Outcomes of screening mammography among women aged 40 to 43

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Toronto, Canada (2006)

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Selection criteria

All women age 40 – 43
resident in Ontario on January 1, 1995
- OHIP (medicare) beneficiaries:
  - all permanent residents + refugees
    - no premium / deductible for beneficiaries
No history of breast cancer prior to this date

Breast screening program recruits from age 50.
Canadian Task Force on Preventive Health Care:
Insufficient evidence to recommend for or against screening younger women.
Study design: case—cohort

Entire underlying population at risk

All deaths  Random sample

Study population

Time to death analysis, corrected s.e.
Ascertainment of cases (deaths)

Multiple hits:
- Ontario Cancer Registry
  (Registrar General of Ontario)
- Hospital database
- OHIP (medicare) eligibility roster
Ascertainment of breast cancer

ICD-9 174xx
registered by Ontario Cancer Registry
diagnosis date between

4,043 / 370,130

Intended to be invasive only, however DCIS is misclassified as invasive
Not an issue for primary analysis because ‘cases’ are ‘deaths’
Sampling subcohort from entire population

Random sample

20,000 / 387,130

(there is no method of calculating sample size requirements for case-cohort design)
Case-cohort study population

Random sample, alive 19,677
(Random sample, breast ca alive) (174)
(Breast cancer cases, alive) (3,262)
Deaths 5,913
(Deaths, breast cancer cases) (607)
Case-cohort population 25,590
(Total breast cancer cases) (4,043)
Underlying population 387,130
Bilateral mammography utilization among underlying population

Bilateral mammography is an insured service available to any woman of any age on request of physician

47.1% one or more eligible bilateral mammograms (no breast procedure or breast visit during preceding 11 months) by December 31, 2002.
Exposure and primary outcome

Exposure:
Periodic bilateral mammography
(no breast imaging or biopsy or procedure or physician visit with breast code within 11 months)
January 1, 1995 to December 31, 2002

Primary outcome:
Death (all causes)
January 1, 1995 to December 31, 2004
Ascertainment of periodic screening (2 or more episodes = periodic) among study population

OHIP (medicare) billing claims

Original reports photocopied and coded

No breast imaging / biopsy / surgery / medical visit with breast code within 11 months preceding

Not more than 16 months following preceding screening mammogram
Ascertainment of periodic screening (2 or more episodes = periodic) among study population

2.1% of subcohort (random sample)

14.4% of cases (women who died)

25.2% of women who developed breast cancer

15.5% of women who developed breast cancer and died
Ascertainingment of covariates

**OHIP (medicare) eligibility roster:**
- Year of birth

**Residence code as at January 1, 1995:**
- Neighbourhood income quintile (adjusted for region)
- Urban / rural distinction

**Hospital database:**
- January 1, 1990 – December 31, 1994
  - ICD-9 diagnosis codes >> *comorbidity score*
Secondary exposures and outcomes
(not for primary analysis of death)

All breast biopsies and surgeries regardless of pathology
(Hospital database > institution, dates, codes for
abstraction / photocopy operative and pathology reports)

Family history of breast cancer
(women with breast cancer and / or breast surgery
chart abstraction)

Radiation therapy, chemotherapy, hormone therapy
for women with breast cancer
Case—cohort mortality analysis
(all cause)
(multivariate, s.e. corrected for design)

Periodic screening mammography  \(2.09\) (1.92, 2.27)

Year of birth (per year 1951 >> 1954)  \(0.94\) (0.92, 0.96)

Urban residence (vs rural)  \(0.88\) (0.82, 0.96)

Neighbourhood income quintile  \(0.91\) (0.90, 0.93)
(per 1 quintile increase, low to high)

Comorbidity score (per 1 unit increase)  \(1.70\) (1.66, 1.74)
Case—cohort mortality analysis (all cause) (multivariate, s.e. corrected for design) among women diagnosed with breast cancer

<table>
<thead>
<tr>
<th>Factor</th>
<th>Odds Ratio (95% CI)</th>
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<tbody>
<tr>
<td>Periodic screening mammography</td>
<td>0.64 (0.49, 0.82)</td>
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<tr>
<td>Year of birth (per year 1951 &gt;&gt; 1954)</td>
<td>1.03 (0.92, 1.11)</td>
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<tr>
<td>Urban residence (vs rural)</td>
<td>0.97 (0.74, 1.26)</td>
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<tr>
<td>Neighbourhood income quintile (per 1 quintile increase, low to high)</td>
<td>0.94 (0.88, 0.99)</td>
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<tr>
<td>Comorbidity score (per 1 unit increase)</td>
<td>0.93 (0.66, 1.31)</td>
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