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Using Scenarios and Simulations to Validate Syndromic Surveillance Systems

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Objective

To devise a methodology for validating the effectiveness of syndromic surveillance systems across a range of public health scenarios, even in the absence of historical example datasets.

Introduction

Whilst the sensitivity and specificity of traditional laboratory-based surveillance can be readily estimated, the situation is less clear cut for syndromic surveillance. Syndromic surveillance indicators based upon presenting symptoms, chief complaints or preliminary diagnoses are designed to provide public health systems with support to detect multiple potential threats to public health. There is however, no gold standard list of all the possible 'events' that should have been detected. This is especially true in emergency response where systems are designed to detect possible events for which there is no directly comparable historical precedent.

Methods

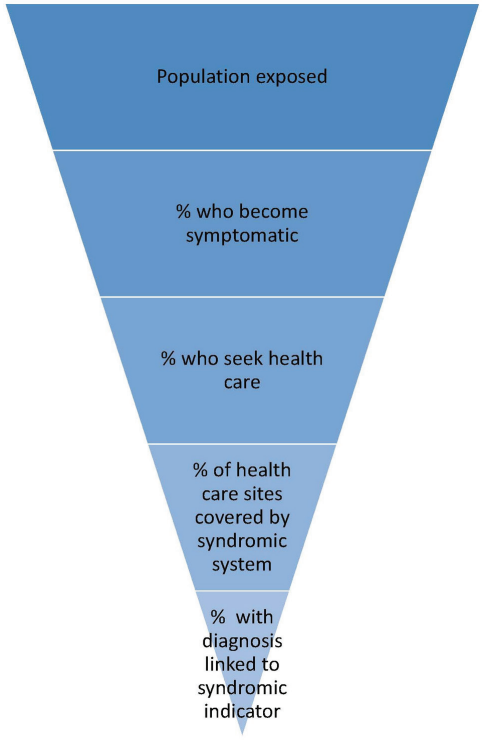
A scenario template specification was created to identify the information needed to validate syndromic systems. In order to estimate the number of extra cases presenting to syndromic systems two types of information were required; a model for the numbers of people affected each day, and a series of parameter estimates to determine if those affected would be captured by the surveillance system.

Results

Scenario templates enabled the collection of the relevant information and estimates for each scenario, using previous research, historical examples and public health expert knowledge. A number of parameters were identified as being required, including: the number of people who become symptomatic, the proportion of these who would seek health care, the population coverage of syndromic systems and the proportion of patients with a diagnosis linked to a syndromic indicator (see figure).

Conclusions

The scenario approach has been combined with simulations to evaluate existing detection algorithms. The approach of identifying key parameters for estimation enables uncertainty to be quantified and combined to give a joint inference for the probability of detection based on both random noise and uncertainty due to modelling and parameter estimation. Scenarios can be easily modified to identify how changes in any aspect of the scenario or the syndromic system would affect detection rates.



Patient presentation pyramid illustrating: parameters that need to be estimated in order to calculate the number of extra cases recorded by syndromic surveillance systems.

Keywords

Simulation; Syndromic surveillance; Scenarios

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