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Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

Abstract

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Abstract

The Electronic Surveillance System for the Early Notification of Community-Based Epidemics (ESSENCE) enables health care practitioners to detect and monitor health indicators of public health importance. ESSENCE is used by public health departments in the National Capital Region (NCR); a cross-jurisdictional data sharing agreement has allowed cooperative health information sharing in the region since 2004. Emergency department visits for influenza-like illness (ILI) in the NCR from 2008 are compared to those of 2009. Important differences in the rates, timing, and demographic composition of ILI visits were found. By monitoring a regional surveillance system, public health practitioners had an increased ability to understand the magnitude and character of different ILI outbreaks. This increased ability provided crucial community-level information on which to base response and control measures for the novel 2009 H1N1 influenza outbreak. This report underscores the utility of automated surveillance systems in monitoring community-based outbreaks.

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Abstract

The 2009 Inauguration and H1N1 outbreak called for real-time electronic information-sharing and surveillance across multiple jurisdictions to better understand the health of migrating populations. The InfoShare web application proved to be an efficient tool for users to share disease surveillance information. During both high profile events, public health users shared information within a secure access-controlled website across regions in the U.S. and among agencies. Due to its flexible design, InfoShare was quickly modified from its 2009 Inauguration interface to an interface that supports H1N1 surveillance. Through discussions and post-use surveys, a majority of InfoShare users revealed that the tool had provided a valuable and needed function. InfoShare allowed individual jurisdictions to receive timely and useful information, which, when merged with neighboring jurisdictions, significantly enhanced situational awareness for better decision-making and improved public health outcomes.

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Laboratory information systems may fulfill many of the requirements for individual result management within a public health laboratory but typically system access by data users, timely data extraction, integration and analysis is difficult. This is further complicated by often having multiple laboratory results for specific analytes or related analytes per specimen tested as part of complex laboratory algorithms requiring specialized expertise for result interpretation. We describe DIAL, (Data Integration for Alberta Laboratories), a platform allowing laboratory data to be extracted, interpreted, collated and analyzed in near real-time using secure web based technology, which is adapted from CNPHI`s Canadian Early Warning System (CEWS) technology. The development of DIAL represents a major technical advancement in the public health information management domain, building capacity for laboratory based surveillance.

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This work extends ongoing development of a framework for modelling the spread of contact-transmission infectious diseases. The framework is built upon Agent Based Modeling (ABM), with emphasis on urban scale modelling integrated with institutional models of hospital emergency departments. The method presented here includes ABM modeling an outbreak of influenza-like illness (ILI) with concomitant surges at hospital emergency departments, and illustrates the preliminary modeling of 'crowdinforming' as an intervention. 'Crowdinforming', a component of 'crowdsourcing', is characterized as the dissemination of collected and processed information back to the 'crowd' via public access. The objective of the simulation is to allow for effective policy evaluation to better inform the public of expected wait times as part of their decision making process in attending an emergency department or clinic. In effect, this is a means of providing additional decision support garnered from a simulation, prior to real world implementation. The conjecture is that more optimal service delivery can be achieved under balanced patient loads, compared to situations where some emergency departments are overextended while others are underutilized. Load balancing optimization is a common notion in many operations, and the simulation illustrates that 'crowdinforming' is a potential tool when used as a process control parameter to balance the load at emergency departments as well as serving as an effective means to direct patients during an ILI outbreak with temporary clinics deployed. The information provided in the 'crowdinforming' model is readily available in a local context, although it requires thoughtful consideration in its interpretation. The extension to a wider dissemination of information via a web service is readily achievable and presents no technical obstacles, although political obstacles may be present. The 'crowdinforming' simulation is not limited to arrivals of patients at emergency departments due to ILI; it applies equally to any scenarios where patients arrive in any arrival pattern that may cause disparity in the waiting times at multiple facilities.

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The North Carolina Comprehensive Assessment for Tracking Community Health (NC CATCH) is a Web-based analytical system deployed to local public health units and their community partners. The system has the following characteristics: flexible, powerful online analytic processing (OLAP) interface; multiple sources of multidimensional, event-level data fully conformed to common definitions in a data warehouse structure; enabled utilization of available decision support software tools; analytic capabilities distributed and optimized locally with centralized technical infrastructure; two levels of access differentiated by the user (anonymous versus registered) and by the analytical flexibility (Community Profile versus Design Phase); and, an emphasis on user training and feedback. The ability of local public health units to engage in outcomes-based performance measurement will be influenced by continuing access to event-level data, developments in evidence-based practice for improving population health, and the application of information technology-based analytic tools and methods.

Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

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Objectives: Several public health education programs and government agencies across the country have started offering virtual or online training programs in emergency preparedness for people who are likely to be involved in managing or responding to different types of emergency situations such as natural disasters, epidemics, bioterrorism, etc. While such online training programs are more convenient and cost-effective than traditional classroom-based programs, their success depends to a great extent on the underlying technological environment. Specifically, in an online technological environment, different types of user experiences come in to play—users' utilitarian or pragmatic experience, their fun or hedonic experience, their social experience, and most importantly, their usability experience—and these different user experiences critically shape the program outcomes, including course completion rates. This study adopts a multi-disciplinary approach and draws on theories in human computer interaction, distance learning theories, usability research, and online consumer behavior to evaluate users' experience with the technological environment of an onlinel emergency preparedness training program and discusses its implications for the design of effective online training programs. . Methods: Data was collected using a questionnaire from 377 subjects who had registered for and participated in online public health preparedness training courses offered by a large public university in the Northeast. Results: Analysis of the data indicates that as predicted, participants had higher levels of pragmatic and usability experiences compared to their hedonic and sociability experiences. Results also indicate that people who experienced higher levels of pragmatic, hedonic, sociability and usability experiences were more likely to complete the course(s) they registered for compared to those who reported lower levels. Discussion: The study findings hold important implications for the design of effective online emergency preparedness training targeted at diverse audiences including the general public, health care and public health professionals, and emergency responders. Strategies for improving participants' pragmatic, hedonic, sociability and usability experiences are outlined. Conclusion: There are ample opportunities to improve the pragmatic, hedonic, sociability and usability experiences of the target audience. This is critical to improve the participants' learning and retention as well as the completion rates for the courses offered. Online emergency preparedness programs are likely to play a crucial role in preparing emergency responders at all levels in the future and their success has critical implications for public health informatics.

Roles of Health Literacy in Relation to Social Determinants of Health and Recommendations for Informatics-Based Interventions: Systematic Review

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In Boston we took the availability and quality of our tap water for granted until May 1, 2010, when a major water pipe break interrupted water service to two million Greater Boston residents. Information spread quickly to citizens about the problem and what to do, all the more notable because the water main break occurred on a Saturday. In this age of consumer paranoia about withheld information, the Massachusetts Water Resources Authority (MWRA) was in front of cameras and online, communicating what they knew and what they were doing. Tufts University and the Boston Public Health Commission used communication channels ranging from Twitter to megaphones to get the word out. Their behind-the-scenes emergency planning processes, their response to this incident, and seven lessons learned from this short-lived crisis are applicable to many other crises.

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