Examining Disparities in Access to Breast and/or Ovarian Cancer Genetic Risk Assessment in “High Incidence Counties” versus “High Usage Counties”

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BRCA and Hereditary Breast and Ovarian Cancer Syndrome

- Hereditary Breast and Ovarian Cancer Syndrome (HBOC) will account for ~ 5-10% of all breast and 18-24% of all ovarian cancers
- *BRCA1 & 2:* "**BR**east **CA**ncer 1 and 2" Genes
  - Code for tumor suppressor proteins
  - Dominant pattern of inheritance; Affected parent has 50% chance of passing gene mutation onto offspring
- Pathogenic *BRCA* mutations confer increased lifetime risk of certain cancers
  - Breast Cancer = 40-80%
  - Ovarian Cancer = 11-40%
- Estimated 1 in 300 to 1 in 500 individuals will have a pathogenic *BRCA* mutation

Sources: 1. Petrucelli, N, Daly, MB, Feldman, GL. 2013. Gene Reviews: *BRCA1* and *BRCA2* Hereditary Breast and Ovarian Cancer. http://www.ncbi.nlm.nih.gov/books/NBK1247/
2. https://www.mdanderson.org/patient-education/Genetics/Hereditary-Breast-and-Ovarian-Cancer-Syndrome_docx_pe.pdf

NCCN Criteria for HBOC Genetic Risk Assessment (2016)

- Personal History
  - Known familial mutation in cancer susceptibility gene (i.e. BRCA)
  - Breast cancer at a young age (≤ 50 y.o.)
  - Triple negative breast cancer diagnosed at 60 y.o. or younger
  - Multiple primary HBOC-related cancers
  - Breast cancer at any age, and
    - ≥ 1 close blood relative with breast cancer at young age, or
    - ≥ 1 close blood relative w/ invasive ovarian cancer at any age
    - ≥ 2 close blood relatives w breast cancer and/or pancreatic cancer
    - From a population at increased risk
  - Male breast cancer
  - Ashkenazi Jewish Heritage w/ breast, ovarian, or pancreatic cancer at any age
  - Ovarian Cancer at any age

NCCN Criteria, Cont.

- Family History; close relative with any of the following:
  - Known familial mutation in cancer susceptibility gene
  - Multiple HBOC primaries in single individual
  - ≥ 2 individuals with breast cancer primaries on same side of family with at least one diagnosed ≤ 50 y.o.
  - Ovarian cancer
  - Male breast cancer
- First or second degree relative with breast cancer ≤ 45 y.o.
- Personal and/or family history of ≥ 3 HBOC-related cancers (e.g. breast, pancreatic, prostate, colon, endometrial, etc.)
- Guidelines are ever-evolving

Website:http://www.nccn.org/professionals/physician_gls/f_guidelines.asp#genetics_screening

Data Sources

- MDHHS *BRCA* Clinical Network Database
  - Funded through multiple CDC cooperative agreements
  - Unique to Michigan
  - Reporting on all BRCA-related counseling visits conducted by board-certified genetics professionals in MI
    - 18 contributing institutions – including one telecounseling service (Informed DNA)
  - Visit information consists of de-identified data on patient demographics, *BRCA* genetic testing, surgical procedures, personal and family history of cancer
- Michigan Cancer Surveillance Program (MCSP)
  - MI's cancer registry
  - Contains data on all cancer cases across the state
  - MDHHS Cancer Genomics requests case data for key cancers implicated in hereditary cancer syndromes, including breast and ovarian cancer

Analysis Objectives

- MDHHS Cancer Genomics aims to increase genetic services utilization for individuals meeting referral criteria
- Examine patient demographics in *BRCA* Clinical Network database Variables:
  - Year of Initial Visit
  - Dichotomous Race (White/Black only)
  - Ashkenazi Jewish heritage
  - Known Familial Mutation Status
  - Referring Physician
  - Insurance providers
- Compare demographics between two sub-populations:
  - "High Usage Counties" (HUC)
  - "High Incidence Counties" (HIC)

Methods

High Incidence Counties:

- 12 counties identified by prior analysis of MCSP data:
  - Highest Age-Adjusted Incidence of *Breast Cancer at a young age*, 1998-2007:
    - **Emmet, Manistee, Grand Traverse, Leelanau, & Mason**
  - Highest Age-Adjusted of *Ovarian Cancer*, 2006-2010
    - **Alpena, Huron, Newaygo, Midland, Berrien, Saginaw, & Bay**
- *BRCA* database participants with zip code of residence in these counties included in this group

High Usage Counties:

- Analysis run on initial patient visits in *BRCA* database by zip code
- High Usage Counties composed of zip codes accounting for top 10% of patient visits by volume
  - **Oakland, Wayne, & Washtenaw**
- *BRCA* database participants with zip code of residence in these counties included in this group

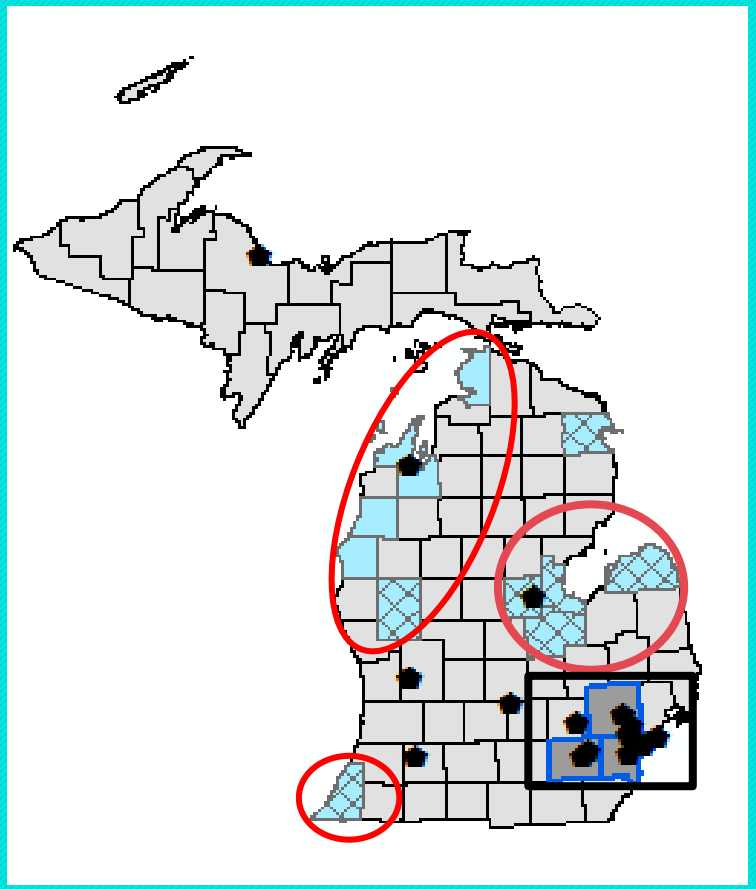
- Pearson Chi-square tests used to evaluate statistical dependence between sub-group designation and demographic characteristics
- Analysis completed using SAS 9.2® software

Geographic Distribution of “High Incidence Counties” and “High Usage Counties”

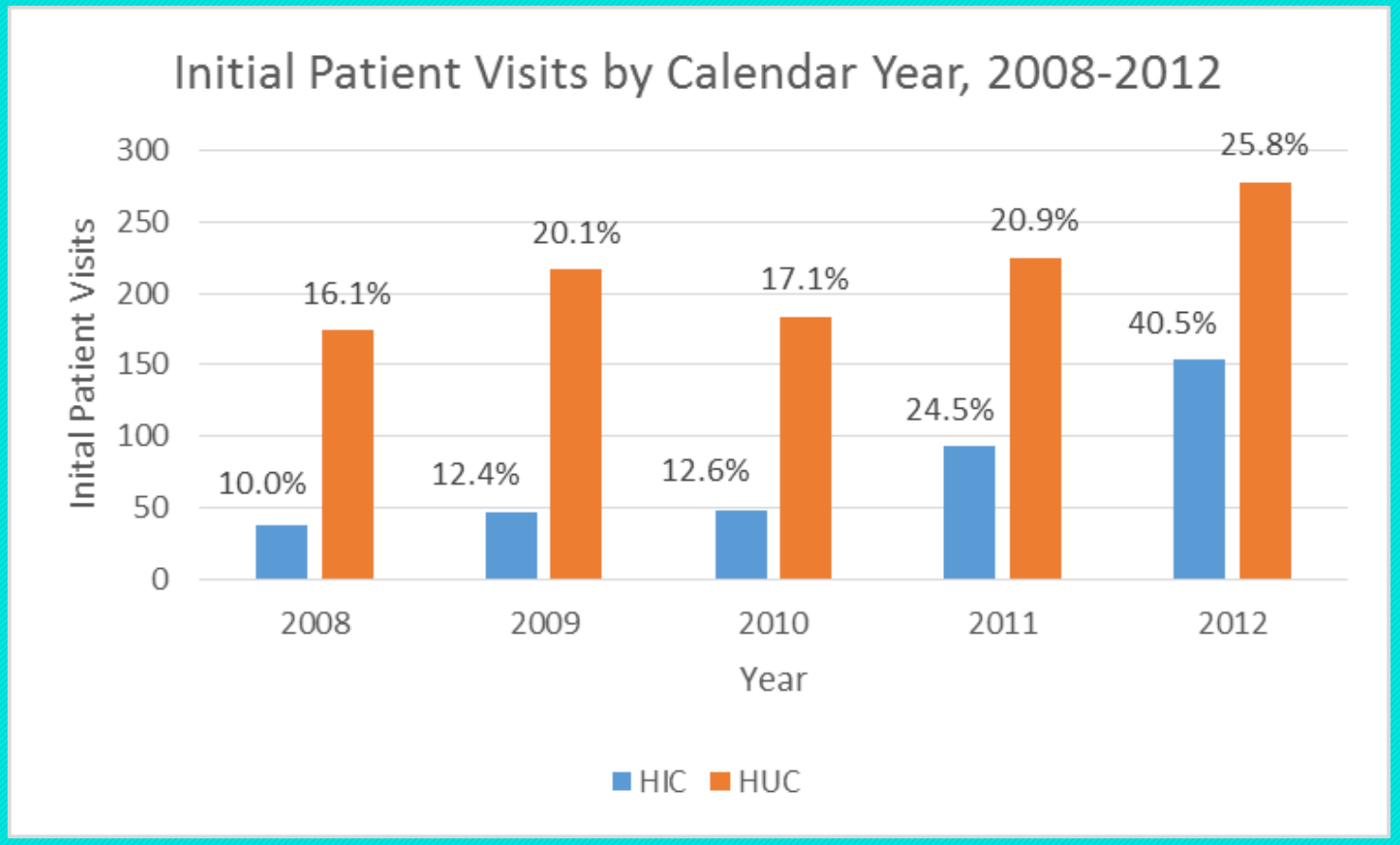
N_{total} = 1,458
HIC, N = 380
HUC, N = 1,078

= Clinic location
= High Incidence Counties: Breast Cancer at young age
= High Incidence Counties: Ovarian Cancer
= High Usage Counties

**Italics denote high OC incidence vs. BC at young age*

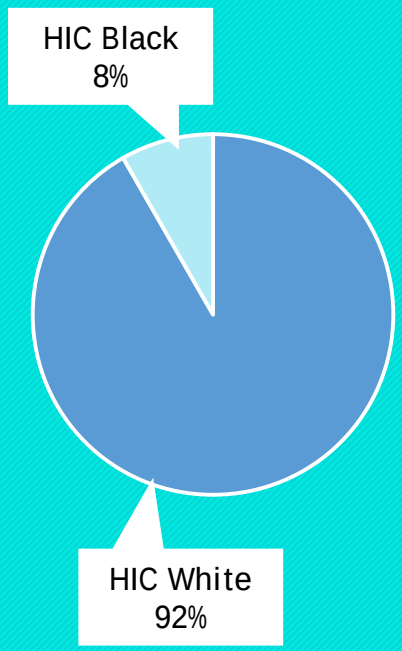


Visit Year Distribution, 2008-2012

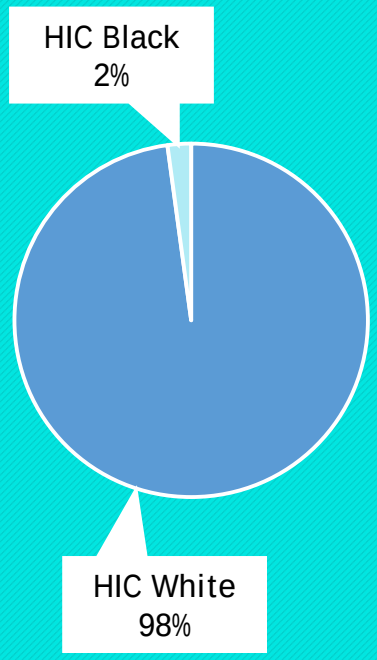


Racial Differences in Genetic Counseling Visits

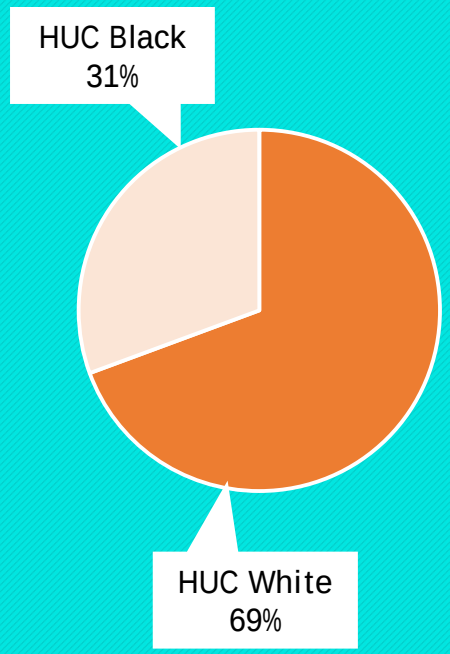
HIC Census Population (2010)



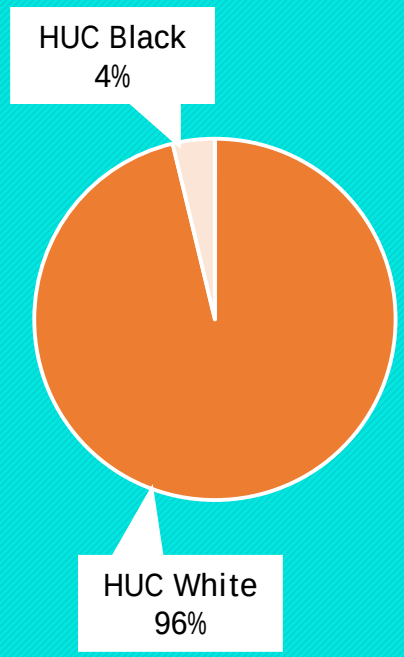
HIC Clinical Population



HUC Census Population (2010)



HUC Clinical Population



Source: U.S. Census QuickFacts, 2010

Ashkenazi Jewish Heritage and Known Familial Mutation Status

	High Incidence Counties		High Usage Counties			
	N	**%**	**N**	**%**	***X²***	***p***
Ashkenazi Jewish (AJ)					95.19	<.0001
No	374	98.42	819	75.79		
Yes	6	1.58	259	24.03		
Known Familial mutation (KFM)					6.48	.011
No	317	83.42	954	88.50		
Yes	63	16.58	124	11.50		

- Core Jewish population in MI exists in Wayne, Oakland, and Macomb counties
  - AJ = 1.9% of overall population in Metro Detroit
  - AJ = 7.5% in BRCA Clinical Network Database
- Overall proportion of KFM in BRCA Clinical Network Database = 12.03%

Results: Insurance Providers

	High Incidence Counties		High Usage Counties			
	N	**%**	**N**	**%**	***X²***	***p***
Top 5 Insurers					104.74	<.0001
Aetna	30	12.71	30	3.56		
Blue Care Network	12	5.08	133	15.78		
Blue Cross Blue Shield	153	64.83	526	62.40		
HAP			105	12.46		
Priority Health	31	13.14	42	4.98		
Uninsured	10	4.24	7	0.83		
Medicare					0.11	0.74
No	327	86.05	935	86.73		
Yes	53	13.95	143	13.27		
Medicaid					20.40	<.0001
No	361	95.00	1,066	98.89		
Yes	19	5.00	12	1.11		

Conclusions

- Results of the current analysis:
  - show an increase in BRCA-related genetic counseling over time for HIC and HUC
    - Aligned with HealthyPeople2020 Genomics Objective
  - Highlight importance of determining barriers and facilitators to access to genetic counseling for populations at highest risk
- Other data sources are being used to conduct additional surveillance activities
- Long-term CDC project objective: reduce the incidence and mortality of hereditary cancers, including breast and ovarian cancer

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