Essential Requirements for Effective Advanced Disease Surveillance

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Objective

The objective of this presentation is to describe both within-discipline and across-discipline changes to standard methods and operating procedures that must be adopted to achieve automated systems that will be an effective complement and extension to traditional disease surveillance. This presentation describes adaptations already in place, as well as those still needed to rapidly recognize and respond to public health emergencies.

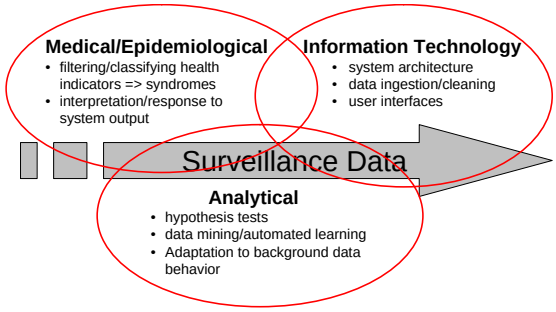
Background

Advanced surveillance systems require expertise from the fields of medicine, epidemiology, biostatistics, and information technology to develop a surveillance application that will automatically acquire, archive, process and present data to the user. Additionally, for a surveillance system to be most useful, it must adapt to the changing environment in which it operates to accommodate emerging public health events that could not be conceived of when the initial system was developed.

Methods

The medical/epidemiological component, which traditionally relies on diagnosis, must be altered to develop an interpretation of less specific health indicators. Correctly filtering data into syndromes or other categories for analysis requires knowledge of the underlying diseases and health seeking behaviors of the population. Analytical tools must take into account the normal deviations of all of the variables that comprise the background for the health indicators to have high specificity. Tools must be implemented that fuse both data and information from inhomogeneous indicators. Information technologists must automate data ingestion and cleansing, optimize system architecture and create user-friendly user interfaces, while meeting the challenge of using and customizing commercial, off-the-shelf products. Proprietary software with high maintenance costs must be avoided. Users' requirements must have higher priority than solutions that are technologically exciting. A continuing dialogue among the users and this multidisciplinary team is required to establish an effective surveillance capability that fits within the environment where it will be deployed. Without close interaction between these groups, effective advanced disease surveillance will be compromised.

Essential Task Interaction



Results

Examples of improved performance by challenging traditional thinking include the following: The accepted practice of coding individuals into one category based on symptom severity has been adapted to more appropriately categorize an individual into multiple groups so as to not limit the data utility. Similarly, over-the-counter medicines have been categorized into groupings based on both clinical knowledge and analytical studies, hence combining both existing knowledge and evidence-based decisions. Combining the trends of all available indicators can provide and earlier notification of an abnormality than looking at the data streams individually. Merging the requirements of the users to take the epidemiology into account has forced the information technologists to develop an alert filtering system that uses rules in conjunction with algorithms to produce a more useful list of anomalies.

Conclusions

Changes to traditional thinking have resulted in implementation of improved methods which are more suited to meet the current challenges facing health departments. Since it is difficult to anticipate future public health emergencies, a continuing adaptation is required to maintain satisfactory system performance.

References

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