Exploring Cancer

Examining the Role of Biology, Race, Class, and Socioeconomics

Live Lecture

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Exploring Cancer

Examining the Role of Biology, Race, Class, and Socioeconomics

Learn more, register for courses, and sign up for our mailing list at
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A collaboration between

NCCentral University | UNC Lineberger Comprehensive Cancer Center | North Carolina Agricultural and Technical State University

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Exploring Cancer
Examining the Role of Biology, Race, Class, and Socioeconomics

Fridays
11:00 - 11:50 AM EST/EDT

August 29
Welcome to Cancer(s) and Health Disparities 101 - The Introduction

September 5
Patient Navigation: The Nurse, Patient & Advocate

September 12
Achieving Excellence and Equity in Difficult Times

October 3
Breast Cancer Health Disparities

October 17
Cancer From a Public Health Perspective

October 31
Reassessing Tumor Biology through the Lens of African Ancestry and Health Equity

November 7
Health Disparities

November 14
Precision Medicine and Immunotherapy

November 21
Cancer Care for All: Challenges and Opportunities in Low-Resource Settings

4

Exploring Cancer
Examining the Role of Biology, Race, Class, and Socioeconomics

October 3, 2025

Breast Cancer Health Disparities

Checo Rorie, PhD
Chair of the Department of Biology
Associate Professor of Genetics
Department of Biology
College of Science and Technology
North Carolina Agricultural and Technical State University

5

Checo Rorie, PhD

Checo J. Rorie, PhD, is originally from Marshville, NC, was raised by his grandparents and is a first-generation college student. Dr. Rorie attended Clark Atlanta University in Atlanta, GA, where he majored in Biology and graduated in 1998 with a bachelor of science degree. As an undergraduate, Dr. Rorie was a MARC Scholar and conducted breast cancer research in a Cancer Cell Biology laboratory. Dr. Rorie then attended the University of North Carolina at Chapel Hill's Curriculum in Toxicology graduate program earning a PhD in 2004. After graduating from UNC-CH, Dr. Rorie completed a postdoctoral fellowship at New York University, and then participated in a second postdoctoral fellowship back at UNC-CH in the Seeding Postdoctoral Innovators in Research & Education (SPIRE) program.

Dr. Rorie has been at North Carolina Agricultural and Technical State University since 2008, and is currently the Professor and Chair of the Department of Biology. Dr. Rorie has a Cancer Genetics and Cell Biology laboratory where his lab studies the mechanisms of breast cancer health disparities in African American Women.

6

Professional Highlights

7

Professional Highlights

5. Dr. Rorie attended Clark Atlanta University where he majored in Biology and graduated with a bachelors in science.

8

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9

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North Carolina Agricultural and Technical State University

Breast Cancer Health Disparities

Checo J. Rorie, PhD
Professor & Chair
Department of Biology

AGGIES DO

13

North Carolina Agricultural and Technical State University

My Journey

- Originally from Marshville, North Carolina; Forest Hills High School 1994
- Attended Clark Atlanta University, Atlanta, Georgia; B.S. Biology 1998 (John Browne)
- Attended UNC Chapel Hill; Ph.D. Toxicology 2004 (Bernard "Buddy" Weissman)
- Postdoc at New York University, New York, New York; Biochemistry 2005 (James "Jim" Boroweic)
- Postdoc in the SPIRE Program at UNC Chapel Hill; Radiation Oncology 2008 (YanPing Zhang)
- Currently: Professor and Chair of Biology, NC A&T State University

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Do you know anyone who has been diagnosed with breast cancer?

Yes 0%

No 0%

Start the presentation to see live content. For screen share software, share the entire screen. Get help at **pollev.com/app**

15


Do you know anyone who has died of breast cancer?
Yes
0%
No
0%
Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

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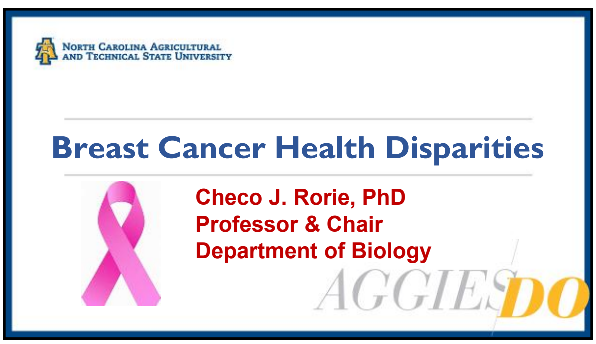
North Carolina Agricultural and Technical State University
Breast Cancer Health Disparities
Checo J. Rorie, PhD
Professor & Chair
Department of Biology
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17


Breast Cancer Awareness Month
In honor of
Aunt Francis
and our friend
Amanda

18


"Is reducing racial disparities in healthcare *truly* possible?"
Anonymous, August 28, 2020

19


Have you ever heard of the phrase, "cancer health disparity"?
Yes
0%
No
0%
Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

20


Define what "cancer health disparity" means: place short definitions using Poll Everywhere or Zoom chat.
Nobody has responded yet.
Hang tight! Responses are coming in.
Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

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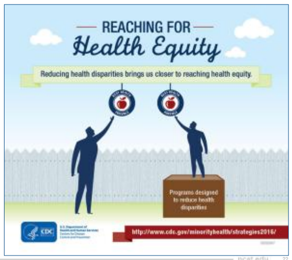
NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

Defining Cancer Health Disparity

Cancer health disparities occur when certain groups bear a disproportionate (uneven, unequal) ***burden*** of cancer compared with other groups.



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Estimated New Cases	Male			Female		
	Prostate	161,360	19%	Breast	252,710	30%
	Lung & bronchus	116,990	14%	Lung & bronchus	105,510	12%
	Colon & rectum	71,420	9%	Colon & rectum	64,010	8%
	Urinary bladder	60,490	7%	Uterine corpus	61,380	7%
	Melanoma of the skin	52,170	6%	Thyroid	42,470	5%
	Kidney & renal pelvis	40,610	5%	Melanoma of the skin	34,940	4%
	Non-Hodgkin lymphoma	40,080	5%	Non-Hodgkin lymphoma	32,160	4%
	Leukemia	36,290	4%	Leukemia	25,840	3%
	Oral cavity & pharynx	35,720	4%	Pancreas	25,700	3%
	Liver & intrahepatic bile duct	29,200	3%	Kidney & renal pelvis	23,380	3%
	All sites	836,150	100%	All sites	852,630	100%

Estimated Deaths	Male			Female		
	Lung & bronchus	84,590	27%	Lung & bronchus	71,280	25%
	Colon & rectum	27,150	9%	Breast	40,610	14%
	Prostate	26,730	8%	Colon & rectum	23,110	8%
	Pancreas	22,300	7%	Pancreas	20,790	7%
	Liver & intrahepatic bile duct	19,610	6%	Ovary	14,080	5%
	Leukemia	14,300	4%	Uterine corpus	10,920	4%
	Esophagus	12,720	4%	Leukemia	10,200	4%
	Urinary bladder	12,240	4%	Liver & intrahepatic bile duct	9,310	3%
	Non-Hodgkin lymphoma	11,450	4%	Non-Hodgkin lymphoma	8,690	3%
	Brain & other nervous system	9,620	3%	Brain & other nervous system	7,080	3%
	All sites	318,420	100%	All sites	282,500	100%

Estimates are rounded to the nearest 10, and cases exclude basal cell and squamous cell skin cancers and in situ carcinoma except urinary bladder.

Cancer Facts & Figures 2017

23

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Cancer Facts & Figures 2017

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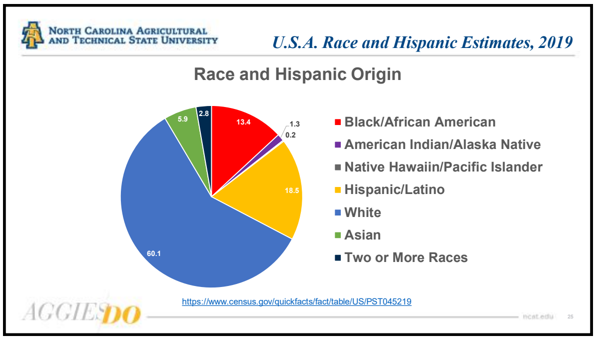
North Carolina Agricultural and Technical State University
U.S.A. Race and Hispanic Estimates, 2019
Race and Hispanic Origin
13.4
1.3
0.2
18.5
60.1
5.9
2.8
Black/African American
American Indian/Alaska Native
Native Hawaiin/Pacific Islander
Hispanic/Latino
White
Asian
Two or More Races
https://www.census.gov/quickfacts/fact/table/US/PST045219
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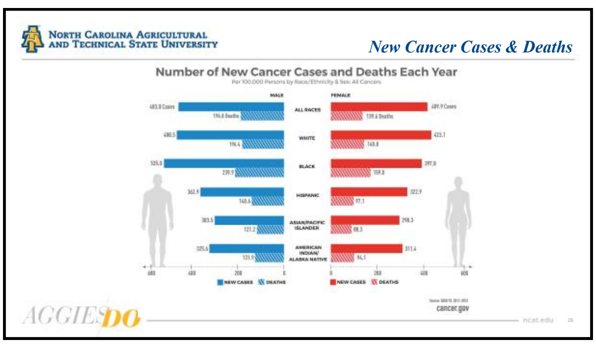
North Carolina Agricultural and Technical State University
New Cancer Cases & Deaths
Number of New Cancer Cases and Deaths Each Year
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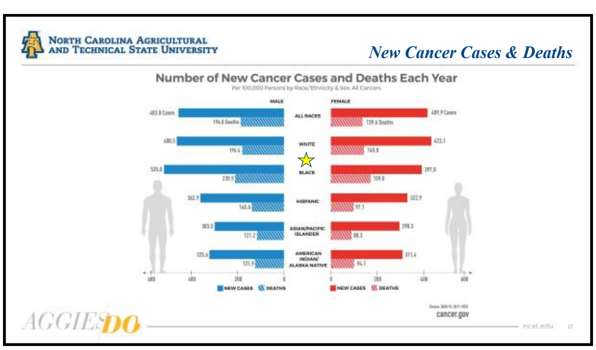
North Carolina Agricultural and Technical State University
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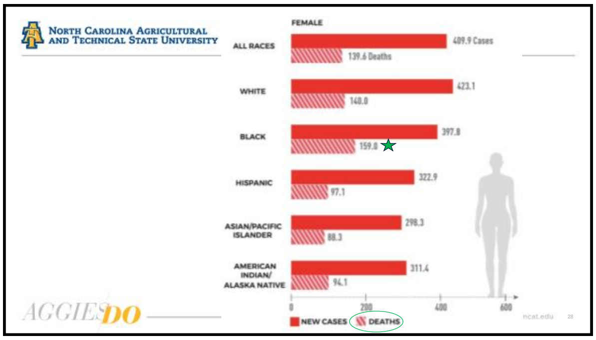
North Carolina Agricultural and Technical State University
FEMALE
ALL RACES
409.9 Cases
139.6 Deaths
WHITE
423.1
140.0
BLACK
397.8
159.0
HISPANIC
322.9
97.1
ASIAN/PACIFIC ISLANDER
298.3
88.3
AMERICAN INDIAN/ ALASKA NATIVE
311.4
94.1
0
200
400
600
NEW CASES
DEATHS
AGGIES DO
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Both men and women can get breast cancer.
True
0%
False
0%
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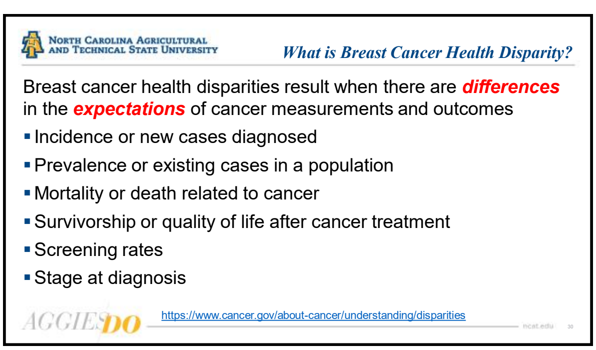
North Carolina Agricultural and Technical State University
What is Breast Cancer Health Disparity?
Breast cancer health disparities result when there are differences in the expectations of cancer measurements and outcomes
Incidence or new cases diagnosed
Prevalence or existing cases in a population
Mortality or death related to cancer
Survivorship or quality of life after cancer treatment
Screening rates
Stage at diagnosis
AGGIES DO
https://www.cancer.gov/about-cancer/understanding/disparities
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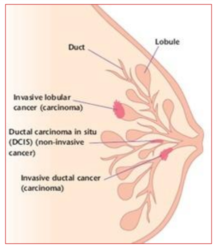
North Carolina Agricultural and Technical State University

Breast Cancer

- Most breast cancers begin in the lobules (milk glands) or in the ducts that connect the lobules to the nipple.
- Typically has no symptoms when the tumor is small and most easily treated, which is why screening is important for early detection.
- Most common physical sign is a painless lump.
- Men get breast cancer too (less than 1%)



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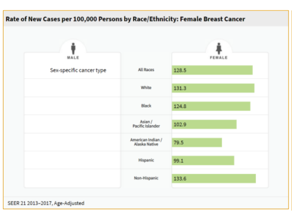
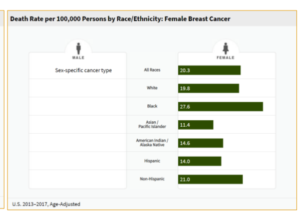
North Carolina Agricultural and Technical State University

Breast Cancer Statistics





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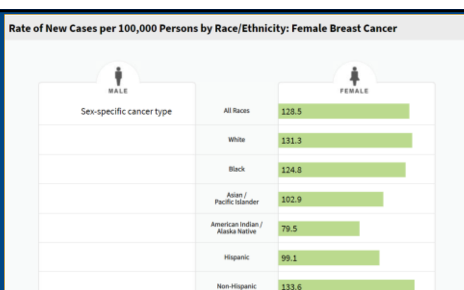
https://seer.cancer.gov/statfacts/html/breast.html

32



https://seer.cancer.gov/statfacts/html/breast.html

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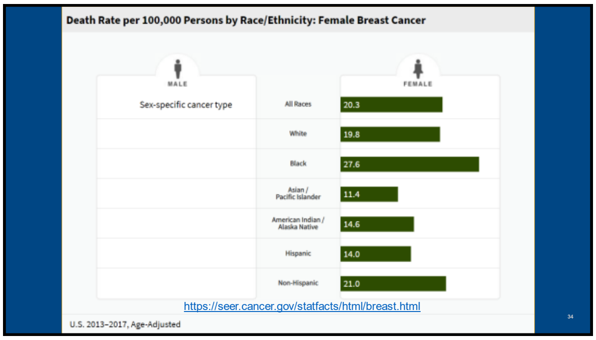
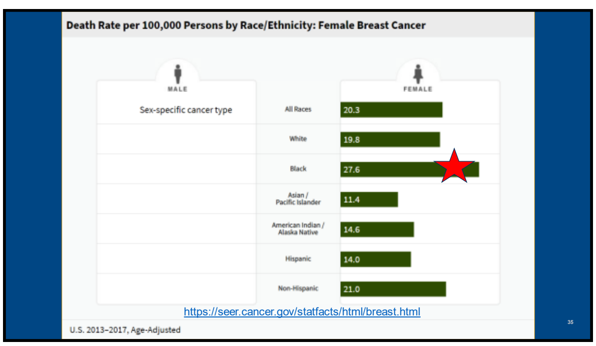

Death Rate per 100,000 Persons by Race/Ethnicity: Female Breast Cancer
MALE
FEMALE
Sex-specific cancer type
All Races
20.3
White
19.8
Black
27.6
Asian / Pacific Islander
11.4
American Indian / Alaska Native
14.6
Hispanic
14.0
Non-Hispanic
21.0
https://seer.cancer.gov/statfacts/html/breast.html
U.S. 2013–2017, Age-Adjusted

34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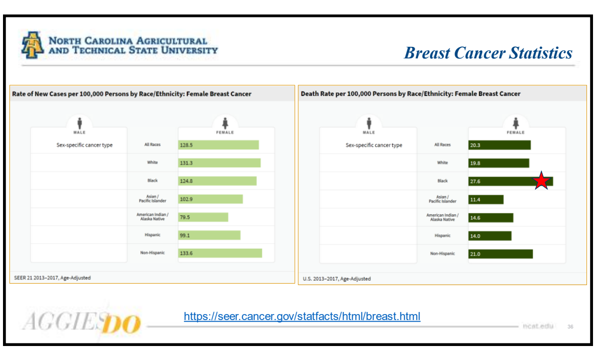
North Carolina Agricultural and Technical State University
Breast Cancer Statistics
Rate of New Cases per 100,000 Persons by Race/Ethnicity: Female Breast Cancer
MALE
FEMALE
Sex-specific cancer type
All Races
128.5
White
131.3
Black
124.8
Asian / Pacific Islander
102.9
American Indian / Alaska Native
79.5
Hispanic
99.1
Non-Hispanic
133.6
SEER 21 2013–2017, Age-Adjusted
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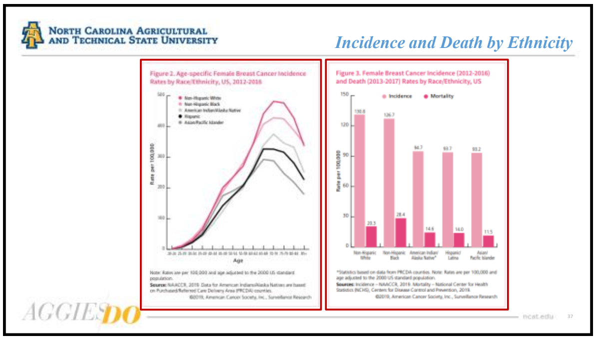
AGGIES DO
https://seer.cancer.gov/statfacts/html/breast.html

36


North Carolina Agricultural and Technical State University
Incidence and Death by Ethnicity
Figure 2. Age-specific Female Breast Cancer Incidence Rates by Race/Ethnicity, US, 2012-2016
Figure 3. Female Breast Cancer Incidence (2012-2016) and Death (2013-2017) Rates by Race/Ethnicity, US
Incidence
Mortality
AGGIES DO

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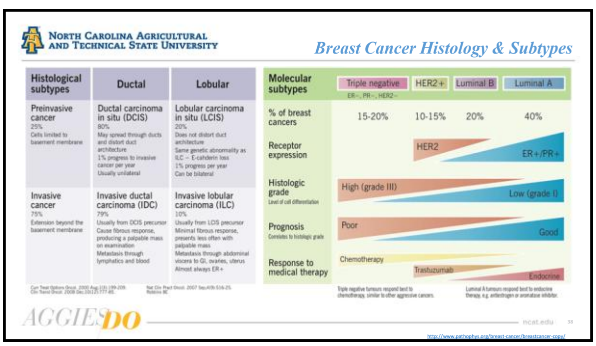
North Carolina Agricultural and Technical State University
Breast Cancer Histology & Subtypes
Histological subtypes
Ductal
Lobular
Preinvasive cancer
25%
Cells limited to basement membrane
Ductal carcinoma in situ (DCIS)
80%
May spread through ducts and distort duct architecture
1% progress to invasive cancer per year
Usually unilateral
Lobular carcinoma in situ (LCIS)
20%
Does not distort duct architecture
Same genetic abnormality as ILC – E-cahderin loss
1% progress per year
Can be bilateral
Invasive cancer
75%
Extension beyond the basement membrane
Invasive ductal carcinoma (IDC)
79%
Usually from DCIS precursor
Cause fibrous response, producing a palpable mass on examination
Metastasis through lymphatics and blood
Invasive lobular carcinoma (ILC)
10%
Usually from LCIS precursor
Minimal fibrous response, presents less often with palpable mass
Metastasis through abdominal viscera to GI, ovaries, uterus
Almost always ER+
Molecular subtypes
Triple negative
ER−, PR−, HER2−
HER2+
Luminal B
Luminal A
% of breast cancers
15-20%
10-15%
20%
40%
Receptor expression
HER2
ER+/PR+
Histologic grade
Level of cell differentiation
High (grade III)
Low (grade I)
Prognosis
Correlates to histologic grade
Poor
Good
Response to medical therapy
Chemotherapy
Trastuzumab
Endocrine
Triple negative tumours respond best to chemotherapy, similar to other aggressive cancers.
Luminal A tumours respond best to endocrine therapy, e.g. antiestrogen or aromatase inhibitor.
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http://www.pathophys.org/breast-cancer/breastcancer-copy/

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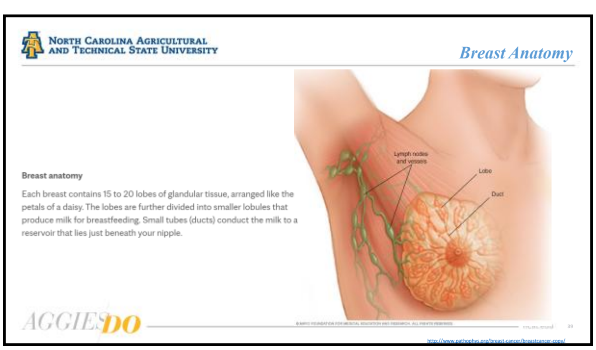
North Carolina Agricultural and Technical State University
Breast Anatomy
Breast anatomy
Each breast contains 15 to 20 lobes of glandular tissue, arranged like the petals of a daisy. The lobes are further divided into smaller lobules that produce milk for breastfeeding. Small tubes (ducts) conduct the milk to a reservoir that lies just beneath your nipple.
Lymph nodes and vessels
Lobe
Duct
AGGIES DO
http://www.pathophys.org/breast-cancer/breastcancer-copy/

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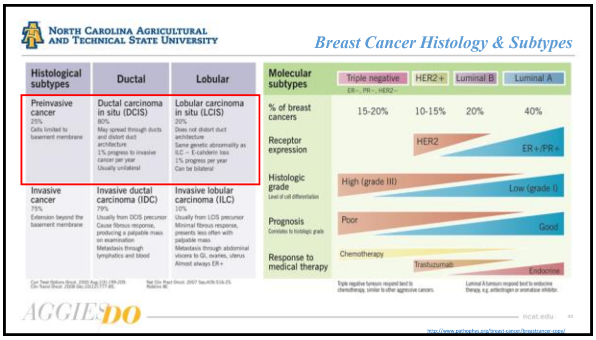
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http://www.pathophys.org/breast-cancer/breastcancer-copy/

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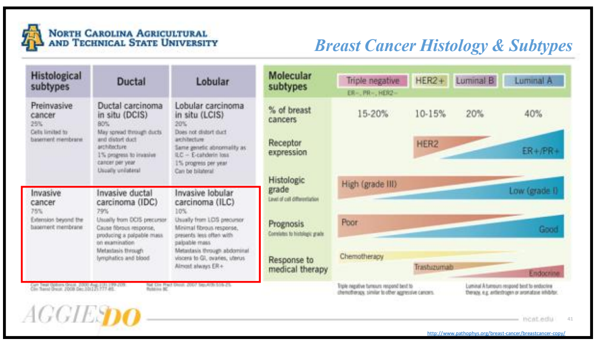
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http://www.pathophys.org/breast-cancer/breastcancer-copy/

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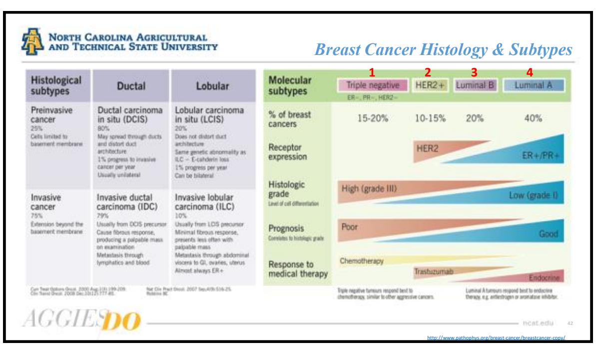
North Carolina Agricultural and Technical State University
Breast Cancer Histology & Subtypes
Histological subtypes
Ductal
Lobular
Preinvasive cancer
25%
Cells limited to basement membrane
Ductal carcinoma in situ (DCIS)
80%
May spread through ducts and distort duct architecture
1% progress to invasive cancer per year
Usually unilateral
Lobular carcinoma in situ (LCIS)
20%
Does not distort duct architecture
Same genetic abnormality as ILC – E-cahderin loss
1% progress per year
Can be bilateral
Invasive cancer
75%
Extension beyond the basement membrane
Invasive ductal carcinoma (IDC)
79%
Usually from DCIS precursor
Cause fibrous response, producing a palpable mass on examination
Metastasis through lymphatics and blood
Invasive lobular carcinoma (ILC)
10%
Usually from LCIS precursor
Minimal fibrous response, presents less often with palpable mass
Metastasis through abdominal viscera to GI, ovaries, uterus
Almost always ER+
Molecular subtypes
1
2
3
4
Triple negative
ER–, PR–, HER2–
HER2+
Luminal B
Luminal A
% of breast cancers
15-20%
10-15%
20%
40%
Receptor expression
HER2
ER+/PR+
Histologic grade
Level of cell differentiation
High (grade III)
Low (grade I)
Prognosis
Correlates to histologic grade
Poor
Good
Response to medical therapy
Chemotherapy
Trastuzumab
Endocrine
Triple negative tumours respond best to chemotherapy, similar to other aggressive cancers.
Luminal A tumours respond best to endocrine therapy, e.g. antiestrogen or aromatase inhibitor.
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http://www.pathophys.org/breast-cancer/breastcancer-copy/

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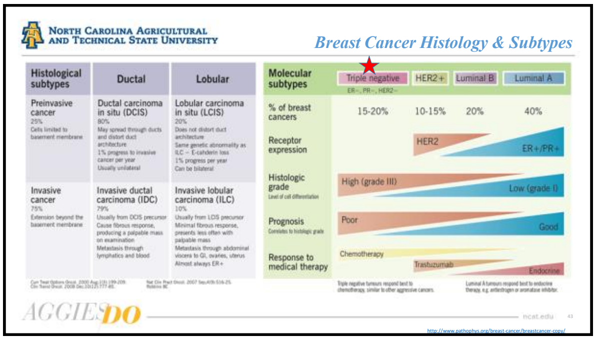
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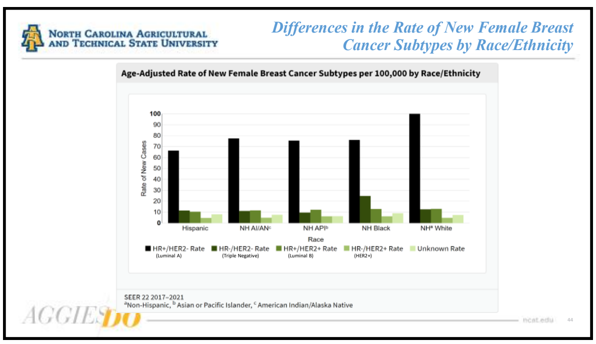
North Carolina Agricultural and Technical State University
Differences in the Rate of New Female Breast Cancer Subtypes by Race/Ethnicity
Age-Adjusted Rate of New Female Breast Cancer Subtypes per 100,000 by Race/Ethnicity
Rate of New Cases
Hispanic
NH AI/AN
NH API
NH Black
NH White
Race
HR+/HER2- Rate (Luminal A)
HR-/HER2- Rate (Triple Negative)
HR+/HER2+ Rate (Luminal B)
HR-/HER2+ Rate (HER2+)
Unknown Rate
SEER 22 2017–2021
Non-Hispanic, Asian or Pacific Islander, American Indian/Alaska Native
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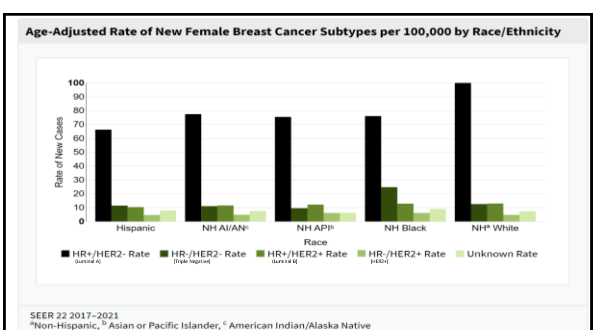
Age-Adjusted Rate of New Female Breast Cancer Subtypes per 100,000 by Race/Ethnicity
100
90
80
70
60
50
40
30
20
10
0
Rate of New Cases
Hispanic
NH AI/AN[c]
NH API[b]
NH Black
NH[a] White
Race
HR+/HER2- Rate (Luminal A)
HR-/HER2- Rate (Triple Negative)
HR+/HER2+ Rate (Luminal B)
HR-/HER2+ Rate (HER2+)
Unknown Rate
SEER 22 2017–2021
[a]Non-Hispanic, [b] Asian or Pacific Islander, [c] American Indian/Alaska Native

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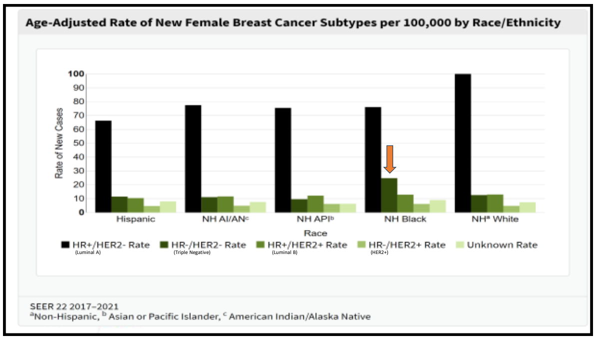
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SEER 22 2017–2021
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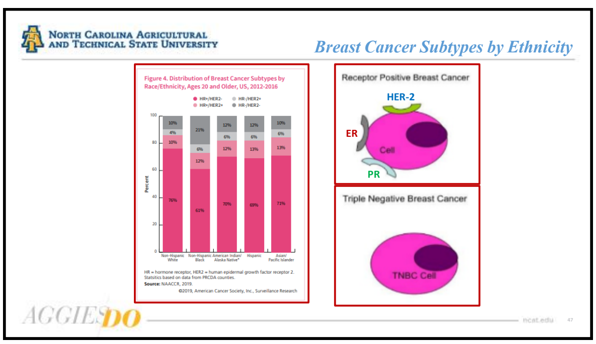
North Carolina Agricultural and Technical State University
Breast Cancer Subtypes by Ethnicity
Figure 4. Distribution of Breast Cancer Subtypes by Race/Ethnicity, Ages 20 and Older, US, 2012-2016
Receptor Positive Breast Cancer
HER-2
ER
Cell
PR
Triple Negative Breast Cancer
TNBC Cell
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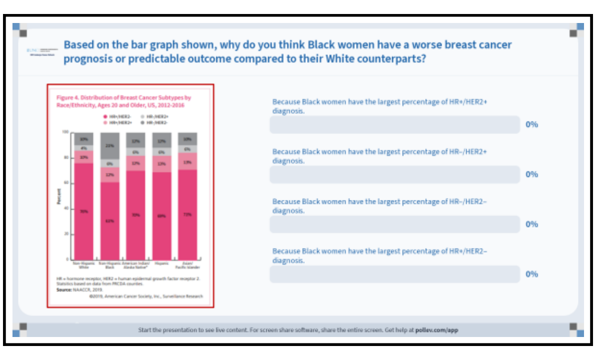
Based on the bar graph shown, why do you think Black women have a worse breast cancer prognosis or predictable outcome compared to their White counterparts?
Figure 4. Distribution of Breast Cancer Subtypes by Race/Ethnicity, Ages 20 and Older, US, 2012-2016
Because Black women have the largest percentage of HR+/HER2+ diagnosis.
0%
Because Black women have the largest percentage of HR-/HER2+ diagnosis.
0%
Because Black women have the largest percentage of HR-/HER2– diagnosis.
0%
Because Black women have the largest percentage of HR+/HER2– diagnosis.
0%
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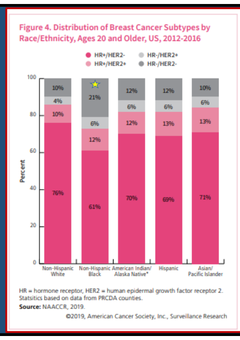
Non-Hispanic Black women have the largest percent at 21% diagnosis of Triple-Negative Breast Cancer, the most aggressive form of breast cancer



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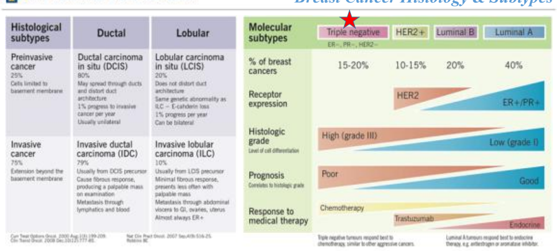
Breast Cancer Histology & Subtypes



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http://www.pathophys.org/breast-cancer/breastcancer-copy/

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Background: Triple negative breast cancer

- Potential driver or breast cancer health disparities
- Lack of estrogen receptors (ER), progesterone receptors (PR) and human epidermal growth factor receptor-2 (HER2) expression resulting in ***lack of targeted therapies***
- Typically stains positive for ***mutant-p53*** (80% of cases)
- Account for 10-17% of all breast cancer
- More prevalent in ***African-American women*** with a higher death rate in those ***age <35***
- Significantly more aggressive (high growth rates, highly invasive/metastatic) than other subgroups with a peak ***risk of recurrence (survival rate 40%)*** in visceral and soft tissue between the first- and third-years following therapy

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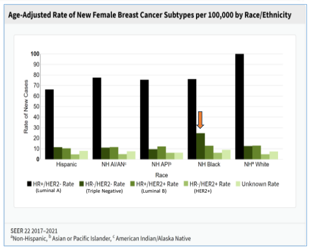
Who is Affected by Triple Negative Breast Cancer?

- The risks are higher in African-American and Latino populations.
- African American women 35 years old or younger.
- Some studies have identified new risk factors for developed TNBC.
  - Early menarche
  - Having a full-term pregnancy at a young age
  - Breastfeed for a short period



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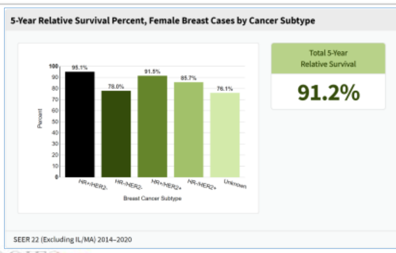
Relative Survival Rates by Cancer Subtypes



- Luminal A
- Triple Negative
- Luminal B
- HER2+

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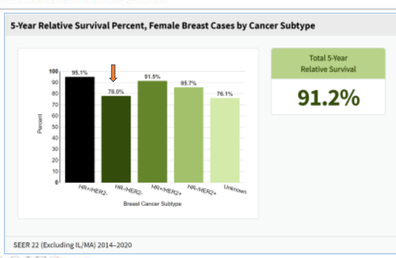
Relative Survival Rates by Cancer Subtypes



- Luminal A
- Triple Negative
- Luminal B
- HER2+

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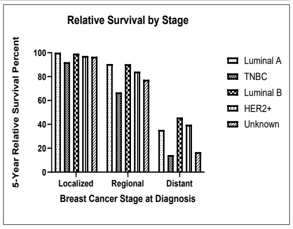
Breast Cancer Relative Survival Rates by Stage of Diagnosis

5-Year Relative Survival Percent, Female Breast Subtypes by SEER Combined Summary Stage

Subtype	Localized	Regional	Distant
HR+/HER2- (Luminal A)	100.0%	90.5%	35.4%
HR-/HER2- (Triple Negative)	92.0%	66.8%	14.3%
HR+/HER2+ (Luminal B)	99.3%	90.4%	45.8%
HR-/HER2+ (HER2+)	97.3%	84.2%	39.7%
Unknown	96.6%	77.4%	16.8%
Total	99.6%	86.7%	31.9%

SEER 22 (Excluding IL/MA) 2014-2020



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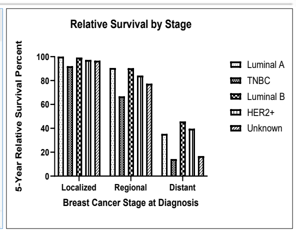

At all stages of diagnosis, Triple Negative Breast Cancer has worst prognosis

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Difference in Survival Rates

- **African American (AA) women-lower 5-year survival rate**
  - » 81% compared to 92% among non-Hispanic/White women
  - » Premenopausal AA women appear to have a higher risk of triple negative and basal-like breast cancers
  - » Have higher rate of occurrence of TNBC (39% versus 15%)

Why the differences in survival rates?

- Biologic and genetic differences in tumors
- Prevalence of risk factors
- Barriers to health care access
- Later stage of breast cancer at diagnosis

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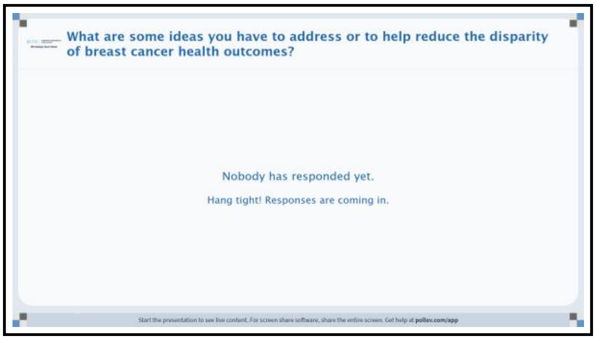
What are some ideas you have to address or to help reduce the disparity of breast cancer health outcomes?
Nobody has responded yet.
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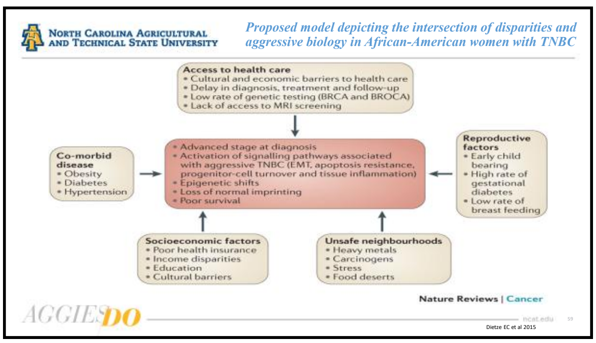
North Carolina Agricultural and Technical State University
Proposed model depicting the intersection of disparities and aggressive biology in African-American women with TNBC
Access to health care
• Cultural and economic barriers to health care
• Delay in diagnosis, treatment and follow-up
• Low rate of genetic testing (BRCA and BROCA)
• Lack of access to MRI screening
Co-morbid disease
• Obesity
• Diabetes
• Hypertension
• Advanced stage at diagnosis
• Activation of signalling pathways associated with aggressive TNBC (EMT, apoptosis resistance, progenitor-cell turnover and tissue inflammation)
• Epigenetic shifts
• Loss of normal imprinting
• Poor survival
Reproductive factors
• Early child bearing
• High rate of gestational diabetes
• Low rate of breast feeding
Socioeconomic factors
• Poor health insurance
• Income disparities
• Education
• Cultural barriers
Unsafe neighbourhoods
• Heavy metals
• Carcinogens
• Stress
• Food deserts
Nature Reviews | Cancer
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59
Dietze EC et al 2015

59


"Is reducing racial disparities in healthcare *truly* possible?"
Anonymous, August 28, 2020

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Thank You!

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Questions/Comments?
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Exploring Cancer
Examining the Role of Biology, Race, Class, and Socioeconomics
Live Lecture
October 17
11:00 AM
Upcoming Live Webinar
Cancer from a Public Health Perspective
Seronda Robinson, PhD
Professor/Epidemiologist
Eagle Pride Blood Drive Coordinator
Eta Sigma Gamma Advisor
Department of Public Health Education
North Carolina Central University
Veronica Carlisle, MPH, CHES
Senior Community Health Educator
Office of Community Outreach and Engagement
UNC Lineberger Comprehensive Cancer Center
The University of North Carolina, Chapel Hill

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Exploring Cancer
Examining the Role of Biology, Race, Class, and Socioeconomics

Exploring Cancer is a webinar series taught by cancer biologists, physicians, public health experts, and other cancer specialists from **NCCU**, **UNC-Chapel Hill**, and **NC A&T.**

For a full list of courses, visit: exploringcancer.org/courses

UNC Lineberger Cancer Network

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Exploring Cancer
Examining the Role of Biology, Race, Class, and Socioeconomics

Thank you for participating!

You may now proceed to the class evaluation and assessment to earn your certificate of completion.

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