TUESDAYS AT APA

PLANNING AND HEALTH

DISCUSSING THE ROLE OF FACTORS INFLUENCING HEALTH
PLANNING AND PUBLIC HEALTH NEXUS
THE CONTEXT

METHODOLOGY
DATA AND VARIABLES
METHODOLOGY
RESULTS

IMPLICATIONS
2nd half of 19th century

 Physical removal of both “environmental miasmas”

 End of 19th century

 Beginning of 20th century

 No distinction between urban planning and public health

 Historical links

 UP and PH started connecting

 1930s-1950s

 Connection between UP and PH increased to a large extent due to “healthy cities” project

 End of 1980s-beginning of 1990s

 1990s

 Increased collaboration between UP and PH in practice and research

 Present context: from healthy cities to healthy urban planning

 1960s-1980s

 Importance of social factors

 Since the beginning of 21st century
DETERMINANTS OF HEALTH
Various factors influence health

known as

Determinants of health

1. **social determinants** refers to sociodemographic characteristics. These social conditions also influence other determinants of health.

2. **physical determinants** refers to the physical characteristics of a neighborhood in which an individual lives.

3. **behavioral determinants** refers to individual behaviors that affects health.

Source: Frieden (2010)
SDOH and Planning

Healthy disparities and poverty
  o Economic segregation
  o Gentrification
  o Spatial Mismatch

Healthy disparities and race
  o Racial segregation
  o Unequal access to resources
PDOH and Planning

**Built environment**
- Walkable neighborhoods

**Distribution of resources**
- Physical activity resources
- Food resources
PDOH and Behavior

Source: Papas et al. (2007)
PLANNERS INFLUENCE HEALTH
THE CONTEXT
OBESITY

- Effects of Obesity
  - health
  - economy
  - social life

- Causes of Obesity
  - genetics
  - energy imbalance: involves eating too many calories and not getting enough physical activity.
  - behavior
  - culture
  - socioeconomic status
  - environment
HAMILTON COUNTY, OH

Existing Condition
Obesity rates are increasing in the greater Cincinnati region

Adults in Greater Cincinnati and the nation who are obese (BMI≥30)

- Greater Cincinnati
- Nation

Healthy People 2010 goal: 15% of adults are obese

* National data are from the CDC’s Behavioral Risk Factor Surveillance System (BRFSS) from 1999, 2002, 2005, and 2009, the most recent year for which data are available.
1) Does social and physical determinants of health influence obesity in Hamilton County, OH?

2) Does built environment change individual behavior enough to alter health outcomes?
DATA & VARIABLES
WHAT IS REQUIRED FOR THE ANALYSIS?

DATA

Primary Data Sources
- Greater Cincinnati Community Health Status Survey (GCCHSS)
- Cincinnati Area Geographic Information System (CAGIS)
- Census

Sample Size
n = 1199
UNIT OF ANALYSIS

Individual-level

Neighborhood-level

not to scale
BMI = \frac{\text{weight}}{(\text{height})^2} \times 703

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<th>BMI</th>
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<tr>
<td>25.0-29.9</td>
<td>Overweight</td>
</tr>
<tr>
<td>30.0 and above</td>
<td>Obese</td>
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1. Social Determinants

- **Individual**
  - race
  - income
  - age
  - gender
  - employment status
  - education

- **Neighborhood**
  - race
  - income
  - social cohesion
Area-weighted Average

population in buffer =

30% of the total population of Neigh A +
20% of the total population of Neigh B +
40% of the total population of Neigh C +
30% of the total population of Neigh D
= 6 + 2 + 12 + 3 = 23

6 people in this buffer area have the value of X = 40, while 2 people have the value of X = 50, and so on
2. Behavioral Determinants

- Food
  - intake of fruits
  - intake of vegetables
  - intake of fast food

- Physical Activity
  - level of moderate physical activity
  - level of vigorous physical activity
  - sidewalk use
3. Physical Determinants

- **Access**
  - to grocery store
  - to parks and open spaces

- **Food environment**
  - food desert

- **Built environment**
  - density
  - diversity
  - design
MEASURING ACCESS

CONSUMER CHOICE ACCESS MODEL
ACCESS TO GROCERY STORE

data point

consumer choice model

attractiveness = store size

data point with stores

network analysis

distance to store

ACCESS TO PARKS AND OPEN SPACES

data point

consumer choice model

attractiveness = park facilities

network analysis

distance to store
MEASURING BUILT ENVIRONMENT

**DENSITY**

= number of people per 1 sq. mile of residential area

**DESIGN**

= street intersection density
DIVERSITY

= Land use mix or Entropy Index

\[ D = - \sum_{i=1}^{n} p_i \ln p_i \]

LOW ENTROPY INDEX  HIGH ENTROPY INDEX
THE METHODOLOGY
CALCULATED

PHYSICAL DETERMINANTS

USING GIS
USE

SOCIAL AND BEHAVIORAL DETERMINANTS

FROM SURVEY
SURVEY DATA PROBLEMS

PROBLEM 1: OUTLIERS

SOLUTION: WINSORIZATION

Values above the 99th percentile were considered missing.
SURVEY DATA PROBLEMS

PROBLEM 2: MISSING/INCOMPLETE DATA

SOLUTION: MULTIPLE IMPUTATION

### Variable: Income

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<td>Stand. Deviation</td>
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### SURVEY DATA PROBLEMS

**PROBLEM 3: OVERSAMPLING**

**PROBLEM 4: SAMPLE NOT REPRESENTATIVE OF THE POPULATION**

**SOLUTION: WEIGHTING THE CASES**

<table>
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<th>Variables</th>
<th>County Data</th>
<th>Sample Data (w/o weights)</th>
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<tr>
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<td>Median</td>
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<tr>
<td>White HHs</td>
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<td>71.1%</td>
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<td>Black HHs</td>
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<td>Other HHs</td>
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<td>3.6%</td>
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<tr>
<td>Income (White)</td>
<td>$57,041</td>
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<tr>
<td>Income (Black)</td>
<td>$27,832</td>
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<tr>
<td>BMI (Overweight &amp; Obese)</td>
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<td>62%</td>
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## SAMPLE DATA: BEFORE AND AFTER WEIGHTING

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<td>Proportion</td>
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<td>Black HHs</td>
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<td>25.3%</td>
<td>–</td>
</tr>
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<td>Other HHs</td>
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<tr>
<td>BMI (Overweight &amp; Obese)</td>
<td>–</td>
<td>62%</td>
<td>–</td>
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</table>
Analyzing Relationships:

Regression Analysis

- Multiple Linear Regression
- Logistic Regression
- Multilevel Model
- Spatial Regression
THE RESULTS
MODEL: LLR1

\[ \log \text{BMI}_i = \beta_0 + \beta_1 (\text{Ind. Income})_i + \beta_2 (\text{Ind. Race-Black})_i + \beta_3 (\text{Ind. Race-Other})_i + \beta_4 (\text{Age})_i + \beta_5 (\text{Gender})_i + \beta_6 (\text{Neigh. Income})_i + \beta_7 (\text{Unemployed})_i + \beta_8 (\text{Retired})_i + \beta_9 (\text{Employment Other})_i + \beta_{10} (\text{Access to Grocery})_i + \beta_{11} (\text{Access to Parks})_i + \beta_{12} (\text{Food Desert})_i + \beta_{13} (\text{Diversity})_i + \beta_{14} (\text{Design})_i + \beta_{15} (\text{Density})_i + \epsilon_i \]

\[ \log \text{BMI}_i = \beta_0 + \beta_1 (\text{SOCIAL DETERMINANTS})_i + \beta_2 (\text{PHYSICAL DETERMINANTS})_i \]

<table>
<thead>
<tr>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of Estimate</th>
<th>AIC</th>
<th>Durbin-Watson</th>
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### Model: LLR1

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Note: Dependent Variable = logBMI, Ind. = Individual, Neigh. = Neighborhood, * = significant at p-value of 0.05
MODEL: LLR2

$logBMI_i =
\beta_0 + \beta_1 (\text{Ind. Income})_i + \beta_2 (\text{Ind. Race-Black})_i + \beta_3 (\text{Ind. Race-Other})_i + \beta_4 (\text{Age})_i + \beta_5 (\text{Gender})_i$
$+ \beta_6 (\text{Neigh. Income})_i + \beta_7 (\text{Unemployed})_i + \beta_8 (\text{Retired})_i + \beta_9 (\text{Employment Other})_i$
$+ \beta_{10} (\text{Access to Grocery})_i + \beta_{11} (\text{Access to Parks})_i + \beta_{12} (\text{Food Desert})_i + \beta_{13} (\text{Diversity})_i$
$+ \beta_{14} (\text{Design})_i + \beta_{15} (\text{Density})_i + \beta_{16} (\text{Fast Food Intake})_i + \beta_{17} (\text{Vegetable Intake})_i$
$+ \beta_{18} (\text{Moderate physical activity})_i + \beta_{19} (\text{Vigorous physical activity})_i + \varepsilon_i$

$logBMI_i =
\beta_0 + \beta_1 (\text{SOCIAL DETERMINANTS})_i + \beta_2 (\text{PHYSICAL DETERMINANTS})_i + \beta_3 (\text{BEHAVIOR DETERMINANTS})_i + \varepsilon_i$

<table>
<thead>
<tr>
<th>R</th>
<th>R Square</th>
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<th>Std. Error of Estimate</th>
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### MODEL: LLR2

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Note: Dependent Variable = logia, Ind. = Individual, Neigh. = Neighborhood, * = significant at p-value of 0.05
RELATIONSHIPS

BLACKS ↑ BMI THAN WHITES

↑ INCOME → BMI ↓

UNEMP ↑ BMI THAN EMPLOYED OTHERS ↓ BMI THAN EMPLOYED

↑ PHYSICAL ACTIVITY → BMI ↓

↑ FAST FOOD INTAKE → BMI ↑

↑ VEGETABLE INTAKE → BMI ↑
SOCIODEMOGRAPHIC VARIABLES AND OBESITY

Highlights Issue of Health Inequity

• Education
• Neighborhood Racial Composition
• Social Cohesion

• Individual Income
• Individual Race
• Neighborhood Income
• Employment Status

NOT ASSOCIATED WITH BMI

ASSOCIATED WITH BMI
Strong Relationship with BMI

- Physical activity habits
- Eating Behavior

ASSOCIATED WITH BMI

- Sidewalk Use

NOT ASSOCIATED WITH BMI
No Concrete Evidence of Relationship

- Access to Healthy Food
- Access to Parks and Open Spaces
- Food Environment
- Built Environment

PhySICAL ENVIRONMENT AND OBESITY

NOT ASSOCIATED WITH BMI
RESEARCH QUESTIONS

1) Does social and physical determinants of health influence obesity in Hamilton County, OH?

2) Does built environment change individual behavior enough to alter health outcomes?
EVIDENCE OF ABSENCE IS NOT ABSENCE OF EVIDENCE
IMPLICATIONS
Healthy Urban Planning

- Address the following
  - Not blame unhealthy environments
  - Prevent urban problems in the first place
  - New science for healthy city planning
  - New politics of healthy city planning
    - Avoid “laboratory” view
    - New models of collaborative research and urban governance
Social Determinants (Policy)

• Policies to alleviate health disparities

  ▪ Address “causes of the causes” – poverty, racism, education

    • Economic development?

    • Poverty deconcentration?

    • Endogenous growth?
FUTURE RESEARCH

Built Environment and Health

- Sensitivity Analysis
- Longitudinal study
- Non-randomized controlled study
TAKE AWAYS

- GIVE IMPORTANCE TO SOCIOECONOMIC CONDITIONS AND SOCIAL EQUITY FOR CREATING HEALTHY CITY

- AVOID DATA AND ANALYTICAL MISTAKES THAT MAY GIVE INCORRECT RESULTS

- DON’T ASSUME THAT CHANGING BUILT ENVIRONMENT WOULD CHANGE BEHAVIOR
“The histories of the fields of planning and public health are littered with the notion that rational physical and urban designs can change social conditions, particularly for the poor. This view has haunted planning...(historically)...to twenty-first century movements for New Urbanism, Smart Growth, and designing for Active Living. Research aiming to link the built environment and human health often characterized places as only the sum total of what is designed and constructed, from streetscapes and highways to houses, businesses, schools, and parks. Yet, as is highlighted...(historically)...., a range of forces beyond physical design, from institutional and cultural commitments to economic and social policies, shape how a place functions and which populations have opportunities to engage in healthy activities. Research into the relationships between the built environment and health has tended to avoid or overlook the interactions and relations among the physical, social, political, economic, and meaning-making that combine to make a space in the universe a place.”

– Jason Corburn

QUESTIONS!

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