CONTACT TRACING

Research Paper

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I. Introduction

a. Background Information on contact tracing

Nearly every element of daily life has been impacted by the COVID-19 epidemic, which has presented the world with previously unheard-of difficulties. In response, several steps have been taken to slow the spread of the virus, including contact tracing. As part of a public health initiative known as contact tracing, people who may have come into touch with someone who is contagious are identified and notified (CDC, 2021). This method has previously been employed to tackle infectious diseases like Ebola, TB, and sexually transmitted infections (STIs). Yet, the COVID-19 epidemic has elevated contact tracing to the fore of worldwide public health initiatives. Also, according to Borry et al. (2020), the use of contact tracing apps to curb the spread of COVID-19 raises several ethical issues, including concerns about privacy, data protection, transparency, and fairness.

b. Importance of contact tracing during pandemics

In designing and implementing these tools, data science engineers will be examining the ethical issues surrounding contact tracing in this study. We will specifically look at the protocols that are now being offered by governments and private enterprise, the advantages, scope, privacy problems, and ethical challenges in creating contact tracing applications, as well as the benefits and drawbacks of contact tracing. The goal of this analysis is to give data science engineers who are creating applications for contact tracing ethical decision-making advice.

c. Overview of the paper's objectives

In the first piece, we'll look at the government's current suggested protocol for putting contact tracking into practice. The scope of this software and the advantages of contact tracing will next be discussed. The final portion will cover contact tracing privacy concerns and ethical considerations for creating contact tracking software. We shall examine the advantages and disadvantages of contact tracing in the fourth section. Finally, we will offer advice on how to help data science engineers working on contact tracing applications make ethical decisions.

II. Current Proposed Protocol

a. Overview of contact tracing principles

To slow the spread of COVID-19, the Centers for Disease Control and Prevention (CDC) have published contact tracing guidelines. Contact tracing, according to the CDC, is finding, evaluating, and managing people who have been exposed to an infectious disease to stop further transmission (CDC, 2021). State and local health authorities should spearhead contact tracing initiatives, according to the CDC, with assistance from the federal government and business. The article by Aziz et al. (2021) highlights the importance of balancing data privacy concerns with public health benefits when implementing digital contact tracing methods.

b. State and local government contact tracing efforts

The implementation of contact tracking programs has been a focus of state and municipal government efforts. For instance, to increase contact tracing operations, the state of Massachusetts has engaged over 1,000 contact tracers and collaborated with a private contractor (Massachusetts Department of Public Health, 2021). Similar to this, New York City has employed almost 3,000 contact tracers to find those who have been into touch with COVID-19-infected people (New York City Department of Health and Mental Hygiene, 2021).

c. Federal government contact tracing efforts

The federal government has also been involved in contact tracing efforts. The Trump administration announced the launch of the COVID-19 Community Corps, a program aimed at promoting COVID-19 vaccine education and encouraging individuals to get vaccinated. Additionally, the Biden administration has released a national strategy for contact tracing that includes expanding testing and contact tracing efforts, supporting state and local health departments, and establishing a national public health workforce to support contact tracing efforts (The White House, 2021).

d. Private industry contact tracing efforts

Private industry has also been involved in contact tracing efforts. Apple and Google partnered to develop a contact tracing system that uses Bluetooth technology to identify

individuals who have been in close contact with someone infected with COVID-19 (The Verge, 2020). Other companies have developed similar contact tracing applications, such as the app developed by Singapore's government called Trace Together.

Overall, the implementation of contact tracing efforts involves collaboration between state and local governments, the federal government, and private industry. The CDC's contact tracing principles provide a framework for these efforts to be carried out effectively.

III. **The Scope of Contact Tracing Programs**

Contact tracing programs aim to track and trace the contacts of individuals who have been infected with a communicable disease, in order to prevent further spread of the disease. The scope of contact tracing programs includes the number of individuals tracked and traced, methods of contact tracing, types of data collected, and privacy considerations.

a. **Number of individuals tracked and traced**

The number of individuals tracked and traced in a contact tracing program can vary depending on the size of the outbreak and the resources available for the program. According to the CDC, contact tracing efforts for COVID-19 should be conducted for all close contacts of an individual with confirmed or probable COVID-19 infection (CDC, 2020).

b. **Methods of contact tracing**

Contact tracing methods can vary depending on the resources available for the program. The CDC recommends that contact tracers interview the infected individual to identify all close contacts, notify those contacts of their exposure, provide instructions for self-quarantine, and monitor those contacts for symptoms (CDC, 2020). Some states and local governments have also implemented digital contact tracing methods, such as mobile apps, to supplement traditional contact tracing efforts.

c. **Types of data collected**

Contact tracing programs collect a variety of data in order to identify and track potential exposures. This data can include personal identifying information, such as name and contact information, as well as information about potential exposures, such as dates and locations of

contact. Digital contact tracing methods may also collect location data or other personal information to facilitate contact tracing (Cho et al., 2020).

d. Privacy considerations

Privacy is a major concern in contact tracing programs, as personal identifying information and potential exposure data must be collected and used to track and trace contacts. The CDC recommends that contact tracers inform contacts of the purpose of the call, maintain confidentiality of the contact's information, and not disclose the identity of the infected individual (CDC, 2020). Digital contact tracing methods must also balance the benefits of data collection for contact tracing with the potential privacy risks to individuals (Abeler et al., 2020).

IV. Benefits of Contact Tracing

Contact tracing has been implemented as a public health measure to help control the transmission of infectious diseases, including COVID-19. By identifying and isolating individuals who have been in contact with an infected person, contact tracing can help to reduce the spread of the virus (CDC, 2020). Some of the benefits of contact tracing include:

a. Control of transmission

Contact tracing helps to identify individuals who may have been exposed to the virus and can help to break the chain of transmission by isolating those individuals and preventing further spread of the virus. This can help to control the spread of COVID-19 and reduce the burden on healthcare systems.

b. Early detection and isolation of infected individuals

Contact tracing can help to identify infected individuals early, even before they develop symptoms, allowing for early isolation and treatment. This can help to reduce the severity of the illness and prevent further transmission.

c. Public health benefits

Contact tracing can also provide valuable information about the spread of the virus, including the demographics of those affected and the locations where transmission is

occurring. This information can help public health officials to develop targeted interventions to control the spread of the virus (Abeler et al., 2020).

V.   Privacy Issues with Contact Tracing

While contact tracing can provide important benefits in controlling the spread of infectious diseases, there are also privacy concerns associated with the collection and use of personal data. Some of the privacy issues related to contact tracing include:

a. Collection and use of personal data

Contact tracing requires the collection of personal data, including information about an individual's health status, location, and contacts. The use of this data raises questions about privacy and consent, and there is a risk that the data could be used for other purposes, such as surveillance.

b. Storage and sharing of data

The storage and sharing of personal data collected through contact tracing raises concerns about the security of the data and the potential for misuse. There is a risk that the data could be accessed by unauthorized individuals, or that it could be shared with third parties without the consent of the individuals involved.

c. Risks of data breaches and misuse

The collection and storage of large amounts of personal data also raises the risk of data breaches and misuse. In the event of a data breach, sensitive personal information could be exposed, leading to identity theft or other forms of harm.

d. Ethical considerations

According to social contract theory, the use of personal data for contact tracing raises ethical questions about the balance between public health and individual privacy. There is a need to ensure that the collection and use of personal data is necessary and proportionate, and that individuals are informed about the collection and use of their data and have the right to control how their data is used (Cho et al., 2020).

VI. **Ethical Concerns in Developing Contact Tracing Applications**

    a. Data gathering and possession

Contact tracing applications have raised several ethical concerns regarding data gathering, use, and possession. The collection of sensitive personal data has led to concerns about the privacy and security of the data. There is a risk of data misuse or breaches if the data is not adequately secured. Data gathering should be done in a way that is respectful of individuals' privacy rights, and data possession should be subject to appropriate regulations and oversight.

    b. Data use and analysis

Furthermore, there are concerns about how data collected from contact tracing applications will be used and analyzed. The data could be used to discriminate against individuals based on factors such as race or health status. Data analysis should be done with a view towards promoting public health without infringing on individual rights.

    c. Informed consent and privacy protection

Informed consent is also a critical issue in developing contact tracing applications. Individuals should be fully informed about the data that is being collected, how it will be used, and the potential risks and benefits of using the application. Users should be given a clear choice about whether to participate, and their consent should be obtained in a manner that is free from coercion or undue influence.

    d. Discrimination and biases

Discrimination and biases are also concerns in developing contact tracing applications. There is a risk that the data collected from these applications could be used to discriminate against certain groups, particularly those who are already marginalized. To prevent this, data analysis should be done with a view towards identifying and addressing biases.

    e. Transparency and accountability

Transparency and accountability are crucial for ensuring the ethical development and deployment of contact tracing applications. The developers of these applications should be transparent about the data they are collecting, how it will be used, and who will have access to it. Accountability measures should be in place to ensure that the developers are complying with ethical standards and regulations. Considering Utilitarianism and Consequentialism, transparency and accountability matters in order to do greatest good for the greatest number of people.

VII.   Pros and Cons of Contact Tracing

a. Advantages of contact tracing

Contact tracing has several potential advantages in controlling the spread of infectious diseases. By quickly identifying and isolating infected individuals and their close contacts, contact tracing can help to break the chain of transmission and prevent further spread of the disease. This can be especially important in the early stages of an outbreak when there are fewer cases and resources can be more effectively targeted.

In addition to its potential public health benefits, contact tracing can also provide individuals with important information about their own health status and help them make informed decisions about their behavior and interactions with others.

b. Limitations and challenges of contact tracing

Despite its potential benefits, contact tracing also has several limitations and challenges. One major limitation is the need for widespread adoption and cooperation. Contact tracing relies on individuals to report their own symptoms and interactions with others, and to comply with isolation and quarantine measures. If individuals are not willing or able to participate, the effectiveness of contact tracing may be limited.

Additionally, contact tracing may face technical challenges related to the accuracy and reliability of data collection and analysis. For example, contact tracing apps that rely on Bluetooth technology may be subject to inaccuracies and false positives, leading to unnecessary isolation and quarantine measures.

Finally, contact tracing may raise ethical and privacy concerns related to the collection and use of personal data, as discussed in Section V above.

VIII. Ethical Decision-making Guidance for Data Science Engineers

a. Ethical theories and principles

Data science engineers developing contact tracing applications should consider various ethical theories and principles. One of the most widely used frameworks is the Belmont Report, which outlines three basic ethical principles: respect for persons, beneficence, and justice. Respect for persons entails respecting individuals' autonomy, allowing them to make informed decisions about their personal data. Beneficence involves doing good and minimizing harm, such as preventing the spread of COVID-19. Justice involves ensuring that the benefits and burdens of contact tracing are distributed fairly across society (Bennett et al., 2020).

Other ethical theories that may apply to contact tracing include utilitarianism, which focuses on maximizing the greatest good for the greatest number of people. A utilitarian approach to contact tracing would prioritize stopping the spread of the virus and protecting public health. Deontological ethics, on the other hand, emphasizes following moral rules and duties, regardless of the consequences. A deontological approach might prioritize protecting individual privacy and autonomy (Bennett et al., 2020).

b. Responsibility and accountability

Data science engineers have a responsibility to develop contact tracing applications that are effective and ethically sound. This includes being transparent about data collection and use, protecting user privacy and autonomy, and minimizing the risks of data breaches and misuse. Engineers should also be accountable for any negative consequences that may arise from their applications.

c. Informed consent and privacy protection

Informed consent is an essential component of ethical contact tracing. Individuals must be informed about what data is being collected, how it will be used, who will have access to it, and the potential risks and benefits of participation. Individuals should have the right to opt-out

or withdraw their consent at any time. Data science engineers should also take steps to protect individual privacy, such as de-identifying data, minimizing the collection of unnecessary data, and using secure storage and transmission methods (Bennett et al., 2020).

d. Transparency and open communication

Transparency and open communication are crucial for ensuring public trust and engagement in contact tracing efforts. Data science engineers should be transparent about their methods and findings, sharing data and insights with the public, policymakers, and other stakeholders. Engineers should also actively seek out and respond to feedback and concerns from the public (Bennett et al., 2020).

e. Avoidance of biases and discrimination

Data science engineers must be aware of and actively work to prevent biases and discrimination in contact tracing applications. This includes avoiding the use of biased algorithms or data, ensuring that data is representative of diverse populations, and avoiding the perpetuation of stigmatization or discrimination against certain groups. Engineers should also consider the potential impact of contact tracing on marginalized or vulnerable populations and take steps to address any potential harms (Bennett et al., 2020).

IX. Conclusion

a. Summary of key points

This paper has provided an overview of contact tracing and its implementation by various stakeholders, including the government and private industry. We have discussed the benefits of contact tracing, such as controlling transmission and early detection of infected individuals, as well as the privacy concerns associated with the collection, storage, and sharing of personal data. Ethical concerns in developing contact tracing applications have been identified, including the need for informed consent, privacy protection, and avoidance of biases and discrimination. Finally, we have provided ethical decision-making guidance for data science engineers, emphasizing the importance of responsibility, accountability, transparency, and open communication.

b. Implications for future research and policy

As the COVID-19 pandemic continues to evolve, contact tracing will likely remain a critical tool in controlling transmission. Future research should continue to explore the ethical implications of contact tracing, particularly as new technologies and approaches are developed. Policy makers should also consider how to balance public health benefits with privacy concerns in the implementation of contact tracing programs.

c. Final thoughts on the ethics of contact tracing

Contact tracing is a powerful tool in the fight against COVID-19, but it must be implemented in an ethical manner. This requires a commitment to transparency, accountability, and privacy protection, as well as a willingness to engage in open communication and avoid biases and discrimination. By following these ethical principles and guidelines, we can help ensure that contact tracing programs are effective, responsible, and respectful of individual rights and freedoms.

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