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Program-Specific Cost-Effectiveness Analysis: Breast Cancer Screening Policies for a Safety-Net Program

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ABSTRACT

Background: *Every Woman Counts* (EWC), a California breast cancer screening program, faced challenging budget cutbacks and policy choices. **Methods:** A microsimulation model evaluated costs, outcomes, and cost-effectiveness of EWC program mammography policy options on coverage for digital mammography (which has a higher cost than film mammography but recent legislation allowed reimbursement at the lower film rate); screening eligibility age; and screening frequency. Model inputs were based on analyses of program claims data linked to California Cancer Registry data, Surveillance, Epidemiology, and End Results data, and the Medi-Cal literature. Outcomes included number of procedures, cancers, cancer deaths, costs, and incremental cost per life-year. **Results:** Projected model outcomes matched program data closely. With restrictions on the number of clients screened, strategies starting screening at age 40 years were dominated (not cost-effective). This finding was highly robust in sensitivity analyses. Compared with no screening, biennial film mammography for women aged 50 to 64 years was projected to reduce 15-year breast cancer mortality by nearly 7.8% at $18,999 per additional life-year, annual film mammography was $106,428 per additional life-year, and digital mammography $180,333 per additional life-year. This more effective, more expensive strategy was projected to reduce breast cancer mortality by 8.6%. Under equal mammography reimbursement, biennial digital mammography beginning at age 50 years was projected to decrease 15-year breast cancer mortality by 8.6% at an incremental cost per additional life-year of $17,050. **Conclusions:** For the EWC program, biennial screening mammography starting at age 50 years was the most cost-effective strategy. The impact of digital mammography on life expectancy was small. Program-specific cost-effectiveness analysis can be completed in a policy-relevant time frame to assist policymakers faced with difficult program choices.

Keywords: breast cancer screening, cost-effectiveness analysis, health policy, safety net programs.

Introduction

Cost-effectiveness analysis (CEA) allows policymakers and others to consider the potential impacts of alternative policies on future program outcomes and costs. As demands escalate on the health care system to provide more services within constrained budgets, CEA is a technique that can enable policymakers to examine the value of health care services [1]. Although well established for providing guidance to policymakers in many arenas, CEA has been slow to take hold in United States health policy [2]. Health care resources, particularly those for safety net programs, are increasingly limited, and carefully constructed CEA models can inform resource allocation decisions.

While CEA has considerable potential to assist makers of health policy, a number of challenges confront its application to health policy formulation. Models often take the perspective of society in accounting for program impacts, but for public health programs, the perspective of the payer is also highly relevant [3]. The generalizability of models is often curtailed by assumptions embedded within the model that may not be relevant to public health program or policy needs [4]. Timeliness is another challenge confronting the adoption of CEA; historically, cost-effectiveness results have been published too late to influence health policy decisions [5].

To use CEA more effectively to inform health policy, we worked with a state safety net breast cancer screening program to conduct a program-specific CEA, based on program data and addressing policy questions posed by program administrators. California's *Cancer Detection Programs: Every Woman Counts* (EWC) was administered through the state Department of Public Health Cancer Detection Section. It is funded jointly by state tobacco tax dollars and federal funds administered through the Centers for Disease Control and Prevention National Breast and Cervical Cancer Early Detection Program. One of the largest of all 68 Centers for Disease Control and Prevention–funded programs, EWC reimburses public and private providers at Medi-Cal rates for screening and diagnostic services for breast and cervical cancers. Medi-Cal is the California version of Medicaid, a joint

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state-federal program providing health insurance to very low-income individuals who meet eligibility criteria. California women not eligible for Medi-Cal whose income is less than 200% of the federal poverty threshold who also lack adequate coverage for breast and cervical cancer screening are eligible to enroll in the EWC program.

Our study focused exclusively on the breast cancer screening program, which largely served women aged 40 to 64 years with both screening and diagnostic evaluations. Like many public health programs, the program budget was limited. Program staff estimated that the program served approximately 40% of low-income, uninsured women 40 years and older. Declining tax revenues combined with increased demand for services created intense budgetary pressure on the program. At the same time, digital mammography, not included in the program because of higher cost, was diffusing throughout the state. Program staff were concerned that EWC program clients might have reduced access to screening in some areas because of rapid provider adoption of this newer technology. Digital mammography requires a large initial investment in equipment, but eliminates the need for film storage and enables the digital manipulation of images. It is reimbursed by Medi-Cal at a rate about double that of film mammography. A large US trial evaluating the diagnostic accuracy of digital compared with film mammography found overall similar performance for the two modalities; however, digital mammography performed slightly better in women younger than 50 years [6]. After the project began, Assembly Bill 359 permitted digital mammography providers to bill the EWC program and be reimbursed at the Medi-Cal film mammography rate beginning January 1, 2010. This legislation will expire in 2014, and if it is not renewed, the program will then be required to pay the higher rate for digital mammograms or limit EWC program clients to film mammography only.

The age to begin regular screening mammography and the interval for screening were additional areas of program policy concern, due to limited resources and scientific controversy [7–13]. Randomized trials have demonstrated a relative reduction of about 15% in breast cancer mortality from screening mammography among women aged 40 to 59 years, but women aged 40 to 49 years have a lower absolute risk reduction due to a lower incidence of breast cancer [14]. This age group also has a higher rate of false-positive mammograms [13,14]. Interpretations of the evidence and resulting recommendations for the age to start screening differ across countries and between guidelines [15–20]. Recommended screening intervals are another area in which evidence is uncertain and recommendations differ [21,22].

Our analysis, based on conversations with program personnel, focused on three key policy questions:

1. What would be the projected program costs and outcomes should the EWC program begin reimbursing for digital mammography?
2. What would be the effect on projected program costs and outcomes of starting screening at age 50 years in place of age 40 years?
3. What would be the effects on costs and outcomes of screening every 2 years in place of the current annual screening policy?

Methods

Model Structure

A microsimulation model was developed in TreeAge Pro (TreeAge Software, Williamstown, MA) to estimate population-level effects associated with breast cancer screening and diagnosis for women enrolled in the EWC program, while at the same time accounting for individual variation in age-related mammography diagnostic characteristics and breast cancer risk, as well as allowing tracking of women in the cohort with undiagnosed breast cancer. Analysis of EWC program claims data provided model inputs including client age and race-ethnicity distributions, status-specific transition probabilities between follow-up diagnostic procedures, and costs for screening and diagnosis.

The model structure is illustrated in Figure 1. EWC clients entering the model included women with no cancer and those whose cancer was undiagnosed. Women with abnormal screening test results received follow-up diagnostic testing. Women began treatment when breast cancer was confirmed by either core needle biopsy or open biopsy. New incident cancer cases and those missed by the previous screening or follow-up diagnostic tests presented clinically as interval cancers between screening rounds or were detected at the subsequent screen.

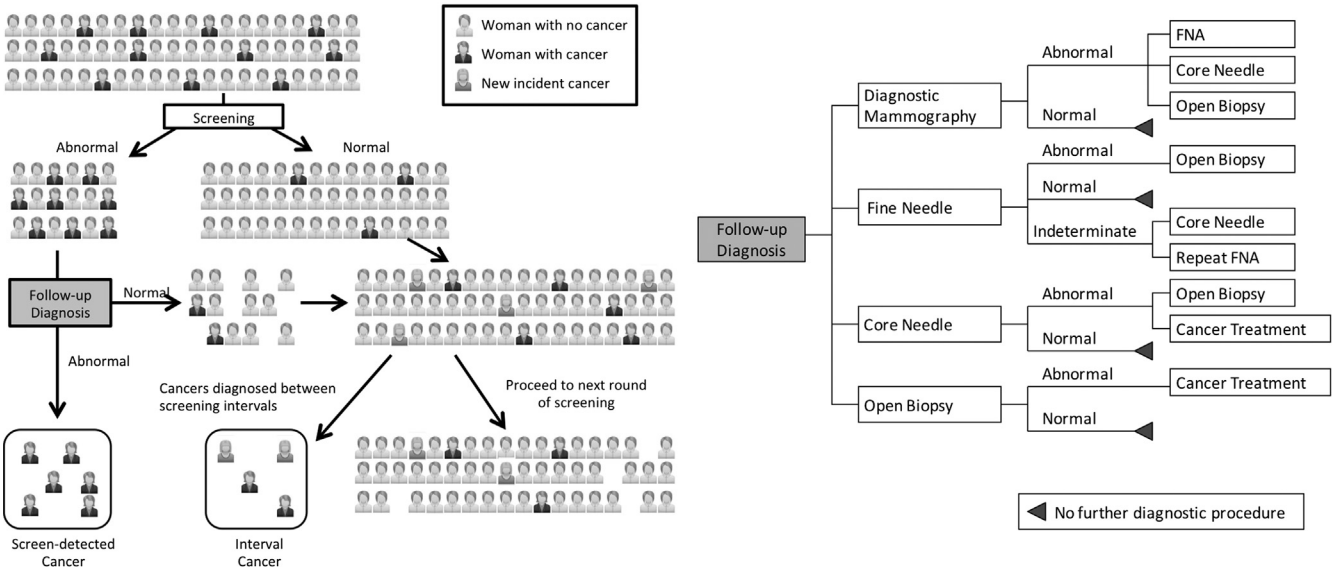

Fig. 1 – Micro-simulation model overview. (Proportions of undiagnosed cancer and incident cancer exaggerated for demonstration.)