

# Design of Web-based Detectability Evaluation Software that Interfaces with a Syndromic Surveillance System

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## OBJECTIVE

To design detectability evaluation software that interfaces with the Realtime Outbreak and Disease Surveillance (RODS) System.

## BACKGROUND

Detectability studies – the measurement of sensitivity, specificity, and detection timeliness of data sources, detection algorithms, and surveillance systems – are fundamental in biosurveillance research. Rarity of outbreaks, limited availability of surveillance data, and computational challenges are significant barriers to the conduct of such studies.

We previously developed a desktop application called HiFIDE [1] that enables users to conduct interactive detectability studies with user-supplied surveillance data and detection algorithms supplied with the software. Our objective was to design a web application that provides similar functionality as HiFIDE but which interfaces with the RODS system to access its surveillance data and detection algorithms. This application would thus enable users to conduct on-the-fly detectability analyses of the RODS system.

## METHODS

We designed the web application under three guiding principles. First, detectability analyses should accurately reflect the true performance of the RODS system. Second, users should be able to conduct detectability studies on time series of over-the-counter (OTC) sales of pharmaceutical products and classified chief complaint data. Third, the analysis and application must be sufficiently fast to ensure a smooth user experience and prevent internet connection timeouts.

We implemented the application using a server-side Java servlet and a client-side Java applet. The servlet resides on the same server as the RODS system and interfaces securely with the RODS system to access surveillance data. The applet provides the graphical user interface and communicates with the servlet to make analysis requests and retrieve results.

## RESULTS

We built the web application in accordance with the principles outlined above. However, each of the principles presented challenges. Evaluating the true performance of the RODS system required a thorough understanding of the system, including its rule-based alerting protocols. Implementation of both

geometric and disease-specific injects to create semi-synthetic outbreak data enabled support for both OTC and chief complaint data. Perhaps the greatest challenge was to make the analysis sufficiently fast for common use. We overcame this challenge through a combination of database performance improvements made by RODS developers and changes to the experimental design of the detectability study. With these modifications, the application launches and completes most analyses in less than one minute.

The primary limitation of the evaluation software is its tight coupling with the RODS system that grew out of the need to access RODS surveillance data and detection algorithms. Another limitation of the software is that it is presently not suitable for evaluating detectability of seasonal outbreaks due in part to constraints on historical data that were imposed to reduce analysis time.

## CONCLUSIONS

The resulting software enables users to conduct detectability studies of the RODS system. However, the tight coupling of the web application to the surveillance system limits evaluation to the RODS system. We are in the process of building evaluation software that can interface flexibly with external surveillance systems. Designing and building the web application revealed challenges that can arise when evaluating a complex surveillance system, and provided insights for building more general evaluation software.

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## REFERENCES

[1] Wallstrom GL, Wagner MM, Hogan WR. High-fidelity injection detectability experiments: a tool for evaluation of syndromic surveillance systems. *MMWR*, 2005. 54 Supplemental: p. 85-91.