Disparities in Breast Cancer

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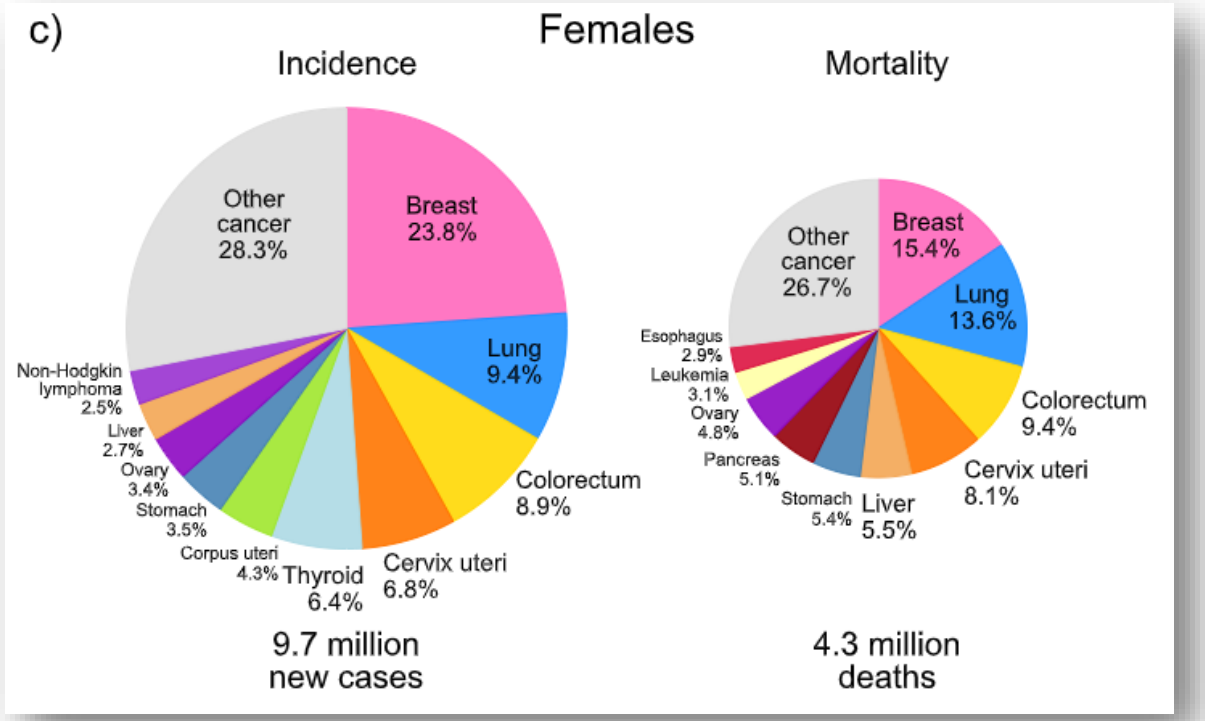
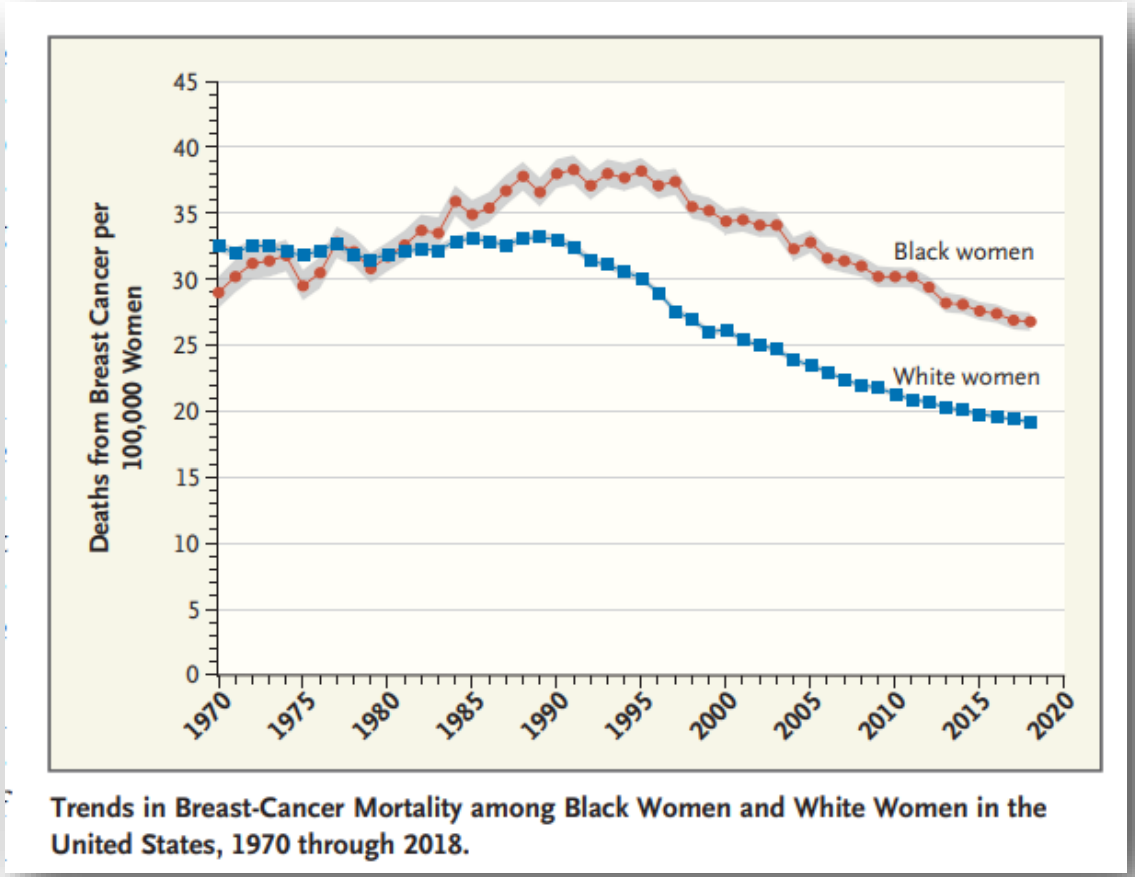
Breast Cancer Incidence and Mortality

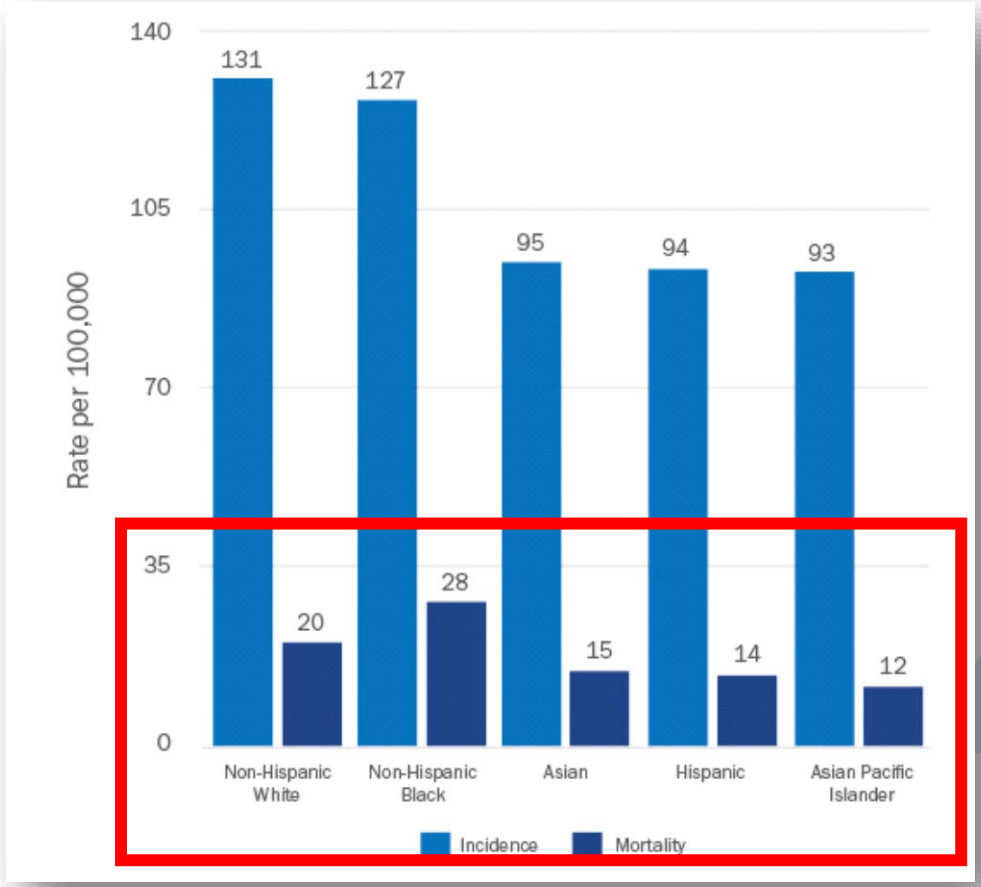


Bray et al, Global Cancer Statistics 2022, CA Cancer J Clin, 2024
SEER Incidence & U.S. Mortality 1992-2020

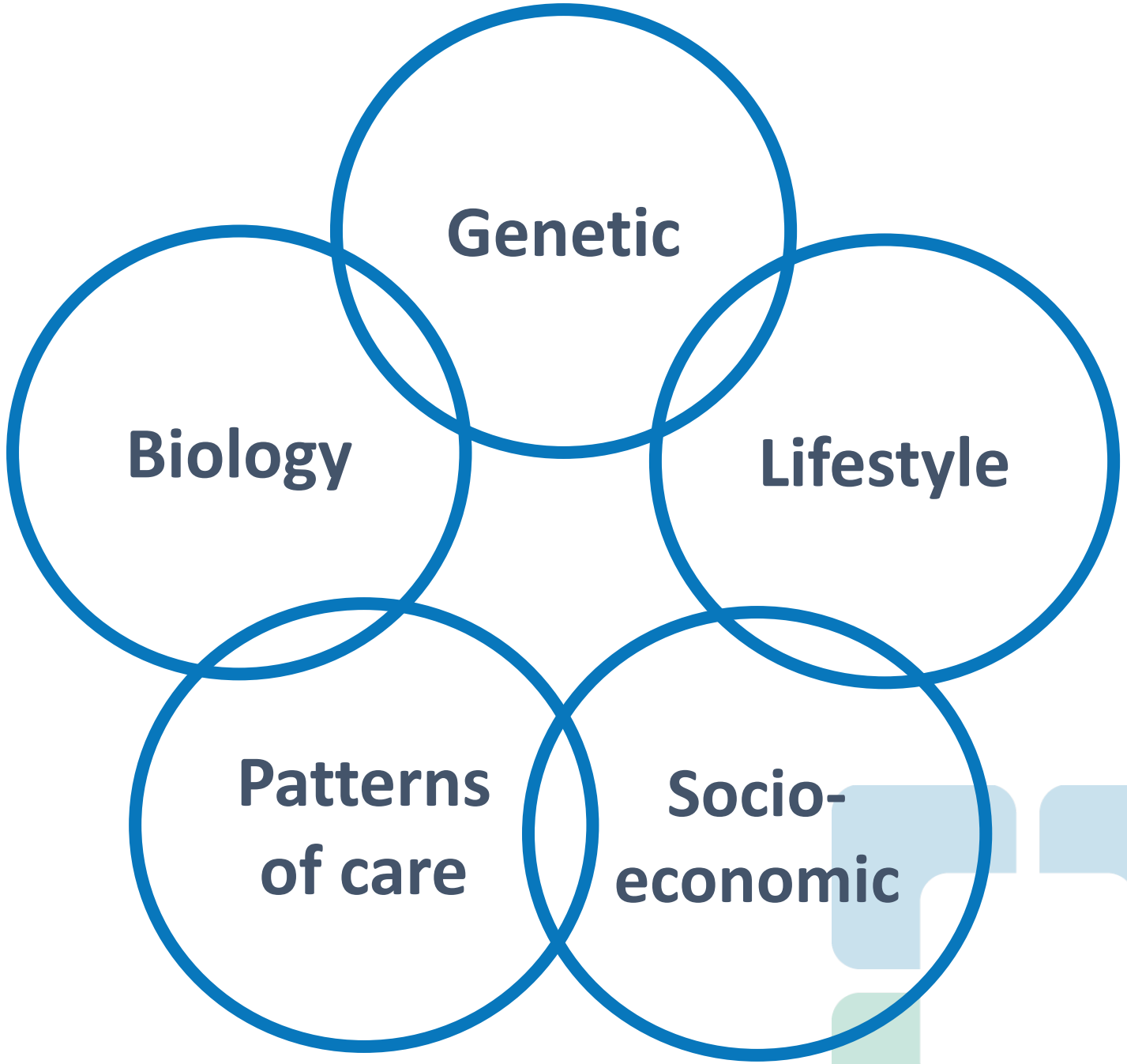
Disparities in Breast Cancer Incidence and Mortality are Well Documented



Trends in Breast-Cancer Mortality among Black Women and White Women in the United States, 1970 through 2018.



De Santis et al, CA Cancer J Clin, 2019
Jatoi I et al, NEJM, 2022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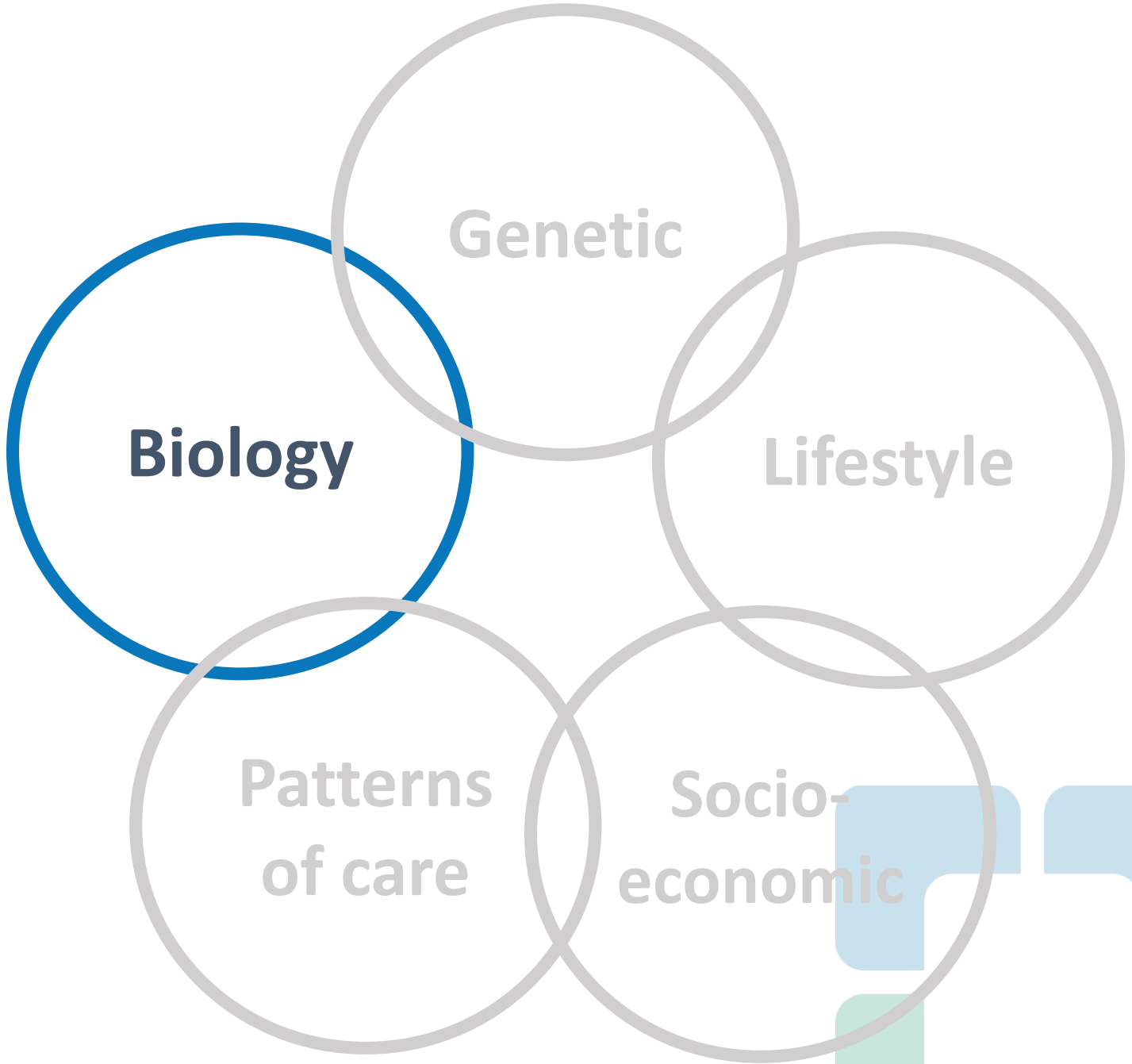
Patterns of care
Socio-economic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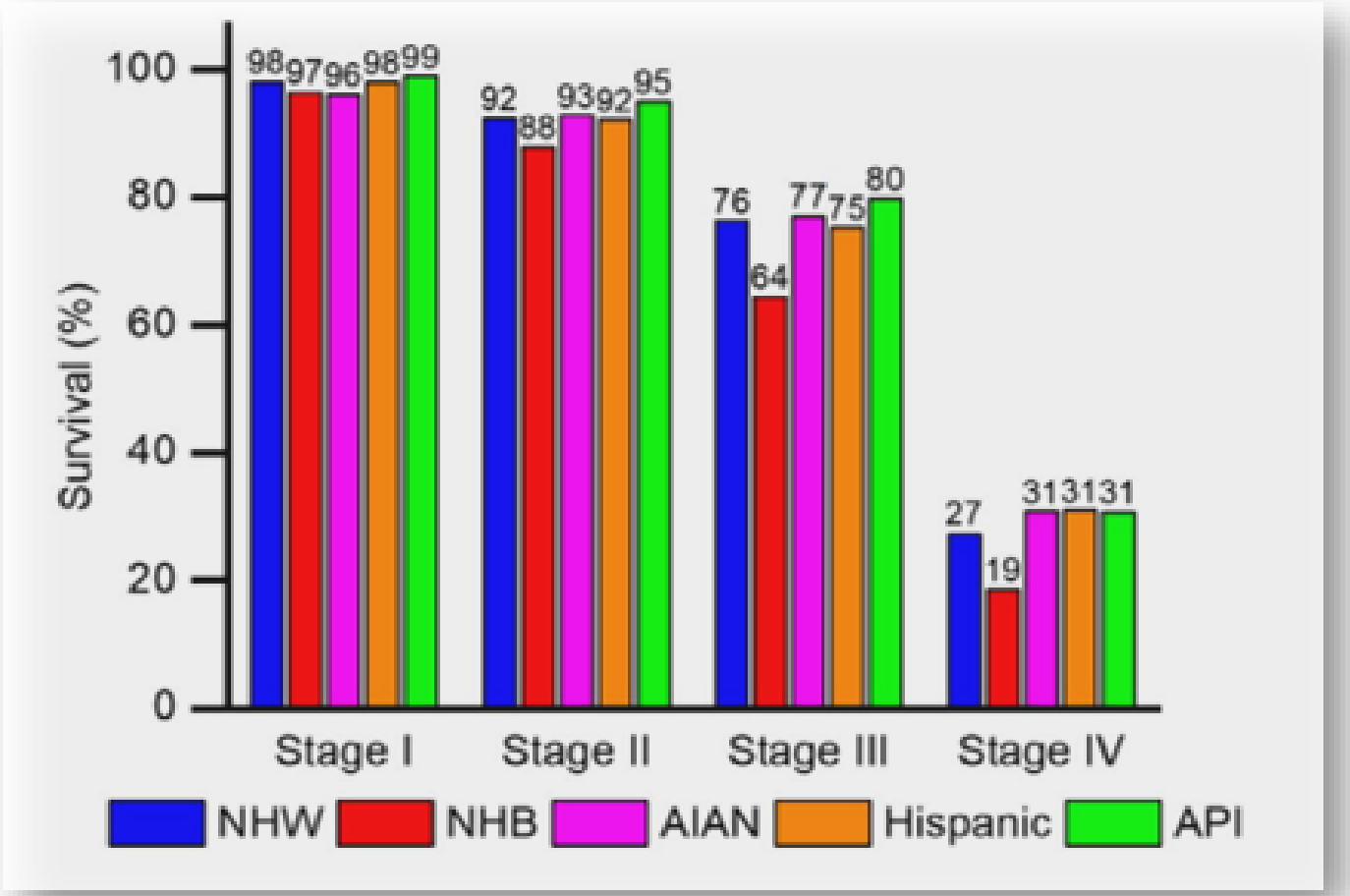
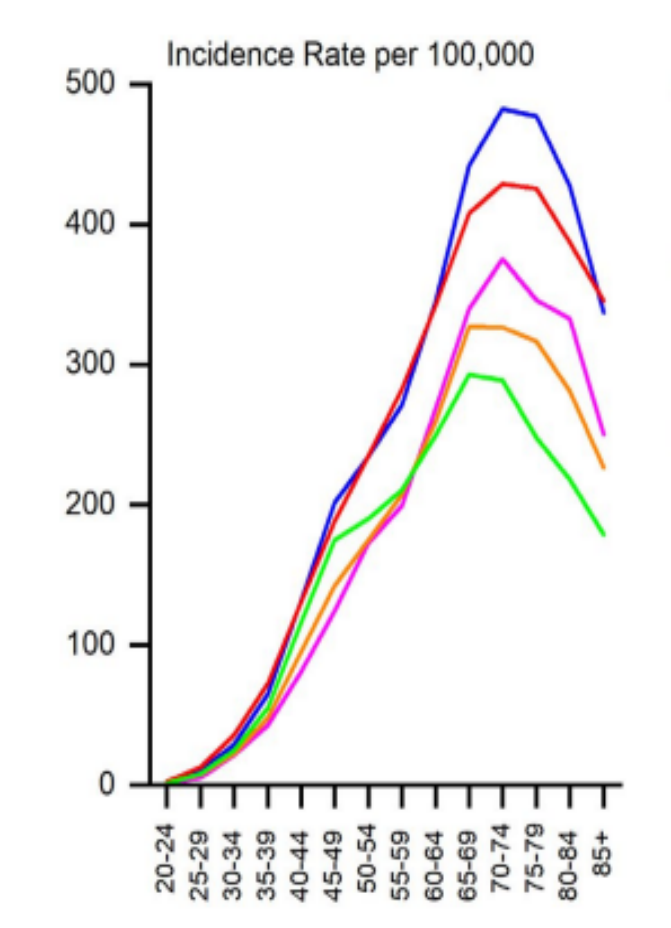
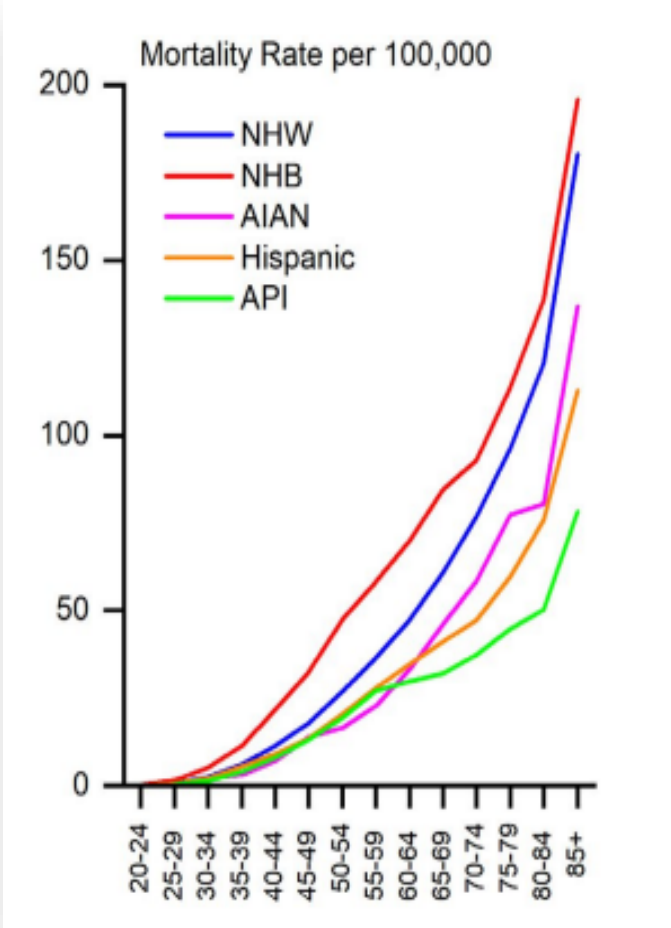
Breast Cancer Survival is Highest for Asian Pacific Islanders and Lowest for Black Women



De Santis et al, CA Cancer J Clin, 2019

Black Women Are More Likely to Die From Breast Cancer at Any Age

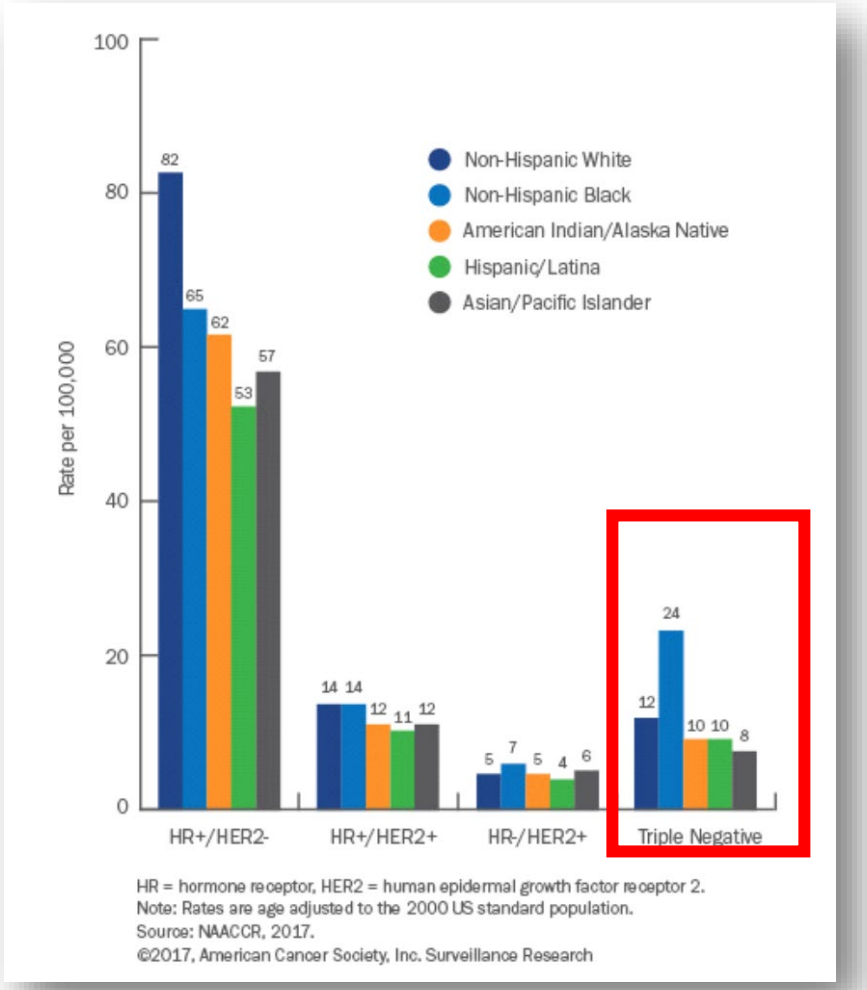


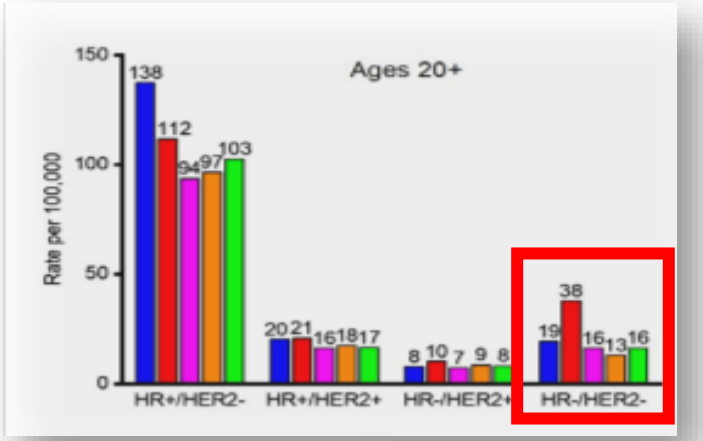


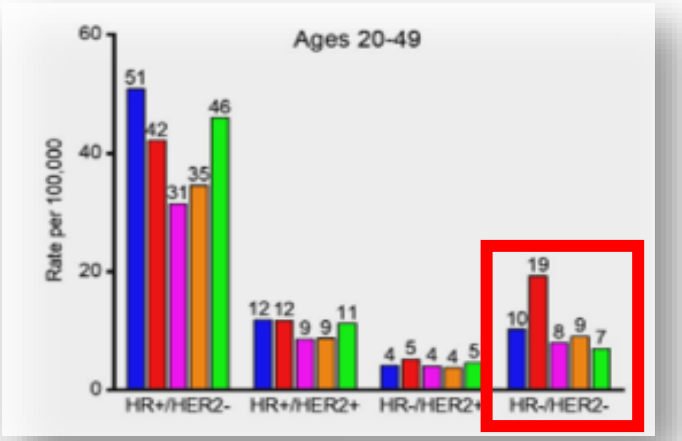
De Santis et al, CA Cancer J Clin, 2019

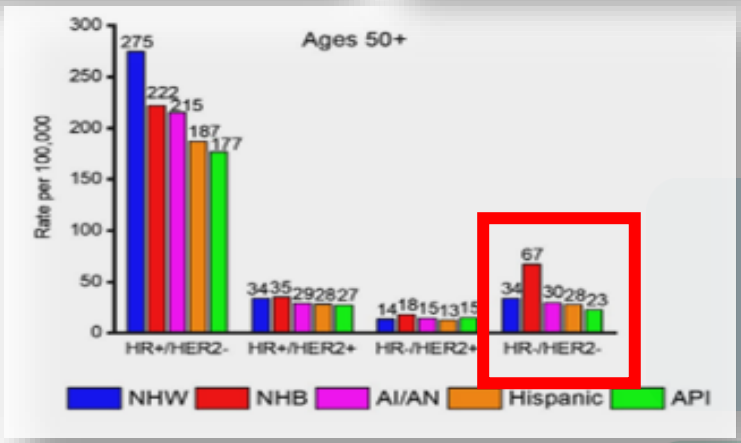
Why do Black Women have 40% Higher Mortality Rates?

Triple Negative Breast Cancer is Twice as High in Black Women









DeSantis CE et al, CA Cancer J Clin 2019
Newman L, JAMA Surg, 2017

Age at Diagnosis

Table 1
Proportion diagnosed by age and race/ethnicity

Age at Diagnosis	All Races	NH White	NH Black	Hispanic	API	AI/AN
20–39	5%	4%	7%	8%	8%	6%
40–49	14%	12%	16%	21%	23%	15%
50–59	23%	22%	27%	26%	26%	27%
60–69	28%	29%	26%	24%	25%	28%
70–79	20%	21%	16%	14%	13%	17%
80+	11%	13%	8%	7%	6%	7%

De Santis et al, CA Cancer J Clin, 2019
De Santis et al, CA Cancer J Clin, 2017

Reported Frequencies of ER- or TNBC is Highest in West Africa

Table 2. Reported Frequencies of ERN or TNBC in Africa

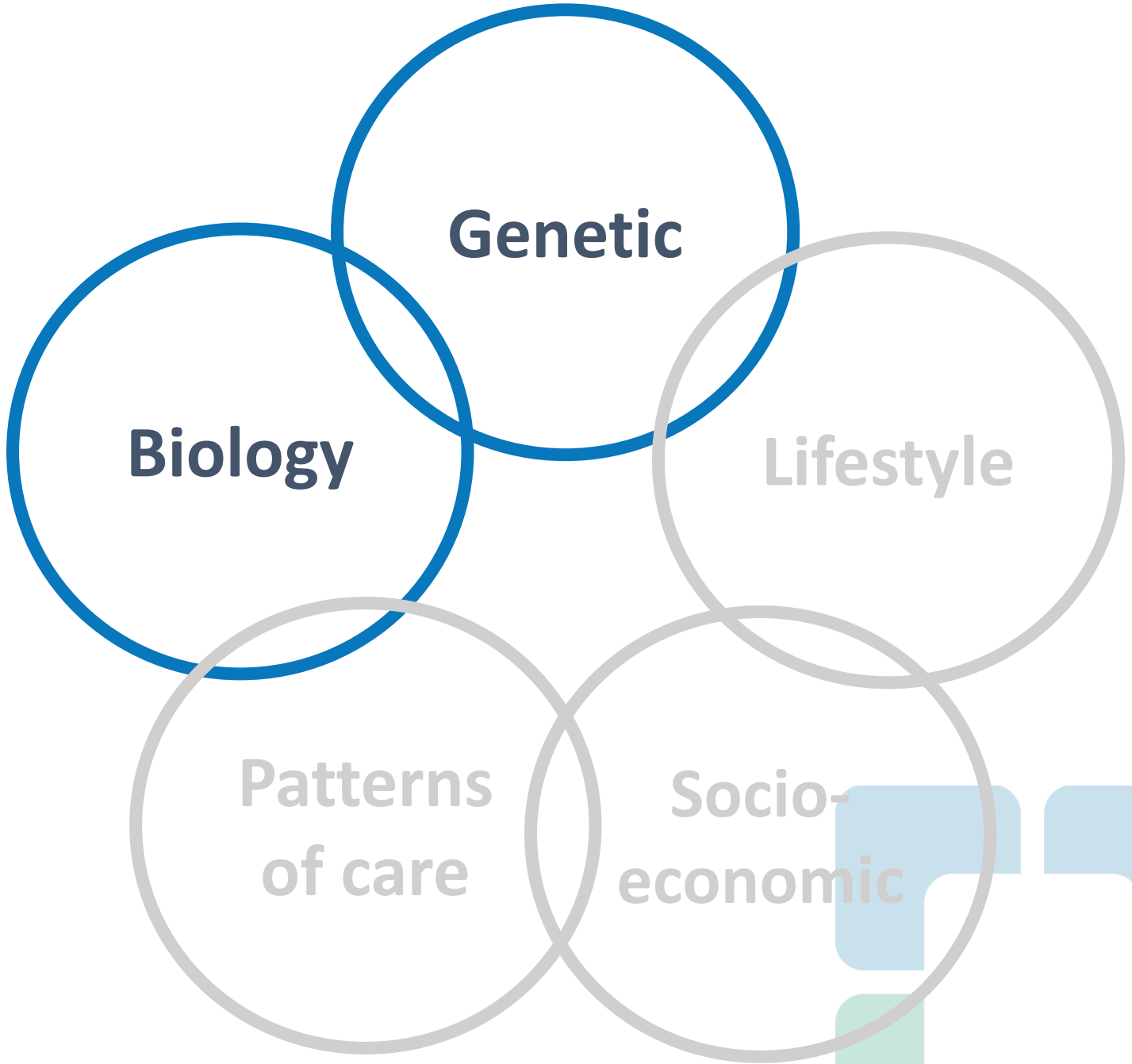
Region, Source	Country	Phenotype Reported	Frequency, %
EastAfrica			
Trinkaus et al,[53] 2011	Kenya	Basal-like (TNBC and CK 5/6 and/or EGFR)	23
Bird et al,[54] 2008	Kenya	TNBC	44
Nyagol et al,[55] 2006	Kenya	TNBC	28
Nalwoga et al,[56] 2007	Uganda	Basal-like (TNBC and CK 5/6)	34
Roy and Othieno,[57] 2011	Uganda	TNBC	36
Mbonde et al,[58] 2000	Tanzania	ERN	67
Burson et al,[59] 2010	Tanzania	ERN	49
Kantelhardt et al,[43] 2014	Ethiopia	ERN	35
Sayed et al,[60] 2014	Kenya	TNBC	20
Galukande et al,[61] 2014	Uganda	TNBC	34
Rambau et al,[62] 2014	Tanzania	TNBC	38
North Africa			
Fourati et al,[63] 2014	Tunisia	TNBC	23
Rais et al,[64] 2012	Morocco	TNBC	17
Bennis et al,[65] 2012	Morocco	Basal-like (TNBC and CK 5/6)	13
El-Hawary et al,[66] 2012	Egypt	TNBC	29
Salhia et al,[67] 2011	Egypt	Basal-like (TNBC and CK 5/6)	11
Cherbal et al,[68] 2015	Algeria	TNBC	20
Aiad et al,[69] 2014	Egypt	TNBC	8
West Africa			
Huo et al,[70] 2009	Nigeria, Senegal	Basal-like (TNBC and CK 5/6)	27
Ly et al,[71] 2012	Mali	TNBC	46
Der et al,[72] 2015	Ghana	TNBC	58
Ohene-Yeboah and Adjei,[73] 2012	Ghana	TNBC	43
Nwafor and Keshinro,[74] 2015	Nigeria	TNBC	29
Proctor et al,[75] 2015	Ghana	TNBC	61

Abbreviations: CK, cytokeratin; EGFR, epidermal growth factor receptor; ERN, estrogen receptor–negative; TNBC, triple-negative breast cancer.

Newman L, JAMA Surg, 2017

Lifestyle, Patterns of Care and Socioeconomic Factors Contribute to Mortality Differences

- Decreased adherence to endocrine therapy
- Treatment advances of TNBC lag behind other subtypes
- Higher prevalence of obesity and comorbidities
- Less access to timely and high-quality prevention, early detection and treatment services
- More likely to be screened at lower resourced and non-accredited facilities
- Delay in diagnosis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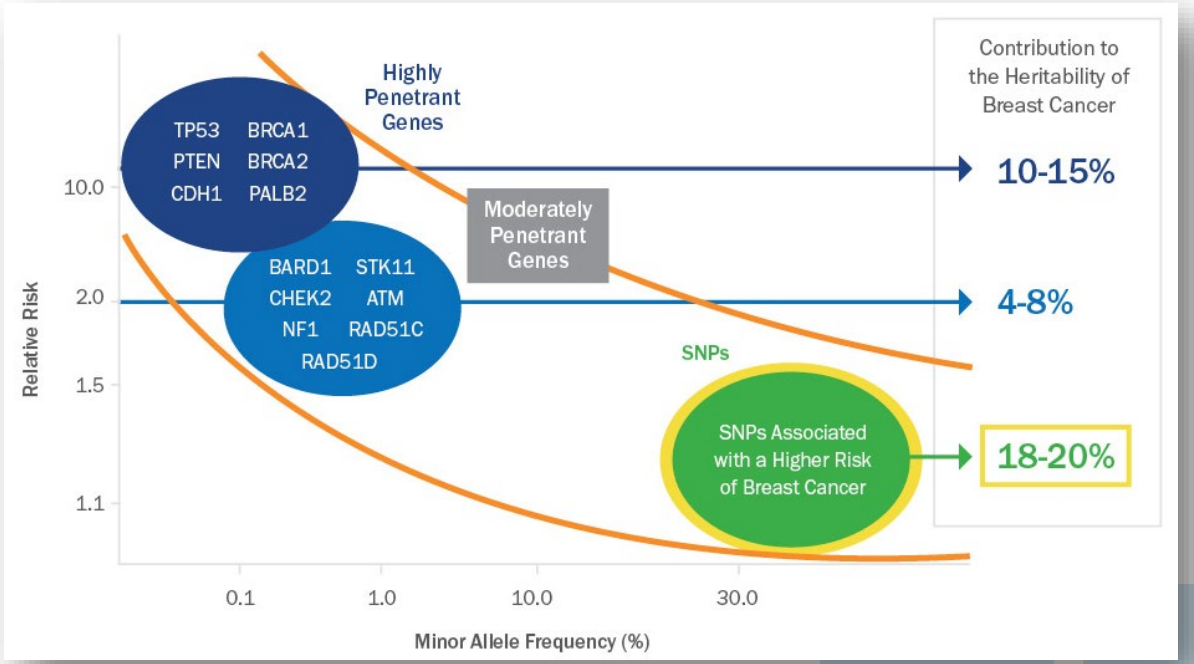
Lifestyle
Patterns of care
Socio-economic

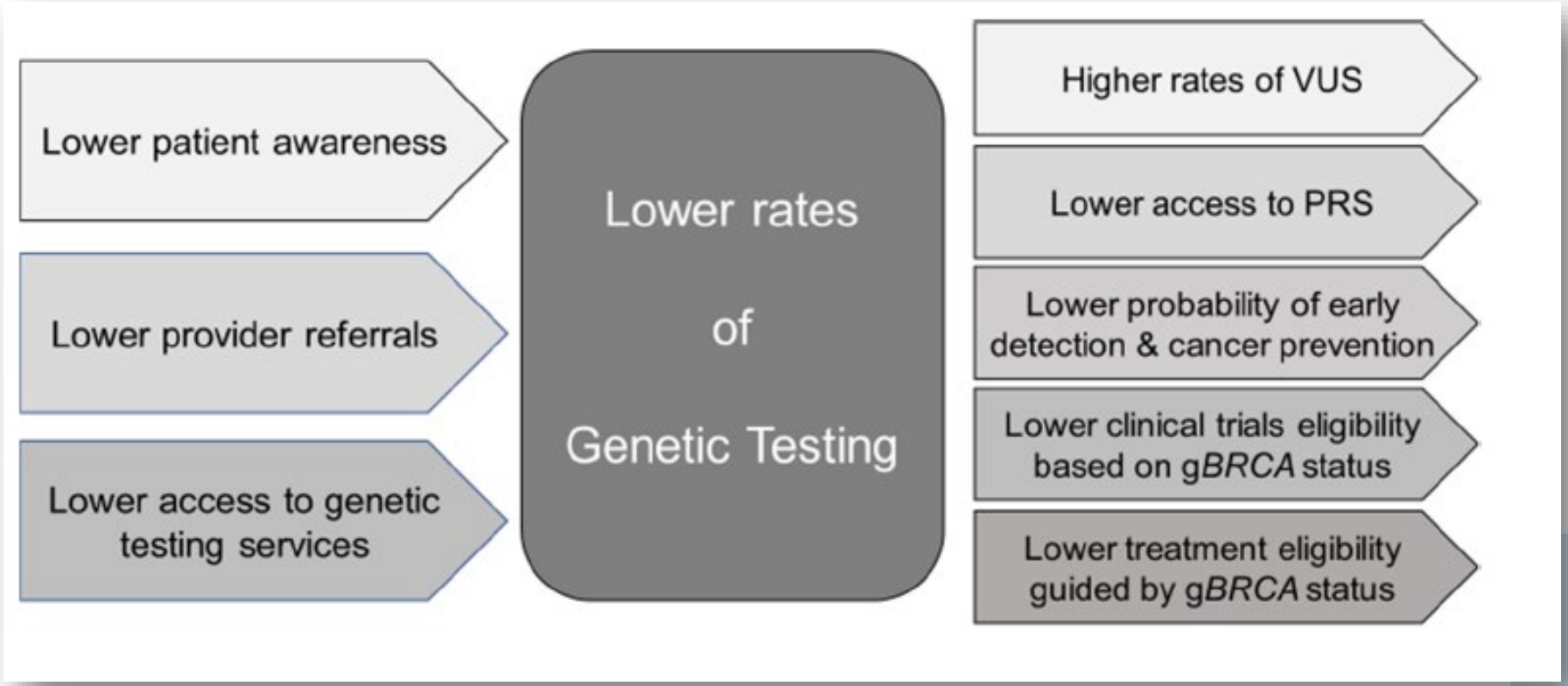
Genetic/Genomic Data is Lacking in Minority Populations

- VUS rates (up to 44.5% vs 23.7%)
- Available data is in context of European ancestry
- Underrepresentation in national databases



Kurian AW, JAMA Oncol, 2018
Felix GES Familial Cancer, 2018
Michailidou et al, Nature, 2017

Black Women are Less Likely to Undergo Genetic Counseling and Testing



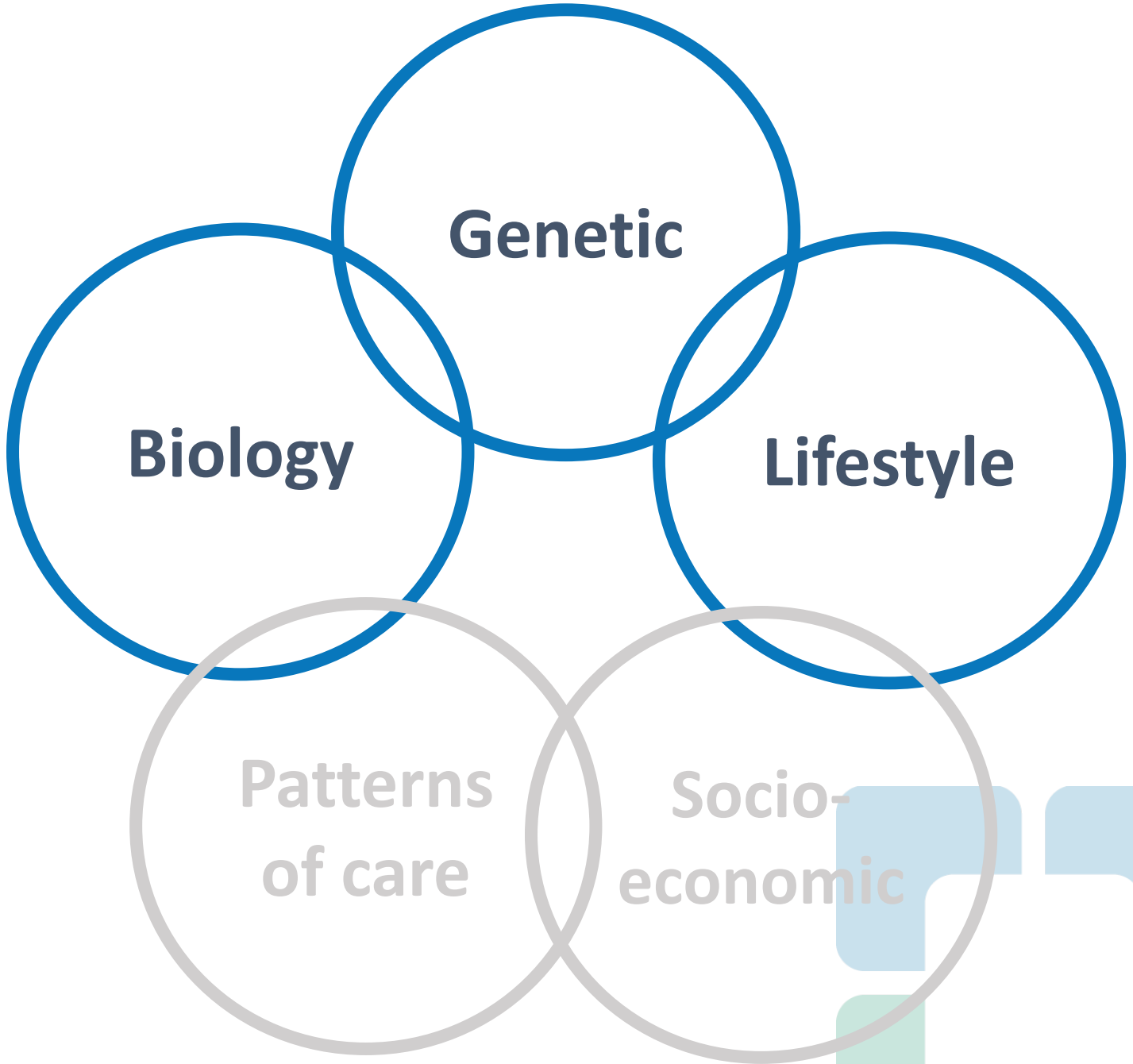
Reid S. Current Breast Cancer Reports 2020

Delivery of Follow-up Hereditary Cancer Risk Management Care

- There are lower rates of bilateral salpingo-oophorectomy among Black women compared to non-Hispanic whites (p=0.008)

- There are lower rates of family disclosure among minorities (allowing for prevention and early detection)

Cragun D et al, Cancer, 2017
Conley CC et al, J Genet Couns, 2020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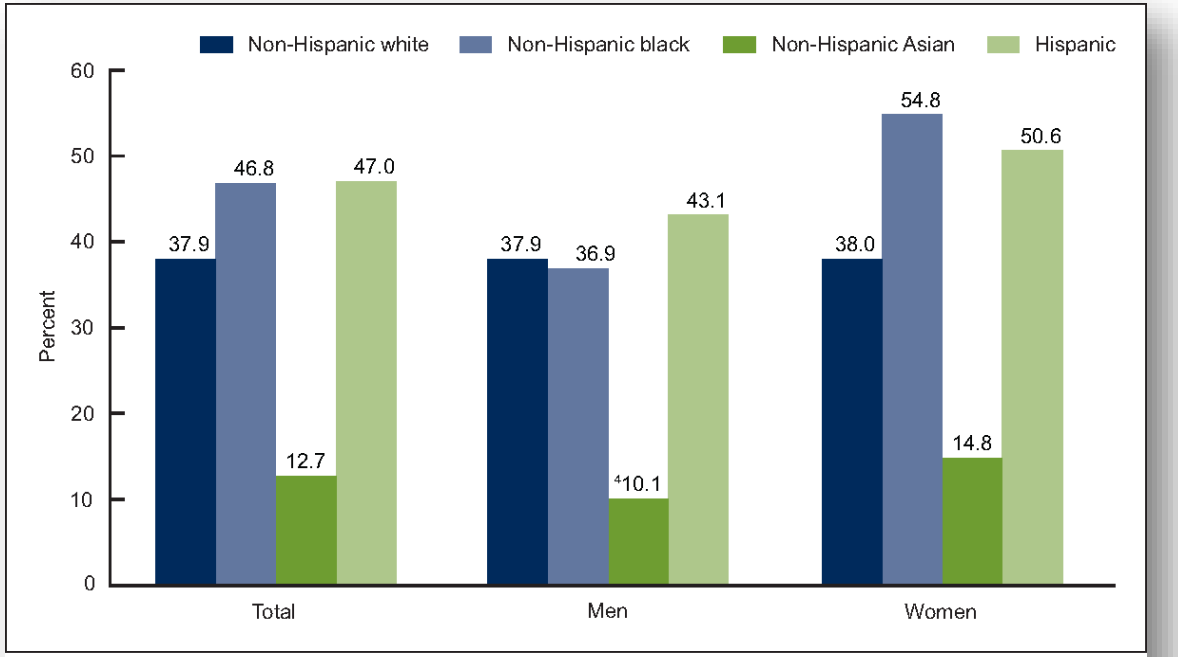
Reproductive Risk Factors are Influenced by Socioeconomic Status

- Early age at menarche
- Early age at first live birth
- Higher Parity
- Breastfeeding

Lack of Exercise, Diet and Obesity are Associated with Increased Cancer Risk

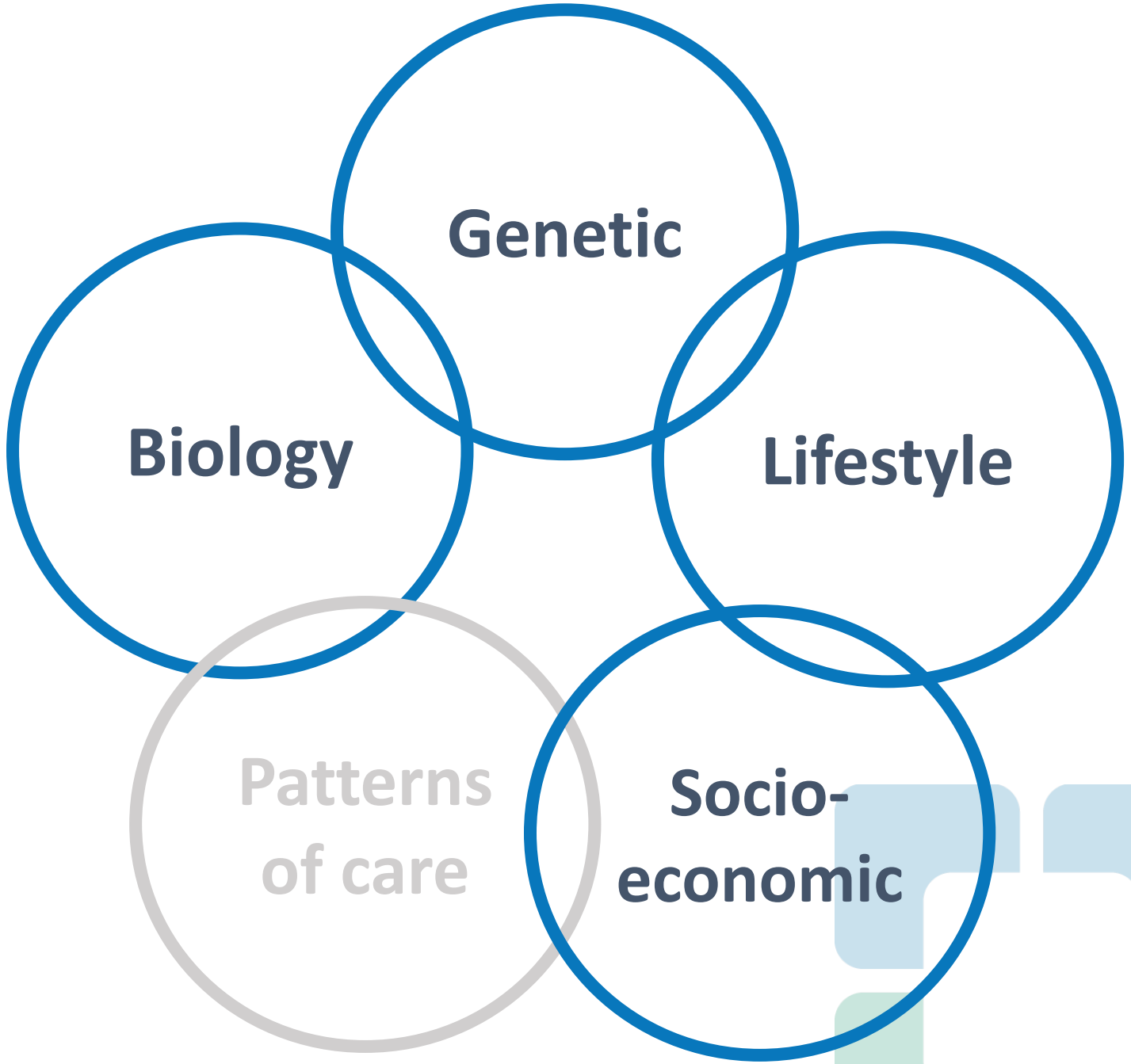


Age-adjusted prevalence of obesity among adults aged 20 and over, by sex and race and Hispanic origin: ic origin: United States, 2015–2016

- A significant inverse correlation found physical activity and incidence in age 55+ and mortality trends in age 40+

- Geographic variation in the burden of obesity and metabolic syndrome in the US, and residents living in the South are most affected.

Xie Z et al, JAMA Network Open, 2022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Risk factors must be evaluated in the context of other social determinants of health

- Women with TNBC were younger, twice as likely to be Black, more likely to have Medicaid or no insurance, and twice as likely to present with a late-stage cancer

- Higher counts of alcohol and fast-food retailers, and correspondingly higher rates of unhealthy alcohol use and obesity, were observed in disadvantaged census tracts and had the highest odds of TNBC

- White patients living in predominantly Black census tracts were at greater risk for TNBC than those living in predominantly White census tracts

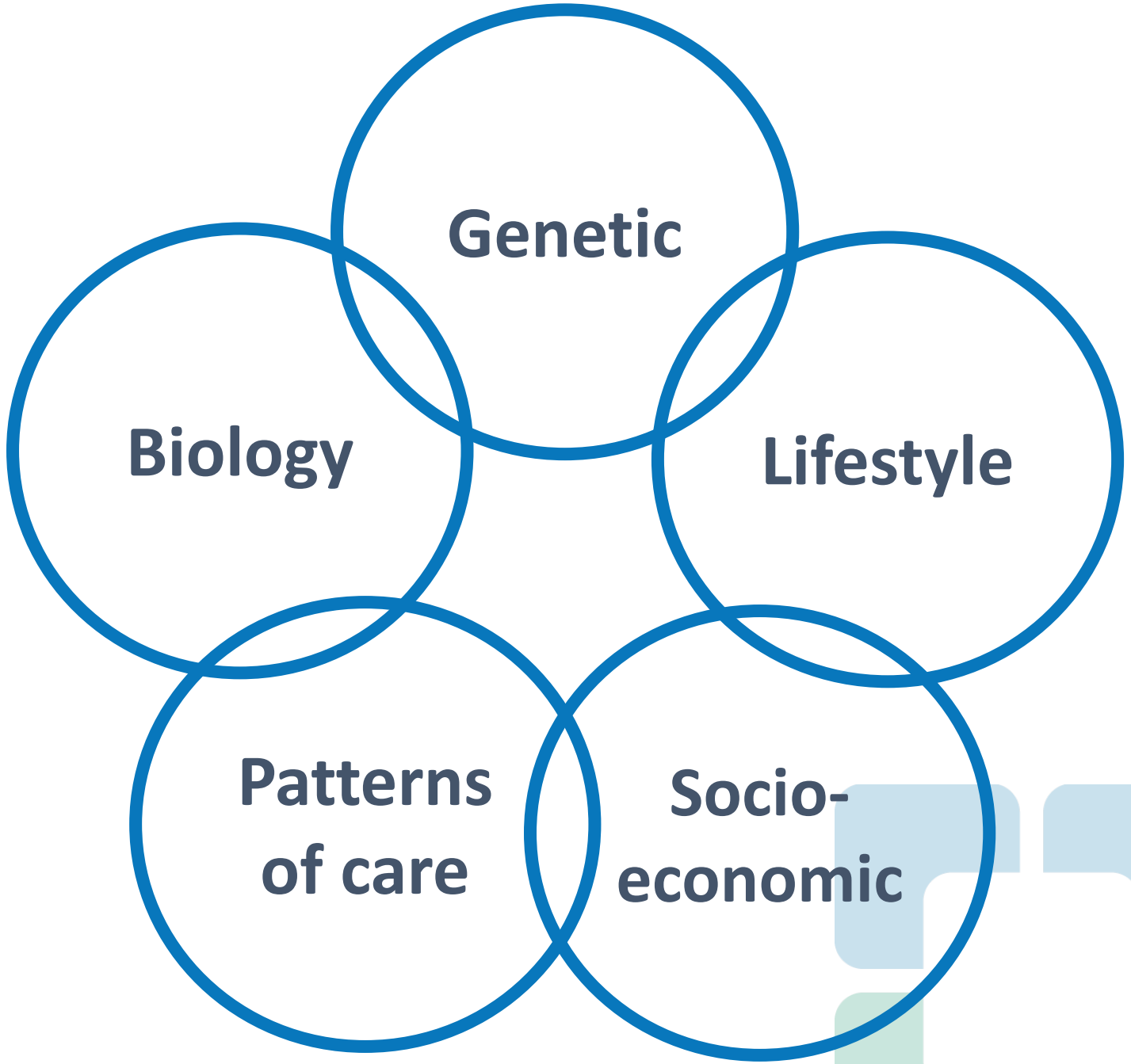
Siegel SD et al, Breast Cancer Research, 2022

Healthcare Access Barriers Result in Diagnostic and Treatment Delays

- Poverty and lack of insurance may result in diagnostic and treatment delays regardless of racial/ethnic identity

- Transportation and financial access as well as patient's own caregiving responsibilities

Newman L, JAMA Surg, 2017
Rose J et al, BMC Women's Health, 2022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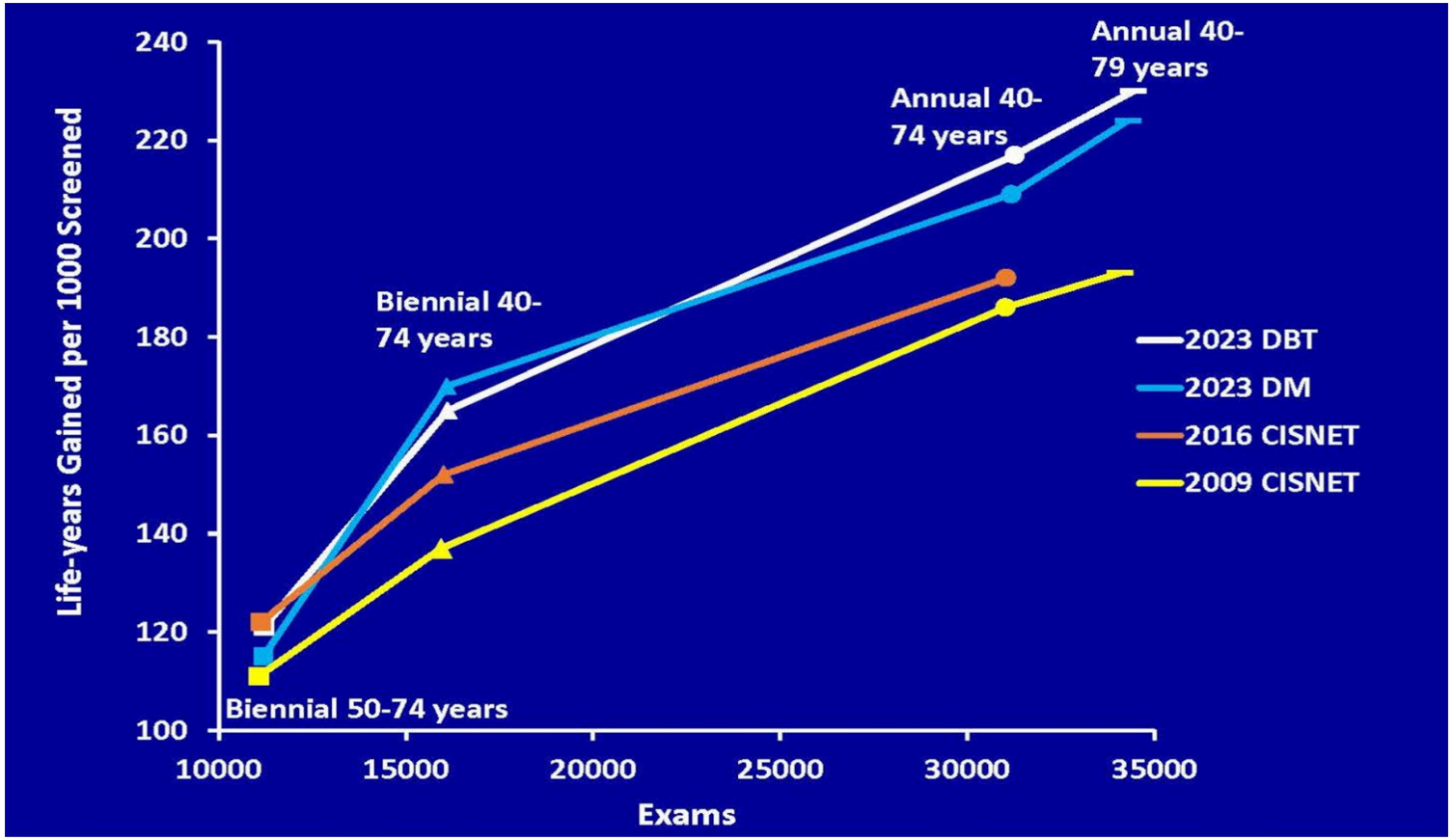
Annual Screening Starting at 40 Leads to Most Life-Years Gained



- 42% decline in breast cancer deaths from 1989 – 2021
- Incidence increased by 0.6%/yr overall vs <u>1% in women <50</u>
- <45yrs
  - New cases: 10.3%
  - Mortality: 5.4%

Monticciolo DL, Radiology, 2024

Breast Cancer Screening Guidelines for Women of Average Risk

	Age 40–44	Age 45–49	Age 50–54	Age 55–74	Age 75+
American Society of Breast Surgeons[43]	Annual	Annual	Annual	Annual	Annual until life expectancy <10 yrs
U.S. Preventative Services Task Force[44]	[redacted] Biennial	[redacted] Biennial	Biennial	Biennial	Insufficient Evidence to Assess
American Cancer Society[45]	Optional - Annual	Annual	Annual	Annual or Biennial	Annual until life expectancy <10 yrs
American College of Physicians (ACP)[46]	Optional - Biennial	Optional - Biennial	Biennial	Biennial	Insufficient Evidence to Assess
American College of Obstetricians and Gynecologists (ACOG)[47]	Annual or Biennial	Annual or Biennial	Annual or Biennial	Annual or Biennial	Shared-Decision based on health status and longevity
American College of Radiology[48]	Annual	Annual	Annual	Annual	Shared-Decision based on health status

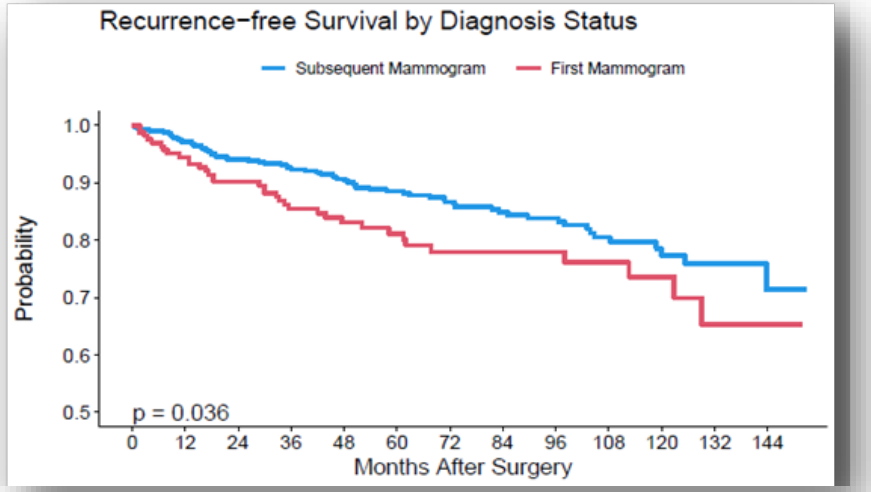
** Risk models may underestimate risk in black women

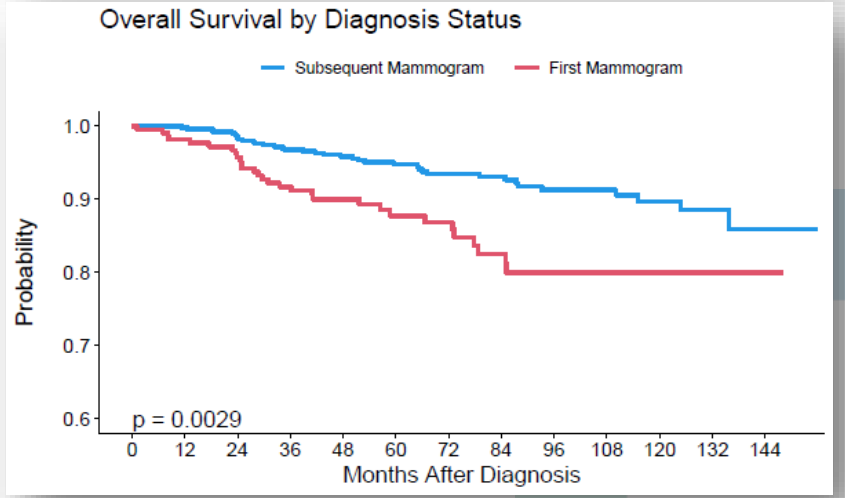
Fayanju OM et al, Ann Surg Oncol, 2023
USPSTF Screening Guidelines, 2024

Young Black Women May be More Likely to Have First Mammogram Cancers

Factor	Comparison	OR	95% LCL	95% UCL	*p*-value
Age at first mammogram	1-month increase	1.06	1.05	1.07	< 0.0001
Race	Black versus White	2.24	1.10	4.54	0.03
	Others versus White	1.17	0.49	2.77	0.72
Insurance	Non-private versus private	2.41	1.22	4.74	0.01
History of biopsy	No versus yes	6.27	2.51	15.66	< 0.0001

OR odds ratio, *LCL* lower confidence limit, *UCL* upper confidence limit





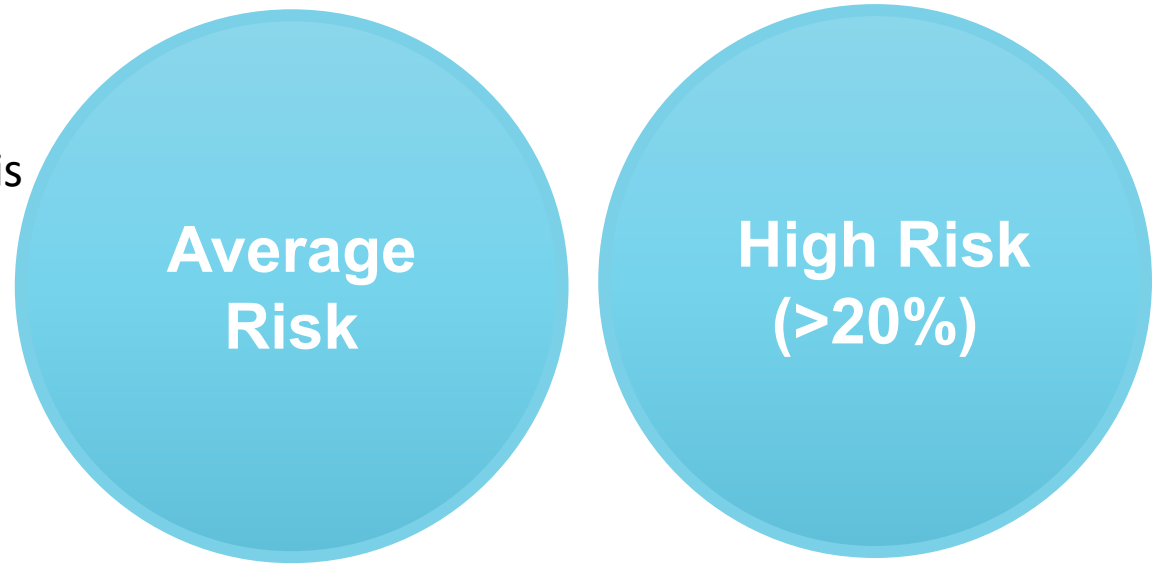
Wilkerson AD, AlHilli Z et al, Ann Surg Oncol, 2023
Wilkerson AD, AlHilli Z et al, Under Review

Other Considerations for Understanding and Reducing Disparities in Breast Cancer

- Breast cancer risk assessment
- Ethnic group breakdown
- Socioeconomic
- Clinical trials

Risk Assessment is Key to Personalized Prevention and Screening Strategies

- Annual clinical encounter
- Mammogram w/tomosynthesis
- Supplemental Screening
  - Abbreviated MRI
  - Contrast enhanced mammography
  - Molecular breast Imaging
  - (Whole breast ultrasound)



- Clinical encounter every 6-12 months
- Mammogram w/ tomosynthesis
- Full sequence contrast enhanced MRI
- Referral to genetic counselor as appropriate

NCCN Guidelines- Breast Cancer Screening and Diagnosis V1.2024

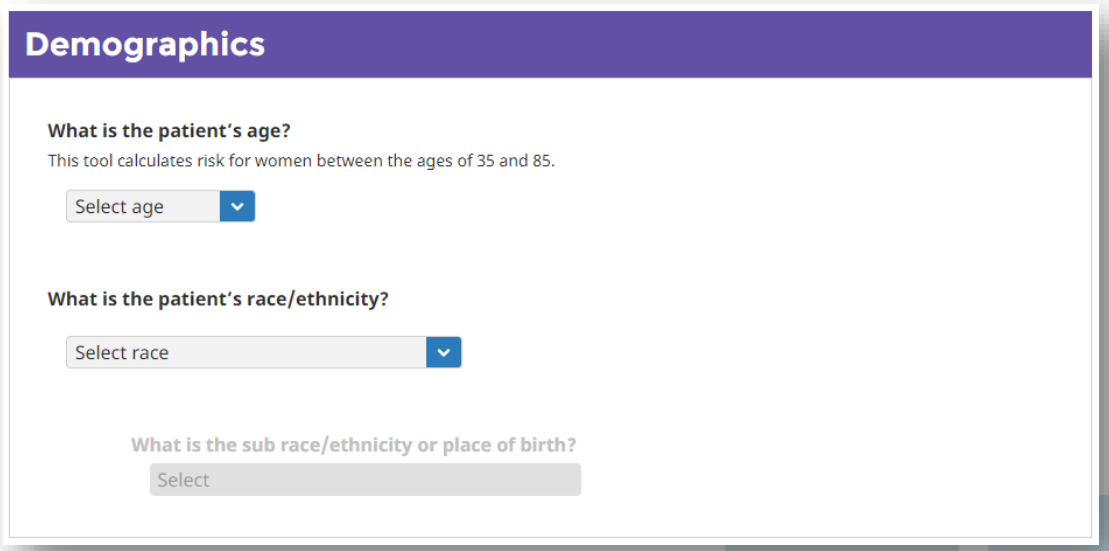
Risk Assessment Tools Underestimate Risk for Minorities

Gail Model

TABLE 1
Gail Model and Socioeconomic Factors among Subjects Completing a Risk Assessment Form for the STAR Trial, by Race/ethnicity[a]

Characteristics	Race or ethnicity: White (n = 134)	Hispanic (n = 542)	Black (n = 147)	Total (n = 823)	P
Current age	57.5 (8.9)	55.1 (7.8)	57.1 (8.7)	55.9 (8.2)	0.14
Age at menarche	12.8 (1.5)	13.2 (1.8)	13.1 (1.9)	13.1 (1.8)	0.03
Age at first live birth	24.6 (7.7)	21.9 (6.0)	21.1 (6.2)	22.1 (6.4)	< 0.0001
Nulliparous	23.8	7.9	8.2	10.6	< 0.0001
Have an affected FDR	35.1	13.7	20.4	18.4	< 0.0001
Ever had a biopsy	55.6	20.1	24.5	26.7	< 0.0001
Of those who had a biopsy					
Atypical hyperplasia	25.3	13.9	2.8	16.0	0.07
Lobular carcinoma in situ	18.7	3.7	2.8	8.7	0.0007
Other	53.3	50.0	66.7	53.9	0.22
Unknown	13.3	29.6	25.0	23.3	0.04
Educational attainment					< 0.0001
High school or less	9.4	48.0	11.8	35.6	
College	40.2	42.2	73.6	47.6	
Graduate education	50.4	9.9	14.6	16.7	
Any health insurance coverage	73.9	32.1	60.5	44.0	< 0.0001
Eligible for STAR trial	67.2	10.9	10.2	19.9	< 0.0001

STAR: Study of Tamoxifen and Raloxifene; FDR: first-degree relative.
[a] Means (standard deviations) are shown for current age, age at menarche, and age at first live birth. All other values are percents.



Breast Cancer Risk Assessment Tool (Modified Gail) accounts for race

Grann VR et al, Cancer, 2005
Tyrer J et al, Stat Med, 2004

Risk Assessment Tools Underestimate Risk for Minorities

IBIS/ Tyrer-Cuzick

TABLE 2. Calibration of the IBIS/Tyrer-Cuzick Model by Race/Ethnicity

Race/ethnicity	Total No.	Observed (O) Breast Cancers	Expected (E) Breast Cancers	O/E Ratio	Lower 95% CI	Upper 95% CI
Non-Hispanic White	80,260	6133	6408.6	0.96	0.93	0.98
All racial/ethnic minority groups	10,707	650	724.3	0.90	0.83	0.97
Black	5903	373	411	0.91	0.82	1.00
Hispanic	2368	115	153.2	0.75	0.62	0.90
United States-born Hispanic[a]	763	47	50.1	0.94	0.69	1.25
Foreign-born Hispanic[a]	380	18	23.6	0.76	0.45	1.21
Asian or Pacific Islander	2131	140	139.2	1.01	0.85	1.19
American Indian or Alaskan Native	305	22	20.9	1.05	0.66	1.59
Total	90,967	6783	7132.9	0.95	0.93	0.97

[a]As noted in Table 1, birthplace was reported for only 54.4% of Hispanic women.

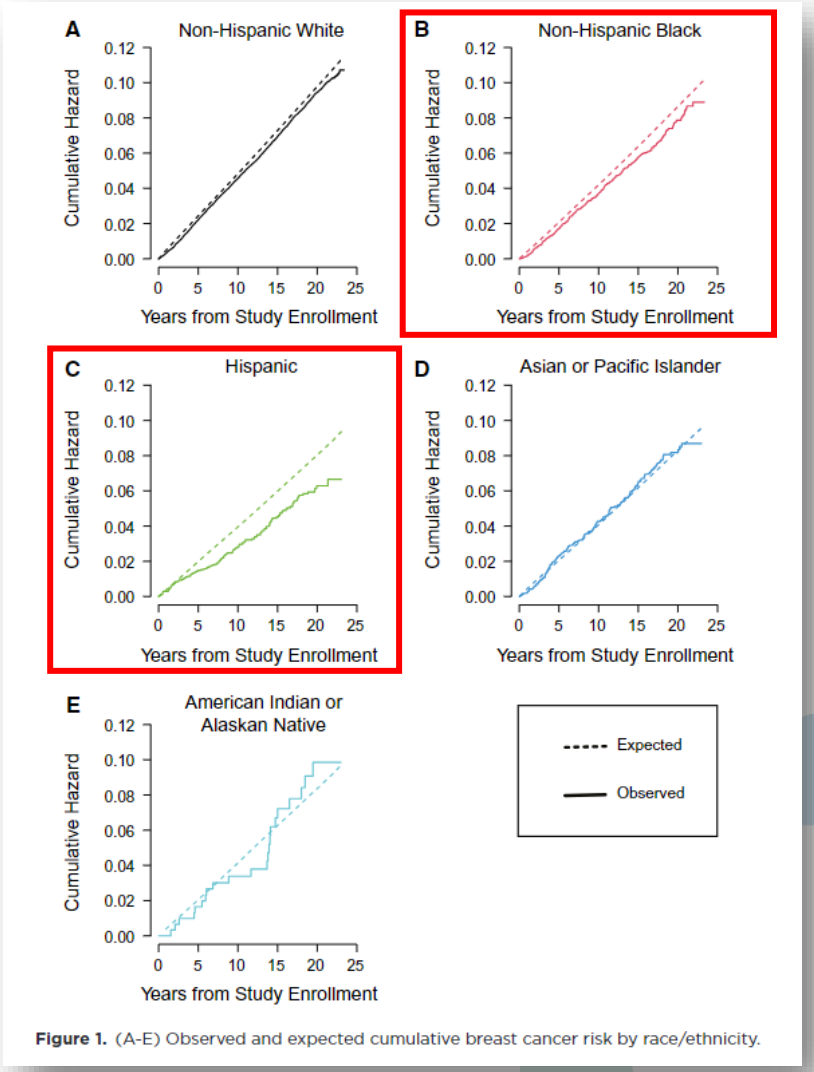


Figure 1. (A-E) Observed and expected cumulative breast cancer risk by race/ethnicity.

Kurian AW et al, Cancer, 2021

Black Women's Health Study Breast Cancer Risk Calculator

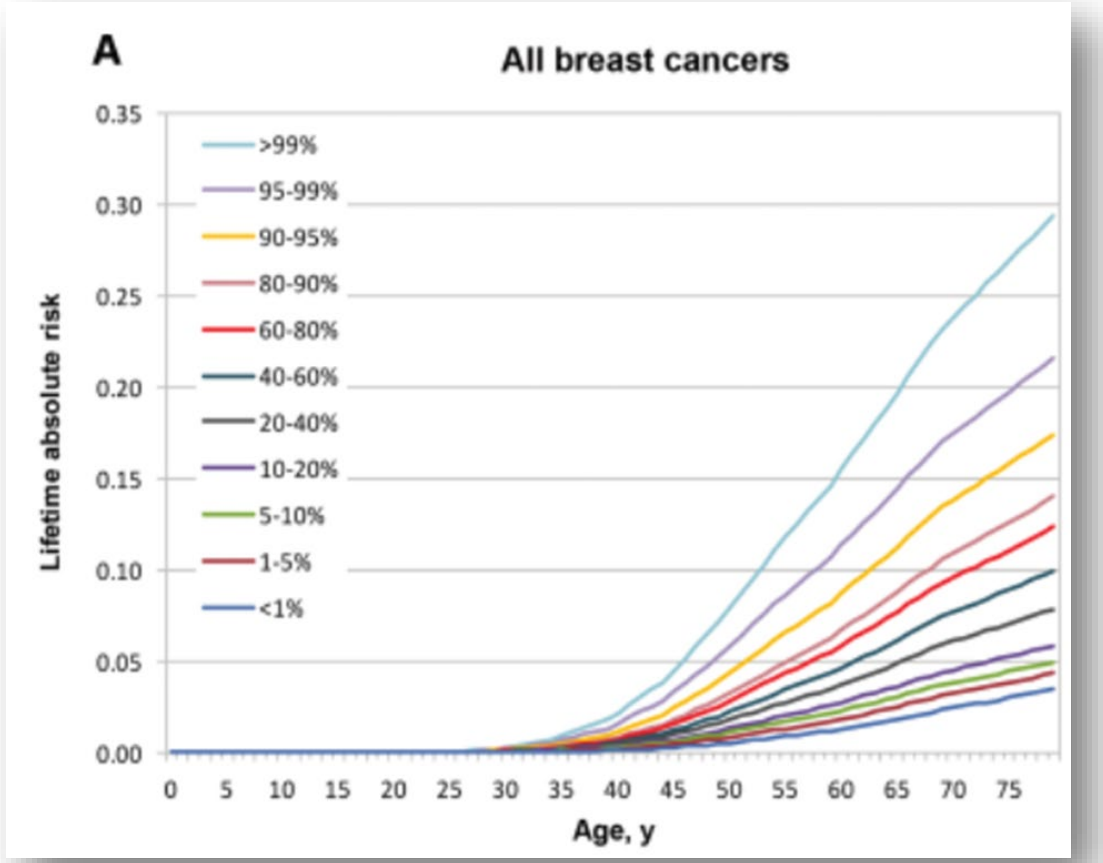
TABLE 4. Discriminatory Accuracy of Risk Prediction Models in 15 Years of Follow-Up Data From the Black Women's Health Study

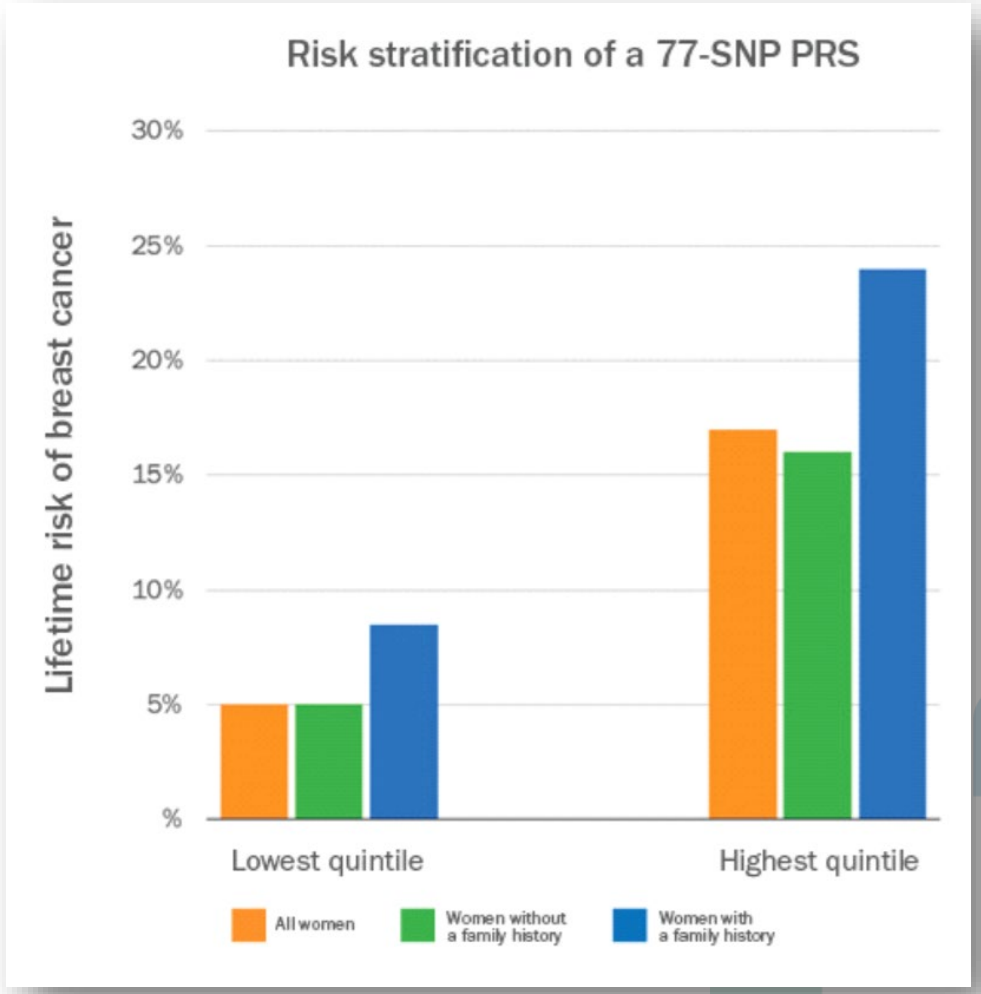
	Invasive Breast Cancers	Model A (on the basis of relative risks and attributable risks for all invasive breast cancers combined)		Model B (on the basis of ER-specific relative risks and attributable risks)	
Age Group, Years	No.	C-Statistic	95% CI	C-Statistic	95% CI
30-39	107	0.63	0.58 to 0.68	0.62	0.57 to 0.67
40-44	197	0.59	0.55 to 0.63	0.59	0.55 to 0.63
45-49	228	0.57	0.54 to 0.61	0.58	0.55 to 0.62
50-54	318	0.58	0.55 to 0.62	0.58	0.55 to 0.62
55-59	284	0.56	0.53 to 0.60	0.56	0.53 to 0.60
60-64	227	0.55	0.51 to 0.59	0.56	0.52 to 0.60
65-70	154	0.58	0.53 to 0.63	0.58	0.53 to 0.63
Overall, weighted average	1,515	0.58	0.56 to 0.59	0.58	0.56 to 0.59

Abbreviation: ER, estrogen receptor.

Palmer JR et al, JCO, 2021

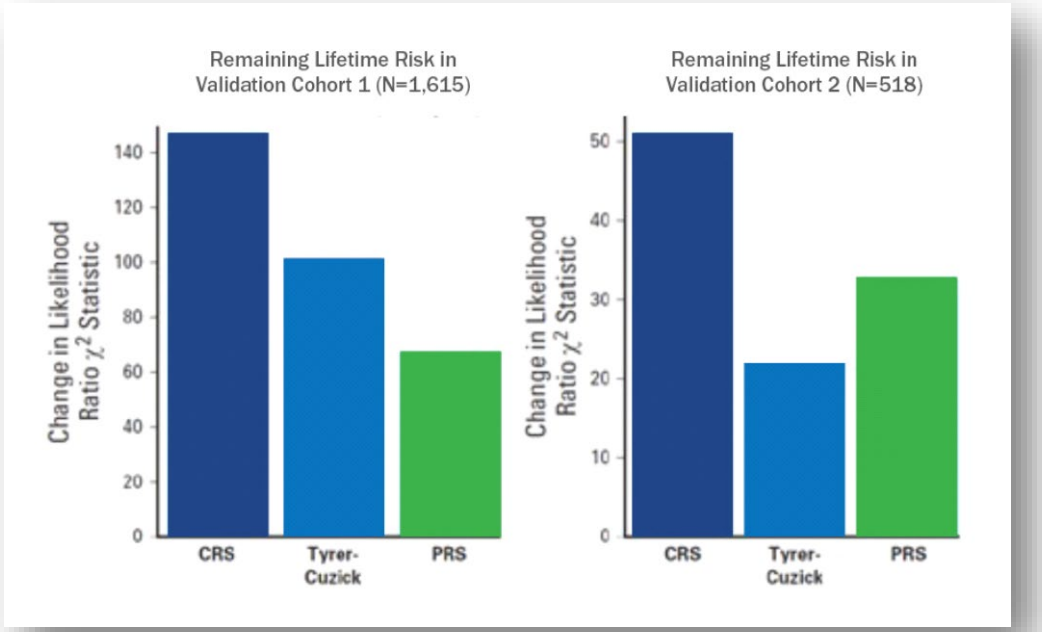
PRS Improves Risk Stratification in Women With and Without Family History

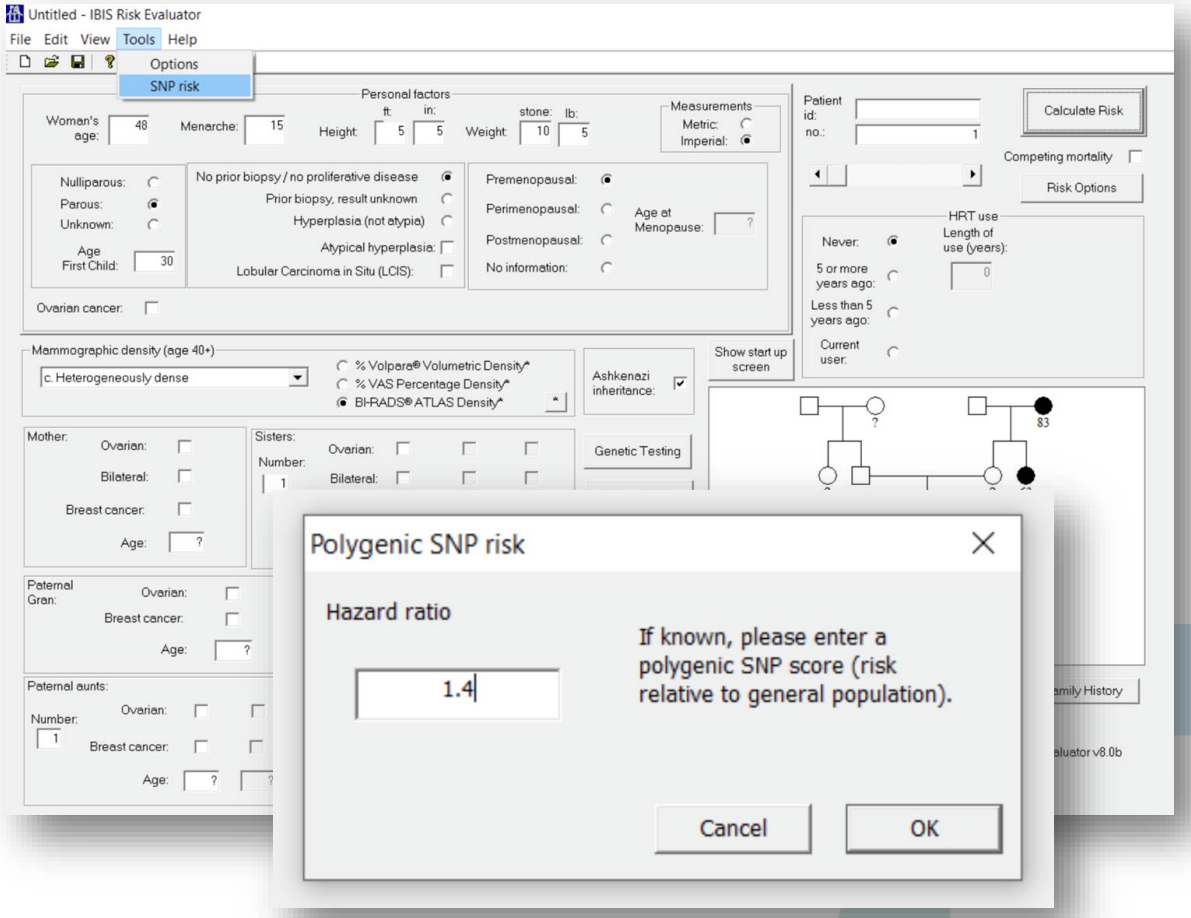




Mavaddat N et al, J Natl Cancer Inst, 2015

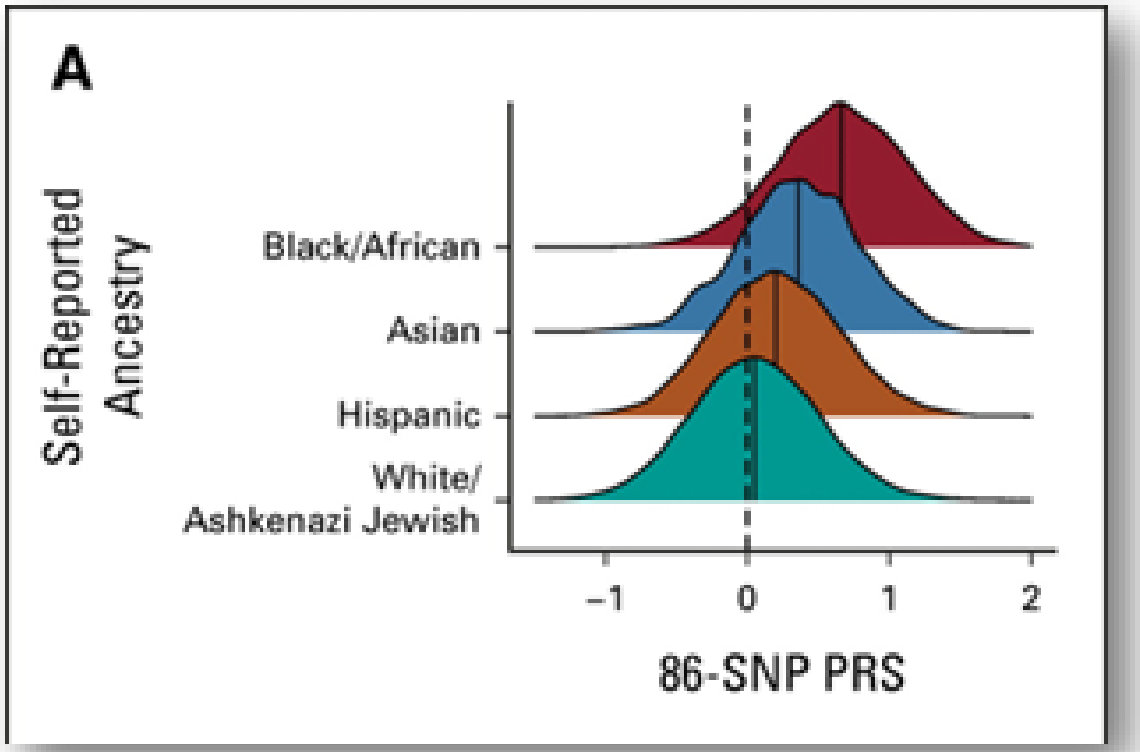
Combining PRS with Traditional Risk Estimation Models Improves Risk Estimation



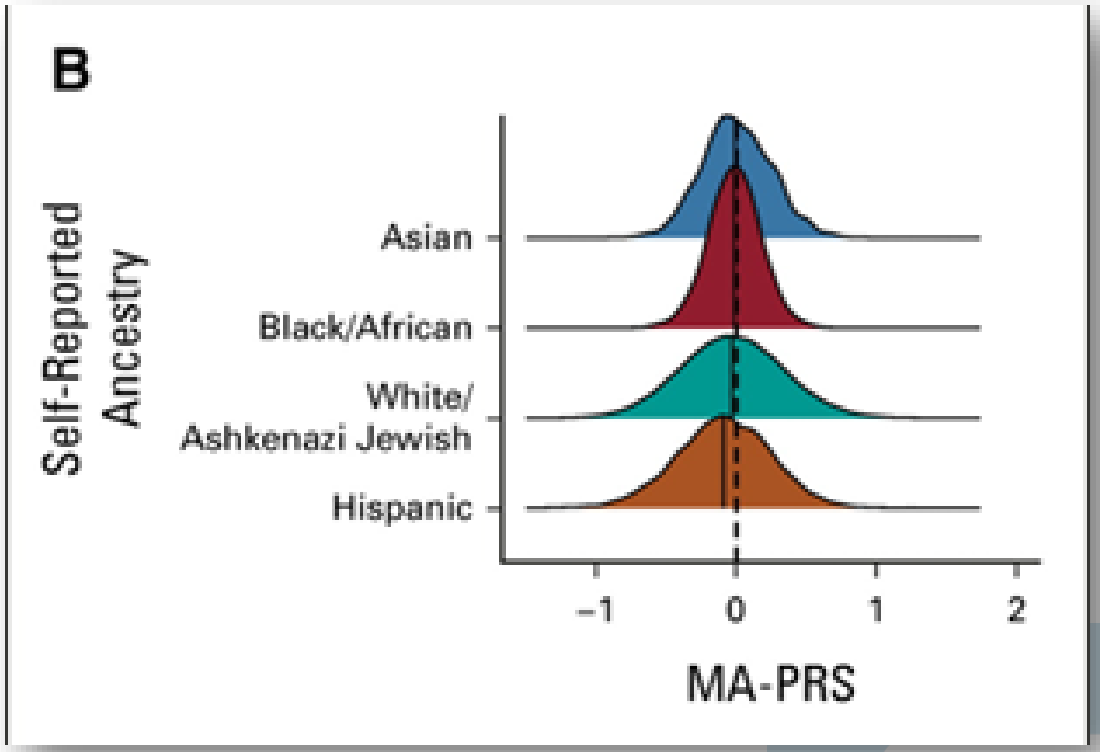


Hughes E et al, JCO Precision Oncology, 2021

PRS derived from European GWAS are Inaccurate for Non-Europeans



Using European-derived weights and allele frequencies



Using ancestry-specific weights and allele frequencies

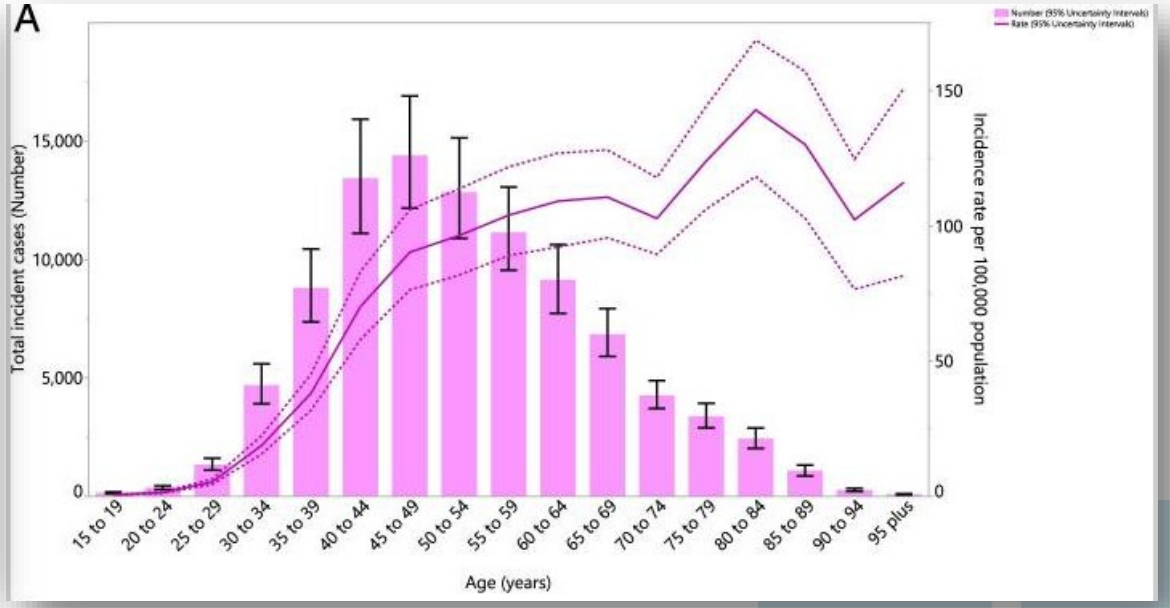
Hughes E et al, JCO Precision Oncology, 2022

Defined Racial and Ethnic Categories

NIH defined racial and ethnic categories

Racial and ethnic category	Definition
American Indian or Alaska Native	A person having origins in any of the original peoples of North and South America (including Central America), and who maintains tribal affiliation or community attachment
Asian	A person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent, including Cambodia, China, India, Japan, Korea, Malaysia, Pakistan, the Philippine Islands, Thailand, and Vietnam
Black or African American	A person having origins in any of the black racial groups of Africa. Terms such as "Haitian" or "Negro" can be used in addition to "Black or African American."
Hispanic or Latino	A person of Cuban, Mexican, Puerto Rican, South or Central American, or other Spanish culture or origin, regardless of race. The term "Spanish origin" can be used in addition to "Hispanic or Latino."
Native Hawaiian or Other Pacific Islander	A person having origins in any of the original peoples of Hawaii, Guam, Samoa, of other Pacific Islands
White	A person having origins in any of the original peoples of Europe, the Middle East, or North Africa.

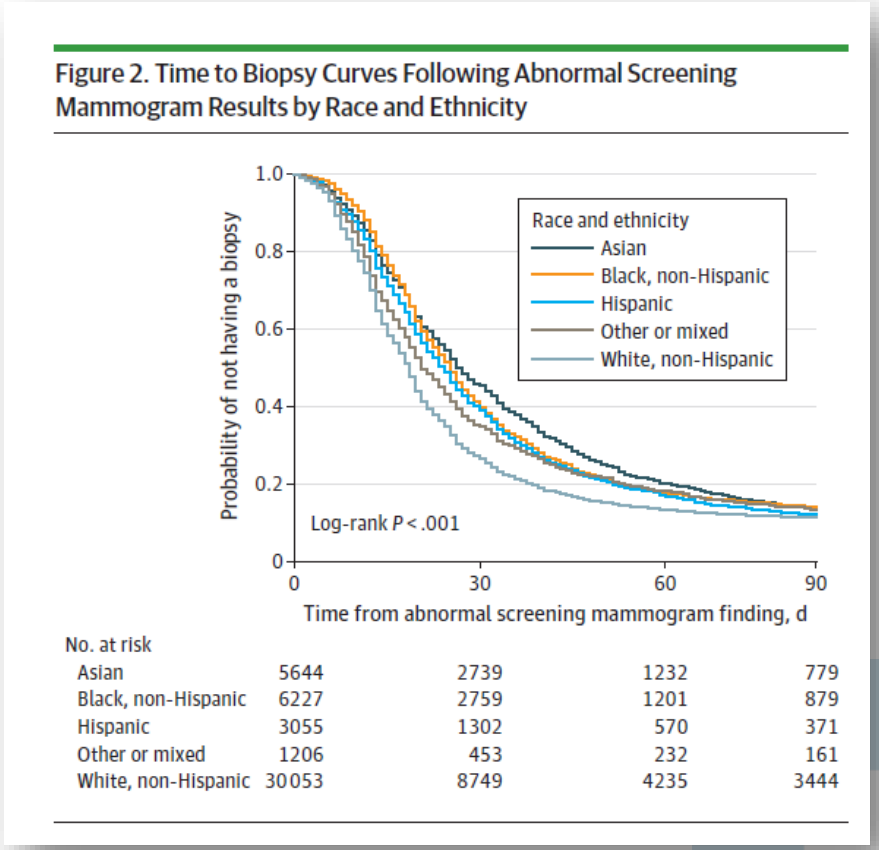
Breast Cancer Incidence in the Middle East and North Africa



Lewis C et al, Cureus, 2023
Safiri S et al, Arch Public Health, 2022

Challenges in Breast Cancer Screening for Women in Lower Socioeconomic Groups

- Breast Imaging
  - Non-accredited facilities
  - Old equipment
  - Resources for follow up
  - Reading by subspecialist
  - Screening in multiple facilities
  - Work-up of abnormalities takes longer



Betancourt JR et al, J Am Coll Radiol, 2019
Ansell D et al, Cancer Causes Control, 2009
Lawson MB, JAMA Oncol 2022

Equitable Recruitment and Enrollment in Trials in Essential

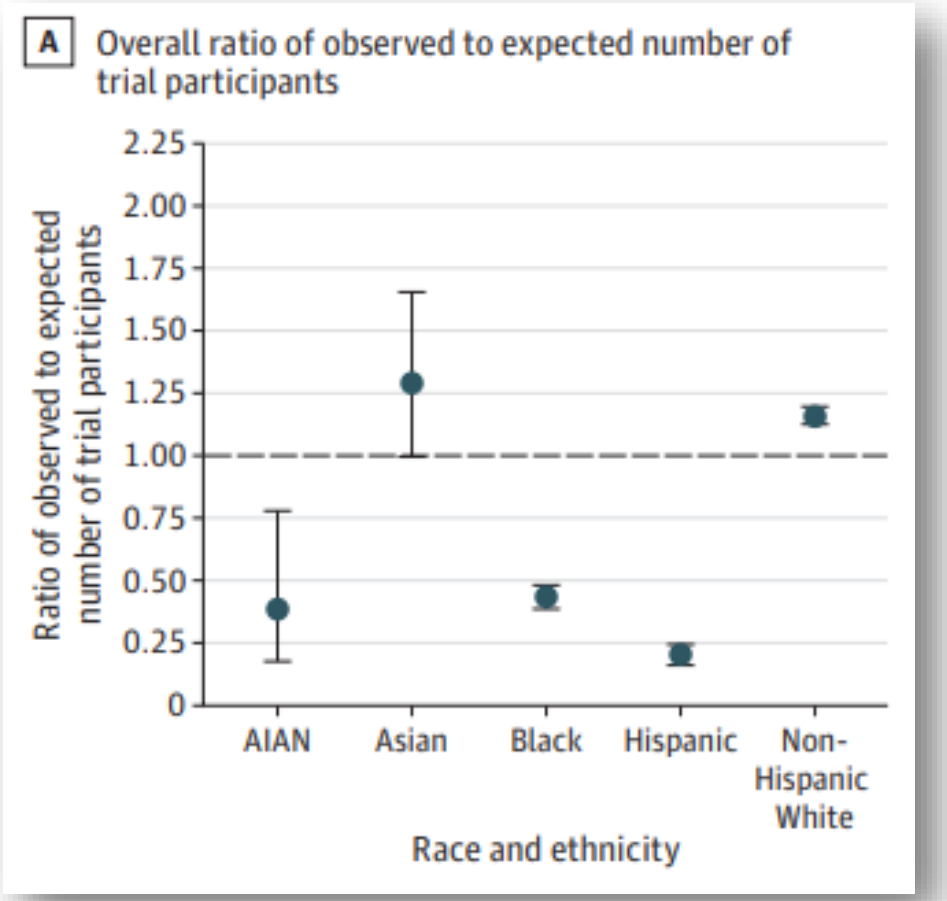


Table 2. Meta-analysis Ratios of Individual Precision Oncology Studies by Cancer Type

	Participants, ratio (95% CI)[a]			
	Non-Hispanic White	Asian	Black	Hispanic
Breast	1.32 (1.23 to 1.41)	1.95 (1.26 to 2.64)	0.62 (0.44 to 0.80)	0.64 (0.37 to 0.90)
Colorectal	1.22 (1.06 to 1.38)	1.29 (0.69 to 1.89)	0.60 (0.39 to 0.81)	0.61 (0.12 to 1.10)
Lung	1.40 (1.32 to 1.47)	2.96 (1.51 to 4.42)	0.32 (0.24 to 0.40)	0.31 (0.11 to 0.52)
Prostate	1.40 (1.29 to 1.52)	1.45 (−0.81 to 3.70)	0.58 (0.30 to 0.85)	0.33 (0.18 to 0.47)
Overall	1.34 (1.29 to 1.39)	1.89 (1.46 to 2.32)	0.51 (0.43 to 0.60)	0.51 (0.37 to 0.66)

Aldrighetti CM et a, JAMA Network Open, 2021

What Can we do to Reduce Disparities?

- Achieve diversity in clinical trials by raising awareness
- Patient education and offering trial materials in multiple languages
- Providing transportation for appointments
- Using technology wisely and thoughtfully
- Involving patients from day one
- Participate in cultural opportunities to increase cancer awareness
- Increase awareness on cancer prevention and screening
- Provide knowledge on lifestyle impact

Key Takeaways

- Declines in mortality could be accelerated by expanding access to high-quality prevention, early detection, and treatment services to all women
- Risk-based breast cancer screening allows for individualized management
- Efforts to address underutilization of genetic counseling and other risk-reducing interventions, and expansion of resources to support screening, risk management and prevention

Cleveland Clinic

Every life deserves world class care.