

CONTACT TRACING APPS FOR COVID-19



Dr Susie Wright is a physical sciences and IT adviser at the Parliamentary Office of Science and Technology (POST). More content from POST on COVID-19 can be found on their website, <https://post.parliament.uk/category/analysis/covid-19/>.

There has been much discussion of the role digital contact tracing might play in helping to reduce the risk of further COVID-19 outbreaks as lockdown restrictions are eased. Contact tracing is the process of identifying people who have come into contact with an infected individual so they can be warned that they may be at risk of illness.

Digital contact tracing using mobile phone apps can automate this process by detecting when people come into close contact and notifying users that they may be at risk. This is a new and relatively untested technology, but potentially allows for quicker and more precise tracing than traditional, manual contact tracing that uses interviews with infected individuals to understand who they have been in contact with. However, for apps to work effectively, numerous challenges must be overcome, including accurately measuring distance between contacts, ensuring users' privacy and encouraging widespread uptake of any app. Many countries have released digital contact tracing apps but, so far, there is limited evidence that they have been able to effectively overcome these challenges. Singapore was one of the first nations to release an app in March. Since then, Australia, Norway, France and Germany, amongst others, have launched their own apps.

On 12 April, the Government announced that NHSx, a unit of the NHS responsible for digital innovation, was developing a contact tracing app for the UK. After early testing at RAF Leeming in Yorkshire, a trial of this app began on the Isle of

Wight on 5 May and the app's source code was published. A national roll-out was expected to follow this trial before the end of May but the app was never released. However, on 18 June the Government announced that they would be changing the trialled app to make use of a software interface released by Apple and Google in May. The release of the UK app is now not expected until the autumn at the earliest. On 22 June, the House of Lords was told that the cost of the app to date was £11.8 million.

HOW DO CONTACT TRACING APPS WORK?

Contact tracing apps work by digitally tracking who an individual has come into contact with. When two people come within a certain distance of each other, their phones exchange 'tokens' (unique identifying numbers) that have been allocated to each phone. It is generally agreed that, to protect an individual's privacy, the tokens should be anonymised, generated randomly and changed regularly. The app stores a list of the tokens belonging to all contacts made over a given period. If an individual begins to show symptoms of COVID-19, or tests positive, the app is notified. It can then alert other users that

they may be at risk of infection if the infected person's token is stored in their phone. When designing an app to carry out this process, different technical specifications can be chosen to meet certain standards of accuracy, security and user privacy.

Most contact tracing apps currently in circulation use Bluetooth to measure contact proximity. In principle, a phone can estimate the distance to another Bluetooth device by measuring the signal strength received from that device. Norway is one of the exceptions to this in Europe as their app collected users' location data via GPS. However, Norway's Institute of Public Health suspended use of this app on 16 June after the country's data protection agency raised concerns that the app's use of location data was unnecessarily invasive to privacy. Bluetooth provides some privacy protection as the proximity of other devices, but not their absolute location, is measured, so less identifiable personal data are collected. However, the accuracy of Bluetooth over the 1–2 metre length scales needed to measure risk of infection has been questioned. For example, research has found that Bluetooth signal strength can be affected by factors such as

whether a phone is indoors or outdoors and how deeply it is placed in a bag. Furthermore, some smartphones, particularly older models, do not support the type of Bluetooth used by

are shared with a central computer managed by the app administrator. Decentralised apps involve less data sharing so are thought to provide better privacy protection.

Google have stated that only apps developed by public health authorities will be able to use the API and these apps must meet certain security, privacy and data control standards. Some of the countries that initially planned to use a centralised approach, including Germany and Italy, switched to a decentralised model before their apps were released to allow them to make use of the API.

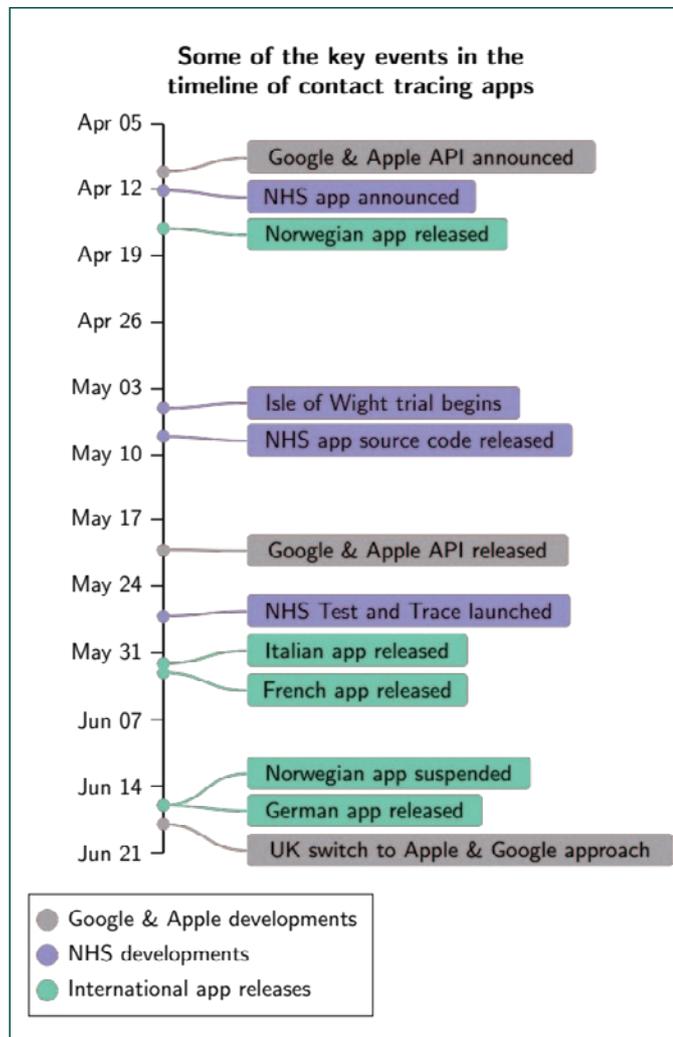
Other countries, including Norway and France, have opted to follow a centralised approach. The Australian app has been described as 'hybrid-centralised' as data are stored on a user's phone but their identity is revealed to the health ministry if they are at risk of infection. The app that the UK Government tested on the Isle of Wight was built on a centralised model but the announcement on 18 June that the Government are now looking to work with Apple and Google suggests a switch to the decentralised approach followed by those companies. A concern that has arisen from countries using different approaches is that their apps may not be compatible with each other and so contacts from other countries may not be recognised.

Another area where many countries have faced difficulties is encouraging a sufficiently large proportion of the population to download the apps. An Oxford University study estimated that uptake by 80% of UK smartphone users would be required for an app to suppress the epidemic (although lower uptake could still help slow the spread of disease). Reports suggest that, as of mid-May, 40% of the population of Iceland, around 25% of the population of Singapore and about 20% of the population of Norway had downloaded the

apps released in those countries. Since 2 June, the French app has been downloaded by 1.8 million people but subsequently deleted by 460,000 of them. Concerns have been raised that individuals without smartphone access, particularly the elderly who at higher risk of severe illness from COVID-19, may be excluded from any benefits offered by an app. The Government have maintained that any app would be used alongside manual contact tracing to support those without smartphones.

NHS TEST AND TRACE

On 28 May, the Government's manual Test and Trace programme was launched. This programme aims to identify the contacts of anyone who tests positive for COVID-19 via interviews with the infected person. The Health Secretary has since argued the importance of receiving information from a human rather than an app to reassure the public during the contact tracing process and in June the Common's Science and Technology committee was told that the app wasn't a Government priority at that time. However, critics have commented that the manual contact tracing programme offered by NHS Test and Trace would not be able to identify contact between strangers and could be too slow, meaning those exposed to the virus could unwittingly spread it before being told to self-isolate. The Royal Society's Data Evaluation and Learning for Viral Epidemics group estimate that testing, tracing and informing contacts needs to take place within 3 days to reduce the number of new infections generated by 15%. □



most apps. Estimates reported by the BBC suggest 12% of phones in active use in the UK may not support it. Singapore is now distributing wearable Bluetooth devices with the same functionality as their app in an attempt to circumvent some of the problems with using Bluetooth on mobile phones.

Another issue that has dominated the debate surrounding contact tracing apps is whether app developers should use a decentralised model, where data are managed locally on a user's device and data sharing is minimised, or a centralised model, where data

In part, this debate around centralisation arose as many countries, including the UK, initially pursued a centralised approach which would allow them to collect data to research the spread of the virus but Apple and Google, as well as some academic groups, supported a decentralised model. The Application Programming Interface (API) released by Apple and Google in May allows contact tracing apps to access additional functionality, such as the ability to run as a background process, which is usually denied to apps for security reasons. Apple and