Health Disparities and Inequities in Hereditary Cancer

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Objectives

1. Review factors contributing to healthcare disparities and inequities
2. Identify groups of patients who are at risk to experience health disparities or inequities related to hereditary cancer assessment, testing, and follow up
3. Describe strategies to address disparities and inequities in the setting of hereditary cancer

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Terms and definitions

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Health equity

- Attainment of the highest level of health for all people

Healthcare disparity

- **Preventable differences** in burden of disease or opportunities to achieve optimal health
  - Differences in incidence, prevalence, mortality, morbidity, survivorship, screening, staging at diagnosis, and financial burden

Health inequity

- Disparities in health that are **systematic**, unfair, and **avoidable injustices**

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Social determinants of health

Non-medical factors influencing health outcomes

Education	Health care	Environment	Community	Economic
• Literacy • Language • Higher education • Early childhood education	• Insurance coverage • Provider availability • Provider cultural competency • Quality of care • Interpretive services	• Housing • Transportation • Walkability • Urban vs rural	• Food security • Social integration • Support system • Community engagement • Discrimination • Stress	• Income • Expenses • Debt • Medical bills • Support • Employment

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Race

- A social construct
- Dividing people based on physical differences

Ethnicity

- A social construct
- Encompassing shared cultural background, language, norms, and values

Ancestry

- Ancestors originating from the same geographic origin
  - Genomic ancestry is the difference in variant frequencies between ancestral populations

Race and ethnicity can correlate with ancestry, but are not the same thing

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Health Disparities in Cancer

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Breast cancer	Black and Hispanic women have higher prevalence of triple negative
	Black women have higher mortality rates
	Hispanic women are younger ages at diagnosis
Colon cancer	Black men have higher mortality rates
	Hispanic and Indigenous Americans are the least likely to have colonoscopy in past 10 years
Prostate cancer	Black men have higher incidence rate and earlier age at diagnosis
Trans and non-binary	Higher rates of mortality from cancer than cis individuals
	19% have been refused care, higher among people of color
	28% subjected to harassment in medical settings

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Health Disparities in Hereditary Cancer

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Eugenic and discriminatory history

Genetics and the idea of inheritance is the basis of eugenics

- Mass sterilizations in the 20th century
  - Aimed at those with physical and mental disabilities
  - Encompassed others based on race, ethnicity, and economic status.
- Nazi movement and other genocide

Genetics has been used incorrectly to perpetuate racism and discrimination

- Myth of IQ being lower in black people
- Sickle cell disease and trait used as reason discourage interracial relationships
- Lack of consent in various studies or sample collection

5 of the first 6 Presidents of the American Society of Human Genetics (ASHG) were on American Eugenics Society board during their presidencies

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General Risk Assessment

- Risk prediction models are based on data from white populations
- No risk models for trans or non-binary

Gail model used for determining chemoprevention

The tool has been validated for white women, black/African American women, Hispanic women and for Asian and Pacific Islander women in the United States. The tool may underestimate risk in black women with previous biopsies and Hispanic women born outside the United States. Because data on American Indian/Alaska Native women are limited, their risk estimates are partly based on data for white women and may be inaccurate. Further studies are needed to refine and validate these models.

bcrisktool.cancer.gov

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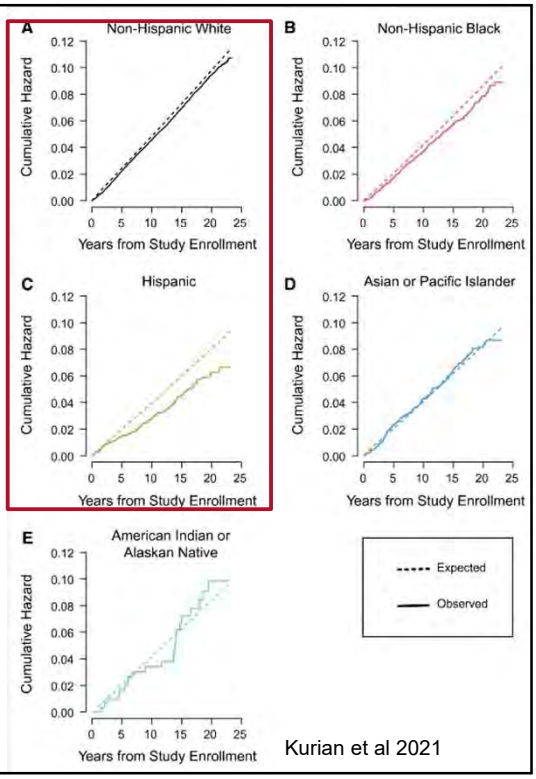
Tyrer Cuzick used for determining MRI screening

Overestimates risk in Hispanic women

	Black or African American	White
Breast cancer incidence rate per 100,000 [5]	126.7	130.8
Breast cancer mortality rate per 100,000 [5]	28.4	20.3
% High-risk TC8 scores	10.7%	17.5%

Porterhouse et al 2022

New version (v8) may underestimate risk in black women



Kurian et al 2021

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Referrals to Genetic Services

We are not close to testing all patients who meet NCCN criteria for testing

- ~50% of patients with high-risk breast cancer are tested (hafertepen et al 2017)
- ~39% of patients with ovarian cancer patients are tested (Lin et al 2021)

The most common reason high-risk patients reported not testing was "my doctor didn't recommend it" (Kaurin et al 2017)

Largest barrier to genetic testing from patients is lack of physician referral

Lowest referral rates from:

- Primary care
- Family medicine
- Obstetrics/gynecology

Lowest referral rates for:

- Patients with public insurance or no insurance
- Patients of color

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Non-white patients are less likely to discuss testing with a provider

- Black patients were **16 times** less likely
- Spanish speaking Hispanic women **2 times** less likely

Racial disparities in *BRCA* testing and cancer risk management across a population-based sample of young breast cancer survivors

Deborah Cragun, PhD[1,2], Anne Weidner, MPH[1], Courtney Lewis, MPH[1], Devon Bonner, BA[1], Jongphil Kim, PhD[1], Susan T. Vadaparampil, PhD[1], and Tuya Pal, MD[1]

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Reasons for referral differ based on race/ethnicity

- White patients are referred due to family history
- Non-white (Black, Hispanic, Asian) due to personal history
  - **25-40%** would have met criteria prior to their personal diagnosis

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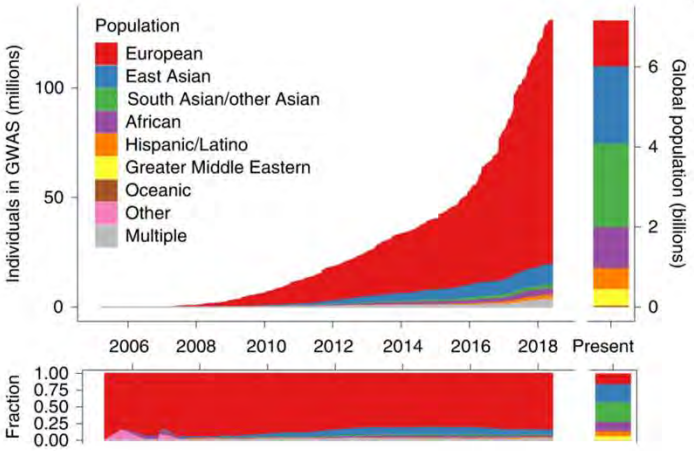
Genetic testing

Reference and base of genetic testing is European

- GWAS studies for cancer risk were 84% European
  - Homogeneity increased statistical power→ prioritized European ancestry
- Omaha is 66% White non-Hispanic
- Only 16% of the global population is European descent

Because of this VUS rates are higher in non-white individuals

- 25% in White, 38% in non-White (Caswell-Jin et al 2017)
- White 9%, Hispanic 17.2% (Soewito et al 2022)



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PRS (polygenic risk scores)

- Historically (**until 2021**) was only available for white individuals
- New version is now "clinically" available
  - Discrimination of low vs high risk is still lower for people with African ancestry
  - Still not equitable and still built from the same European based GWAS data

Self-Reported Ancestry	Total No.	Patients With BC (No.)	OR per SD (95% CI)	P
All	89,126	20,323	1.43 (1.40 to 1.46)	8.6×10^{-308}
Asian	2,063	613	1.45 (1.28 to 1.63)	2.2×10^{-9}
Black/African	10,334	2,425	1.23 (1.17 to 1.30)	2.5×10^{-14}
Hispanic	7,815	1,334	1.46 (1.36 to 1.57)	2.5×10^{-25}
Mixed Ancestry[a]	4,126	560	1.54 (1.38 to 1.72)	1.1×10^{-14}
Non-European[b]	21,668	4,660	1.35 (1.30 to 1.41)	2.0×10^{-47}
White/Ashkenazi	60,520	13,880	1.45 (1.42 to 1.49)	4.2×10^{-235}

Hughes et al 2022

PRS practice resource

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Disparities are not limited to germline testing

Patients with ovarian cancer and Medicaid were less likely to undergo somatic and germline testing

Gamble et al 2021

	Any precision medicine test¥		Molecular genetic testing†		Ancillary pathology tests‡	
	Commercial *N* (row %)	Medicaid *N* (row %)	Commercial *N* (row %)	Medicaid *N* (row %)	Commercial *N* (row %)	Medicaid *N* (row %)
Testing rates *n* (%)	13,385 (55.6)	1497 (48.4)	3311 (13.7)	140 (4.5)	12,332 (51.2)	1443 (46.6)
Multivariate analysis* aRR (95%CI)	0.91(0.84 to 0.98)		0.33 (0.25 to 0.42)		0.97 (0.89 to 1.07)	
Year of procedure						
2011	2525 (47.0)	158 (41.4)	17 (0.32)	0 (0.0)	2518 (46.8)	158 (41.4)
2012	2571 (53.3)	232 (48.7)	397 (8.24)	3 (0.6)	2432 (50.5)	231 (48.5)
2013	2411 (58.0)	218 (44.9)	738 (17.8)	7 (1.4)	2170 (52.2)	216 (44.4)
2014	1851 (52.9)	204 (41.2)	699 (20.0)	41 (8.3)	1605 (45.9)	187 (37.8)
2015	1664 (63.6)	260 (52.2)	596 (22.8)	33 (6.6)	1486 (56.8)	249 (50.0)
2016	1605 (64.8)	277 (55.4)	559 (22.6)	42 (8.4)	1436 (58.0)	258 (51.6)
2017	758 (66.6)	148 (57.6)	305 (26.8)	14 (5.5)	685 (60.2)	144 (56.0)
p-value#	<0.0001	<0.0001	<0.0001)	<0.0001	<0.0001	0.0002

5.6%

9%

¥Any test includes any molecular test or ancillary test.
†Any molecular test includes: both somatic and germline testing. BRCA 1/2 gene only: limited sequencing, BRCA1/2 gene only: full sequencing, multi-gene sequencing, and single gene analysis (non-BRCA/Lynch).
‡Ancillary pathology test includes: Microsatellite Instability / Immunohistochemistry (IHC) testing, IHC alone, Fluorescence in situ hybridization(FISH) testing, and ancillary procedures.

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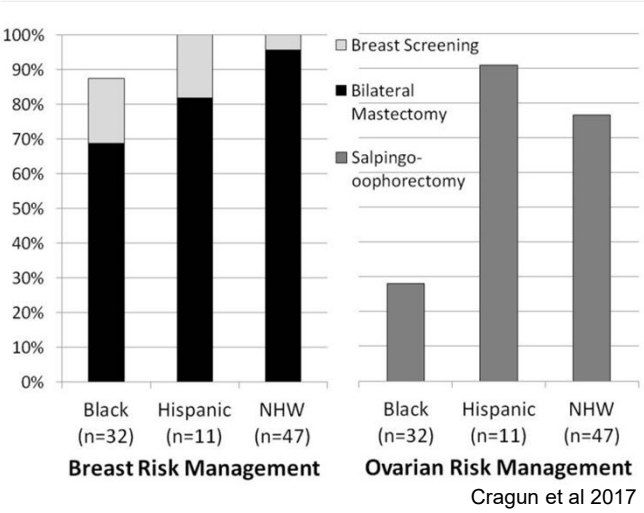
Risk reduction and follow up

Black women are less likely to get RRSO or RRM after + result

Across all clinical trials participants are more likely to be white

- 80% of participants in clinical trials are white

Non-white individuals have lower rates of cancer screenings



Cragun et al 2017

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Addressing disparities

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Self education

College of Public Health Series
Becoming an Antiracist Public Health System

NSGC Cancer SIG
Antiracism Cancer Curriculum Toolkit

UCSF
Gender Affirming Care Guidelines

Nebraska Medicine
Gender Care Clinic

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Decrease barriers to genetics

- Remote and telehealth options
  - Available through Nebraska Med/UNMC
- Involvement with community healthcare
- Population based genetic testing
  - Already recommended for **ovarian** and **pancreatic**
  - Already "considered" for **colon**
- Talk to patients about genetics **before** referring
- Refer regardless of presumed insurance barriers

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For high-risk patients

- Follow risk reducing and screening recommendations
- Help with patient care coordination
  - PCP
  - Cancer Risk and Prevention Clinic
  - Survivorship Clinic
- Assist in recommending cascade testing for family members
- Support groups and resources
  - Emotional and financial support

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Referrals in Epic
Fax: 402-559-6688
Phone: 402-559-3602

Yes / No	Known genetic cancer risk in the family (sometimes called a gene mutation)
Yes / No	Cancer diagnosed younger than age 50
Yes / No	3 or more relatives with the same type of cancer
Yes / No	Ovarian cancer, triple negative breast cancer, or pancreatic cancer
Yes / No	Prostate cancer that has spread (metastasized)
Yes / No	Male with breast cancer
Yes / No	3 or more relatives on the same side of the family with breast, prostate, and/or ovarian cancer
Yes / No	3 or more relatives on the same side of the family with colon and/or uterine cancer
Yes / No	Female with breast cancer under the age of 45
Yes / No	10 or more colon polyps (in a lifetime)
Yes / No	Kidney cancer under the age 46
Yes / No	Stomach cancer under the age of 40
Yes / No	Adrenal cortical carcinoma (cancer of the adrenal gland)
Yes / No	Neuroendocrine type of pancreatic tumor
Yes / No	Paraganglioma or pheochromocytoma (type of neuroendocrine tumor)
Yes / No	Medullary thyroid cancer at any age
Yes / No	Ashkenazi Jewish ancestry (heritage)
Yes / No	3 or more diagnoses of invasive melanoma (in a lifetime)

If you circled YES to any of the questions, genetic counseling and testing may be helpful for you. Please talk to your doctor or contact us to make an appointment to discuss your family history further.

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