

Digital public health and COVID-19



Digital public health refers to the use of technology, new types of data, and new ways of working that come with digitisation of public health and associated data. Data have been central to public health ever since John Snow used maps and case reports to identify the Broad Street pump as a source of cholera in London in 1854.¹ Even today, data are just as central to public health, and digital technology provides new ways to collect data through efficient administrative interfaces, sensors, and non-traditional sources such as social media; new ways to link different data sources to generate new insights; and new ways to visualise and analyse data. Digital public health also means government and non-governmental public health organisations can work with data, to be more effective and communicate with both the public and with decision makers. In this Comment, we use the ongoing COVID-19 pandemic to explore some of the ways in which digital public health can transform the public health response. Through this exploration, we hope to highlight the broader potential for digital public health in making public health prevention, surveillance, and responses more effective across a wide range of challenges.

First, digital acquisition of administrative data can drastically improve the timely tracking of the COVID-19 pandemic. The core data reported by most countries are the number of confirmed cases and the number of deaths. In most settings, these data are collected through paper reporting and forms. Time lags in reporting and disruptions to reporting at weekends and during holidays are clearly evident. Simple inspection of daily numbers shows, for example, that US COVID-19 deaths and cases drop substantially on every Sunday and Monday, with case numbers rebounding later in the week. Many of these issues in data reporting would probably disappear with direct digitisation at the point of data collection and automated reporting. In an era of widespread access to digital technology in high-income and middle-income countries, it is remarkable that most reporting for the pandemic does not take advantage of these technologies. Such technologies, combined with commitments by sentinel hospitals and labs around the world, could be used to build a 21st-century surveillance network to detect the next pandemic and resurgences of existing infectious diseases.

Second, data collected through other, non-health service sources can play a crucial role in understanding the pandemic and forecasting the next hotspot. Mobility data collected through the use of smartphone apps and reported by platforms like Facebook, Google, Apple, among others have been an important input into many efforts to track the drivers of the pandemic in nearly every country. These data sources provide near real-time (a 1-day lag in the case of Facebook) information on mobility and thus likely human contact in nearly every country in the world. In future pandemics and public health emergencies, the ability to deliver massive information in near real-time could be transformative for coordinating future responses.

Third, in the past, surveys were planned and executed over periods of 2–4 years, usually providing information that was 2–3 years old at best by the time the process was complete and the data were analysed and approved. This lag makes the data for dealing with a public health emergency essentially useless. Cell phone data have been supplemented with survey data on symptoms, behaviours, and knowledge. Clearly, smartphone surveys and social media platform surveys have limitations because they are not representative of the entire population. Nevertheless, the speed of data collection and the large fraction of the population on these platforms in many countries also means great potential for real-time input on knowledge, attitudes, and behaviours. Work to understand biases in data collected through these platforms should be done before the next public health emergency, so that the greatest benefit can be derived from these platforms in the future.

Fourth, contact tracing is of crucial importance both early in the pandemic and later on, when case numbers have declined to manageable levels through other means. Interviews in person or by phone have traditionally been used for contact tracing, but new technologies have been effectively deployed to strengthen contact tracing in South Korea, Singapore, and other countries. A variety of technology providers have developed tracing apps, and these are being used more widely. Ongoing privacy concerns are being addressed through various opt-in options and privacy-preserving contact-tracing technologies. These tools have the potential to greatly increase the effectiveness

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For the interactive dashboard of global COVID-19 cases see <https://coronavirus.jhu.edu/map.html>

of the test, trace, and isolate strategy for pandemic control.

Fifth, a core component of effective public health is communicating to the media, the public, decision influencers, and decision makers. Data visualisation, particularly interactive data visualisation, and storytelling, can be a more effective way to communicate key messages and broaden understanding of a public health challenge. We see this crucial role of data visualisation as a core component of future digital public health.

Sixth, digitisation of case reports, hospital admissions, and deaths, together with digitisation of a wide variety of variables that drive COVID-19 transmission such as cell phone mobility data, survey data on mask use, or testing rates, can be made even more effective through data linkage and disaggregation of data to the very local level. As the pandemic unfolds, control strategies are increasingly being targeted at the city or neighbourhood level. Digitisation with appropriate disaggregation provides the opportunity to develop new insights, for instance which groups in particular communities are at greatest risk. In the USA, for example, Black, Hispanic or Latino, and Native Americans are at much greater risk of COVID-19.²⁻⁴ Linkage of various data sources provides much more effective and efficient ways to derive these insights quickly. The potential of linking various data systems remains largely untapped in the COVID-19 pandemic.

Digital public health has huge potential to accelerate effective public health responses to pandemics. For COVID-19, we have seen glimpses of this potential

in some countries and local communities leveraging pre-pandemic digital investments in public health. However, there is clearly massive untapped potential. The technologies exist; the main barriers appear to be the combination of resistance to new ways of working and a natural instinct to suppress data in case it reveals shortcomings, the cost and literacy of digital technologies is also an important barrier for some countries. The imperative to save lives in the COVID-19 pandemic will hopefully accelerate progress in expanding digital public health.

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**Christopher J L Murray, Nurah Maziad S Alamro, Hee Hwang, Uichin Lee*
cjlm@u.washington.edu

Institute for Health Metrics and Evaluation, University of Washington, Seattle, WA, USA (CJLM); College of Medicine, King Saud University, Riyadh, Saudi Arabia (NMSA); Seoul National University Bundang Hospital, Seoul, South Korea (HH); and Department of Industrial & Systems Engineering, Korea Advanced Institute of Science and Technology, Daejeon, South Korea (UL)

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