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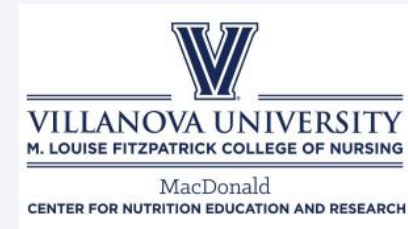
MacDonald
CENTER FOR NUTRITION EDUCATION AND RESEARCH

To Plant or Not to Plant:
Overview of Cancer Epidemiology
and
Analyzing the Food Environment and its Role in Obesity-Related Cancer

Wednesday, 12/11/24

Moderator:
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Villanova University M. Louise Fitzpatrick College of Nursing

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Today's webinar objectives

1. Understand the relationship between environment, specifically food deserts and food swamps, and obesity-related cancer.

2. Discuss cancer health disparity in the United States and the impact of lifestyle on obesity-related cancer outcomes.

3. Review effectiveness of gardening-based interventions and other community-based initiatives, on reducing obesity and cancer risk.

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Finding Slides for Today's Webinar

- Slides are posted at villanova.edu/cope
- From right menu→ Webinars
- Go to 12/11/24 webinar presented by Malcolm Bevel, PhD, MSPH

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- Villanova University M. Louise Fitzpatrick College of Nursing is accredited as a provider of nursing continuing professional development by the American Nurses Credentialing Center's Commission on Accreditation. This activity awards 1 contact hour for nursing professionals.

- This activity awards 1 CPEU in accordance with the Commission on Dietetic Registration's CPEU Prior Approval Program

  - Level 2 activity
  - Suggested CDR Performance Indicators: 6.2.3, 12.1.1, 12.1.3, 12.3.3
  - To receive CE credit, you must attend the entire program.

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Use the Q&A Box for Questions

- Questions are welcome!
- Please send through the Q&A Box during the presentation.
- Q&A session will follow the program.

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Disclosures

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Introducing our Speaker

Malcolm Bevel, PhD, MSPH
Assistant Professor
Cancer Prevention, Control & Population Health
Department of Medicine
Medical College of Georgia at Augusta University

TO PLANT OR NOT TO PLANT: OVERVIEW OF CANCER EPIDEMIOLOGY AND ANALYZING THE FOOD ENVIRONMENT AND ITS ROLE IN OBESITY-RELATED CANCERS

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Department of Medicine

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A little about Me

Outline

- Overview of Cancer Epidemiology

- Community Based Participatory Research

- Obesity-related cancers

- What are food swamps?

- Previous research on the food environment and obesity-related cancers

- My current research

- Future studies including CBPR efforts to promote healthy lifestyles

Epidemiology

- Definition: the study of the distribution and determinants of health-related events/outcomes in various populations and the application of this study to the control of health problems (Last JM ed. Dictionary of Epidemiology, Oxford University Press, 1995)

- Types
  - Descriptive: examines patterns, focus on person/place/time
    - Hypothesis Generating
  - Analytic: more resources needed
    - Hypothesis Testing

- Field of study used to discuss patterns of health outcomes, including racial/ethnic/gender health disparities
 - Community Health

Cancer Epidemiology

- The study of the distribution and determinants of cancer outcomes in various populations including:
  - Disparities in cancer morbidity and mortality
  - Temporal trends
  - Cohort studies
- Multiple cancer databases/cohorts in the Unites States
  - Surveillance, Epidemiology and End Results (SEER) program
  - United States Cancer Statistics (USCS)
  - CDC Wonder
  - National Cancer Database (NCDB)
  - Southern Community Cohort Study (SCCS)
  - Iowa Women's Health Study (IWHS)

Community-Based Participatory Research

- CBPR: integration and open communication of community partners throughout various research processes; goal is to reduce or prevent stereotyping or stigmatizing underserved/underrepresented communities.[1-2]
  - Community advisory boards (CAB)
  - Intervention development
  - Recruitment and retention
  - Dissemination of preliminary and board-approved results
- We don't move until the community says so!
- History of mistreatment of Black community in Public Health
  - Tuskegee Syphilis Study
  - Henrietta Lacks
  - Forced sterilization of Black women
  - Unethical "Agent Orange" experiments on incarcerated individuals (Dr. Albert Kligman)

Community-Based Participatory Research cont.
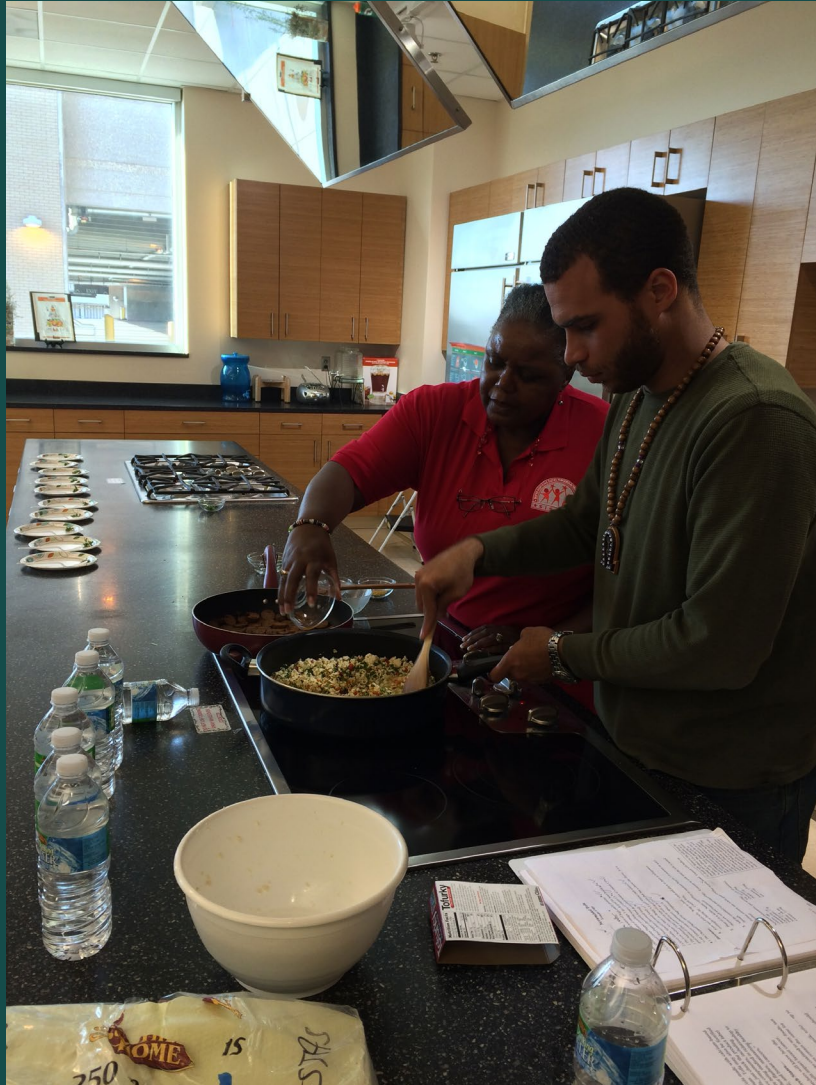
Obesity-related Cancer

- Approximately 2 million U.S. citizens diagnosed with cancer; 611,720 survivors will die from cancer (2024)[1]

- According to International Agency for Research on Cancer (IARC), there are 13 cancer types associated with obesity/overweight status[2]
  - Endometrial, esophageal adenocarcinoma, gastric cardia, liver, kidney, multiple myeloma, meningioma, pancreatic, colorectal, gallbladder, breast, ovarian, and thyroid

- Cost of cancer is not just financial ($183 billion in 2015, projected to increase to $208.9 billion in 2020 and to $246 billion by 2030)[3]
  - Families/friends
  - Mental health QOL significantly reduced

Obesity-related Cancer

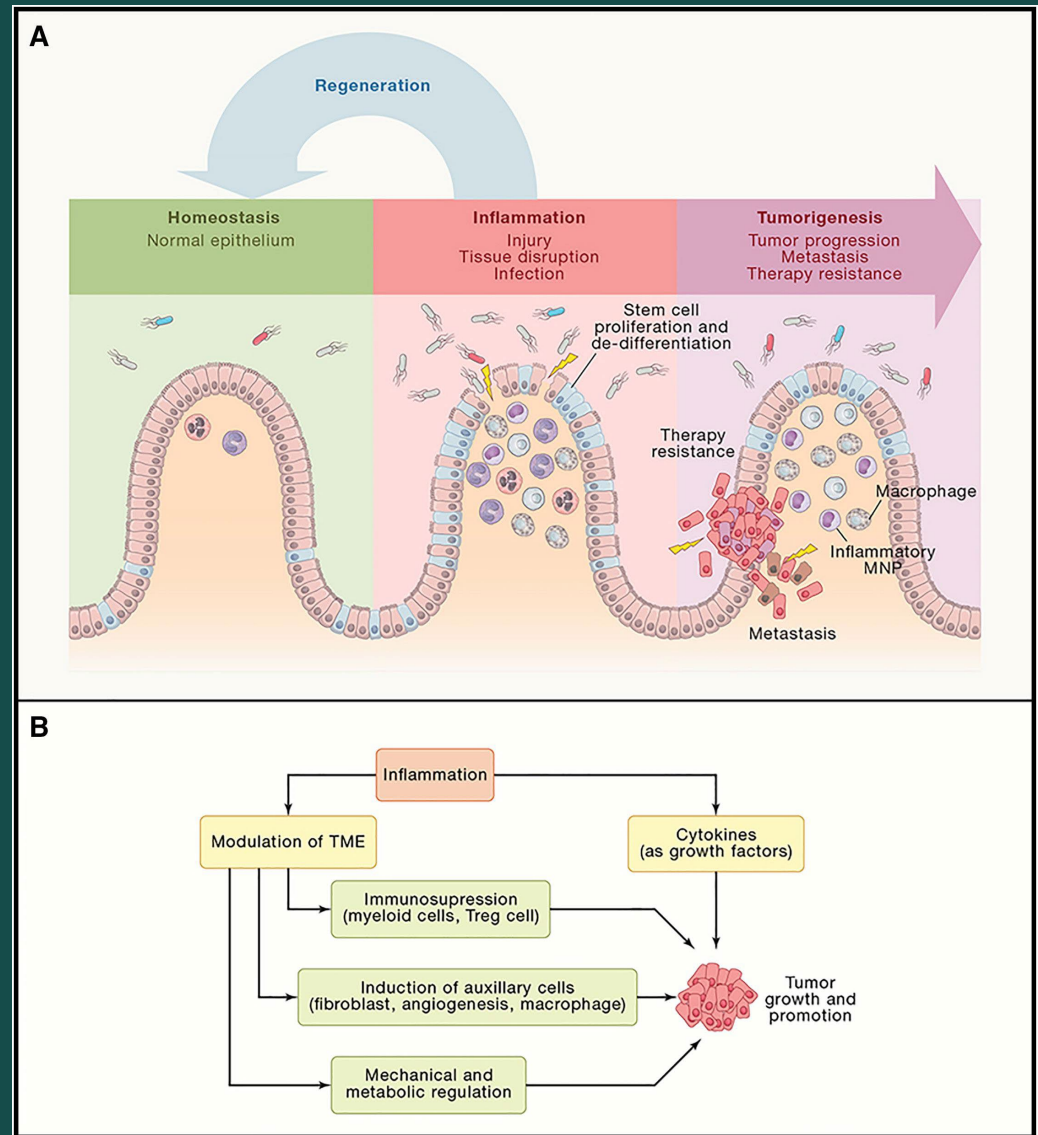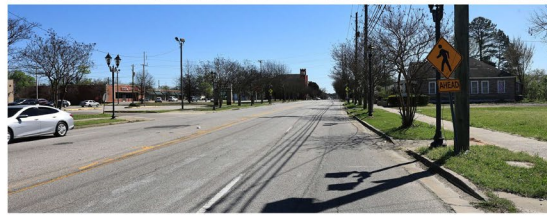Elevated hormonal disruption , chronic inflammation, and changes to the gut microbiome

Figure 1. Pro-Tumorigenic Actions of Inflammation in Progression, Metastasis, and Growth

Greten FR, Grivennikov SI. Inflammation and Cancer: Triggers, Mechanisms, and Consequences. *Immunity*. 2019;51(1):27-41. doi:10.1016/j.immuni.2019.06.025

Food Swamps

Previous Research on Food Deserts, Swamps, and Obesity-Related Cancer

- One U.S. study (California) found that food deserts was associated with a 16% increased risk of breast cancer mortality, and 12% increased risk of colorectal cancer mortality[4]

- Another U.S. study (New Hampshire) found that esophageal cancer patients had significantly higher hospital readmission after esophagectomy when residing in food deserts[5]

- A different ecological U.S. study determined that food swamps were better predictors of obesity vs. food deserts alone[6]

- Paucity of research on the association of food deserts, swamps, and obesity-related cancer morbidity and mortality

Association of Food Deserts and Food Swamps With Obesity-Related Cancer Mortality in the US[9]

Methods

- Study design & Population: cross-sectional at ecologic level; U.S. counties (3142)

- Data sources (linked by FIPS codes)
  - 2010 – 2020 obesity-related cancer mortality from CDC Wonder[10]
  - 2012, 2014, 2015, 2017, and 2020 food environment data from the Economic Research Service of the US Department of Agriculture[11]

- Food Environment Measures
  - Food Deserts = low access and low income
  - Food Swamps = ratio of fast food and convenience stores to grocery stores and farmer's markets
  - Low vs. Moderate vs. High

- Obesity-Related Cancer Mortality
  - Death certificates, cross-referenced with ICD-10 codes for every obesity-related cancer type, provided the underlying data for cause of death.
  - High (≥71.8 per 100 000 population) vs low (<71.8 per 100 000 population)
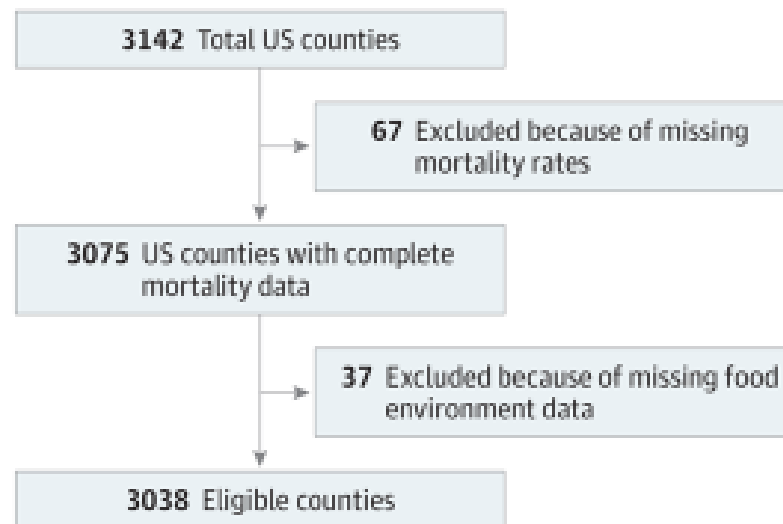
Figure Legend:

Flowchart of US Counties or County Equivalents Reporting Food Environment Measures

Methods

- Statistical Analyses
  - Pearson correlation coefficients
  - Generalized linear mixed model accounting for an unstructured covariance-variance matrix
    - Binomial distribution and logit function
  - Multilevel generalized linear mixed-effects model was used to analyze the association among 3 levels of food desert scores, 3 levels of food swamp scores, and 3 levels of obesity-related cancer mortality rates
  - All models were reported as adjusted odds ratios (AORs) and associated 95% CIs, with statistical significance set at .05 and the P values based on 2-sided t-tests
  - All analyses were conducted with SAS, version 9.4 (SAS Institute, Cary, NC).

Results

Table 2. Association of Food Environment Measures With Obesity-Related Cancer Mortality Among 3038 US Counties or County Equivalents

Variable	Odds of high obesity-related cancer mortality		
	Counties with low obesity-related cancer mortality, No. (%) (n = 2283)[a,b]	Counties with high obesity-related cancer mortality, No. (%) (n = 758)[a,b]	AOR (95% CI)
Food desert			
Low	800 (35.0)	215 (28.4)	1 [Reference]
Moderate	781 (34.2)	235 (31.0)	1.12 (0.91-1.38)
High	708 (31.0)	307 (40.5)	1.59 (1.29-1.94)
Food swamp (comprehensive RFEI)			
Low	794 (34.8)	219 (28.9)	1 [Reference]
Moderate	785 (34.4)	229 (30.2)	1.15 (0.93-1.43)
High	708 (31.0)	306 (40.4)	1.77 (1.43-2.19)

Abbreviations: AOR, adjusted odds ratio; RFEI, Retail Food Environment Index.

[a] Adjusted for the percentage of county population aged 65 years or older. Results from the adjusted generalized mixed-effects models can be interpreted as the odds of counties with high obesity-related cancer mortality rates compared with that of those with low mortality rates (referent category).

[b] Group percentage presented as the proportion of counties within variable strata with food environment category.

Results

Table 3. Multivariable Polytomous Association of Food Environment Measures With Obesity-Related Cancer Mortality Among 3038 US Counties or County Equivalents[a]

Variable	Low, %[b,c]	Moderate[d]		High[e]	
		%[c]	AOR (95% CI)	%[c]	AOR (95% CI)
Food desert					
Low	38.4	32.7	1 [Reference]	28.9	1 [Reference]
Moderate	29.7	38.4	1.52 (1.23-1.87)	31.9	1.43 (1.15-1.78)
High	31.8	29.4	1.06 (0.86-1.32)	38.8	1.59 (1.28-1.96)
Food swamp (comprehensive RFEI)					
Low	38.1	32.3	1 [Reference]	29.6	1 [Reference]
Moderate	33.8	35.7	1.33 (1.07-1.64)	30.5	1.29 (1.03-1.61)
High	28.1	32.5	1.50 (1.20-1.88)	39.4	2.10 (1.67-2.63)

Abbreviations: AOR, adjusted odds ratio; RFEI, Retail Food Environment Index.

[a] Adjusted for the percentage of county population aged 65 years or older. Results from this polytomous generalized mixed-effects models can be interpreted as the log odds of counties with either high or moderate obesity-related cancer mortality rates compared with the log odds of counties with low mortality rates (reference category).

[b] Low categorized as counties with obesity-related cancer mortality rates from 31.0 to 74.0 per 100 000 population.

[c] Group percentage presented as the proportion of counties within variable strata with food environment category.

[d] Moderate categorized as counties with obesity-related cancer mortality rates from 75.0 to 82.0 per 100 000 population.

[e] High categorized as counties with obesity-related cancer mortality rates from 83.0 to 185.7 per 100 000 population.

Supplemental Results

eTable 2. Additional Generalized Mixed Effects Models* for the Association of Food Environment Measures and Obesity-Related Cancer Mortality among U.S. Counties (N = 3041)				
	Adjusted OR (and 95% CI) of High Obesity-Related Cancer Mortality			
Variable	Model 1	Model 2	Model 3	Model 4
Food Desert				
Low	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Moderate	1.11 (0.89 – 1.38)	1.08 (0.86 – 1.35)	1.08 (0.86 – 1.35)	1.04 (0.83 – 1.31)
High	1.14 (0.92 – 1.41)	1.07 (0.86 – 1.34)	1.18 (0.95 – 1.47)	1.10 (0.87 – 1.38)
Food Swamp (Comprehensive RFEI)				
Low	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Moderate	1.04 (0.83 – 1.31)	1.02 (0.81 – 1.29)	0.95 (0.76 – 1.20)	0.92 (0.72 – 1.17)
High	**1.29 (1.03 – 1.63)**	**1.32 (1.04 – 1.67)**	1.06 (0.84 – 1.34)	1.06 (0.83 – 1.36)

Model 1: Adjusted for the percentage of county population ages 65 years old or older, percentage of NH-Black residents per county, and poverty rate per county. Model 2: Adjusted for the percentage of county population ages 65 years old or older, percentage of NH-Black residents per county, poverty rate per county, and physician density. Model 3: additionally adjusted for adult obesity rate per county. Model 4: full model.

Results from the adjusted generalized mixed effects models can be interpreted as the odds of counties with high obesity-related cancer mortality rates compared to the odds of counties with low mortality rates (referent category).

Abbreviations: CI, confidence intervals; OR, odds ratio.

Supplemental Results

eTable 3. Fully Adjusted Multilevel Generalized Mixed Effects Models* for the Association of Food Environment Measures and Obesity-Related Cancer Mortality among U.S. Counties (N = 3041)

	Adjusted OR (and 95% CI) of Obesity-Related Cancer Mortality					
	Food Deserts			Food Swamps (Comprehensive RFEI)		
Models	Low	Moderate	High	Low	Moderate	High
Model 1						
Moderate vs. Low	1.00 (Referent)	**1.47 (1.19 – 1.82)**	0.87 (0.70 – 1.09)	1.00 (Referent)	**1.26 (1.02 – 1.57)**	1.26 (1.00 – 1.60)
High vs. Low	1.00 (Referent)	**1.40 (1.11 – 1.76)**	1.05 (0.83 – 1.32)	1.00 (Referent)	1.16 (0.92 – 1.46)	**1.45 (1.14 – 1.85)**
Model 2						
Moderate vs. Low	1.00 (Referent)	**1.50 (1.21 – 1.87)**	0.91 (0.72 – 1.15)	1.00 (Referent)	1.23 (0.99 – 1.54)	1.25 (0.98 – 2.60)
High vs. Low	1.00 (Referent)	**1.44 (1.14 – 1.83)**	1.05 (0.83 – 1.33)	1.00 (Referent)	1.12 (0.88 – 1.43)	**1.45 (1.13 – 1.86)**
Model 3						
Moderate vs. Low	1.00 (Referent)	**1.46 (1.18 – 1.81)**	0.88 (0.70 – 1.11)	1.00 (Referent)	1.15 (0.92 – 1.43)	1.02 (0.80 – 1.31)
High vs. Low	1.00 (Referent)	**1.38 (1.09 – 1.74)**	1.09 (0.86 – 1.38)	1.00 (Referent)	1.00 (0.79 – 1.27)	1.05 (0.81 – 1.35)
Model 4						
Moderate vs. Low	1.00 (Referent)	**1.48 (1.19 – 1.84)**	0.92 (0.73 – 1.16)	1.00 (Referent)	1.11 (0.88 – 1.39)	1.01 (0.79 – 1.30)
High vs. Low	1.00 (Referent)	**1.40 (1.10 – 1.78)**	1.08 (0.85 – 1.38)	1.00 (Referent)	0.95 (0.74 – 1.22)	1.03 (0.79 – 1.34)

Model 1: Adjusted for the percentage of county population ages 65 years old or older, percentage of NH-Black residents per county, and poverty rate per county. Model 2: Adjusted for the percentage of county population ages 65 years old or older, percentage of NH-Black residents per county, poverty rate per county, and physician density. Model 3: additionally adjusted for adult obesity rate per county. Model 4: full model.

Results from this generalized mixed effects models can be interpreted as the log odds of counties with either high or moderate obesity-related cancer mortality rates compared to the log odds of counties with low mortality rates (referent category).

Low categorized as counties with obesity-related cancer mortality rates from 31.0 – 74.0 per 100,000.
Moderate categorized as counties with obesity-related cancer mortality rates from 75.0 – 82.0 per 100,000.
High categorized as counties with obesity-related cancer mortality rates from 83.0 – 185.7 per 100,000.
Abbreviations: CI, confidence intervals; OR, odds ratio.

Discussion

- U.S. counties or county equivalents with poorer food desert or swamp environments had a significantly greater odds of obesity-related cancer mortality

- Findings are consistent with previous studies

- Theories behind the Rise of Food Swamps
  - Lack of vested interest among chain grocery stores[12]
  - Competition between chains and "mom & pop shops"
  - Systemic issues (e.g. gentrification/redlining)[11]

- Given the glaring increases in obesity rates, and disparities regarding the built food environment, local and state officials should partner with local leaders about best methods for improving the food environment

Examining Racial Disparities in the Association between Food Swamps and Early-Onset Colorectal Cancer Mortality[13]

Methods

- Study design & Population: retrospective cohort; Surveillance, Epidemiology, End Results (SEER) patients (7,841)

- Data sources (linked by FIPS codes)
  - 2010 – 2016 CRC patient-level data
  - 2012, 2014, 2015, 2017, and 2020 food environment data from the Economic Research Service of the US Department of Agriculture

- Food Environment Measures
  - Food Swamps = ratio of fast food and convenience stores to grocery stores and farmer's markets
  - Low vs. Moderate vs. High

- EOCRC Mortality
  - Death certificates, cross-referenced with ICD-10 codes, provided the underlying data for cause of death.
  - Censoring variable (1 = died from EOCRC-specific cancer, 0 = alive, 2 = died from other causes)
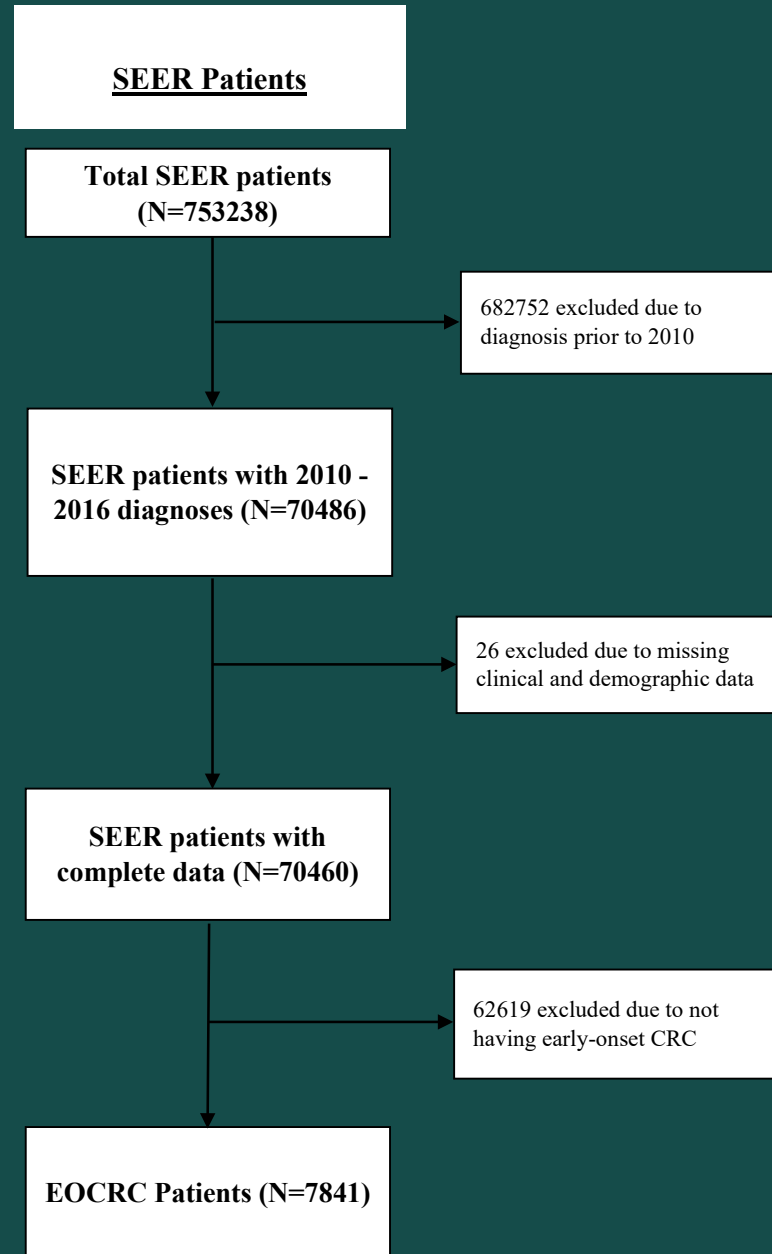
Flowchart

Table 1. Multivariable Adjusted Hazard Ratios (HRs) and 95% Confidence Intervals (CIs) for the Association between Food Swamp Score and EOCRC Mortality, Stratified by Race (n = 7841)

	Events/strata*	Mean survival time**	Model 1	Model 2	Model 3
NH-Whites					
Low	351/1346	48.5	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)
Moderate	324/1104	46.6	**1.17 (1.00 – 1.36)**	**1.17 (1.01 – 1.37)**	1.15 (0.98 – 1.34)
High	595/2063	46.8	1.14 (1.00 – 1.30)	**1.15 (1.01 – 1.31)**	1.07 (0.93 – 1.23)
NH-Blacks					
Low	87/271	43.5	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)
Moderate	89/280	44.1	0.97 (0.71 – 1.32)	1.00 (0.74 – 1.34)	0.81 (0.60 – 1.10)
High	197/581	43.8	1.06 (0.82 – 1.38)	1.09 (0.85 – 1.41)	0.97 (0.75 – 1.25)
NH-Asians					
Low	60/208	47.5	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)
Moderate	79/270	47.2	1.04 (0.74 – 1.48)	1.03 (0.74 – 1.44)	1.11 (0.79 – 1.56)
High	71/251	46.1	1.00 (0.70 – 1.42)	0.97 (0.69 – 1.38)	1.02 (0.71 – 1.48)
Hispanics					
Low	103/418	44.1	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)
Moderate	137/451	41.4	**1.35 (1.04 – 1.75)**	**1.29 (1.00 – 1.67)**	**1.52 (1.16 – 1.98)**
High	135/452	43.5	1.25 (0.97 – 1.63)	1.26 (0.98 – 1.63)	**1.33 (1.02 – 1.73)**
AI/AN/Other					
Low	4/33	51.1	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)
Moderate	5/44	48.4	0.73 (0.17 – 3.25)	0.72 (0.21 – 2.42)	0.95 (0.26 – 3.45)
High	14/69	46.6	1.47 (0.41 – 5.21)	1.33 (0.46 – 3.83)	0.95 (0.30 – 3.06)

*Event/strata: death due to EOCRC per levels of food swamp score presented from row totals

**survival time in months

Model 1 adjusted for age.

Model 2 additionally adjusted for gender and marital status.

Model 3 fully adjusted, including tumor grade, tumor stage, ever had chemotherapy, and ever had radiation therapy.

Bold indicates significance p value ≤ 0.05.

Abbreviations: CRC, colorectal cancer; NH, Non-Hispanic, AI/AN, American Indian/Alaskan Native.

Table 2. Multivariable Adjusted Hazard Ratios (HRs) and 95% Confidence Intervals (CIs) for the Association between the Interaction of Food Swamp Score on Race and EOCRC Mortality (n = 7841)

	Model 1	Model 2	Model 3
Race*Food Swamp Score			
NH-White, Low	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)
NH-White, Moderate	**1.17 (1.00 – 1.36)**	**1.17 (1.01 – 1.37)**	1.14 (0.98 – 1.33)
NH-White, High	**1.15 (1.00 – 1.31)**	**1.14 (1.00 – 1.31)**	1.05 (0.92 – 1.21)
NH-Black, Low	**1.34 (1.06 – 1.70)**	1.26 (1.00 – 1.60)	**1.44 (1.14 – 1.81)**
NH-Black, Moderate	**1.31 (1.04 – 1.65)**	**1.27 (1.00 – 1.60)**	1.16 (0.90 – 1.50)
NH-Black, High	**1.41 (1.19 – 1.68)**	**1.36 (1.14 – 1.62)**	**1.38 (1.14 – 1.65)**
NH-Asian, Low	1.13 (0.86 – 1.48)	1.18 (0.90 – 1.55)	1.03 (0.78 – 1.35)
NH-Asian, Moderate	1.17 (0.93 – 1.49)	1.22 (0.96 – 1.55)	1.20 (0.95 – 1.52)
NH-Asian, High	1.13 (0.88 – 1.46)	1.14 (0.89 – 1.47)	1.09 (0.85 – 1.41)
Hispanic, Low	1.03 (0.83 – 1.28)	1.02 (0.82 – 1.27)	0.89 (0.71 – 1.12)
Hispanic, Moderate	**1.33 (1.09 – 1.62)**	**1.32 (1.08 – 1.61)**	**1.39 (1.12 – 1.73)**
Hispanic, High	**1.27 (1.04 – 1.54)**	**1.29 (1.06 – 1.56)**	1.20 (0.97 – 1.48)
AI/AN/Other, Low	0.46 (0.17 – 1.22)	0.48 (0.19 – 1.27)	0.67 (0.22 – 2.08)
AI/AN/Other, Moderate	0.44 (0.18 – 1.04)	0.46 (0.19 – 1.10)	0.69 (0.31 – 1.55)
AI/AN/Other, High	0.81 (0.48 – 1.39)	0.86 (0.51 – 1.47)	1.20 (0.76 – 1.89)

Model 1 adjusted for age.
Model 2 additionally adjusted for gender and marital status.
Model 3 fully adjusted, including tumor grade, tumor stage, ever had chemotherapy, and ever had radiation therapy.
Bold indicates significance p value ≤ 0.05.
Abbreviations: CRC, colorectal cancer; NH, Non-Hispanic, AI/AN, American Indian/Alaskan Native.

Discussion

- NH-Black and Hispanic adults residing in food swamps had significantly higher risk of EOCRC death compared to NH-White adults.

- Findings were consistent to our previous work and the Fong study
  - Reduced risk among other racial/ethnic groups could be due to "racial enclaves"[12]

- Targeted efforts should utilize the community-based participatory research approach to develop and implement culturally tailored, sustainable community-garden based interventions for obesity and obesity-related cancer prevention

Examining Racial Disparities in the Association between Food Swamps, Liquor Store Density, and Postmenopausal Breast Cancer Mortality

Methods

- Study design & Population: retrospective cohort (n = 282)

- Data sources (linked by FIPS codes)
  - 2016 – 2022 postmenopausal BRCA patient-level data
  - 2012, 2014, 2015, 2017, and 2020 food environment data from the Economic Research Service of the US Department of Agriculture
  - 2012, 2014, 2015, 2017, and 2020 beer, wine, and liquor stores from the U.S. Census County Business Patterns

- Food Environment Measures
  - Food Swamps = ratio of fast food and convenience stores to grocery stores and farmer's markets
  - Liquor store density = proportion of beer, wine, and liquor stores to Georgia county populations per 100,000.
  - Low vs. High

- Postmenopausal Breast Cancer Mortality
  - Death certificates, cross-referenced with ICD-10 codes, provided the underlying data for cause of death.
  - Cox Proportional hazard models

Table 1. Multivariable Adjusted Hazard Ratios (HRs) and 95% Confidence Intervals (CIs) for the Association between Food Swamps and Postmenopausal BRCA Mortality (n = 282)

Food Swamp Score	Model 1	Model 2	Model 3
Low	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)
High	**4.26 (1.25 – 14.5)**	**4.00 (1.06 – 15.1)**	4.19 (0.98 – 18.0)

Model 1 adjusted for age.

Model 2 additionally adjusted for race and marital status.

Model 3 fully adjusted, including tumor grade, tumor size, ever had chemotherapy, and ever had radiation therapy.

Bold indicates significance p value ≤ 0.05.

Abbreviations: BRCA, breast cancer.

Table 2. Multivariable Adjusted Hazard Ratios (HRs) and 95% Confidence Intervals (CIs) for the Association between the Interaction of Food Swamps and Postmenopausal BRCA Mortality (n = 282)

Race*Food Swamp Score	Model 1	Model 2	Model 3
NH-White, Low	1.00 (Ref.)	1.00 (Ref.)	1.00 (Ref.)
NH-White, High	**5.68 (1.23 – 26.2)**	4.47 (0.84 – 23.9)	4.22 (0.62 – 28.7)
NH-Black, Low	1.03 (0.09 – 11.5)	0.81 (0.08 – 8.61)	0.55 (0.05 – 5.93)
NH-Black, High	3.46 (0.73 – 16.4)	2.64 (0.52 – 13.5)	2.27 (0.37 – 14.0)

Model 1 adjusted for age.

Model 2 additionally adjusted for race and marital status.

Model 3 fully adjusted, including tumor grade, tumor size, ever had chemotherapy, and ever had radiation therapy.

Bold indicates significance p value ≤ 0.05.

Abbreviations: BRCA, breast cancer. ; NH, Non-Hispanic.

Conclusions/Future Studies

- The rise of food swamps, coupled with the rise of obesity, is an epidemic that we should not overlook

- Future studies should elucidate the relationship between food deserts, food swamps, obesity-related cancer (by type), and other social determinants of health at granular levels

- Solutions
  - CBPR Health Lifestyle Interventions
  - Gardening (In home vs. community gardening)

Week 1   Week 2   Week 3

REFERENCES

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Thank You!

To Receive Your CE Certificate

- A link to an evaluation will be sent within a day or two.

- RNs must complete the evaluation to receive CE certificate.

- RD/RDNs: Although completing an evaluation is not required, we truly appreciate your feedback.
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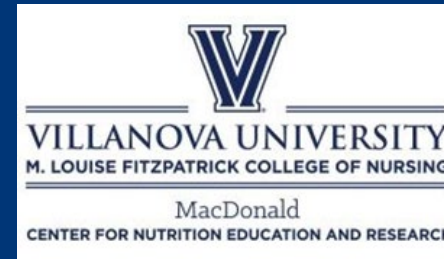
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