TRENDS IN SCREENING MAMMOGRAPHY USE IN UNDERSERVED POPULATIONS BEFORE AND AFTER THE USPSTF 2009 RECOMMENDATION

John R. Scheel
MPH candidate, 1st year

Outline

- Background
  - Breast Cancer
  - Screening Mammography
  - USPSTF
- Proposal
  - Prior work
  - Sample population
- Discussion

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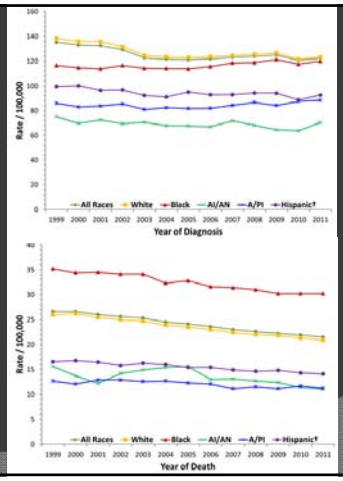
- Background
  - Breast Cancer
  - Screening Mammography
  - USPSTF
- ~~Proposal~~ Interesting Idea?
  - Prior work
  - Sample population
- Discussion

Breast Cancer in the United States

- Most common cancer in women after skin cancer
- Second leading cause of cancer death in women
- Leading cause of death in women age 35-54
- 2014 estimates: 232,670 new cases and 40,000 deaths*
- **1 in 8 women diagnosed in their lifetime**

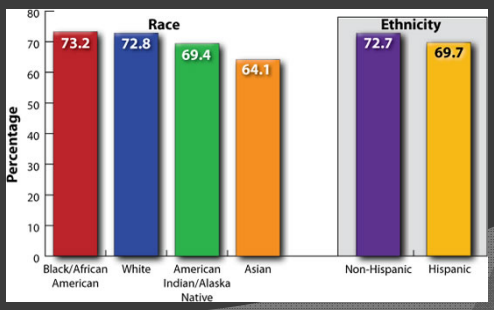
*SEER



Incidence

Mortality

Screening Mammography Rates by Race in 2010

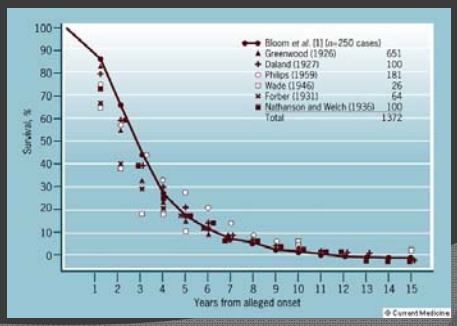


USPSTF - 2009 Recommendations

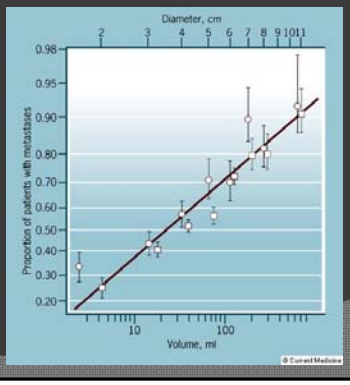
- Against routine SM in women 40-49
  - Individualized decision making encouraged
- Biennial SM in women 50-74
- Insufficient evidence to assess SM benefits/harms in women >=75
  - Not studied in any of the RCTs
- *One recommendation fits all?*

BENEFITS OF SCREENING MAMMOGRAPHY

The Natural History of Untreated Breast Cancer



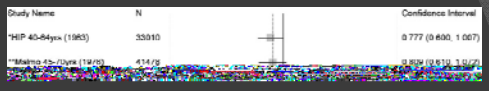
Lymph Node Metastases as Function of Tumor Size



What is the Mortality Reduction related to Screening Mammography?

- 10 trials, spanning 4 decades:
  - Intention to treat: 19% mortality reduction (95% CI 12%-26%)
  - Adjusted for nonattendance: 25% mortality reduction.
  - Translates to 1% all cause mortality reduction.

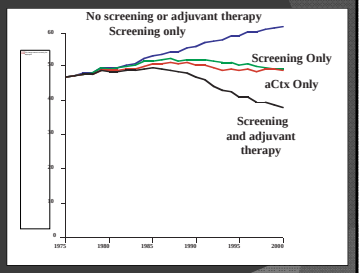
Breast Cancer Mortality Risk Ratio



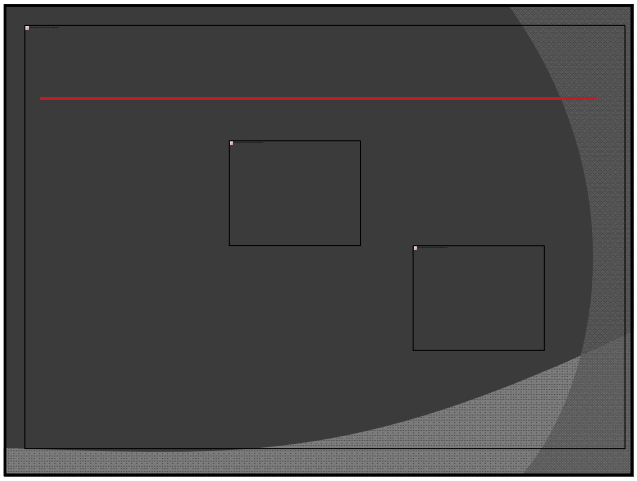
P. Glasziou, N. Houssami. Preventive Medicine 53 (2011) 100–102

Is Mortality Reduction due to Improved Treatment?

- 12-21% breast cancer mortality reduction from improved therapies
- Should've had similar affects in both arms of SM clinical trials

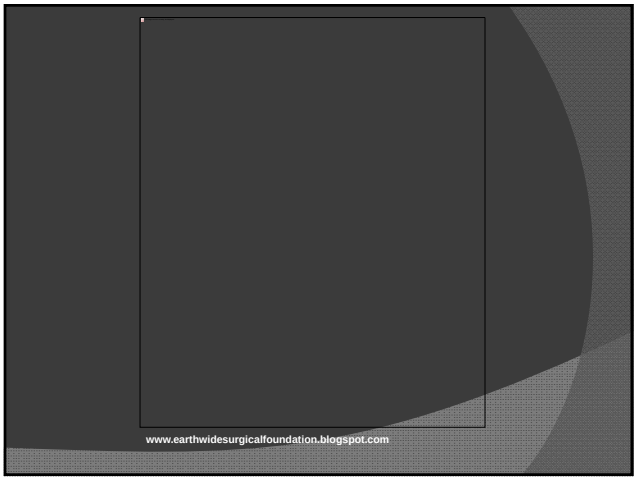


Berry et al. (2005) Effect of Screening and Adjuvant Therapy on Mortality from Breast Cancer.

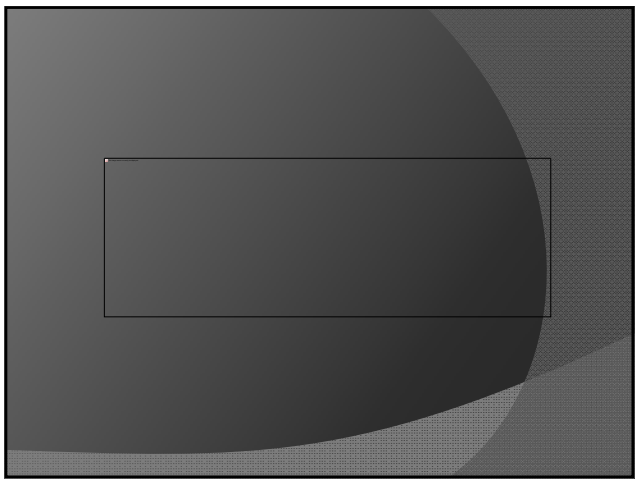


Five-Year Survival By Stage

- I 2 cm or less, no nodes 98%
- IIa ≤2 cm with nodes 88%
  - 2-5 cm, no nodes
- IIb 2-5 cm, axillary nodes 76%
  - > 5 cm, no nodes
- IIIa > 5 cm, ax nodes 56%
  - Any size, fixed or IM nodes
- IIIb Chest wall, skin 49%
- IV Distant metastases 16%



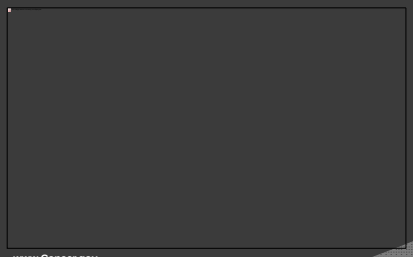
www.earthwidesurgicalfoundation.blogspot.com



Potential Problems

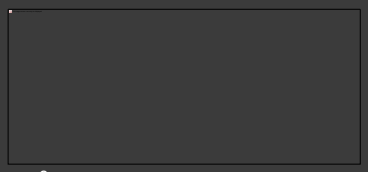
- Length Time Bias
- Lead Time Bias
- Over-diagnosis
- False Positives

Length Time Bias



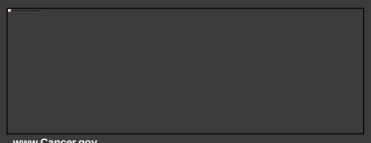
www.Cancer.gov

Lead Time Bias



www.Cancer.gov

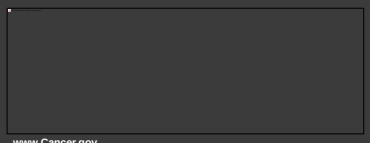
Over-diagnosis



www.Cancer.gov

- **Estimates 0-50%**

Over-treatment



www.Cancer.gov

- **Estimates 0-50%**

False Positives

- Callback from screening that does not represent cancer
- Results in extra views, follow-up imaging or biopsies
- Cumulative risk of false-positives after 10 rounds of screening 16%-63%[1]

[1]Hofvind, 2004; Hubbard, 2010; Njor, 2007

False Positives (cont.)

- Meta-analysis of 17 studies (n=29,781)
  - Not all effects were negative
  - Influence generalized well-being
    - Limited to breast specific outcomes
    - Small effect on generalize anxiety
    - Some of these measures uncover underlying psychiatric problems unrelated
- Predictors:
  - Sociodemographic factors
  - Clinical factors

Salz, et al. (2009). Meta-analysis of the effect of false-positive mammograms on generic and specific psychosocial outcomes

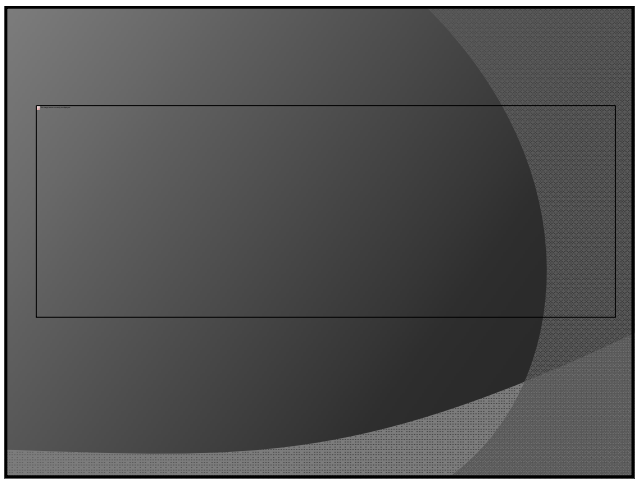
Patient Perspective

- Most women (62%) view false positives as an acceptable consequence of screening mammography
- However,
  - Anxiety common
  - Race/ethnicity is important
    - RCT from UK, Canada, Sweden, US
  - Ignored QOL: surgery and chemo

Jafri, et al. (2008). Screening Mammography: Does Ethnicity Influence Patient Preferences for Higher Recall Rates Given the Potential for Earlier Detection of Breast Cancer?
Brodersen J. et al. (2013). Long-Term Psychosocial Consequences of False-Positive Screening Mammography. Annals of Family Medicine.
Schwartz, et al (2000). US women's attitudes to false positive mammography results and detection of ductal carcinoma in situ: cross sectional survey.

Conclusions - SM

- Breast cancer is common in women
- Untreated breast cancer is deadly
- Treated breast cancer is survivable if detected at an early stage
- There are potential harms associated with screening mammography



United States Preventative Services Task Force Recommendations (USPSTF) - 2009

- Purpose: Effectiveness of screening mammography in average risk women
- Attention to 40-49, >70 y.o.
- Multiple data sources
  - Meta-analysis of 8 RCTs
  - Harms: published studies and clinical data
  - Optimal starting/stopping: CISNET models

Screening for breast cancer: U.S. Preventive Services Task Force recommendation statement. US Preventive Services Task Force. Ann Intern Med. 2009 Nov 17;151(10):716-26, W-236.

USPTF - 2009 Recommendations

- Against routine SM in women 40-49
  - Individualized decision making encouraged
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Rationale and Controversies: 39-49 y.o.

- Same relative mortality benefit in 39-49 (15%) and 50-59 y.o. (14%)
- "Net benefit in 39-49 small…lower incidence…greater harms"

Age	RR Breast Ca Mortality	NNI to Prevent 1 Breast Ca Death
39-49 y.o.	0.85	1904
50-59 y.o.	0.86	1339
60-69 y.o.	0.68	377

USPSTF, 2009

USPSTF Rationale

- 40-49 y.o.
  - The harms outweigh the life years gained
  - Acknowledge that magnitude and effect of harms are difficult to measure
- 50-59 y.o.
  - Biennial screening will reduce the false positive rate
  - Acknowledge that this will result in deaths avoidable by annual screening

Professional Organizations' Perspective

Organization	Recommendation
American Cancer Society	Every year beginning at age 40
American College of Radiology	Every year beginning at age 40
American Medical Association	Every year beginning at age 40
National Comprehensive Cancer Network	Every year beginning at age 40
American College of Obstetricians and Gynecologists	Every year beginning at age 40
Canadian Task Force on Preventative Health Care	*Not routinely recommended 40-49* *Every 2-3 years from age 50-74*
*American Academy of Family Physicians**	*Not routinely recommended 40-49* *Every 2 years from age 50-74*

**USPSTF 11/2009*

Median Cost per Life-Year Saved in Women 40-79 Years

Screening Test	Median Cost ($)/year of life saved
Mammography	18,800
Colorectal	3,000
Cholesterol	6,000
Cervical	12,000
Antihypertensive drugs	15,000
Automobile seatbelts and airbags	32,000
Renal Dialysis	46,000
Cholesterol Treatment	154,000

Tengs TO, Adams M, Pliskin J, et al. Five hundred life-saving interventions and their cost-effectiveness. Risk Anal 1995;15:369–90

Interesting Project?

Trends in Breast Cancer Screening Mammography Among Underserved Populations Before and After the USPSTF 2009 Recommendations

- Modeled after Sprague, et al 2014
  - Vermont screening mammography (SM) registry
  - US census data for women eligible for SM
  - Years: 1997-2011, joint-point modeling
  - Included 150,000 women ≥ 40 years
  - Did not include specific data on underserved populations screening

Trends in the Percentage of Vermont Women 40+ years who Underwent SM

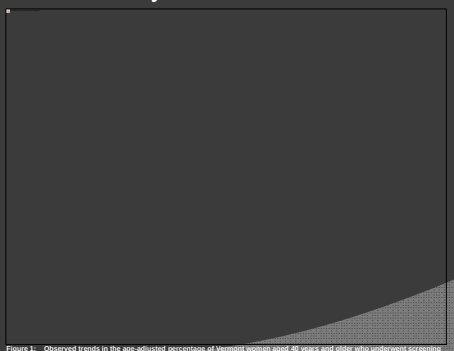


Figure 1: Observed trends in the age-adjusted percentage of Vermont women aged 40 years and older who underwent screening mammography in the past year and past 2 years. Solid lines depict the best fits from the join- point analyses.

Trends in the Percent of Vermont Women Who Underwent SMA

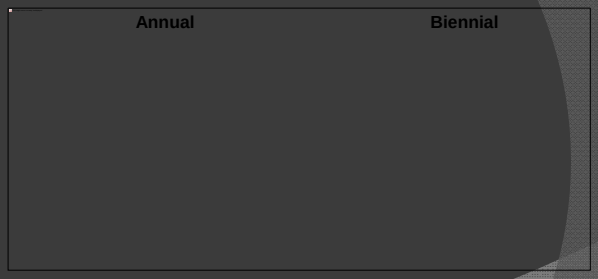


Figure 2: Observed trends in the percentage of Vermont women who underwent screening mammography (a) in the past year and (b) past 2 years according to age group. Solid lines depict the best fits from the join-point analyses.

Utilization of SM in Vermont According to Screening Interval

Figure 3: Utilization of screening mammography in Vermont according to screening interval. (a) Observed age-adjusted percentage of Vermont women aged 40 years and older who underwent mammography according to the time since their last mammography examination (annual, < 18 months; biennial, 18–30 months; longer, > 30 months). (b) Observed percentage of Vermont women who underwent annual screening mammography (< 18 months since a previous mammography examination) according to age group. Solid lines depict the best fits from the join-point analyses.

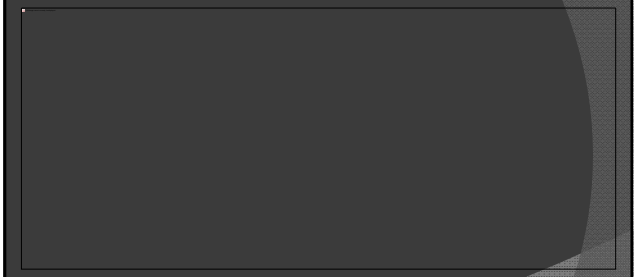
Proposed Idea

- Purpose: To determine whether the 2009 USPSTF guidelines for breast cancer screening mammography were followed by similar changes in screening utilization by the underserved
- Aim:
  - To determine the age-specific patterns in SM utilization by underserved populations (2000-2014)

Breast Cancer Surveillance Consortium (BSCS)

- Largest longitudinal collection of mammography data from breast cancer screening in community practice.
- Collaboration of seven mammography registries in US.
- Database (2009):
  - 2.3 million women
  - 9.5 million mammograms
  - 180,000 biopsies
  - 113,000 breast cancer cases (19,000 DCIS)

Participating sites



Patient Demographic and Health History Data

- *Demographic Variables*
  - Unique anonymous identification number
  - Zip code
  - Date of birth
  - Race (white, black, Asian or Pacific Islander, Native American, other); ethnicity (Hispanic)
  - Education (1-11 years, 12, 13-15 years, 16 years, 16+ completed years of education)
  - Health insurance (Medicare, Medicaid, other, none)
- *Health History*
  - Age at birth of first child (year)
  - First-degree family history of breast cancer (mother, sister, daughter) and age: <50, >50
  - Personal history of breast cancer (yes, no)
  - Personal history of breast biopsy, surgery, or radiation (yes, no)
  - Procedure history per breast (implants, needle biopsy, surgical biopsy, lumpectomy, mastectomy, radiation therapy, and reconstruction)
- *Screening History*
  - Ever screened by mammography (yes, no)
  - Time since last mammogram (within last year, 1-2 years, 3-4 years, 5 or more years)
- *Current Health*
  - Menopausal status at examination (pre-, peri-, postmenopausal)
  - Hormone use at time of examination (yes, no)
  - Presence of symptoms in last 3 months (nipple discharge or lump; right or left breast)
- Main reason for current visit (routine screening exam, follow-up to routine screening exam, concerns about breast problems)

Radiologic History Data

- *Radiologic Site and Interpreting Mammographer Identification*
  - Variables are encrypted to protect confidentiality.
- *Dates of Current Examination and Comparison Film*
- *Use of Comparison Mammogram at Time of Evaluation (yes, no)*
- *Indication for Examination*
  - Screening (asymptomatic), evaluation of breast problem (symptomatic), additional evaluation of recent mammogram, short interval follow-up
- *Type of Examination(s) Performed*
  - Standard screening views, additional diagnostic views, sonography, other breast imaging
- *Breast Density (American College of Radiology lexicon)*
  - Entirely fat, scattered fibroglandular densities, heterogeneously dense, extremely dense
- *Assessment per Woman*
  - Incomplete assessment, normal, normal with benign finding, probably benign, suspicious abnormality, highly suggestive for malignancy
- *Recommendation*
  - Mammography in normal interval follow-up, additional views, sonography, short-term follow-up, fine-needle aspiration, core biopsy, consider biopsy or surgical evaluation, clinical evaluation for further diagnostic evaluation

Follow-Up Data

- *Follow-Up Performed (summarized per woman)*
  - Date and result (include right versus left breast): additional views, short-interval follow-up mammogram
  - Date and laterality required, laterality result recorded if available: clinical examination, sonography, fine-needle aspiration, core biopsy, excisional biopsy
- *Pathologic Variables*
  - Carcinoma pathology (as obtained in SEER registries)
    - Type of procedure, reporting source, laterality
    - Staging: size, histopathology, grade, tumor size, number of positive nodes, metastasis present (TNM), American Joint Committee on Cancer stage, extension*, nodal involvement* (number examined and positive), tumor sequence*, estrogen and progesterone receptor status*
    - Therapy (date first initiated): surgery, radiation, chemotherapy, hormonal, biologic modification, no surgery reason*
    - Follow-up status*: date of last follow-up, vital status last follow-up*, cause of death
- *Benign pathology*
  - Type of Procedure
  - Reporting source
  - Laterality
  - Histopathology (as recorded and also categorized into major groups: atypical hyperplasia, ductal hyperplasia, fibroadenoma, phyllodes tumor, benign, normal, inconclusive