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Commentary

Syndromic surveillance of COVID-19 using crowdsourced data

Michael R. Desjardins

Department of Epidemiology & Spatial Science for Public Health Center, Johns Hopkins Bloomberg School of Public Health, Baltimore, MD 21205, USA

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As of August 20, 2020, COVID-19 has caused ~22.4 million co nfirmed cases and over 789,000 confirmed deaths, globally [1]. However, the global case and death counts are likely much higher due to a variety of factors, such as misdiagnoses during the early stages of the pandemic, testing disparities, and high rates of asymptomatic carriers (up to 50%) of the SARS-CoV-2 virus [2]. Surveillance of COVID-19 has largely relied on confirmed case and death statistics, contact tracing, and projections via epidemiological modeling [3,4]. Furthermore, the timeliness of data availability often suffers from reporting delays due to the incubation period, testing lags, and others.

Since symptoms occur before the disease, syndromic surveillance systems can complement traditional COVID-19 surveillance by understanding *where* and *when* there are spikes in COVID-like-illness (CLI) symptoms. Detecting anomalous increases in CLI symptoms may improve COVID-19 response, such as testing allocation, educational campaigns, and facilitate decision making regarding lockdowns and quarantines. Using crowdsourced data to develop a syndromic surveillance system can allow individuals to actively participate in COVID-19 control and prevention. Further statistical analyses can validate the efficacy of such surveillance systems by determining if CLI symptoms are strongly correlated with confirmed COVID-19 cases.

Two such examples include recent research articles published in *The Lancet Regional Health – Western Pacific* by Yoneoka et al. [5] and Nomura et al. [6]. Both papers discuss the Japanese COVID-19 syndromic surveillance system called COOPERA (COvid-19: Operation for Personalized Empowerment to Render smart prevention And care seeking). The system was implemented via LINE Corporation's mobile messenger application, which has approximately 83 million active users (65% of Japan's population) [7]. Yoneoka et al. [5] utilized 353,010 participants aged 13 years or older in Tokyo, while Nomura et al. [6] utilized 227,898 participants in Fukuoka Prefecture (southwestern Japan). Daily confirmed cases of COVID-19 were also extracted that would later be used for validation purposes. The number of participants is certainly impressive and highlights communities coming together to address major public health issues.

COOPERA collects information about an individual's age, gender, occupation, health conditions, preventative actions related to COVID-19, postcode for subsequent spatial analysis; and "current" and CLI symptoms experienced in the previous month, including the duration each symptom was experienced. The two symptoms that individuals can report include fever (above 37.5 °C) and fatigue, and shortness of breath. The authors noted that 4.4% of the participants reported at least one symptom between March 27-April 6, 2020 in Tokyo; and 3.48% reported at least one symptom between March 1-April 30, 2020 in Fukuoka. It is important to note that other CLI symptoms were not considered, such as sudden loss in taste (ageusia) and/or smell (anosmia), diarrhea, headache, cough, etc. The lack of other symptoms likely did not capture a wider range of symptomatic participants. For example, a high proportion of individuals with COVID-19 presents with loss in taste and/or smell [8]. Furthermore, only the first entry of each participant was utilized in the analysis, not considering those who entered data multiple times (potentially masking key spatio-temporal patterns of CLI symptoms).

Nevertheless, the authors provided key evidence that such a syndromic surveillance system for COVID-19 can be used to predict outbreaks of confirmed cases at a fine level. In both papers, the authors reported strong spatial correlations between clusters of self-reported symptoms and confirmed COVID-19 cases, which provide strong evidence that COOPERA can be used as an early warning system of imminent COVID-19 outbreaks at fine levels in Japan; in both examples, the municipality level. They also found that low-risk areas increased after Prime Minister Shinzo Abe declared a state of emergency on April 7, 2020, suggesting overall adherence to preventative measures and guidelines.

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E-mail address: mdesjar3@jhmi.edu

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The authors' syndromic surveillance system is an example of volunteered geographic information (VGI) [9], without the public dissemination component. A comprehensive VGI-based syndromic surveillance system will provide direct feedback to its users, public, and decision-makers via a dashboard, for example [10]. Furthermore, to fully maximize the public health response capabilities of syndromic surveillance systems, developers should both analyze and disseminate results daily [4,10]. Doing so will result in *proactive* syndromic surveillance, rather than analyzing data using a single snapshot in time. Yoneoka et al. [5] and Nomura et al. [6] provide key examples of the potential of COVID-19 syndromic surveillance systems. Such a system can be extended to provide daily feedback on an interactive online platform – with the goal of facilitating targeted and rapid interventions, while also understanding the efficacy of preventative measures such as social distancing and lockdowns.

Declaration of Interests

M.R. Desjardins has nothing to disclose.

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Author contributions

M.R. Desjardins was solely responsible for the literature search, preparing, writing, and revising this commentary.

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