Being Cautious: The Dangers From Digital Contact Tracing Systems

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Tahsin Kazi

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

Advisor

Kathryn A. Neeley, Associate Professor of STS, Department of Engineering and Society

Introduction

As of December 11, 2022, more than 6.65 million deaths have been attributed to COVID-19, with excess deaths far outpacing anything seen in the last decade (Edouard et al.,2020). The advent of a novel airborne respiratory virus that could possibly remain dormant in the host body for up to 20 days before showing symptoms and can result in death caused global disruption and economic devastation (NCIRD, 2022). The President of the United States declared a national emergency along with the statement that summarizes the threat they faced: "The spread of COVID-19 within our Nation's communities threatens to strain our Nation's healthcare systems" (POTUS, 2020, p. 15337).

In order to contain the spread of the virus which was not properly understood in March 2020, the governments around the world the world implemented social distancing, mask policy, and travel ban for incoming and outgoing transportation systems (POTUS, 2020). As scientists rushed to create a vaccine, other avenues of protecting people and reducing the spread of the virus is being explored. Pressure mounted on the tech industry in Silicon Valley to respond with a solution. Encouraged by the White house, they came up with an invasive digital solution for contact tracing, allowing smartphones to be used as location tracking. This system constantly monitors and broadcasts information, tracing people they have been in contact with.

This seems like a great solution on the surface however it would require fast and wide adoption by the public while guaranteeing privacy and security that this data will not be used for any other purpose. Mistrust in the system of contact tracing will only slow down the adoption, thus leading to low effectiveness of this technology while still posing the great risks. The dangers brought up by researchers warn that this sort of technology could

eventually lead to an unprecedented surveillance state for society at large (Sharma et al., 2020, p. 1166).

The benefits to curbing COVID-19 spread versus the dangers posed by private companies and governments alike implementing obligatory contact tracing may be difficult to understand. In this paper, I discuss the dangers posed by contact tracing apps and how we must carefully consider the privacy implications of such technology. To support this claim, I will use Actor Network Theory framework to understand the perspectives of the government, private companies, World Health Organization (WHO), and the populace in order to ensure that ethical guidelines are being followed when implementing contact tracing apps.

Supporting Argument No. 1: The Initial Response in Frenzy

Why is contact tracing even being considered?

While the social distancing and mask policy was implemented in the United States by the federal government, individual institutions implemented their own detailed policies on how they think would be the best way to respond to the situation. We do have historical context on dealing with the Influenza, and thus similar methods were being considered as the best response initially to curb the spread (Ott et al., 2007). Various institutions such as state or local governments disbanded all social gatherings besides your personal residence while businesses and universities implemented strict health advisory based on Center for Disease Control (CDC) guidelines. All businesses and education facilities were not allowed to have in person employees and only under strict health guidelines were essential businesses and employees allowed to return to work. Governments and companies faced a

big shock to the economy as they saw the largest recession since the Great Depression of the 1920s. As shown by Figure 1, in the time frame from December 2019 to March 2020, the number of new Covid-19 cases rose from around 200 to 60,000, which signaled an out-of-control increase in the cases of a novel airborne virus.

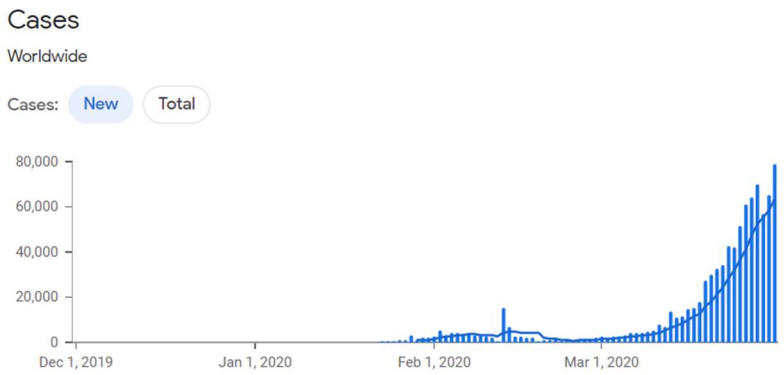

Figure 1 Chart visualizing the number of new COVID-19 cases reported worldwide from the frame of reference between the first known case and before the lockdown policies were implemented. This shows an exponential increase in the number of cases and frames the perspective from which the entities were making decisions on. (Edouard et al.,2020)

With the wide prevalence of smartphones and it being a very concentrated industry with only a couple of large manufacturers holding nearly the entire market, and having only two main operating systems that all phones run on: Android (by Google) and iOS (by Apple) results in a steep power dynamic between the public and such companies. Because of the tight control of the software layer by US public companies, the US government saw it as an easy path to help contain the spread of the virus if these two companies decided to create contact tracing features in their software. But unfortunately, individual countries and regions started implementing their own versions which led to a vast number of different implementations of contact tracing apps.

What is contact tracing?

Contact tracing in this case refers to digital contact tracing where a phone would be utilized to create an efficient digital notification and tracking system that can effectively track infections. This functionality would require constant access to GPS geolocation data and geolocation history that tracks where you have been over an extended period of time. Along with that, there needs to be some sort of signaling through the various communication protocols available, such as Bluetooth or Wi-Fi, that can make your phone's presence aware of other phones around you at a certain distance. Depending on implementation, a unique identifier is stored on a database and if a person you have come into contact with was recently diagnosed with COVID, your phone will warn you of the information. For providing timely exposure notifications, accurate contact tracing information plays an important role. There are two overarching methods of implementing contact tracing, centralized and decentralized solutions. The centralized solution maps the unique ID to individuals to identify at risk contacts when they receive a positive test result for COVID. This is done through a centralized database that the health officials use to keep track of infected individuals and they carry the responsibility of contacting everyone that may have come into contact. The decentralized method takes the centralized party database out of equation and uses an anonymous public server to keep track and notify people, thus preserving privacy for personal information while fulfilling the functionality of contact tracing. (Sowmiya et al., 2020, p. 2)

Why are there different implementations?

The implementation of contact tracing can be done in a safe manner when using proper encryption and anonymization standards along with transparency on the data collected and functionality of the application. Due to disagreement in the approach for implementing contact tracing, various countries implemented their own versions of contact tracing in haste, without any consideration of the privacy and security concerns. A previous study conducted by Sharma and Bashir (2020) found that over 50% of the apps used for contact tracing did not appropriately protect user's personal data in an anonymous, encrypted, and secure way along with requiring additional information besides the ones necessary to conduct contact tracing.

Apple and Google decided to jointly develop and collaborate in creating a privacy focused and interoperable contact tracing system, demonstrating that contact tracing can be achieved without compromising the privacy of the public. They took input from privacy scholars and the system was designed for decentralized local storage so the information is always locally stored and information is only sent to health officials in a non-identifiable way, as shown in Figure 2. Unfortunately, most other implementations around the world did not share the transparency or privacy features seen in the Apple & Google collaboration (Sowmiya et al., 2020, p. 4).

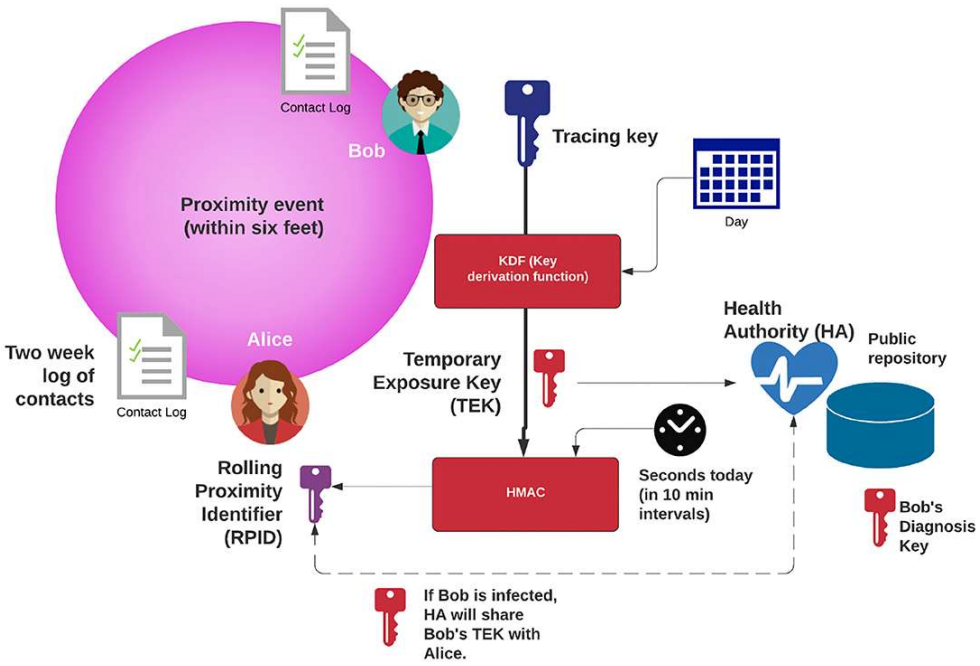

Figure 2 Contact Tracing Diagram of the Apple & Google collaboration for the contact tracing app. It shows details published by Apple in the specifications and design of the entire system. (Buchanan et al., 2020)

What are the dangers?

The most pressing concern voiced by the public and privacy researchers is the usage of the data for other purposes by entities that hold the information. The ethical implications of collecting accurate personally identifiable information can cause significant harm to individuals by the unauthorized usage of their data. Location history can expose your personal address, work location, social circles, and behavior patterns to the government or anyone with access to the data, something very difficult to evaluate with closed source apps. Additionally, personal information like name, address, email, and phone number can cause you fall victim to malicious threat actors if the database was ever hacked. Having weak security implementations can also leave you vulnerable to tracking by third parties who could gain access to your location data. Some clear and present danger would be the use of law enforcement on regular citizens as not all countries have the same civil liberties

and rights protected by the government. As such, they could specifically use such data to target a specific subset of the population and marginalize them (Klar et al., 2020).

Given the repeated historical abuse of power by governments in order to marginalize vulnerable individuals in the name of public good, there is not a good historical track record that the public would feel comfortable sharing their data with (Dubov & Shoptawb, 2020). As such, it is pertinent for the success of contact tracing that there be a governing and oversight committee that takes in public opinion with the aid of civil liberty scholars and privacy advocates in order to ensure proper governance of the system. The public should be regularly updated on the information gathered and its usefulness to evaluate if this path of contact tracing is even aiding in curbing the spread of the virus or would our efforts and resources be better spent elsewhere. We need to understand the decisions made regarding contact tracing by analyzing the disparity between intentions and actions by the large entities involved in the decision-making process. While this may not provide the most robust details on the intentions of the entities, it will allow us to identify if there could be hidden agendas in the system.

Supporting Argument II: Analyzing the Incentives of the Entities Using Actor Network Theory

The trustworthiness of the entities involved in the contact tracing system can be analyzed by looking at the incentive structure and stakes involved of a select few specific actors. With additional context added to the actors involved in making decisions in the design and implementation of contact tracing, we can better understand if they are behaving ethically or if we should worry about the direction they are headed. The actors in

this paper that will be analyzed using actor network theory are: governments, companies, the World Health Organization, oversight committees, and the populace. The use of actor network theory allows us to analyze the interactions between the non-human entities and their effect on the populace.

Table 1 Actors in the network and what attributes we are using to analyze their role in the network in order to understand more about their relationship and put context behind their actions

Actor	Actions	Intentions
Government	The method of displaying government action is by analyzing their spending and new policies implemented	Their intentions are displayed by the statement to the public based on what they consider should be stated to the masses
World Health Organization	Their method of displaying action is by advising respective governments on the best method of combating the virus	Their intentions are stated on their press releases and medical information that they distribute through different channels
Companies	Their method of displaying actions is by designing and implementing the contact tracing app through coding and deployment on their services	Their intentions can only be analyzed from their public statements and promise of following ethical practices
Oversight Committees	Oversight committees are responsible for regulating and monitoring if service or policy is following the guidelines. The display their actions by making specific points of contention or concern visible to the regulatory authority	Their intentions are difficult to find details about as they are usually secretive in their conduct as to avoid any external influence. Their intentions can be deduced from their public statements or by inspecting if they are being funded by special interest groups
Populace	The main entity that all actors should be concerned about. Their actions can be observed through compliance of medical information	Their intentions are difficult to discern but can be reasonably determined through participation in research and polls

Actor Network Theory is a theoretical approach to social theory that looks at sociotechnical phenomena a network of interconnected actors (Stanforth, 2006, p. 40). This framework was chosen as the most appropriate because it focuses analysis on the relationships between human and non-human entities. This framework allows us to create an abstract layer of entities to allowing us to analyze the actions and intentions of the entities in the context of privacy and ethical practices. The paper "Wildlife Tourism, Science and Actor Network Theory" explores the topic using actors and relationships to understand the big picture in wildlife and tourism (Rodger et al., 2006). The paper by Rodger, et al, (2006) demonstrates how entities such as living animals, research scientists, a scientific committee and their plans can all be interconnected and supplemented with quantitative data to draw conclusions. Similarly, I am analyzing the role of each actor on how they are currently contributing to the dangers posed by implementing digital contact tracing. Each actor acts like a node that has their unique set of powers and controls that can either compromise civil liberties and privacy or respect them.

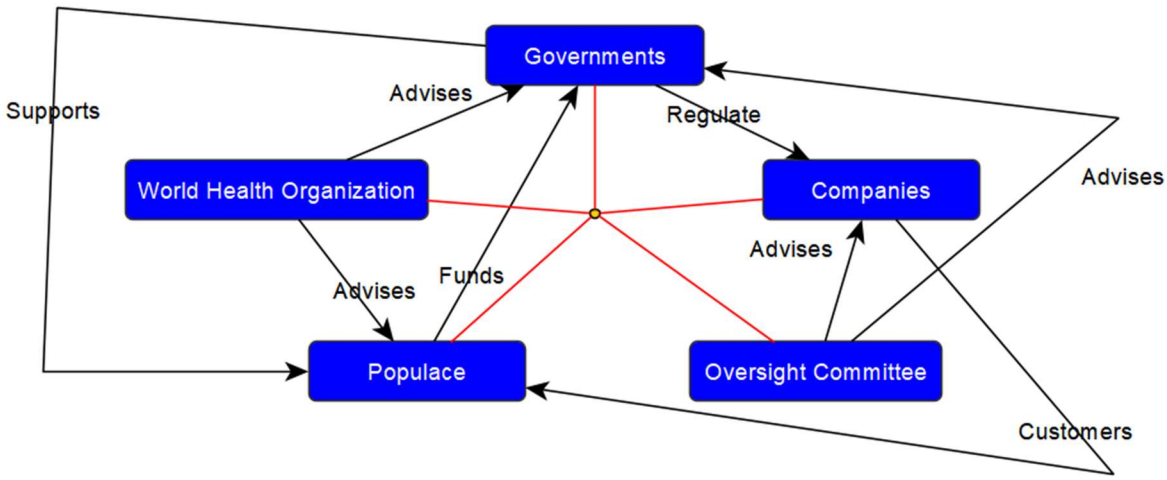

Figure 3 Network Relationship Map that displays some important connections between the actions that help up discern if they have the best intentions in helping stop the spread of COVID-19 without compromising civil liberties

The main focus of the paper is analyzing the dangers of digital contact tracing based on the actions that can be taken by each of the actors. I plan to use the analytical methods provided by the network representation to evaluate the trustworthiness of the statements provided by each entity to provide a clearer understanding to the public to make better informed decisions. The existence of contact tracing introduces a very invasive and persistent technology into our daily lives and the consequences can be severe if such powerful technology is misused. After analyzing the individual incentives and actions of the actors, I plan to use the information to make reasonable assumptions on what actions each actor can take to mitigate the dangers while still helping curb the spread of COVID-19. This paper uses official government sources to retrieve relevant data and uses previous studies done in the field of contact tracing and privacy. By including such sources, we can provide detailed analysis on dangers that contact tracing systems can pose and what the considerations must be to make it a safer technology that will be deeply intertwined with personal lives. As we have seen that there are clear and present danger from current implementations of contact tracing, public trust is one of the core principles that all the actors in the network must maintain if there is to be meaningful adoption for the applications. Public trust must be maintained continuously over time and as such the actors in this network must continuously maintain the social relations with each other in order to keep upholding the expected privacy and ethical considerations for people.

Supporting Argument III: Taking a look at the trustworthiness

The most influential actors involved in the creation of contact tracing in order to develop a better understanding of their actions and intentions.

The World Health Organization (WHO) is a specialized agency of the United Nations responsible for international public health. They seek to advise and aid governments and institutions in properly responding to public health risks and coordinate efforts around the world towards a solution. During the COVID-19 pandemic, they coordinated research and manufacturing systems in order to find a cure as fast as possible while being the driving force behind guaranteeing fair and equitable to the vaccines to every country in the world (source wiki). Such beneficial actions show that the WHO is striving to help the world deal with COVID-19 in a smart resourceful manner, especially focusing on the manufacturing and distribution of the vaccine as the most effective way of curbing the dangers of the virus. They did follow a diplomatic approach when issuing their advisory statements to countries in order to maintain international cooperation in the humanitarian effort. The fact that contact tracing is not a method they even suggested in an official capacity shows that it is not a robust method of dealing with the virus and have some serious ethical and privacy concerns for the general public.

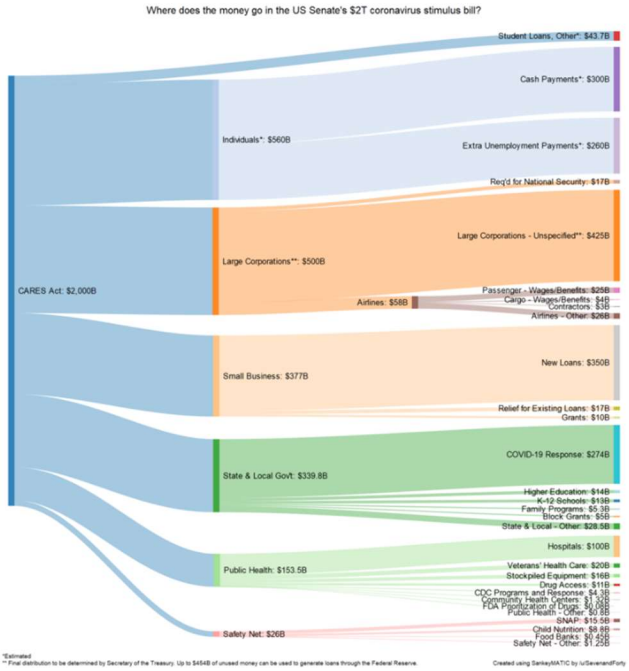

Figure 4 Cares Act 2020 spending distribution of $2 trillion showing which sectors received money and for what purposes. This allows us to track how much the government is spending on medical purposes to deal with the pandemic and how much they are spending to prop up the economy in a recession (H.R.748 - 116th Congress, 2019-2020).

The governments around the world are responsible in also leading their national research in exploring effective methods of dealing with what they prioritize in keeping control of. The safety of the public was of great concern and as such almost all governments mandated stay at home order and mask policies. The concerns arise in their special interest based on the spending in different sectors of the economy. Since one of the few ways that the US government can show its actions in this situation is by passing spending bills. In the US, the Legislative Branch passed the 2 largest economic stimuli ever in US history, totaling over $4.5 billion (H.R.748 - 116th Congress, 2019-2020). Figure 4 shows a distribution the spending providing us insight to where the money went. Such staggering amounts of government spending show that there are economic resources available to support the economy and public, which puts into question why even bother with contact tracing when we could be focusing our resources in medical innovation instead. It is well known that

only solution to the COVID-19 pandemic is to find a vaccine that makes our biological body resistant to the virus, thus preventing it from affecting us and replicating. Therefore, the most amount of effort should be placed in the creation and distribution of the vaccine, which is what most governments focused on. The first spending bill contained only 7.6% of the budget for public health while the rest went to other parts of the economy. This shows that the government, while trying to actually deal with the pandemic, was actually more concerned with the rest of the economy, especially supporting businesses rather than individuals. The second spending bill did have much more provision to support the healthcare and supporting the citizens directly, showing that the focus and best method of combating the pandemic was by creating the vaccines and supporting the medical professionals.

The tech companies are a critical actor to the entire system as they are the ones who will actually create the implementation and be responsible for managing the data that can pose serious dangers to the public if exposed. They carry a tremendous responsibility in ensuring save and secure implementation of the contact tracing app as they are responsible for the exact design implementation, such how long to store data, what data to collect and so on (Wacksman, 2021). The conflict of interest shows up because the main players in the market, Apple and Google, are known to collect data from their customers and Google is well known for monetizing their data through advertisement. This may pose a risk as they could be tempted to find ways to monetize the data collected by the app (Lindh et al. 2016). So, we need to be especially conscious of what data we are providing and where that data is being used. While they have never intentionally compromised customer data, the design of the contact tracing app would require it to interface with hospitals and other external

services, where Google and Apple would have to make sure that the data delivery path is secure. Additionally, they should collaborate with the appropriate parties to ensure that, in the case the data is somehow compromised, it would not contain personally identifiable data. Compromised could lead to targeted attacks such as fraud, robbery, release of personal health information etc.

Each actor in the network should be aware of the motivations and incentives of the other actors in order to ensure that everyone is following ethical practices. Governments should consider the risks created by digital contact tracing and balance the division of resources in the medical sector and the technology sector. The WHO should strive to advise countries with the best course of actions they can take and warn them of the dangers that new & experimental technology could pose to their populations. Companies, if they were to implement contact tracing should take the privacy and security of the data with the upmost respect and put their best effort before delivering a finished product. Oversight committees should continuously monitor and advise the other entities about following the best ethical practices and the effectiveness of contact tracing. Oversight committees should make sure that the appropriate data is being collected and the contact tracing is implemented only for the duration necessary and not any longer.

Conclusion:

In order to have an ethical implementation of contact tracing app, the creators must keep these questions in mind as important points that need to be addressed: Is this the best use of available resources, is it voluntary, is the data kept private and users anonymized, can users delete the data, is the purpose limited to COVID tracking only, is it used for

compliance, and is it temporary. It is not certain what the exact answers to these questions are because they can change based on many factors such as culture, financial resources, and urgency of the preventative measure. It is however important to have answers to these questions in agreeance with the public in order to have a trustworthy and useful implementation of contact tracing. Digital contact tracing can be a gamechanger in dealing with new pandemics but the dangers posed by digital tracking can also be a gamechanger, allowing governments to use technology to create a surveillance state, stripping away personal privacy and respect for human rights.

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