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A Review of Evaluations of Electronic Event-based Biosurveillance Systems

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Objective

To assess evaluations of electronic event-based biosurveillance systems (EEBS's) and define priorities for EEBS evaluations.

Introduction

EEBS's that use near real-time information from the Internet are an increasingly important source of intelligence for public health organizations (1, 2). However, there has not been a systematic assessment of EEBS evaluations, which could identify uncertainties about current systems and guide EEBS development to effectively exploit digital information for surveillance.

Methods

We searched PubMed and consulted EEBS experts to identify EEBS's that met the following criteria: uses publicly-available Internet info sources, includes events that impact humans, and has global scope. We constructed a list of 17 key evaluation variables using guidelines for evaluating health surveillance systems, and identified the key variables included in evaluations per EEBS, as well as the number of EEBS's evaluated for each key variable (3,4).

Results

We identified 10 EEBS's and 17 evaluations (Table 1). The number of evaluations per EEBS ranged from 1 (Gen-Db, GODsN) to 7 (GPHIN, HealthMap). The median number of variables assessed per EEBS was 6 (range, 3-12), with 5 (25%) evaluations assessing 7+ variables. Nine (53%) published evaluations contained quantitative assessments of at least 1 variable. The least-frequently studied variable was cost. No papers examined usefulness as specific public health decisions or outcomes resulting from early event detection, though 8 evaluations assessed usefulness by citing instances where the EEBS detected an outbreak earlier, or by eliciting user feedback.

Conclusions

While EEBS's have demonstrated their usefulness and accuracy for early outbreak detection, no evaluations have cited specific examples of public health decisions or outcomes resulting from the EEBS. Future evaluations should discuss these critical indicators of public health utility. They also should assess the novel aspects of EEBS and include variables such as policy readiness, system redundancy, input/output geography (5); and test the effects of combining EEBS's into a "super system".

Table 1. Number of published evaluations and variables on identified EEBS's

EEBS	Year started	No. evaluations	No. key variables assessed
Argus	2005	5	7
BioCaster	2006	5	9
EpiSpider	2006	2	4
Geni-Db	2012	1	4
GODsN	2006	1	3
GPHIN	1997	7	10
Health Map	2006	7	12
MedISys	2006	2	4
ProMed	1994	5	12
PULS	2006	2	5

Table 2. Key variables used in evaluations of EEBS

Key eval var	Ref.	No. evals using the var	No. of EEBS's evaluated on this var
Acceptability	3,4	6	4
Accessibility	4	5	4
Cost	4	3	2
Data quality	3,4	5	3
Flexibility	3,4	2	3
Population coverage	4	9	5
Predict. value pos.	3	5	4
Purpose	4	15	10
Portability	4	2	2
Representativeness	3,4	5	5
Resources	3,4	7	3
Sensitivity	3	9	5
Simplicity	3	5	4
Stability	3,4	0	0
Timeliness	3,4	14	9
Usefulness	3,4	8	7
Validity	4	5	4

Keywords

evaluation; biosurveillance; event-based surveillance

References

Heymann DL, et al. Hot spots in a wired world: WHO surveillance of emerging and re-emerging infectious diseases. Lancet Infect Dis. 2001;1:345–53.

Keller M, et al. Use of unstructured event-based reports for global infectious disease surveillance. Emerg Infect Dis. 2009;15:689–95.

German RR, et al. Guidelines working group centers for disease control and prevention (CDC).Updated guidelines for evaluating public health surveillance systems: Recommendations from the Guidelines Working Group. MMWR Recomm Rep. 2001;50(RR-13):1–35.

Buehler JW, et al. Framework for evaluating public health surveillance systems for early detection of outbreaks: Recommendations from the CDC working group. MMWR Recomm Rep. 2004;53(RR-5):1–11.

Corley CD, et al. Assessing the continuum of event-based biosurveillance through an operational lens. Biosecur Bioterror 2012;10:131-141.

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