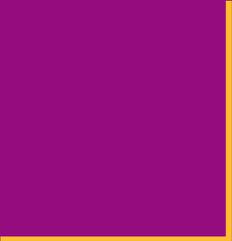




Pandemic, Privacy, & Public Health:
**An Update on Digital
Contact Tracing**

Hien '*Boba Queen*' Pham '23

Betsy Pu '22



Outline

- Recap: What is contact tracing?
- Overview of different national systems
- Effectiveness & Resistance

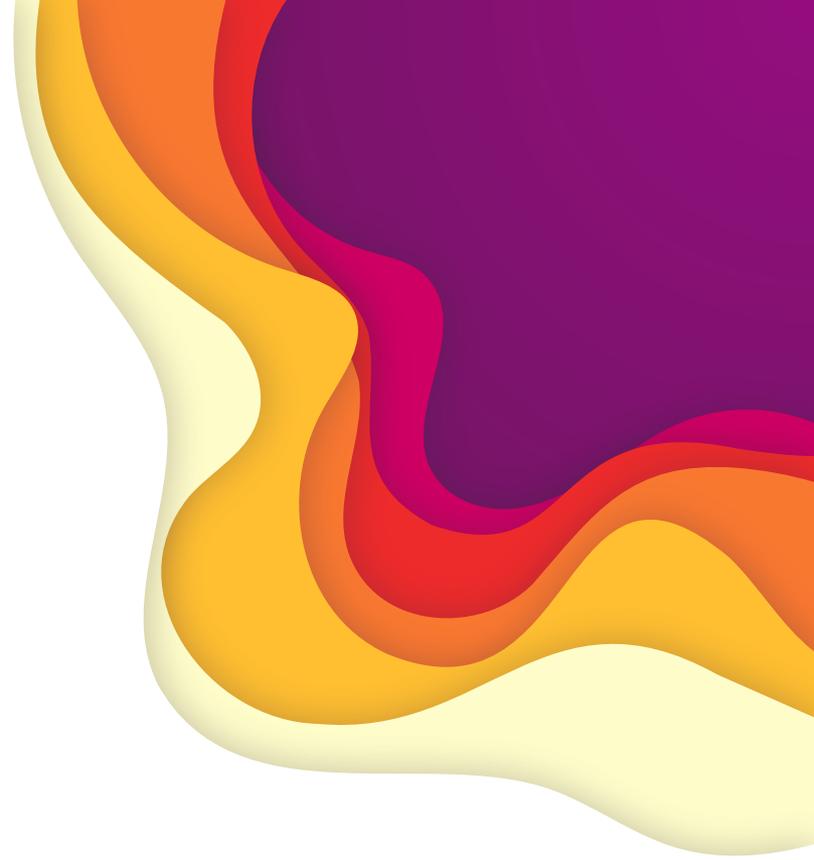
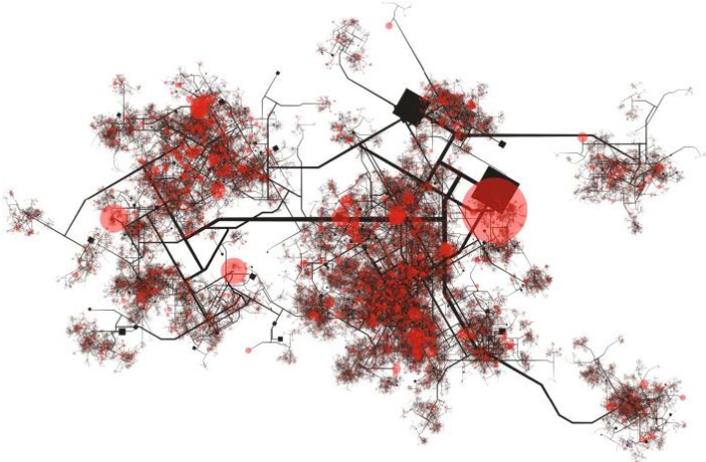
Feel free to interrupt us with questions & thoughts \o/



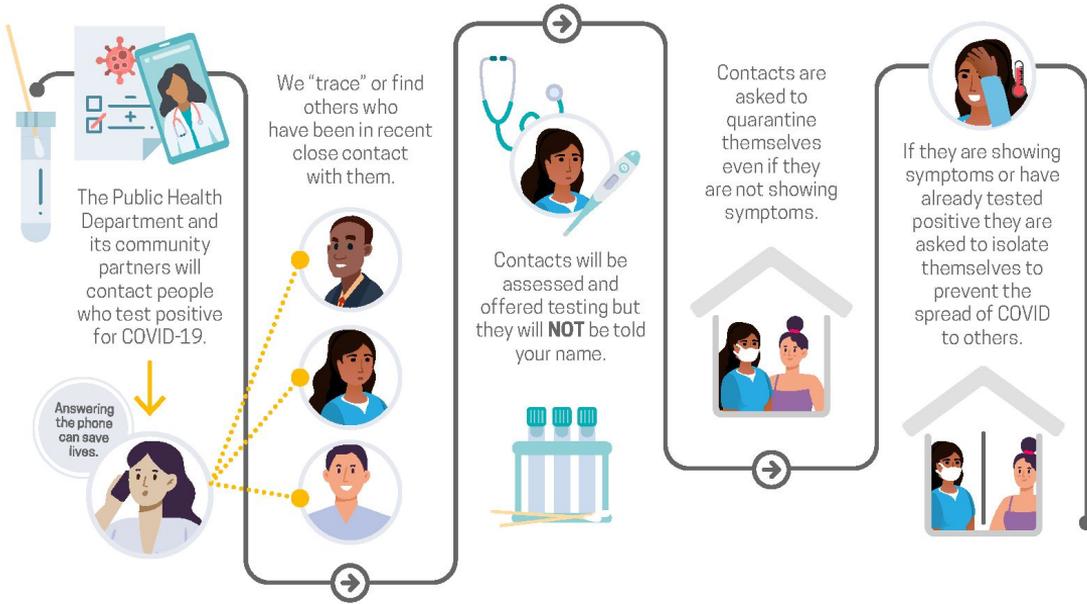
Poll Time!

Anonymous poll question:

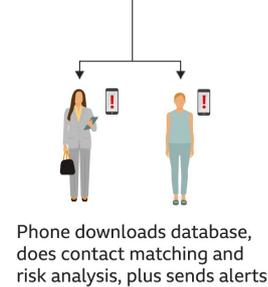
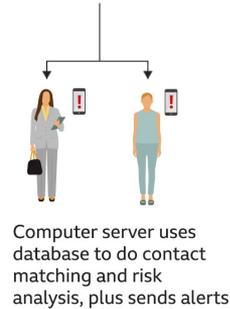
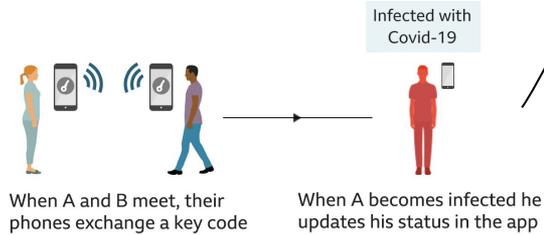
<https://bit.ly/3qEDrSu>



How manual contact tracing works

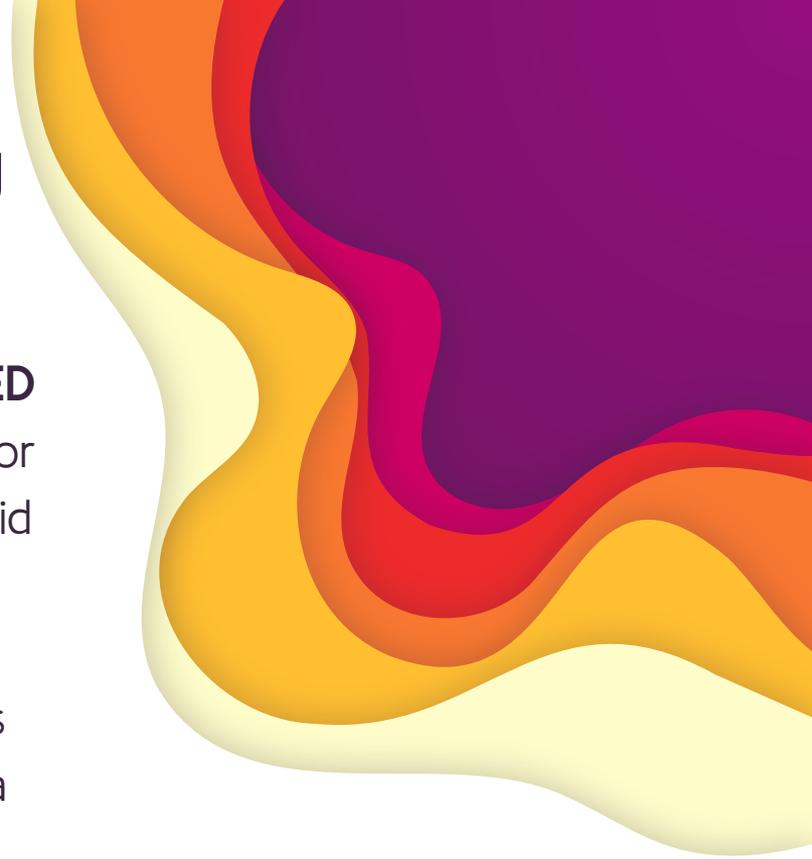


How digital contact tracing (ideally) works



Google/Apple Contact Tracing (GACT)

- **TL;DR: IT IS ANONYMOUS & DECENTRALIZED**
- In April, Google & Apple promised method for digital contact tracing built into iOS & Android
- In mid-May, released API to build contact tracing apps
- In November, released Exposure Notifications Express built into OSes, can be enabled by a state/government

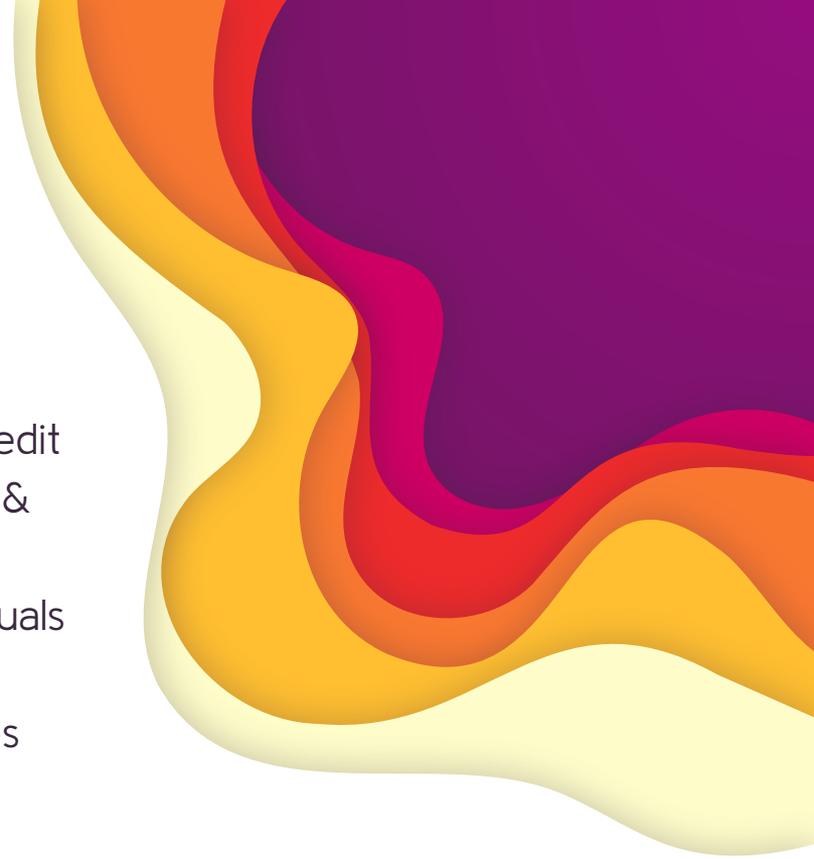


A Rundown: Global Tracing Responses

South Korea

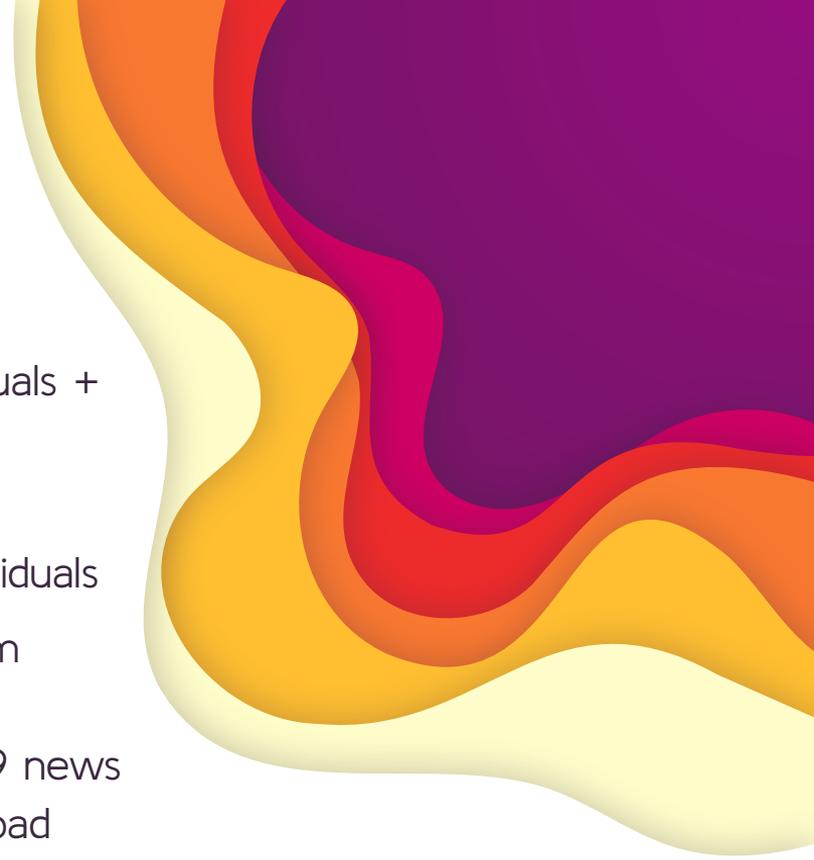
A Low-Tech Contact Tracing Built Upon Public Cooperation

- Thorough contact tracing
 - Officials permitted to use CCTV footage, credit card info, location data, etc to retrace route & identify those who came near
 - Routes are posted publicly & relevant individuals are notified by text
 - Can totally wreck businesses & personal lives
- App-enforced home quarantine
 - Location-tracking: leaving home reports to officials, up to \$2500 fine



Vietnam

- Similar to South Korea - routes are public, individuals + close contacts are tested and quarantined (entire schools, neighborhoods, condo buildings)
- Encourage reporting + testing for suspected individuals
- Open-source Bluezone app - doubles as symptom tracking app, calendar, QR code scanner, w/ motivational quotes, daily horoscope and Covid-19 news through notifications. Extra free data upon download (since gov owns telcom).



Singapore

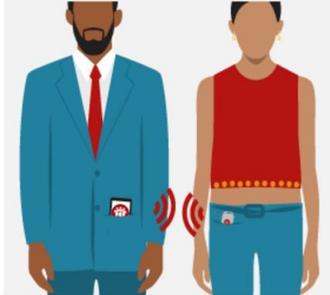
- TraceTogether app (over a million downloads)
- TraceTogether Bluetooth token - similar as the app, but you hand in the token after testing positive
- Uses short-range bluetooth tracking similar to Google/Apple Contact Tracing, but centralized
- Australia uses the same app protocol

How Singapore's tag-tracing system works

1. The TraceTogether token is carried in a bag or pocket



2. Bluetooth signals exchanged with other tags or app users nearby



3. Interactions kept for 25 days, then deleted



4. If user tests positive for Covid-19, tag must be handed to authorities for contact tracing



China

- Alipay Health Code
 - Uses “big data” to predict contagion risk and assign a color ranking
 - NYT analyzes source code and finds **“reportInfoAndLocationToPolice,”** which sends the person’s location, city name and a numerical identifier to a LE server upon install
 - Location sent each time the code is scanned
- History of function creep
 - “The coronavirus outbreak is proving to be one of those landmarks in the history of the spread of mass surveillance in China,” (Maya Wang, Human Rights Watch)



Hong Kong

- Wristbands + app for incoming travellers
 - Enforces 2-week quarantine
 - Establish the perimeter of your dwelling, & beeps if you go outside it
 - Can only stop the beeping by scanning wristband QR codes of everyone in quarantine with you (social tech?)
 - Some wristbands are dumb paper, some appear to be “smart” and work without an app



“Yes, as an American, it’s pretty unpalatable,” Ms. Song, [medical anthropologist and professor at the U. of Hong Kong] said of the tracking system. But ultimately, she added, she saw it as ‘evidence of a functioning public health system.’”

Artefact Magazine
@ArtefactLCC

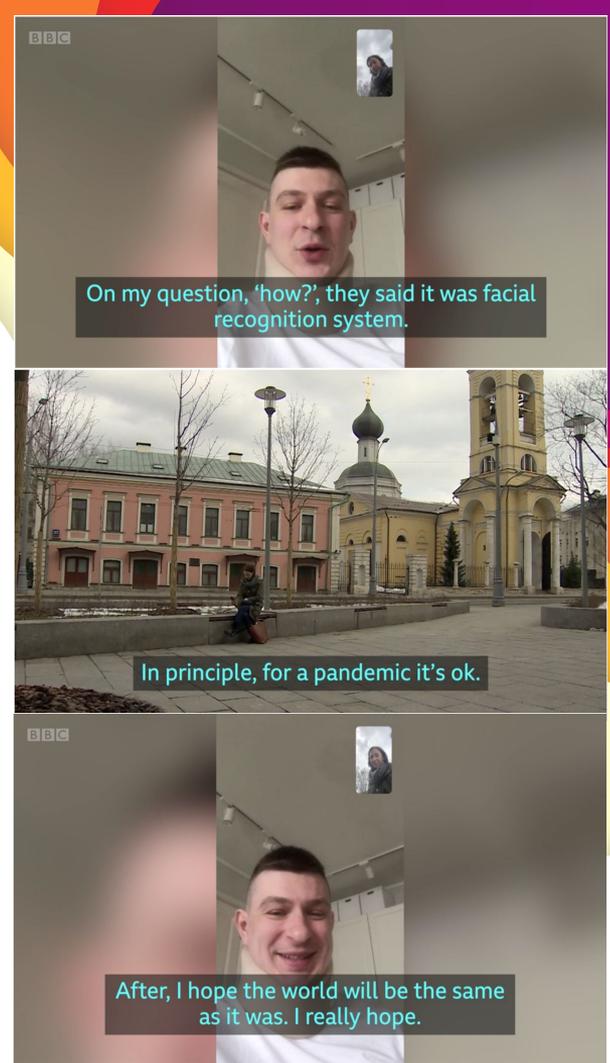
Ally, Hong Kong: at HK airport we were tested for covid and told to wear a wristband that reported our location during the 14-day quarantine period



11:58 AM · Apr 4, 2020 · Twitter Web App

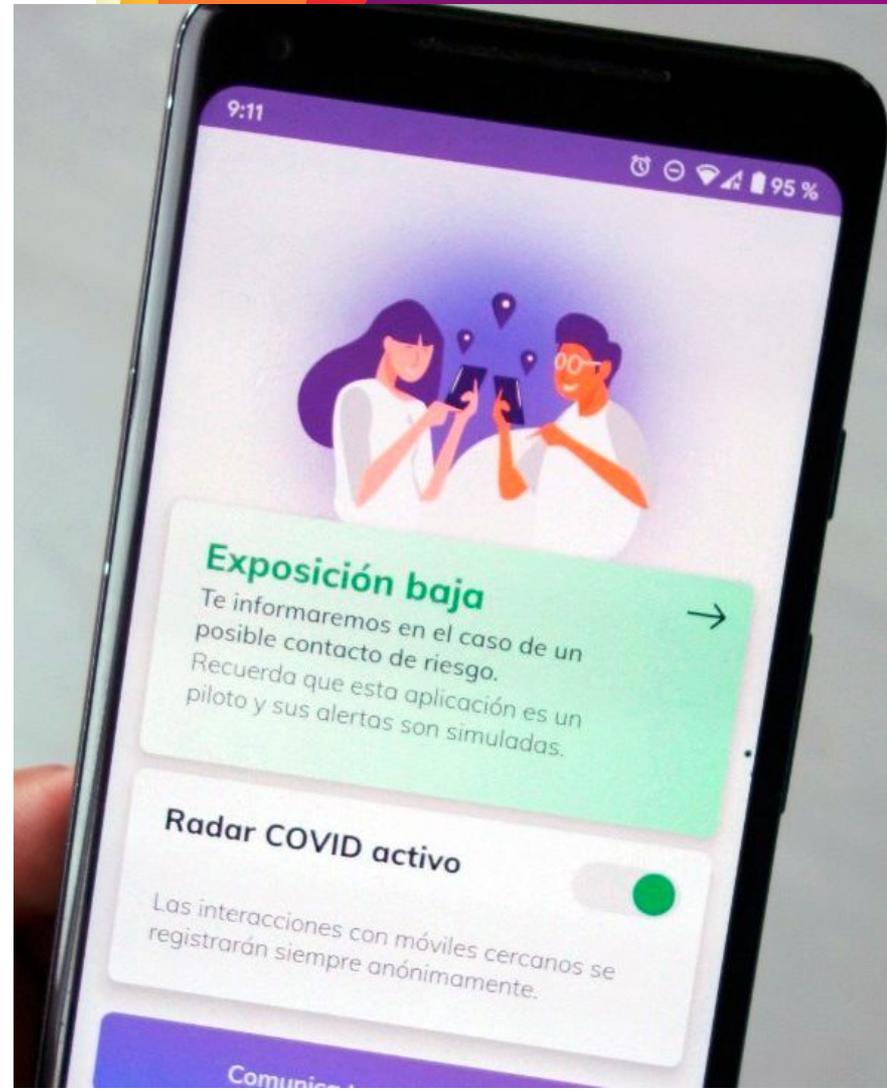
Russia: FindFace

- FindFace facial recognition software
 - System being used to enforce quarantine orders
 - Real time alerts to police for detected faces
 - Officials claim hundreds of people have been caught using this system



Spain: Radar Covid

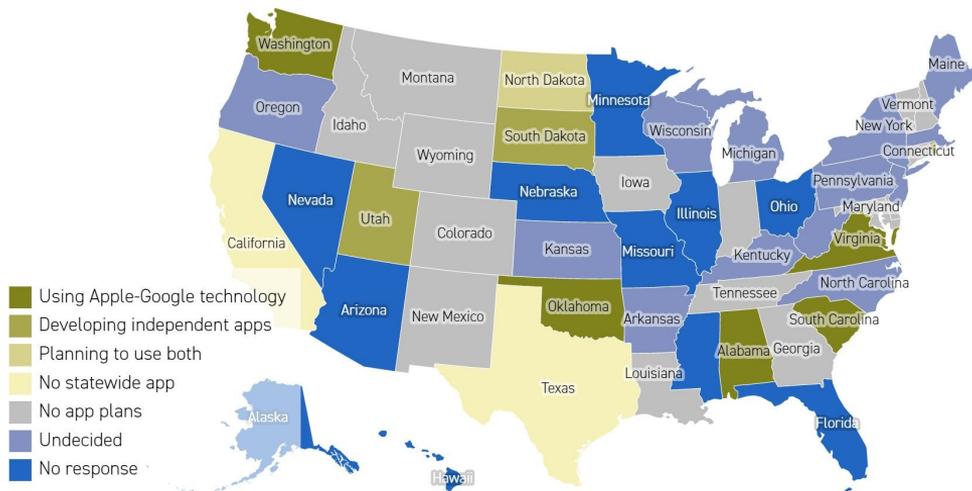
- Built on Google/Apple protocol, GDPR-compliant
- Tested adoption in a controlled experiment



US: Manual Contact Tracing + Scattered Apps

The United States of apps

States are split on how to use smartphone apps to track the coronavirus, despite Apple's and Google's attempt to impose uniform standards.

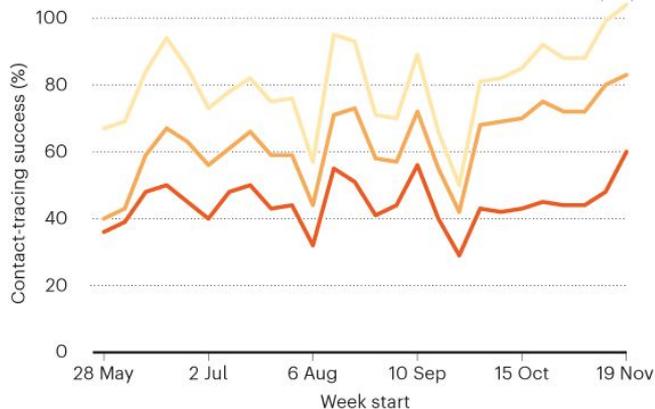


Notes: California and Texas each have regional apps. New York City has its own system.
Map: Bob King/Politico • Source: POLITICO research | Updated: June 11, 2020 1PM

MISSED CONTACTS

Between late May and November, contact-tracers in England generally reached less than half of the close contacts of people who tested positive for COVID-19.

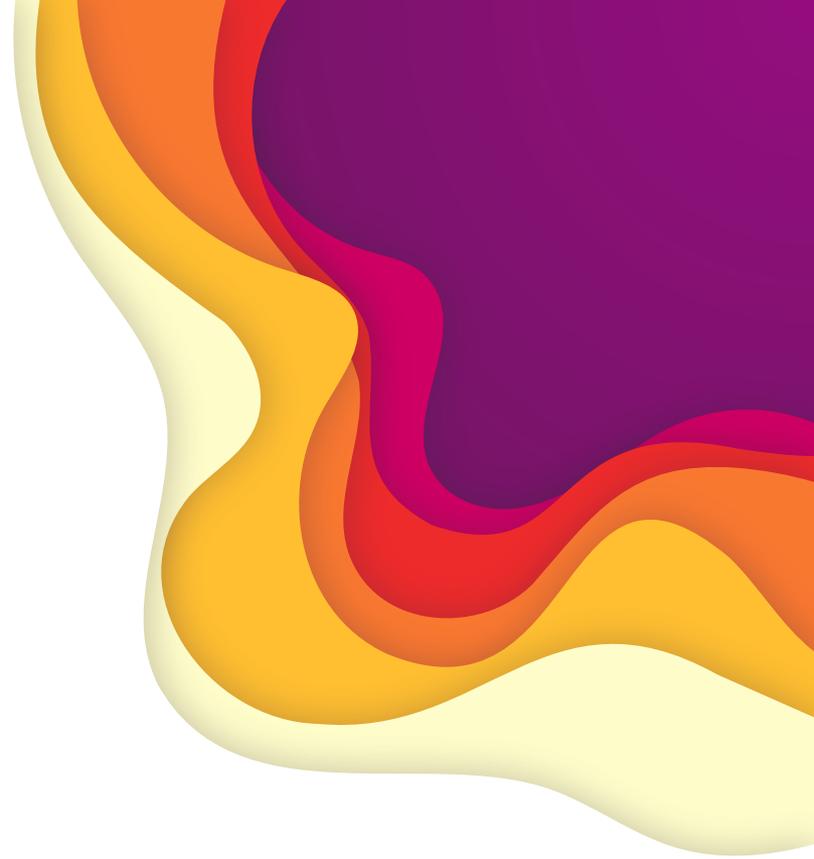
- Confirmed cases of COVID-19 reached by contact-tracers
- Confirmed cases who gave details of their close contacts
- Estimated proportion of contacts whom tracers reached



*Number rises over 100% because some positive cases were carried over from the previous week.

Summary: Design Considerations?

- Opt-in versus opt-out
 - Asking consumers to download an app
 - Bundling with pre-existing application / OS
 - Requiring participation to use certain amenities / upon entry into the country
- Scalability
 - Manual contact tracing + notification
 - Automatic contact tracing + notification
 - Automated detection of violations (facial recognition, location data)
- Public vs private disclosures
 - Notify potentially exposure with little vs a lot of detail
 - Publicly post information about confirmed cases



Have Contact Tracing Apps
Been Effective?



Effectiveness

- High false positive / false negative rates
- September study from Oxford University & Google says contact tracing apps reduce infections, hospitalizations, and deaths at almost any level of adoption *
- Recent study into NHS contact tracing app in the UK estimated that every 1% increase in app users can reduce coronavirus cases by as much as 2.3% ***
- Spain's controlled study: 2x as many contacts found through app than manual contact tracing alone

NHS Covid app prevented 600,000 infections, claim researchers

Study finds link in areas of England and Wales between high app usage and lower case numbers

Contact-tracing apps were the biggest tech failure of the COVID-19 pandemic

By Andrew Martonik
February 15, 2021

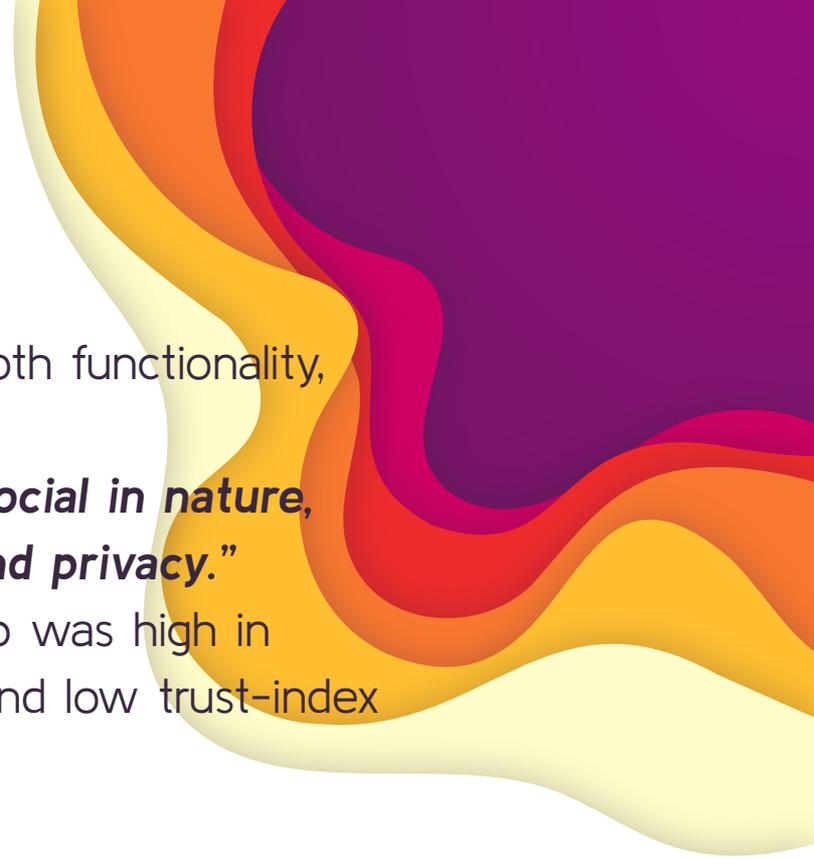
"We should've seen this from the start: Relying on Bluetooth was destined to lead to failure."

Coronavirus tracing apps can save lives even with low adoption rates

"Even at low uptake, it can make significant contributions," says an Oxford University researcher.

Adoption

- Most apps have issues related to the Bluetooth functionality, battery consumption, reliability, but--
- ***“The major issues around the apps were social in nature, [related to] trust, transparency, security, and privacy.”***
- Resistance to downloading and using the app was high in countries with a voluntary adoption model and low trust-index on their governments



Incentives

- “Fully committing to the app’s recommendations [of reporting and quarantining] may carry a hefty cost, **such as a loss of wages or an impact on your mental health.**”
- Showing people a video on how the app helps others or their own self-interest didn’t increase their chance of downloading the app significantly
 - **Small monetary incentives did**
- In Vietnam, downloading the app gives extra free data, and quarantined individuals/families/neighborhood gets free groceries and government assistance.



*“That sluggish user adoption can partly be explained by people’s **unfounded** fears that contact-tracing apps are tracking their location or other personal information.”*

- Alejandro De La Garza for TIME

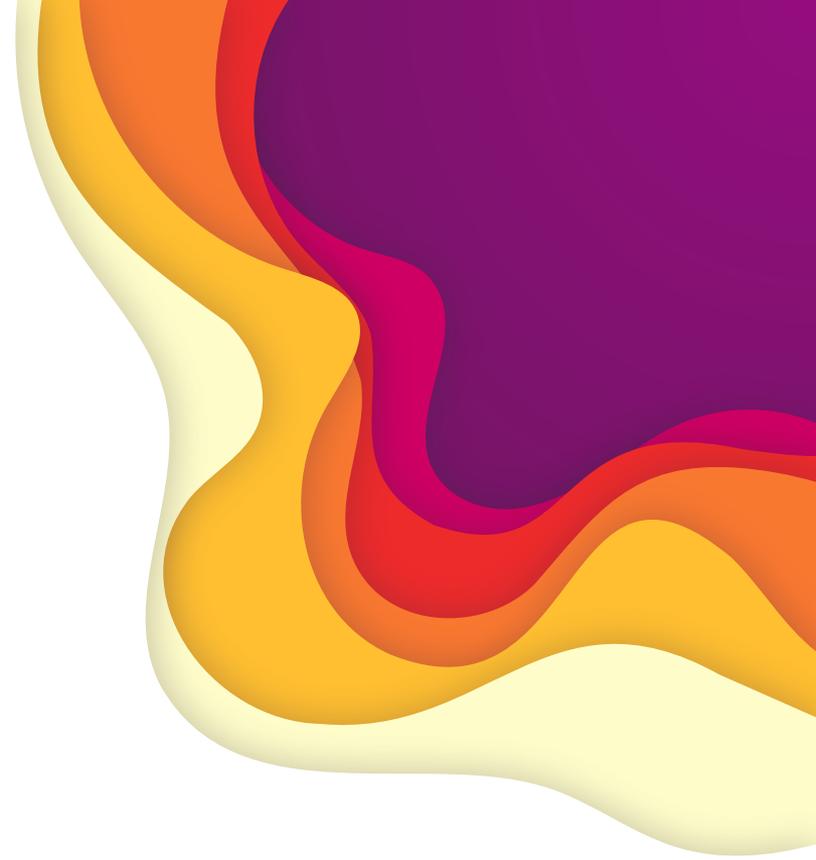
Historic Function Creep in the US of A

- USA Patriot Act passed with little debate in wake of 9/11
 - But, 5-year sunset on some provisions, re-authorized for over a decade
- During 2010 Cholera outbreak, CDC used Palantir's technology to "explore text messages" between Haitians and a text platform built by an outside technology company



Function Creep in Singapore

(ॐ _ ॐ)



“Governments could argue they needed to keep the biometric surveillance systems in place because they fear a second wave of coronavirus, or because there is a new Ebola strain evolving in central Africa, or because... you get the idea.”

- Yuval Noah Harari

“Some communities that have been hardest hit by COVID-19 have a long-standing distrust of public-health authorities, she says. “For the African American community, there’s a history of malfeasance on the part of the public-health system,” she says, “and for the Latino community, there’s a problem of members of the community who are undocumented” – and fear deportation.

*- Mary Bassett, public-health researcher
@Harvard*

How would you feel if
Princeton mandated a
contact-tracing mobile app?

BIG Q's:

- What are the tradeoffs for different techniques, technologies, and designs?
- Given those, which would you put in place?
- And, what safeguards would you use to prevent abuses?