Breast Health

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Quantum Radiology

Breast Cancer Statistics

(2015 USA Data)

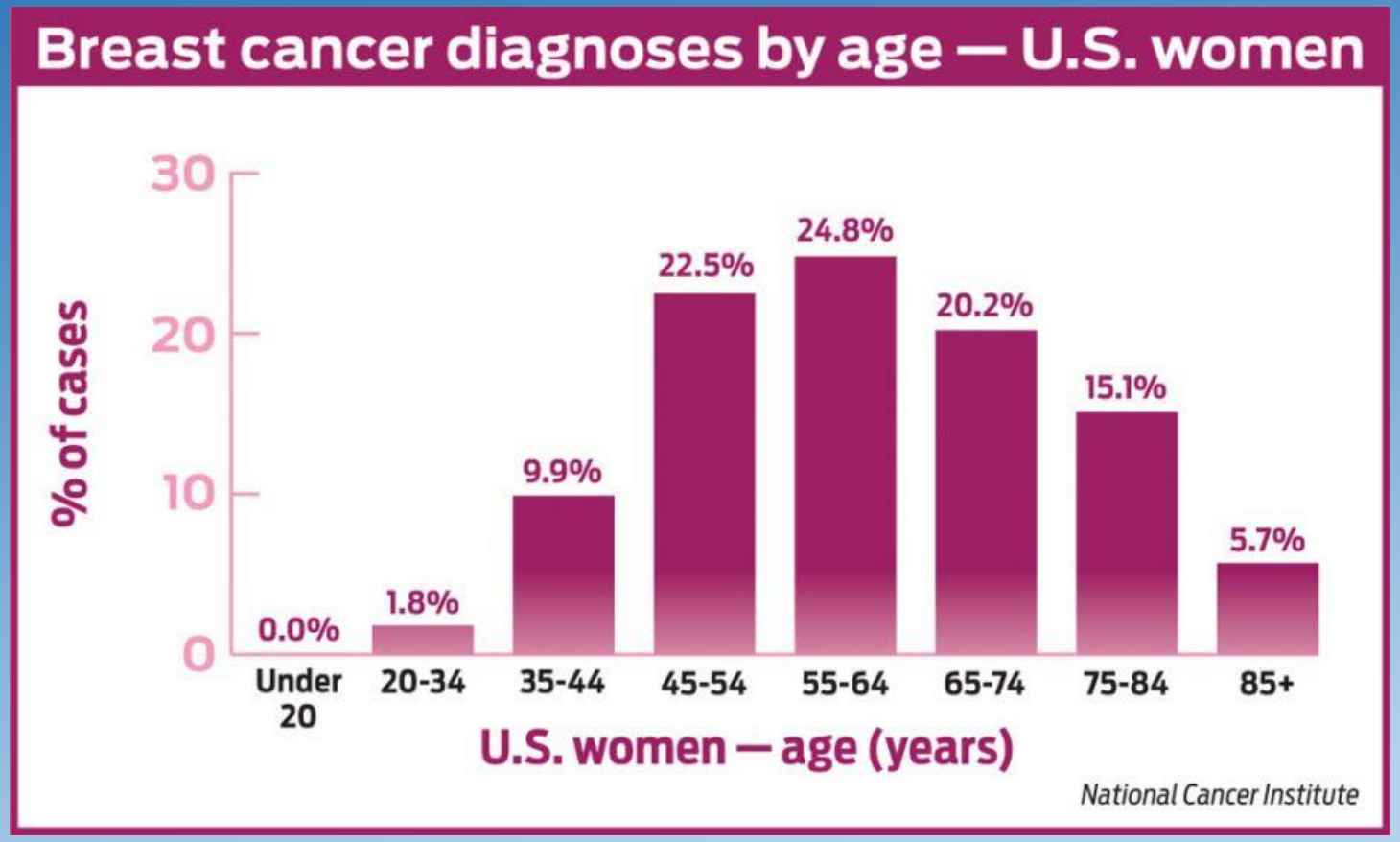
- 2nd Highest Diagnosed cancer in women (Skin) – 30% of all newly dx cancers
- 2nd Highest cancer deaths in women (Lung)
- Breast cancer risk doubles if you have a first degree relative with Breast cancer (mother, daughter, sister)
- Only 15% of Breast cancer pts have a family history

(Breastcancer.org)

- 292,000 new cases Breast cancer (80% invasive)- Women
- 2,350 cases in men
- 40,290 fatal cases
- >2.8 million women have a history of Breast cancer

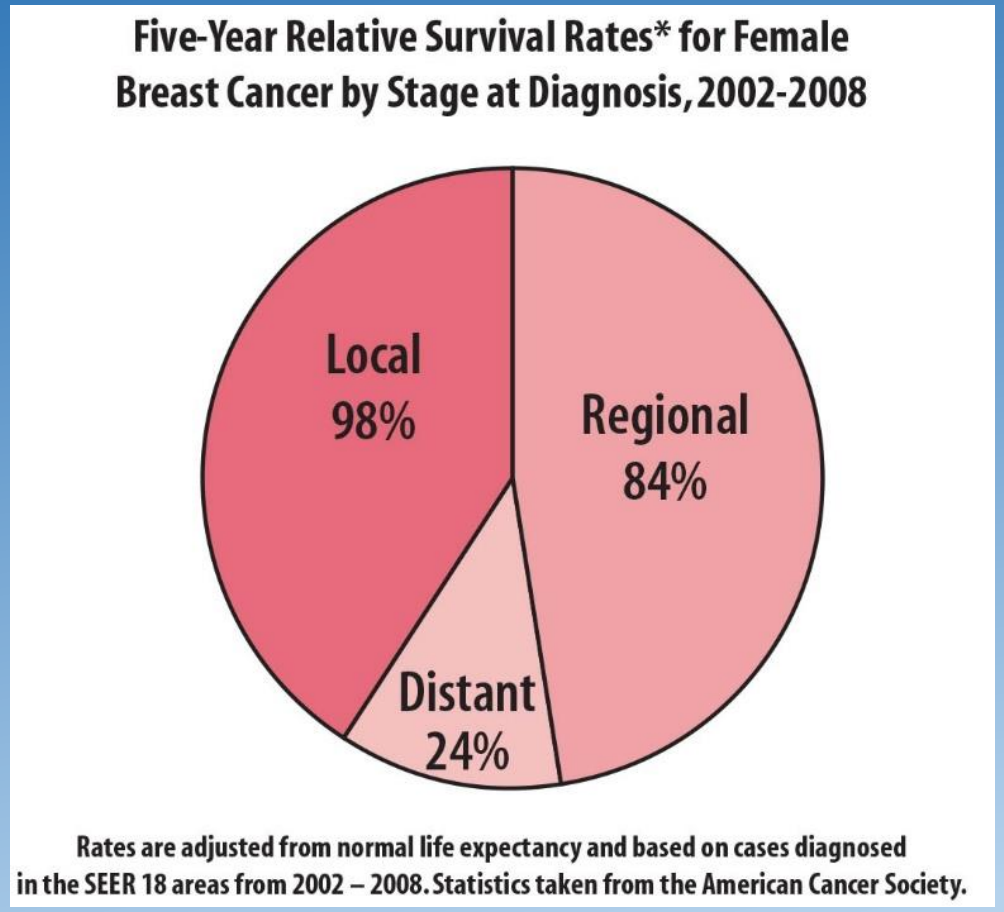
Comparison to Heart Disease

- Includes heart disease, HTN, and stroke
- #1 killer of women (1/2 million/year)
- Kills more than the next seven causes of death combined
- Women are 15% more likely to die of a heart attack than men
- Only 34% of women correctly identified heart disease as the leading cause of death.



Age and Breast Cancer Risk

By age 25:	one in 19,608	By age 60:	one in 24
By age 30:	one in 2,525	By age 65:	one in 17
By age 35:	one in 622	By age 70:	one in 14
By age 40:	one in 217	By age 75:	one in 11
By age 45:	one in 93	By age 80:	one in 10
By age 50:	one in 50	By age 85:	one in 9
By age 55:	one in 33	Ever:	one in 8



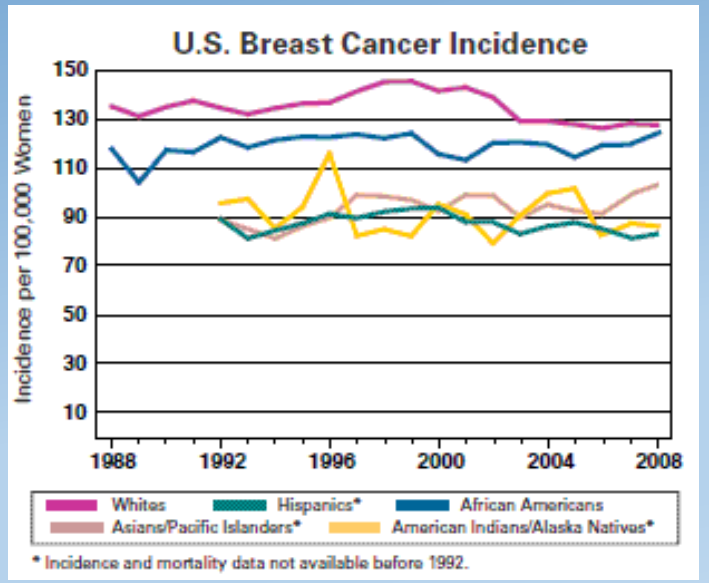
Survival Rates

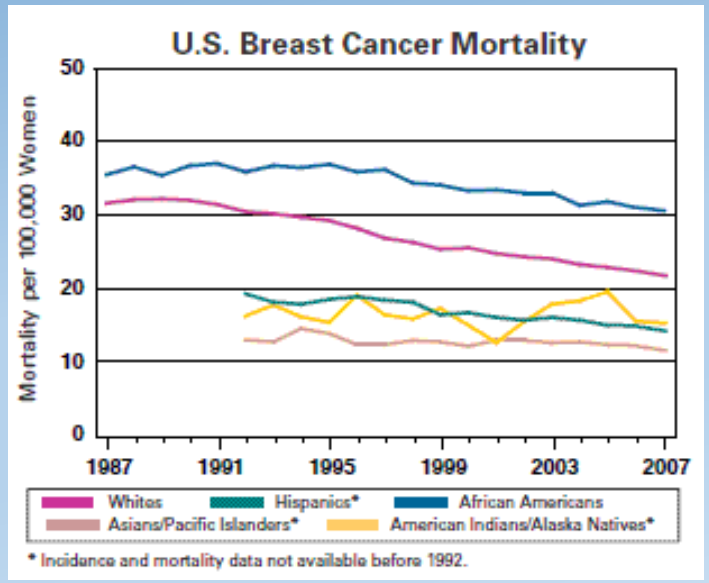
- At 5 Years: 89%
- At 10 years: 82%,
- At 15 years: 77%

****The key to surviving the disease is early detection. If detected and treated early, the 5 year relative survival rate for localized breast cancer is 99%**

Trends

- Breast Cancer incidence rates began decreasing in the year 2000 (HRT? – Women's Health Initiative)
- Breast cancer death rates on the decline since 1989 - women under 50 have experienced the largest decrease
  - Treatment advances
  - Earlier detection (screening)
  - Increased awareness





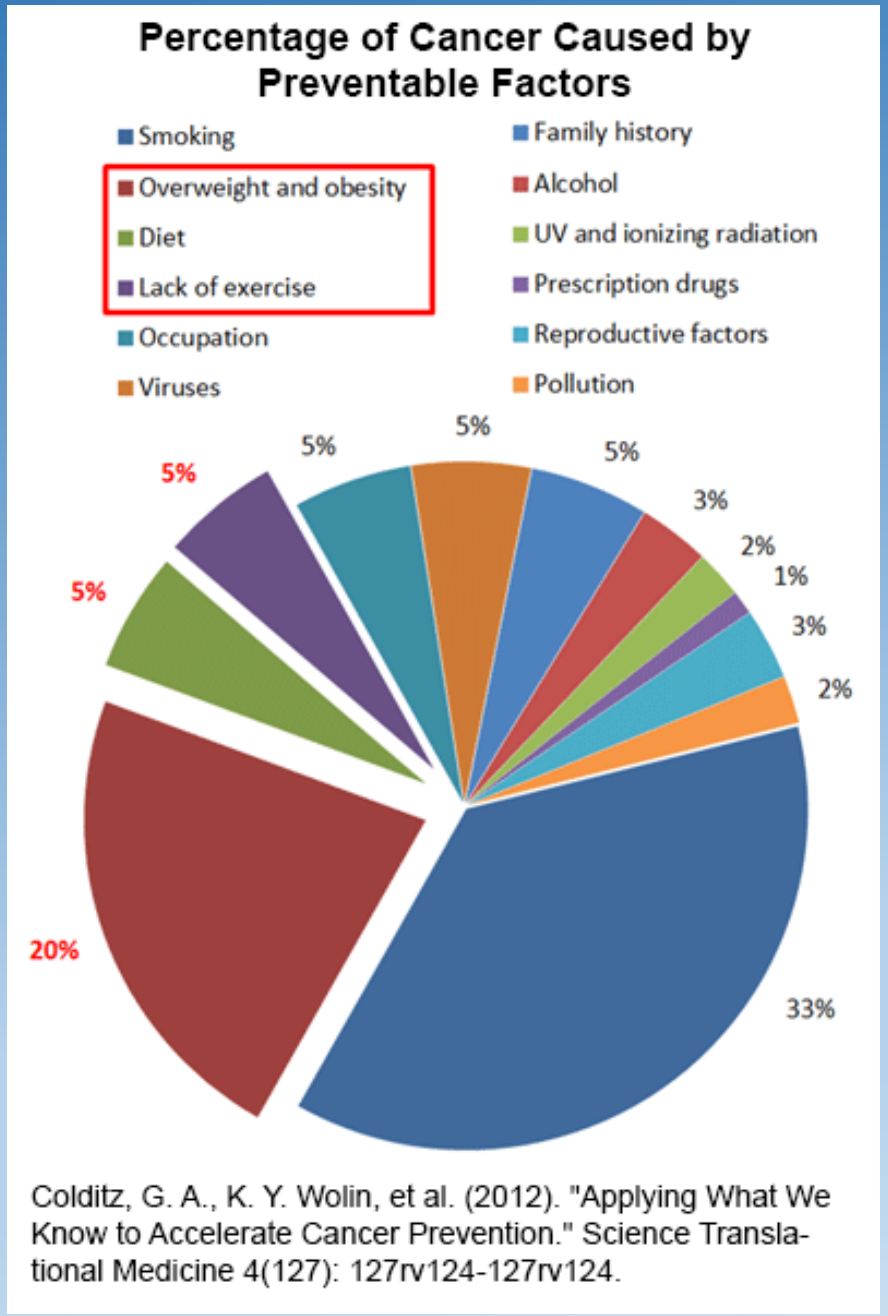
Risk Factors

Table 1. Risk Factors for Breast Cancer

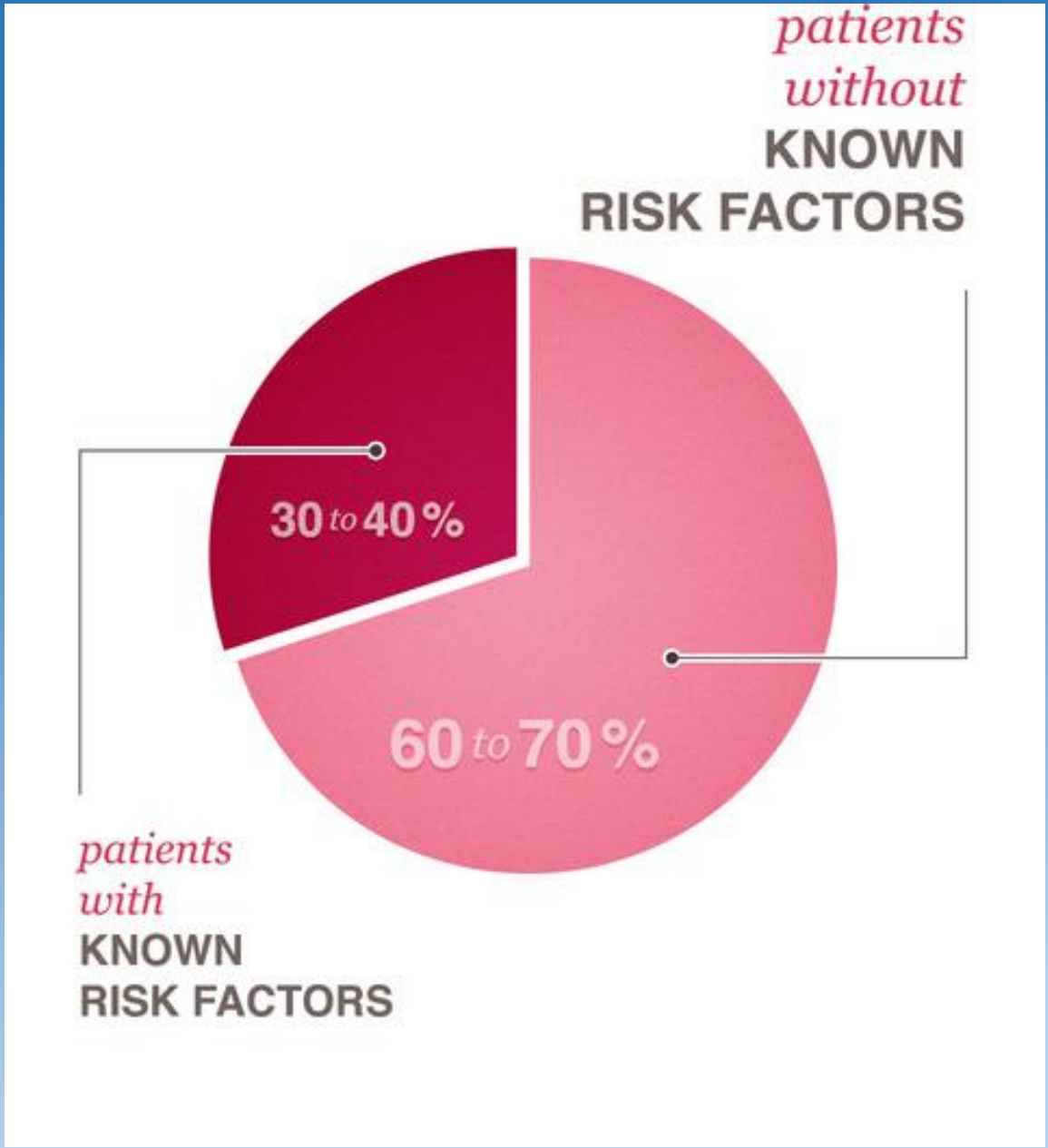
Nonmodifiable	Modifiable
• Female gender	• Not having children (slight risk increase)
• Age (>45 y)	• Oral contraceptives (slight risk increase)
• Genetic changes (mutations, *BRCA*)	• Depo-Provera (slight risk increase)
• Family history of breast cancer	• Hormone therapy after menopause (risk increase after 2 y of use)
• Personal history of breast cancer	• Breastfeeding (slight risk reduction)
• Race and ethnicity (White > African > Asian)	• Alcohol consumption (risk increase)
• Dense breast tissue	• Obesity (risk increase)
• Certain benign breast conditions[a]	• Physical exercise (risk reduction)
• Lobular carcinoma in situ (LCIS)	
• Menstrual periods (early menarche, late menopause)	
• Previous chest radiation	
• Diethylstilbestrol exposure	

[a] *Proliferative lesions with or without atypia.*
BRCA: *breast cancer susceptibility gene. Source: References 1, 2.*

**** SMOKING**



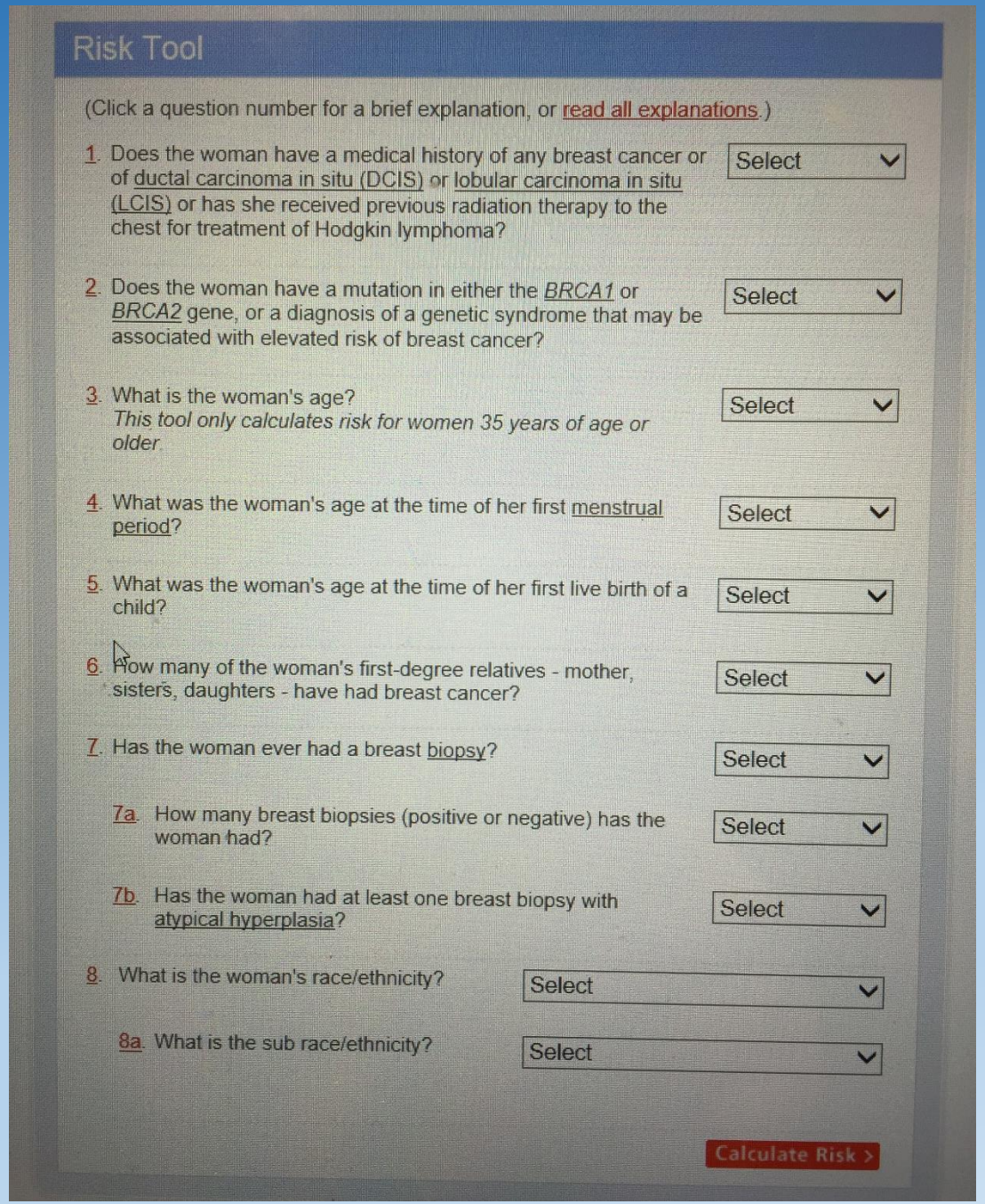
Colditz, G. A., K. Y. Wolin, et al. (2012). "Applying What We Know to Accelerate Cancer Prevention." Science Translational Medicine 4(127): 127rv124-127rv124.



- **5-10% of Breast cancers in women are genetic (40% in men)**
- **Only 15% of women with Breast cancer have a family history**

Computerized Risk Assessment

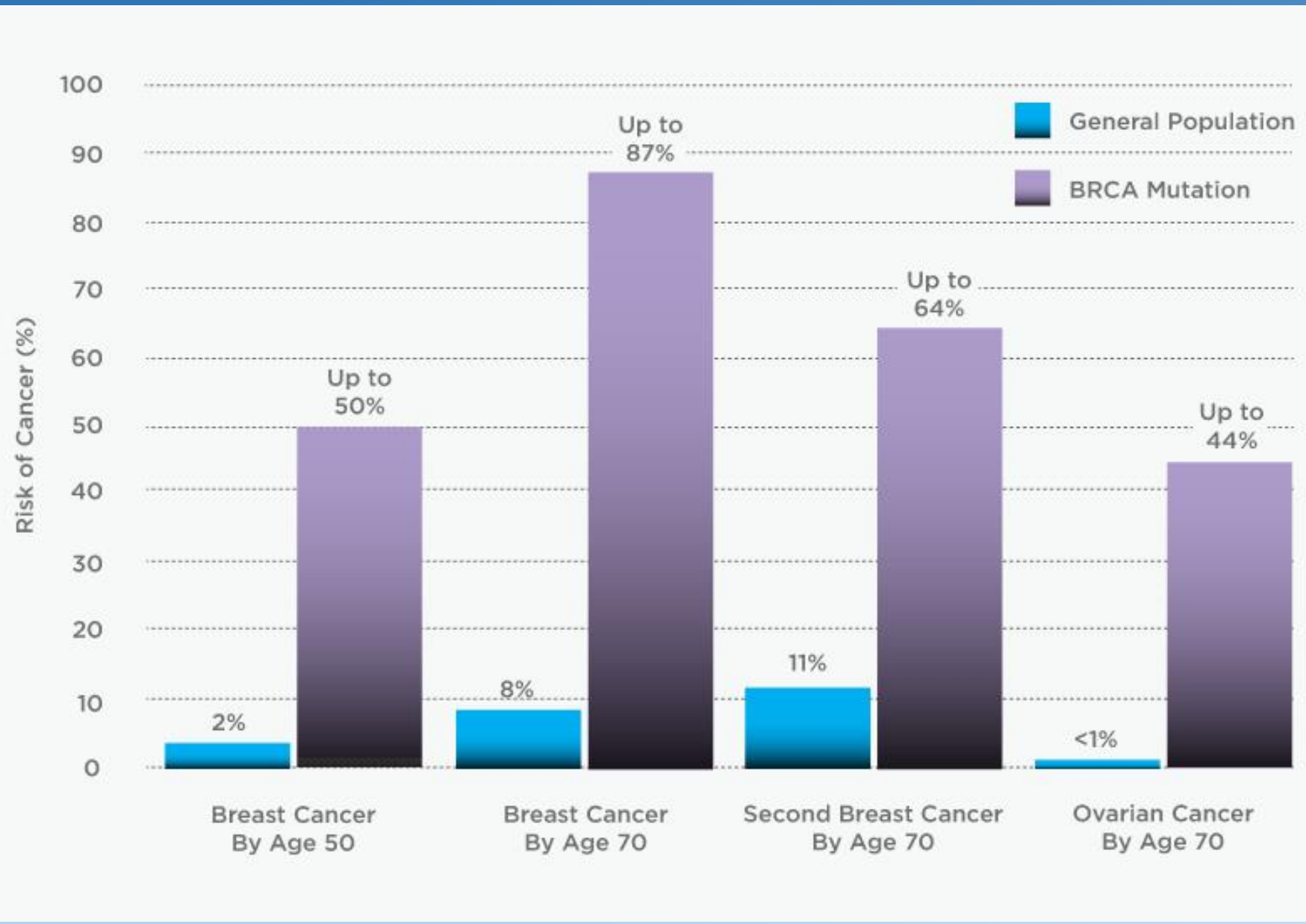
- Gail Model
- Claus model

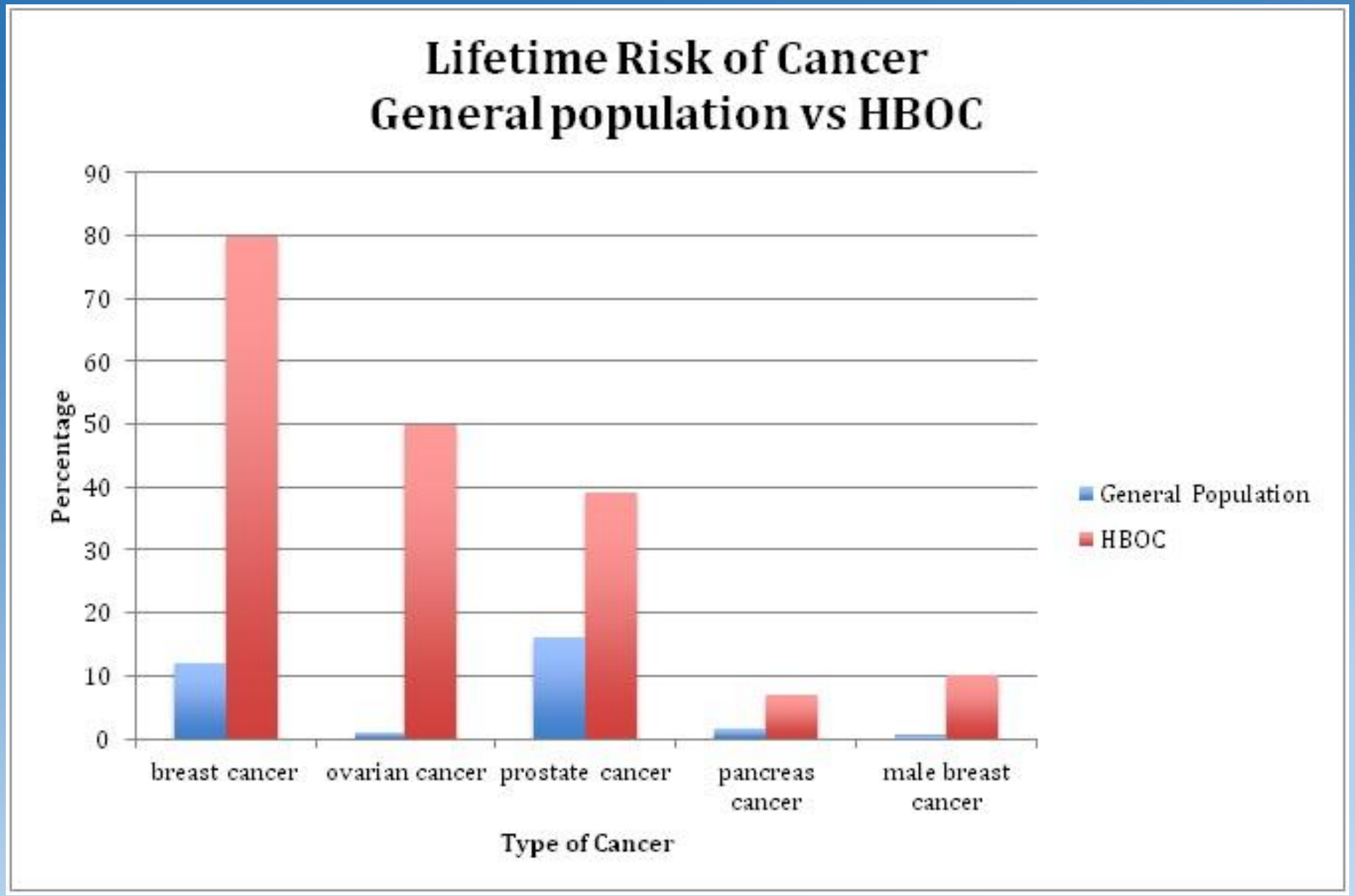


Genetic Testing

- May help you determine if your cancer was due to a genetic mutation and/or help determine if you are at increased risk of cancer/second cancer
- Informed decision making concerning your and your families risk of future cancers (screening recommendations, risk reduction, treatment plans)
- Performed with a mouth wash or blood test
- BRCA 1, BRCA 2, HBOC (BRCA genes repair cell damage)

  *P53, PALB2, CHEK2, STK11, CDH1, PTEN, and more . . .


Risk of Cancer (%)
100
90
80
70
60
50
40
30
20
10
0
General Population
BRCA Mutation
2%
Up to 50%
8%
Up to 87%
11%
Up to 64%
<1%
Up to 44%
Breast Cancer By Age 50
Breast Cancer By Age 70
Second Breast Cancer By Age 70
Ovarian Cancer By Age 70

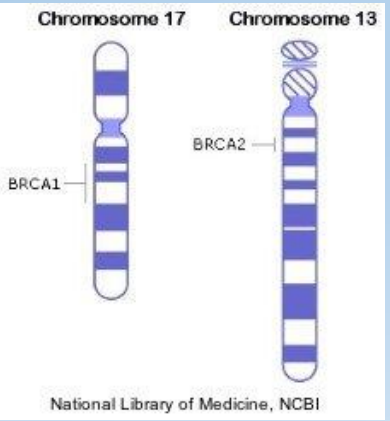


HBOC: Hereditary Breast and Ovarian Cancer

Genetic Testing Indications

<u>An Individual with, or a Family History of any of the following</u>

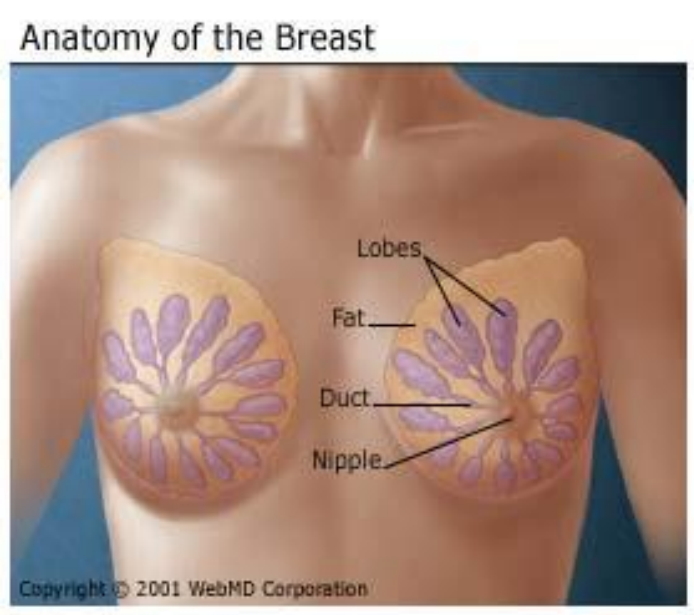
- Breast Cancer diagnosed at age 50 or younger
- Ovarian cancer at any age
- Two primary breast cancers
- Male breast cancer
- “Triple negative” breast cancer
- Pancreatic cancer with HBOC-asso cancer (Breast, ovarian, pancreatic)
- 2 relatives with breast with breast cancer, one under age 50
- 3 relatives with breast cancer at any age
- BRCA mutation in the family

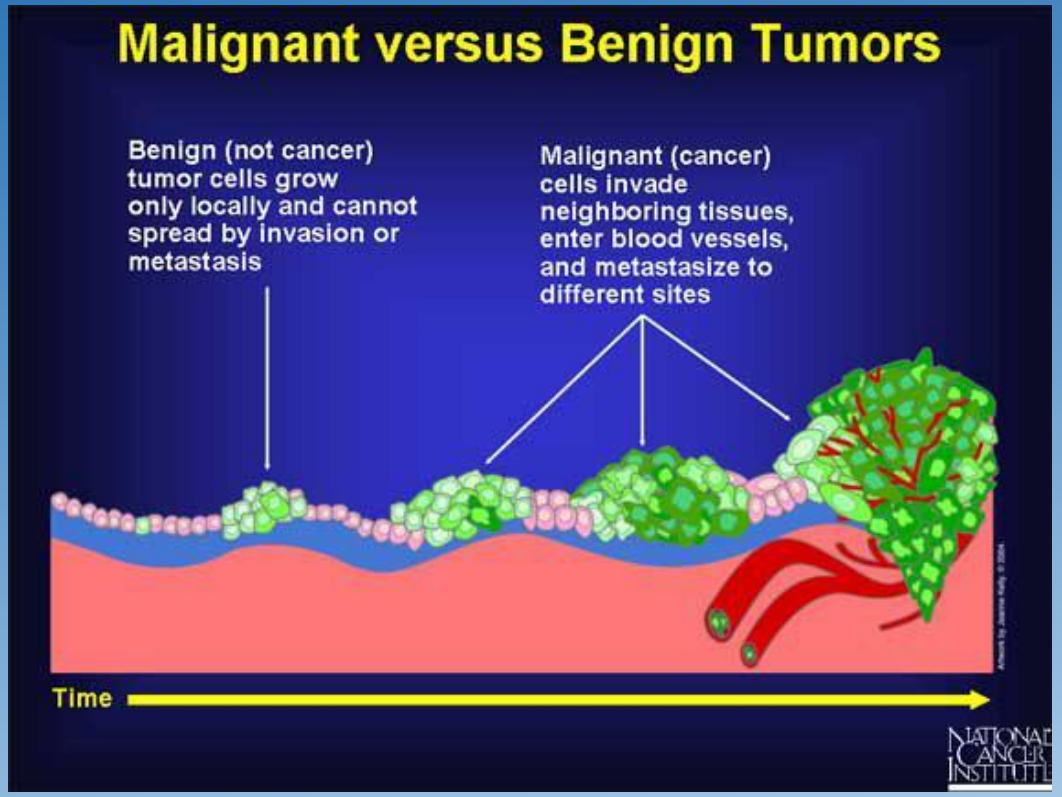


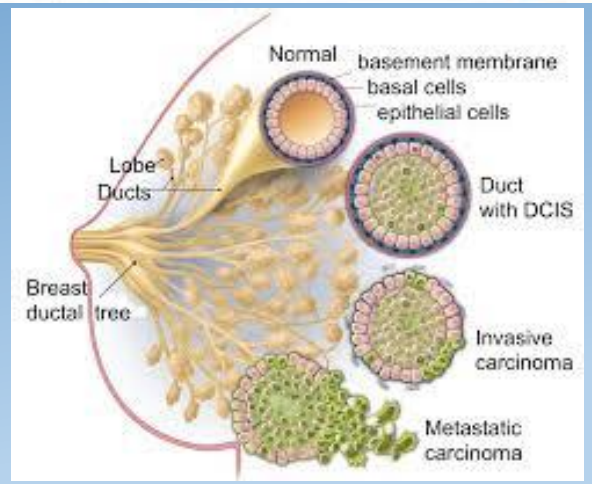
Genetic Counseling

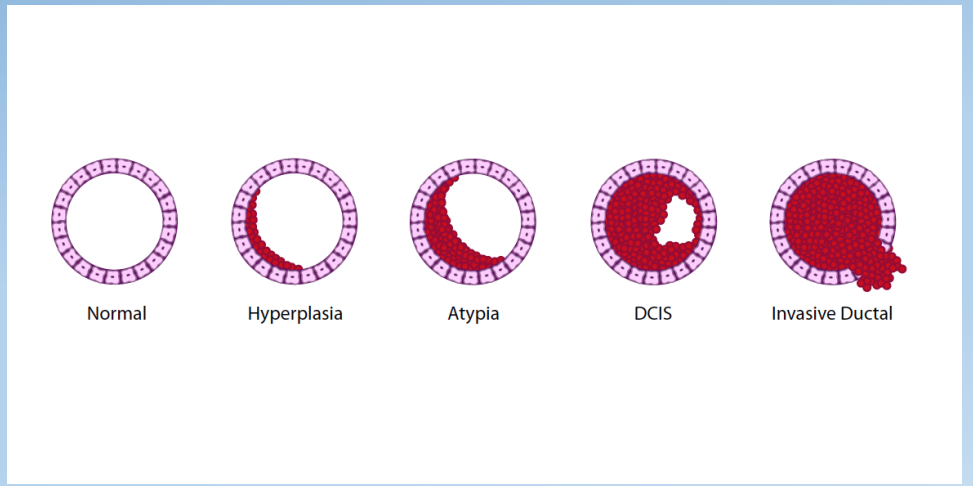
- Hershey Medical Center
  - Dr. Maria Baker PhD
  - 1-800-233-4082

Cancer Basics

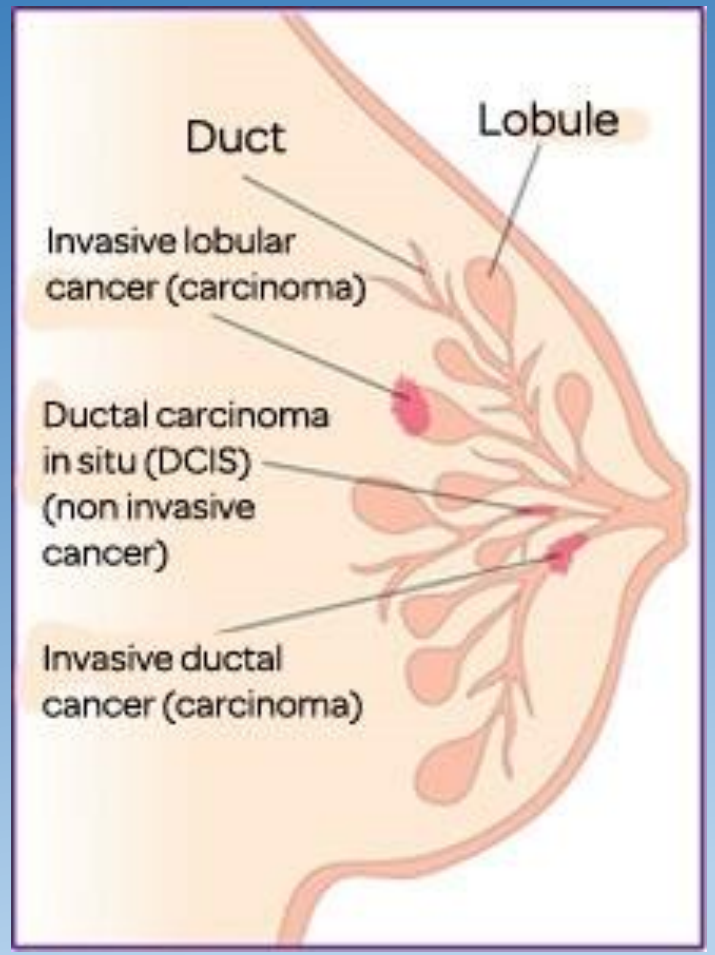


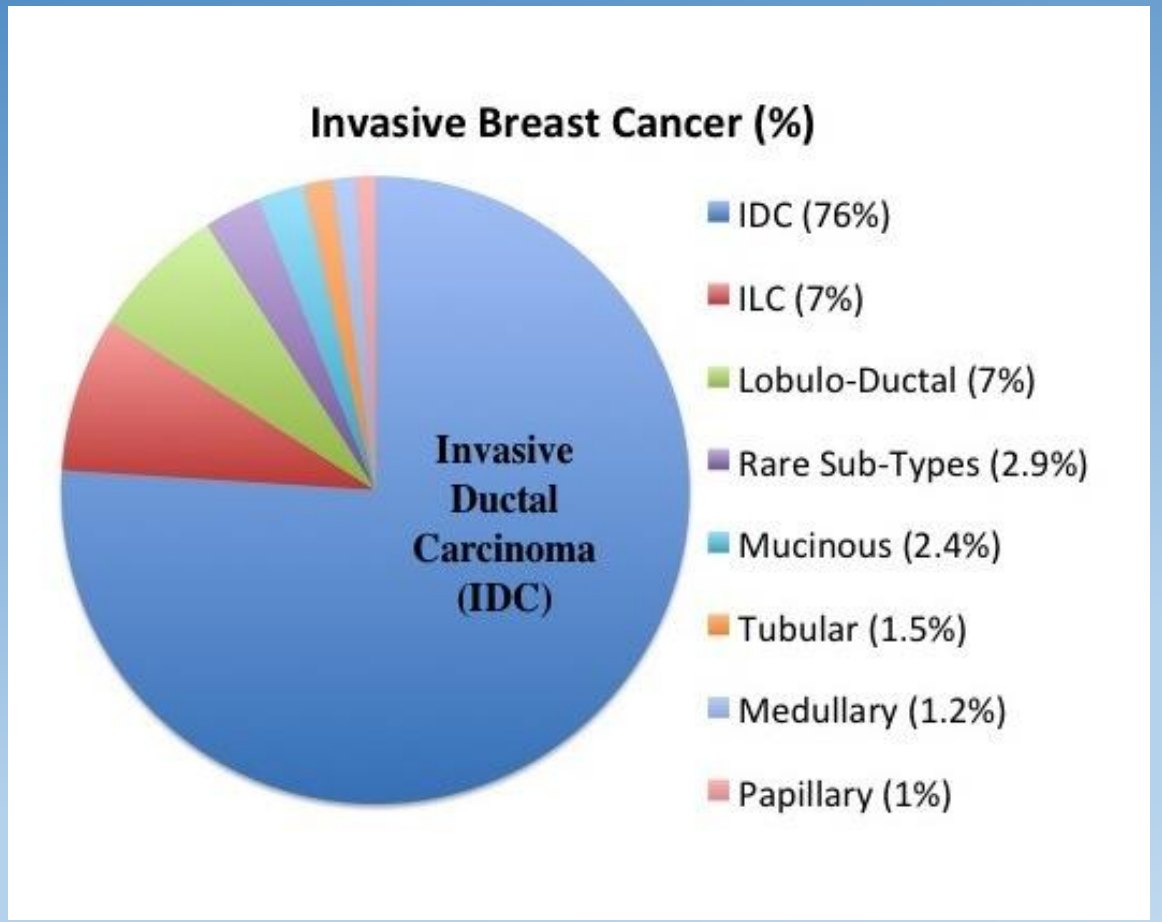






Types of Breast Cancer



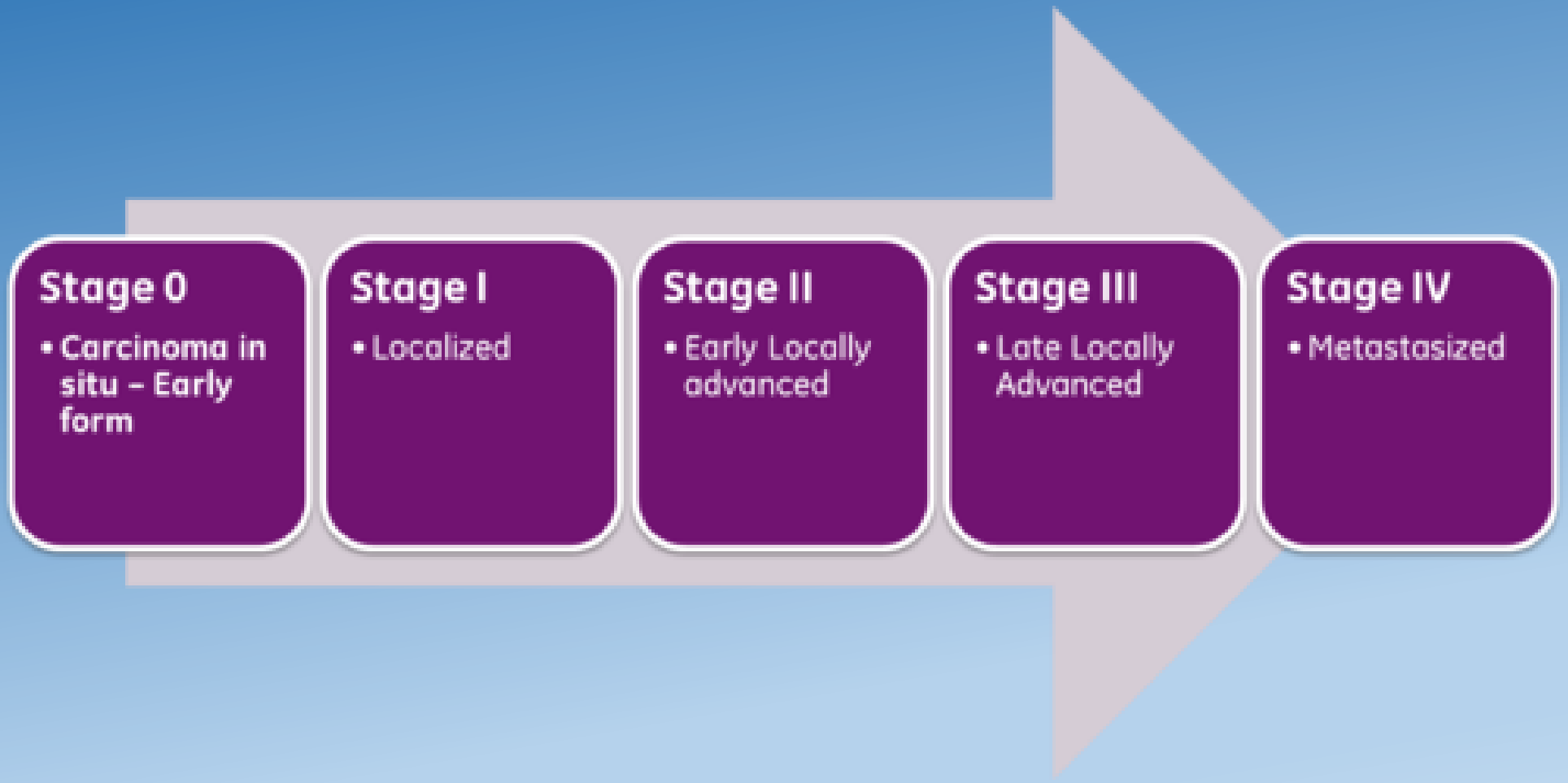


Grading vs Staging

Total Feature Score	Tumor Grade	Appearance of Cells
3-5	Grade 1 Tumor	Well-differentiated (appear normal, growing slowly, not aggressive)
6-7	Grade 2 Tumor	Moderately-differentiated (semi-normal, growing moderately fast)
8-9	Grade 3 Tumor	Poorly-differentiated (abnormal, growing quickly, aggressive)

Staging

Stage	Tumor Size	Lymph Node Involvement	Metastasis (Spread)
I	Less than 2 cm	No	No
II	Between 2-5 cm	No or in same side of breast	No
III	More than 5 cm	Yes, on same side of breast	No
IV	Not applicable	Not applicable	Yes


Stage 0
• Carcinoma in situ – Early form
Stage I
• Localized
Stage II
• Early Locally advanced
Stage III
• Late Locally Advanced
Stage IV
• Metastasized

Staging

5 year Overall Survival by Stage		
Stage	**5- year overall survival**	**Classification**
0	100%	In situ
I	100%	Cancer formed
II	93%	Lymph nodes
III	72%	Locally advanced
IV	22%	Metastatic

http://www.cancer.org/cancer/%20breastcancer/detailedguide/breast-cancer-survival-by-stage

Screening Recommendations

New recommendations on breast cancer screening

The American Cancer Society has updated its guidelines for healthy women with an average risk of getting breast cancer.

	Mammogram		Clinical breast exam	
Age range	Old	New	Old	New
20-39	No	No	Every 3 years	No
40-44	Annual	Optional*	Annual	No
45-54	Annual	Annual	Annual	No
55+	Annual	Every one or two years*	Annual	No

*Based on discussion with doctor about benefits and risks of mammography.

NOTE: Screenings should continue as long as a woman has a life expectancy of 10 years and is a good candidate for breast cancer treatment.

Source: American Cancer Society

@latimesgraphics

Recommendations for Breast Cancer Screening for Average-Risk Women Differ Among Guidelines

ACS[1]	USPSTF (DRAFT)[2]	NCCN[3]	NICE[4]
• **Age 45-54y**: recommends **annual screening mammography** • **Age ≥55y**: recommends **biennial screening mammography** as long as women's overall health is good with life expectancy > 10y • Clinical breast examination is not recommended	• Age 40-49y: the decision to start screening mammography should be an individual one [Grade C] • **Age 50-74y**: recommends **biennial screening mammography** [Grade B] • Age ≥75y: concludes insufficient evidence to assess benefits and harms of screening [Grade I]	• Age 25-39y: recommends clinical breast examination every 1-3y • **Age ≥40y**: recommends annual clinical breast exam, **annual screening mammography**	• Age 50-70y: invited for **screening mammography every 3 years**

ACS: American Cancer Society; NCCN: National Comprehensive Cancer Network; NICE: National Institute for Health and Care Excellence; USPSTF: US Preventive Services Task Force

1. Oeffinger KC et al. Breast Cancer Screening for Women at Average Risk: 2015 Guideline Update From the American Cancer Society. JAMA. 2015 Oct 20;314(15):1599-1614.
2. USPSTF. Draft Recommendation Statement. Breast Cancer: Screening. Available at: http://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementDraft/breast-cancer-screening1. Accessed October 27, 2015.
3. NCCN. Breast Cancer Screening and Diagnosis. Version 1. 2015. Available at: http://www.nccn.org/professionals/physician_gls/pdf/breast-screening.pdf. Accessed October 27, 2015.
4. NICE. Early and Locally Advanced Breast Cancer: Diagnosis and Treatment. Published February 2009. Last Reviewed April 2012. Available at: http://www.nice.org.uk/guidance/cg80. Accessed October 27, 2015.

Methods of Breast Imaging

- Mammography
- Ultrasound
- MRI – testing without contrast
- Tomosynthesis – Mammography
- 3-D Ultrasound
- Nuclear Medicine – BSGI (Setamibi) and PEM
- Elastography - Ultrasound
- Optico-acoustic – Ultrasound
- Electrical Impedance Imaging
- Thermal Imaging – Not effective 2012

Breast Screening

- Mammography
  - 30-60% reduction of breast cancer mortality (50+)

Angoff Consensus - Screening Mammography

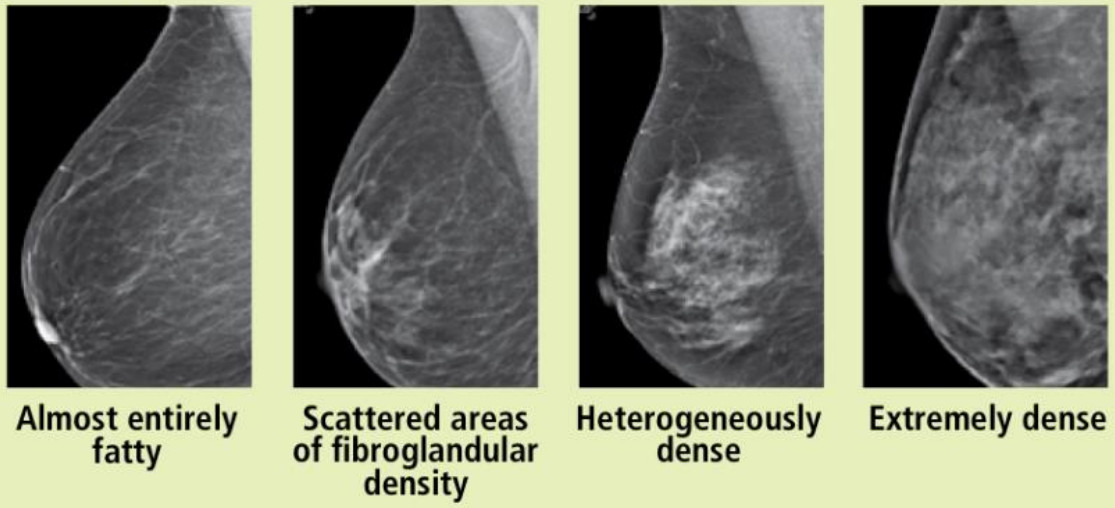
Cancer Detection rate:	>2.5 per 1000
Recall Rate	5 – 12%
PPV1	3 – 8%
PPV2	20 – 40%
Sensitivity	>75%
Specificity	88 – 95%

Radiation Exposure from Mammography

- New equipment is low dose radiation
- 2 view mammogram = 0.4 mSv
- Radiation from natural surroundings is 3-5 mSv (> 12 x mammogram)
- Mammogram radiation dose = 7 weeks of background radiation (10 days in Denver)
- No significant increased risk of breast cancer due to screening mammograms.

Breast Density and why it matters

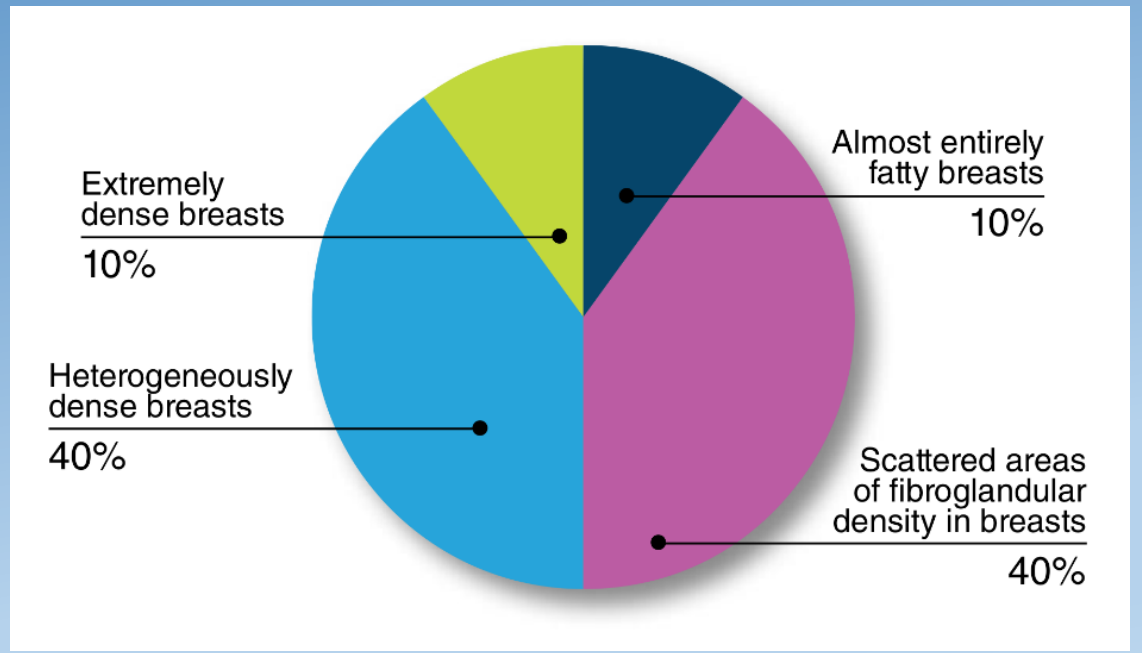
Radiologists classify breast density using a 4-level density scale:



Almost entirely fatty | Scattered areas of fibroglandular density | Heterogeneously dense | Extremely dense

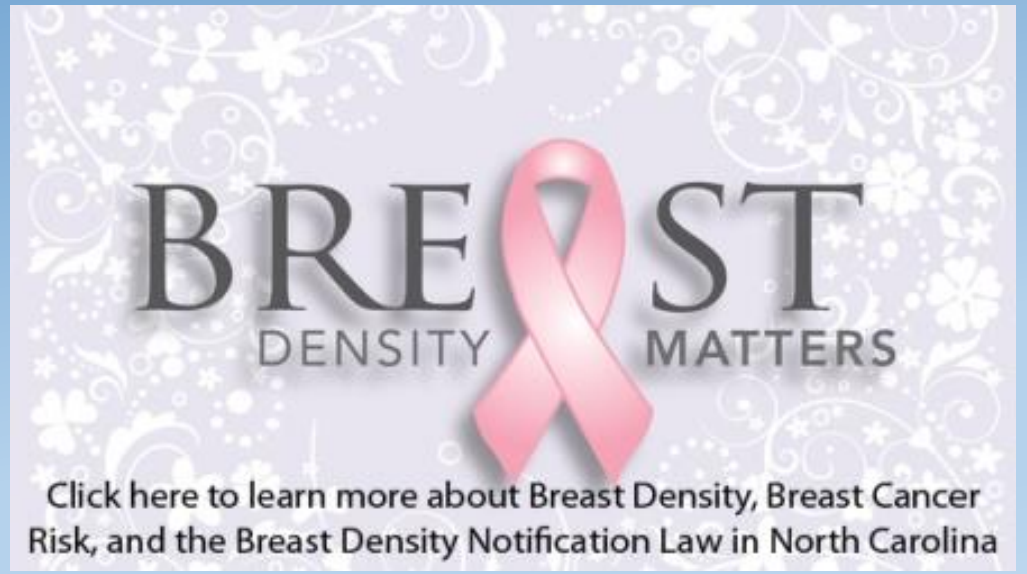
Breast density in the U.S. (See pie chart)

- 10% of women have almost entirely fatty breasts
- 10% have extremely dense breasts
- 80% are classified into one of two middle categories



Breast Density and why it matters

- Although the cause is uncertain, there is a higher risk of breast cancer in women with dense breasts (4 – 8 X increase from fatty to dense)
- The sensitivity and specificity of mammography decrease as breast density increases



Breast Density and why it matters

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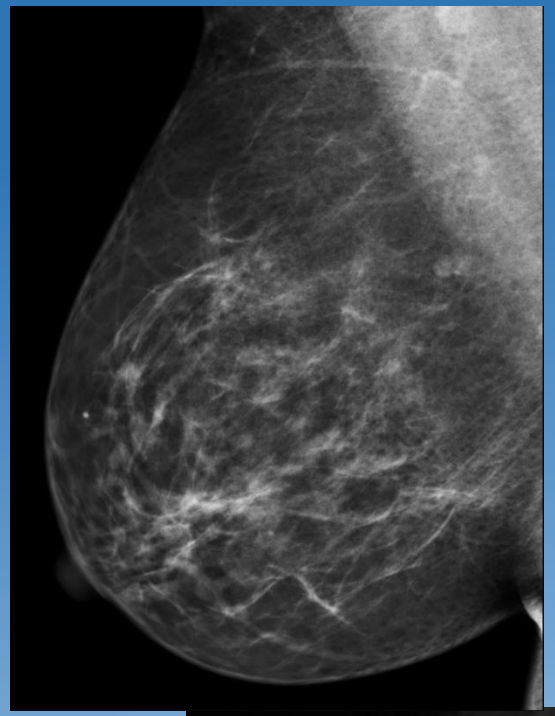
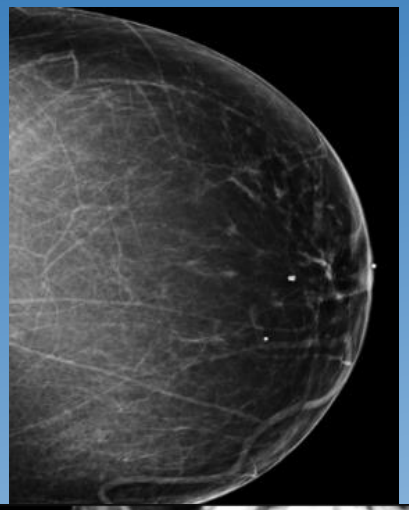
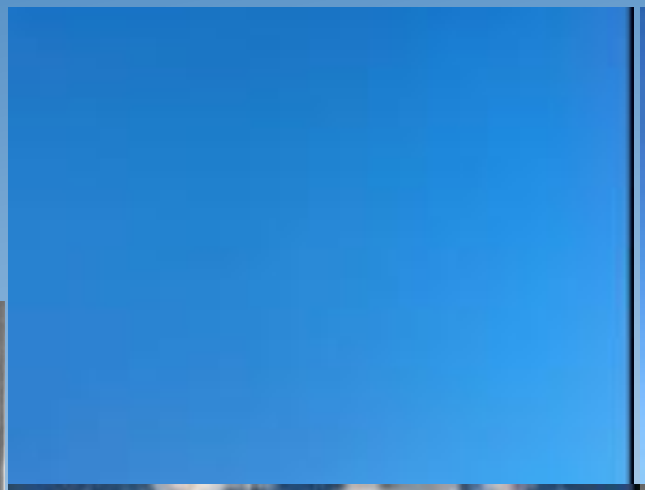
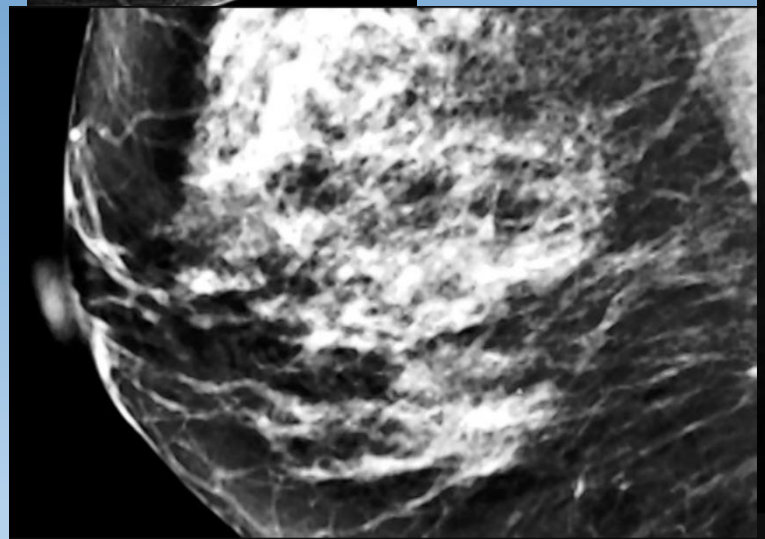
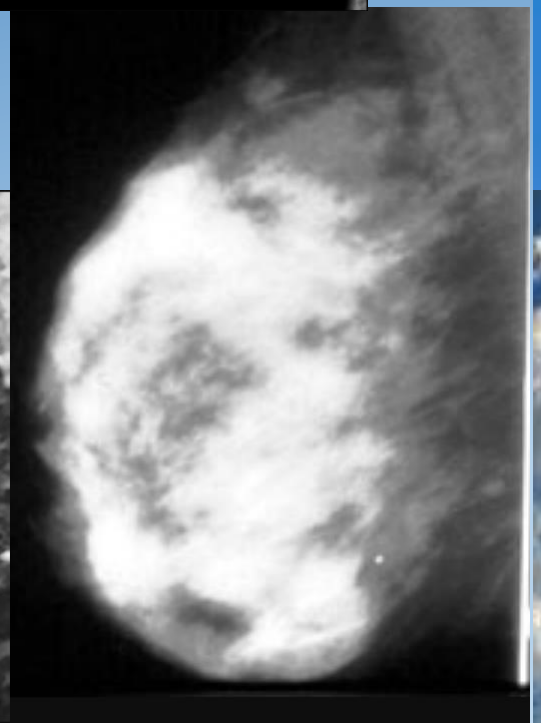
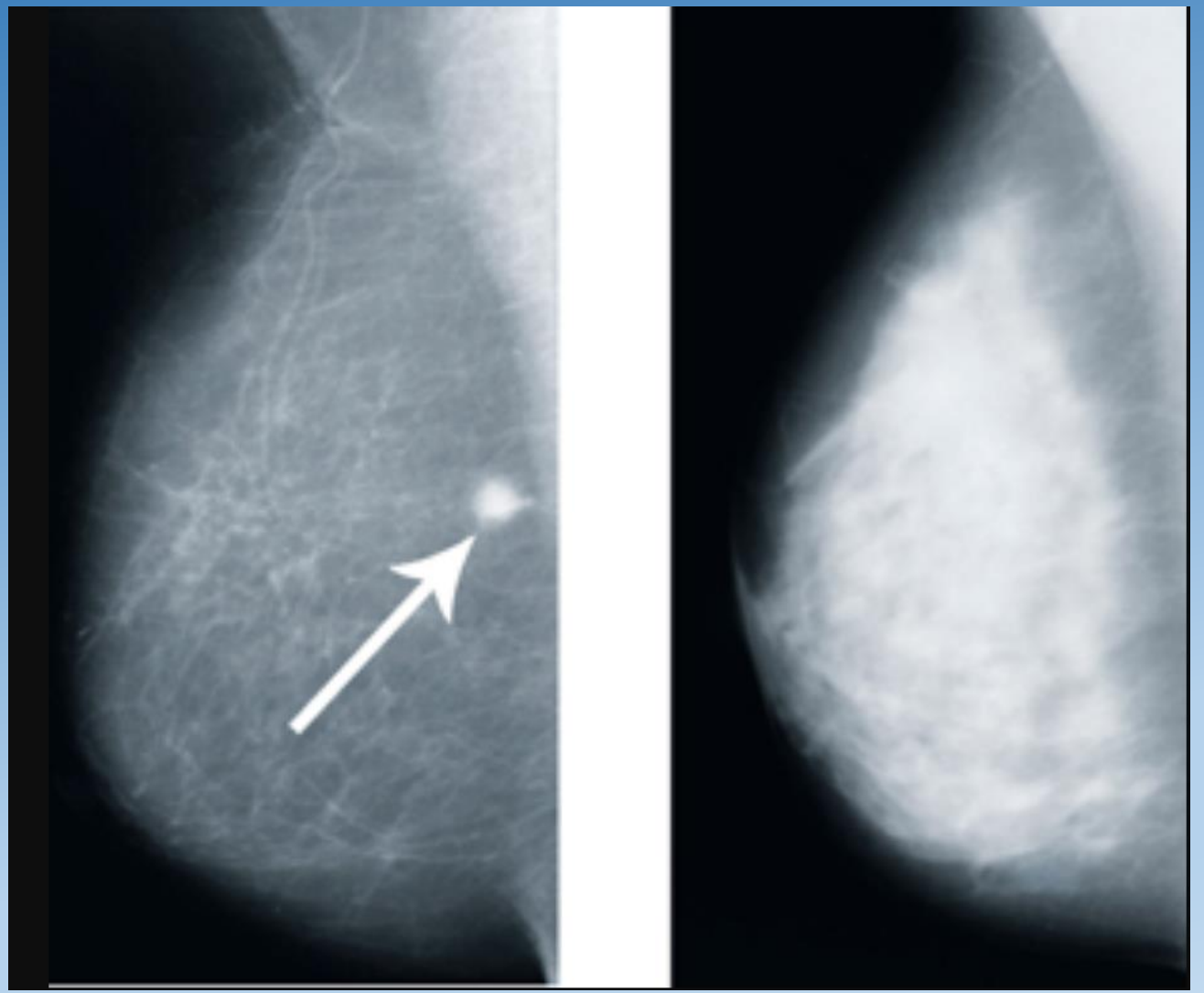


Breast Density and why it matters



Breast Density Notification Act

THE GENERAL ASSEMBLY OF PENNSYLVANIA

SENATE BILL

No. 358 Session of 2013

INTRODUCED BY MENSCH, GREENLEAF, TEPLITZ, VULAKOVICH, KASUNIC, WASHINGTON, HUGHES, WILLIAMS, FARNESE, YUDICHAK, TARTAGLIONE, BROWNE, ERICKSON, RAFFERTY, FERLO, SOLOBAY, ALLOWAY, COSTA, BOSCOLA, BAKER, BREWSTER AND WOZNIAK, JANUARY 31, 2013

REFERRED TO PUBLIC HEALTH AND WELFARE, JANUARY 31, 2013

Breast Density Notification Act

"This notice contains the results of your recent mammogram, including information about breast density. If your mammogram shows that your breast tissue is dense, you should know that dense breast tissue is a common finding and is not abnormal. Statistics show many women could have dense or highly dense breasts. Dense breast tissue can make it harder to find cancer on a mammogram and may be associated with an increased risk of cancer. This information about the result of your mammogram is given to you to raise your awareness and to inform your conversations with your physician. Together, you can decide which screening options are right for you, based on your mammogram results, individual risk factors or physical examination. A report of your results was sent to your physician."

Together, you can decide which screening options are right for you, based on your mammogram results, individual risk factors or physical examination. A report

Supplemental Imaging

- Tomosynthesis
- Ultrasound
- MRI

Tomosynthesis

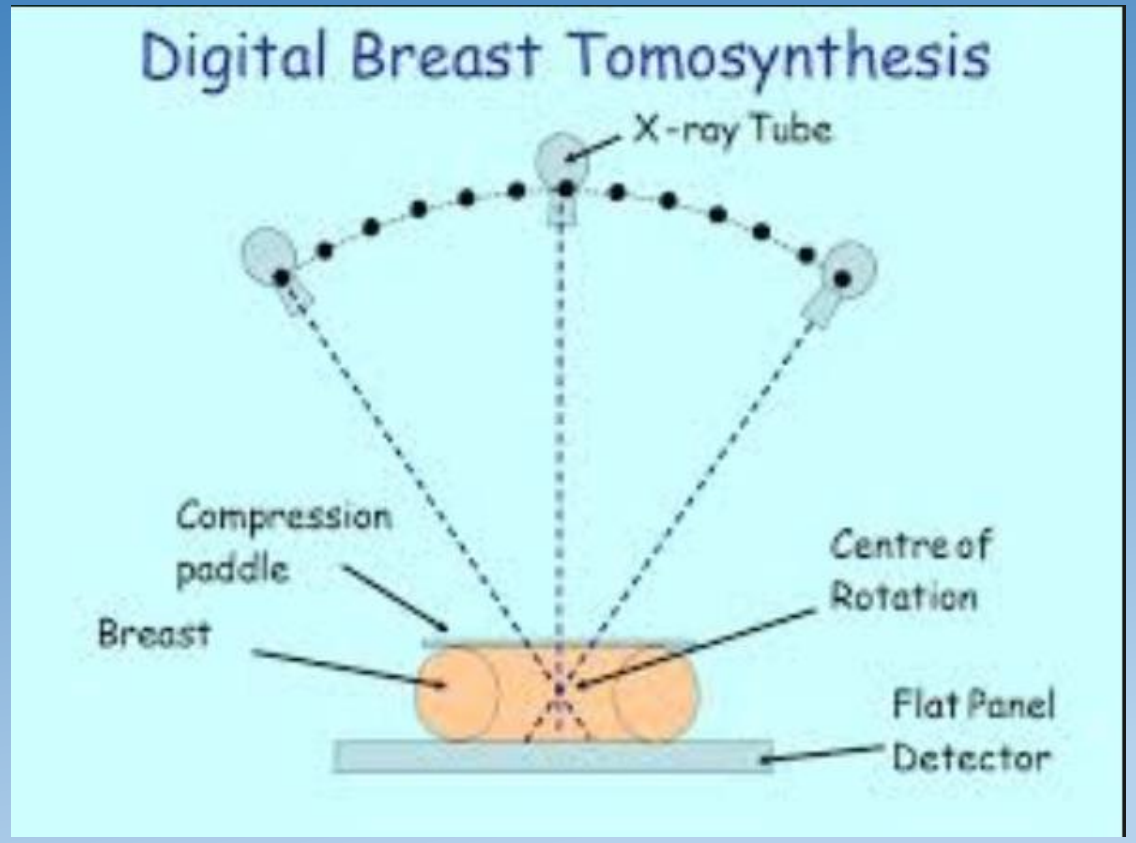
- “3D Mammography”
- Obtains slices through the breast to limit overlap of tissues
- Slight increased radiation dose (double but low)

20%

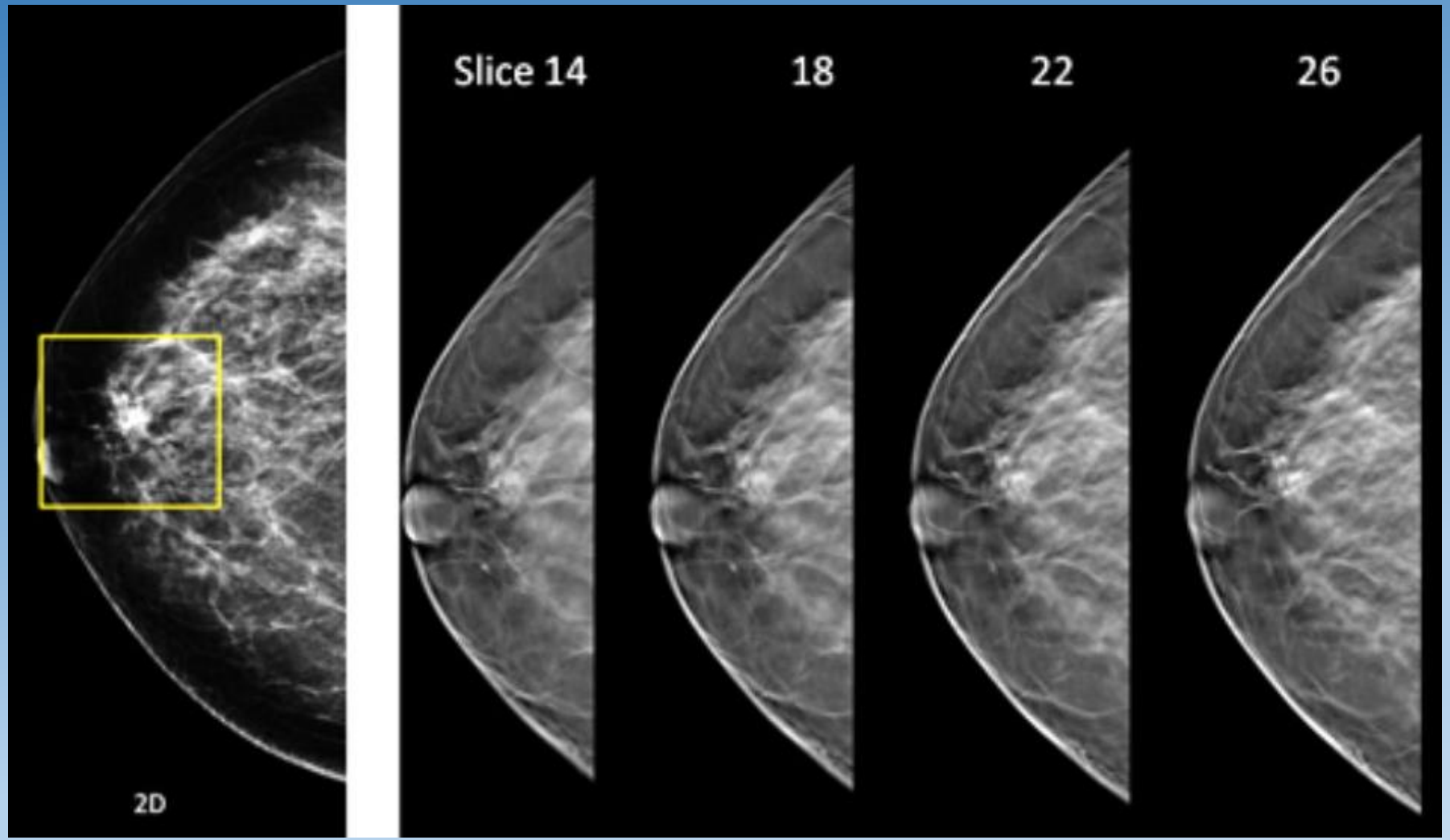
50%

50% Positive bx rate

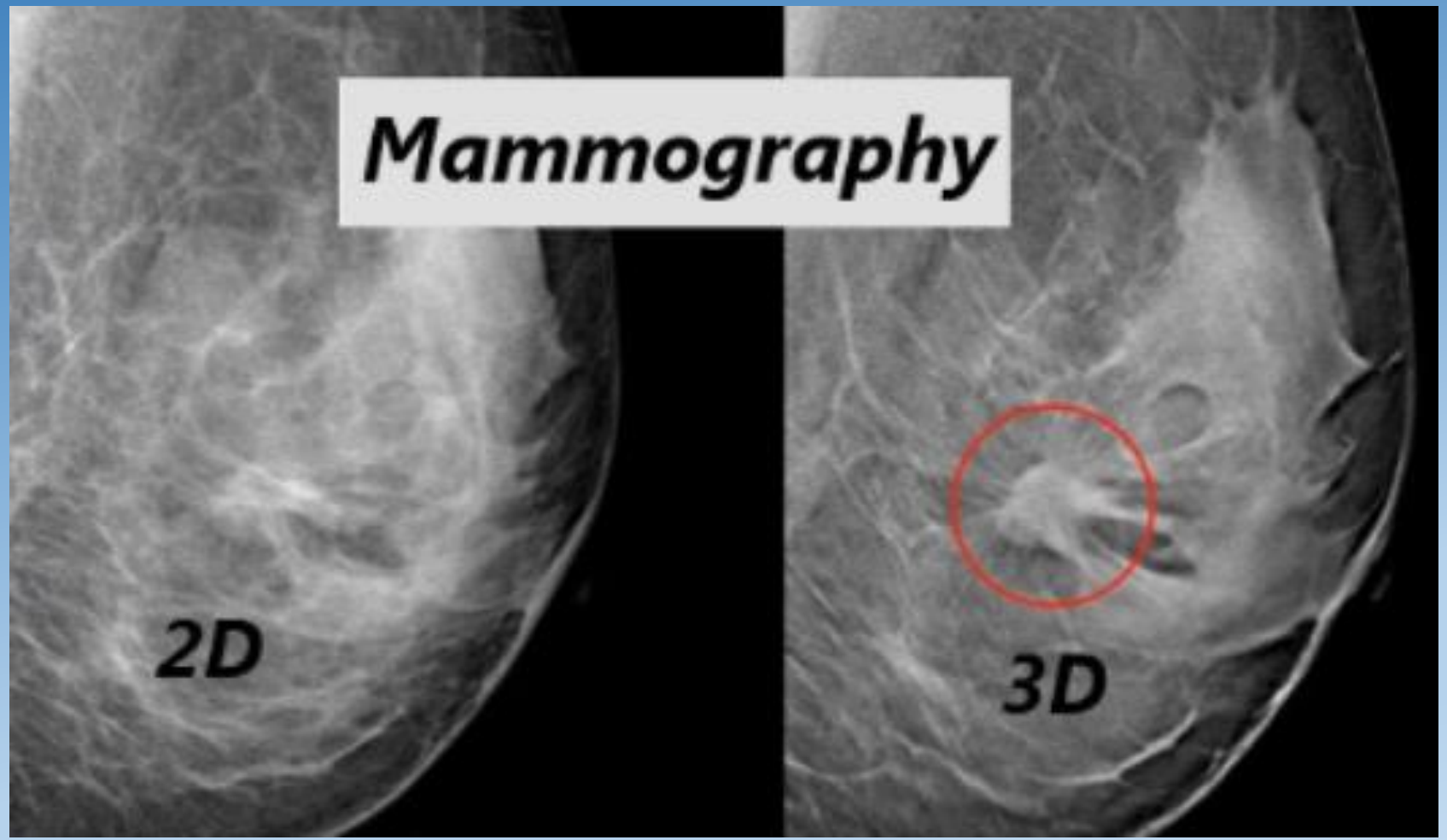
Tomosynthesis



Tomosynthesis

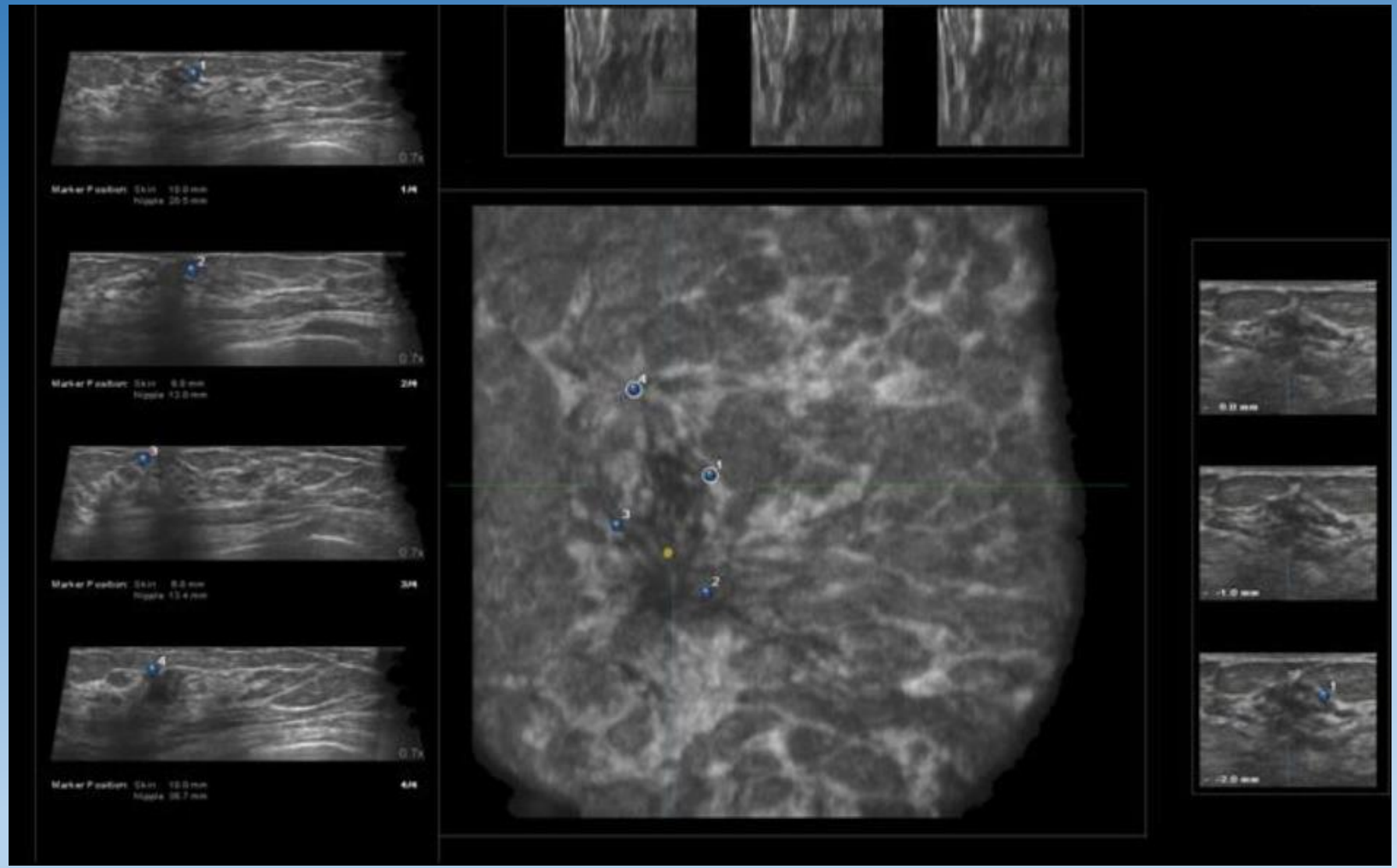


Tomosynthesis



“Screening” Breast Ultrasound

“Screening” Breast Ultrasound



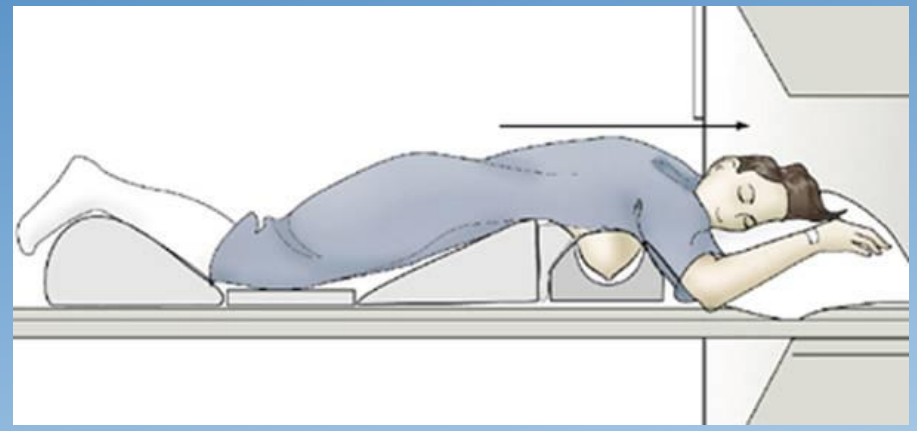
“Screening” Breast Ultrasound

- The addition of ABUS to screening mammography increases the detection rate of invasive cancer by more than 35% (similar detection rate as mammography of 3.7/1000)
- False positive call back rate is increased by up to 50%. Likewise increases false positive biopsy rate.

Breast MRI

Current indications:

- Screening high risk patients
- Post lumpectomy with positive margins
- Neoadjuvant chemotherapy
- Evaluate recurrence if inconclusive
- Metastatic disease of unknown primary
- Lesion characterization
- MRI guided biopsy



Breast MRI

Current indications:

- Screening high risk patients
    - Women with 20-25% or greater lifetime risk of breast cancer
    - BRCA mutation
    - Hodgkin's disease treatment
    - Strong FH of breast or ovarian cancer
    - Not enough evidence for dense breasts or pts with h/o br ca
- Adding MRI to screening mammography is better than adding US.

- Dr. Christopher Sneider
  - Surgery
- CRMC/PSU Cancer Center
  - Dr. Irina Sachelarie
  - Dr. Julia Blum
- Tracie Osborn RN, BSN,
  - Breast Nurse Navigator (960-3254)