The Intersection of Policy and Systems Science Modeling in Examining Social Determinants of Physical Activity and Obesity

Tiffany M. Powell-Wiley MD, MPH, FAHA
Stadtman Tenure-Track Investigator
Chief, Social Determinants of Obesity and Cardiovascular Risk Laboratory
Cardiovascular Branch, DIR, NHLBI
Adjunct Investigator, Intramural Research Program, NIMHD

tiffany.powell@nih.gov



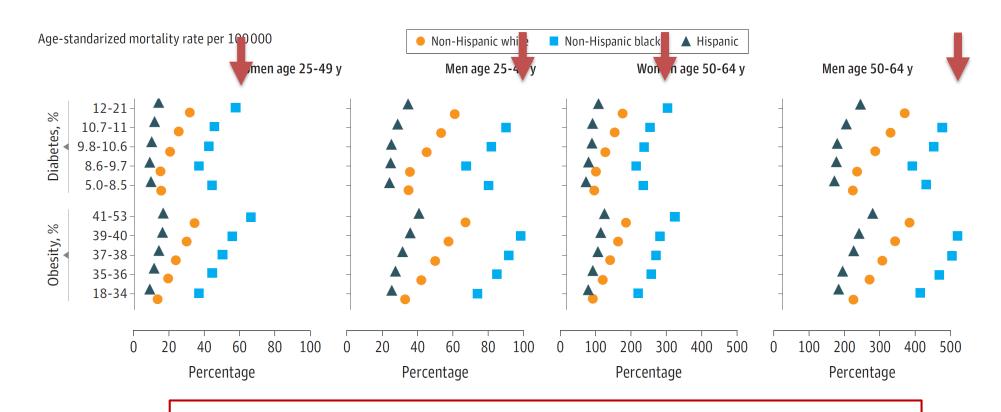


Disclosures

- 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 NHLBI; the NIMHD; the National Institutes of Health; or the U.S. Department of Health and Human Services.



Obesity and Diabetes Associated with Premature CVD Mortality Across Racial/Ethnic Groups in U.S.



How do we address these CV disparities for at-risk, non-Hispanic Black populations?

Neighborhood Social Environment is an Important Component of Multi-Level Interventions



Socio-ecological Model for Health Behavior

Social
Determinants
of Obesity and
Cardiovascular
Risk Laboratory

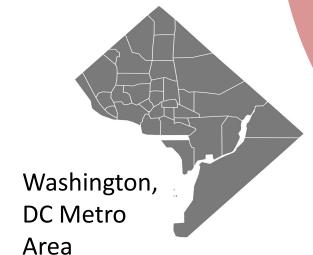
Simulation
Modeling and
Systems Science
Approaches

Epidemiologic Studies

Neighborhood Social Environment



Cardiometabolic Risk Translational
Science and
Interventional
Trials

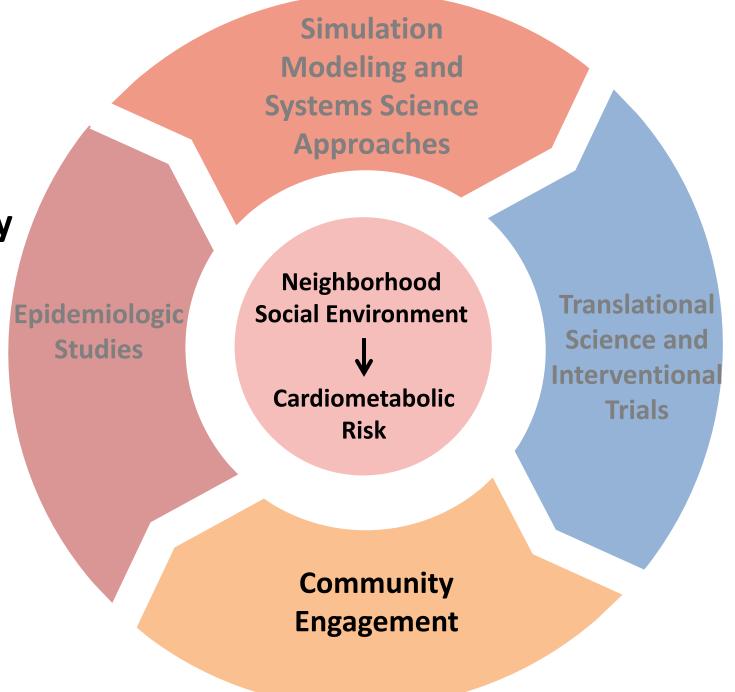


Community Engagement



Urban Areas of U.S.

Social
Determinants
of Obesity and
Cardiovascular
Risk Laboratory

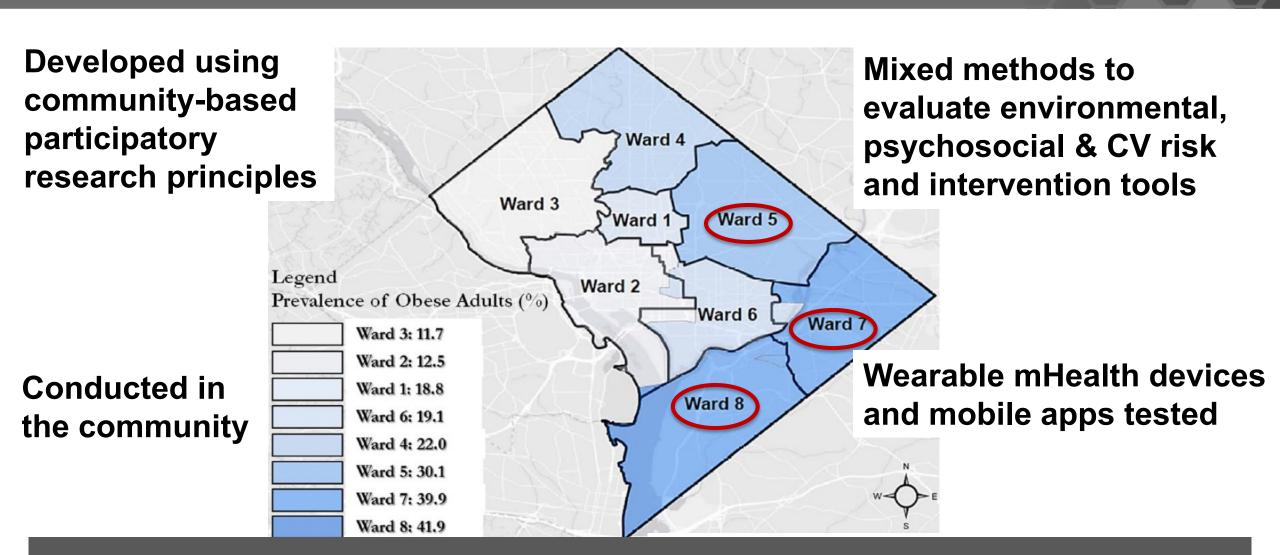


The Washington DC Cardiovascular Health and Obesity Collaborative (DC CHOC)

- Community advisory board that facilitates community engagement
- Multidisciplinary group of church & community leaders
- Provide input on project development and design
- First project: The Washington DC Cardiovascular Health and Needs Assessment (DC-CHNA)



Washington, D.C. CV Health and Needs Assessment



Aimed at developing interventions for improved CV health

Washington, D.C. CV Health and Needs Assessment

Developed using community-based participatory research principles



Mixed methods to evaluate environmental, psychosocial & CV risk and intervention tools

devices

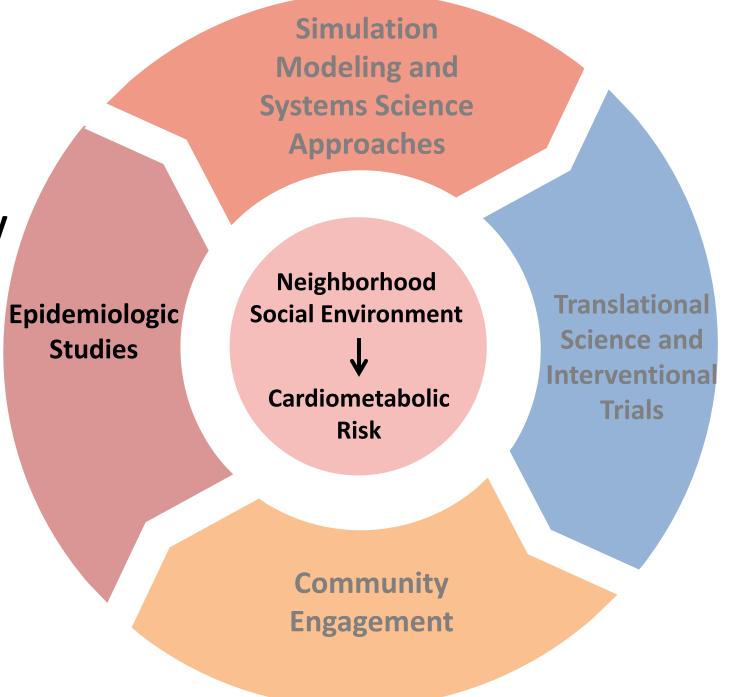
sted

Feasible to Use mHealth Apps and Wearables for Community-based Physical Activity Intervention

Crime and Limited Safety as Barriers to Physical Activity



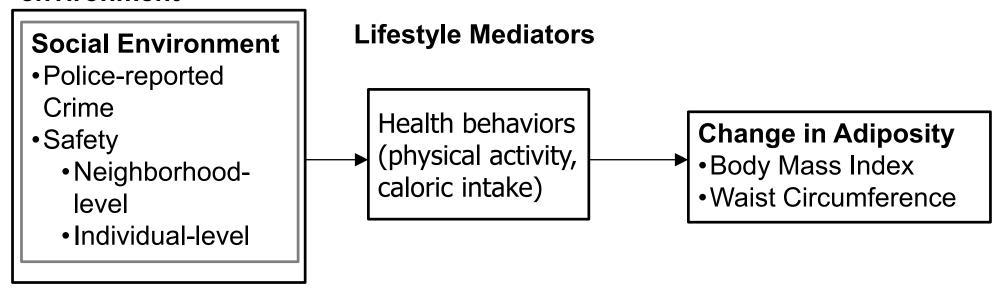
Fowler L et al. JMIR mHealth and uHealth 2018 Yingling L et al. Translational Behavioral Medicine 2017 Thomas S et al. Journal of Racial Ethnic Health Disparities 2016 Social
Determinants
of Obesity and
Cardiovascular
Risk Laboratory



Crime, Safety and Cardiometabolic Risk Change: Multiethnic Study of Atherosclerosis (MESA)



Neighborhood environment



Findings:

- Greater ↓ in safety over time associated with greater ↑ in BMI/WC
- No clear relationship between objective crime and adiposity
- Perceived safety as a potential target for intervention

Simulation
Modeling and
Systems Science
Approaches

Mixed Findings in Cohort Studies Linking Crime to Physical Activity and Obesity Neighborhood
Social Environment

Cardiometabolic
Risk

Intervention to
Increase Physical
Activity and Reduce
Obesity that Accounts
for Crime/Safety

Crime and Safety as Barriers to Physical Activity from Community-engaged Studies

Ahuja et al. Prev Med Reports 2018 Tamura K et al. Current Card Reports 2019

"Agents" represent individuals in population Agent-Based Model: Computational Modeling Agents interact with Environmental. environment and change behavior based on social Individual-level changes cues

Interaction Between "Agents" represent **Autonomous Agents** individuals in population Agent-Based Model: Computational Modeling Agents interact with Environmental. environment and change behavior based on social Individual-level changes cues

"Agents" represent individuals in population

Interaction Between Autonomous Agents

Agent-Based Model:

Computational Modeling

Agents interact with environment and change behavior based on social cues

Environmental, Interpersonal and Individual-level changes affect system as whole

"Agents" represent individuals in population

Interaction Between Autonomous Agents

Agent-Based Model:

Computational Modeling

Agents interact with environment and change behavior based on social cues

Environmental, Interpersonal and Individual-level changes affect system as whole



Simulating the Impact of Crime on African American Women's Physical Activity and Obesity

Tiffany M. Powell-Wiley¹, Michelle S. Wong ^{2,3}, Joel Adu-Brimpong⁴, Shawn T. Brown^{2,5,6}, Daniel L. Hertenstein^{2,5}, Eli Zenkov^{2,5,6}, Marie C. Ferguson^{2,5}, Samantha Thomas⁴, Dana Sampson¹, Chaarushi Ahuja¹, Joshua Rivers¹, and Bruce Y. Lee ^{2,5}

- As exercise propensity increases, crime reductions and increase in PA location accessibility have larger impact
- Policies aimed at reducing obesity by increasing leisure-time PA should take multi-level approach
- Consider targeting crime through urban renewal and policies to improve perceived safety in resource-limited urban communities

Example of
Urban Renewal
Process with
Health Equity
Focus

Slide From:
Mustafa Abdul-Salaam
Managing Partner
Community Economic
Development Partners
http://www.linkedin.co
m/in/mabdulsalaam/

Steering Committee

- Martha's Table
- UPO Advocacy Advisory Council
- · ANC 8C
- Anacostia
 Coordinating Council
- Developing Economic Opportunities
- National Children's Center
- Bread for the City
- Redbrick LMD
- DC Primary Care Association

PARTNERS

DATA COLLECTORS

Community organizations, businesses,

and stakeholders in community

conomic development planning

Leaders embedded in community

institutions, nonprofits, or businesses

organizations like ANCs, civic associations.

tenant associations, faith and educational

Ward 8 Community Economic Development Planning Process Community Engagement Plan

Steering Committee

- ANC8A
- Congress Heights CTDC
- Ward 8 Faith Leaders
- City First Bank
- Anacostia Business Improvement District
- Ward 8 Health Council
- Whitman-Walker Health
- Far Southeast Family Support Collaborative
- Office of Ward 8
 Councilmember Trayon
 White

Project Management Team

Develops governance, vision and strategy on behalf of steering committee and residents.

Community Engagement

Training

★ Iterative data collection process to capture the voice of the community on important quality of life issues

Governance, Vision, and Strategy October 2019-June 2020

WE ARE HERE

Action Planning/Co-design

Common Agenda Setting

Working Principles for Health Justice & Racial Equity

- ith Justice & Racial Equity
- Act with care
 Inclusivity
- 3. Authentic community collaboration
- 4. Sustainable solutions

Data Interpretation & Analysis

COMMUNITY MEMBERS
REACHED THROUGH DATA
COLLECTION

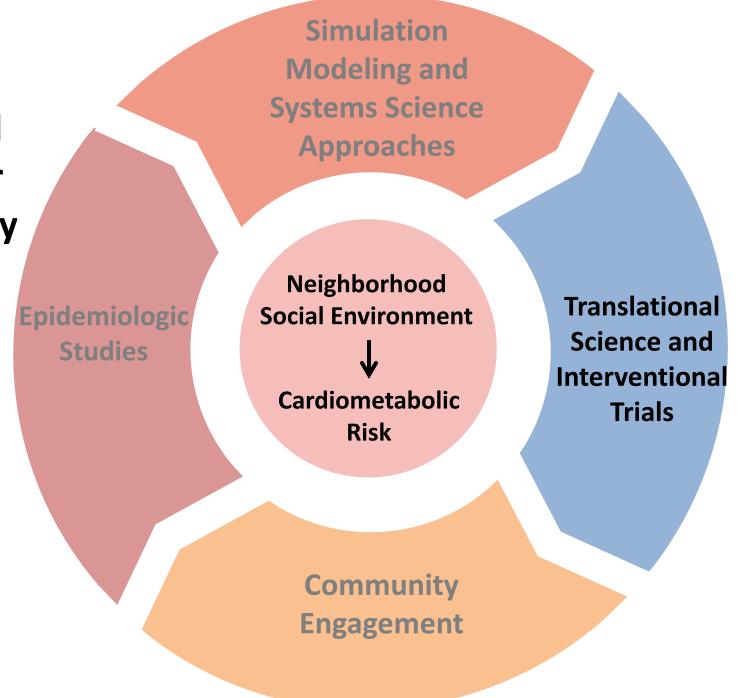
Data collectors will recruit community members with context expertise (particularly youth, regions, and returning citizens, as well as people experiencing heightened nealth risk) to participate in data collection using Streetwyze platform. Community members will be invited to participate in subsemmittees alongside subject matter experts to drive the development of CED strategies.



nmunity Driven CED Strategy
June 2021
pment of Community Leadership

Body

Social
Determinants
of Obesity and
Cardiovascular
Risk Laboratory



Systems Science Modeling in Community-based Physical Activity Intervention Development

- Agent-based modeling to test multilevel interventions for African American women in DC:
 - mHealth intervention promoting PA at most accessible recreation center classes
 - Potential to test how crime may limit intervention
 - Simulates community-based intervention developed by team



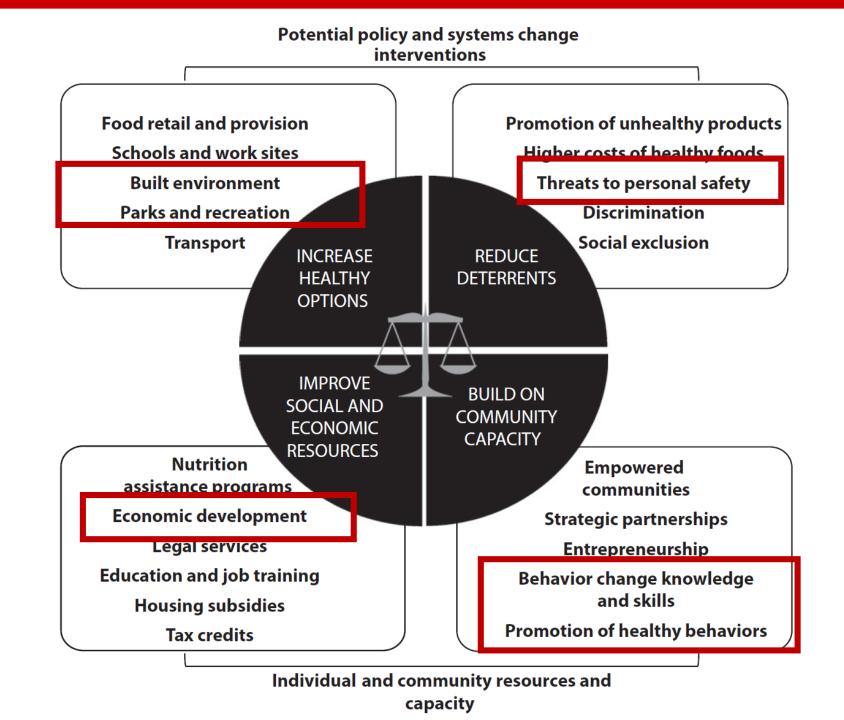




Getting to Health Equity: A Framework for Obesity Prevention

Kumanyika S. AJPH 2019

Cardiovascular
Health Equity as
the Ultimate Goal





Thank you for your attention



Email: tiffany.powell@nih.gov

Phone: 301-594-3735