients, rapid deployment of unproven tests, pioneered use of drive-through, and strive to reduce indoor face-to-face contact.

Approaches to Contact Tracing – Democratic Nation

NEW ZEALAND



“[Data] Privacy Commissioner” was instrumental in rolling-out and then endorsing a litany of contact tracing applications.

In practice, during less dire phases of a lock-down, participants on the NZ gov’t -endorsed apps use a QR code to “check” in to places like gyms, shops, hair salons, restaurants. Iterations were recorded onto a secure log assigned to each business via Bluetooth with the participants’ phone app.

Individuals and Businesses by law cannot access the data as well as use beyond public health purposes or risk legal liability.

Approaches to Contact Tracing – Communist Nation

VIETNAM - No reported Covid19 deaths,



Increased investments in public health infrastructure from SARS onward: with a national public health emergency operations center and a national public health surveillance system.

Web based system that aggregates data from public health entities in real time

Contact tracing & Quarantine – unique and could very well apply machine learning tools: cases are identified and quarantined based on suspected epidemiological risk of infection if in contact with a confirmed case or traveled to a Covid 19 affected region NOT whether they exhibited symptoms

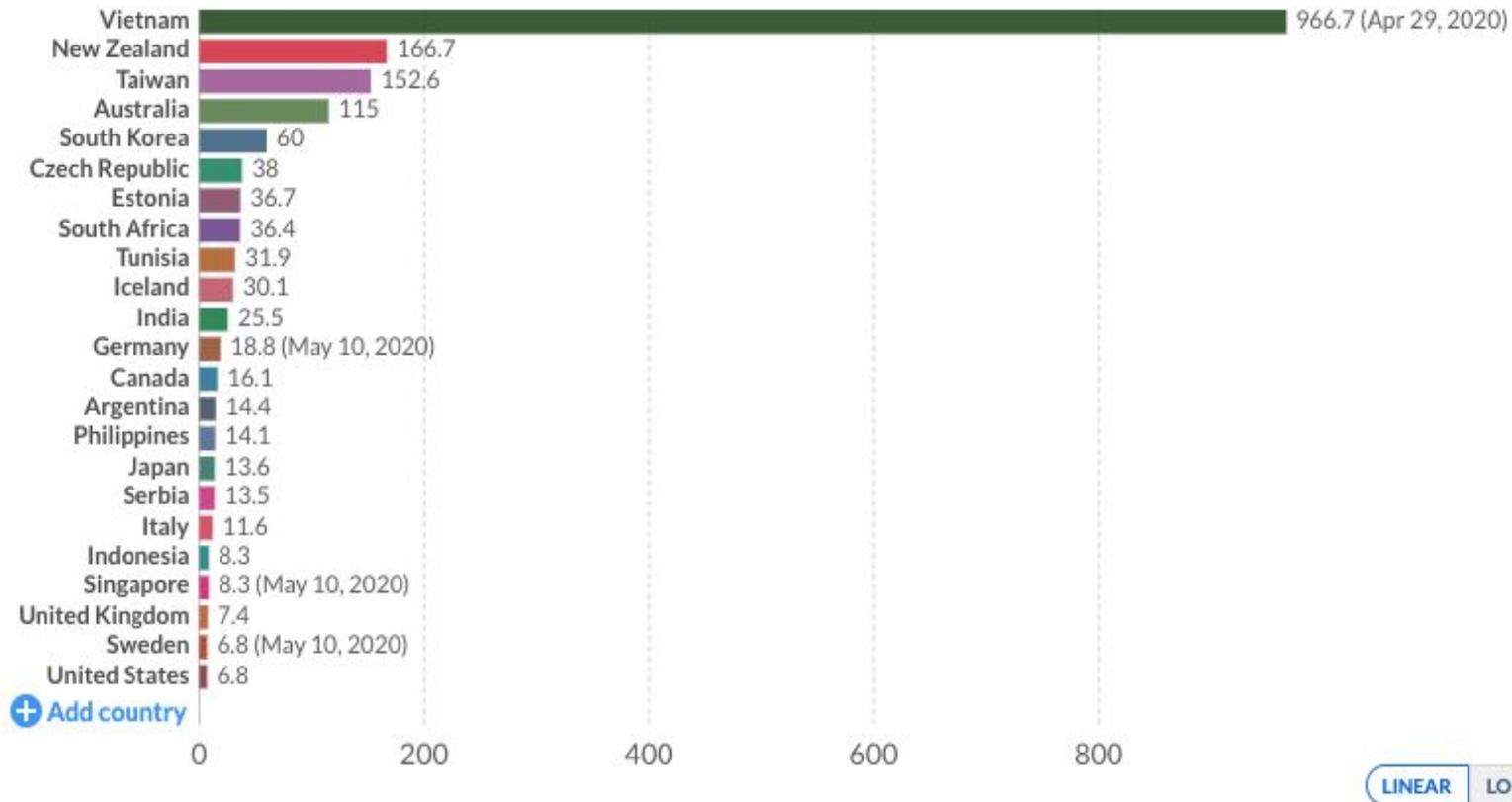
Contracting tracing within 3 degrees of separation

VIETNAM [0.00 Covid19 deaths, 100M population]



Total COVID-19 tests for each confirmed case, May 9, 2020

Our World in Data



Source: Testing data from official sources collated by Our World in Data, confirmed cases from ECDC
 Note: Comparisons of testing data across countries are affected by differences in the way the data are reported. Details can be found at our Testing Dataset page.

CC BY

ANALYSIS OF INTERNATIONAL CONTACT TRACING

SILICON VALLEY PARTNERSHIP – APPLE & GOOGLE



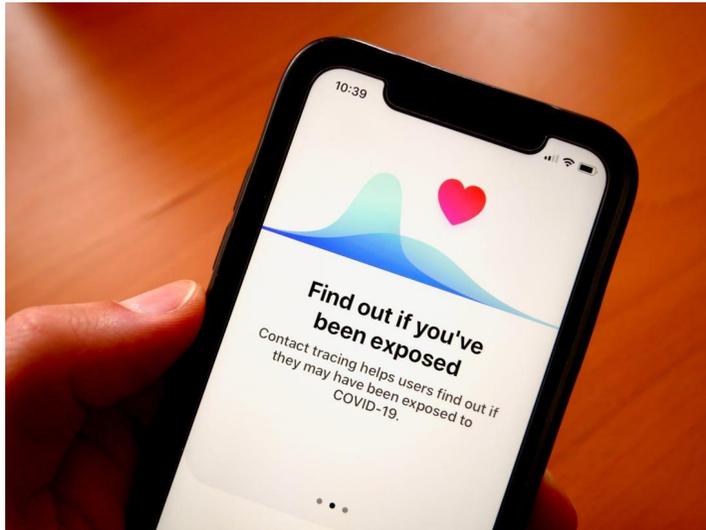
Joint venture application to combat Covid

Uses the same Bluetooth technology and app used by New Zealand and S. Korea but does not require people to “check-in” to places using a QR code – it is automatic.

Contact tracing is “opt-in” with extra steps required to participate

Method is slowly gaining traction both in the US and abroad

Best Approaches Use Contact Tracing Blend Low Tech and High Tech



- Bluetooth
- Geo-fencing
- Notifications
- Recommendations on what to do next?



- Boots on the ground
- Testing Availability
- Reporting and follow up

Considerations for efficacy and success

Contact tracing does not work in isolation, availability of testing is critical in order to resolve whether the exposed individual contracted the disease

In areas where there are high and increasing rates of positive test, the value of contact tracing decreases.

Conversely, contact tracing is extremely effective at reducing and minimizing spread when rates are low.

What are the privacy concerns?

- Survey of Privacy Law for Contact Tracing
- Applicable US Laws – Federal & State
- Applicable International Law

Survey of Privacy Law for Contact Tracing

What is Privacy: Laws referring to personally identifiable information typically collected by other individuals or entities (business or governments)



For COVID-19, contact tracing involves legal privacy aspects of *individuals' activities and location* logged by software on respective mobile devices:

- US Electronic Health Privacy laws
- US geolocation Privacy Laws
- US Intellectual Property and Proprietary rights relating to collecting and storing data
- US & International laws regarding data collection and aggregation of online personal data

Source: <https://cwmtafmorgannwg.wales/we-are-cwm-taf-morgannwg/>

U.S. Health Privacy & Electronic Health Privacy Laws



HIPAA - The Health Insurance Portability and Accountability Act of 1996 (HIPAA) P.L. No. 104-191, 110 Stat. 1938 (1996). In the context of personal health insurance information, it is the ability to protect an individual's medical records and right to obtain their medical records.

HITECH - Health Information Technology for Economic and Clinical Health Act, HITECH, 42 U.S.C. §300jj *et seq.*; §17901 *et seq.* Incredibly important as it encourages for the adoption of EHRs so that patients entitled to their records in electronic form and prohibits the sale of PHI in most circumstances. Also mandates notifications to individuals subject to PHI data breaches *after 60 days* of discovery of breach to US Dept. HHS

PERMITTED USE EXCEPTION

- HIPAA Use of Protected Health Info w/o Patient Authorization *Pub Health Investigation of Communicable Disease Exposure*

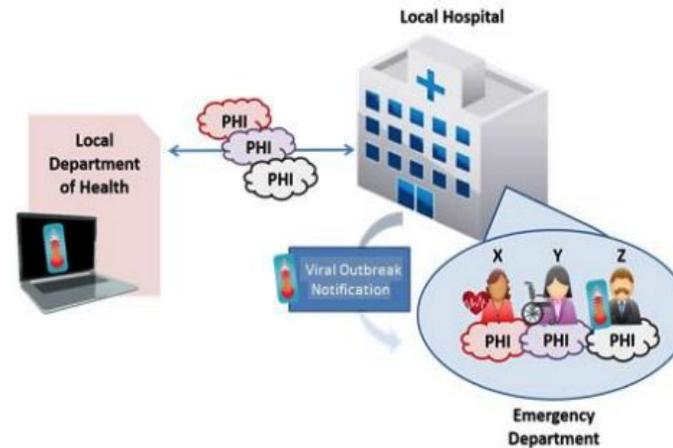


Figure 7: Exchange for Persons Exposed to Communicable Disease and for Related Public Health Investigations Scenario

45 C.F.R. §164.512(b)(1)(iv) provides for contact tracing – permits cert. entities, CE/ providers to notify individuals may have been exposed to a communicable disease through contact with a known positive case, the health department and CE/ providers typically send notices to potentially exposed contacts --- disclosure notification regarding the known potential exposure event is permitted to use some discretion beyond the minimum health data (PHI) in light of conducting an investigation

Typically the ***minimum information necessary*** for the specific purpose in the course of public health activities: reporting diseases to CDC, disclosure to a health department central registry in the name of public health surveillance or investigations (under security rule compliance) – **patient ID**, **“demographic info” & positive test results**. Scope of demographic information is dictated by the local health departments no uniformity, although CDC provides guidelines.

Personal Geolocation

Communications Act of 1934, Permits the Federal Communications Commission FCC to regulate “Consumer Privacy Network Information”, CPNI



CPNI 47 U.S.C. § 222 - defines CPNI to include information that relates to . . . **destination, location** . . . of ***use of a telecommunications service*** subscribed by the telecommunications service.

Jan 2020 - FCC currently has found ***disclosure of consumers' real-time location data to be in violation*** of Federal Law as **wireless carriers** are selling geolocation data to 3rd party data aggregators. <https://docs.fcc.gov/public/attachments/DOC-362222A1.pdf>

Geolocation & Data Privacy Bills Before Congress – 3 Bills Pending as of July 2020

COVID-19 Consumer Data Protection Act (Sen. Wicker):

make the FCC the enforcer of geolocation data privacy as a tool for COVID 19 requiring carriers to obtain "*affirmative express consent*" for tracking the spread of the virus – where people are allowed to opt-out of any data collection by carriers and data aggregators.



Public Health Emergency Privacy Act (Sen. Blumenthal).

Exposure Notification Privacy Act (Sen. Cantwell) requires cooperation with public health with regard to operation of "*automated exposure notice services*" as relating to testing of an infectious disease. A richer data set will be offered but does not go far enough to apply to contact tracing.



- Potential Conflict of Laws (?): CCPA's Opt-Sale of Personal Information
- FCC not an ideal privacy enforcer vs. CDC/Local health depts for data privacy in an infectious disease pandemic

Individual Privacy Laws USA & EU

WHAT IS PRIVACY: Laws referring to personally identifiable information typically collected by other individuals or entities (business or governments)



In the USA, the right to privacy never mentioned in the constitution. Contrastingly, European Union Charter of Fundamental Rights (Article 8): Explicit right to protection of personal data enshrined as a condition of citizenship. In other words, Data Privacy is baked-in to a European Citizens bill of rights so to speak

(EU) 2016/679 (General Data Protection Regulation, GDPR) effective 25 May 2018

Companies must process personal data in a lawful, fair and transparent manner. Individual has right to ask company what information it has, what they are doing with it, right to correct or dispute the data and, importantly, right to delete or obtain copies of their personal data

California Consumer Privacy Act, CCPA, Cal. Civ. Code §§1798.100 *et seq.*

Individuals fight to know what consumer data is being collected, and object to sale of such data, right to access and request to delete such data. CCPA is not applicable to individual data already acquired from third parties and not directly from individuals.



OPT-IN vs OPT-OUT Privacy Rights

GDPR: Opt-In to consent to personal data being used by collectors

-vs-

CCPA: Opt-out of consent to sell consumers' individual information

Proprietary Rights

TRADESECRETS (Intellectual Property)



Databases & Database Design *per se* tradesecrets ---

Uniform Tradesecrets Act refers to Trade Secrets as “all forms and types of financial, business, scientific, technical, economic, or engineering information, including . . . compilations, . . . processes . . . programs or codes “ where such information is kept secret by the owner and derives independent economic value to any would-be competitor”.

Applies to both Federal law (Defend Trade Secrets Act (DTSA), 18 USC §§ 1839 *et seq.*) and State law (Uniform Trade Secrets Act (UTSA))

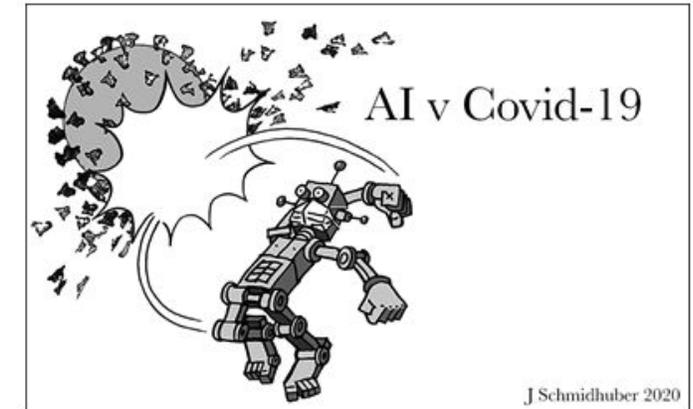
USE CASES – APPLYING AI & MACHINE LEARNING TO CONTACT TRACING

- General Survey of ML & AI Applications in Health
- Contact Tracing Build (A) – PRPODA Automated Tool
- Contact Tracing Build (B) -- Chatbot & Analytics Tracing

General Survey of ML & AI Applications in Health

General Healthcare AI technology as applied to COVID-19:

- Imaging Recognition – Virus Detection in Chest CT Scans & Facial Recognition (non-Democracies)
- Informatics & Molecular Drug Design for Vaccines and Testing – molecular manipulation
- Big Data auditing of geolocation and social media activity to provide context to virus spread
- Autonomous disinfection with UV light and other means



Meaningful use of AI in Contact Tracing will 1st require some new AI Infrastructure with respect to Privacy:

- Designated CDC/ Local Health Department Database with transparent Public Health Tagged KPIs curated for ML
- Public-Private Testing & Tracing Dataset-sharing through legislation, possibly expanding **Permitted Use Exception** of HIPAA (45 C.F.R. §164.512)

Source: <https://unctad.org/en/pages/newsdetails.aspx?OriginalVersionID=2364>

Proposed BIG DATA Infrastructure Build for fueling AI

& Redesign of Key Performance Indicators/ Metrics for Infection Reporting

Embers Embers are emitted from the fire over night and float in the air, often seemingly unpredictable happenstance occurs where one or several embers come together to ignite certain areas of the forest.. Various factors bear on each individual ignition.

General Observation: Best way for root cause analysis for infection spread for Contact Tracing is through generating measurement data. Average lag-time between CDC reported infection and death – 25 days.

General Observation: Current data collected varies by local metro health departments in terms of metrics and it is not aggregated to perform meaningful AI modeling and automated contact tracing.

Concerns of Inconsistency of Metrics on forms for reporting, CDC should harmonize model forms for richer demographic data. No law correlating reporting of richer demographic information between Physicians and Lab Directors to CDC for infections

– EX: California Lab Directors report case of COVID19 within one hour of result to public health officer via LOINK codes and the following demographic information: **Released, Unit Code, Test Name, Source, Result, Physician's Network, Physician's name, State, Patient Name, Patient ID, Sex, Age, DOB**

Proposed BIG DATA Infrastructure Build for fueling AI

Firstly – Uniform CDC standards for infection reporting and contact tracing: Data needs to be gathered and stored in a meaningful uniform manner, that will have baseline value to all public health departments collectively throughout the country but flexibility to add local and regional metrics for study as well.

“PRPODA” **Pandemic Real-time Privacy Oriented Data Aggregation**: -- Uniform, transparent, robust online network for at least gathering infection data – likely under HIPAA Permitted Use Exception – while maintaining health and individual legal privacy concerns for real time infection modeling and containment.

Secondly Data Needs to be Accessible to Data and Computer Scientists. Problem is twofold – currently.

- 1) Compete buy-in from all stakeholders in the USA toward exceptional public health through individual participation for the public good
- 2) Access to HIPAA redacted (edited for Medical Privacy Laws) data sets, healthIT.gov: Permitted uses & Disclosures for Public Health Activities https://www.healthit.gov/sites/default/files/12072016_hipaa_and_public_health_fact_sheet.pdf

CONTACT TRACING BUILD (A) Real-time Aggregation of Infection Data – a *SANDBOXING* PR PODA automated tool



TECHNOLOGY: (a) Decentralized storage of personal and health data on a mobile device with encryption to release data for contact tracing.

Ex: Google Apple Partnership, MIT SafePaths: <https://youtu.be/yuXzAh4sINw>

(b) Near Field (Bluetooth®) automated activation of device data share, “Chirps” (with MIT anonymized geolocation)

Versus:

QR Code Image Scan @ participating merchant that holds the individual location manifest (New Zealand)

(c) Online Portal – provide network pointers to decentralized data for aggregation to fuel ML & AI Models / Algorithms.
Internet Service Providers mindful of HIPAA privacy (many are commercially available)

PRIVACY LAW: (a) Permitted to gather COVID19 infection data under HIPAA Permitted Use Exception; 45 C.F.R. §164.512(b)(1)(iv) provides for contact tracing

(b) Geolocation - FCC currently has found wireless disclosure of consumers’ real-time location data to be in violation of Federal Law; CPNI 47 U.S.C. § 222 ,See <https://docs.fcc.gov/public/attachments/DOC-362222A1.pdf>

CONTACT TRACING BUILD (A) Real-time Aggregation of Infection Data – a *SANDBOXING* PR PODA automated tool



TAKEAWAYS:

Hybrid technology of near field chirps but QR location manifests can be set as an optional customer login but as a legal condition of State & Local health departments for merchants to remain open. Health departments holding one encryption key.

FCC is very aggressive with enforcing geolocation data obtained wirelessly, near field technology like MIT SafePaths does anonymize geolocation but not practical as requires many users of the app to first get a working sense of location. Use of QR location manifests at commercial sites – like a gym, grocery etc. provides location tracking as an option for consumers.

Decentralized data storage on the device but online access through a robust online network, restricted access by first responders, ex FirstNet online mobile network – robust stand-alone broadband network for first responders only (Mission Critical Internet Infrastructure) <https://firstnet.gov/about>

CONTACT TRACING BUILD (B)

Contact Tracing with Chatbots & Analytics tools

IBM Watson – Call Center AI & Boston Children's Hospital's HealthMap

TECHNOLOGY: (a) Chatbots for Initiating First Call to Infection Contact and redirection to the Contract Tracer

Ex: Chatbots are an AI tool to simulate a conversation with an individual

(b) BIG Data tools for analytics to build a healthmap. Natural Language Processing? Webscraping?

PRIVACY LAW: (a) Permitted to gather COVID19 infection data under HIPAA **Permitted Use Exception**; 45 C.F.R. §164.512(b)(1)(iv) provides for contact tracing

(b) BIG Data – breach legal concerns: Data breach of private health records: The Health Insurance Portability and Accountability Act of 1996 (HIPAA) P.L. No. 104-191, 110 Stat. 1938 (1996); Data breach of Electronic Health Records: Health Information Technology for Economic and Clinical Health Act, HITECH, 42 U.S.C. §300jj *et seq.*; §17901 *et seq.*; Data breach of individual (consumer information – name, age) California Consumer Privacy Act, CCPA, Cal. Civ. Code §§1798.100 *et seq.*

****CONTACT TRACING BUILD (B)**

Contact Tracing with Chatbots & Analytics tools

IBM Watson – Call Center AI & Boston Children's Hospital's HealthMap

TAKEAWAY: Chatbots can be an effective way to leverage resource constrained contact tracing programs. If chatbots can be linked to big data like EMR or healthcare data, they can be used to identify and prioritize screening and treatment of individuals with underlying health conditions that may put them in a high-risk category.

Legally, these AI & Big Data tools can be implemented right away to Contact Tracing so long as the contact tracers are mindful of good practices to prevent data breach of health privacy and individual (consumer) information

--- QUESTIONS ? ---

COVID-19 Contact Tracing in a Democracy: Balancing Public Health vs Privacy

Striking a balance in a vibrant democracy will require rethinking both privacy and the public health technique of contact tracing legally and technically for the 21st Century.

Rafael V. Baca, Esq. The Adelante IP Law Group <https://adelanteiplaw.com/>
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