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Estimation of screening sensitivity and sojourn time from an organized screening program

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Regular screening for breast cancer with mammography is widely recommended to reduce mortality due to breast cancer. However, whether breast cancer screening does more harm than good, has been constantly debated. Since a full evaluation of screening will take a follow-up of about 10 to 15 years to provide reliable estimate of the benefits, it is often unrealistic to expect each new modification of a screening technique to be evaluated in this way. Therefore, one needs measures of effects which are rapidly estimable. In this presentation, two measures of interest, the duration of pre-clinical state and the false negative rate, are discussed. Two estimation procedures are proposed to model the pre-clinical state duration, the false negative rate of screening exam and the underlying incidence rate in the screened population. Both methods assume the sojourn time follows a negative exponential distribution, but two different functions are used for the false negative rate: (1) constant over time and (2) an exponential distribution to reflect the fact that lesions may become easier to detect the closer in time that they are to being detected clinically. We show how to estimate those measures by using data on the observed prevalence of disease at a series of screens and on the incidence of disease during intervals between those screens. We illustrate the methods with data from the Ontario Breast Screening Program.

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Foundations and technical challenges of spatio-temporal epidemiological surveillance

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In this talk, we will discuss fundamental concepts of Epidemiological Surveillance (ES). ES is an ongoing systematic collection, visualization, analysis and interpretation of health data, collected for the purpose of timely dissemination of outbreak forecasts. It is an investigational approach where health experts are provided with automated set of tools for real-time data collection from various health departments, monitoring of disease indicators to detect outbreak earlier than would otherwise be possible with traditional diagnosis based methods. Hence the detection of adverse effects can be made at the earliest possible time, possibly even before disease diagnoses can be confirmed through clinical procedures and laboratory tests. We will highlight key challenges faced in the development and operations of Epidemiological Surveillance systems, mainly due to: (A) complex characteristics and the diverse nature of the infectious diseases, (B) the distinct nature of population dynamics, mobility, demographic factors and (C) the geographic nature, environment and the weather conditions of the area under study. We will discuss evolutionary development in the trends, methods and technologies of the surveillance systems and discuss how this progress is addressing the key challenges. In the end, we will argue how a sophisticated health surveillance system helps in alleviating potential health risks and minimize the threats of natural or man-made disasters and eventually supports effective decision making in emergency management.

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