Cost-effectiveness of Screening for Women's Cancers

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Although intuitively attractive, the benefits, as well as inherent risks and costs, of mass population pap and mammography screening have yet to be rigorously considered in Chinese women, who comprise one-fifth of the world's female population. This is particularly important because the epidemiologic patterns of breast and to a lesser extent cervical cancer differ markedly between Chinese and western women, which has serious implications for many health care interventions including preventive strategies. Moreover, health system characteristics and the distribution of resources vary across countries and should be accounted for in evidence-based public policy development.

There has been a growing body of literature on the use of cost-effectiveness analyses in health care evaluation. In particular, a few such analyses have used advanced simulation techniques such as state-transition Markov ("deep") and age-period cohort ("shallow") models to study screening programmes. I will review some of our recent work on the systematic assessment of the health consequences, costs, and cost-effectiveness of population-based pap and mammography screening in Hong Kong Chinese women.

For cervical cancer screening based on the Markov method, we found that compared with no screening, a simulation of the current situation of opportunistic screening using cervical cytology produced a nearly 40% reduction in the lifetime risk of cervical cancer. However, with organized screening every 3, 4 and 5 years, corresponding reductions with conventional (and liquid-based) cytology were 90.4% (92.9%), 86.8% (90.2%) and 83.2% (87.3%) compared with no screening. For all cytology-based screening strategies, opportunistic screening was more costly and less effective than an organized programme of screening every 3, 4 and 5 years. Every 3-, 4- and 5-year screening cost US$12 300, $7100 and $800 per years of life saved, each compared with the next best alternative. Similar findings were obtained from age-period-cohort projections.

Our ongoing work in breast cancer screening involves simulating a hypothetical cohort of two groups of local Chinese women, one undergoing mammography screening and the other without screening (controls). Different screening strategies are evaluated. Three variables determine the different combinations of screening strategies: (a) starting age (40, 50 years), (b) stopping age (69, 79 years), and (c) frequency of screens (every 1, 2, 3, 4 and 5 years). We further examine the effect of multiple cohort simulation by reflecting the effect of screening on the whole range affected and by taking into account the age structure of the population that would be affected by each policy. Sensitivity analyses are performed to assess the stability of the results within plausible ranges of uncertain parameters and to derive a set of epidemiologic threshold parameters beyond which screening should be re-evaluated. We also incorporate the effects of four more recent screening modalities in our model (ultrasound, magnetic resonance imaging, full-field digital mammography and computer-aided detection) compared to two-view mammography.

Finally, recommendations regarding population-wide screening interventions on the policy level should not be considered separately for different cancers given competing priorities and limited resources. A current focus of our work examines the classical "shopping spree" policy decisions of which, how much of and for whom different screening modalities should be offered, taking into account the respective incremental cost-effectiveness ratios and burdens of disease of three common cancers that have appropriate screening tests (i.e. breast, cervix and colorectal).