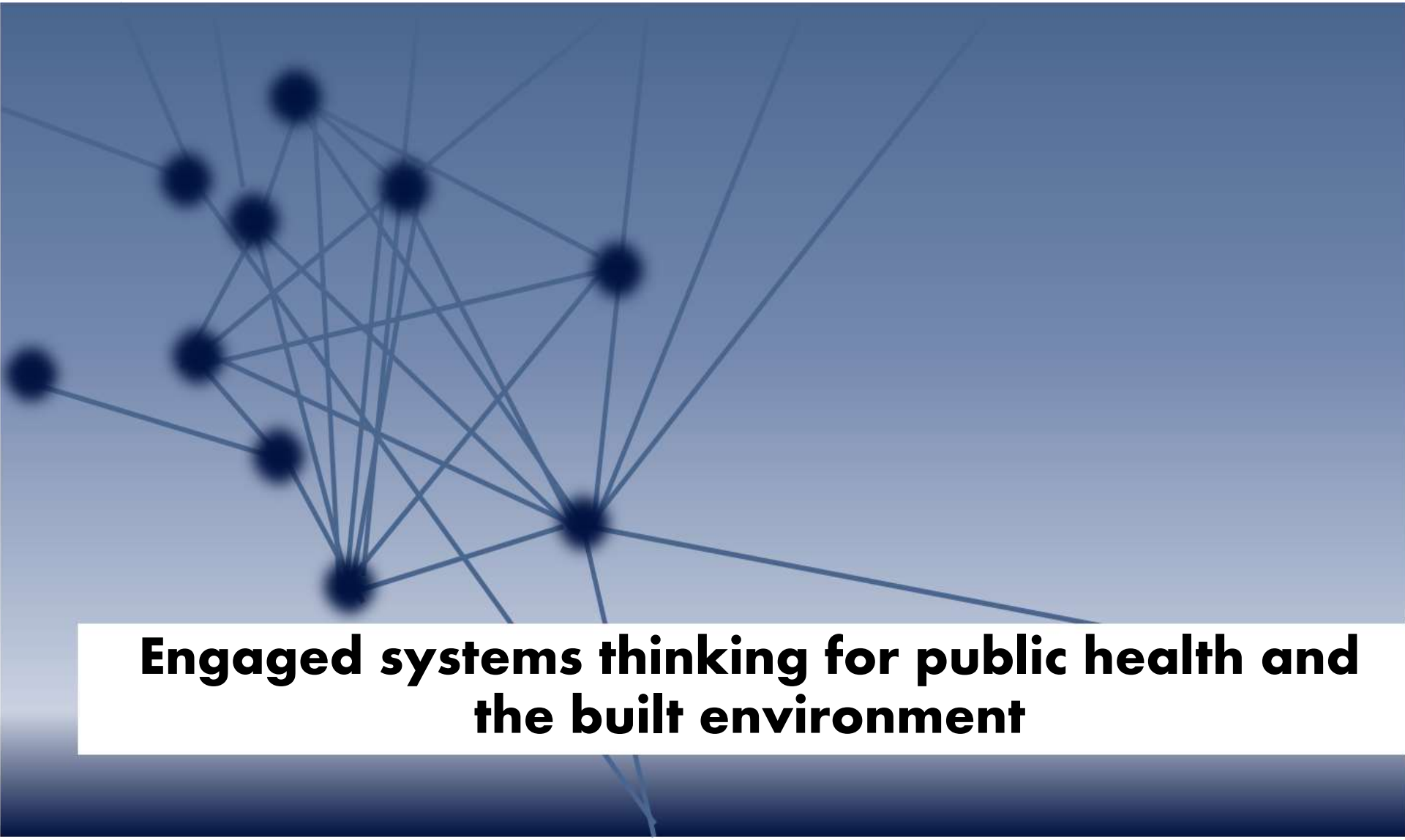
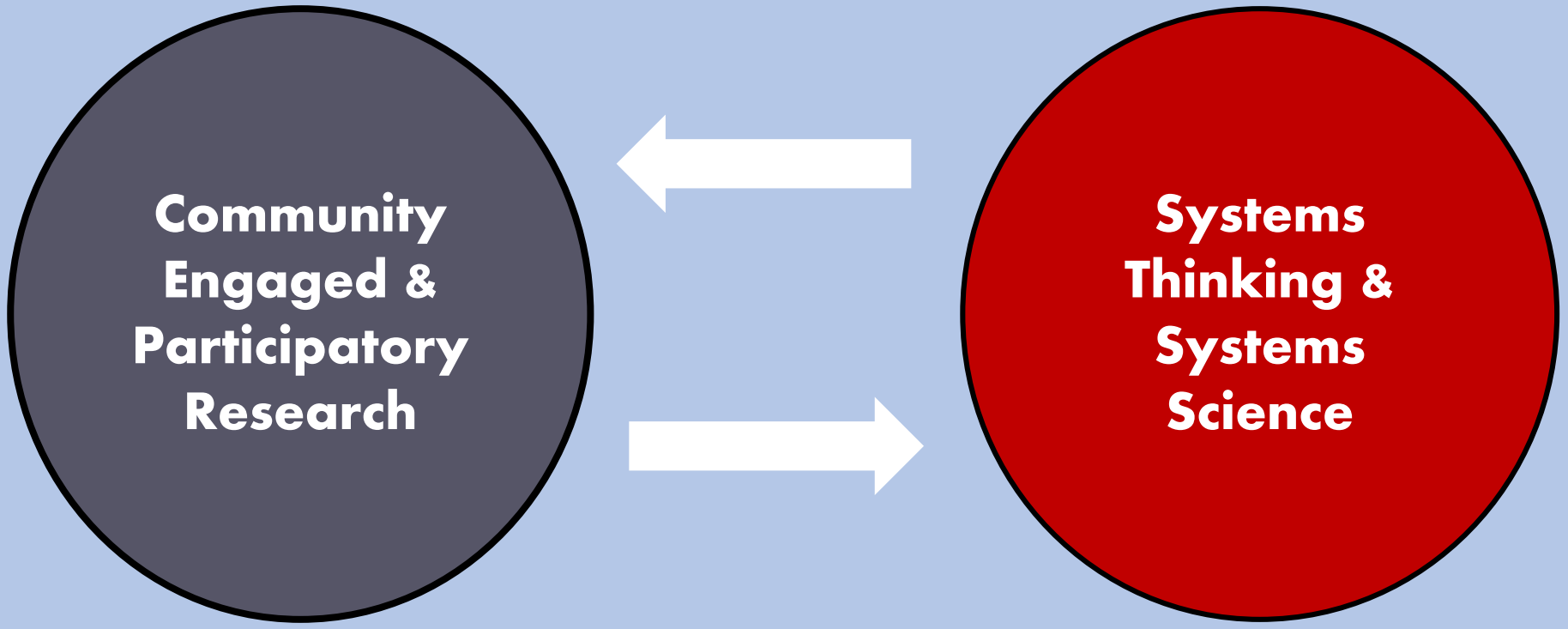


Engaged systems thinking for public health and the built environment

Leah Frerichs, PhD
Assistant Professor
leahf@unc.edu

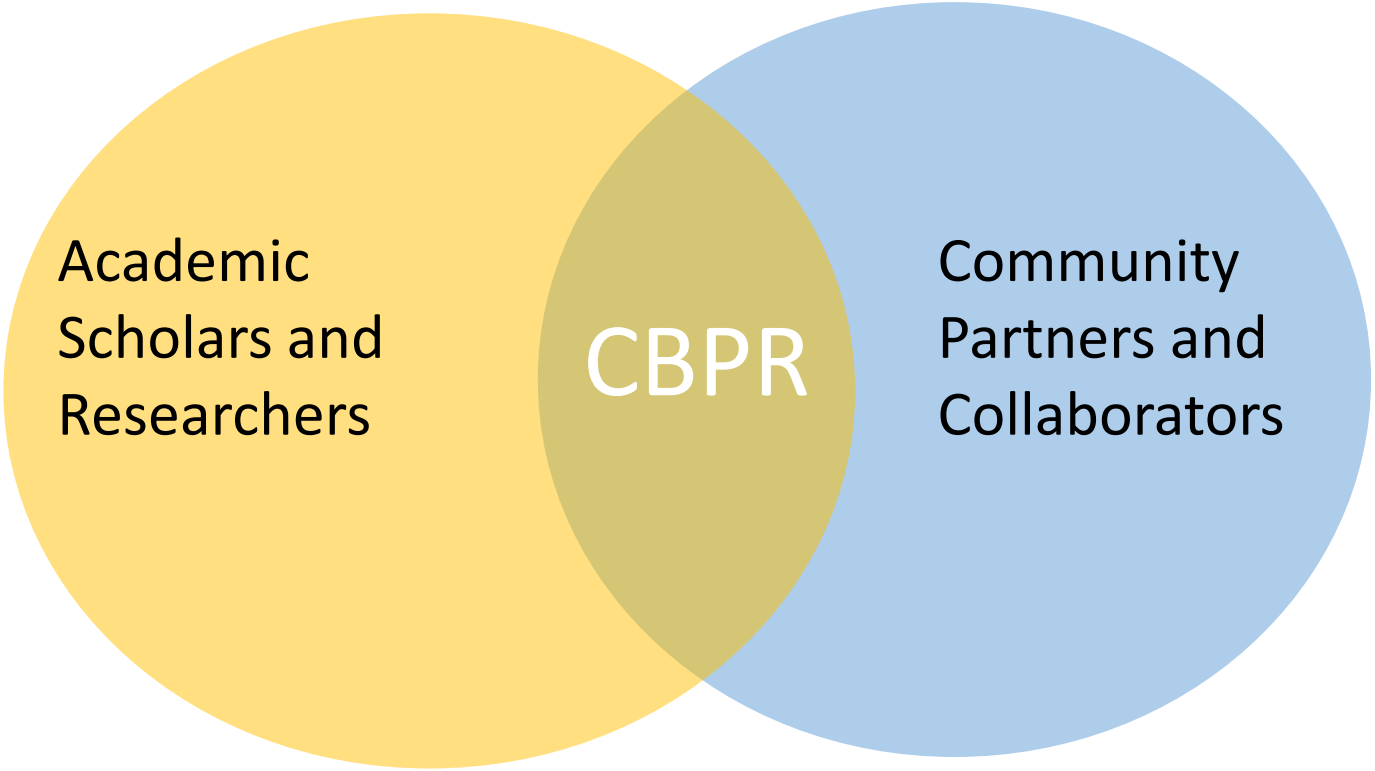


Frerichs, L., Hassmiller Lich, K., Dave, G., Corbie-Smith, G. (2016) Integrating systems science and community based participatory research – an approach to achieve health equity. *American Journal of Public Health.* 106(2):215-22.

Community-Based Participatory Research (CBPR)

CBPR is a collaborative approach to research that equitably involves, community members, organizational representatives, and researchers in all aspects of the research process.

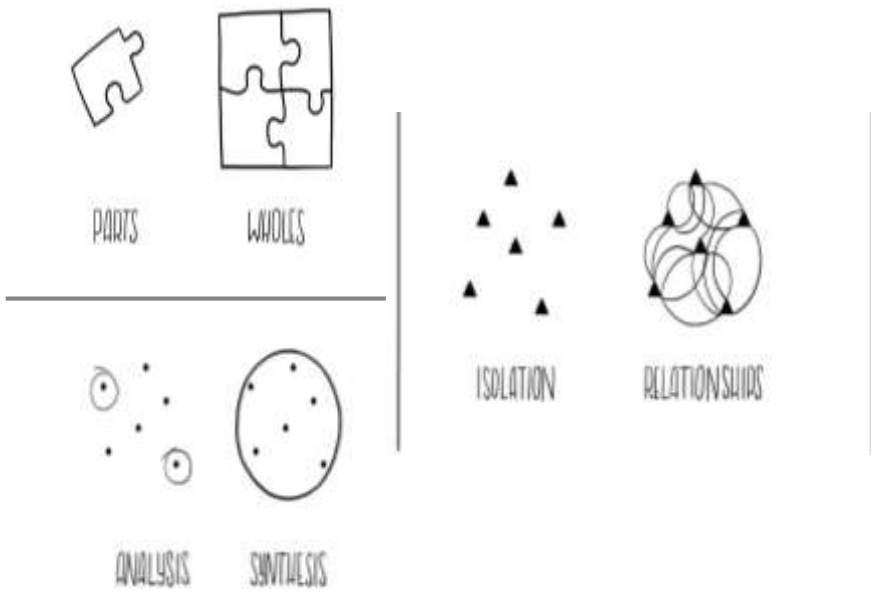
Israel, et al, 1998

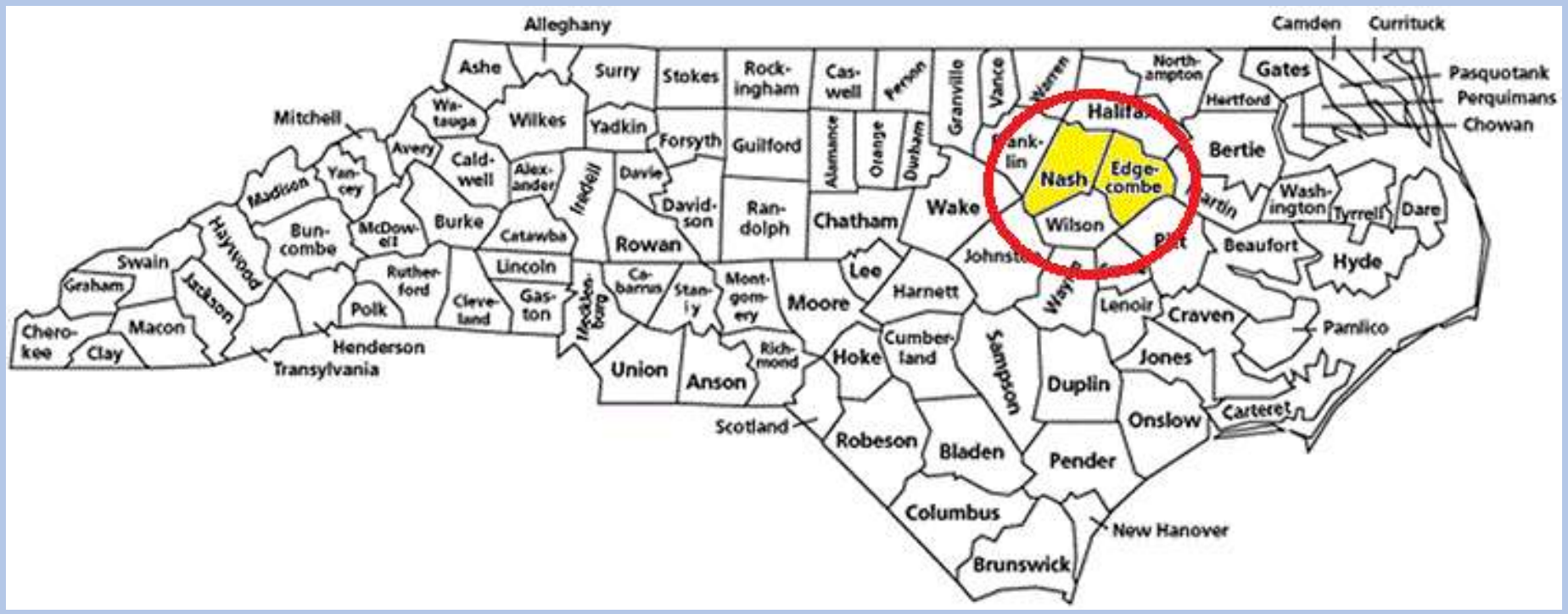


Systems Thinking

"Systems thinking is a framework for seeing interrelationships rather than things, for seeing patterns rather than static snapshots. It is a set of general principles spanning fields as diverse as physical and social sciences, engineering and management."

Peter Senge





Nash & Edgecombe County

- The CVD mortality rates for Edgecombe and Nash counties are 1.23 and 1.13 times the overall rate of North Carolina.
- In community health assessments conducted in the last three years, CVD risk factors, such as obesity and hypertension, were among the top 10 health priorities in both counties.

Sources: Nash County Department of Health and Human Services. 2012-2016 NC Resident Race/Ethnicity and Sex-Specific Age- Adjusted Death Rates. & Nash County 2016 Community Health Assessment.

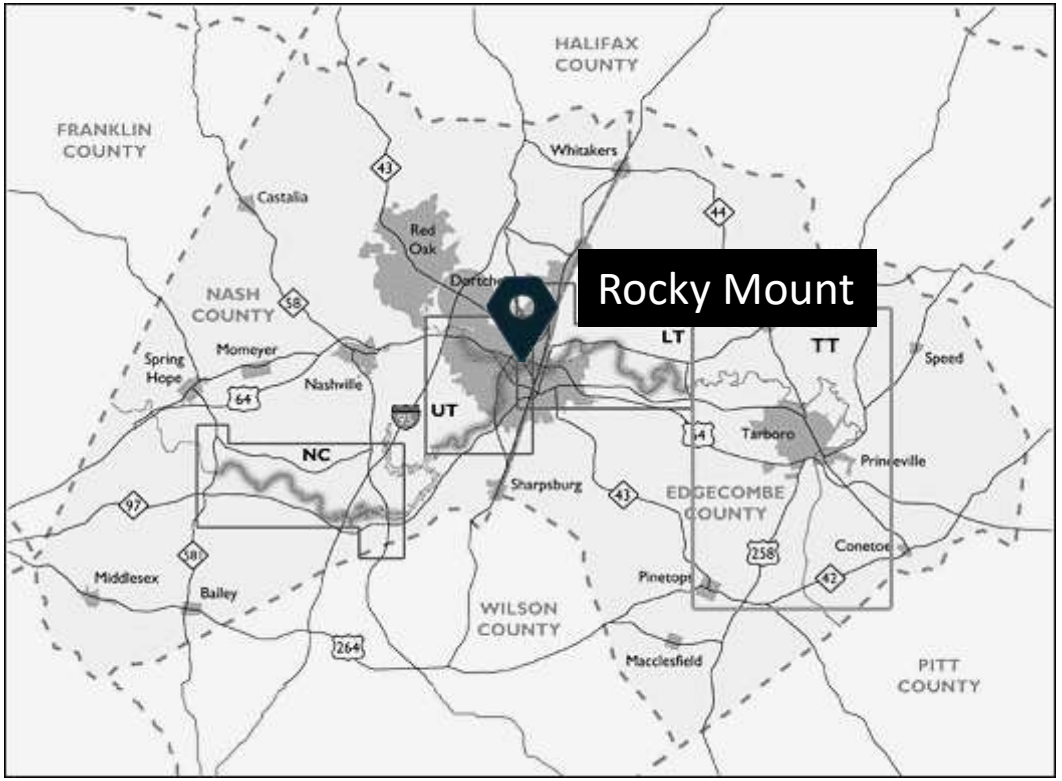
Meaningful

Active

Productive

Science in service to communities

MAPSCORPS

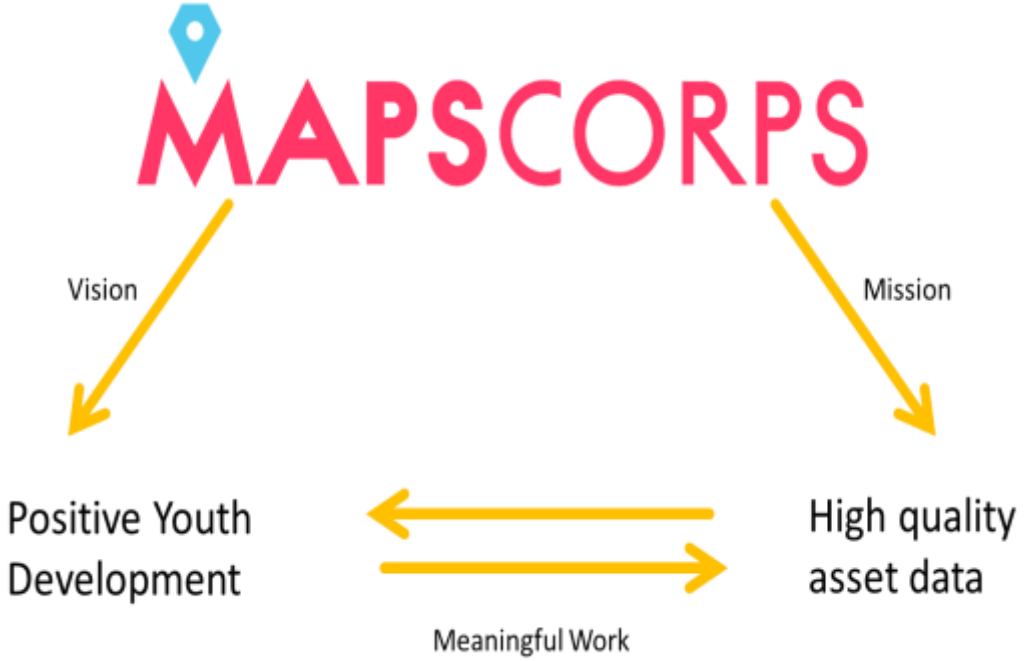


MAPSCorps slides credit:
Nicole Robinson-Ezekwe, MA, MPH; UNC Center for Health Equity Research

Origins: The University Chicago, 2009

Mission: To train youth to produce high quality data about community assets that everyone can use to improve the human condition.[1]

Locations: Chicago, New York City (Harlem and The Bronx), Niagara Falls and Rocky Mount, NC



Process

MAPSCorps Nash & Edgecombe partners with local community organizations in order to recruit high school students

Resourceful Communities
People. Places. Opportunities.
A PROGRAM OF THE CONSERVATION FUND

PROJECT MOMENTUM INC

ProjectGRACE
Growing, Reaching, Advocating for Change & Empowerment

OIC
Helping People Help Themselves

Community Enrichment Organization

Process

MAPSCorps collects data using the MAPSCorps webpage on mobile phones.

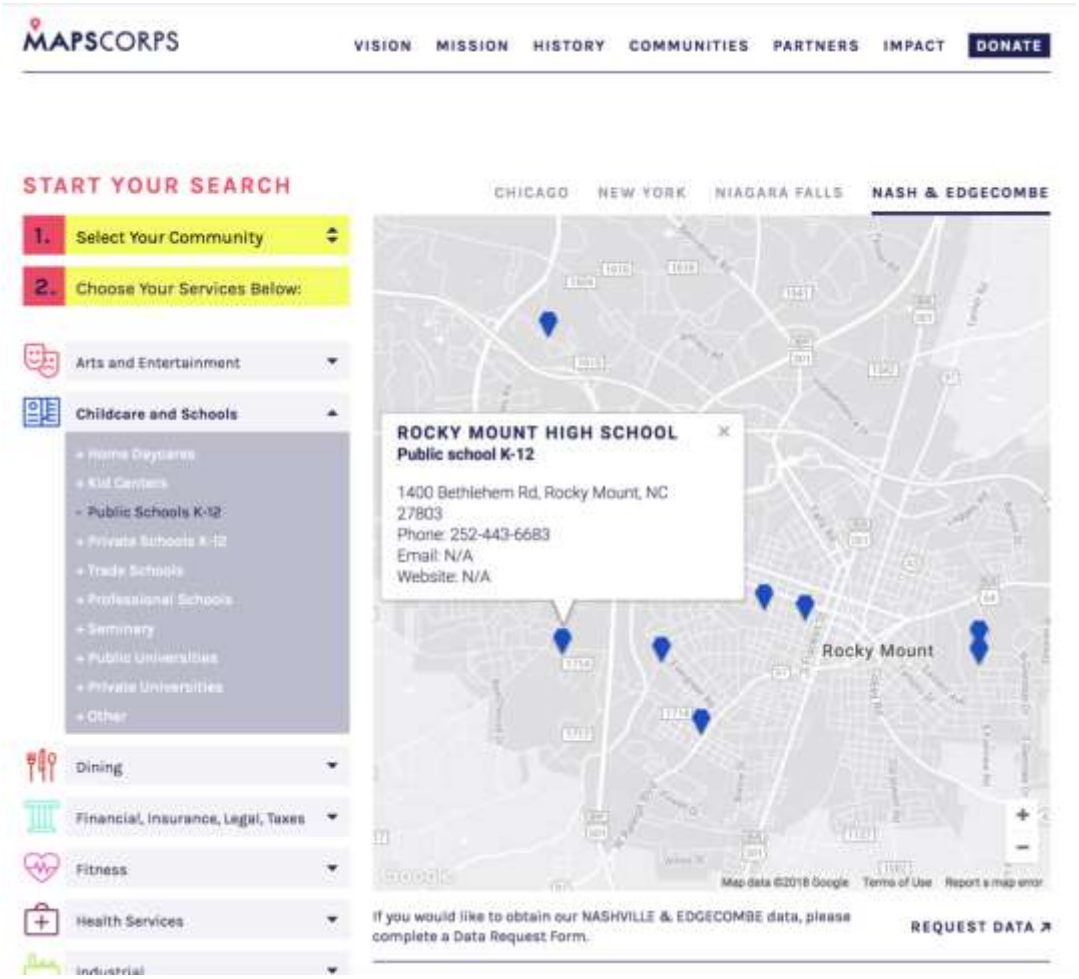
Mappers physically walk to each address they're assigned in order to classify them.

Process

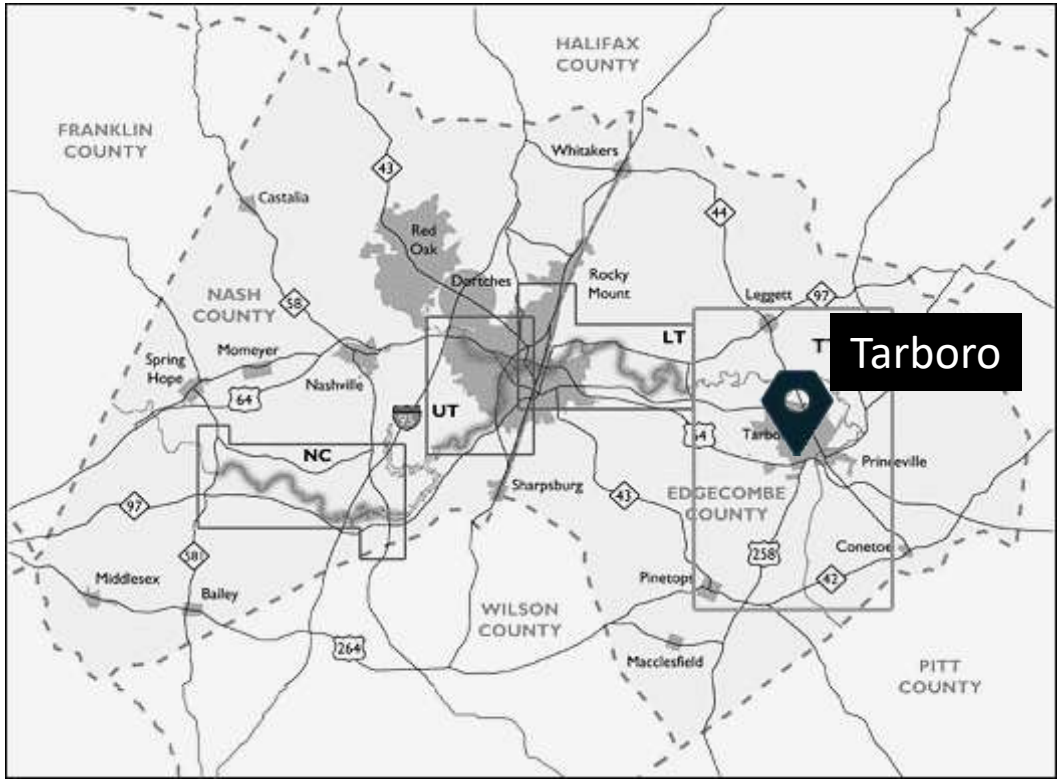
At the end of the program, mappers use the data they collected to create and present community-based research projects at the Scientific Symposium

Process

After data is cleaned, the data is uploaded and made accessible on mapscorps.org

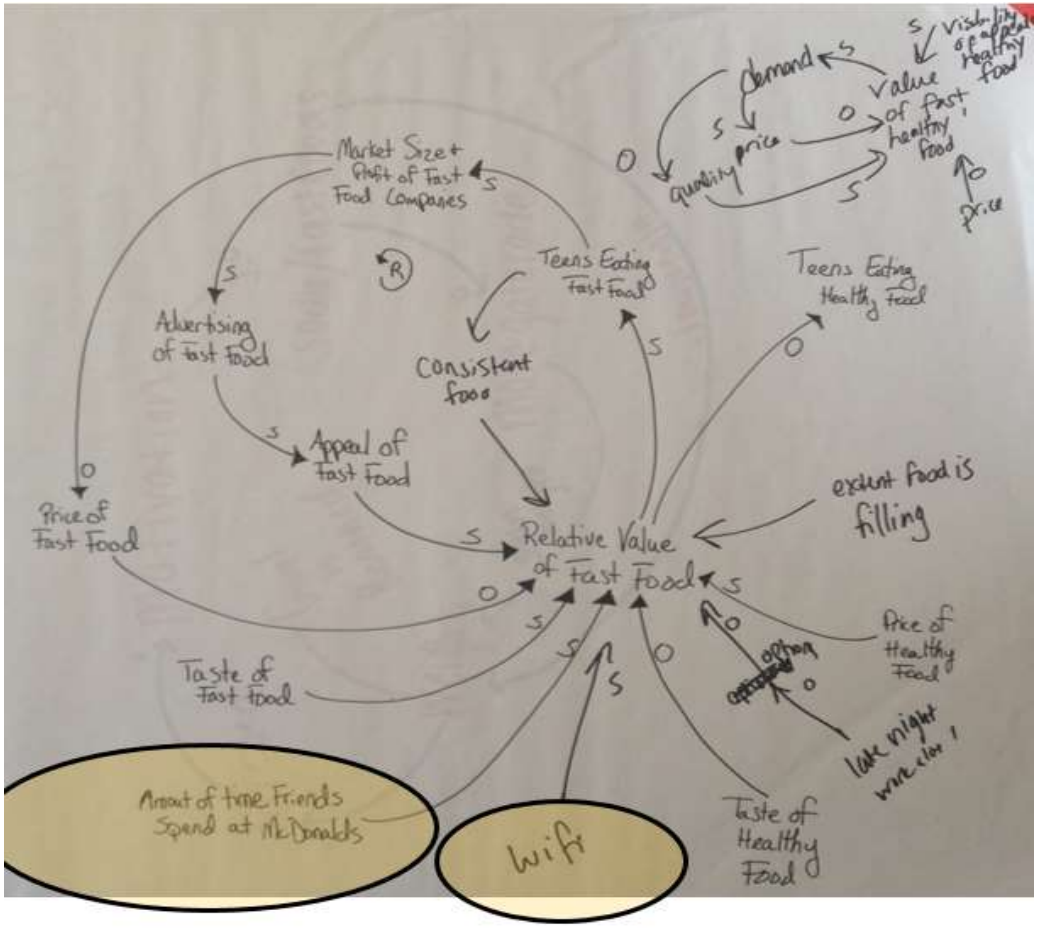


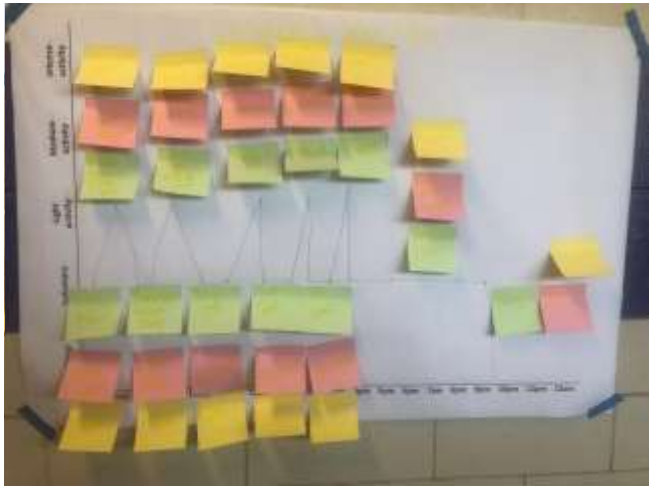
Project #2: Awesome catchy program name



Training youth in systems thinking

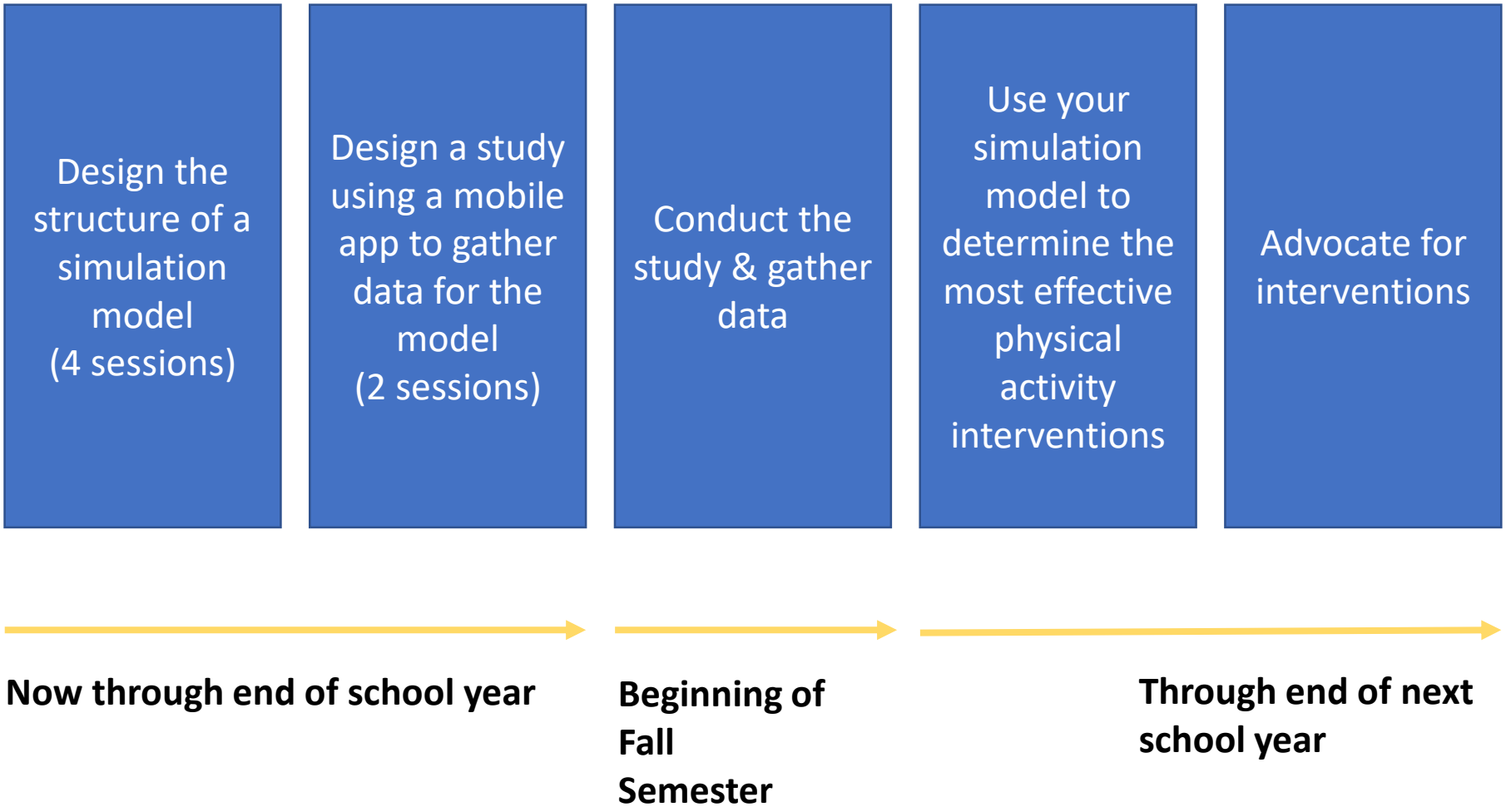
Acknowledgements: Center for Health Equity Research; K24HL105493, PI: Dr. Giselle Corbie-Smith; UL1TR001111, NC TraCS





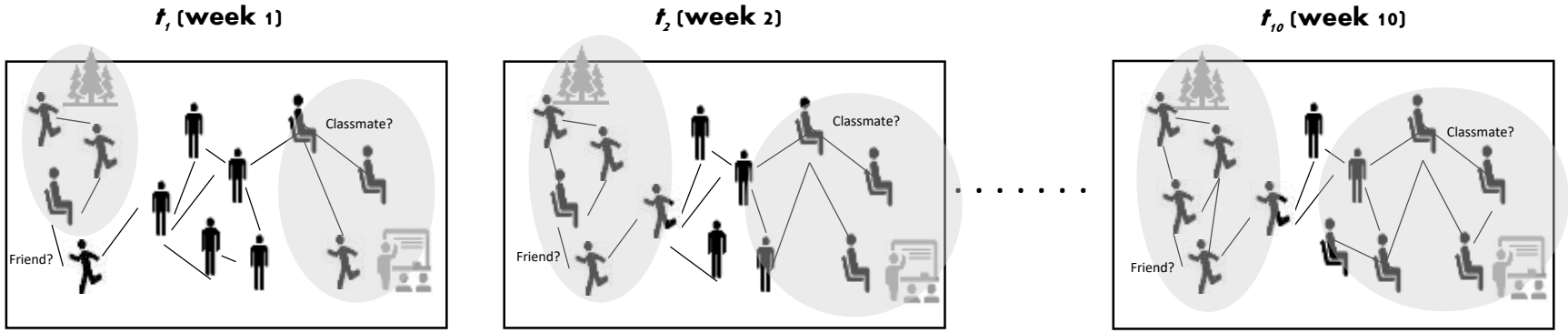
Frerichs, L., Hassmiller, K., Young, T.L., Dave, G., Stith, D., Corbie-Smith, G. (2017) Development of systems science methods to engage rural African American teens in understanding and addressing childhood obesity prevention. *Health Education and Behavior*. doi: 10.1177/1090198117726570.

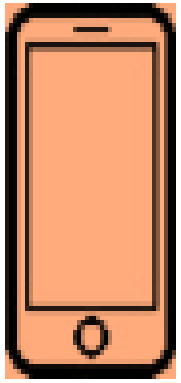
Training youth in systems thinking



Training youth in systems thinking

Schematic of empirical data collection for use in agent based simulation models





Smartphone tri-axial accelerometer data every 2 minutes for physical activity data

Bluetooth media access control identifiers of other participant smartphones for social interaction and network data

Friend?
Classmate?

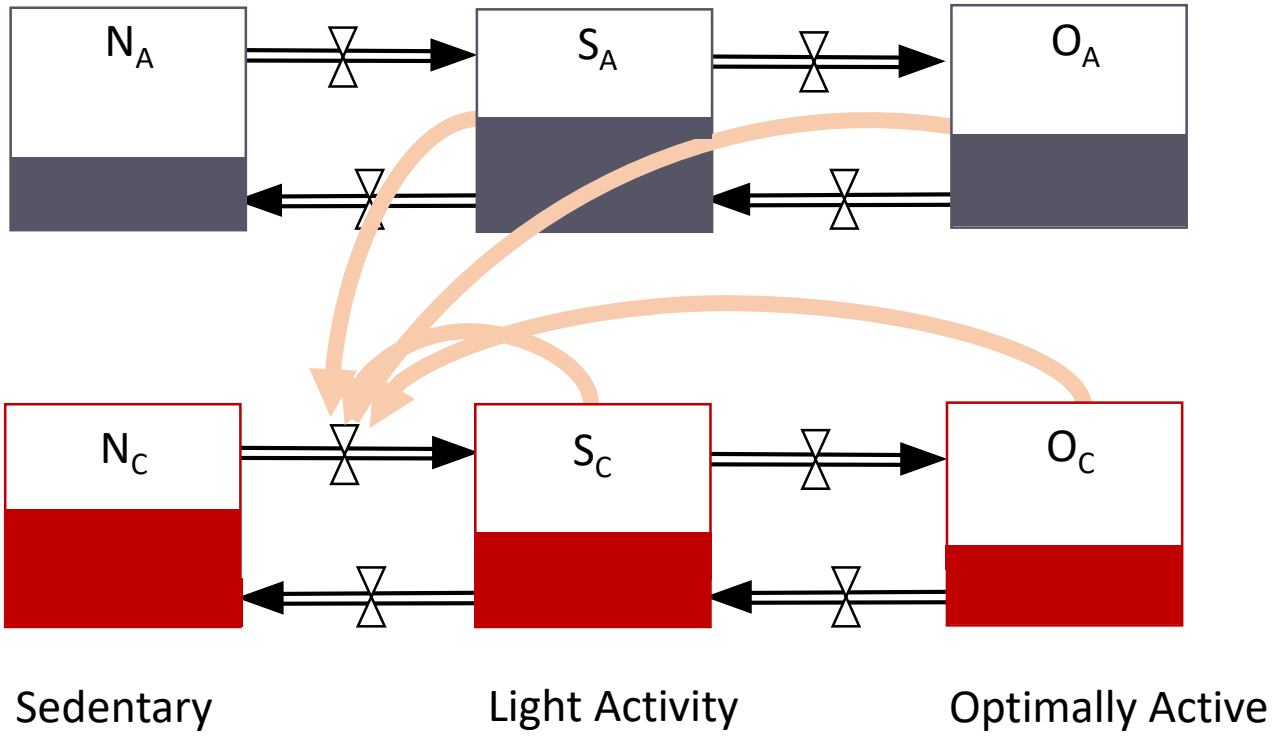
Short-message surveys (triggered when Bluetooth detected other participant smartphones) on social relationship and information on the context of interaction (same room, talking, touching, etc.)

Unique identifiers and signal strength of wireless internet routers for environmental exposure data

Data collected continuously from logs of sensor data using the iEthica smartphone app

Training youth in systems thinking

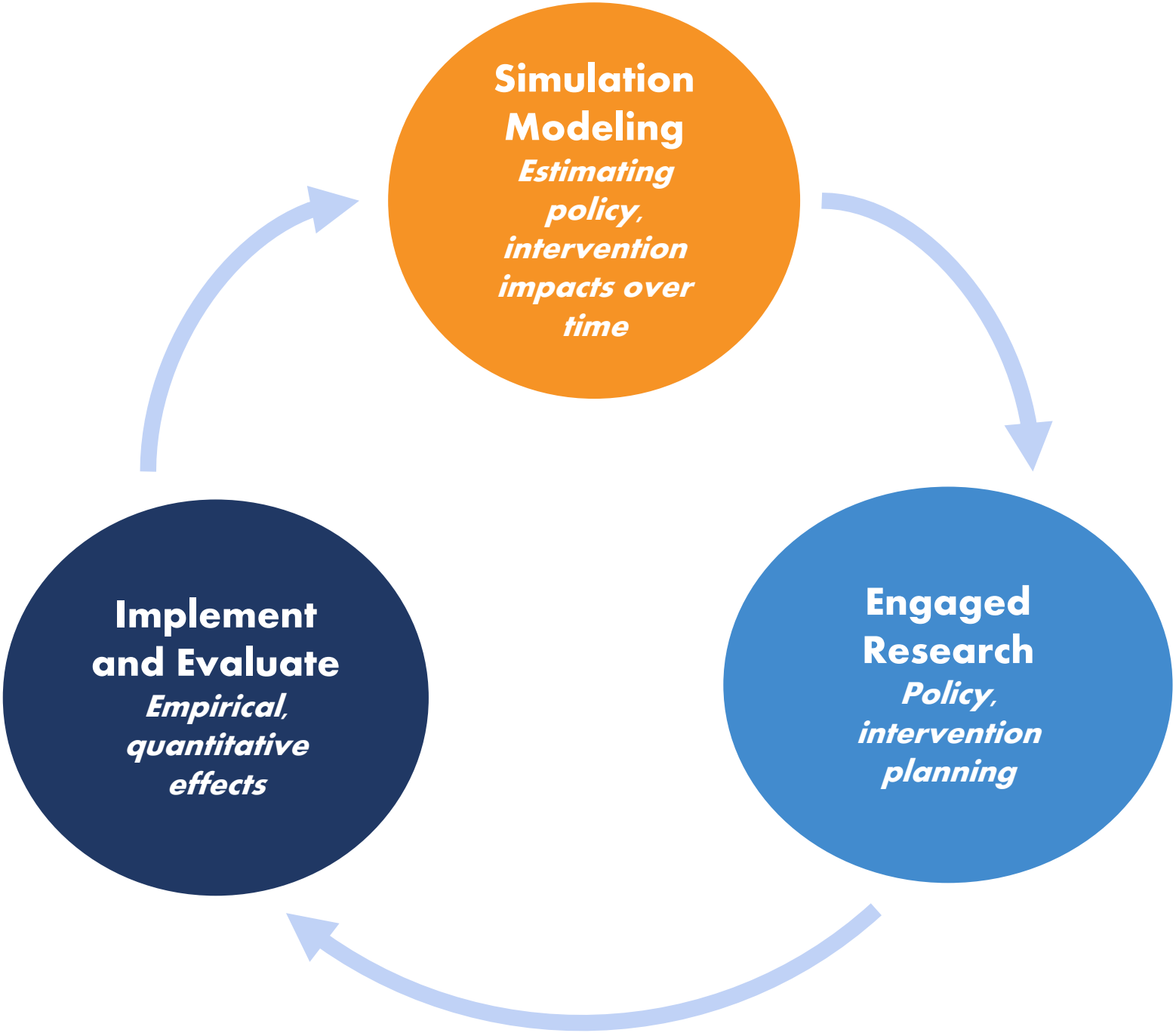
Schematic of Simulation model



The types of questions we can ask:

- **Who is optimal to target in social networks to effectively diffuse positive behavior change?**
- **What types of multi-level interventions most cost-effectively improve physical activity?**

Frerichs, L., Araz, O., Huang, TTK. (2013). Modeling social transmission dynamics of unhealthy behaviors for evaluating prevention and treatment interventions on childhood obesity. *PLoS One. 8(12) e82887. doi:10.1371/journal.pone.0082887*


Simulation Modeling
Estimating policy, intervention impacts over time
Engaged Research
Policy, intervention planning
Implement and Evaluate
Empirical, quantitative effects