Emerging Health Threats Journal 2011, 4:s106. doi: 10.3134/ehtj.10.106

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ABSTRACT

BioSINE: an intuitive visualization tool to enhance collaboration between research and practice in disease surveillance

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Objective
BioSINE strives to improve situational awareness by making data visualization and collaboration capabilities intuitive and readily available for a wide range of public health (PH) stakeholders.

Introduction
Funded by the Army's Telemedicine and Advanced Technology Research Center (TATRC), we developed the BioSINE toolset to provide visualization and collaboration capabilities to improve the accessibility and utility of health surveillance data. Investigation of PH practitioners' needs with cognitive engineering methods revealed two key objectives:

1. To provide analysts and decision makers with an intuitive, visually driven workspace.
2. To support a web presence to provide rapid updating and facilitate greater interaction with data analysis in the PH community.

To better serve under-resourced PH organizations, both domestic and abroad, it is necessary to minimize information technology (IT) requirements and expertise in complex analytic tools.

BioSINE provides decision makers with the ability to create customized visualizations, focus on specific aspects of the data, or conduct hypothesis testing. Users can also view or hide variables, specify data ranges, and filter data relevant to their interests. Figure 1 shows a display in which a user investigated seasonal effects by narrowing the analysis to the summer months. Intuitive filtering is a key characteristic of the application to quickly produce snapshots of local interests.

Figure 1 Screenshot of consumer probing for seasonal trends by customizing date range.

Methods
We conducted usability tests with a sample of six participants, including three (military) public health experts and three (civilian) naïve users. Each performed a series of standardized tasks that required probing the dataset to identify morbidity patterns and answer specific questions. Morae© usability testing software was used to record the entire session, including the number of errors made, real-time verbal commentary, and survey items measuring satisfaction and usability opinions. Each questionnaire was scored on a five-point Likert scale with anchors ranging from *Strongly Disagree* (1) to *Strongly Agree* (5). After each testing session was completed, users participated in a semi-structured interview to suggest additional software features and functionality that might be useful to the larger PH community. Each user session lasted approximately 90 min.

Results

Users were quite successful in completing their tasks. Military and civilian users performed similarly. The mean number of errors per user was 4.17 (s.d. = 2.04), none of which prevented completion. Users also reported they enjoyed using the BioSINE software. The mean satisfaction score was 4.07 (s.d. = 0.59). Of the narrative comments collected, users reported that the BioSINE interface was easy to use, and provided a unique approach to interacting with and extracting information from health surveillance data.

Conclusions

Our findings over the course of this project suggest the ability to *interact with data,* and not just view reports, leads to improved understanding, situational awareness, and collaboration. Our testing results indicate that even first-time users without PH expertise can successfully complete complex tasks and correctly answer health surveillance queries. Collected user opinions showed BioSINE to be useful and intuitive. Our intent is to harden the BioSINE prototype and make it a freely available web tool to the PH community.

Acknowledgements

This paper was presented as an oral presentation at the 2010 International Society for Disease Surveillance Conference, held in Park City, UT, USA, on 1–2 December 2010.