1. Introduction

The comments that follow on Fricker’s paper examining methodological issues in biosurveillance [1] are primarily from the perspective of public health practice. As Fricker noted, a recent directive [2] identified the two main objectives of biosurveillance as early event detection (EED) and situational awareness (SA). The focus of Fricker’s paper was EED and I begin by commenting on the evidence for this objective. I also consider the evidence for SA as practice patterns suggest that this function of biosurveillance, even if it remains poorly defined, is particularly valuable to public health organizations [3, 4].

2. Early event detection

I agree wholeheartedly with Fricker that poor EED performance in current systems does not imply biosurveillance should not be used for this purpose. Concerted research in this area is relatively recent and there is every reason to believe that innovations will occur in data processing and biostatistical methods. From a practical perspective, there will also remain a need in public health to detect disease outbreaks through surveillance, even if many outbreaks will be detected through other routes.

However, research in EED should be informed by a sober assessment of the current evidence and by pragmatic consideration of the additional evidence required to advance early detection in public health practice. As noted by Fricker, results are difficult to synthesize from much of the research on this topic due to wide variation in the data sources used, inconsistency in the performance measures assessed, and infrequent comparison of new methods to existing ones. Consequently, published reviews have tended to be qualitative [5], although reviews do suggest that EED as currently performed can detect some types of disease outbreaks rapidly with high accuracy.

Standardizing algorithm performance studies as Fricker suggests will certainly facilitate identification of when and how EED should be used. Agreement on elements of the study design, including the role of simulation, the selection of performance metrics, and comparison to existing algorithms, is critical to develop evidence on this topic and to translate the evidence into practice. Although this field of research is still young, it may be time to consider the development of guidelines for reporting such studies, as has been done other areas of epidemiology and biostatistics [6]. Another important aspect of standardization is the naming and classification of detection algorithms. Although Fricker focused on methods drawn from statistical process control (SPC), public health organizations use a much wider variety of methods in practice. Work to develop standard definitions of detection algorithms based upon their function as opposed to their origins will also facilitate the distillation of evidence from results [7, 8]. Consistent use of terminology about algorithms, data, and outbreak signals, will help to advance this field of research and build evidence about the performance of different algorithms when operating under different conditions.

Department of Epidemiology and Biostatistics, McGill University, 1140 Pine Avenue West, Montreal, QC, Canada H3A 1A3
*Correspondence to: D. L. Buckeridge, Department of Epidemiology and Biostatistics, McGill University, 1140 Pine Avenue West, Montreal, QC, Canada H3A 1A3.
†E-mail: david.buckeridge@mcgill.ca

Copyright © 2011 John Wiley & Sons, Ltd.
In addition to standardizing study design and reporting, expanding the scope of evaluation studies is essential to answer important, practical questions about how EED should be used in public health. Most research has focussed on the accuracy of algorithms in laboratory settings. While this type of algorithm research is important, studies to evaluate the effect of early detection and response on health and financial outcomes are needed to truly understand how EED should be used in practice. The results from such studies will help guide ‘systems-design’ development, as noted by Fricker. In other words, accurate and timely algorithms are necessary, but not sufficient, for effective EED in practice. Realistic simulation studies may be helpful in this regard [9], but observational and experimental studies of surveillance in public health settings are also needed.

Taking a broader perspective on EED to include response protocols and associated actions in public health settings helps to clarify the relative importance of early detection and identify a broader set of methodological issues in biosurveillance. Although outbreak detection is an important objective of surveillance, in my experience, public health personnel devote more time and effort towards controlling outbreaks than towards detecting them. Research directed towards the use of biosurveillance to support disease control activities, or SA, is therefore critical for the future.

3. Situational awareness

The concept of SA is intuitively clear but vaguely defined and poorly studied. Increasingly, however, it appears that SA may be the most meaningful application of biosurveillance in public health [3, 4]. By its very nature, SA transcends individual surveillance data sources and the traditional ‘stovepipe’ approach used in the development and operation of surveillance systems. Consequently, as public health personnel attempt to make use of biosurveillance data for SA, they face the non-trivial challenge of simultaneously interpreting data from biosurveillance systems and traditional surveillance sources in order to make decisions about disease control [10]. In many public health settings, the integration of surveillance data from different sources is accomplished in an ad hoc and qualitative manner, with rudimentary biostatistical methods used to describe the progression of an outbreak. Given the importance of outbreak control and the increasing amount of information available to public health personnel, clear definition of the public health processes necessary for SA and development of novel biostatistical methods to support SA are critical challenges for the future of biosurveillance and public health in general [11].

4. Conclusions

Ongoing evaluation and innovation in early event detection is important, but standardization of study design and reporting of results is required to enable synthesis of results and translation of findings into surveillance practice. SA is increasingly recognized as a benefit of biosurveillance, but it must be better defined and research is needed to develop methods for integrating surveillance data sources and to evaluate the effect of enhanced SA on health and economic outcomes. Seen more broadly, research to enhance EED and SA presents an opportunity for biostatisticians and others to identify innovative approaches that will explicitly connect surveillance information to decisions, and ultimately, advance the science and practice of public health surveillance.

Acknowledgements

David Buckeridge is supported by a Canada Research Chair in Public Health Informatics.

References


