



C-19 Tracker/Tracer Smart Phone Apps:
Fairness, Transparency, and Accountability

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Do no harm...





Data sources

1. Bluetooth (low energy) - Fluphone, tracetogether, (joinzoe?)
2. Location Services (android/ios)
3. Cellular Provider (cell tower, CDR)
4. TfL (oyster, loop, congestion ANPR)
5. M-pesa use/like (feature phone)



Meanings

1. Contacts ~ meters, intervals, duration, risk
2. Absolute location ~10m
3. Cell level loc (~100m) & velocity
4. waypoints (e.g. start/end journeys)
 - payment info on phone...



data ownership/control

1. On the phone

1. could upload to NHS/PHE

1. singapore&korean "accidentally" disclosed

2. contact trace (secure map imei>person)

1. warn contacts (privad style)

2. In cloud (if user consent - default)

1. ask google/apple

3. Telco data subject to Lawful intercept/wiretap

4. TfL journey only GDPR:-)



Use cases

1. On phone: warn user & contact tracing
 1. @NHS: epidemic SIR parameter tune
 2. Self reporting symptoms v. test
2. Approx contact tracing
 1. @NHS help SIR estimation/bounds
 2. Self reporting symptoms
3. sanity check 1&2, movement compliance
4. lockdown compliance... ..



Privacy of smart phone data

- Keep on phone
 - can still do warning & contact trace
 - if subject is tested +ve by NHS
 - +asked to give contact data (see later)
- If data logged to NHS
 - better estimate SIR/"contact"/risk
 - hotspot detect (restart local lockdown)



SIR

- Susceptibility/Infectiousness/Recover
 - by age/gender (both of infected and infector - kids->adults etc)
 - pre- & asymptomatic carrier stats
 - early detection of re-infection prob.
 - i.e. duration of immunity stats.



SIR parameter > actionable

- Model phase changes in infection, epidemic, pandemic
- predict recovery/treatments
- Model impact of interventions
 - Natural experiments' data
 - different interventions at different times in different countries



Later app proposals

- Store data in secure MPC (safetrace)
 - jana / share mind (not blockchain:)
 - or trust NHS not to be bozos(GDPR)
- test results service (back to work!)
 - (C-19 +ve, recovered, antibody, other?)
 - QR code (verified service/tamper evident) & parking permit card?



Who users services/data/analytics?

- We get warned about possible infection
- May get told about safe home/work.
- Epidemiology models massively better
- as we get over it we can go out
- we can then help (volunteer nhs/school/care homes)



Test workflow design challenge.

- cyberphysical system problem
 - (most) virus tests are 2 stage:
 - swab->pcr->result
- but also self test virus&for antibodies
 - need verified results<->subject linkage.
 - need certified physical&digital result.



Third party access to results

- needs auth (biometric/picture id)
 - -ve, +ve,
 - -ve after +ve (or antibody)I,S,R
 - very like age (>18) verification
 - assurance...about confidentiality
 - assurance ... about no further use of data.



Problems

- What about people without phones?
 - contact trace classic already solves.
 - sample bias needs mitigating ^
 - can use census data with phone distr
 - but do **not** need 60% phones to get some benefit from contact tracing app
- Turn into future surveillance tech
 - that's why we have GDPR & IPA

References



Empirical Basis for Contact Tracing

[https://www.thelancet.com/journals/laninf/article/PIIS1473-3099\(20\)30357-1/fulltext](https://www.thelancet.com/journals/laninf/article/PIIS1473-3099(20)30357-1/fulltext)

NHS App Source/Doc

<https://github.com/nhsx/COVID-19-app-Android-BETA>

Why Centralised

<https://paravirtualization.blogspot.com/2020/05/arguments-for-nhsx-centralised-approach.html>

Decentralised Contact Tracing App/Design

<https://github.com/DP-3T/documents>

Oxford/NHSX design basis

<https://science.sciencemag.org/content/early/2020/03/30/science.abb6936>

Test everyone

<https://www.sciencemuseumgroup.org.uk/testing-for-coronavirus/>

What is SARS-CoV-2 (COVID-19) ?

<https://cdn.elifesciences.org/articles/57309/elifesciences-57309-v1.pdf>



Who Am I?

