Statement of Ramesh Raskar, PhD, Asso. Prof. Massachusetts Institute of Technology and Founder and Chief Scientist, PathCheck Foundation

Before the United States House of Representatives Committee on Financial Services Task Force on Artificial Intelligence

Hearing on "Exposure Notification and Contact Tracing: How AI Helps Localities Reopen Safely and Researchers Find a Cure" July 8, 2020

Let me begin by expressing my thanks to Chairman Foster and Ranking Member Loudermilk, to the members of the subcommittee and the full committee for the opportunity to testify today. It is an honor and privilege to be here today.

We face an unprecedented economic and health crisis brought on by the COVID-19 pandemic. It is a crisis that calls on the best of us as Americans to seek innovative solutions to the immense challenges we have coping with the pandemic and its impact on our economy and country.

Today we have two fundamental questions before us. The first is how we can use technology and the tremendous capacity for technical innovation in this country to help turn the tide on COVID-19. Second is how do we deploy digital public health technologies without sacrificing our deeply held national values of personal privacy, liberty and freedom. I'm optimistic that there are positive and impactful solutions to these challenges available today and are ready for large scale adoption.

I come to these questions having spent much of the last decade working in advanced technologies at the Massachusetts Institute of Technology researching artificial intelligence, digital health, and algorithms for the preservation of personal privacy. We have been working on how to create privacy preserving global AI: a distributed machine learning method called Split Learning that can build AI without accessing any raw data that may be unavailable because of the factors such as privacy, HIPAA regulations or trade secrets.

In March, my research team at MIT created one of the first privacy preserving smartphone app called MIT SafePaths that illustrated how smartphone data analyzed locally can provide confidential notifications to an individual and also support manual contact tracing efforts. That research led to the creation of PathCheck Foundation, a charitable nonprofit organization dedicated to building free open software and industry standards that assist US states, nations and private sector organizations with their pandemic response. PathCheck plans to augment and simplify manual contract tracing (exposure notification, case interviews and contact followup) using privacy preserving solutions for the users. We are already building exposure notification apps, backend servers and dashboards for various US states and nations.

Since our first demonstration, the digital solutions to assist public health authorities at the local, state, and national level have evolved and developed rapidly. Today, health officials now have at their disposal a powerful toolset that complements the growing capacity for testing, manual contact tracing, and the management of cases for self-quarantine to reduce spread.

As the committee has justly identified, there are several challenges with contact tracing, both the manual efforts and through the use of smartphone apps. Let me first address the four top concerns and present some recommendations.

- There are cases that fraudsters are taking advantage of manual contact tracing efforts by soliciting personal and financial information from unsuspecting consumers. A smartphone app with the

proper privacy controls in place can make a difference here. Every bank and consumer financial institution in this country has an app that their customers use to access their private information. The same sorts of technologies that banks use can be used for contact tracing, to ensure that consumers secure their own data and share it with only authorized institutions.

- Smartphone apps that facilitate contact tracing have been developed and deployed in several states and countries around the world. Some have been demonstrated to collect consumer data without their consent, and in some cases, even sharing that data, inadvertently or otherwise, with third party data brokers. It is imperative that any contact tracing technology be developed by credible organizations, preferably non-profit organizations that are not looking to make money from the use of their technology. Furthermore, the technology should be built as open source so that anybody can see exactly what is being built and how it works so that malicious intent and security issues can be identified and dealt with openly. The open-source approach yields collaboration of the smartest minds. Public health is about the *public* - there should be no secrecy in how we address a public health emergency.
- The accuracy of digital contact tracing solutions is evolving rapidly. There is much research and development to be done. At the same time, organizations like MIT PACT and PathCheck and others have made tremendous strides in making the sensors more accurate. At PathCheck, we have shown that with the combination of sensors like GPS, WiFi and bluetooth, we are better at triangulating where somebody is and who they have come in proximity with. At the same time, let's not forget that there are more low-tech ways of determining where people go and who they come in contact with - as simple as scanning QR codes or manually "checking in" to a location. We must use multiple methods to reach the masses, especially in cases where people do not own a smartphone or those who cannot afford the latest smartphone technology.
- Lastly, great progress has been made from the collaborative efforts of Google and Apple to create sensor technology that allows for both types of phones (Android and iPhones) to be able to talk to each other. However, we have not seen widespread adoption of this technology by state authorities. I believe that this is due to a lack of a comprehensive and consistent national strategy for sharing data across state lines. As we all know, the virus does not respect borders. Just like there are national and regional utility alliances to move electricity around the country, there must be a national "grid" of contact tracing alliances that allow for contact tracing across borders.

These four concerns - fraud, privacy, accuracy and adoption - all lend to what I believe is the necessary public policy to kickstart contact tracing (both manual and digital) as a viable and scalable solution to reduce the spread of the virus:

1. Congress should advocate for the broad adoption of **digital apps to augment any manual contact tracing** endeavours, especially when they can make a difference with improving the public's trust in such efforts and to protect against malicious actors.
2. Congress should set out a series of requirements that ensure that contact tracing **technologies are built transparently, as open source ideally by non-profits** and like other public utilities, open for scrutiny by the public.
3. Congress should actively **require inclusive solutions** to not exclude those who don't have the latest technology. We can't make contact tracing only effective for the well off.
4. Congress should require the creation of a central body - **National Pandemic Response Service**, that is mandated with coordinating data sharing across state and county lines to make sure that we can trace the spread of the virus no matter where it causes infections.

Let me discuss a few of these points in detail.

How Manual and Digital Tracing will work together:

Digital exposure notification apps in Germany & Switzerland, two highly privacy-aware countries, already have 15% adoption in less than two weeks. They are using US technology which we are not yet using in our country on a large scale. However, we can at least assume that the adoption will pick up if the app is privacy preserving.

In our beautifully diverse country, with varying opinions about personal freedom, uneven use of smartphones and a distrust of government mandated programs, it is also important to reach the last few percent of the population. So it is critical to also use manual contact tracing to improve inclusivity. Beyond contact identification, manual tracers also conduct case management: monitoring and supporting the exposed person.

Manual contact tracing has a rich history. But for Covid-19, to manage the scale with 50,000 cases per day, we need technology for public health as well as apps in the hands of the citizens. Several public health officials have said that with so much community spread, trying to trace the contacts of every positive case is unrealistic.

It is true that solutions that rely on smartphones cannot serve everyone. However, smartphone penetration in US is 70% and amongst 18-64 age group it is 90% . Thus, the digital exposure notification can reduce the burden on manual tracing operations. In addition, digital apps can be deployed overnight. So we believe a hybrid solution can let apps address smartphone users and manual tracing can address the rest of the cases. At PathCheck, we also plan to provide follow on guidance to an exposed person so it partially supports the triage and monitoring.

How this relates to testing infrastructure, vaccine development and AI

According to MIT Institute for Data, Systems and Society, just 50% adoption of contact tracing can bring the spread factor RO to 0.5 and eliminate the pandemic. This model assumes no social distancing or widespread testing. This is particularly important when considering low income communities who don't have access to testing.

The US is expanding testing infrastructure and making great progress on vaccines. At the same time, testing 300+M Americans every 14 days or about 20M per day is impractical. For small businesses, testing their employees regularly is cost prohibitive. For low and middle income communities, setting up such infrastructure is challenging. It is going to take a long time to create, validate, and scale the vaccine & administer to the wider population. With notification and tracing apps, we have a privacy first American solution in action that will get us out of this disaster now. It's about saving lives and revitalizing our economy, till we get widespread testing and vaccines.

National Pandemic Response Service and Smartphone Apps

We need a National Pandemic Response Service that can not only monitor current cases, but provide insights on policy decisions and predict the spread. Just like the National Weather Service predicting the path of the next hurricane, accurate data is the most important element. It is the same with a pandemic - we need to have access to real time data to monitor, predict and reduce the spread. However, responding to the dynamics of a hurricane is different from the response to the dynamics of the movement of the inflected people. Instead of creating a surveillance state and a top-down response system, we need to encourage the people to participate in this data-dependent operation. Smartphone apps are the best tools. We need a new AI that relies on the information stored in people's smartphones. We have learned through Split Learning, our work on privacy preserving AI at MIT, that we can indeed create such a decentralized AI and orchestrate

the socio-economic interaction between the government, businesses, individuals and their communities without creating a surveillance state. The National Service will allow this micro and macro aggregation for analysis, prediction and actionable intelligence.

Thank you.

References

1. Split Learning: MIT's Privacy Preserving Distributed Machine Learning for Health Data https://splitlearning.github.io/
2. MIT SafePaths https://www.media.mit.edu/projects/safepaths/overview/
3. PathCheck Foundation https://pathcheck.org/
4. Adam Berrey, 'From Concept to Delivery: Digital Contact Tracing Moves to the Next Stage' https://pathcheck.org/blog/
5. Ramesh Raskar, Isabel Schunemann, Rachel Barbar, Kristen Vilcans, Jim Gray, Praneeth Vepakomma, Suraj Kapa, AndreaNuzzo, Rajiv Gupta, Alex Berke, Dazza Greenwood, Christian Keegan, Shriank Kanaparti, Robson Beaudry, DavidStansbury, Beatriz Botero Arcila, Rishank Kanaparti, Vitor Pamplona, Francesco M Benedetti, Alina Clough, RiddhimanDas, Kaushal Jain, Khahlil Louisy, Greg Nadeau, Vitor Pamplona, Steve Penrod, Yasaman Rajaee, Abhishek Singh, GregStorm, and John Werner. 2020. Apps Gone Rogue: Maintaining Personal Privacy in an Epidemic. arXiv:2003.08567 [cs.CR]. https://arxiv.org/abs/2003.08567
6. MIT PACT Protocol https://pact.mit.edu
7. MIT IDSS https://idss.mit.edu/research/idss-covid-19-collaboration-isolat/
8. Ramesh Raskar, Abhishek Singh, Sam Zimmerman, and Shrikant Kanaparti. 2020. Adding Location and other Context to the Google/Apple Exposure Notification Bluetooth API. arXiv:2007.02317. https://arxiv.org/abs/2007.02317
9. Ramesh Raskar, Greg Nadeau, John Werner, Rachel Barbar, Ashley Mehra, Gabriel Harp, Markus Leopoldseder, Bryan Wilson, Derrick Flakoll, Praneeth Vepakomma, Deepti Pahwa, Robson Beaudry, Emelin Flores, Maciej Popielarz, Akanksha Bhatia, Andrea Nuzzo, Matt Gee, Jay Summet, Rajeev Surati, Bikram Khastgir, Francesco Maria Benedetti, Kristen Vilcans, Sienna Leis, and Khahlil Louisy. 2020. COVID-19 Contact tracing mobile apps: Evaluation and Assessment for Decision Makers. arXiv:2006.05812 [cs.CR]. https://arxiv.org/abs/2006.05812
10. Manish Shukla, Rajan M A, Sachin Lodha, Gautam Shroff, Ramesh Raskar. 2020. Privacy Guidelines for Contact Tracing Applications. arXiv:2004.13328.
11. Ramesh Raskar, Deepti Pahwa, and Robson Beaudry. Contact Tracing Beyond Bluetooth. 2020. Contact Tracing Beyond Bluetooth
12. Ramesh Raskar and Sai Sri Sathya. Bluetooth based Proximity, Multi-hop analysis and Bi-directional Trust: Epidemics and More.https://github.com/PrivateKit/PrivacyDocuments/blob/master/BluetoothProximity.pdf
13. Ramesh Raskar and Deepti Pahwa. Transparency and Consent by Default. 2020. Transparency and Consent by Default
14. Deepti Pahwa and Robson Beaudry. The architecture of trust in contact tracing - How to evaluate and assess contact tracing solutions. Architecture of Trust in Contact Tracing
15. Suraj Kapa, John Halamka, and Ramesh Raskar. Contact Tracing to Manage COVID-19 Spread—Balancing Personal Privacy and Public Health, Mayo Clinic Proceedings, Volume 95, Issue 7, 2020, Pages 1320-1322, ISSN 0025-6196, https://doi.org/10.1016/j.mayocp.2020.04.031. http://www.sciencedirect.com/science/article/pii/S0025619620304249
16. As the Virus Surged, Florida Partied. Tracking the Revelers Has Been Tough. 2020. https://www.nytimes.com/2020/07/06/us/coronavirus-florida-miami.html
17. Smartphone penetration in the US. 2020. https://www.emarketer.com/chart/219283/us-smartphone-user-penetration-by-age-2018-of-population-each-group