EARLY DETECTION OF DISEASE AND STOCHASTIC M ODELS

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The early detection of disease presents opportunities for using existing technologies to significantly improve patient benefit. The possibility of diagnosing a chronic disease early, while it is asymptomatic, may result in diagnosing the disease in an earlier stage leading to better prognosis. Many cancers, diabetes, tuberculosis, cardiovascular disease, HIV related diseases, etc. may have better prognosis when combined with an effective treatment. However gathering scientific evidence to demonstrate benefit has proved to be difficult. Clinical trials have been arduous to carry out, because of the need to have large numbers of subjects, long follow-up periods and problems of non-compliance. Implementing public health early detection programs have proved to be costly and not based on analytic considerations. Many of these difficulties are a result of not understanding the early disease detection process and the disease natural histories. One way to approach these problems is to model the early detection process. This lecture will discuss stochastic models for the early detection of disease. The talk will discuss : basic ideas, length biased sampling and its implications, randomized trials, scheduling of examinations, ,populations at elevated risk and the over diagnosis of disease. Breast and prostate cancers will be used to illustrate the application of the stochastic models. Among the issues which will be discussed are: screening younger women with mammography, over diagnosis of prostate and breast cancer and choosing optimal schedules for public health programs for breast cancer screening. These issues cannot be addressed by clinical trials because such trials are unethical or are impractical.