Environmental and Social Determinants of Cardiovascular Health and Wellbeing

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Disclosures

- Relevant Financial Disclosures
  - None

- Non-FDA Approved Uses
  - None

- The views expressed in this presentation are my own and do not necessarily represent the views of the National Heart, Lung, and Blood Institute; the National Institutes of Health; or the U.S. Department of Health and Human Services.
Racial/Ethnic Disparities in Coronary Heart Disease Deaths

Healthy People 2020 (www.healthypeople.gov)
Heart Disease Death Rates, 2011-2013
Adults, Ages 35+, by County

Rates are spatially smoothed to enhance the stability of rates in counties with small populations.

Data Source:
National Vital Statistics System
National Center for Health Statistics
Neighborhood Environment as a Component of the Socio-Ecological Model

INTERNATIONAL FACTORS
- Market globalization
- Development
  - Urbanization
  - Health
  - Media & Culture
  - Education
  - Food & Nutrition

NATIONAL/REGIONAL
- Urbanization
- Health
- Media & Culture
- Education
- Food & Nutrition

NEIGHBORHOOD ENVIRONMENT
- Neighborhood design & safety
  - Air Pollution
- Healthcare Access
- Food quality

WORK/SCHOOL/HOME
- Leisure
- Labor
- Workplace
- Home
- School

INDIVIDUAL POPULATION
- Energy expenditure
- CV Health Outcomes
- Food intake

Socio-ecological Model modified from Kumanyika et al., Circulation 2008
Neighborhood Environment and Cardiometabolic Risk in Epidemiologic Studies

- Ethnically diverse adult populations
- Natural experiment allows evaluation of effect of change in neighborhood environment on risk
- Dallas Heart Study (DHS) – based at UT Southwestern Med Center in Dallas, Texas
- Multi-ethnic Study of Atherosclerosis (MESA)
  - NHLBI-sponsored
  - Six sites (focus on Chicago, IL)
Socioeconomic Environment and Development of Cardiometabolic Risk in Dallas Heart Study

Neighborhood environment

Socioeconomic environment
• Neighborhood Deprivation
• Proxy Measure of Built and Social Environment

Lifestyle and Psychosocial Mediators

Health behaviors (physical activity, diet)

Psychosocial Stress (perceptions of environment)

Change in Adiposity
Weight gain

Psychosocial stress does not attenuate relationship between neighborhood SES change with moving and weight change.

Duration of residence modifies relationship between neighborhood SES change with moving and weight change.

Effect Modifier

Duration of Neighborhood Residence

Powell-Wiley TM et al., Preventive Medicine 2014; Powell-Wiley TM et al. AJPM
Social Environment and Development of Cardiometabolic Risk in MESA

**Neighborhood environment**

- **Social Environment**
  - Police-reported Crime
  - Safety
    - Neighborhood-level
    - Individual-level

**Lifestyle and Psychosocial Mediators**

- Health behaviors
  - Physical activity
  - Caloric intake

- Psychosocial Stress

**Change in Adiposity**

- Body Mass Index
- Waist Circumference

**Effect Modifiers**

- Duration of Residence
- Neighborhood SES

**Greater ↓ in safety over time associated with greater ↑ in BMI and waist circumference**

- Women: individual-level safety
- Men: neighborhood-level safety

**No association between ↑ in crime and change in BMI or waist circumference.**

*Powell-Wiley TM et al., AJE, In Press*
Air Pollution and Cardiovascular Health Disparities in MESA

Race modified the relationship between air pollution (PM2.5, NO, NO2) and LV mass index
- **Blacks > Whites**

Segregation, SES, psychosocial adversity did not modify the relationship between air pollution and LVMI

*Hickson MT et al, Epidemiology 2016*
Synergistic Effects of Air Pollution and Social Determinants of Health in Early Life-Course

- Systematic review focused on obesity, asthma, perinatal outcomes, cognition/behavior
- 72% of studies found significant synergistic associations
- Paucity of data on social and environmental risk related to childhood obesity
- Reliance on SES as measure of early-life social environment
- Air pollution most common environmental exposure

Challenges to Understanding Relationship between Environment and CV Health Disparities

- What potentially synergistic relationships with social determinants of health are important to study?

- What constitutes a person’s environment? How do we measure activity space?

- Latency of effect of environmental exposures on CV outcomes

- How do we account for changes in environmental exposures across the life-course?
Future Research Directions in Environment and Cardiovascular Health Disparities

- Life-course and multi-level approaches
  - Environment and genetics/epigenetics
  - Gene X environment interactions
- ‘-Oomics’ approaches (genomics, metabolomics, exposomics) to characterize impact of environment on CV health
- New data modeling
  - Systems science modeling
  - Findings that translate into interventions
Blacks and Hispanics Have Higher Obesity Prevalence than Other Racial/Ethnic Groups

Flegal et al., JAMA 2016
Class III Obesity Associated with Greater 30-Day Mortality after STEMI in National Registry

*Class III Obese:
- Younger
- Less extensive CAD
- Greater # Risk factors

*Disproportionate # of women with Class III obesity are Black

*Class III Obesity: BMI ≥ 40 kg/m²

Das SR, Powell-Wiley TM, et al., JACC 2011
Evaluating Neighborhood Environment and Cardiometabolic Risk in the Dallas Heart Study

- Probability-based population sample of Dallas County residents (N=6,101)
- 50% African-American, 30% White, 20% Hispanic
- 1835 participants included in analyses
- Longitudinal data available from 2000 to 2009

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