Breast Cancer Screening:

Addressing Disparities and Screening for Average Risk

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Past President, ACR

no COI or financial disclosures

Breast Cancer

- most common cancer in women
- 30% of all new cancer diagnoses in U.S.

Breast Cancer

new cases 2021 ♀ 330,840

281,550 invasive
49,290 in situ

expected deaths 2021 ♀ 43,600

Breast Cancer

- most common cancer in women
- 30% of all new cancer diagnoses in U.S.

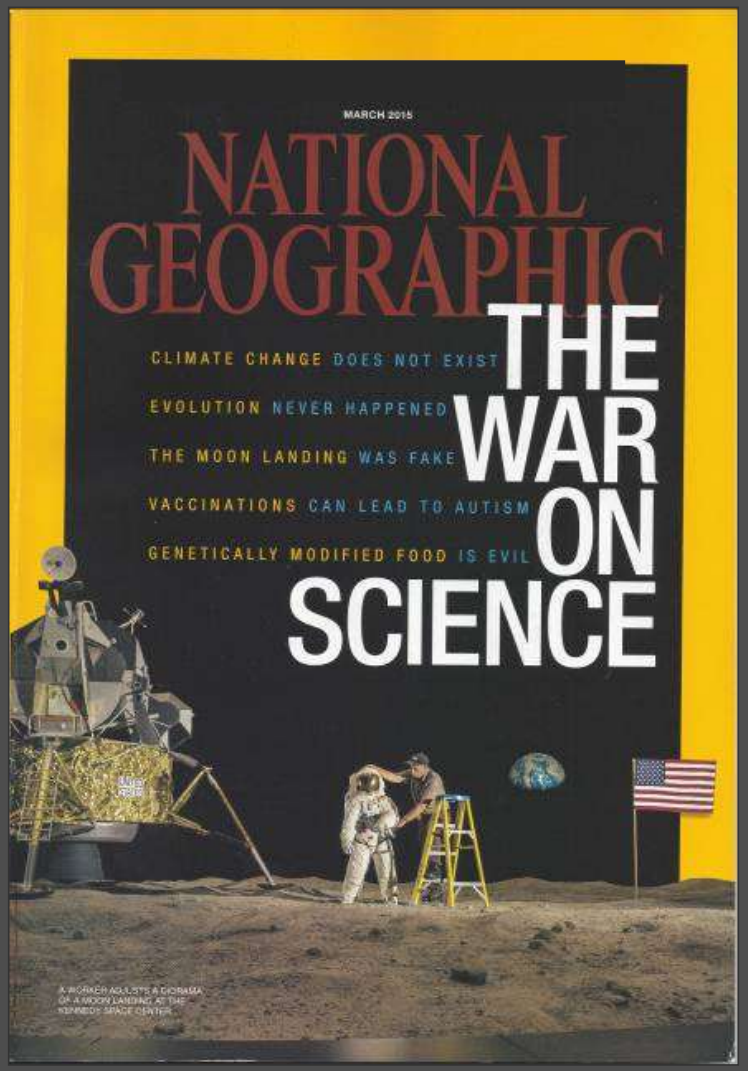
- second leading cause of cancer death

Breast Cancer

- most common cancer in women
- 30% of all new cancer diagnoses in U.S.

- second leading cause of cancer death

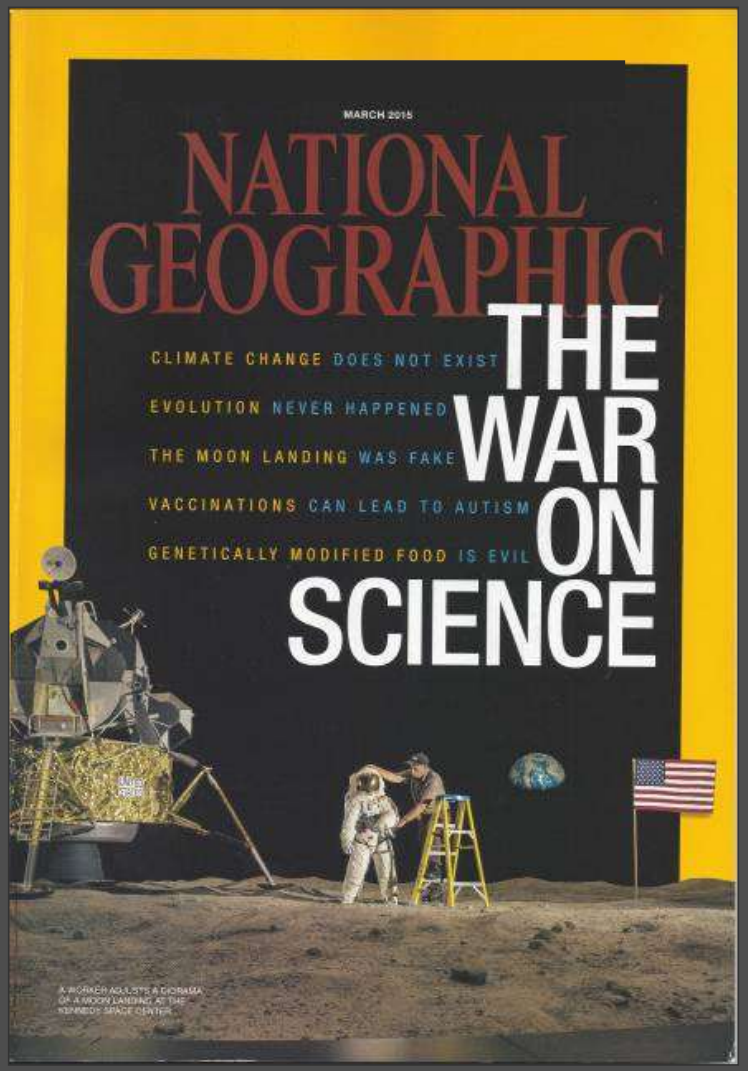
- nearly 80% new cases have no “high risk” factors
- greatest risk: being female and age



screening has little effect on breast cancer mortality

chemotherapy is so good we don't need to screen

many breast cancers will just go away on their own



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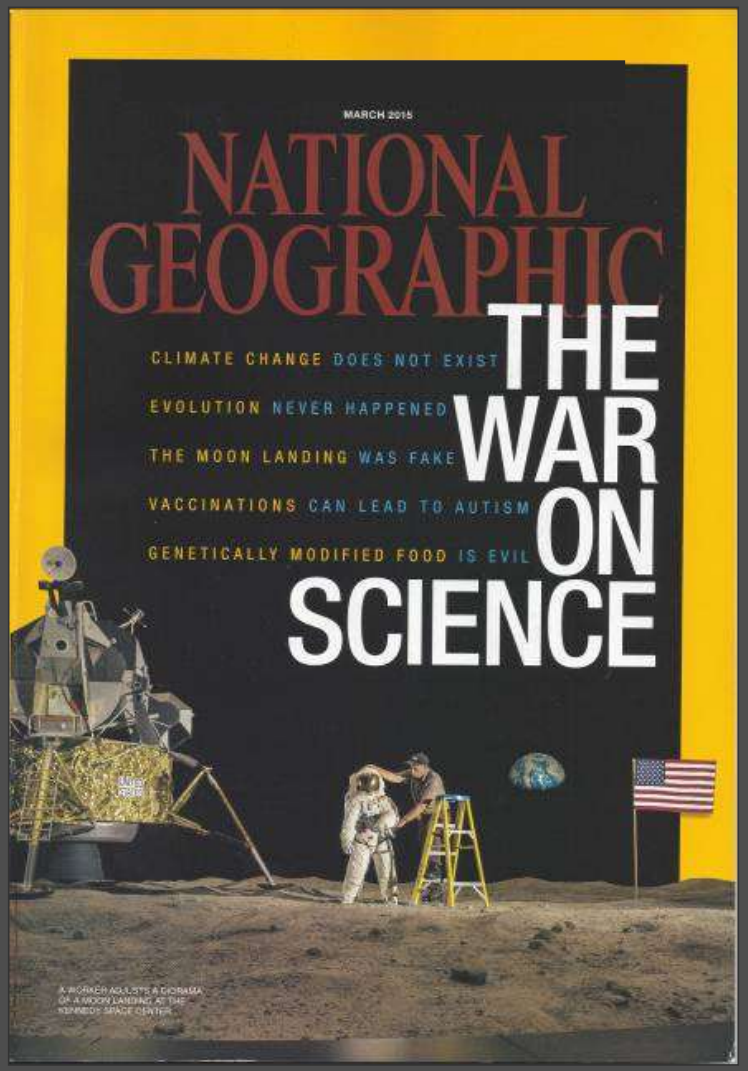

Truths:

screening DECREASES breast cancer deaths by about 40%

early detection allows treatment to be most effective

no breast cancers will go away on their own

Breast Cancer Screening:

- key facts –

  what every radiologist (and woman) should know

- benefits and risks –

  what are positives and negatives of screening

- our latest recommendations

  updated for diversity and inclusion

The Facts: Evidence Summary

- Randomized Controlled Trials (RCT)
- Observational Trials

  case control, incidence-based mortality, cohort, and trend studies

- Surrogate Data
- Modeling (NCI CISNET)

RCTs: Era and Design

TRIAL	AGES	DESIGN	WOMEN
HIP 1965	40-64	2 View + CBE	61,004
MALMO 1977	45-69	1 or 2 View	42,283
KOPPARBERG 1977	40-74	1 View	57,040
OSTERGOTLAND 1977	40-74	1 View	75,550
EDINBURGH 1978	45-64	1 or 2 View	54,654
CNBSS 1980	40-49	2 View + CBE	50,430
CNBSS 1980	50-59	2 View + CBE	39,405
STOCKHOLM 1981	40-64	1 View	60,261
GOTHENBURG 1982	40-59	2 View	51,611
AGE 1991	39+41	1 View	160,840*

*53,884 invited to screening

RCTs: Era and Design

NONE DIGITAL

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*53,884 invited to screening

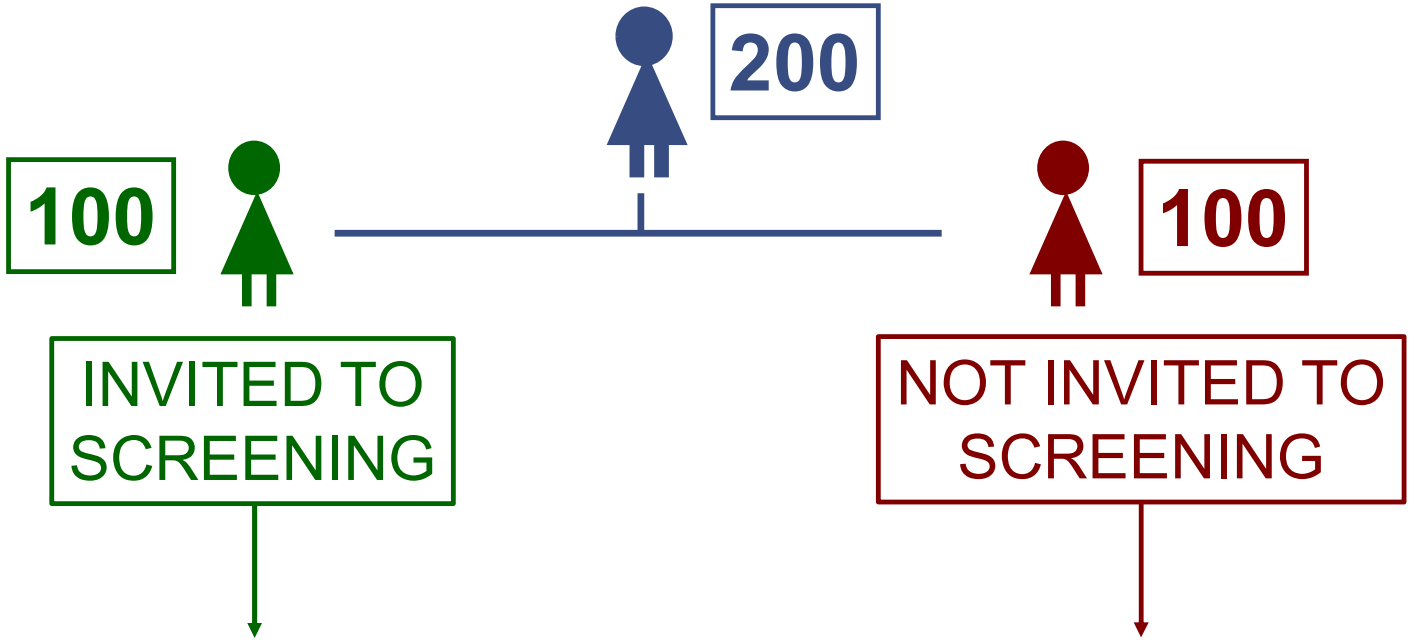
RCTs: Mortality Reduction

TRIAL	RR	95% CI
HIP	0.77	0.63,0.93
MALMO 1	0.82	0.67,1.00
MALMO 2	0.64	0.39,1.06
TWO-COUNTY	0.69	0.56,0.84
EDINBURGH	0.71	0.53,0.95
CNBSS 2	1.02	0.78,1.33
STOCKHOLM	0.74	0.51,1.08
GOTHENBURG	0.76	0.56,1.04
AGE	0.75	0.58,0.97
OVERALL	**0.78**	**0.72,0.84**

RR = 0.78 or a 22% reduction breast cancer death

Tabar, et al. 2015

RCT



70 or less have mammogram
30 NO MAMMOGRAM– but are COUNTED AS SCREENED

(noncompliance)

80 no mammogram
20 have MAMMO
not counted as helped by mammo even if it finds early CA
(contamination)

RCTs: Noncompliance and Contamination

causes underestimation of benefit

RR = 0.78 or a 22% reduction breast cancer death

the benefit established by RCT will be the bottom

++++

the actual benefit will always be more

Science: Evidence Summary

- RCT: ⬇ mortality of at least 20%

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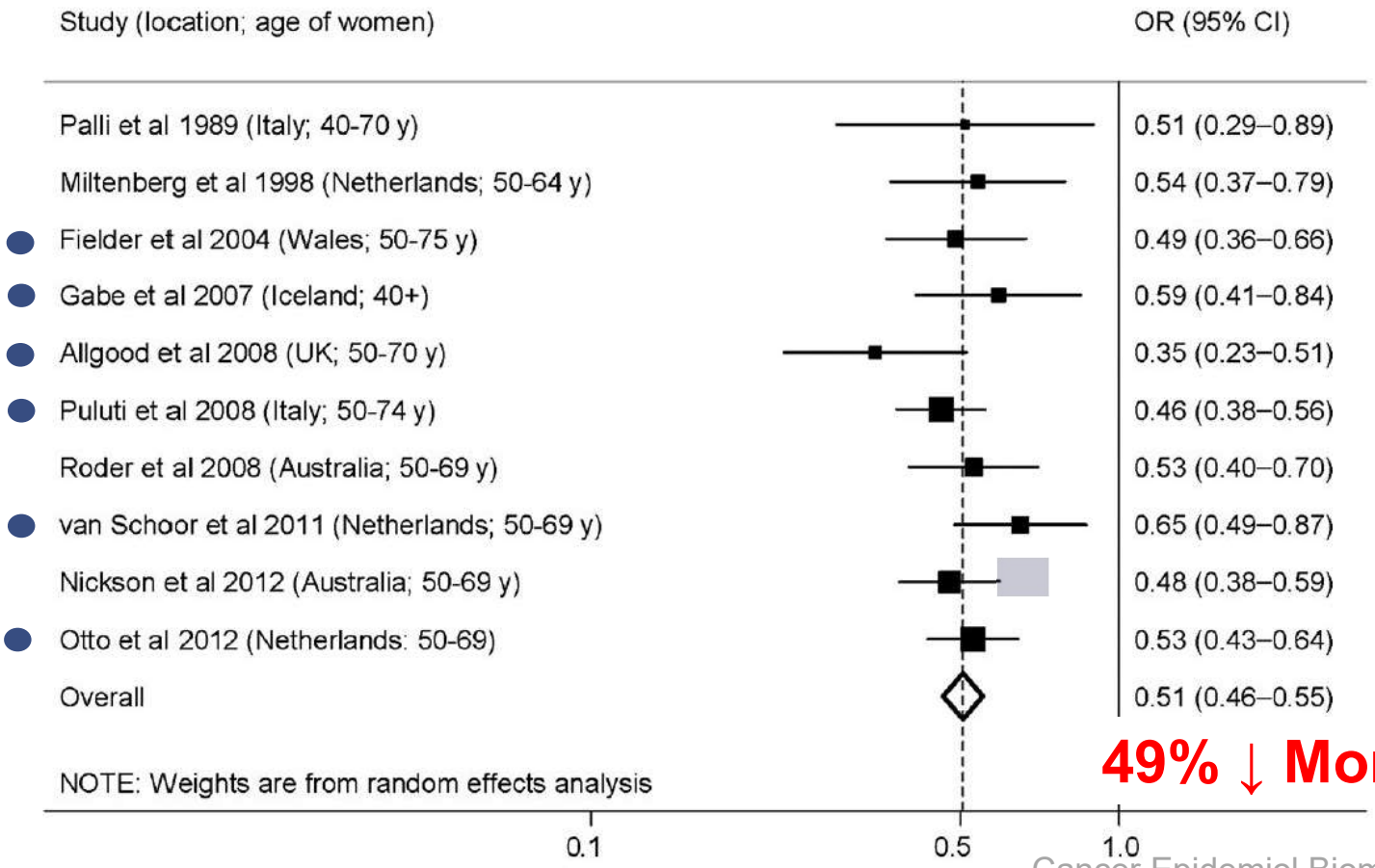
Case-Control Studies (Ages 40-75)



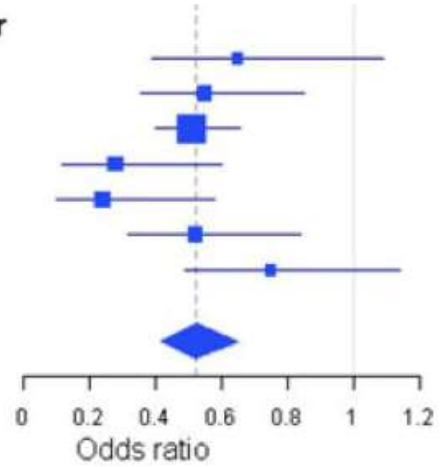
49% ↓ Mortality

Cancer Epidemiol Biomarkers Prev 2012

Case-Control Studies (Ages 40-75)

Screened vs Unscreened

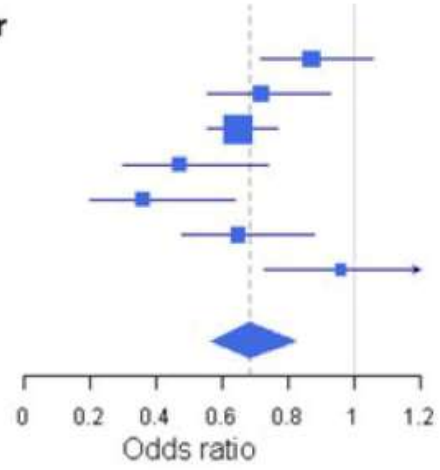
Study	OR	Lower	Upper
Gabe, (2007)[40]	0.65	0.39	1.09
Puliti, (2008)[43]	0.55	0.36	0.85
Otto, (2012)[47]	0.51	0.4	0.66
Van Schoor, (2011)[15]	0.28	0.12	0.6
Paap, (2010)[49]	0.24	0.1	0.58
Allgood, (2008)[65]	0.52	0.32	0.84
Fielder, (2004)[66]	0.75	0.49	1.14
Summary (random)	**0.52**	**0.42**	**0.65**



48% ↓ Mortality

Invited vs Not Invited

Study	OR	Lower	Upper
Gabe, (2007)[40]	0.87	0.72	1.06
Puliti, (2008)[43]	0.72	0.56	0.93
Otto, (2012)[47]	0.65	0.56	0.77
Van Schoor, (2011)[15]	0.47	0.3	0.74
Paap, (2010)[49]	0.36	0.2	0.64
Allgood, (2008)[65]	0.65	0.48	0.88
Fielder, (2004)[66]	0.96	0.73	1.27
Summary (random)	**0.69**	**0.57**	**0.83**



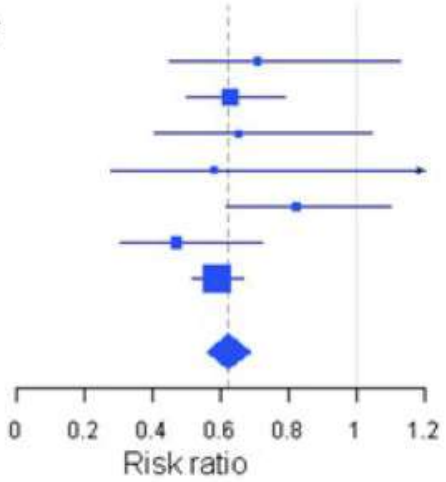
31% ↓ Mortality

J Med Screen 2012

Europe Service Screening

Screened vs Unscreened

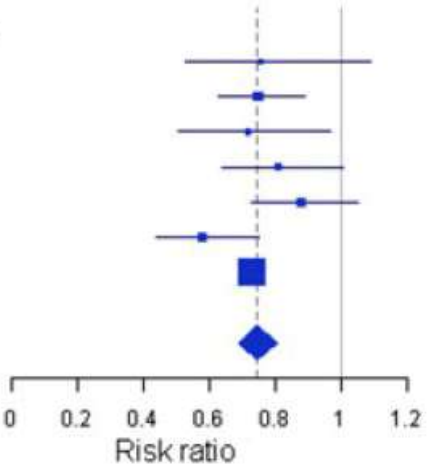
Study	RR	Lower	Upper
Hakama, (1997)[39]	0.71	0.45	1.13
Olsen, (2005)[32]	0.63	0.5	0.79
Sarkeala, (2008)[36]	0.65	0.41	1.05
Paci, (2002)[42]	0.58	0.28	1.22
Kalager, (2010)[51]	0.82	0.62	1.1
Ascunce, (2007)[53]	0.47	0.31	0.73
SOSSEG, (2006)[59]	0.59	0.52	0.67
Summary (random)	**0.62**	**0.56**	**0.69**



38% ↓ Mortality

Invited vs Not Invited

Study	RR	Lower	Upper
Hakama, (1997)[39]	0.76	0.53	1.09
Olsen, (2005)[32]	0.75	0.63	0.89
Sarkeala, (2008)[36]	0.72	0.51	0.97
Paci, (2002)[42]	0.81	0.64	1.01
Kalager, (2010)[51]	0.88	0.73	1.05
Ascunce, (2007)[53]	0.58	0.44	0.75
SOSSEG, (2006)[59]	0.73	0.69	0.77
Summary (random)	**0.75**	**0.69**	**0.81**



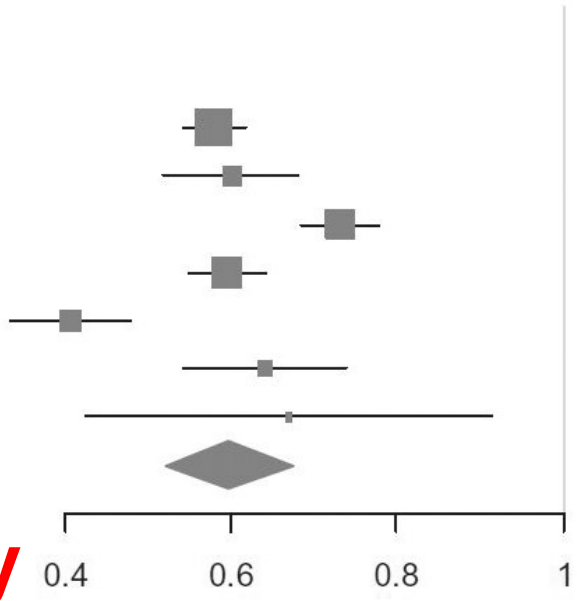
25% ↓ Mortality

J Med Screen 2012

Pan-Canadian Service Screen (Ages 40-79)

2,796,472 women

Region	SMR	95% CI
British Columbia	0.58	0.54 to 0.62
Manitoba	0.60	0.52 to 0.68
Ontario	0.73	0.68 to 0.78
Quebec	0.59	0.55 to 0.64
New Brunswick	0.41	0.33 to 0.48
Nova Scotia	0.64	0.54 to 0.74
Newfoundland and Labrador	0.67	0.42 to 0.91
Summary (random)	**0.60**	**0.52 to 0.67**



40% ↓ Mortality

more than 4 X larger than all RCTs combined

J Natl Cancer Inst 2014; 106(11)

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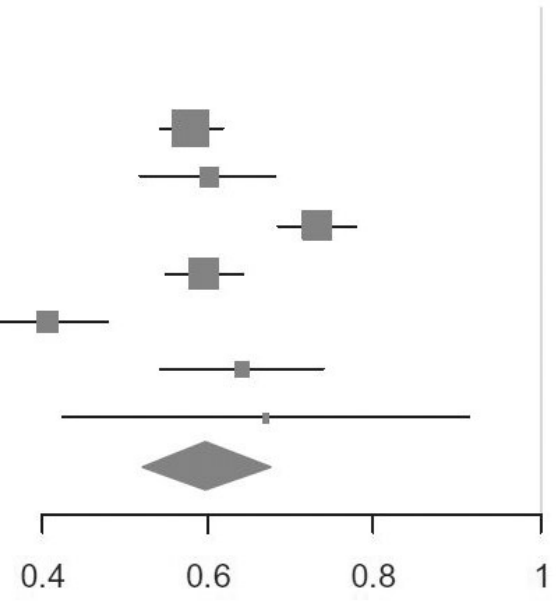
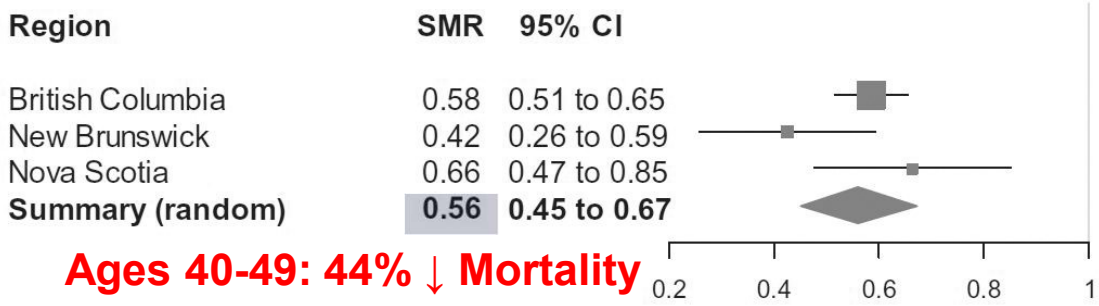


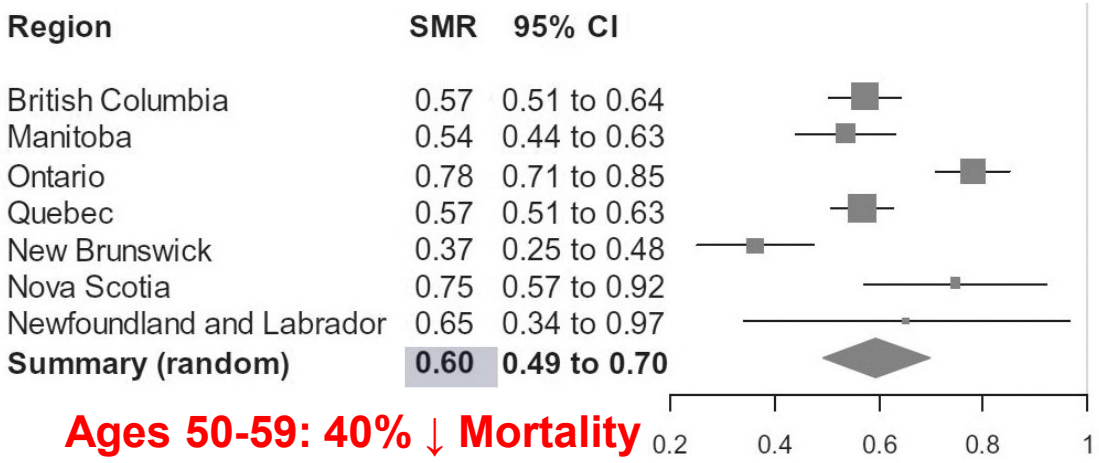
40% ↓ Mortality

J Natl Cancer Inst 2014; 106(11)

Pan-Canadian Service Screening (Ages 40-49, 50-59)



Ages 40-49: 44% ↓ Mortality

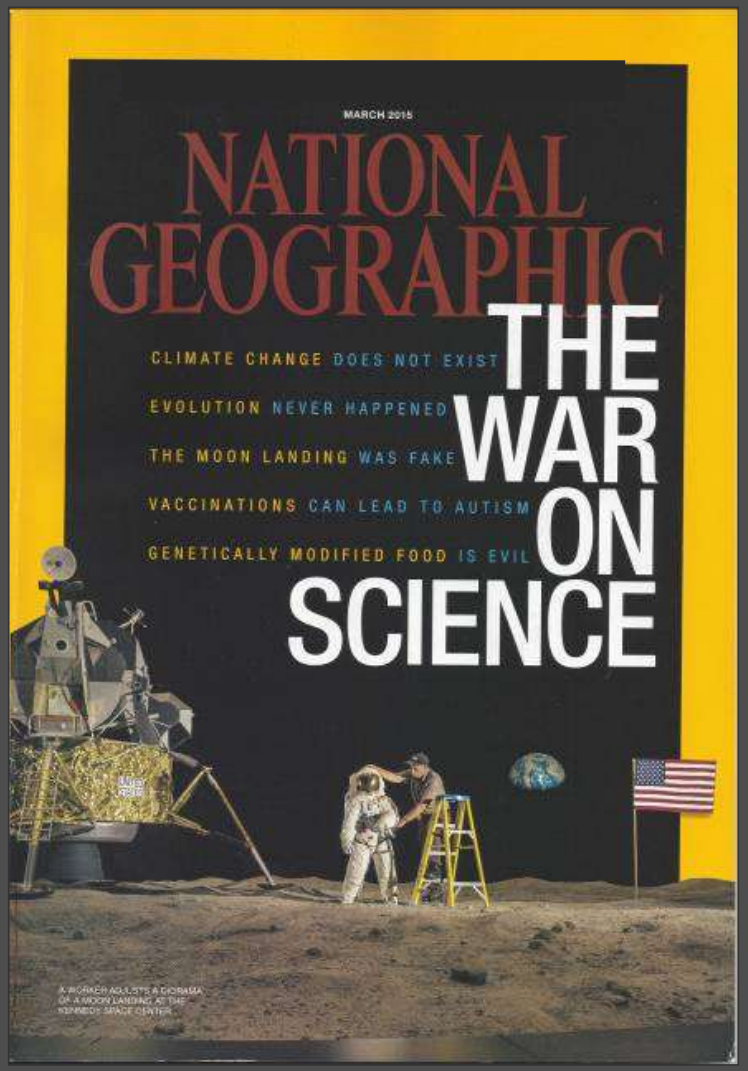


Ages 50-59: 40% ↓ Mortality

J Natl Cancer Inst 2014; 106(11)

Science: Evidence Summary

- RCT: ⬇ mortality of at least 20%
- Observational Trials: ⬇ mortality 40%



Truths:

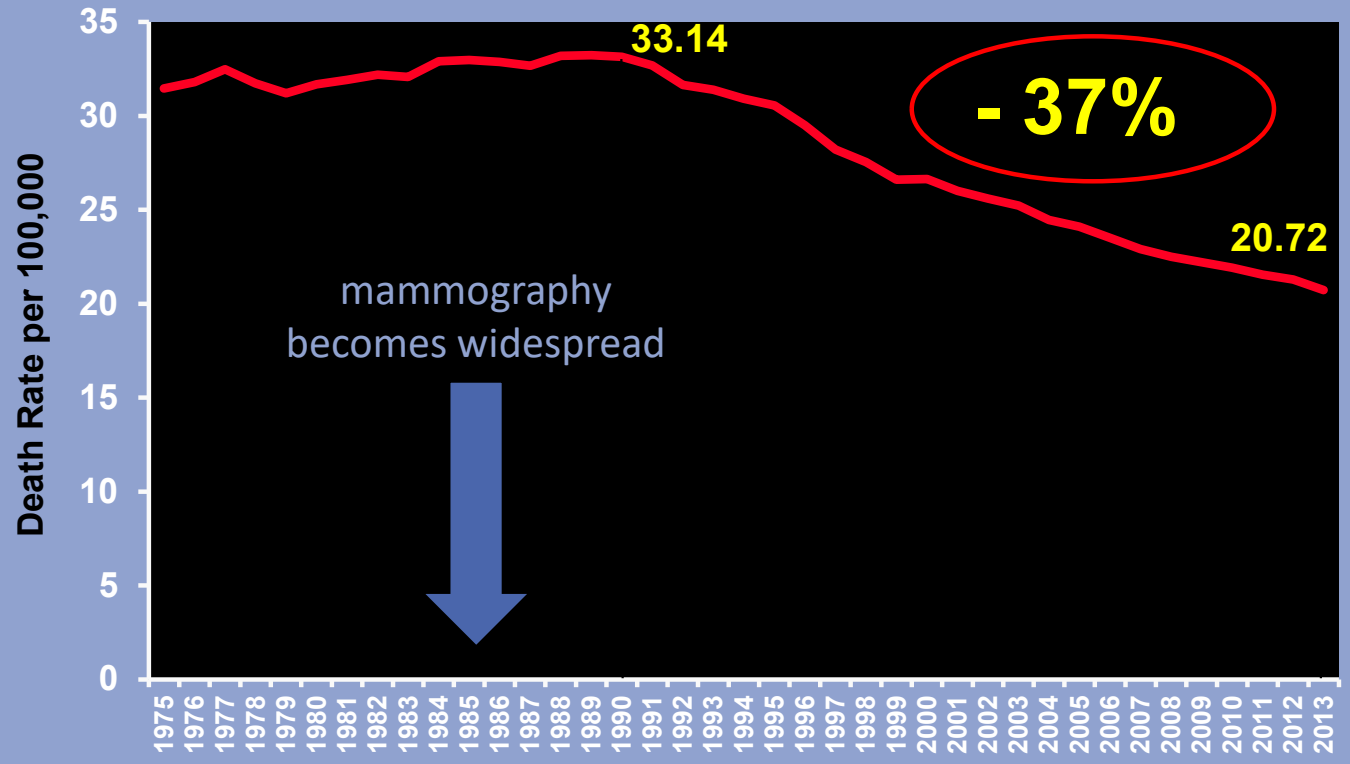
screening DECREASES breast cancer deaths by about 40%

Surrogate Markers: Evidence

- advanced cancers and mortality deduction

Surrogate Markers: Screening Evidence

Age-Adjusted U.S. Death Rate – Female Breast Cancer (Invasive)



SEER Cancer Statistics Review 1975-2013 (http://seer.cancer.gov/csr/)

Courtesy Ed Sickles, MD

Age-Adjusted U.S. Death Rate* – Invasive BC

	1990	2013	Change
Female	33.14	20.72	– 37.48%
Male	0.28	0.30	+ 7.14%

* Death rate per 100,000

SEER Cancer Statistics Review 1975-2013

Courtesy Ed Sickles, MD

Tabar, et al, Cancer 2018 November

- landmark study:
- covers nearly 6 decades
- 10 - 20 yrs of follow-up for EVERY woman

958,594 with 20 yrs F/U

1,485,204 with 10 yrs F/U

- screened women do much better

Tabar, et al, Cancer 2018 November

Using the same available treatments,

SCREENED women had

60% LOWER mortality at 10 yrs follow up and

47% LOWER mortality at 20 yrs follow up

than UNSCREENED women

treatment without screening

will not beat breast cancer

Duffy,Tabar, et al, Cancer 2020

- same methodology, 30% of Swedish scr-eligible women

52,438 in 1 county → **549,091 in 9 counties**

Duffy,Tabar, et al, Cancer 2020

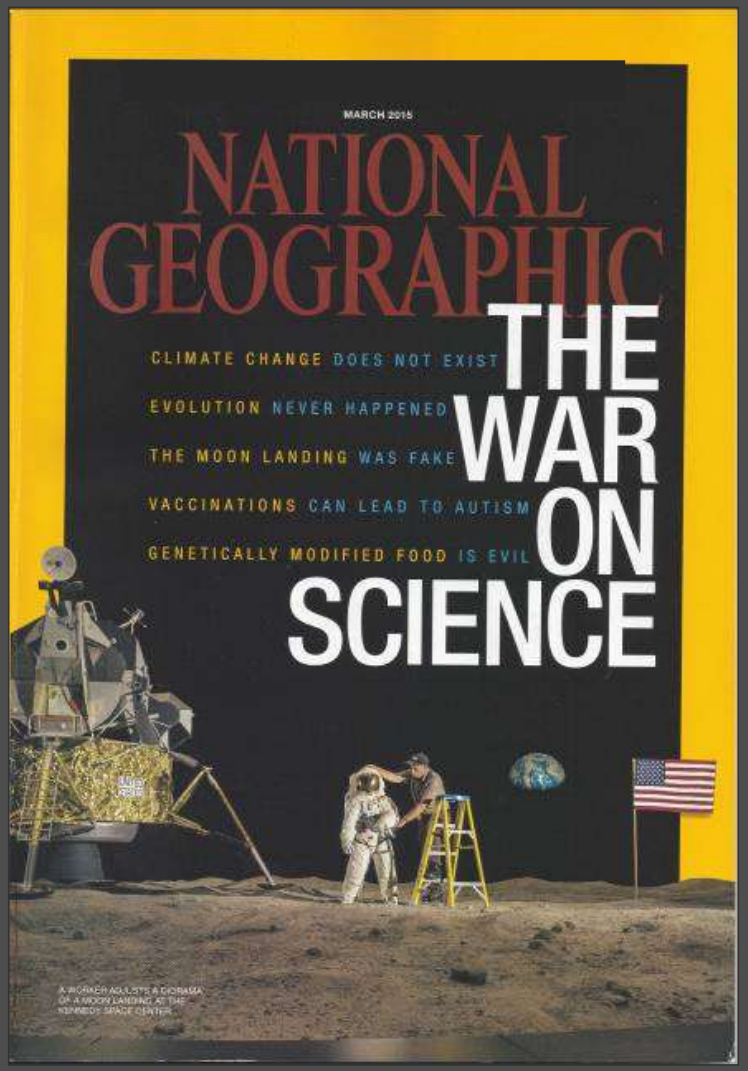
Using the same available treatments,

SCREENED women had

41% LOWER mortality at 10 yrs follow up and

25% LOWER risk of advanced breast cancer

than UNSCREENED women



Truths:

screening DECREASES breast cancer deaths by about 40%

early detection allows treatment to be most effective

Advanced Cancer Frequency

Reduction in Late-Stage Breast Cancer Incidence in the Mammography Era

Implications for Overdiagnosis of Invasive Cancer

- 37%

Mark A. Helvie, MD[1]; Joanne T. Chang, MPH[2]; R. Edward Hendrick, PhD[3]; and Mousumi Banerjee, PhD[4]

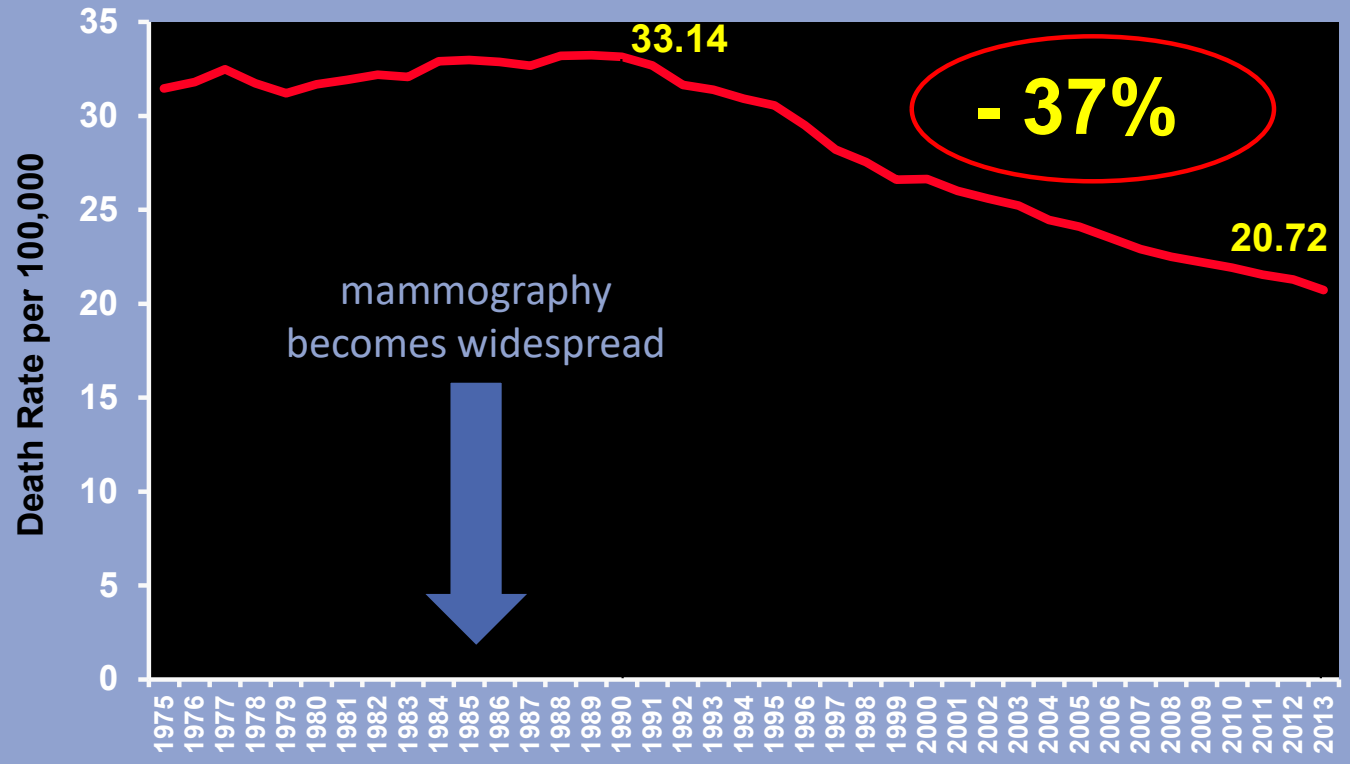
BACKGROUND: Mammographic screening is expected to decrease the incidence of late-stage breast cancer. In the current study, the authors determined the decrease in late-stage cancer incidence and the changes in invasive cancer incidence that occurred in the mammographic era after adjusting for prescreening temporal trends. **METHODS:** Breast cancer incidence and stage data were obtained from the Surveillance, Epidemiology, and End Results program. The premammography period (1977-1979) was compared with the mammographic screening period (2007-2009) for women aged ≥40 years. The authors estimated prescreening temporal trends using 5 measures of annual percentage change (APC). Stage-specific incidence values from 1977 through 1979 (baseline) were adjusted using APC values of 0.5%, 1.0%, 1.3%, and 2.0% and then compared with observed stage-specific incidence in 2007 through 2009. **RESULTS:** Prescreening APC temporal trend estimates ranged from 0.8% to 2.3%. The joinpoint estimate of 1.3% for women aged ≥40 years approximated the 4-decade long APC trend of 1.2% noted in the Connecticut Tumor Registry. At an APC of 1.3%, late-stage breast cancer incidence decreased by 37% (56 cases per 100,000 women) with a reciprocal increase in early-stage rates noted from 1977 through 1979 to 2007 through 2009. Resulting late-stage cancer incidence decreased from 21% at an APC of 0.5% to 48% at an APC of 2.0%. Total invasive breast cancer incidence decreased by 9% (27 cases per 100,000 women) at an APC of 1.3%. **CONCLUSIONS:** There is evidence that a substantial reduction in late-stage breast cancer has occurred in the mammography era when appropriate adjustments are made for prescreening temporal trends. At background APC estimates of ≥1%, the total invasive breast cancer incidence also decreased. ***Cancer*** **2014;120:2649-56.** © *2014 American Cancer Society.*

KEYWORDS: mammography, screening, overdiagnosis, breast cancer, late-stage disease.

Cancer 2014; 120:2649-2656

Surrogate Markers: Screening Evidence

Age-Adjusted U.S. Death Rate – Female Breast Cancer (Invasive)



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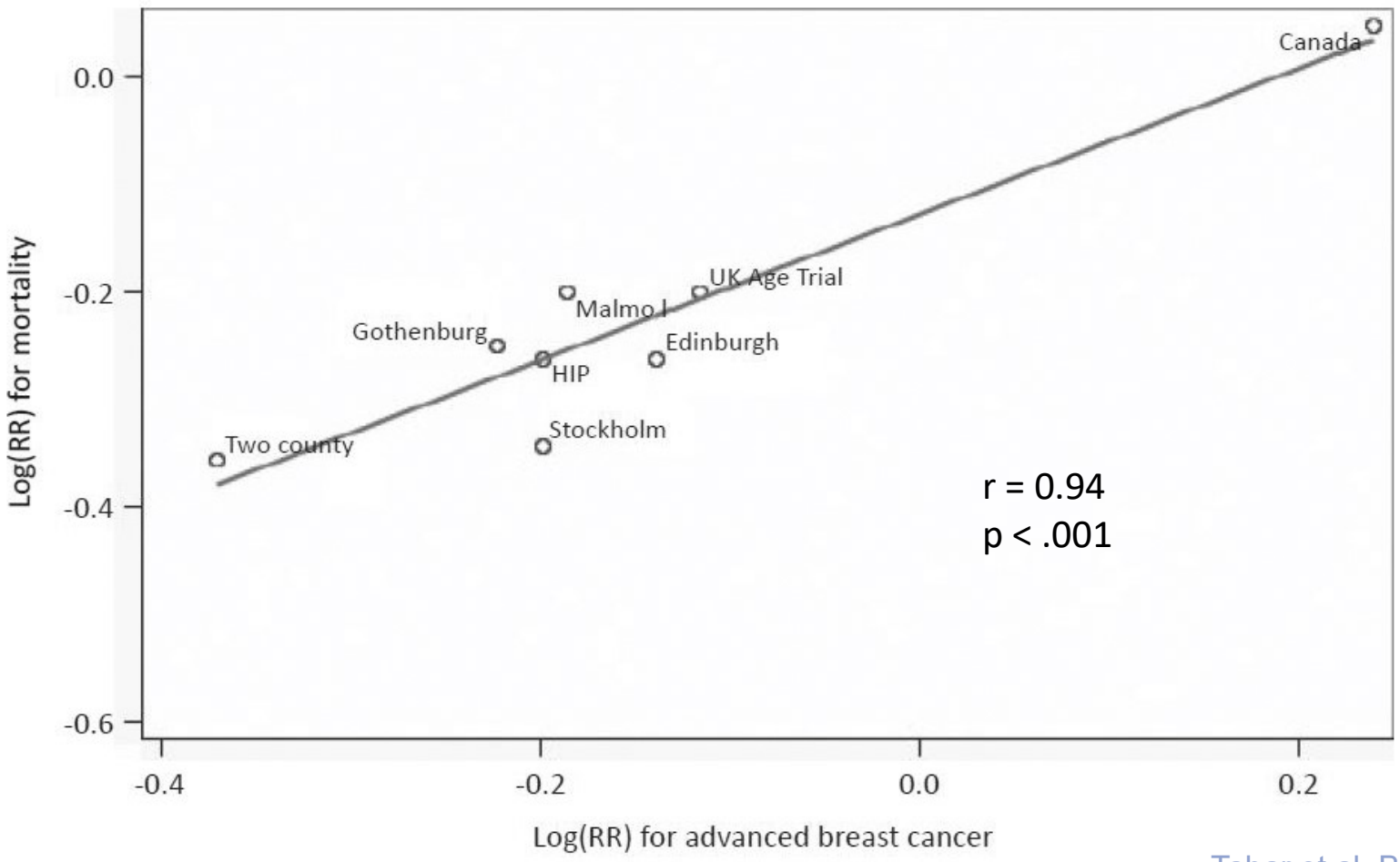
Courtesy Ed Sickles, MD

Advanced Invasive Cancer Frequency



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Tabar et al. Breast J 2015

Science: Evidence Summary

- RCT: ⬇ mortality of at least 20%
- Observational Trials: ⬇ mortality 40%
- Decrease in advanced CA by 37%

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- RCT: ⬇ mortality of at least 20%
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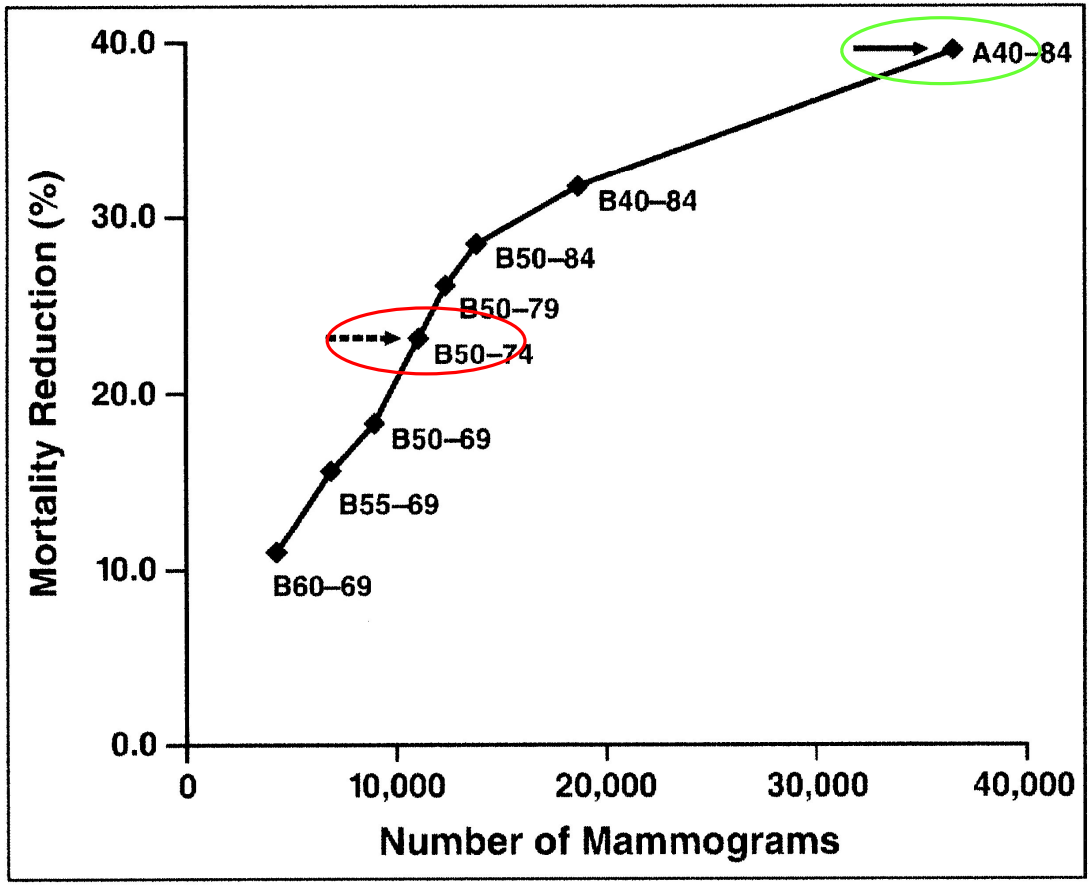
- Decrease in advanced CA by ~~37%~~ → 43% by 2015

CISNET Modeling

(Cancer Intervention and Surveillance Modeling Network)

- modeling attempts to rectify shortcomings of both RCTs and observational trials
- can apply consistent starting ages and screening intervals
- 6 groups independently developed models
  - mammo performance: BCSC; cancer mortality: SEER

Maximum Benefit: Annual Screening starting Age 40



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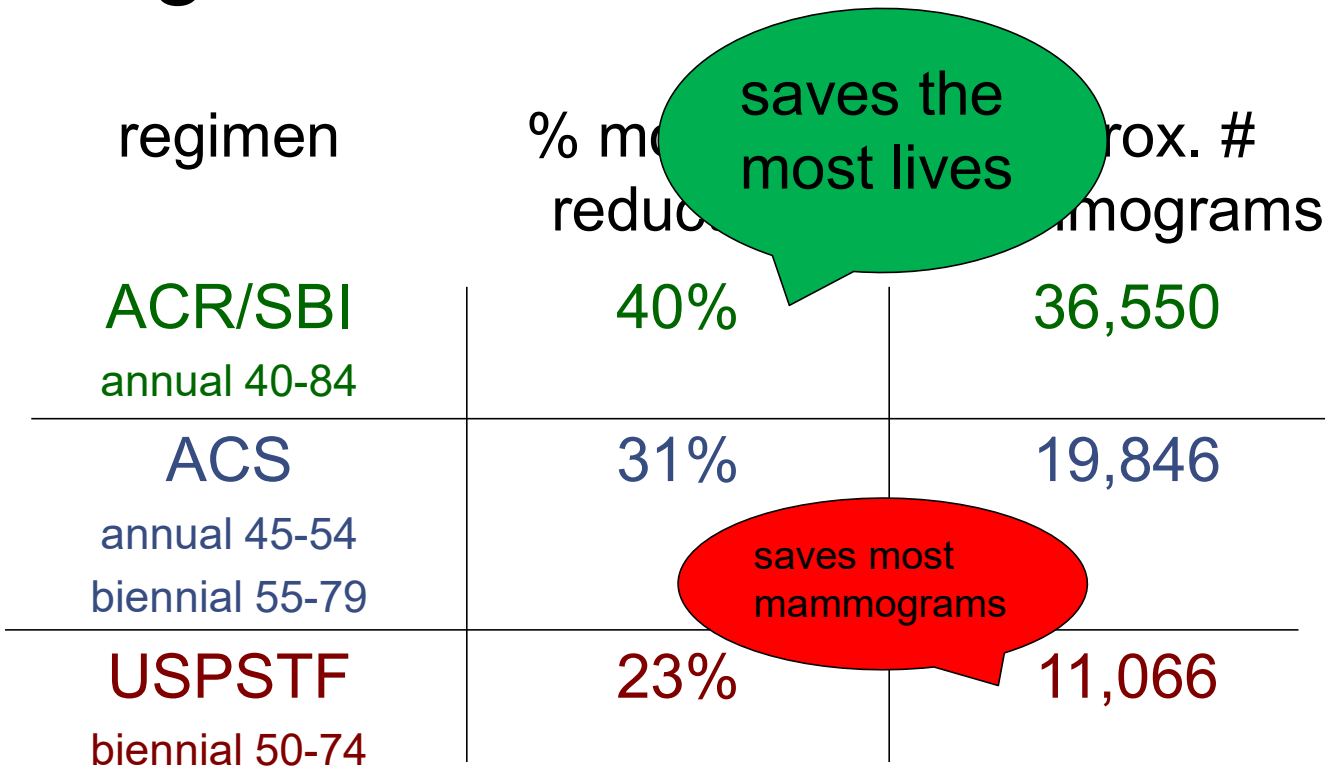
AJR 2011;196:W112-116

Screening Benefits

regimen	% mortality reduction	approx. # mammograms
ACR/SBI annual 40-84	40%	36,550
ACS annual 45-54 biennial 55-79	31%	19,846
USPSTF biennial 50-74	23%	11,066

Arleo et al. Cancer 2017

Screening Benefits



Arleo et al. Cancer 2017

Science: Evidence Summary

- RCTs : ⬇ mortality of at least 20%
- Observational trials: ⬇ mortality of 40%
- Decreased advanced CA by 43%
- CISNET Modeling: ⬇ mortality 40%
  (annual at 40)

The Facts: Evidence Summary

The **evidence** that mammography confers a **substantial reduction** in breast cancer **mortality** is **strong**

Breast Cancer Screening:

- key facts –
  what every radiologist (and woman) should know
- benefits and risks –
  what are positives and negatives of screening
- our latest recommendations
  updated for diversity and inclusion

Benefits of Screening

- 40% fewer breast cancer deaths

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- 40% fewer breast cancer deaths
- less extensive surgery
- less chemotherapy
- **treatments are more effective**
- removal of high risk lesions

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NOT CONSIDERED BENEFITS by ACS OR USPSTF

Risks of Screening

- recall for additional imaging
- needle biopsy

quantifiable

- anxiety
- overdiagnosis

non-quantifiable

Risks of Screening

- recall for additional imaging
- needle biopsy
- anxiety
- overdiagnosis

all non-lethal

Recall & Biopsy

- U.S. annually
  - 10% recall rate
  - 1-2% minimally invasive biopsy
- USPSTF lists cumulatively by decade
  - 61% per 10 yrs recall
  - 7% over 10 yrs biopsy

Recall & Biopsy

- U.S. annually
  - 10% recall rate
  - 1-2% minimally invasive biopsy
- Woman's perspective: (average woman screened age 40)
  - 1 negative diagnostic work up every 13 years
  - 1 biopsy every 187 years

Arleo/Hendrick/Helvie/Sickles 2017
Hendrick/Helvie 2011

2016 CISNET Models: Biopsy

annual screening at age 40:
1 LYG per 1 benign biopsy

Arleo,Hendrick,Helvie, Sickles Cancer 2017

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2016 CISNET Models: Biopsy

annual screening at age 40:
1 LYG per 1 benign biopsy

KOMEN:
asked for volunteers
healthy women to undergo breast biopsy
hoping to get 100 women

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Arleo,Hendrick,Helvie, Sickles Cancer 2017
personal communication; ACOG Consensus Day1

2016 CISNET Models: Biopsy

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1 LYG per 1 benign biopsy

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asked for volunteers
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10,000

Arleo,Hendrick,Helvie, Sickles Cancer 2017
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Risks of Screening

- recall for additional imaging
- needle biopsy
- anxiety
- overdiagnosis

Anxiety

- medical procedures cause anxiety
- not woman specific
- no appropriate metric

Overdiagnosis

- cancer that would not kill patient in her lifetime
- used as argument against screening
  - assumes that diagnosis in the absence of screening is better or more ideal

Natural History of Breast Cancer

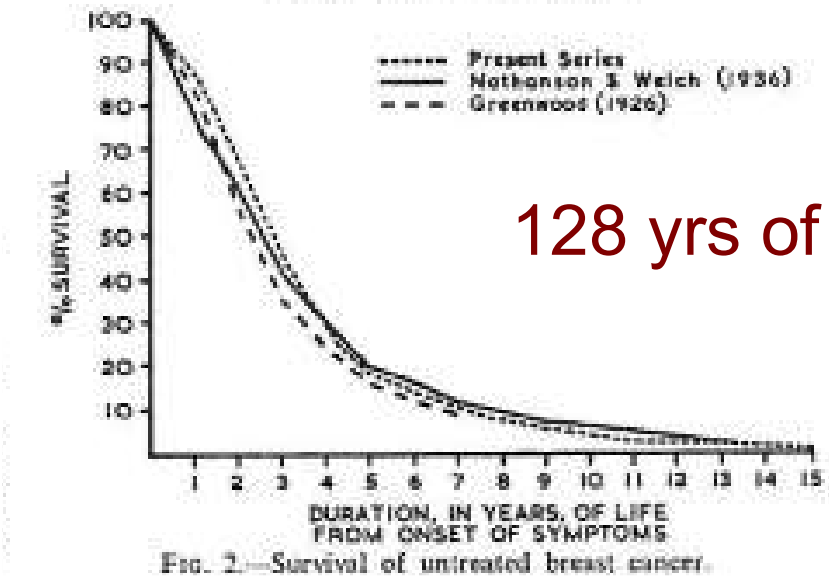

FIG. 2.—Survival of untreated breast cancer.

128 yrs of data

survival of untreated breast cancer
= ZERO

Bloom BMJ 1962

Overdiagnosis

- used as argument against screening
- underdiagnosis is not ideal

Overdiagnosis

- not unique to breast cancer screening
- high blood pressure
- elevated cholesterol

goal is to
DECREASE MORTALITY

Overdiagnosis

- cannot be measured directly
- only is estimated
- estimates are often not done properly

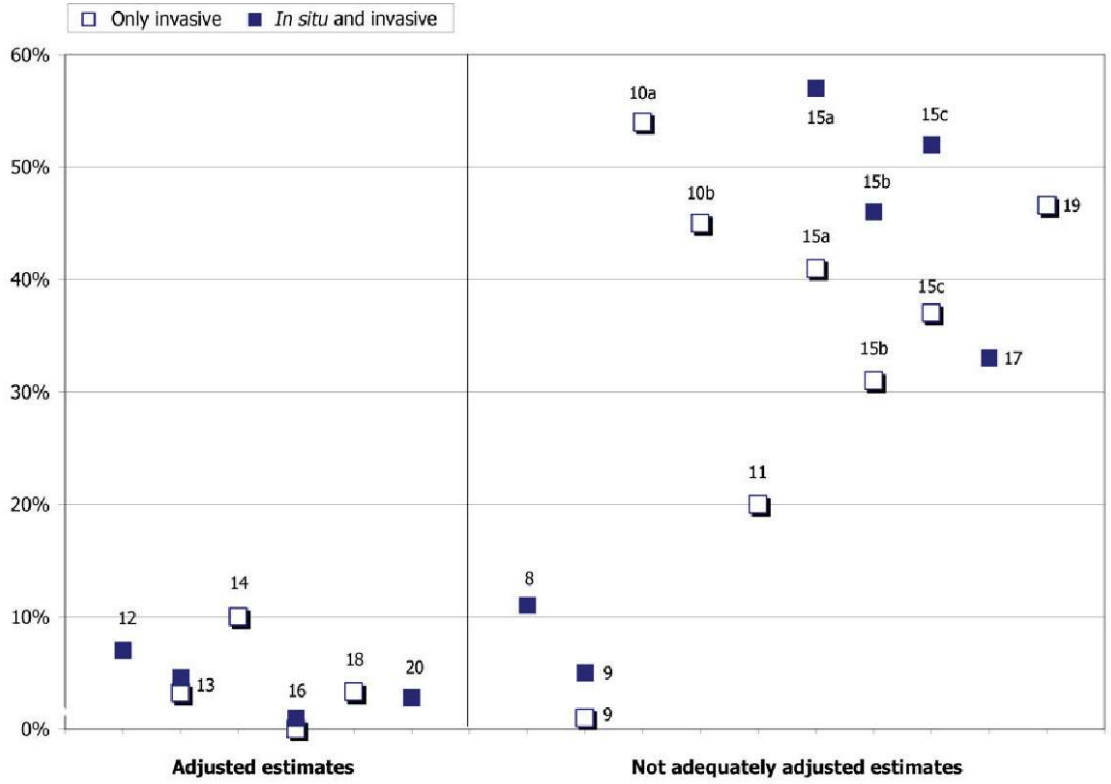

Figure 1 Overdiagnosis estimates classified according to the presence/absence of both the adjustments. The numbers indicate the related reference. *Notes*: (1) For the paper by Jonsson *et al.*,[11] we reported the pooled estimate for 40–74 years (20%) calculated by Jonsson himself. (2) For the paper by Martinez-Alonso *et al.*,[19] we reported the estimate of the cohort of women born in 1950 considered by the authors themselves to be the best estimate (personal communication)

Puliti et al. J Med Screen 2012

ORIGINAL ARTICLE

Overdiagnosis in mammographic screening for breast cancer in Europe: a literature review

Donella Puliti, Stephen W Duffy, Guido Miccinesi, Harry de Koning, Elsebeth Lynge, Marco Zappa, Eugenio Paci and the EUROSCREEN Working Group (members listed at the end of the paper)

J Med Screen 2012;**19 Suppl 1**:42–56

Conclusions The most plausible estimates of overdiagnosis range from 1% to 10%. Substantially higher estimates of overdiagnosis reported in the literature are due to the lack of adjustment for breast cancer risk and/or lead time.

England and Wales.

Methods We conducted a literature review of observational studies that provided estimates of breast cancer overdiagnosis in European population-based mammographic screening programmes. Studies were classified according to the presence and the type of adjustment for breast cancer risk (data, model and covariates used), and for lead time (statistical adjustment or compensatory drop). We expressed estimates of overdiagnosis from each study as a percentage of the expected incidence in the absence of screening, even if the variability in the age range of the denominator could not be removed. Estimates including carcinoma *in situ* were considered when available.

Results There were 13 primary studies reporting 16 estimates of overdiagnosis in seven European countries (the Netherlands, Italy, Norway, Sweden, Denmark, UK and Spain). Unadjusted estimates ranged from 0% to 54%. Reported estimates adjusted for breast cancer risk and lead time were 2.8% in the Netherlands, 4.6% and 1.0% in Italy, 7.0% in Denmark and 10% and 3.3% in England and Wales.

Conclusions The most plausible estimates of overdiagnosis range from 1% to 10%. Substantially higher estimates of overdiagnosis reported in the literature are due to the lack of adjustment for breast cancer risk and/or lead time.

See end of article for authors' affiliations

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Overdiagnosis

misleading women
by suggesting that invasive breast cancer is
commonly innocent or non-progressive,

which is NOT TRUE

ORIGINAL ARTICLE HEALTH SERVICES RESEARCH AND POLICY

Persistent Untreated Screening-Detected Breast Cancer: An Argument Against Delaying Screening or Increasing the Interval Between Screenings

Elizabeth Kagan Arleo, MD[a], Debra L. Monticciolo, MD[b], Barbara Monsees, MD[c], Geraldine McGinty, MD, MBA[a], Edward A. Sickles, MD[d]

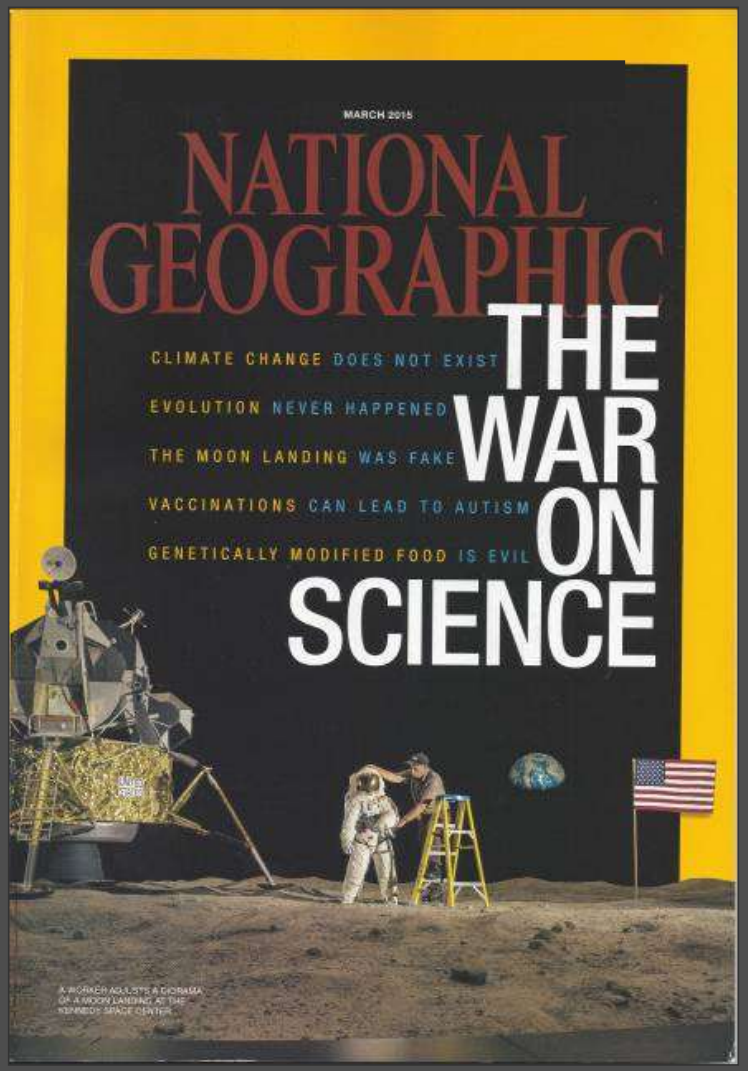
25,281 screen-detected invasive
9,360 screen-detected DCIS

479 untreated – none regressed at next mammogram

An unknown percentage of these cancers represent overdiagnosis, but because all untreated screen-detected cancers were visible and suspicious for malignancy at next mammographic examination, delaying the onset of screening or increasing the interval between screenings should not reduce the frequency of overdiagnosis.

Key Words: Screening mammography, breast cancer natural history, screen-detected breast cancer, overdiagnosis, Society of Breast Imaging, SBI

J Am Coll Radiol 2017;14:863-867.



Truths:

screening DECREASES breast cancer deaths by about 40%

early detection allows treatment to be most effective

no breast cancers will go away on their own

Overdiagnosis

- an “overdiagnosed” cancer will still look suspicious on mammography, whether that mammogram is done at 40, 45, or 50

- waiting until 45 or 50 or screening biennially won’t change the small amount of overdiagnosis that exists

Overdiagnosis

NO EFFECT ON OVERDIAGNOSIS

by

screening later

or

longer screening intervals

Overdiagnosis

- cannot be measured directly
- reasonable estimates: 1-10%

- not decreased by screening later
- underdiagnosis is not ideal

Breast Cancer Screening

benefits	risks
• 40% fewer deaths	• recall for imaging
• less extensive treatment	• mini-invasive biopsy
• more effective treatment	• anxiety
• dx of high risk lesions	• overdiagnosis

Breast Cancer Screening:

- key facts –
  what every radiologist (and woman) should know
- benefits and risks –
  what are positives and negatives of screening
- our latest recommendations
  updated for diversity and inclusion

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ACR Recommendations

Annual Screening Beginning Age 40

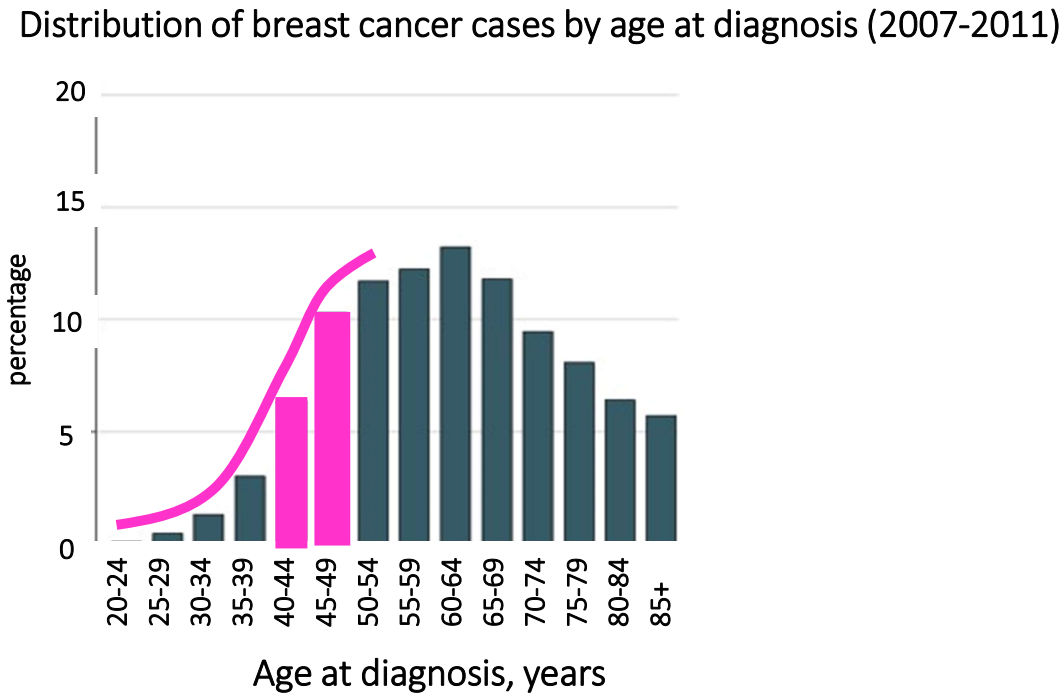
supported by

SBI, NCCN, ACOG, ASBS, SSO

Why Age 40?

- sharp increase incidence at 40

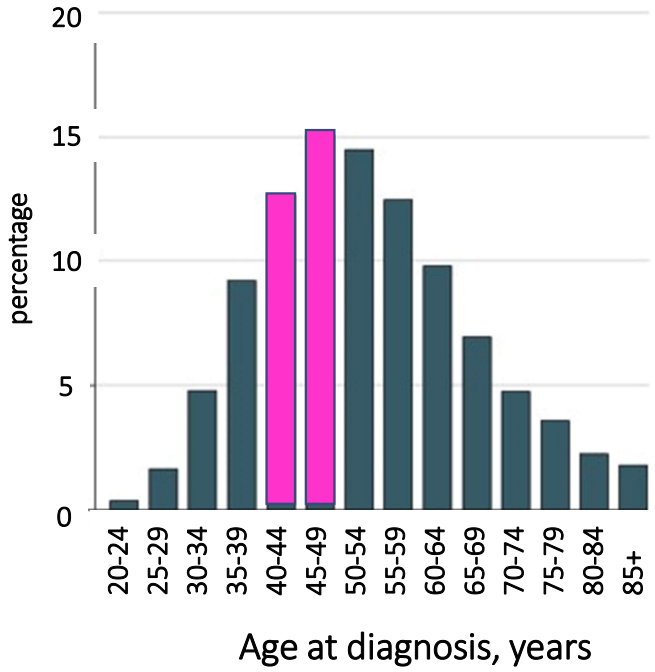
American Cancer Society Report



Adapted from JAMA 2015 314(15):1602

American Cancer Society Report

Distribution of person-years of life lost to breast cancer by age at diagnosis (2007-2011)



JAMA 2015 314(15):1602

Guidelines

CISNET modeling for USA population shows that if screening is not done at ages 40-44 there will be:

- 1037 more breast cancer deaths per year
- 34552 life-years lost per year

Sickles EA, personal communication

Why 40 not 50?

sharp increase incidence at 40

waiting until 45 or 50 to screen
results in an unacceptable loss of life

Why 40 not 50?

- 1 in 6 breast cancers occur in women in their 40s

- 1/3 of cancers in minority women dx'd under 50 (compared to 1/4 of all cancer in Whites)

Risk, Diversity, and Breast Cancer Screening

- evidence sources

western European women

Risk, Diversity, and Breast Cancer Screening

- our population

Black women

Asian women

western European women

HISPANIC WOMEN

LGBTQ women

Risk, Diversity, and Breast Cancer Screening

2017: average risk separated from higher risk

2021: average risk updated for more inclusion

ORIGINAL ARTICLE ■ *Health Services Research and Policy*

Breast Cancer Screening Recommendations Inclusive of All Women at Average Risk: Update from the ACR and Society of Breast Imaging

Debra L. Monticciolo, MD[a], Sharp F. Malak, MD, MPH[b], Sarah M. Friedewald, MD[c], Peter R. Eby, MD[d], Mary S. Newell, MD[e], Linda Moy, MD[f], Stamatia Destounis, MD[g], Jessica W. T. Leung, MD[h], R. Edward Hendrick, PhD[i], Dana Smetherman, MD[j]

Abstract

Breast cancer remains the most common nonskin cancer, the second leading cause of cancer deaths, and the leading cause of premature death in US women. Mammography screening has been proven effective in reducing breast cancer deaths in women age 40 years and older. A mortality reduction of 40% is possible with regular screening. Treatment advances cannot overcome the disadvantage of being diagnosed with an advanced-stage tumor. The ACR and Society of Breast Imaging recommend annual mammography screening beginning at age 40, which provides the greatest mortality reduction, diagnosis at earlier stage, better surgical options, and more effective chemotherapy. Annual screening results in more screening-detected tumors, tumors of smaller sizes, and fewer interval cancers than longer screening intervals. Screened women in their 40s are more likely to have early-stage disease, negative lymph nodes, and smaller tumors than unscreened women. Delaying screening until age 45 or 50 will result in an unnecessary loss of life to breast cancer and adversely affects minority women in particular. Screening should continue past age 74 years, without an upper age limit unless severe comorbidities limit life expectancy. Benefits of screening should be considered along with the possibilities of recall for additional imaging and benign biopsy and the less tangible risks of anxiety and overdiagnosis. Although recall and biopsy recommendations are higher with more frequent screening, so are life-years gained and breast cancer deaths averted. Women who wish to maximize benefit will choose annual screening starting at age 40 years and will not stop screening prematurely.

Key Words: Breast cancer, breast cancer screening, early detection, mammography, mammography screening

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Original Article

Age Distributions of Breast Cancer Diagnosis and Mortality by Race and Ethnicity in US Women

R. Edward Hendrick, PhD [1]; Debra L. Monticciolo, MD[2]; Kelly W. Biggs, MD[3]; and Sharp F. Malak, MD, MPH[4]

BACKGROUND: Surveillance, Epidemiology, and End Results (SEER) data from 1973-2010 have been used to show that minority women have disproportionately higher percentages of breast cancers diagnosed at younger ages in comparison with White women. **METHODS:** The authors analyzed SEER 21 invasive breast cancer incidence data for 2014-2017 and National Center for Health Statistics mortality data for 2014-2018 and compared invasive incidence and mortality by age in non-Hispanic Black (NH-Black), Asian American/Pacific Islander (AAPI), Native American, and Hispanic women with those in non-Hispanic White (NH-White) women. They evaluated incidence rates and percentages of invasive breast cancer cases and breast cancer deaths occurring before the age of 50 years along with advanced-stage incidence rates and percentages in minority women versus NH-White women. **RESULTS:** Recent SEER data showed that invasive breast cancers were diagnosed at significantly younger ages in minority women versus NH-White women. Among women diagnosed with invasive breast cancer, compared with NH-White women, minority women were 72% more likely to be diagnosed under the age of 50 years (relative risk [RR], 1.72; 95% confidence interval [CI], 1.70-1.75), 58% more likely to be diagnosed with advanced-stage breast cancer under the age of 50 years (RR, 1.58; 95% CI, 1.55-1.61), and 24% more likely to be diagnosed with advanced-stage (regional or distant) breast cancer at all ages (RR, 1.24; 95% CI, 1.23-1.25). Among women dying of breast cancer, minority women were 127% more likely to die under the age of 50 years than NH-White women. **CONCLUSIONS:** NH-Black, AAPI, Native American, and Hispanic women have higher proportions of invasive breast cancers at younger ages and at advanced stages and breast cancer deaths at younger ages than NH-White women. ***Cancer* 2021;0:1-9**. *© 2021 American Cancer Society.*

LAY SUMMARY:

- This study analyzes the most recently available data on invasive breast cancers and breast cancer deaths in US women by age and race/ethnicity.
- Its findings show that non-Hispanic Black, Asian American/Pacific Islander, Native American, and Hispanic women have a higher percentage of invasive breast cancers at younger ages and at more advanced stages and a higher percentage of breast cancer deaths at younger ages than non-Hispanic White women.

KEYWORDS: breast cancer, early detection of cancer, female, incidence, minority groups, mortality, screening mammography.

Age Distributions of Breast Cancer Diagnosis and Mortality by Race and Ethnicity in US Women

- SEER (Surveillance, Epidemiology, and End Results)

SEER 9 – incidence data since 1973, ~ 9% U.S. population

SEER 18 –18 registries in 2000, = 27.8% U.S. population by 2010

SEER 21 registries (our study) = 36.7% U.S. population

Hendrick, Monticciolo et al. *Cancer* 2021, in press

Age Distributions of Breast Cancer Diagnosis and Mortality by Race and Ethnicity in US Women

- SEER 21 data 2014-2017 invasive br CA incidence
- NCHS* for mortality data 2014-2018

*National Center for Health Statistics

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  NH-Black
  Asian American/Pacific Islander (AAPI)
  American Indian/Alaska Native (Native Amer)
  Spanish-Hispanic-Latina (Hispanic)
  NH-White

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% inv br CA diagnosed under age 50
% inv br CA diagnosed at advanced stage
% advanced stage ds diagnosed under age 50

% breast cancer deaths under age 50

Hendrick, Monticciolo et al. *Cancer* 2021, in press

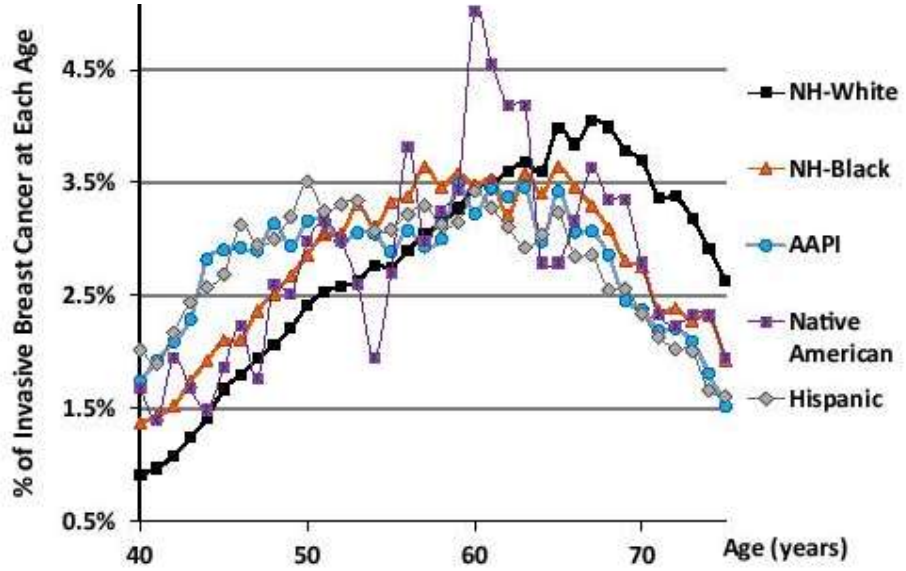
Age Distributions of Breast Cancer Diagnosis and Mortality by Race and Ethnicity in US Women

- SEER 21 data 2014-2017
  - 362,503 invasive br cancers in all ages
  - 278,871 invasive br cancers women 40-75

- NCHS for mortality data 2014-2018
  - 208,329 female breast cancer deaths

Hendrick, Monticciolo et al. *Cancer* 2021, in press

Age Distributions of Breast Cancer Diagnosis and Mortality by Race and Ethnicity in US Women



incidence tends to occur at younger ages in each minority cohort in comparison with NH-White women

Hendrick, Monticciolo et al. *Cancer* 2021, in press

Breast Cancer Diagnosis and Mortality by Race/Hendrick et al

TABLE 2	Invasive Breast Cancer Diagnosed Under Age 50 Years				
	# of Invasive Breast Cancers	# Under Age 50 y	% Under Age 50 y	RR of Inv Ca < 50 y	95% CI
NH-White	246,943	37,685	15.3%	1	--
NH-Black	39,761	8,782	22.1%	1.45	[1.42,1.48]
Asian/PI	29,037	8,099	27.9%	1.83	[1.79,1.87]
Native American	1,336	297	22.2%	1.46	[1.32,1.61]
Hispanic	40,609	11,938	29.4%	1.93	[1.89,1.96]
All Minorities	110,743	29,116	26.3%	1.72	[1.70,1.75]

Breast Cancer Diagnosis and Mortality by Race/Hendrick et al

TABLE 3

	Advanced-stage (Regional or Distant) Breast Cancer (BC)					Advanced-stage BC Under Age 50 Years			
	# of Invasive BCs*	# of Advanced	% Advanced	RR of Advanced	95% CI	# Advanced < Age 50 y	% Advanced < Age 50 y	RR of Adv. < Age 50 y	95% CI
NH-White	244,681	75,193	30.7%	1	--	15,038	20.0%	1	
NH-Black	39,444	16,319	41.4%	1.35	[1.33,1.36]	4,284	26.3%	1.31	[1.27,1.35]
Asian/PI	29,432	9,756	33.1%	1.08	[1.06,1.10]	3,280	33.6%	1.68	[1.63,1.73]
Native American	1,413	525	37.2%	1.21	[1.13,1.29]	152	29.0%	1.45	[1.27,1.66]
Hispanic	40,181	15,546	38.7%	1.26	[1.24,1.28]	5,614	36.1%	1.81	[1.76,1.85]
All Minorities	110,470	42,146	38.2%	1.24	[1.23,1.25]	13,330	31.6%	1.58	[1.55,1.61]
	* Includes only invasive breast cancers of known stages								

Table 4

	Breast Cancer Deaths Under Age 50 Years				
	# of Breast Cancer Deaths	# Under Age 50 y	% Under Age 50 y	RR of Cancer Death < 50 y	95% CI
NH-White	154916	11817	7.6%	1	--
NH-Black	31418	5066	16.1%	2.11	[2.05,2.18]
Asian/PI	6386	1115	17.5%	2.29	[2.16,2.42]
Native American	1041	129	12.4%	1.62	[1.38,1.91]
Hispanic	14568	2935	20.1%	2.64	[2.55,2.74]
All Minorities	53413	9245	17.3%	2.27	[2.21,2.33]

Hendrick, Monticciolo et al. *Cancer* 2021, in press

Population Distribution is important
minority women have population distributions skewed to younger ages

Hendrick, Monticciolo et al. *Cancer* 2021, in press

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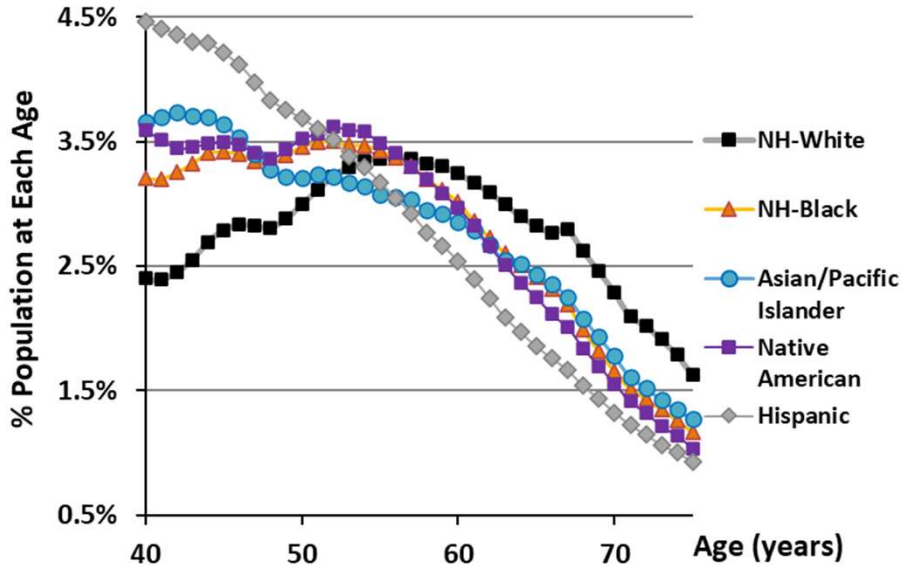

gives higher percentages of cancers/cancer deaths at younger ages

Hendrick, Monticciolo et al. *Cancer* 2021, in press

Breast Cancer Diagnosis and Mortality by Race/Hendrick et al

TABLE 5. Women Under Age 50

Race/Ethnicity	Invasive Breast Cancer Incidence				Adv-Stage Breast Cancer Incidence*				Breast Cancer Mortality			
	Inc. Rate	RR	95% CI	p-value	Inc. Rate	RR	95% CI	p-value	Mort. Rate	RR	95% CI	p-value
NH-White	49.2	1			19.6	1			4.0	1		
NH-Black	47.9	0.97	0.95, 1.00	0.03	23.1	1.18	1.14, 1.22	<0.0001	7.5	1.88	1.82, 1.94	<0.0001
Asian-PI	45.5	0.92	0.90, 0.95	<0.0001	17.7	0.91	0.87, 0.94	<0.0001	3.0	0.74	0.69, 0.79	<0.0001
Native American	28.6	0.58	0.52, 0.65	<0.0001	13.4	0.68	0.58, 0.80	<0.0001	3.0	0.76	0.64, 0.90	0.002
Hispanic	36.8	0.75	0.73, 0.76	<0.0001	16.9	0.87	0.84, 0.89	<0.0001	3.2	0.81	0.78, 0.84	<0.0001

Incidence rates and mortality rates are per 100,000 women

* Advanced-stage (Regional + Distant) Breast Cancers

Hendrick, Monticciolo et al. *Cancer* 2021, in press

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KEYWORDS: breast cancer, early detection of cancer, female, incidence, minority groups, mortality, screening mammography.

Why 40 not 50?

minority women

- **72%** more likely dx'd invasive BrCA **under age 50**
- **58%** more likely=advanced disease **under age 50**

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Diversity in Guideline Construction

- younger (15-44) vs older (45-64) using SEER 18

Hung et al. Cancer Epidem 2016

- greater proportion of younger women dx'd at advanced stage: **48.1%** vs **38.7%** (p<0.0001)

- dx'd at late-stage:

54.5% young NH Black
52.9% young Hispanic
46.0% young NH White

p<0.0001

Breast Cancer Screening Recommendations Inclusive of All Women at Average Risk: Update from the ACR and Society of Breast Imaging

Debra L. Monticciolo, MD[a], Sharp F. Malak, MD, MPH[b], Sarah M. Friedewald, MD[c], Peter R. Eby, MD[d], Mary S. Newell, MD[e], Linda Moy, MD[f], Stamatia Destounis, MD[g], Jessica W. T. Leung, MD[h], R. Edward Hendrick, PhD[i], Dana Smetherman, MD[j]

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Key Words: Breast cancer, breast cancer screening, early detection, mammography, mammography screening

J Am Coll Radiol 2021;■:■-■.

TAKE-HOME POINTS

- Mammography screening has been proven effective in reducing breast cancer deaths in women age 40 years and older, with a mortality reduction of 40% possible with regular screening.
- Annual mammography screening starting at age 40 provides the greatest breast cancer mortality reduction by enabling diagnosis at smaller sizes and earlier stages, better surgical options, and more effective chemotherapy.
- Delaying screening until age 45 or 50 results in unnecessary loss of life to breast cancer, adversely affecting minority women in particular.
- Breast cancer screening in women ages 75 years and older has continued benefits in terms of deaths averted and life-years gained.
- Annual screening results in more screening-detected tumors, tumors of smaller sizes, and fewer interval cancers than longer screening intervals.
- There is risk in not screening; treatment advances are important but cannot overcome the disadvantage of being diagnosed with an advanced-stage tumor.

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Breast Cancer Screening: Summary

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Screening Saves Lives

- has been rigorously tested
- can decrease mortality by 40%
- treatment much more effective in screened women

Breast Cancer Screening: Summary

- waiting until age 45 or 50 to screen will adversely effect all women but minority women in particular

- full information is needed to help women make the right choice
- women should understand the risks – and ALL the benefits

- women can decide for themselves how they view the risks – all of which are non-lethal

Breast Cancer Screening: Summary

- **screening decisions should be made by women, not for women**

- **women who want to maximize the benefits should choose annual screening starting at 40**

Breast Cancer Screening:
Addressing Disparities
and
Screening for Average Risk

THANK YOU

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