Use of Simulated Bioterrorist Attacks to Evaluate Syndromic Surveillance Systems Based on Multiple Data Sources

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1. Background

Syndromic surveillance systems (SSS) are useful not only for early detection but also for rapid monitoring of the spread of the outbreak.

SSS based on single data sources have limited sensitivity , specificity and predictive value.

2. Aims

To evaluate the contribution of multiple data sources to early detection and monitoring of unusual infectious disease outbreaks.

To evaluate LEADERS (Lightweight Epidemiology Advanced Detection & Emergency Response System) as a tool for syndromic surveillance systems.

To evaluate dynamic changes in patterns of disease resulting from a simulated bioterror attack.

3. Methods

Retrospective data on visits to community clinics and ER's and reported deaths were used to generate mean and threshold incidence curves.

The LEADERS platform was used for collection, storage and analysis of data from different sources.

A simulated anthrax outbreak based on the Svredlovsk outbreak was superimposed on background morbidity.

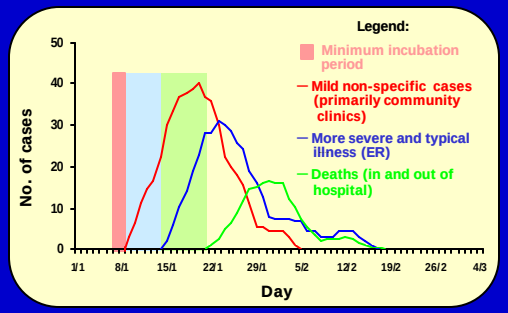
GIS and SaTScan software (NCI) were used for cluster analysis.

The temporal – spatial changes in the different data source were compared.

4. Results

- Figure 4.1 shows a theoretical model of a shift from mild to severe cases following a bioterror attack characterized by sudden exposure of a large group of people.
- Figure 4.2 - arrows indicate early signs of the simulated outbreak progressing from visits to outpatient clinics to admissions to ER to deaths.
- Figure 4.3 indicates the shift in the ratio of visits to community clinics to ER admissions in the clusters, against a background of unassociated morbidity.

4.1. A theoretical model for a bioterrorist outbreak – sudden exposure during a short period



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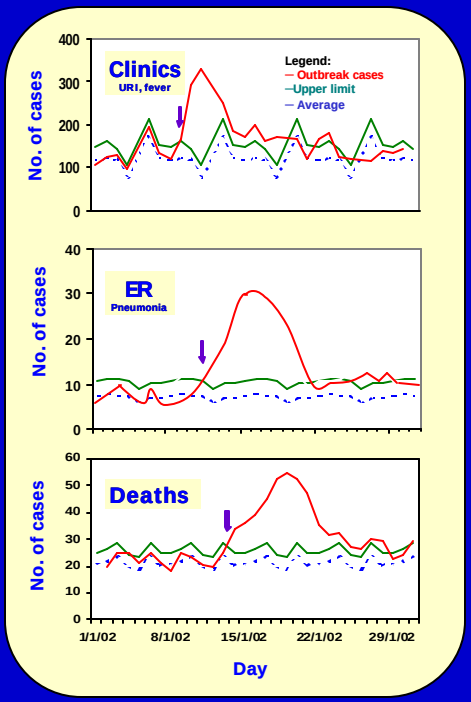
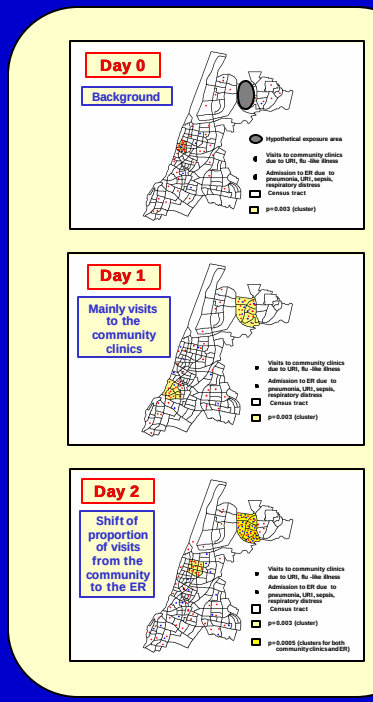
4.2. Simulation of anthrax attack superimposed on background morbidity in community clinics, ER and deaths



4.3. Early detection using GIS and SaTScan technologies – Tel Aviv Area



5. Conclusions

1. Combination of data sources from community clinics and ER's show the progression of the illness from mild to severe cases.
2. Differential dynamic changes in morbidity and mortality from different data sources is a useful means of detecting and monitoring unusual infectious disease outbreaks .
3. More advanced statistical models will improve the performance of the system for early detection.
4. Decision algorithms integrated into the system are currently being developed.
5. A secured web-based system for integrating multiple data sources such as LEADERS