THE UNIVERSITY OF CHICAGO

THE IMPACT OF THE PHYSICAL ENVIRONMENT

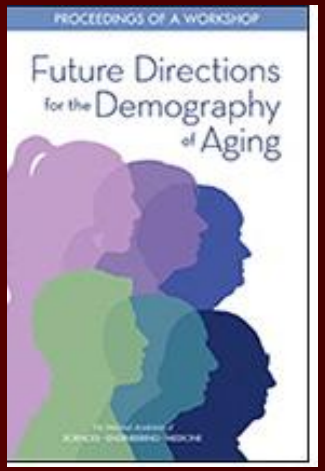
KATHLEEN CAGNEY

Department of Sociology, Population Research Center
University of Chicago

RCCN
DEC 2018

Overview

Whether older adults reside in their long-term communities or move to other locations, the characteristics of the places within which they experience the aging process likely have profound consequences for their abilities to adapt to changes such as bereavement, retirement, the development of chronic health conditions or functional impairments, as well as to recover from illness and maintain independent community residence (Cagney & York Cornwell, 2018)



Steering Committee for Workshop on the Future Directions for the Demography of Aging (NIA)

Mark Hayward, Vicki Freedman, Linda Waite, David Weir, Rebeca Wong

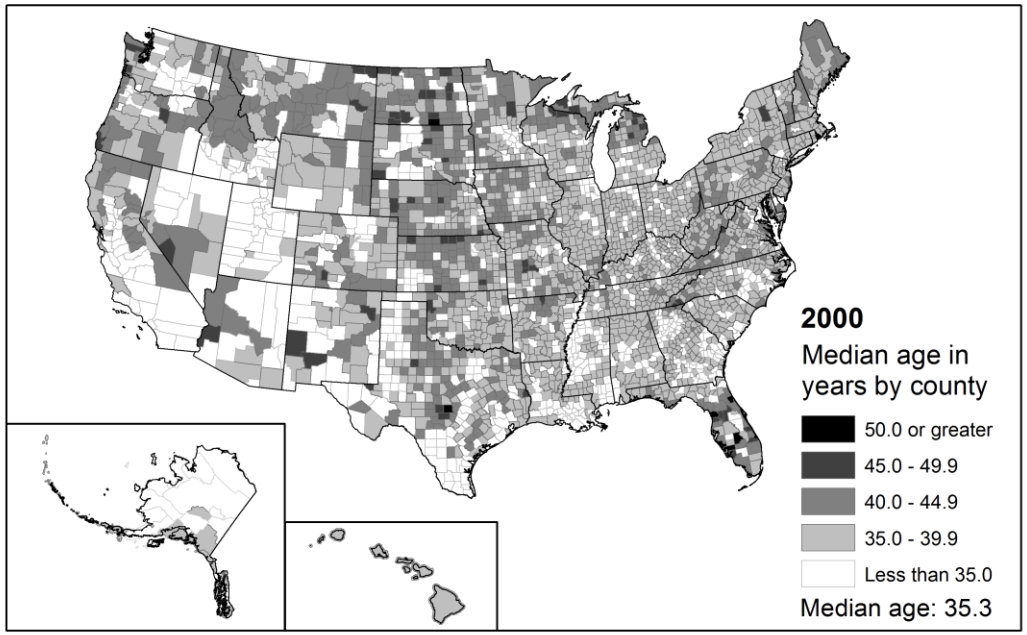
Mark Hayward & Malay Majmundar, eds

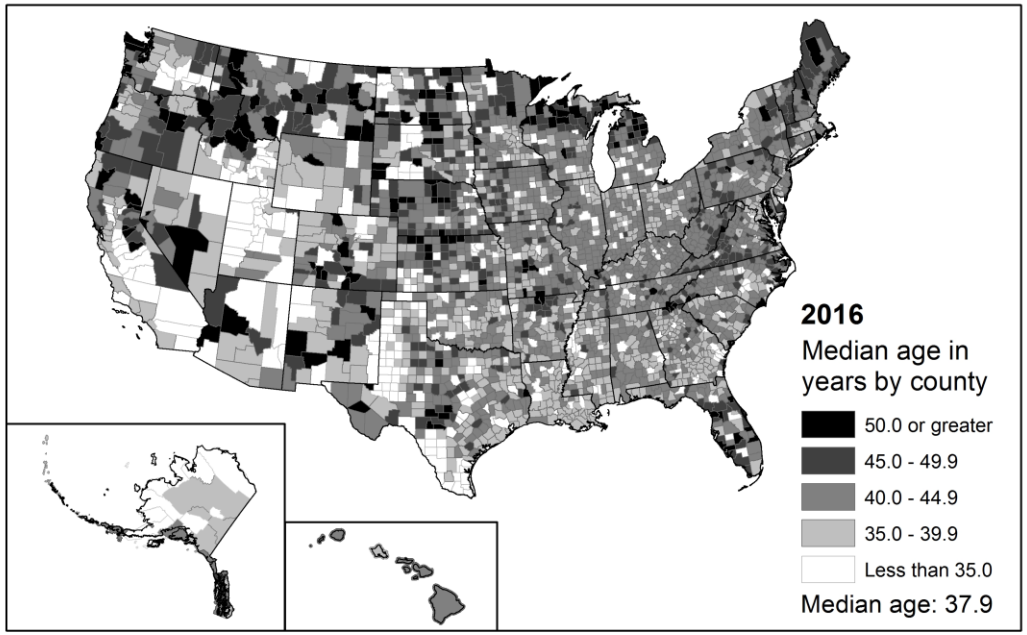
What is Place?

- A physical space
  - Municipal designation (e.g., city, county, state)
  - Residential location
  - Household
- A social space
  - Public/private
  - Indoor/outdoor
  - Institutional context
- Nested and overlapping environments

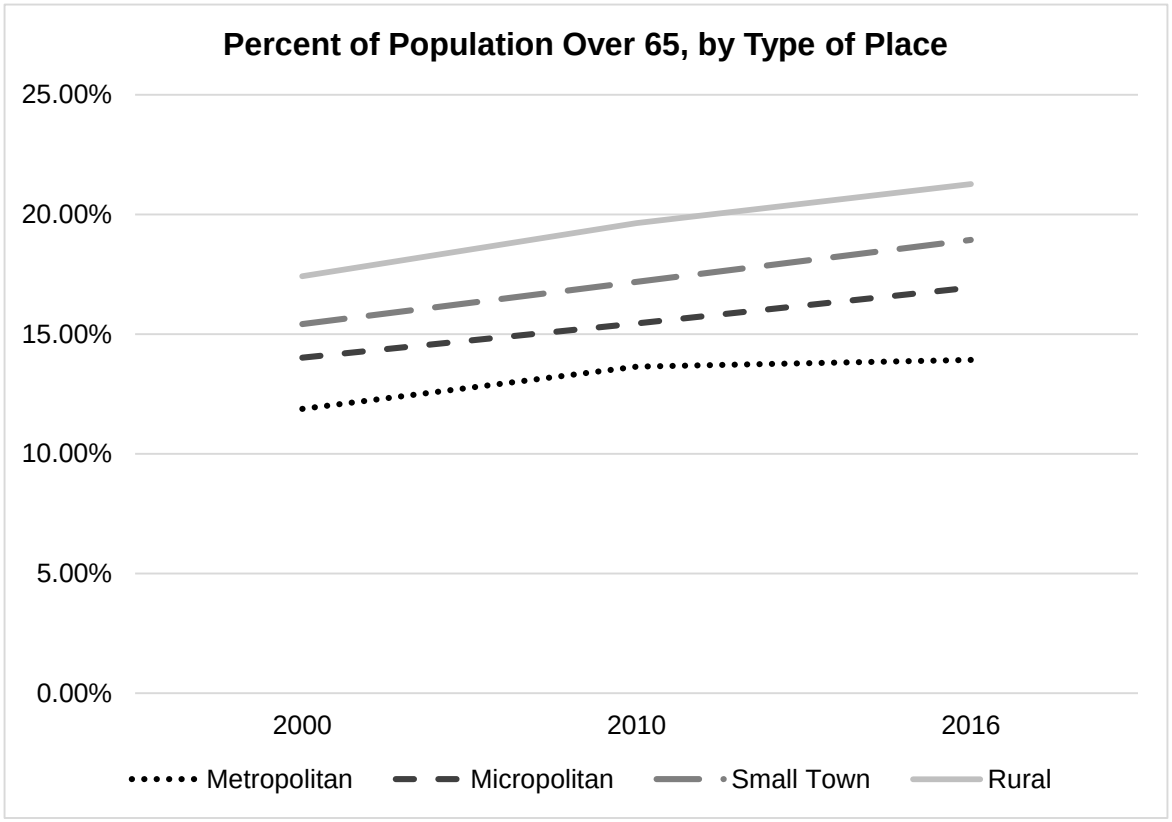
Place and Aging

- Individual level
  - Aging in place
  - Embeddedness (network ties, homeownership)
- Contextual level
  - Age structure
  - Built and social environment
  - Segregation by place (e.g., race, class, age)
- Mobility and micro/macro influences (Bean et al., 1994)
- Push/pull and dynamic nature of residential environment



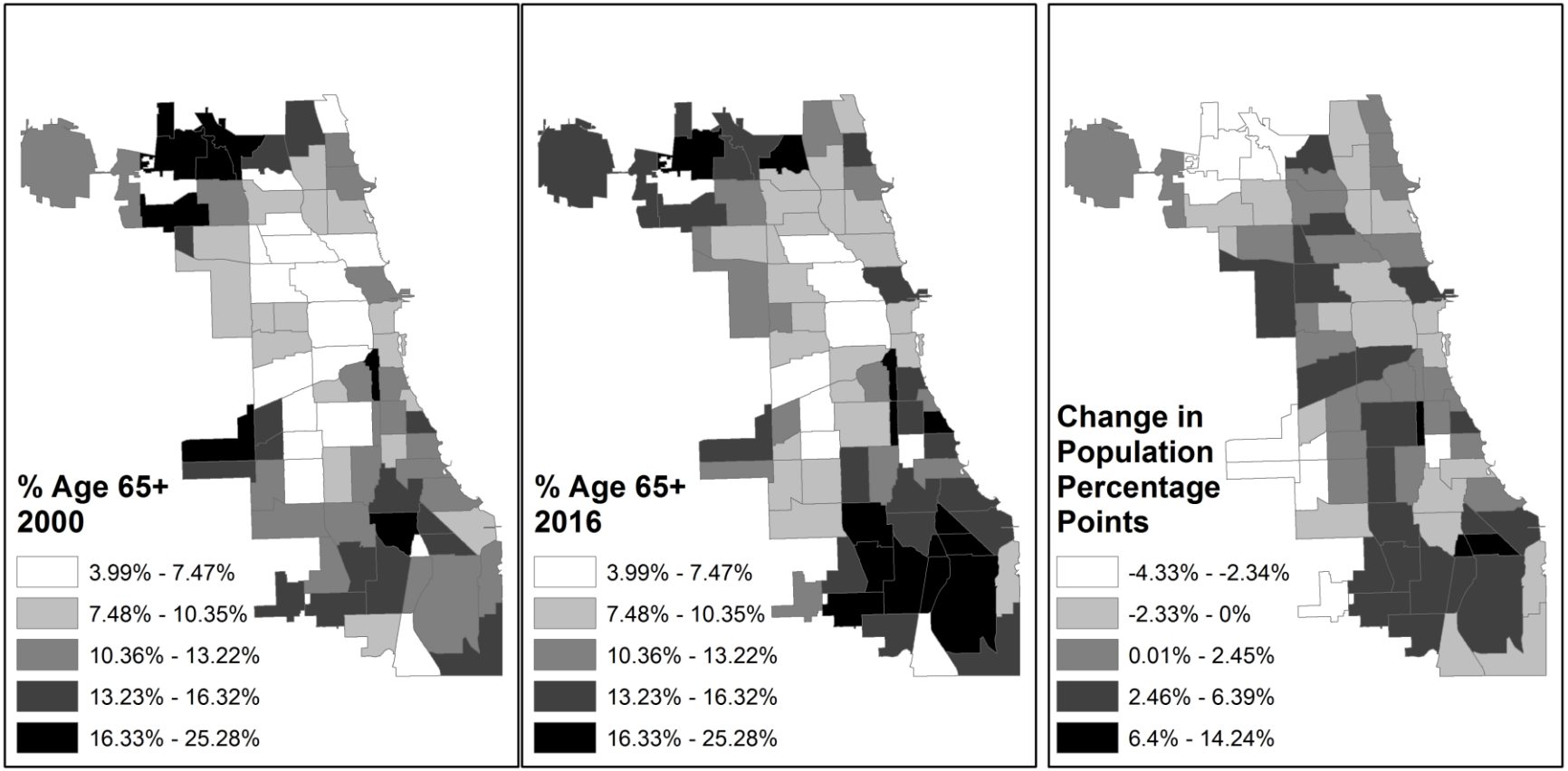


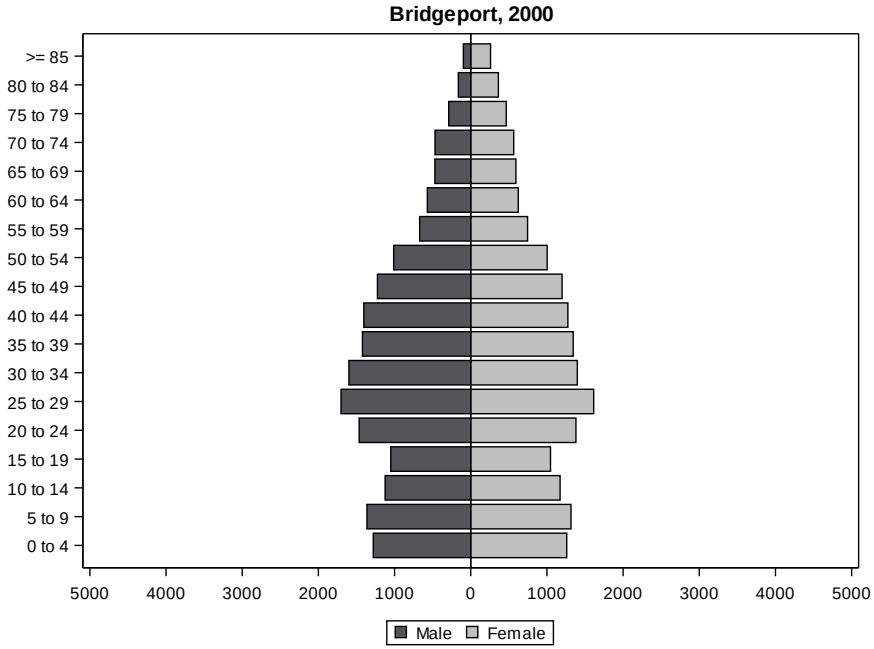
- Median age for adults in rural areas 51, as compared to 45 in urban
- By 2040, 25% of rural households will be 65 or older as compared to 20% of urban
- 2020-2030, rural population growth predicted 1%; urban population growth 8%

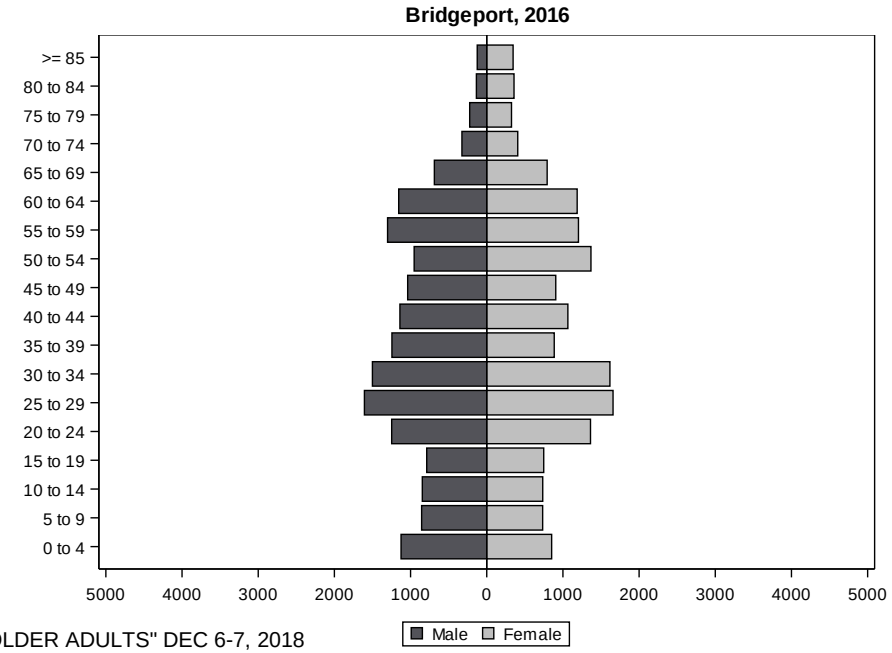


Note: Metropolitan (50,000 or more); Micropolitan (at least 10,000 but fewer than 50,000), Small Town (at least 2,500 but fewer than 10,000), Rural (all other).

Chicago and its 77 Community Areas
Population Composition for those 65+



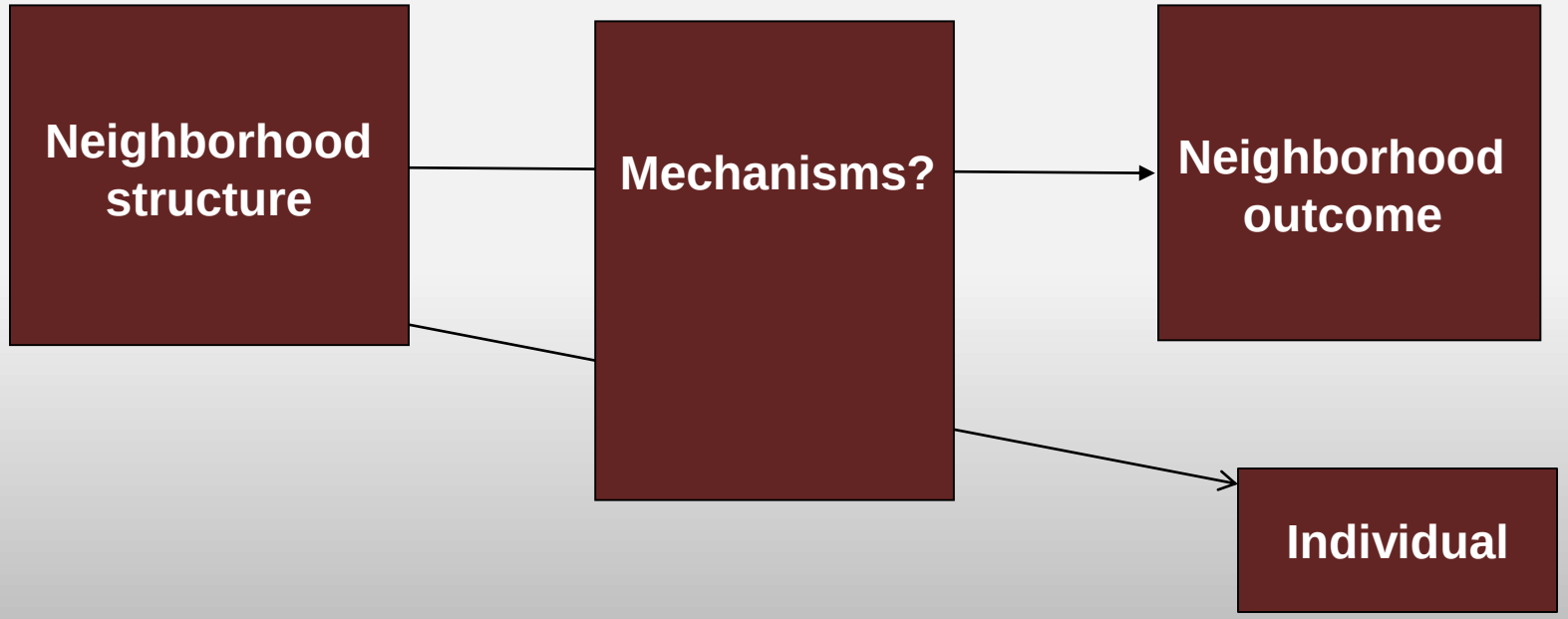

Bridgeport, 2000
>= 85
80 to 84
75 to 79
70 to 74
65 to 69
60 to 64
55 to 59
50 to 54
45 to 49
40 to 44
35 to 39
30 to 34
25 to 29
20 to 24
15 to 19
10 to 14
5 to 9
0 to 4
5000 4000 3000 2000 1000 0 1000 2000 3000 4000 5000
Male Female


Bridgeport, 2016
>= 85
80 to 84
75 to 79
70 to 74
65 to 69
60 to 64
55 to 59
50 to 54
45 to 49
40 to 44
35 to 39
30 to 34
25 to 29
20 to 24
15 to 19
10 to 14
5 to 9
0 to 4
5000 4000 3000 2000 1000 0 1000 2000 3000 4000 5000
Male Female

Ex: A Sociological Approach to Understanding the Impact of Place

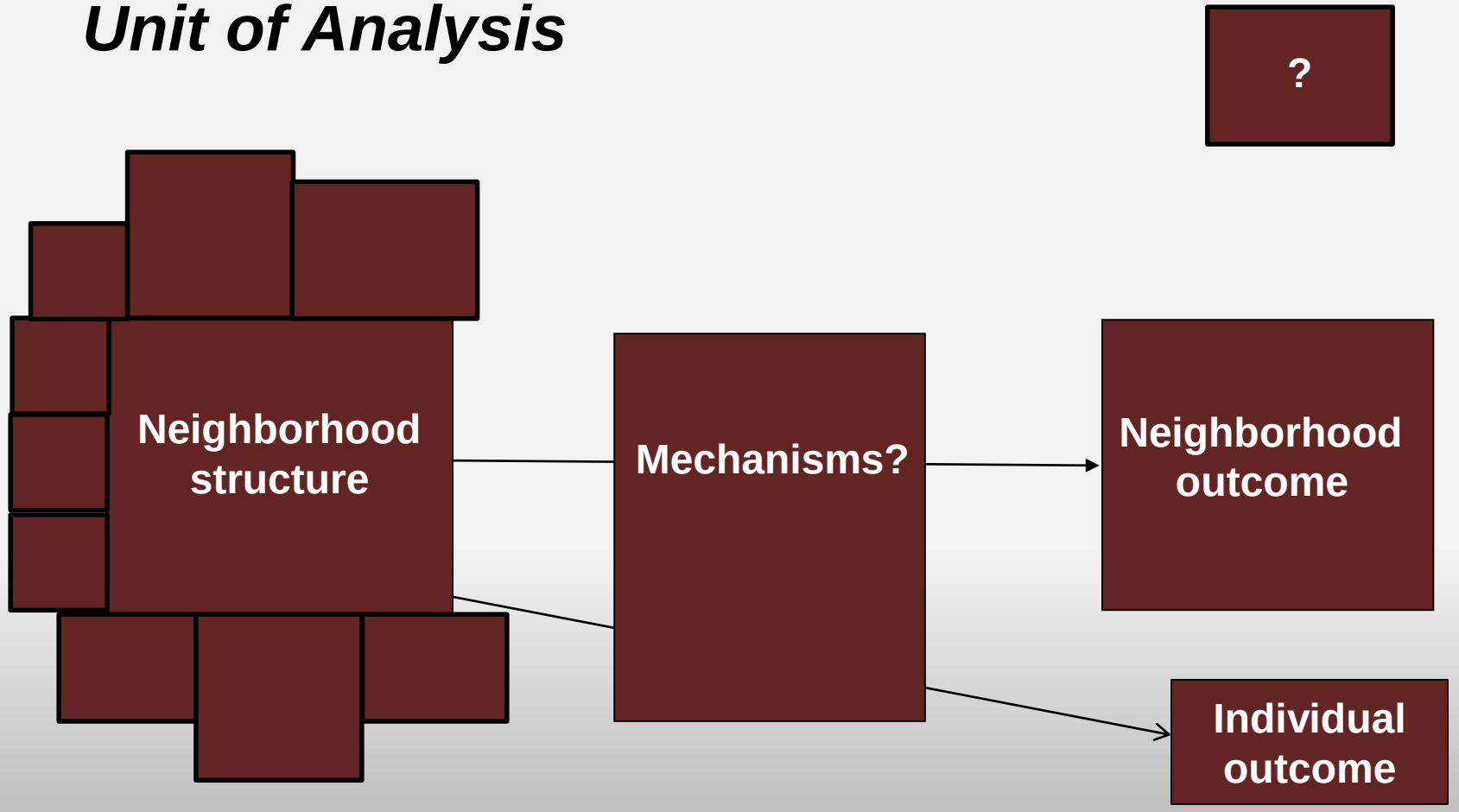
- People in and across place, in real time
- Limitations in characterization of space (breadth and depth)
  - Circumference of turf
  - Micro-environment
- *Can new methods provide insight into what place is, how it is perceived, how it matters for health and, potentially, how it might be modified for an aging population?*
- *Do lives constrict as we age?*

Neighborhood Research: *Theory*



Theory: What processes link e.g., poverty to outcomes?
Kasarda (social networks); Sampson (collective efficacy); Skogan (disorder); Wilson (institutions); Anderson (culture); Entwisle (population processes)

Neighborhood Research:
Unit of Analysis



Neighborhood unit: What boundary is most appropriate? Assumption of independence (residents may be exposed to other nearby units)

The Structure of Sociospatial Exposure

Activity space:

The set of places individuals come into contact with as a result of their routine activities

Kwan, 2013

Activity Space, Social Interaction and Health Trajectories in Later Life

NIA R01AG050605 (Cagney, PI)
Project Period: 09/01/2016 – 05/30/2021

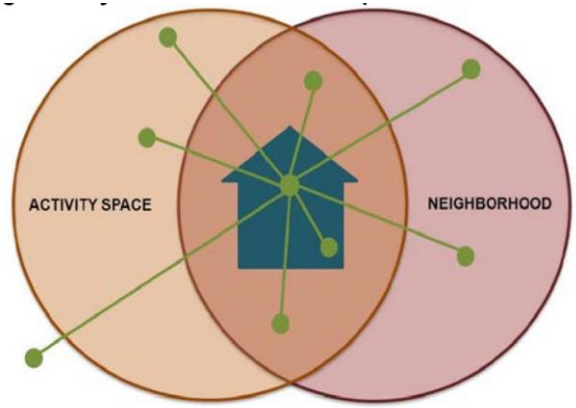
Research Team*

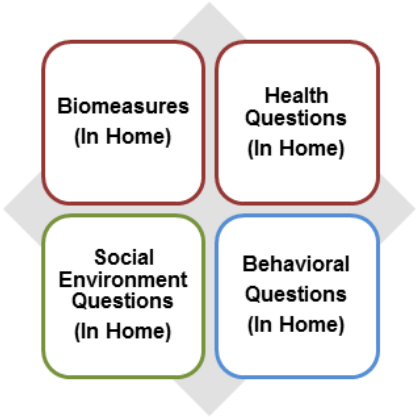
Kevin Brown (NORC)
Chris Browning (OSU)
Kate Cagney (Chicago)
Robert Gibbons (Chicago)
Louise Hawkley (NORC)
Kelly Pudelek (NORC)
Lekha Venkataraman (NORC)
Linda Waite (Chicago)
Erin York Cornwell (Cornell)

Advisory Board

Charlie Catlett (Chicago)
Ken Langa (Michigan)
David Meltzer (Chicago)
Colm O'Muircheartaigh (Chicago)
Rob Sampson (Harvard)
Teresa Seeman (UCLA)

*And Katie Morris!





Wave 1: Baseline (All In-Home)

Wave 2: Follow-Up (All In-Home)

Wave 3: Follow-Up (All In-Home)

ECOLOGICAL MOMENTARY ASSESSMENT (EMA 1-5)
7-day Real-Time Data Capture of Variation (△)

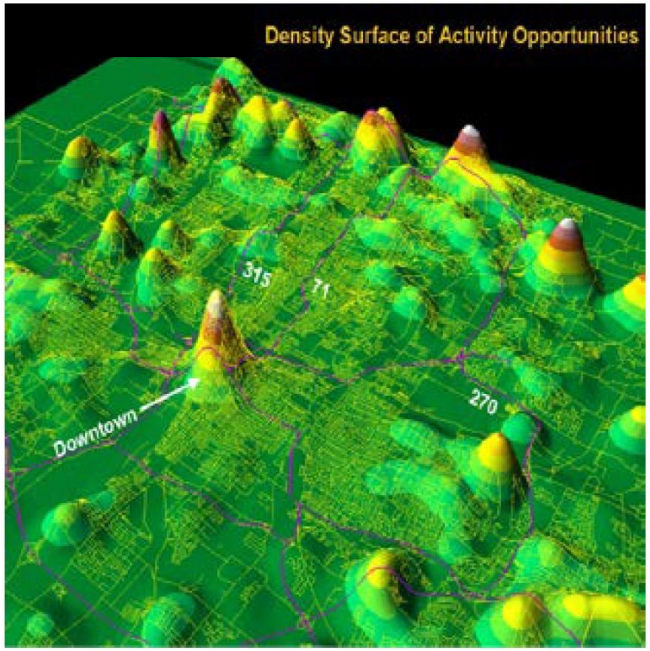
e.g., △ Pain

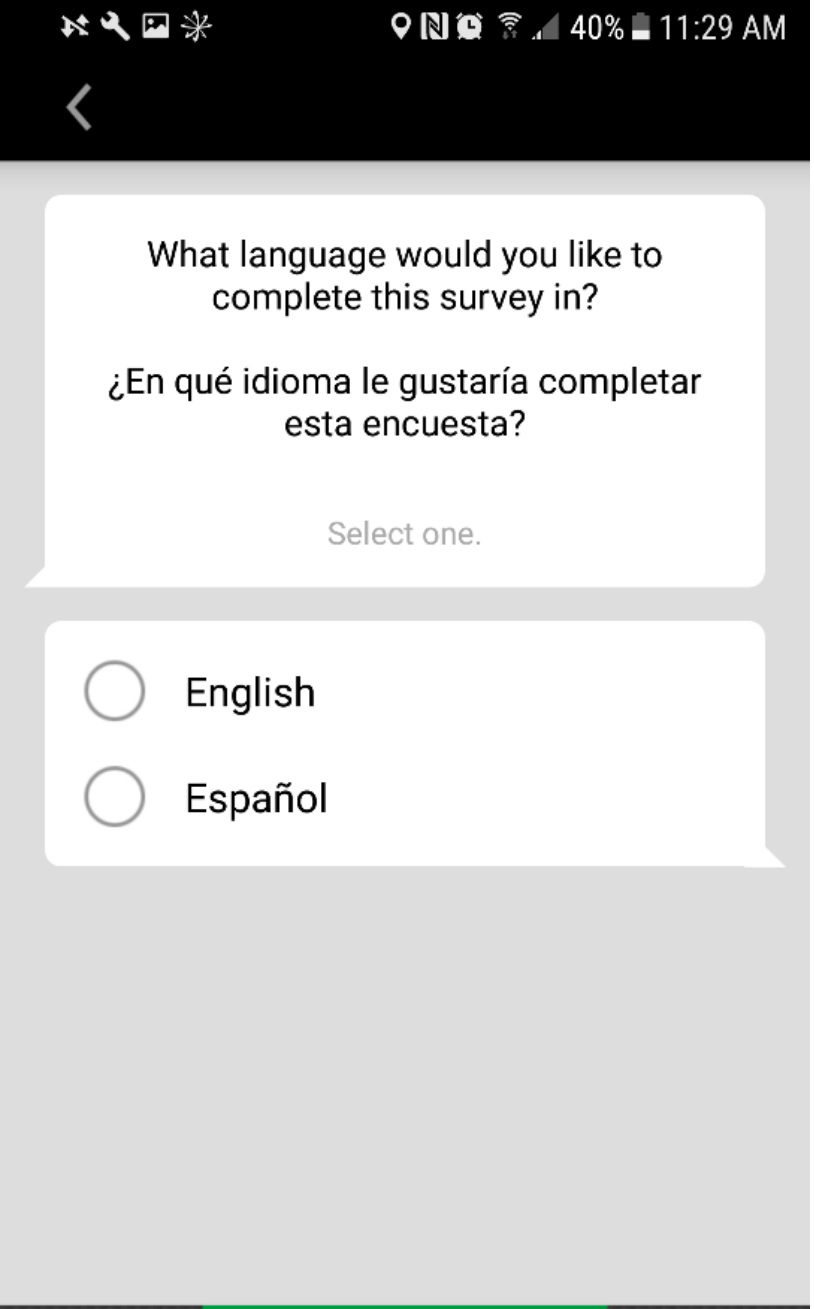
e.g., △ Positive Affect

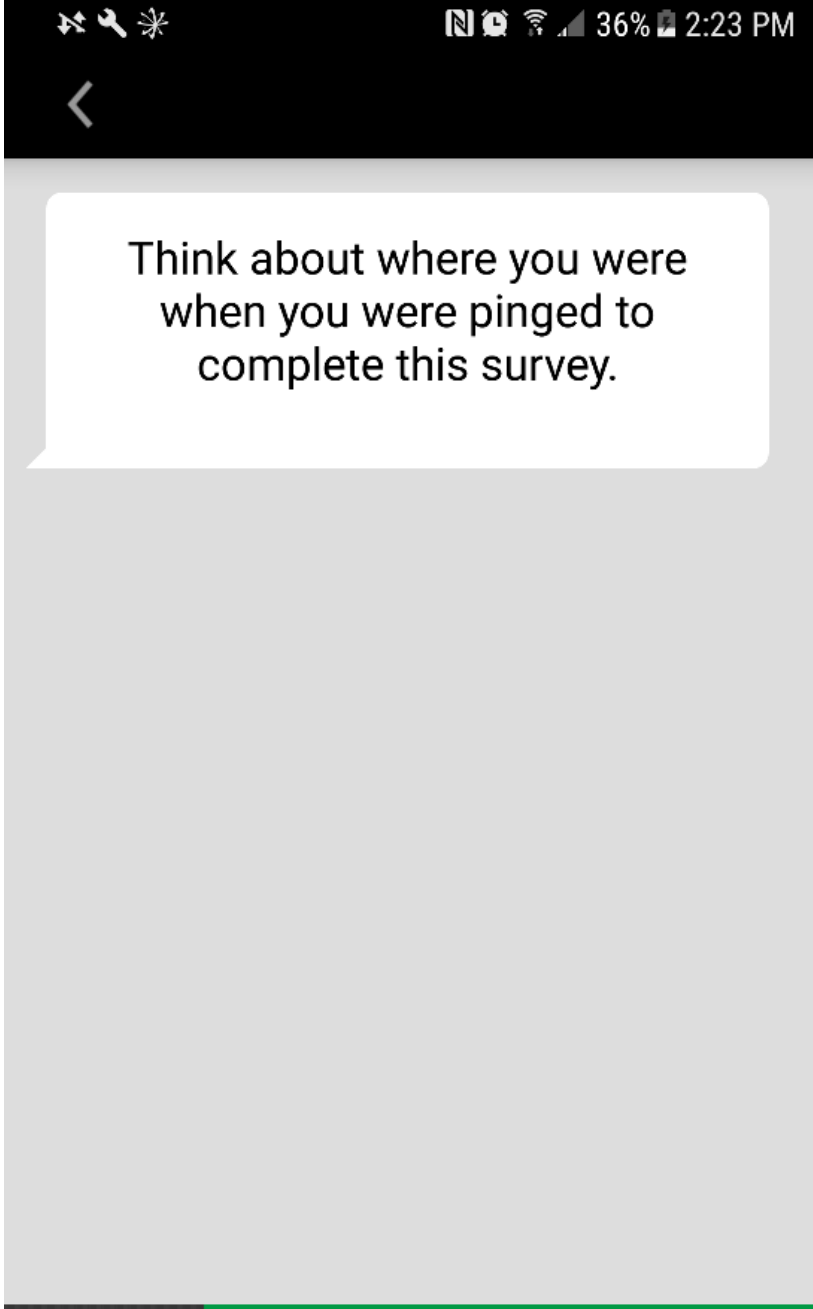
e.g., △ Social Engagement

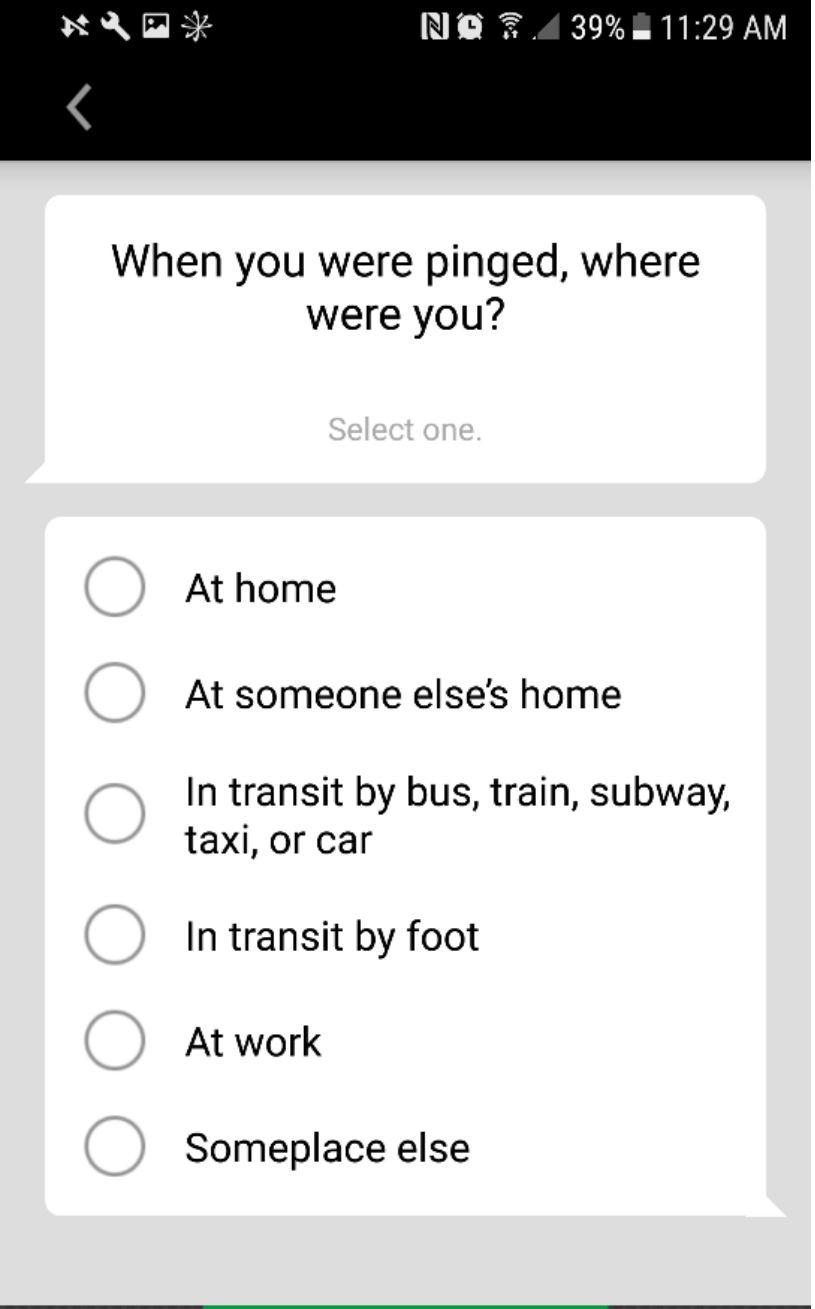
e.g., Activity Space (Geographic Location)

In-Person Questionnaire
Neighborhood Context Neighborhood social ties and interaction Perceptions of neighborhood physical/social environment Norms and collective efficacy Transportation access
Household Context Household roster Perceptions of household physical and social environment Household order/disorder
Social Context Social network roster Social support Social involvement and activities
Physical Health Self-rated health and Morbidity Functional health and disablement (including mobility and assistive devices) Health-related behaviors Health care utilization
Well-being: Depression (CES-D), Loneliness. Anxiety
Transit: Driving ability and transportation practices
Sociodemographic Characteristics: Age, Gender, Race/Ethnicity, Foreign-born status, Education, Income

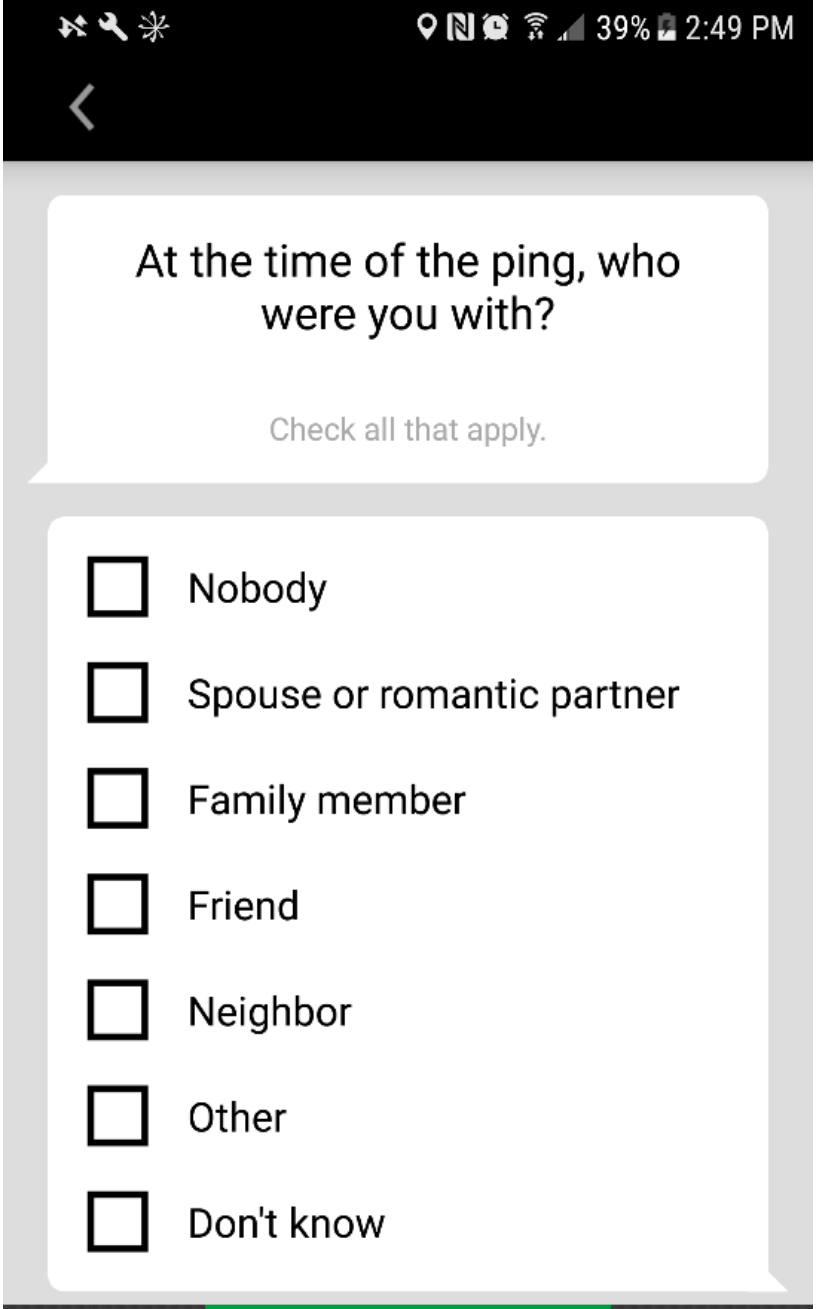


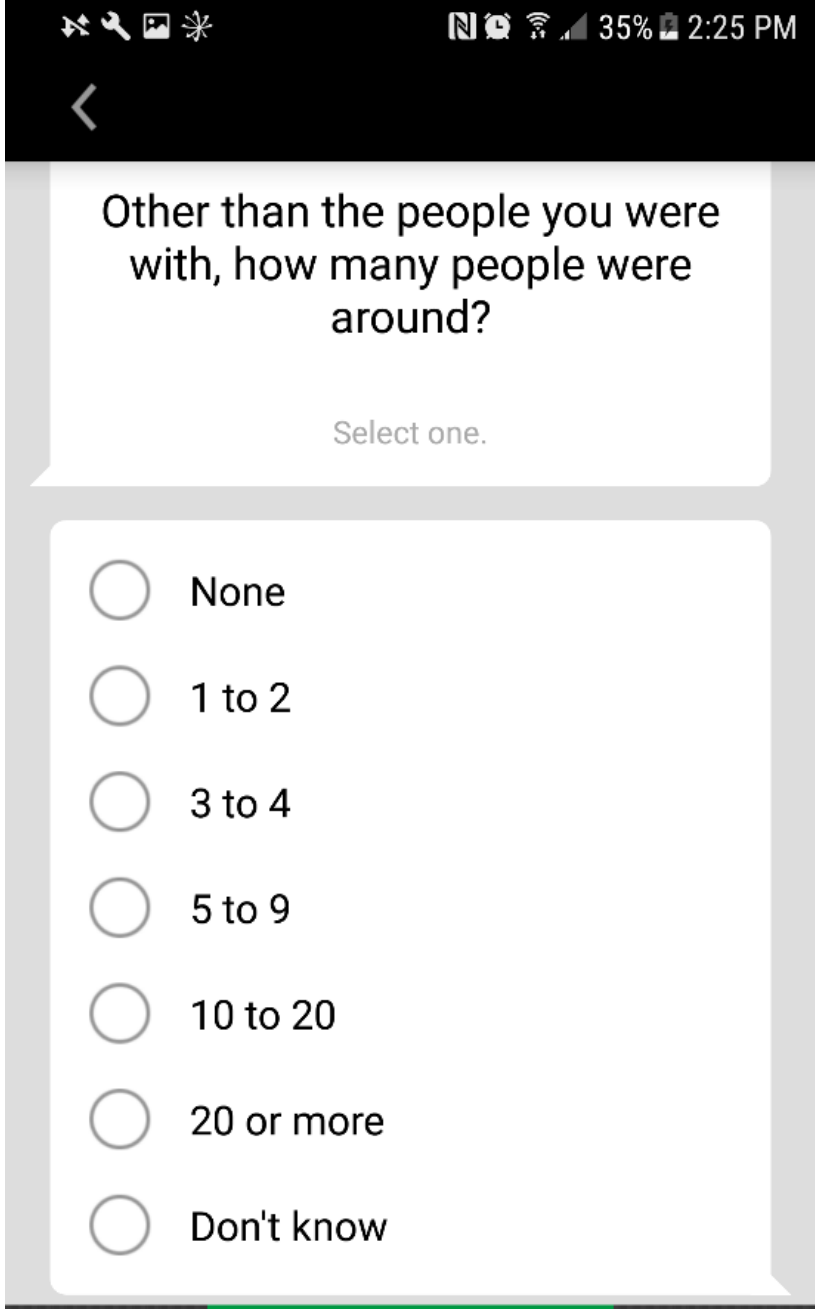






KATHLEEN CAGNEY, "ACHIEVING AND SUSTAINING BEHAVIOR CHANGE TO BENEFIT OLDER ADULTS" DEC 6-7, 2018





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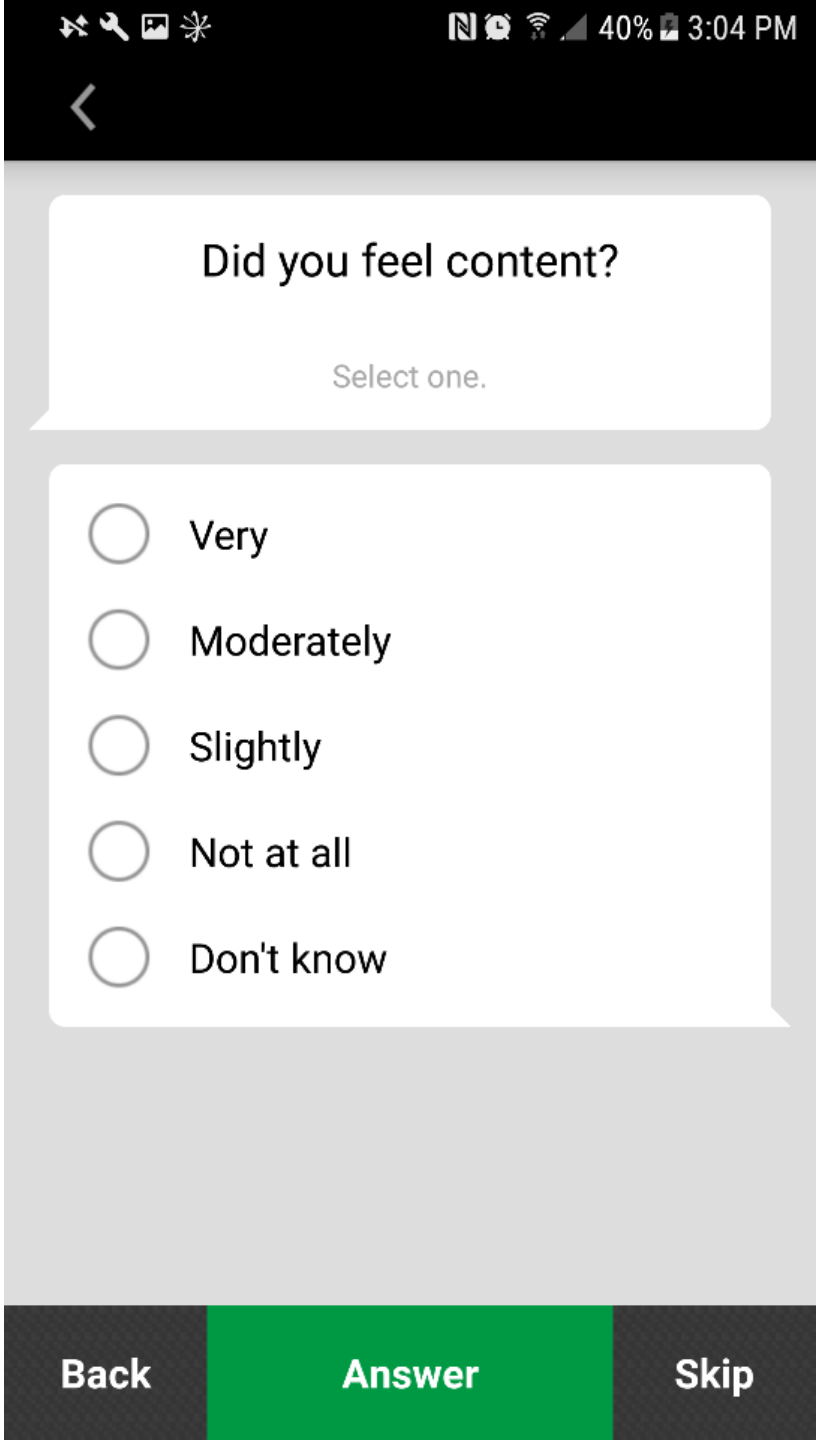

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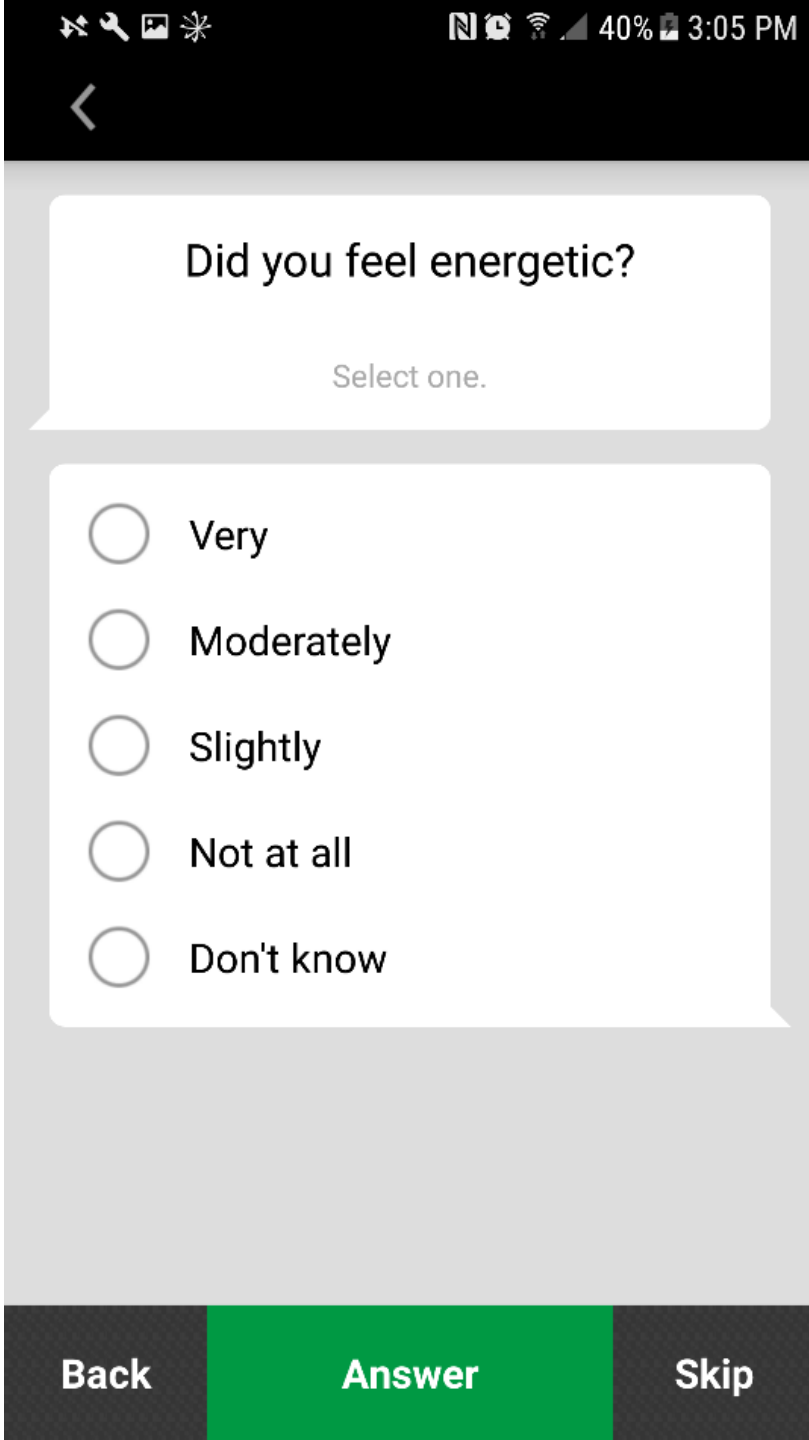
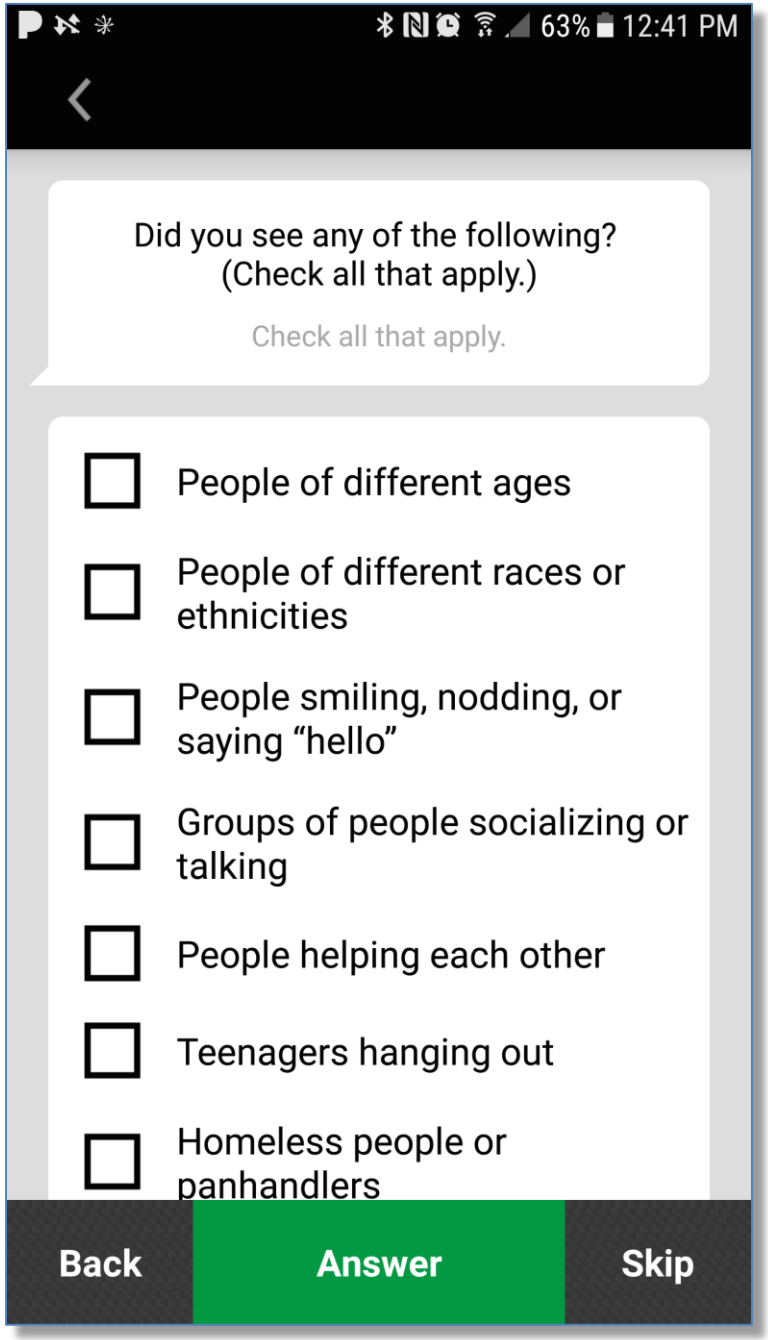


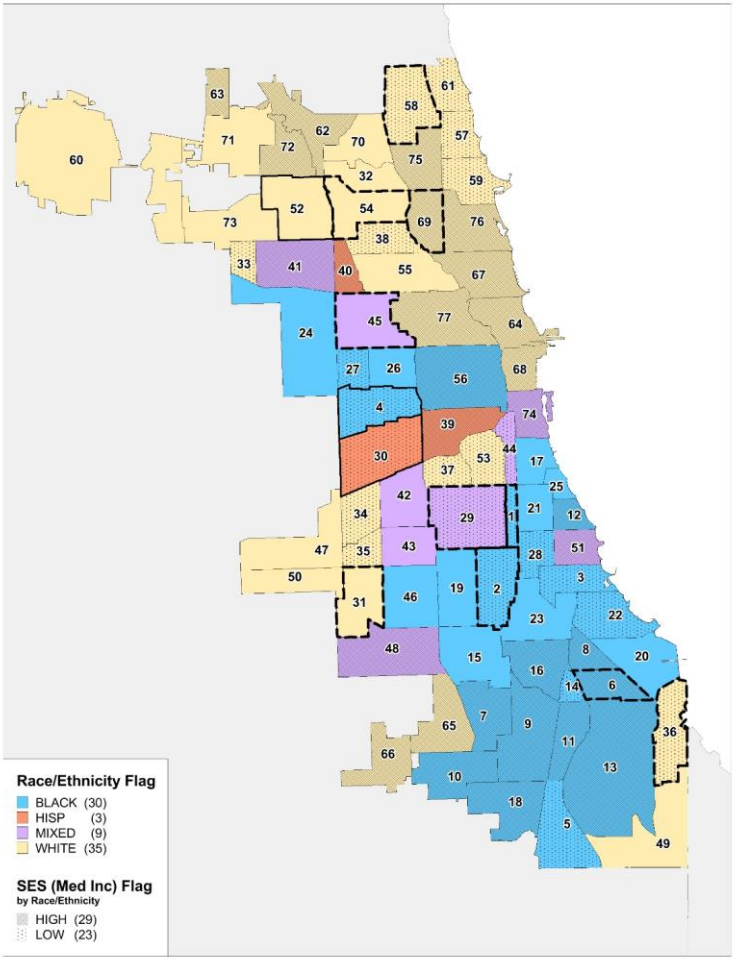
EMA ITEMS

- Where are you? With whom? Doing what?
- Symptoms of stress, mood, perceived safety, health
- Social and physical characteristics of current location
  - Disorder
  - Street-level integration by age and race/ethnicity
  - Perceived collective efficacy, e.g.,:
    "This place feels close-knit"
    "If I needed help in this place, someone would come to my aid"
  - Positive and negative forms of local interaction



The application of collective efficacy theory to places one passes through, observations of prosocial activity

Chicago Neighborhoods Selected

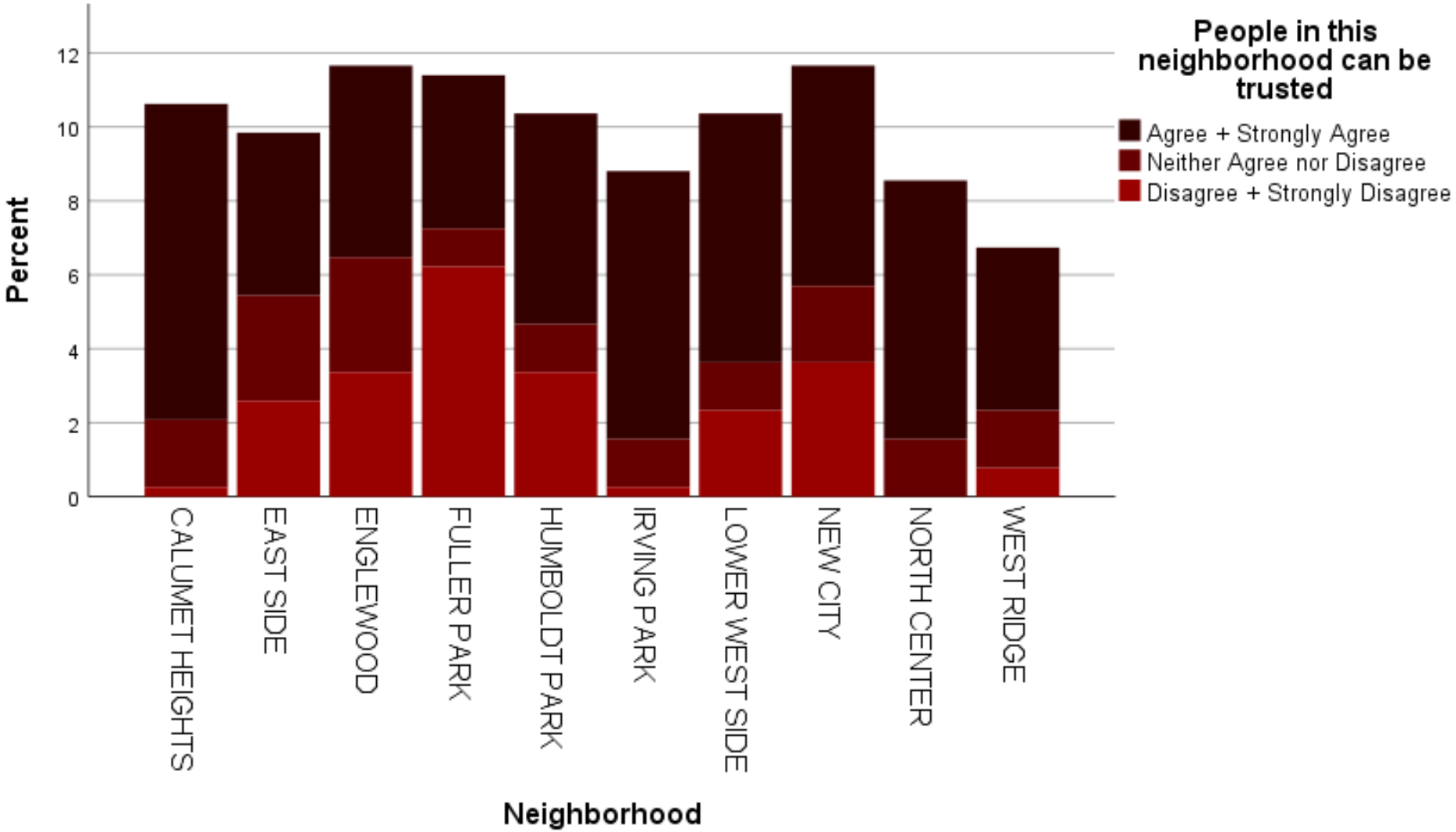


Neighborhood	Overall
CALUMET HEIGHTS	50
EAST SIDE	42
ENGLEWOOD	53
FULLER PARK	50
HUMBOLDT PARK	48
IRVING PARK	40
LOWER WEST SIDE	44
NEW CITY	49
NORTH CENTER	38
WEST RIDGE	35

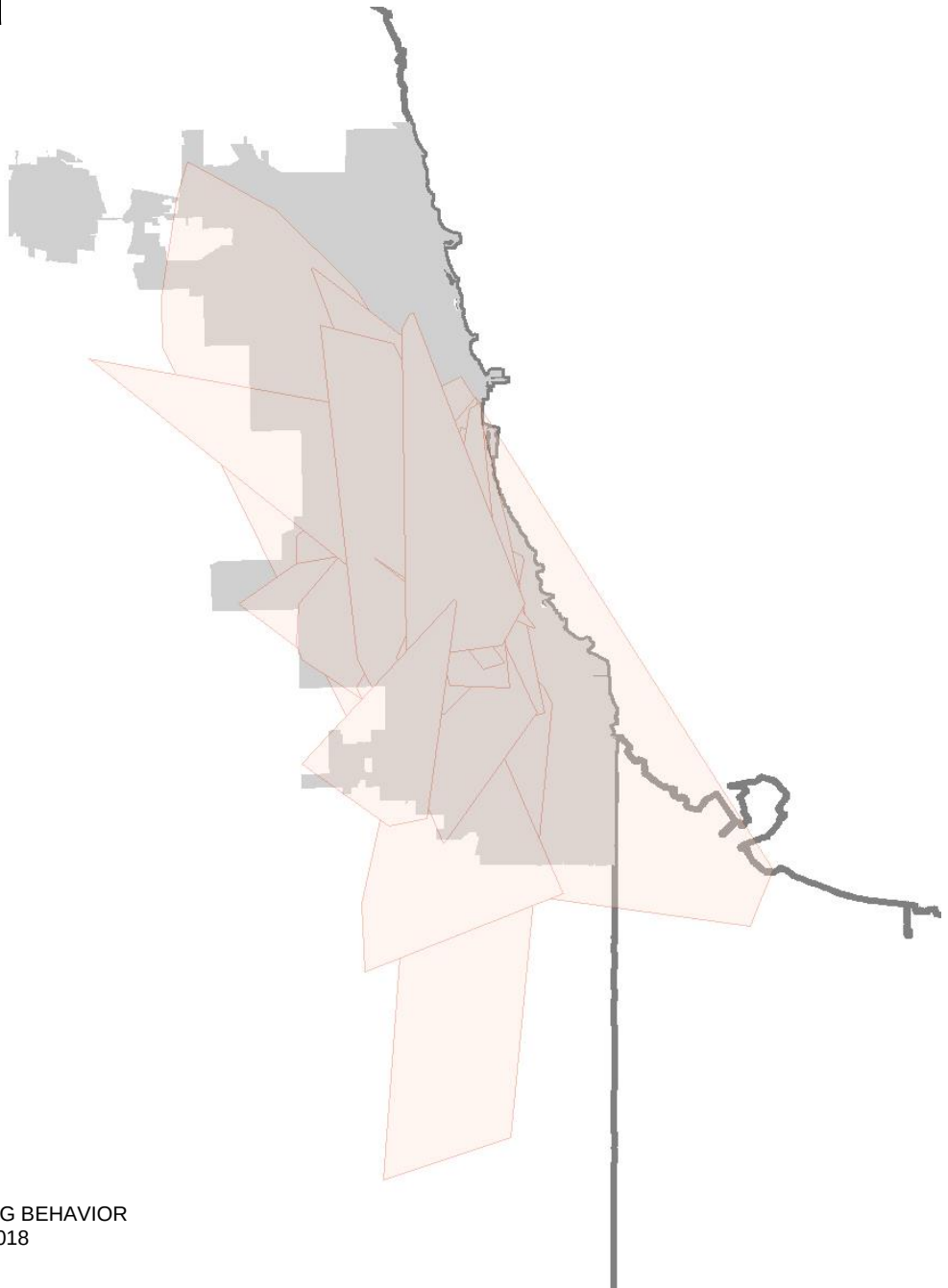
449 cases, Nov 06 2018

KEY: 1 = FULLER PARK; 2 = ENGLEWOOD; 6 = CALUMET HEIGHTS; 29 = NEW CITY; 36 = EAST SIDE; 39 = LOWER WEST SIDE; 45 = HUMBOLDT PARK; 54 = IRVING PARK; 58 = WEST RIDGE; 69 = NORTH CENTER

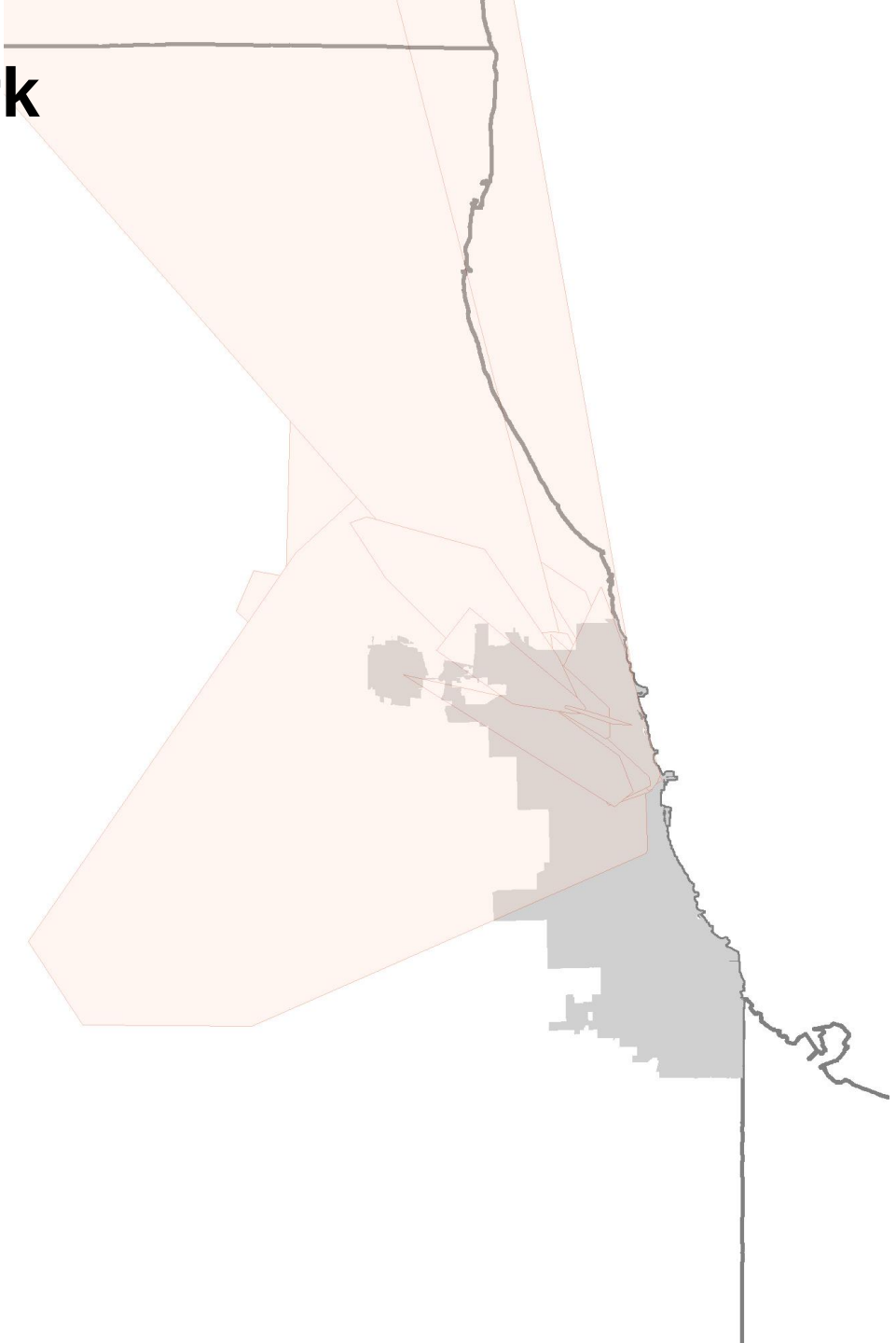
Neighborhoods & Trust



Englewood

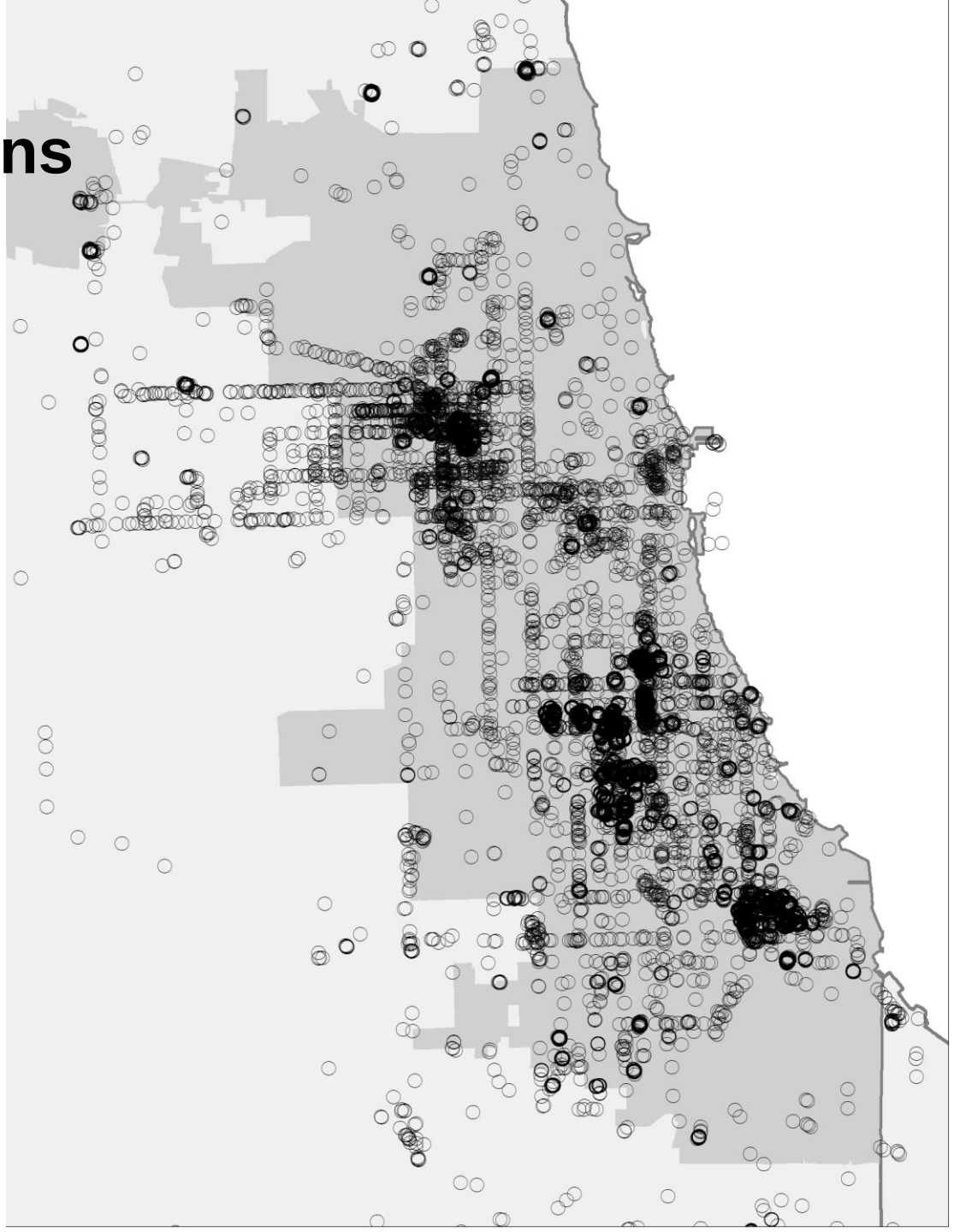


Irving Park



KATHLEEN CAGNEY, "ACHIEVING AND SUSTAINING BEHAVIOR CHANGE TO BENEFIT OLDER ADULTS" DEC 6-7, 2018

GPS Locations: African Americans



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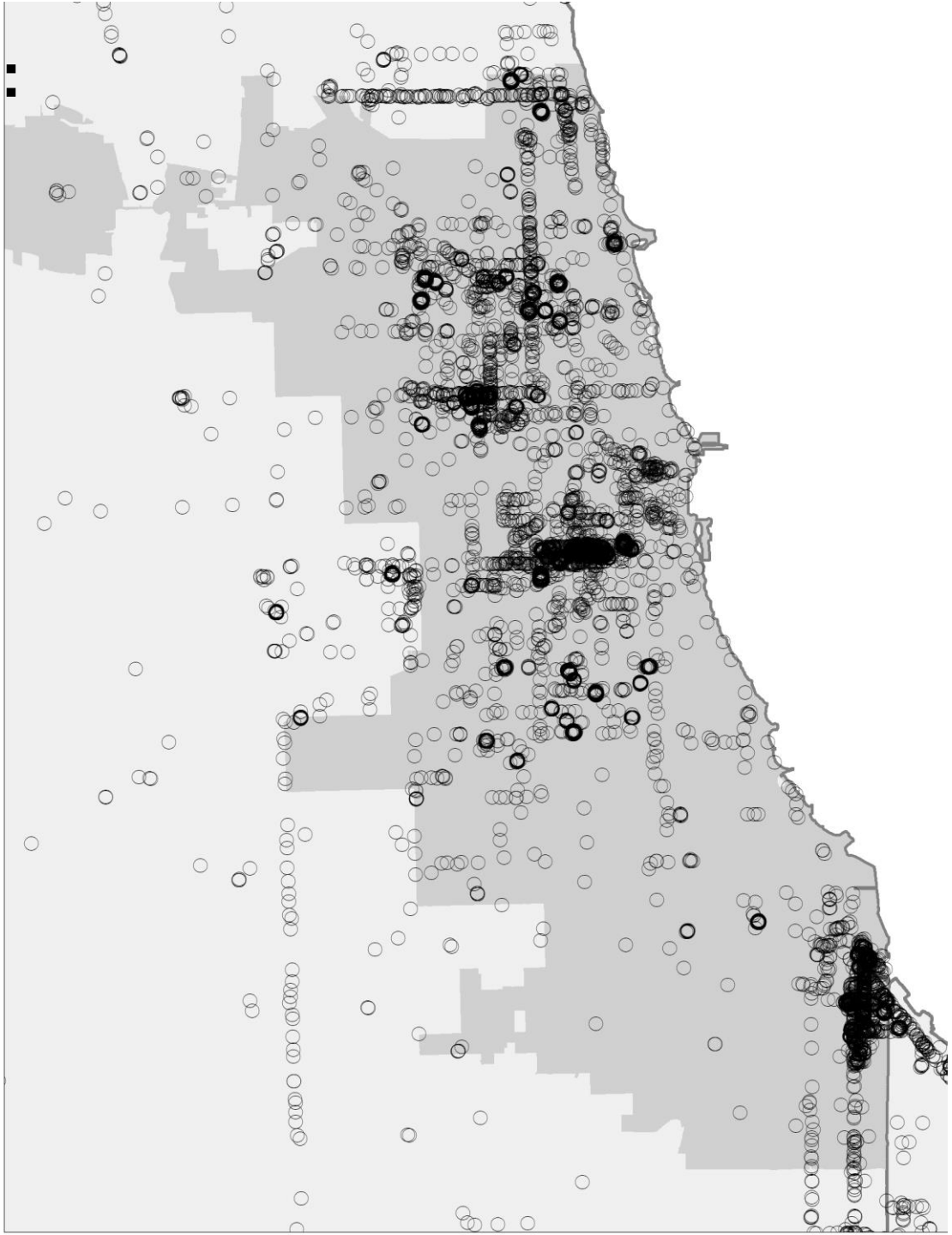
GPS Locations: Latinos



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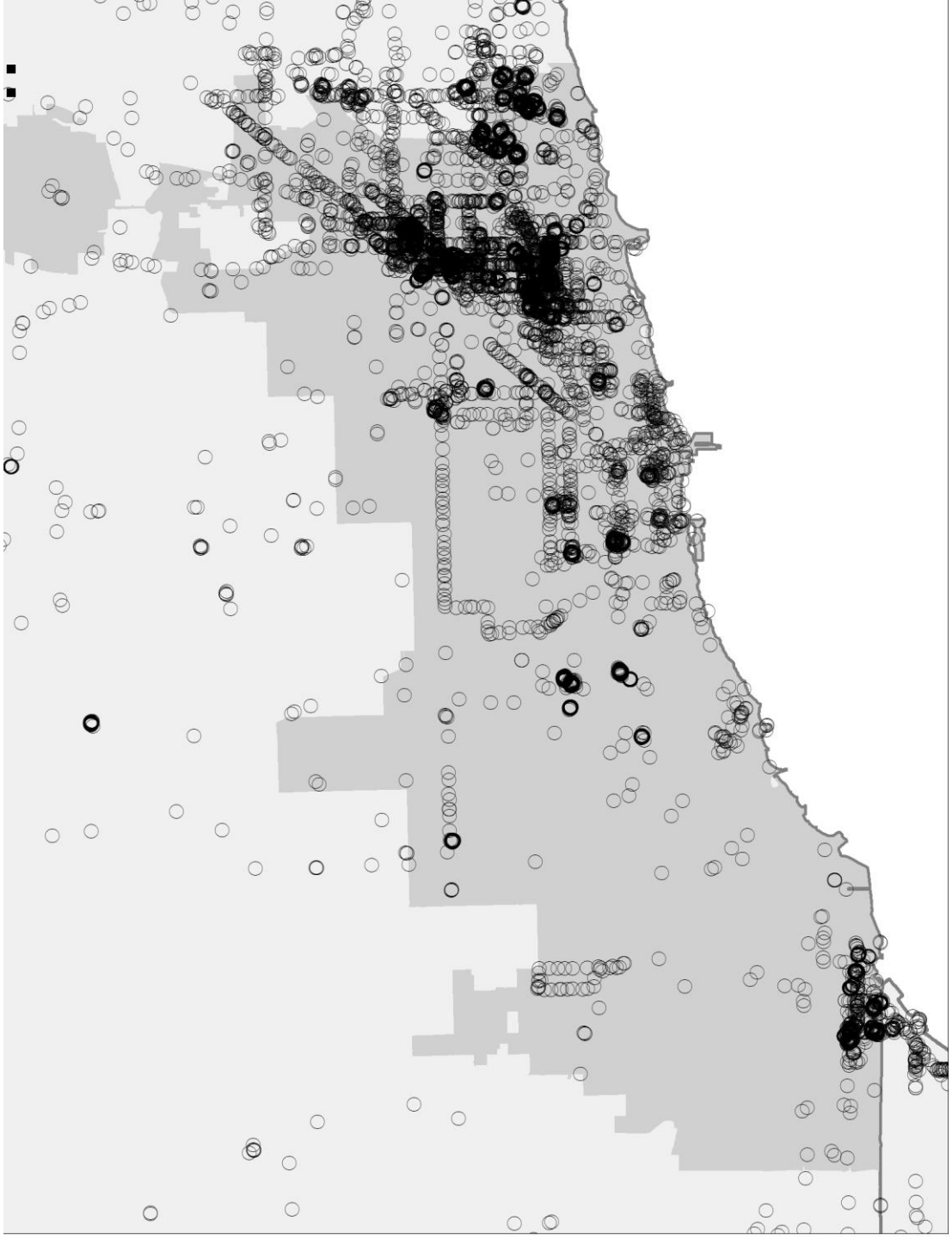
GPS Locations: Whites

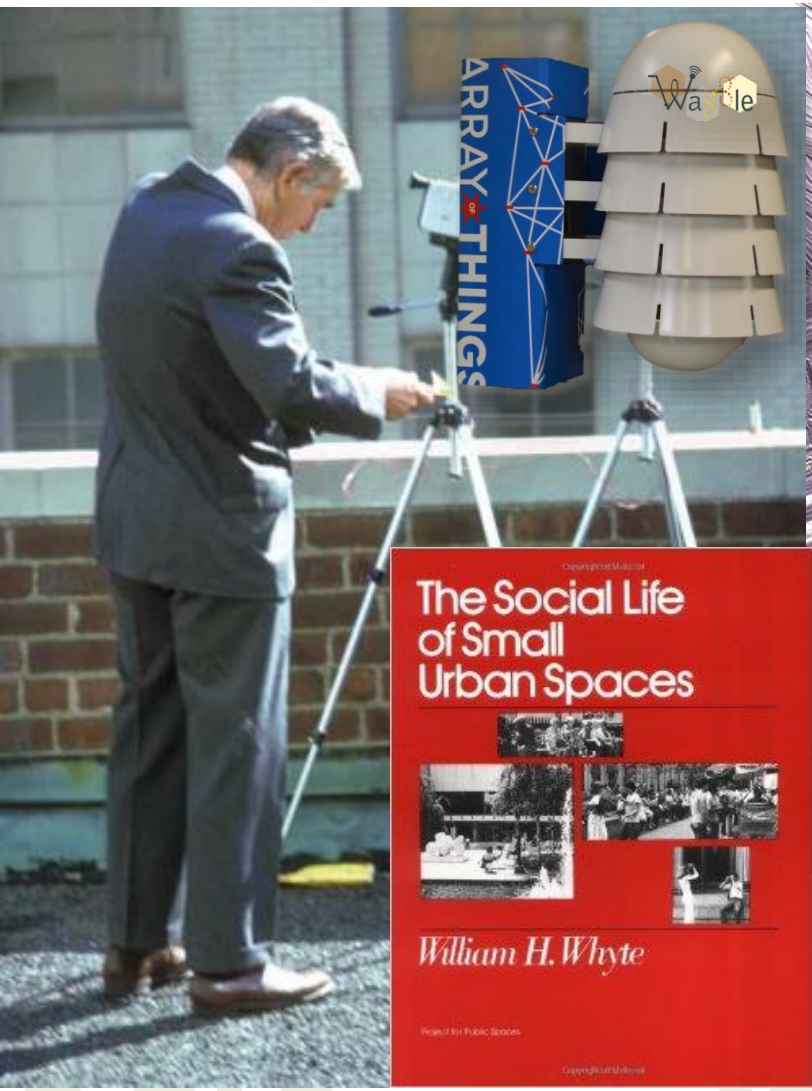


KATHLEEN CAGNEY, "ACHIEVING AND SUSTAINING BEHAVIOR CHANGE TO BENEFIT OLDER ADULTS" DEC 6-7, 2018

Understanding Cities through Data and Computation

KATHLEEN CAGNEY, "ACHIEVING AND SUSTAINING BEHAVIOR CHANGE TO BENEFIT OLDER ADULTS" DEC 6-7, 2018

UrbanCCD (Computation Institute of the University of Chicago and Argonne National Lab)


ARRAY of THINGS
Waggle
The Social Life of Small Urban Spaces
William H. Whyte

New Directions

How might all this matter for behavior change?

- Incorporate social theory – relevant space to consider guided by theory (political, social)
- Attend to nested contexts
- Explore found/big data, with implications for social surveys
- Examine virtual places– substitute?
  - Physical place matter less, differently?
- Assess how communities form, and barriers and inducements to residential sorting
  - Role of propinquity, nature and extent of intergenerational exchange

- EXTRA

Results So Far

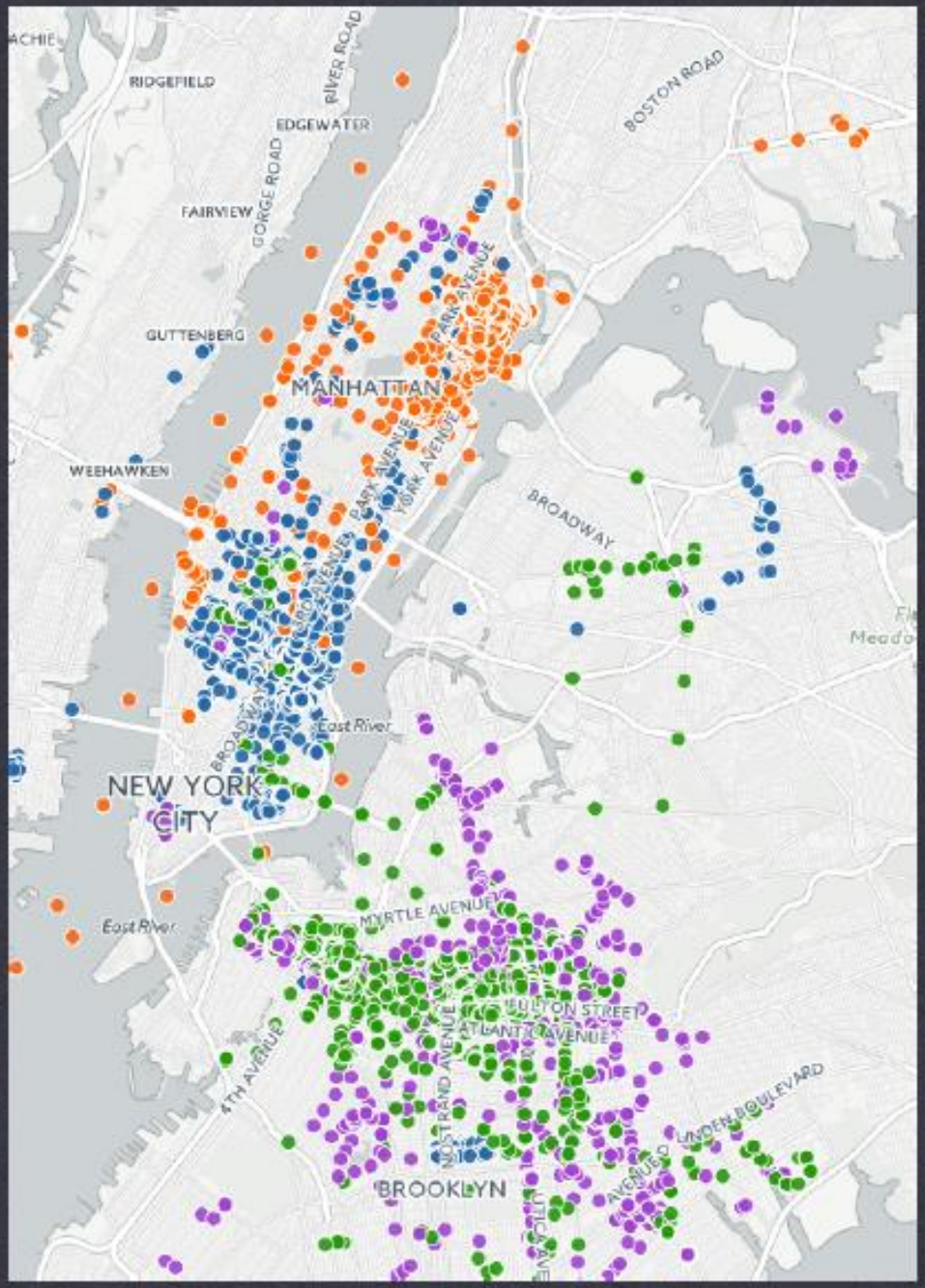
In field since April 16:

- 449 cases
  - Sex: 57.9% F
  - Age: mean 74, median 73, range 65-97
  - Race/ethnicity: African American (46.9%), White (25.3%), Latino (23%), Other (4.5%)
  - Education: $\leq 8^{th}$ (15.5%), < HS (15.3), HS grad (20.5%), AA (4.6%), BA (10.7%), Grad/prof (15.9%)
  - Income: mean $36,164, median $21,000
  - Roster:
    - SN1 (important people) mean 2.86, median 3.0
    - SN2 (people you spend your time with, not listed above) mean 1.12, median 1.0
    - SN3 (people you live with, not listed above) mean 0.39, median 0
    - All 3 SNs combined mean 4.38, median 4.0

Table 5. Poverty in Residential and Nonresidential Tracts, by Respondent Characteristics

	Mean poverty level in residential tract (*SD*)[a]	Exposure-weighted poverty level in nonresidential tracts (*SD*)[b]	Within-group difference between nonresidential and residential poverty[c]
Overall	23.31 (9.12)	19.96 (7.30)	–3.35**
Age			
55–64	*28.01 (9.31)*	*22.29 (6.11)*	*–5.72†*
65–74	22.21† (8.53)	19.71 (7.70)	–2.50
75 and over	21.52† (8.38)	18.46 (7.30)	–3.06
Gender			
Male	*21.52 (8.38)*	*19.79 (7.58)*	*–1.73*
Female	24.13 (9.42)	20.03 (7.26)	–4.10**
Racial/Ethnic Background			
Black, non-Hispanic	22.59† (6.80)	20.14** (6.98)	–2.45
Hispanic	29.37** (8.97)	23.75*** (7.74)	–5.62*
White, non-Hispanic	*17.13 (10.46)*	*14.41 (3.41)*	*–2.72*
Education			
Less than college degree	*23.65 (8.07)*	*21.87 (7.42)*	*–1.78*
College degree or more	22.67 (11.59)	15.45*** (4.75)	–7.22*
Income			
Less than $20,000	25.69* (8.47)	22.69* (6.84)	–3.00†
$20,000 and higher	*20.31 (9.05)*	*17.63 (6.90)*	*–2.68*
Car ownership			
No	*22.85 (9.93)*	*20.50 (7.70)*	*–2.35*
Yes	24.67 (6.16)	18.32 (5.84)	–6.35***
Senior Center Site			
East Harlem	*32.47 (2.07)*	*24.31 (6.37)*	*–8.16****
Gramercy Park	15.28*** (11.34)	14.69** (8.53)	–0.59
North Bedford-Stuyvesant	23.50*** (2.41)	25.02 (3.45)	1.52
South Bedford-Stuyvesant	21.60*** (8.76)	15.04*** (2.61)	–6.56**

Note: [a]Symbols denote statistically significant differences compared to the italicized group, from bivariate OLS regressions of poverty rates in residential tracts. [b]Symbols denote statistically significant differences compared to the italicized group, from bivariate OLS regressions of poverty rates in *nonresidential* tracts. [c]Symbols denote statistically significant differences in residential and nonresidential poverty levels *within the same group,* based on paired-sample t-tests with df = n-1. †$p < .10$. *$p < .05$. **$p < .01$. ***$p < .001$ (two-tailed tests).



Activity Space

Locations outside of the respondent's residential tract: 40.1%

Tracts visited: mean = 30.8

- Gramercy Park
- East Harlem
- N Bed-Stuy
- S Bed-Stuy

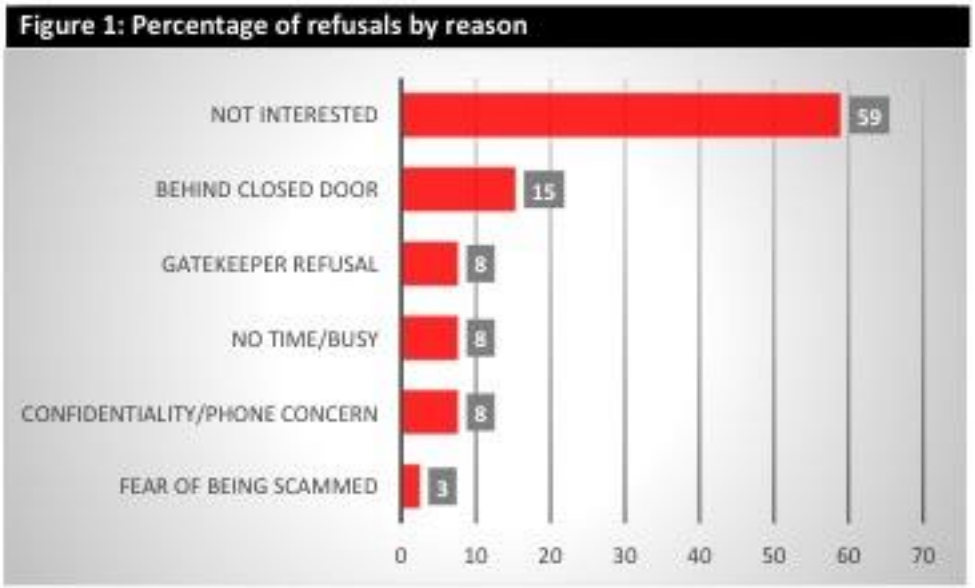
A Note on Mobility

- Residential mobility more prevalent:
  - Retired, younger, higher levels of income/wealth, poorer health, urban
- Mobility rates for all age groups have fallen over last two decades – two-earner households and long-term population shift to south and west have reduced later life incentive to move (Fernald, 2014)
  - Mobility drops after age 50; continues to decline through the 60s with a sharp uptick at approximately age 85
- Older adults who do move disproportionately do so within their county or state; 14 percent move to another state
  - In context of disadvantage, African American older adults moved to a worse neighborhood, White counterparts to a better one (Riley, Hawkley & Cagney, 2016)
- Voluntary
  - Weather
  - Children
- Involuntary
  - Eviction
  - Foreclosure

The Main Study Pilot – Chicago Health and Activity in Real-time (CHART)

- Pilot Nov 08 2017-Jan 06 2018
  - 22 respondents
  - Neighborhoods
    - North Lawndale
    - South Lawndale
    - Portage Park
- Questions to consider:
  - Reliability and validity of questions
  - Instrument length
  - Need for geofencing
  - Use of CAT-MH
  - Field challenges
  - Interface with app developer (MetricWire)

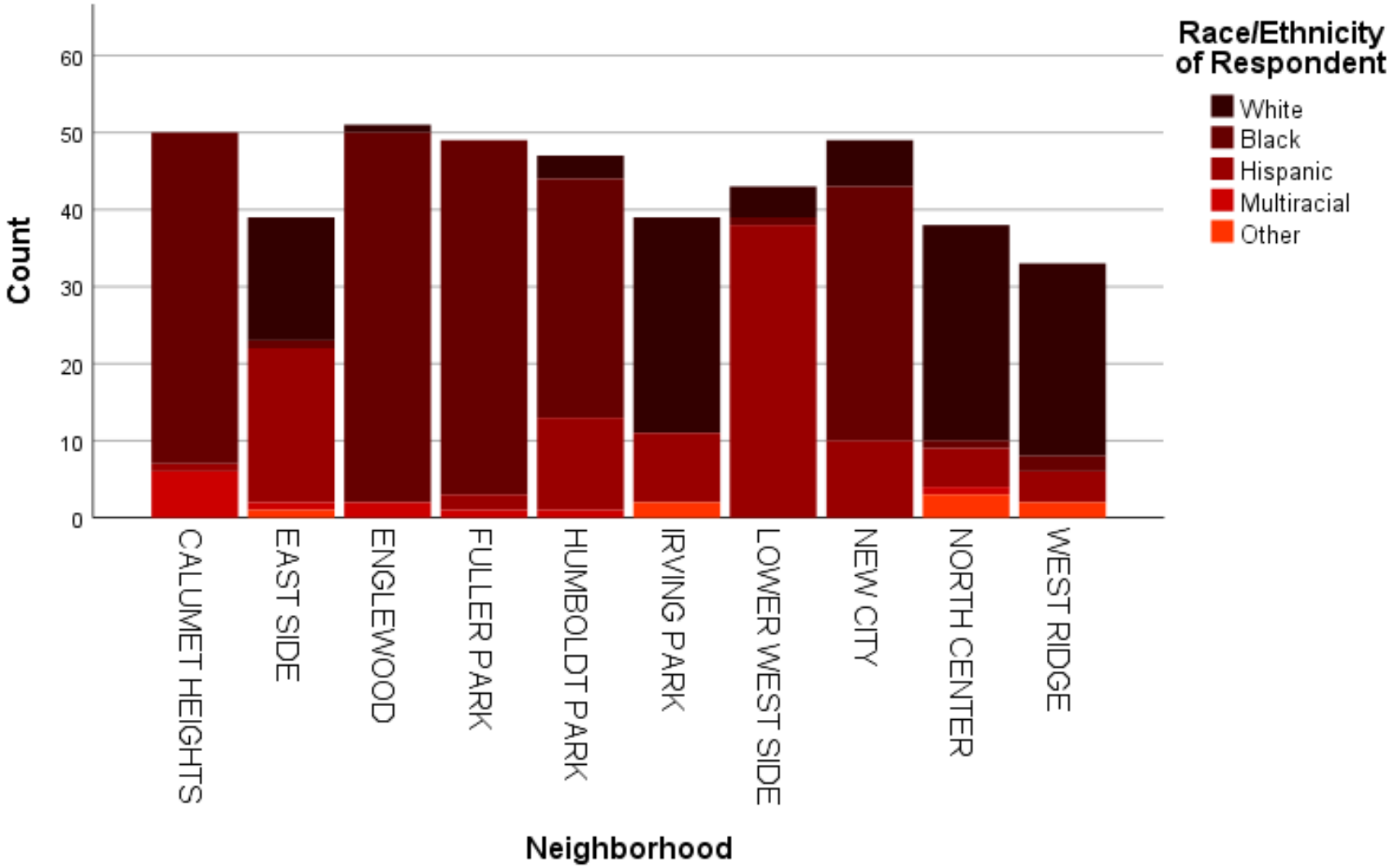
A Key Field Challenge…



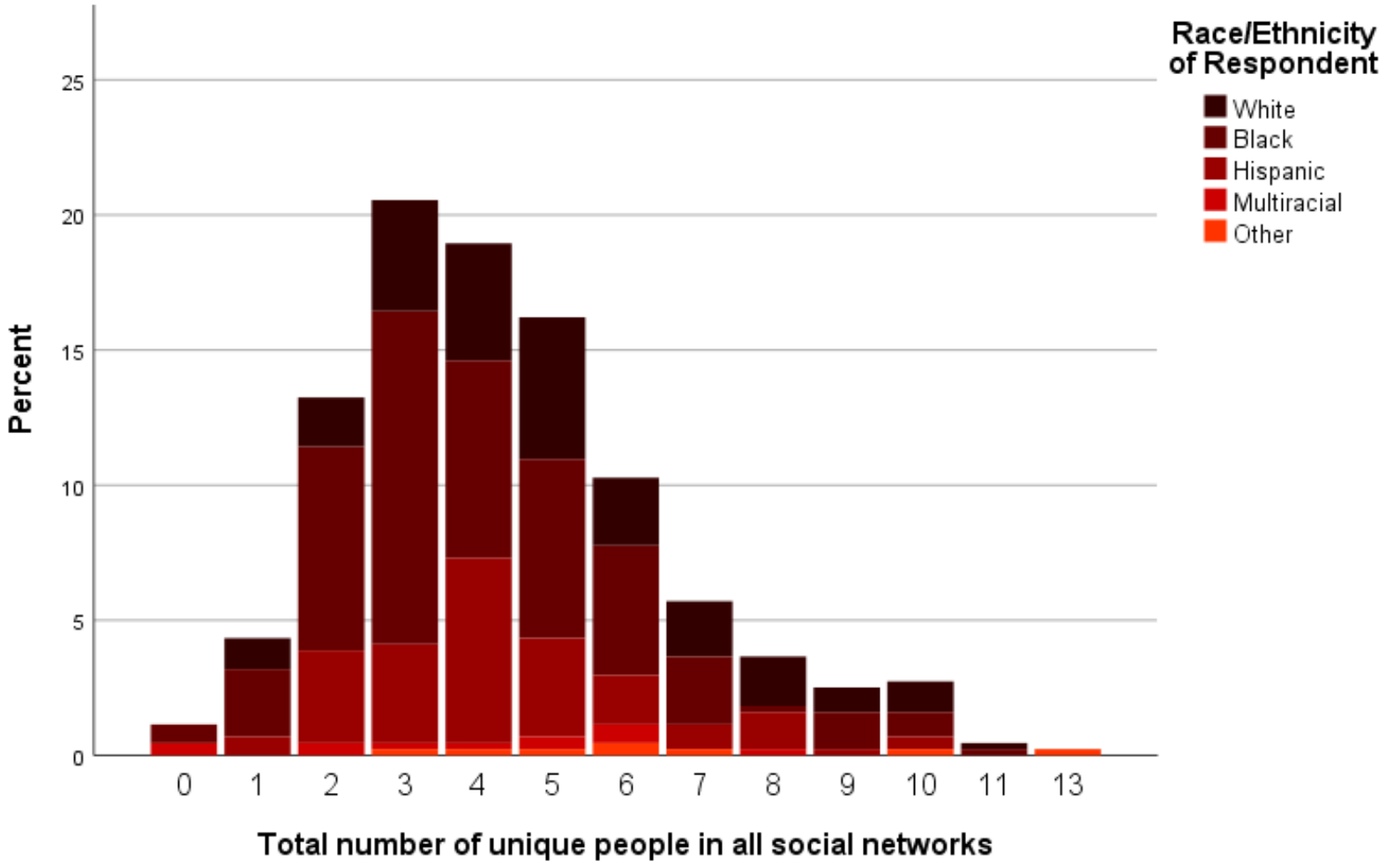
What we Learned from the Pilot

- Innovations/Decisions
  - Addition of a 5th daily EMA survey
  - Experiment on $
    - Modifying incentive structure of EMA surveys to include two options ($1 per survey vs $5 per day when 3+ surveys completed) – will use more effective of two in future waves
  - Blood spots instead of saliva (earlier)
  - In-home baseline revisions
    - Minor fixes applied to programming of name-generator items and questions about victimization modified to reflect study timelines
    - CAT-MH adaptive assessments used considerably more items than expected (22 for Anxiety and Depression combined; A+D score related to # items at $p<.001$), but total time was <5 minutes and did not generate complaints from respondents or FIs
  - EMA revisions
    - Eliminating items that showed no variability, adding more “positive” choices for neighborhood characteristics and emotional states, as well as option to be with a “pet” rather than being “alone”
    - 41% of completed surveys indicated that respondent was either in someone else’s home or in public space (so decided not to use geofencing)
- FI Training Considerations
  - Respondent interaction
    - Fear that FIs were selling something (e.g., private health insurance)
    - Talkative
    - Gatekeepers – compliance from adult children and caretakers (FI emphasize credential and academic goals)
    - How to describe GPS tracking?
  - Smartphone challenges
    - Lack of familiarity
    - Did not like being responsible for phone
    - Hard to hear ping

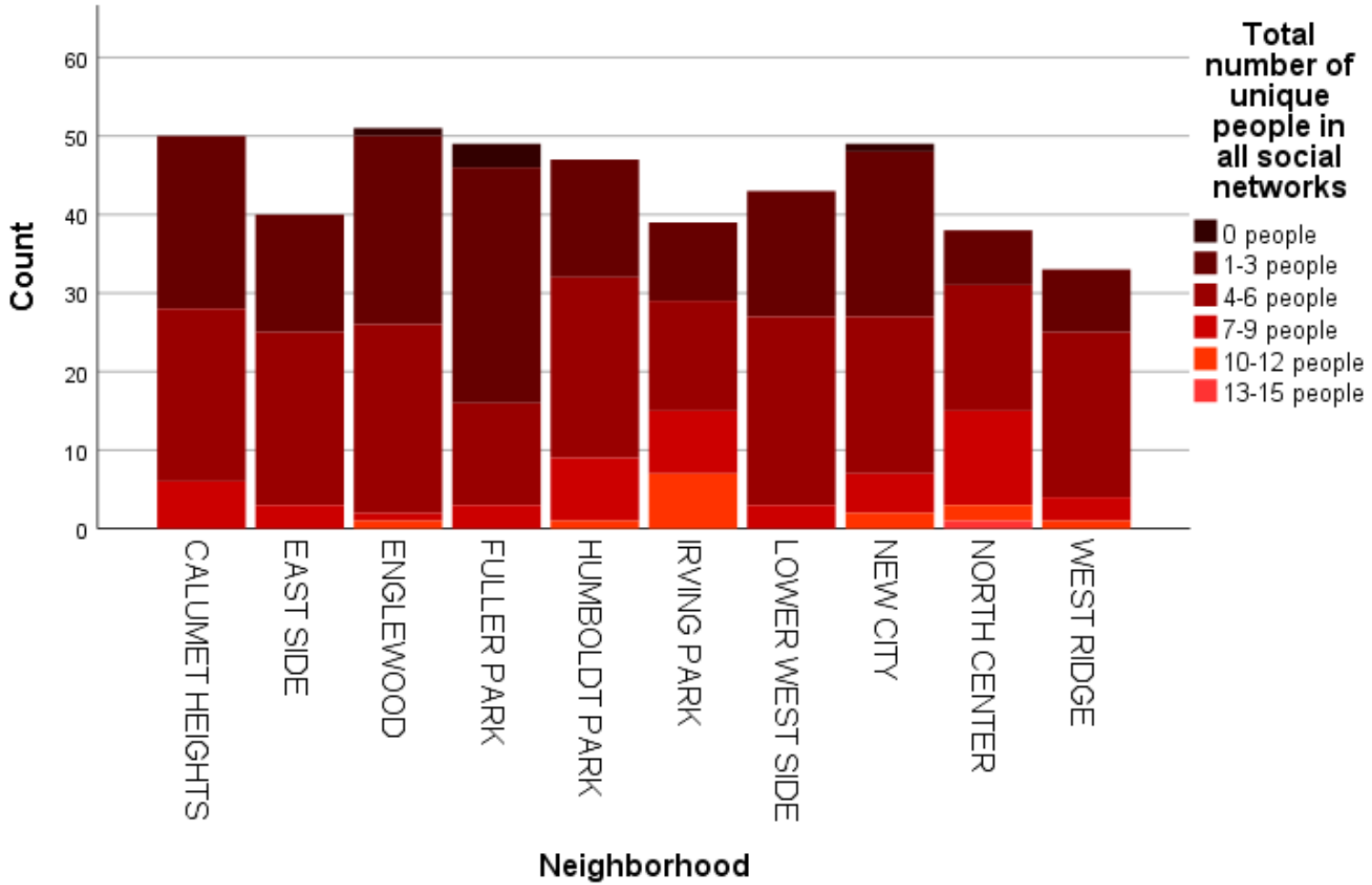
Neighborhood & Racial/Ethnic Composition



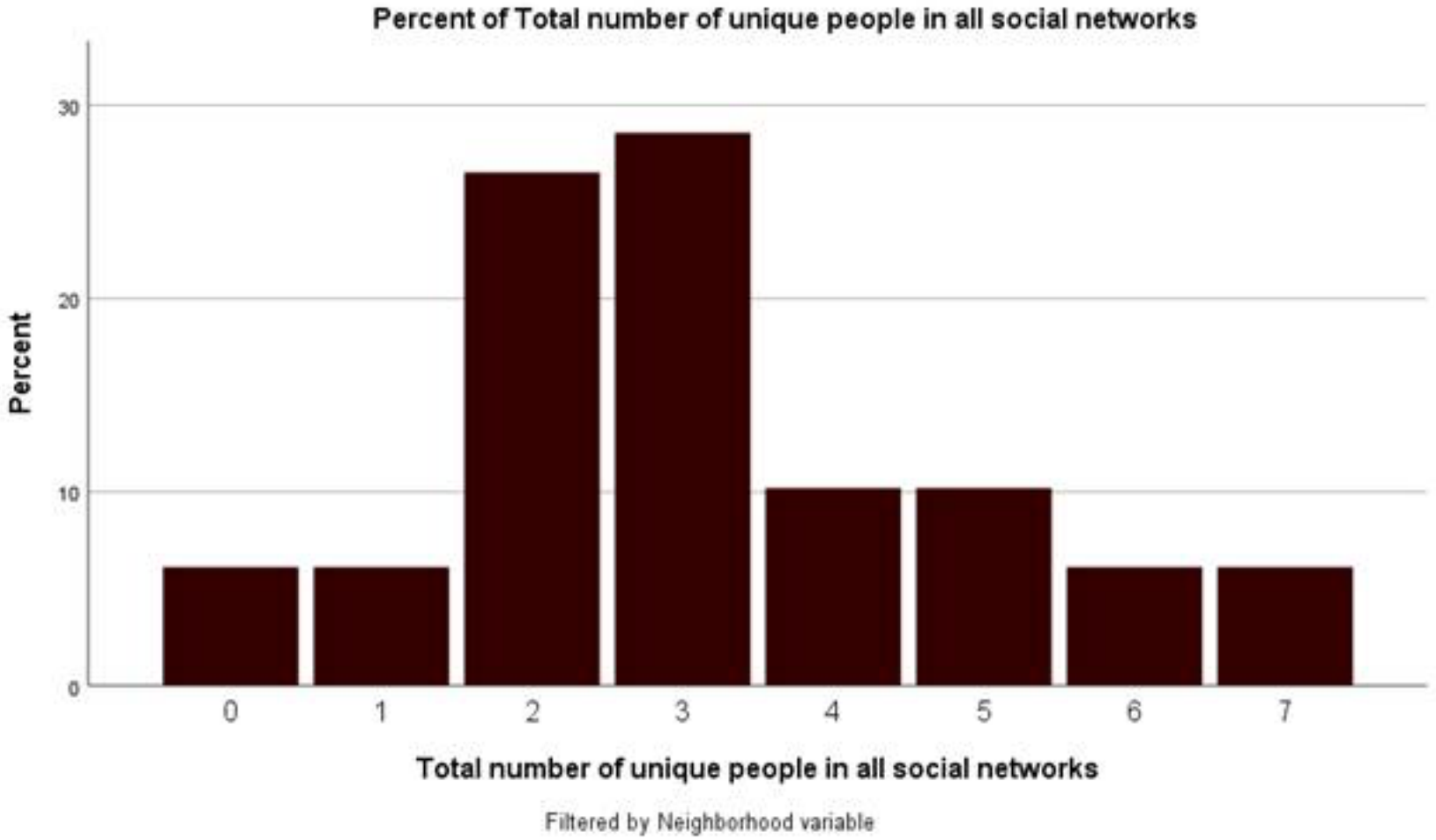
Race/Ethnicity & Networks



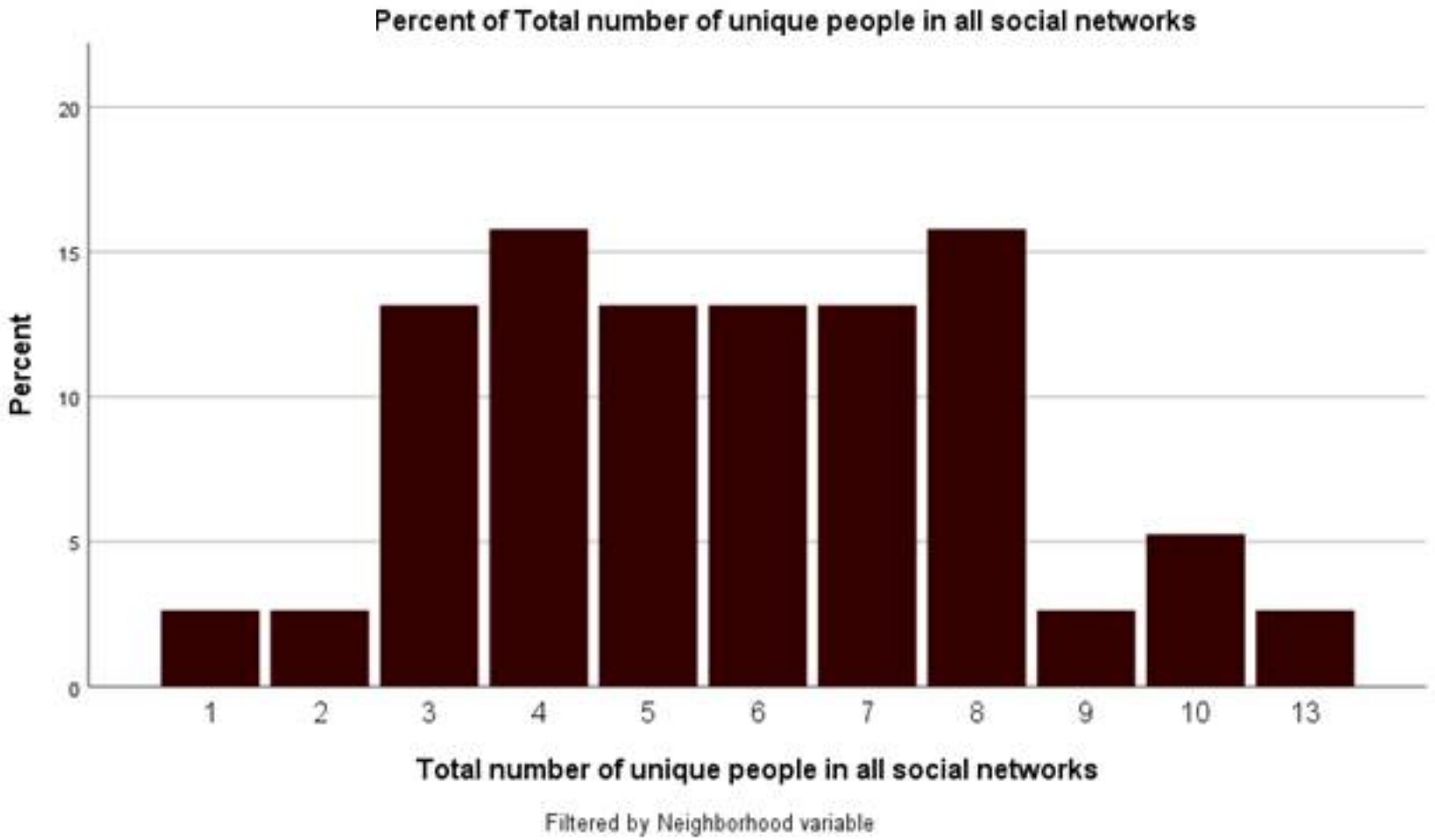
Neighborhoods & Networks



Fuller Park


Percent of Total number of unique people in all social networks
Percent
30
20
10
0
0
1
2
3
4
5
6
7
Total number of unique people in all social networks
Filtered by Neighborhood variable

North Center



Why is Place Important?

- Resource allocation
  - Health services (Ng et al., 2015)
  - Social safety net (Tach & Edin, 2017)
- Resource availability
  - Formal (Altschuler et al., 2004)
  - Informal (Moore et al., 2011; Berman, 2008)
- Opportunity structure
    - Employment (Turney et al., 2006)
    - Social engagement (Pettit, 2004)
- Sense of belonging/connectedness (Sampson, 2012)
- Exposure space (Cagney et al., 2013)

Relevant Disciplines to Inform Study of Place

- Psychology – place attachment (Lawton, Berman)
- Economics – evolution of the city (Glaeser)
- Anthropology – experience of aging in place (Penny)
- Architecture – social architecture (Boyd)
- Urban planning – age-accommodating urban places (Burkart et al.)
- Geography – “spatial” gerontology (Andrews)
- Epidemiology – social factors and population health (Berkman, Diez Roux, Galea)
- Sociology – place and social cohesion (Longino, Sampson)

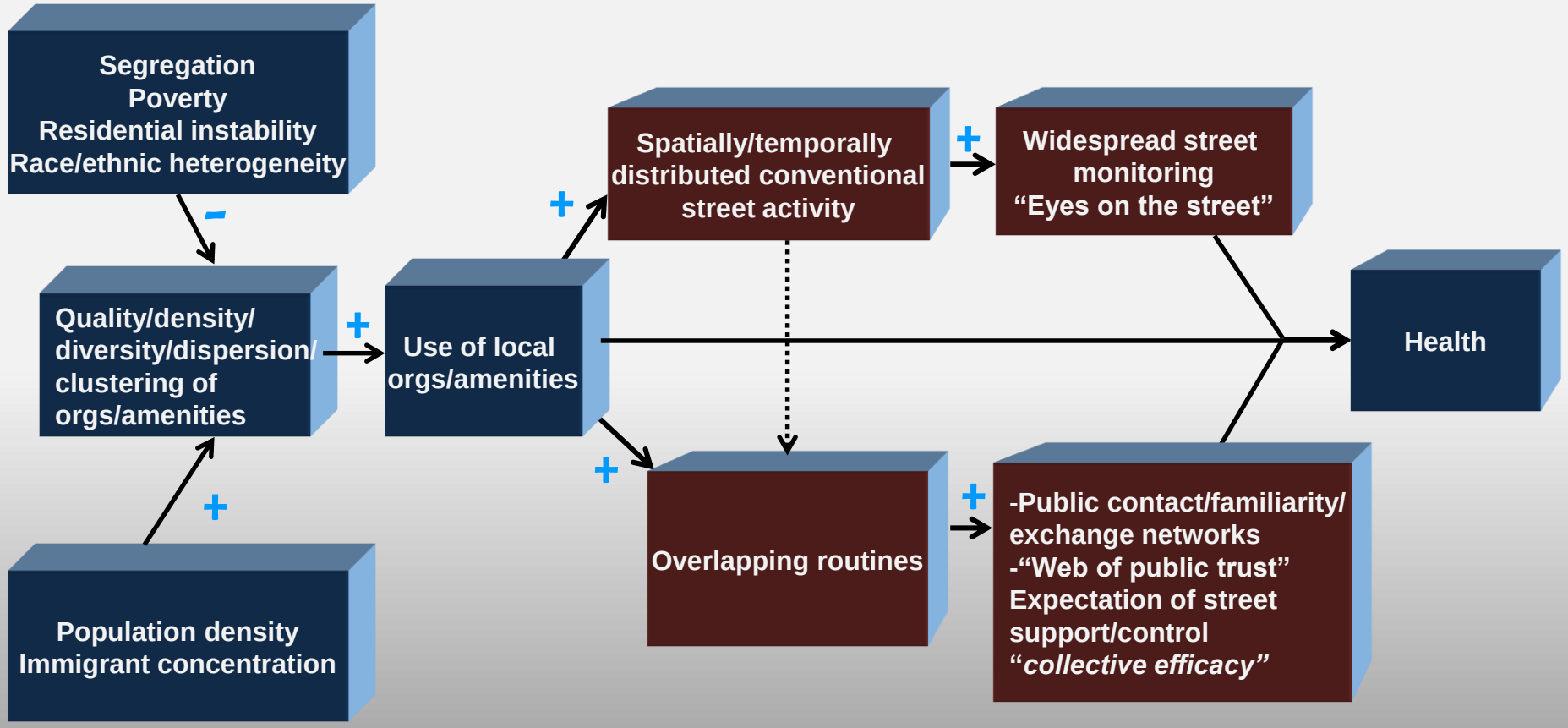
Research on “Neighborhoods Effects” and Health

- Theoretical approaches largely neglect actual spatial exposure patterns (beyond residential address)
- Integrate
  - Social disorganization theory
  - Social ecological approach (Jane Jacobs)
- Incorporate conceptualization of individual level exposures (“activity space”)
- Emphasize age and aging
  - Circumference of turf may shrink but little know about these patterns
  - Neighborhoods—and networks within—may be more consequential

Beyond the Residential Neighborhood

- Current approaches may not effectively assess exposure, access to resources
- Residential neighborhood a small part of daily experience?
  - Arbitrary census-based units may obscure more complicated geographic exposures
  - Where/how people spend time may prove more valuable for health, well-being, access to care

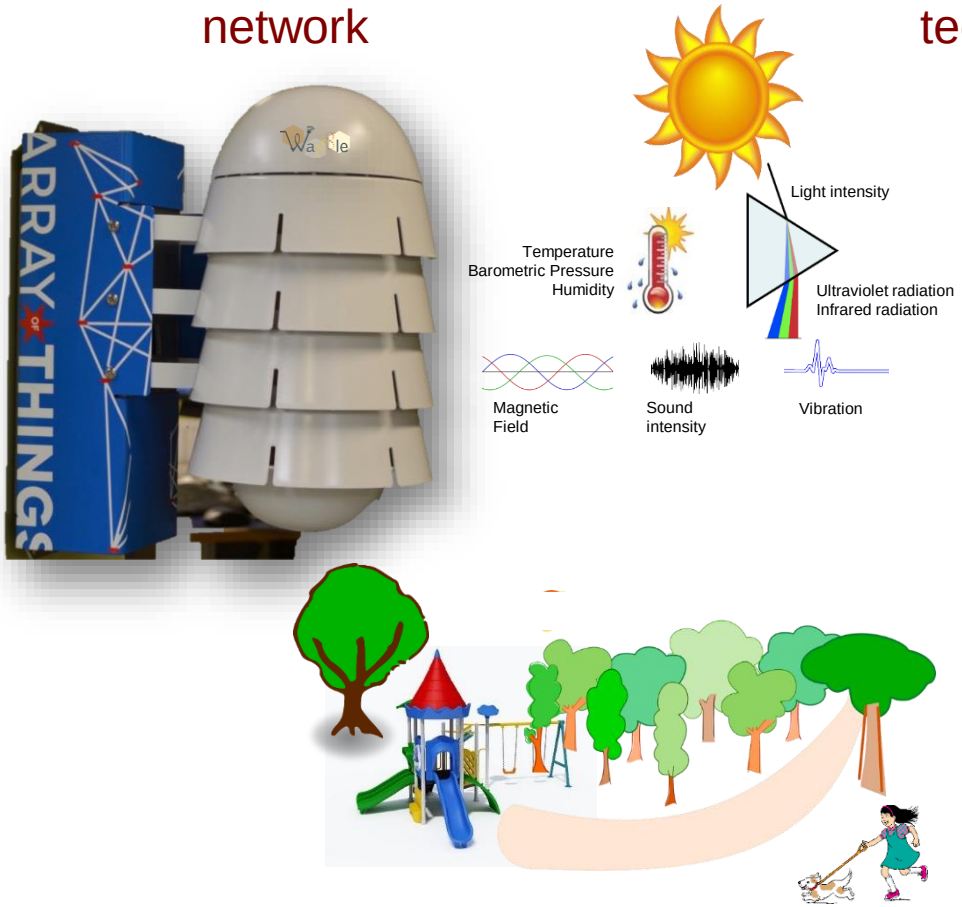
Neighborhood Influences on Health



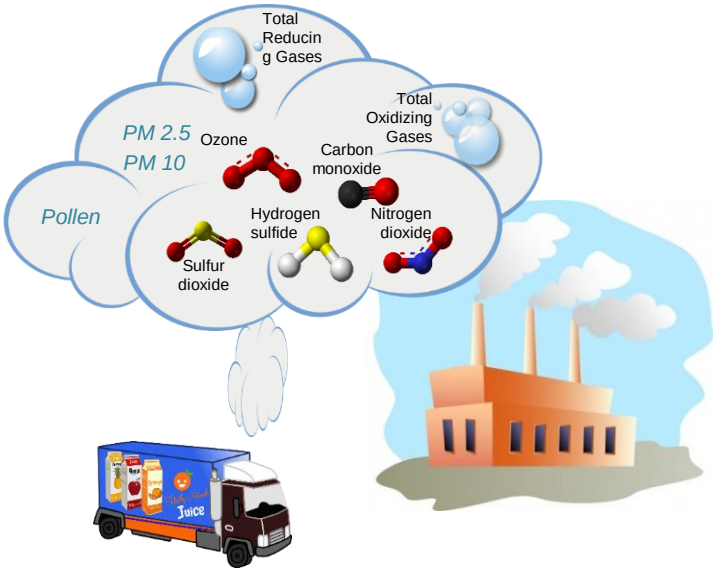
The Array of Things

KATHLEEN CAGNEY, "ACHIEVING AND SUSTAINING BEHAVIOR CHANGE TO BENEFIT OLDER ADULTS" DEC 6-7, 2018

1. A Standard Sensor network



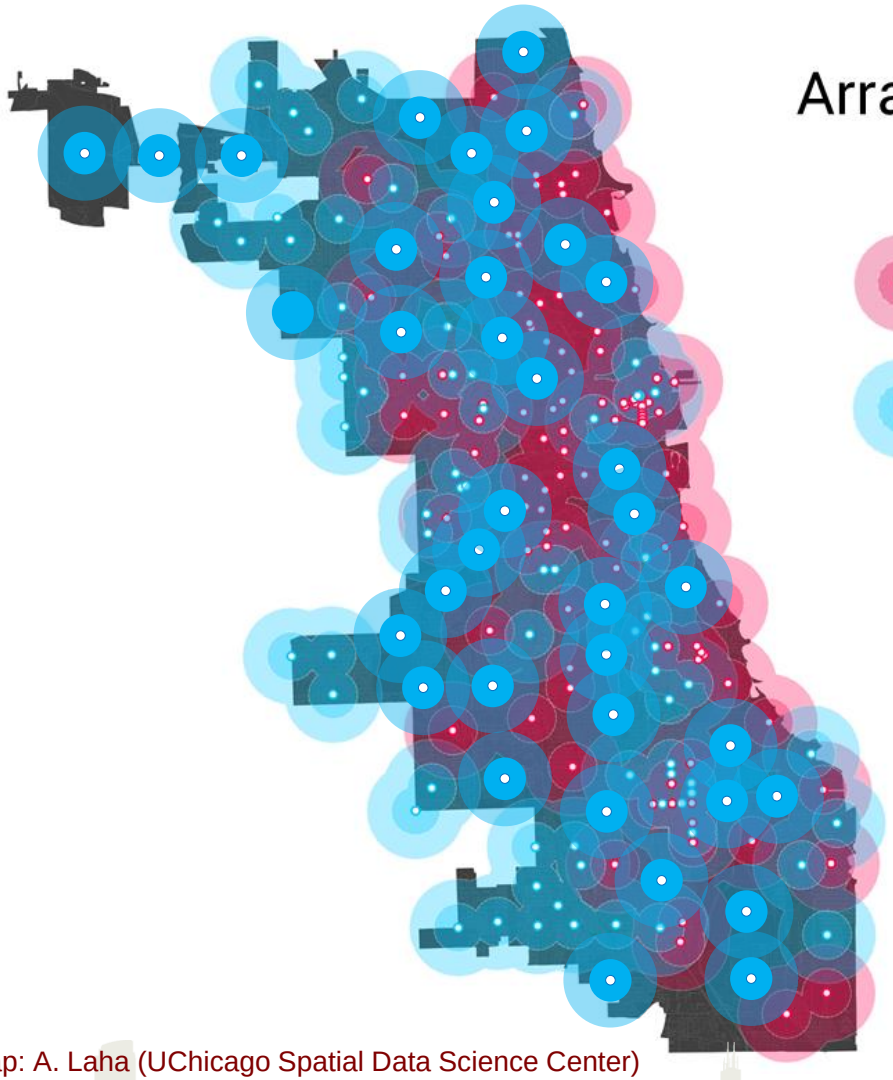
2. A *Platform* to Evaluate new sensor technologies



3. A *Platform* with embedded ("edge") computing to develop and evaluate new computer perception capabilities
4. https://arrayofthings.github.io/node-locations.html

Argonne NATIONAL LABORATORY

Chicago AoT Installation Coverage



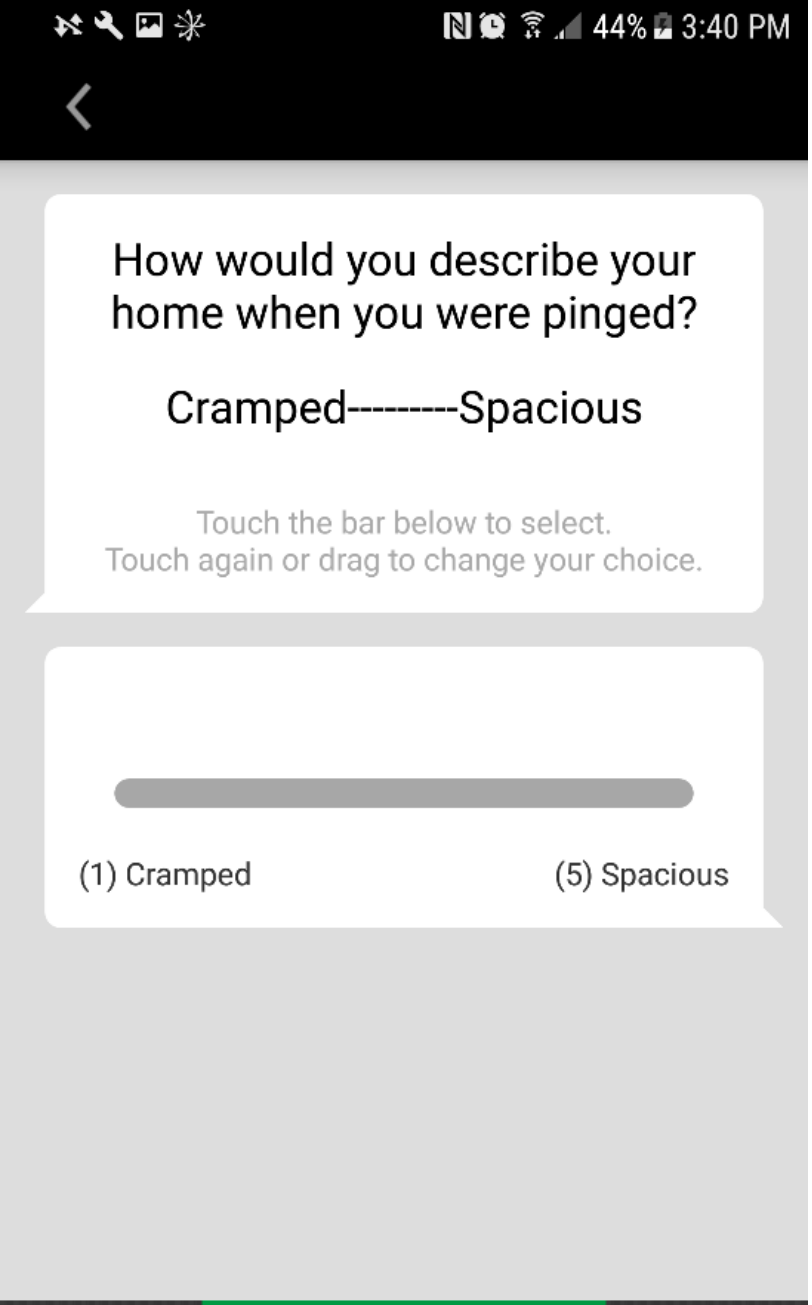
Today there is an AoT node (red) within 2km of 80% of Chicago's population, and within 1km of 42% of the population

By early 2019 every Chicago resident will have an AoT node within 2km and at least 70% will live within 1km of a node.

Map: A. Laha (UChicago Spatial Data Science Center)

Specific Aims:

- The project aims to collect primary, multi-wave data from 450 Chicagoans aged 65 and older by:
  - conducting in-person interviews to obtain baseline measures of self-reported and objective indices of health, including BMI, physical mobility, and any changes in mental, emotional, and physical health status between each of the three waves of data collection;
  - using smartphone app over week-long periods to identify latitude, longitude, and distance traveled in order to describe respondents' physical activity spaces and to obtain real-time reports of social settings, health status, and well-being using EMA in order to identify day-to-day fluctuations in social environment and both emotional and physical health; and
  - leveraging extant information such as Census and Area Resource File data and sensor-type data on Chicago neighborhoods collected by NSF-funded Array of Things project to identify neighborhood environmental and demographic determinants of both activity space and health status.



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