

Open Source Development of Syndromic Investigation Decision Support Tools

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OBJECTIVE

This paper describes the integration of open source applications as portable, customizable tools for epidemiologists to provide rapid analysis, visualization, and reporting during surveillance investigations.

BACKGROUND

Real-time Outbreak and Disease Surveillance (RODS), a syndromic surveillance system created by the University of Pittsburgh has been used in Ohio by the state and local health departments since late 2003 [1]. There are currently 133 health care facilities providing 88% coverage of emergency department visits statewide to the RODS system managed by Health Monitoring Systems Inc. (HMS) [2,3]. The system automatically alerts health department jurisdictions when various syndromic thresholds are exceeded.

As part of response protocols, investigators export a case listing in a comma-separated values (CSV) file which typically includes thousands of lines with each row containing: date admitted, age, gender, zip code, hospital name, visit number, chief complaint, and syndrome. The HMS-RODS web site provides basic graphs and maps, yet lacks the flexibility afforded by ad hoc queries, cross tabulation, and portability enabling off-line analysis.

METHODS

While the CSV content is variable, its predictable structure should enable investigators to trigger pre-compiled procedures for automated analysis, visualization, and reporting (AVR). Similarly, the formatting of information graphics could be preconfigured with georeferenced objects and demographic attribute data. This vision led to the four phase development of a portable public health analysis, visualization, and reporting tool referred to as PPHAT which included: 1) business process analysis, 2) technology selection, 3) application development and testing, and 4) distribution [4]. Phase 1 examined the requirements definition to characterize the desired functionality of PPHAT to ensure the workflow and system outputs would support the business process redesign of existing reportable disease protocols with the integration of syndromic investigation from RODS. Selection criteria during Phase 2 included: portability, open source, automation of processes, multidimensional relationship summary, output to graphs and maps, and customizable by non-programmers. Phase 3 and Phase 4 involve iterative and ongoing activities.

RESULTS

XAMPP Lite, a preconfigured development framework, was selected as the core technology to provide web and database servers with advanced scripting support [5]. The system was configured on a 1 gigabyte USB flash drive and customized to rapidly transform the CSV file to pivot tables, filter query tables, and map with only a few mouse clicks. Three local health departments and the Ohio Department of Health were provided the application for evaluation.

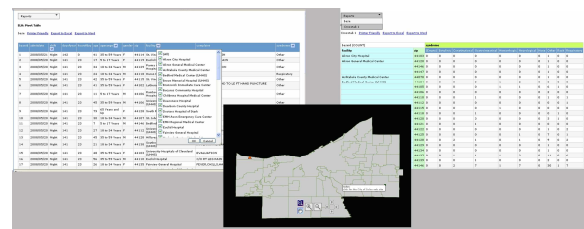


Figure 1 – Component output prototypes from PPHAT showing: filter query view, geo-referenced map of Cuyahoga County, OH showing municipal boundaries (green) overlaid with points, and pivot table of facilities by zip code and syndrome.

CONCLUSIONS

The fusion of syndromic and reportable disease data may increase capacity for the early detection of both bioterrorism and epidemics along with a more rapid public health response that is initiated prior to clinical recognition of disease clusters. PPHAT provides epidemiologists with a portable method of analysis and decision support tool, at no cost, to verify the validity and magnitude of an alert and whether continued investigation is warranted.

REFERENCES

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