

# COVID-19 Contact Tracing Apps: How They Notify Users of Potential Exposure

William A. Mattingly<sup>1\*</sup>

<sup>1</sup> Center of Excellence for Research in Infectious Diseases, Division of Infectious Diseases, University of Louisville School of Medicine, Louisville, KY, USA

\*bill.mattingly@louisville.edu

## Introduction

Quarantine is considered an effective way to mitigate the spread of many infectious diseases. Once a person has tested positive for a pathogen, they can be quarantined in a medical facility or, in less severe cases, practice self-isolation. This prevents an infected person from further spreading the disease until they are no longer infectious. To go one step further is to notify and test others who were exposed to the infected person in the time before they were tested but since they likely became infectious. The process of identifying and locating these previously exposed persons is known as contact tracing.

## Process of Contact Tracing

Conventional contact tracing starts with identifying an infected person with an approved test. Health experts then interview this person to determine the people (contacts) to which they were in close proximity while contagious. The process is error prone and highly time sensitive as a contact continues to expose others to the disease until they are successfully tracked down. Like most processes needing coordination and fast communication, contact tracing is one that can benefit from technology, as instant text messaging can aid both tracing efforts and notification of contacts. The most advanced contact tracing apps go a step beyond this, employing recent innovations in short range wireless signals to anonymously alert individuals who were previously near contagious persons. These apps are sometimes called proximity tracing rather than contact tracing.

The wireless technology used by proximity tracing apps is called Bluetooth<sup>®</sup> and has been present in cell phones, tablets, laptops and desktop computers for over a decade. If you've used rechargeable mice, keyboards or headphones, then you have likely used a device with Bluetooth technology. The primary advantage of Bluetooth communication is its short effective range. The signal of the class 2 battery powered devices only travels about 10 meters. This range is what makes the devices useful in contact tracing. When a Bluetooth radio on a cell phone is enabled, it will communicate with every other Bluetooth device that comes in range. Most of these communications are short and involve two devices deciding not to connect. But if two phones are both using a contact tracing app, the short Bluetooth communication can exchange a digital token allowing the app to remember all of the other phones it has passed near.

There are many examples of governments using these apps to try and help slow the spread of pandemics like COVID-19. While they all make use of Bluetooth technology on the phone, there are two major differences in the way the apps are designed. These differences center around how information about exposure is communicated to users of the app. In centralized contact tracing apps, all exposure information is maintained on a central database administered by the developers of the app or their clients which are usually government bodies. Decentralized tracing apps do not maintain any information in a central database except the IDs that need to be periodically transmitted back to all apps after a positive test case is confirmed. The decentralized design is considered more protective of users' privacy by limiting the amount of information shared with the central database. That also limits the quality and type of interventions and modeling that

## Recommended Citation:

Mattingly, William A. (2020). "COVID-19 Contact Tracing Apps: How They Notify Users of Potential Exposure," *The University of Louisville Journal of Respiratory Infections*: Vol. 4, Iss. 1, Article 65.

**Received Date:** September 14, 2020

**Accepted Date:** September 17, 2020

**Published Date:** October 16, 2020

**Copyright:** © 2020 The author(s). This original article is brought to you for free and open access by ThinkIR: The University of Louisville's Institutional Repository. For more information, please contact thinkir@louisville.edu. This article is distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.



**Funding Source:** The author(s) received no specific funding for this work.

**Conflict of Interest:** All authors declared no conflict of interest in relation to the main objective of this work.

health departments can do. The centralized design can provide a large amount of useful network data on person to person interactions to health officials.

### Effectiveness

It will take some time to know whether these types of apps help to mitigate the spread of a pandemic. A major limiting factor to the success of contact tracing apps are what are termed barriers to adoption. For an App to be effective, it must be selected by a user and installed on their phone. It is possible in the near future that Google and Apple may have built-in contact tracing apps always running in the background of every phone that is purchased. In such a scenario, the effectiveness of contact tracing apps would extend to every person with a smart phone. Privacy concerns aside, this would be a highly effective means of contact tracing and would help answer the question of whether or not these sorts of measures are viable in fighting the spread of disease. Until that time however, we can only look at the current adoption rates of contact tracing apps, which are reported to be very low. [1]

Fighting with barriers to adoption are a common problem for app developers and contact tracing apps are no different. Installing an app requires all of the following steps from the user:

1. Search for the app in their device's app store.
2. Install the app
3. Agree to user license agreements
4. Assign Notification Settings
5. Grant the device access to hardware features (Bluetooth, etc.)

Each of these steps increases the burden on the user for using an app. When a large volume of response is needed for a successful project, making it as easy as possible for users to submit data is crucial.

Web apps are websites that can be accessed on a smart phone's web browser and they have much lower barriers to adoption than native smart phone apps. Historically, the hardware features of a phone are restricted to native apps, but this has changed recently with GPS and even Bluetooth now being accessible to websites via the web browser. The future of contact tracing will likely depend on either web apps or built-in software from Apple and Google for adoption to be high enough to be effective.

---

## References

1. Vogelstein F, Knight W. Health officials say 'no thanks' to contact-tracing tech. Wired [newspaper on the Internet]. 2020 May 8 [date cited 2020 Aug 15]:Science. Available from: <https://www.wired.com/story/health-officials-no-thanks-contact-tracing-tech/>