

Utilization of Mobility Data in the Fight Against COVID-19

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As the coronavirus 2019 (COVID-19) pandemic continues to evolve, evaluating the impact of stay-at-home executive orders and individual social behaviors are paramount. Although stay-at-home orders and social distancing have successfully “flattened the curve,” states are relaxing these executive orders and businesses are beginning to reopen.¹ The impact of businesses reopening on social mobility and COVID-19 infection spread are uncertain, and there is a possibility that a second spike in COVID-19 cases will occur. With less than 5% of our population with a positive serology indicating prior infection and deployment of an effective vaccine 12 to 18 months away, individual behaviors including social distancing, face masks, and hand hygiene remain the pillars for prevention of spread of infection. By analyzing social mobility data, researchers can evaluate if changing social mobility in outdoor or indoor settings influences COVID-19 infection spread in real time.

Social mobility data have been made publicly available by a number of groups to enable research on the impact of changes in social mobility. Four major organizations currently sharing their mobility data are Google, Apple, Facebook, and Unacast.²⁻⁵ Google collects mobility information through its Google Maps app and then aggregates and reports the information with no identifiable information. They break down mobility based on the type of environment, which includes retail and recreation, grocery, pharmacy, parks, transit stations, workplaces, and residential.² Apple follows a similar pattern of reporting data collected through Apple Maps. They, however, report mobility data based on transportation modality, which includes walking, driving, and transit.³ Facebook has partnered with other organizations via the COVID-19

Mobility Data Network and allows collaborators in this network to utilize their mobility data. Facebook reports movement trends based on baselines from February and informs researchers how often people in specific regions choose to either stay at home or travel based on their original population baselines.⁴ Unacast, on the other hand, is unique in that they provide compiled mobility data from various partner applications. Their partnered apps have GPS functions that consumers opt into when using the app, and the mobility data from these various sources is compiled and analyzed to create one generalized data set. Another unique feature Unacast offers is proximity data, which reports close encounters between 2 devices per square kilometer. This measurement is reported as a fraction of precoronavirus baseline.⁵ As outlined, all 4 of these organizations provide different variations of mobility data that could potentially be combined and used as a powerful tool to track the efficacy of COVID-19 interventions and detect new hot spots.

CURRENT DIRECTION AND FUTURE APPLICATIONS

Researchers have already started to analyze mobility data and the impact movement has on COVID-19 spread. Chang et al⁶ analyzed Facebook data and developed a metropolitan population model to assess the risk of viral spread in high-risk areas based on human mobility and the impact of travel restrictions.⁷ They found that intracity travel reductions had a higher impact on overall infection numbers, while intercity travel reductions narrowed the scope of the outbreak. Furthermore, they were able to pinpoint areas that were more highly connected and would consequently serve as higher-risk zones during an outbreak. Jia et al⁸ looked into spatiotemporal data sets

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obtained from cell phones and developed a “risk source” model to observe the spread of disease from the epicenter in Wuhan based on the geographic flow of the public to and from Wuhan, indexing the community transmission risk over time. Their model was able to estimate the location, intensity, and timing of outbreaks as the coronavirus spread throughout China. There were certainly deviations from their model when compared with actual cases, but nevertheless, they found that population mobility data can serve as a powerful tool during a pandemic.

As the pandemic progresses, innovations such as geospatial data tracking applications will be key for identifying new cases of COVID-19. Apps that can detect other users who have come into close proximity of a COVID-19—positive individual could change management in the midst of this pandemic by alerting exposed individuals and recommending testing options. Google and Apple believe that this could be accomplished by enabling Bluetooth on smartphones, and this functionality has already been documented by a novel Singaporean app called TraceTogether, which is an optional download for the public. If a user does contract COVID-19, the country’s Ministry of Health can look at the information stored on the device to “identify a list of other app users who were in close contact with the infected person during the previous 14 days.”⁹ There are certainly privacy concerns that come along with this approach.¹⁰ Applications could also be used to regulate appropriate distancing between individuals by alerting users that they are too close to one another via their smartphones. An application in China with a similar aim has been used to record proximity events between COVID-negative and COVID-positive individuals but has taken things one step further. Individuals in China are required to use the app, which alerts them whether they are cleared to be mobilizing or whether they need to go home based on certain individual criteria. If the app states that they need to quarantine, they must stay at home or risk being penalized by law enforcement, who have access to the status of everyone using the app.¹¹ China is a country known to have loose laws protecting consumer privacy, and an app like this could not exist in the United States.

However, it does emphasize the scope of how impactful mobility data could potentially be.

PRIVACY CONCERNS

Implementing consumer location tracking specifically for disease surveillance does risk consumers’ digital privacy. Consumer mobility is already tracked, and data is gathered by telecommunication companies and other applications using geospatial information. Many insurance companies even provide substantial discounts on car insurance premiums if you agree to install a GPS tracking device in your car.¹² However, privacy concerns should be strongly considered and balanced with public health benefits prior to the implementation of new laws and policies that give researchers open access to mobility databases. There are certainly measures that can be taken to avoid substantial intrusion to privacy.

The COVID-19 Mobility Data Network was created with the aim of gathering and analyzing confidential data from technology companies to guide officials involved in formulating public health policies. The approach of this network is to respect consumer privacy while providing high-quality data for research. By anonymizing and aggregating their data, organizations such as Google, Apple, Facebook, and Unacast have introduced a safe way to disseminate critical information while guarding against unauthorized access to identifiable consumer information. Furthermore, individuals using applications from these organizations have opted into GPS tracking, although sometimes unknowingly. Apps will often ask for GPS access when you open them for the first time, and state that it will improve the apps’ functionality. Most people just click “accept” without giving the agreement much thought. Importantly, this is still an opt-in situation, and users can opt out at any time; the default is an opt out. Giving the consumer control of this function is paramount, and organizations need to clearly state how to opt in and out rather than giving vague messages about application improvement. Also, there is a distinction to be drawn here for making data publicly available for research vs using the data to serve the consumer directly. With regard to the collection process, Apple’s mobility

system has random and rotating identifiers that are continuously reset to prevent consumer profile tracing.¹³ Google and Facebook have adopted a differential privacy system that integrates artificial noise to collect user data without compromising consumer privacy.¹⁴

Certain countries with aggressive surveillance systems using identifiable data in response to COVID-19 have undermined public privacy and have been criticized for doing so; these countries include China, South Korea, and Israel. During times like this, it is important that international rules and regulations be implemented for organizations tracking and providing public mobility data to ensure appropriate protection of personal identifiable information and ethical use of data.¹⁵

CLOSING THOUGHTS

Analysis of mobility data from various sources can undoubtedly be beneficial to better understand how changes in mobility in outdoor and indoor settings may impact COVID-19 infection spread, and this data can help inform prediction models. Internal auditing of data by stakeholders involved in data mining and analysis is critical for validating the quality of data to ensure that we do not misinform policymakers or the public. Importantly, we must remember to respect the privacy of individuals in our communities as we use this powerful data to inform public policy decisions.

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