



Editorial

Field epidemiology and COVID-19: always more lessons to be learned

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The COVID-19 pandemic has increased the public's familiarity with the word 'epidemiology' to a degree unparalleled during previous public health events. Although epidemiology at its core is an application of the scientific method, as with all science, some of its methods evolve as a result of new discoveries. This is also true for 'field epidemiology', the subspecialty of epidemiology 'with the goal of immediate action to address a public health problem of concern'.¹ The emerging COVID-19 pandemic is a clear example of how new phenomena in human health prompt consideration of possibilities for further strengthening the discipline of field epidemiology.

In 2015, when we were employees at the US Centers for Disease Control and Prevention (CDC), we were invited by CDC leadership to serve as editors of the *The CDC Field Epidemiology Manual*,² the fourth edition of a book previously titled *Field Epidemiology*, first published in 1996 and edited by Dr Michael Gregg. The book, designed to train health professionals in field epidemiology, was initially adapted from the contents of an annual course for new members of CDC's elite Epidemic Intelligence Service (EIS) program, a two-year fellowship program first created in 1951. These trainees, also known as EIS officers or 'disease detectives', continue to serve on the front-line of many public health investigations and often remain on CDC staff after their training.

Although much of the book addresses the 'basics' of field epidemiology, including core principles and methods that have remained relatively stable, each successive edition has incorporated updates to reflect new methods and innovations in field investigations. Successive editions have often drawn on and reflected lessons learned from field investigations conducted in between editions, including those done as part of responses to major public health emergencies. For example, after the 2001 anthrax attacks,³ the third edition introduced a chapter on terrorism preparedness and emergency response to address the special challenges that may arise when field investigations involve coordination between public health and law enforcement. Other examples include the fourth edition's new chapter on coordination between multiple states and federal agencies in addressing challenges that arose during the 2012–13 investigation of the multistate fungal meningitis outbreak associated with contaminated steroid injections,⁴ and a new chapter on multinational outbreak investigations to capture lessons learned during the 2014–16 response to the Ebola outbreak in West Africa.⁵ Successive editions have also included updates on novel methods that have been incorporated into field investigations since the last edition, such as new chapters on the use of geographic information system data and on using new technologies (e.g. mobile devices and environmental sensors) in field investigations that were added to the most recent edition.

The fourth edition was published in late 2018, about a year before the first cases of coronavirus disease 2019 (COVID-19) were identified in Wuhan, China.⁶ The ongoing response to the COVID-19 pandemic has exposed a multitude of novel issues. Although the pandemic is far from over, it has become apparent that some issues have longer-term implications for field epidemiology and warrant discussion now. Moreover, the need to recognize and incorporate these lessons similarly applies to the broad field of epidemiology. At a minimum, lessons learned include the following.

(i) Ensure timely availability of diagnostic tests. Although the book emphasizes the need to confirm the diagnosis as one of the first steps in a field investigation and contains a chapter on the importance of collaborations between laboratory scientists and epidemiologists, the pandemic response further highlights the need for timely availability and dissemination of validated diagnostic testing as an integral tool early in a field investigation. Delays in the deployment of testing that occurred early in the COVID-19 response in the USA led to uncertainty regarding burden of disease and degree of community spread, which contributed to rapid acceleration of the pandemic.^{7,8} Timeliness of test results continues to challenge the pandemic response since containment relies on rapid availability of results to enable timely contact tracing and implementation of isolation for the infected and quarantine of exposed persons.⁹

(ii) Assess the effects of social determinants of health on disease burden. As the pandemic has progressed in the USA, the finding that certain groups are at higher risk for SARS-CoV-2 infection and its severe complications demonstrates the need for early descriptive epidemiologic analysis of social determinants in future outbreaks to accelerate development of population-level interventions. These findings have led CDC to add a Chief Health Equity Officer, a senior leader who will focus on identifying and addressing health disparities to the COVID-19 Incident Management Structure, and on releasing a COVID-19 Health Equity Strategy.¹⁰ Collection of data is needed on race-ethnicity, but also on potential drivers of disparities, such as living conditions, work settings or health circumstances.^{11,12} Early consideration of social determinants of health in future public health responses could lead to more timely identification of disparities so that they can be appropriately addressed.

(iii) Strengthen existing or rebuild damaged global partnerships. The COVID-19 pandemic again emphasizes the paramount need for strong global partnerships in detecting and effectively responding to large-scale public health emergencies. While the International Health Regulations agreement from 2005 addresses the importance of international collaboration and coordination and is binding for all

World Health Organization Member States, maintaining relationships with other countries based on trust is essential. Maintaining US participation in multi-lateral public health enterprises such as the World Health Organization and strengthening US-supported collaborations on epidemiologic surveillance of emerging infections and other health threats enable efficiencies in detection and effectiveness in implementing interventions to control pandemics and other global public health emergencies.^{13,14}

(iv) Ensure primary communications regarding the public health aspects of the response are provided by trusted and credible messengers. The importance of communications in an emergency response was well-recognized before the COVID-19 pandemic, and the chapter on communications emphasizes the need for a trusted and credible messenger. The chapter lists other factors including empathy and caring, honesty and openness, dedication and commitment, and competence and expertise.¹⁵ During the COVID-19 response, messengers have often been politicians rather than public health experts,¹⁶ in stark contrast, e.g. to the 2009 H1N1 influenza pandemic and other previous public health emergencies. Politics have complicated the response to previous public health emergencies,¹⁷ but never to such a level as that seen with COVID-19; e.g. an event history analysis of social distancing policies across 50 US states showed that the most important predictors were political, with governors who were Republican being slower to implement social distancing policies.¹⁸ Awareness of the potential for politicization of a public health emergency should guide response communications and selection of public health communicators. Messaging also needs to focus on educating the public on basic public health literacy issues to bolster understanding of the rationale for different interventions in order to increase their acceptance and adoption (e.g. the rationale for wearing face coverings, maintaining physical distancing and handwashing in the COVID-19 pandemic).

(v) Implement targeted evidence-based interventions as early as possible. The importance of timely implementation of evidence-based interventions is a core emphasis of field epidemiology. However, the COVID-19 pandemic demonstrates the critical importance of the timing of the interventions. For example, data from the European Centre for Disease Prevention and Control on policies introduced in 149 countries showed that physical distancing interventions such as school and workplace closures, restrictions on mass gatherings and restrictions of population movement (lockdown) were associated with significant decreases in incidence of COVID-19; however, decreases were even greater in countries employing earlier implementation of lockdown along with school and workplace closures.

(vi) Emphasize the importance of conducting training and exercises. Although the importance of preparing for a public health emergency is well-recognized, the focus on continual training and exercising needs to be intensified. Exercises such as the Clade X pandemic tabletop exercise conducted in May 2018 by the Johns Hopkins Center for Health Security¹⁹ identify gaps that need to be filled to better prepare for future emergencies and raise awareness about the need for policy solutions to improve emergency preparedness. The series of emergencies faced by federal, state and local public health entities in the USA in recent years has been unrelenting—including, e.g. 9/11 and the anthrax attacks (2001), Hurricane Katrina (2005), H1N1 influenza (2009), Ebola (2014), Zika (2016) and COVID-19 (2020)—and underscore the need for all levels to train and exercise for the next public health emergency. Whereas each of these emergencies raised different challenges, all have required a disciplined and strategic response that would benefit from improved preparation.

The COVID-19 pandemic has presented public health with its biggest infectious disease challenge since the 1918 influenza pandemic. Although we are early in the pandemic, several issues have already arisen that necessitate their incorporation into educational and training materials for future field epidemiologists. As the pandemic continues, it is important to continue to document challenges and how these can be overcome in future public health emergencies. For the discipline of field epidemiology, there are always more lessons to be learned!

Disclosures

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