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Investigating the impact of neighborhood and environmental exposures in breast cancer survivorship cohort: the Pathways Study

Salma Shariff-Marco, PhD, MPH

Pathways Forum, 9/21/2023

Place matters: opportunities for improving health

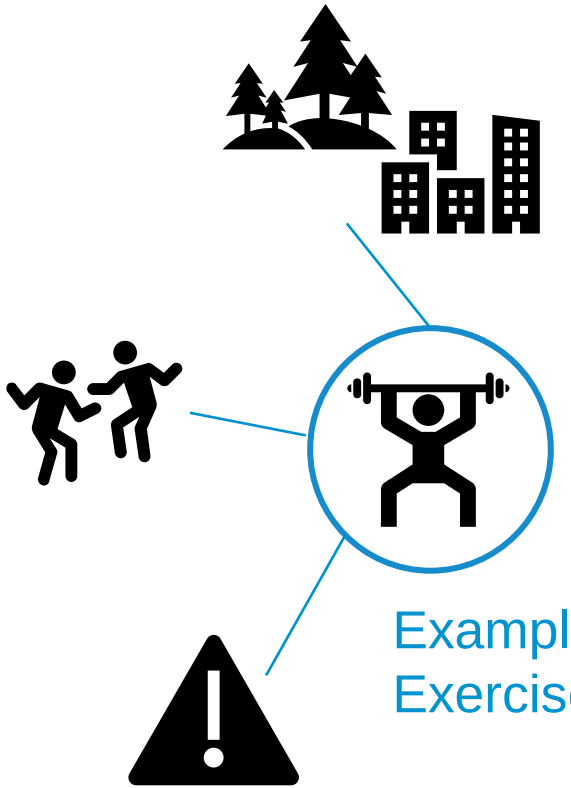
Why is your street address…such a good predictor of your health?

"When we think about health, we usually think about health care and access to health care and the quality of care. But what research clearly shows is that health is embedded in the larger conditions in which we live and work….

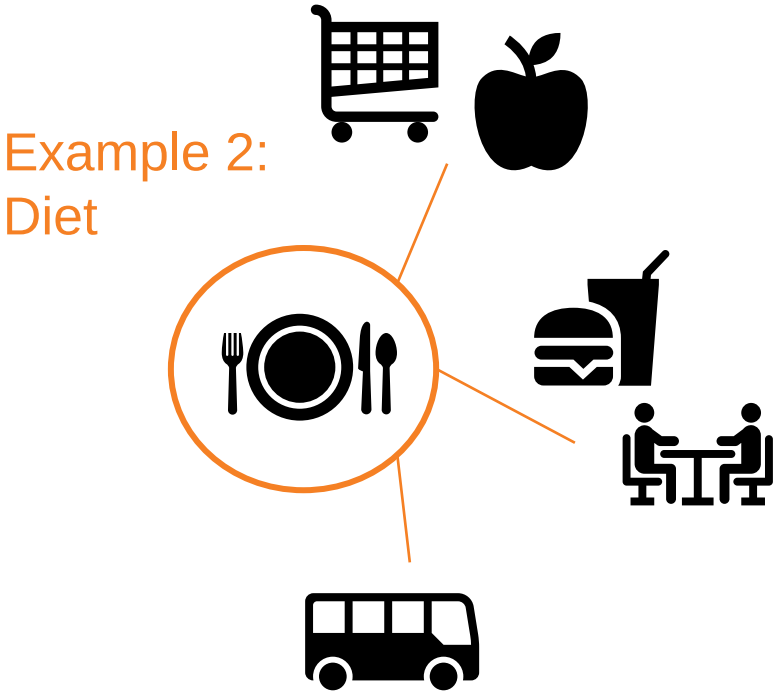
Sometimes, we naively think of improving health by simply changing behaviors. **But the choices of individuals are often limited by the environments in which they live.**"

Professor David Williams (Harvard)
"Unnatural Causes. Place Matters." (PBS documentary, 2008)

Why is your street address…such a good predictor of your health?



Example 1:
Exercise



Example 2:
Diet

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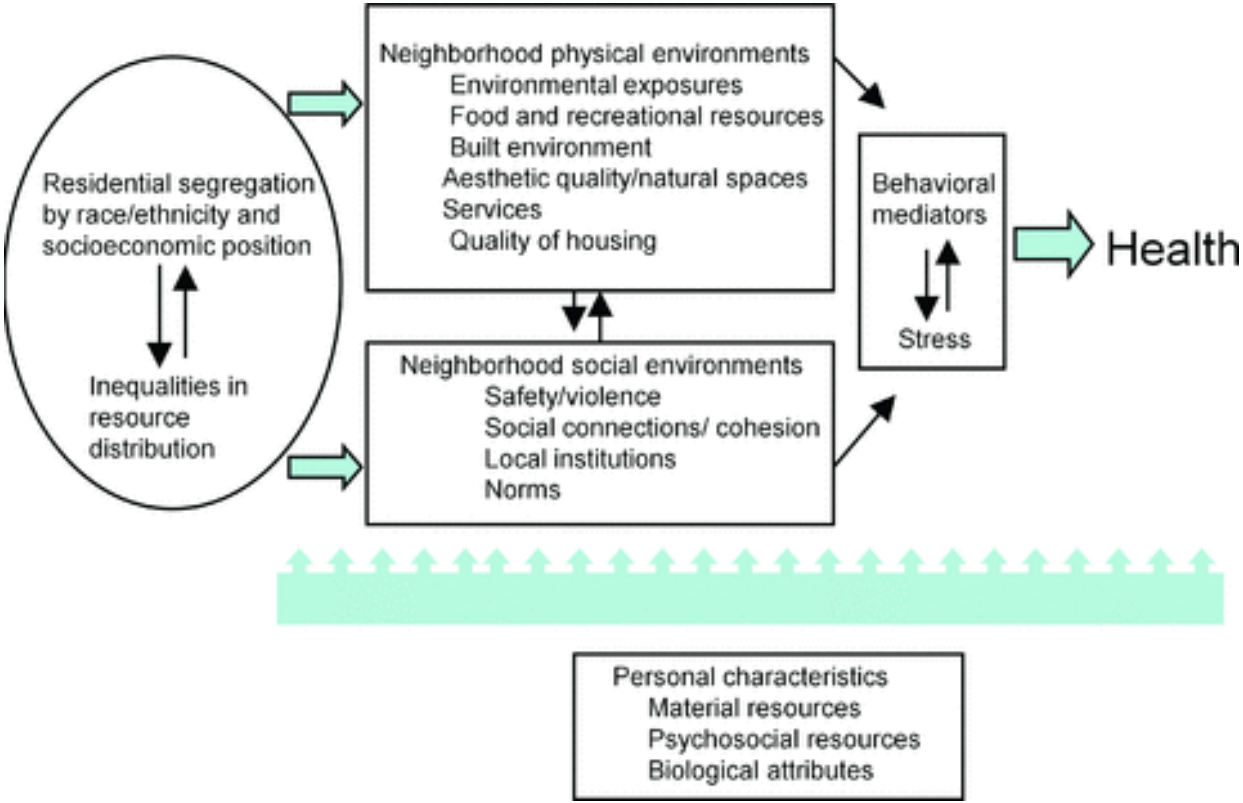
Contributions of neighborhood environments to health inequalities

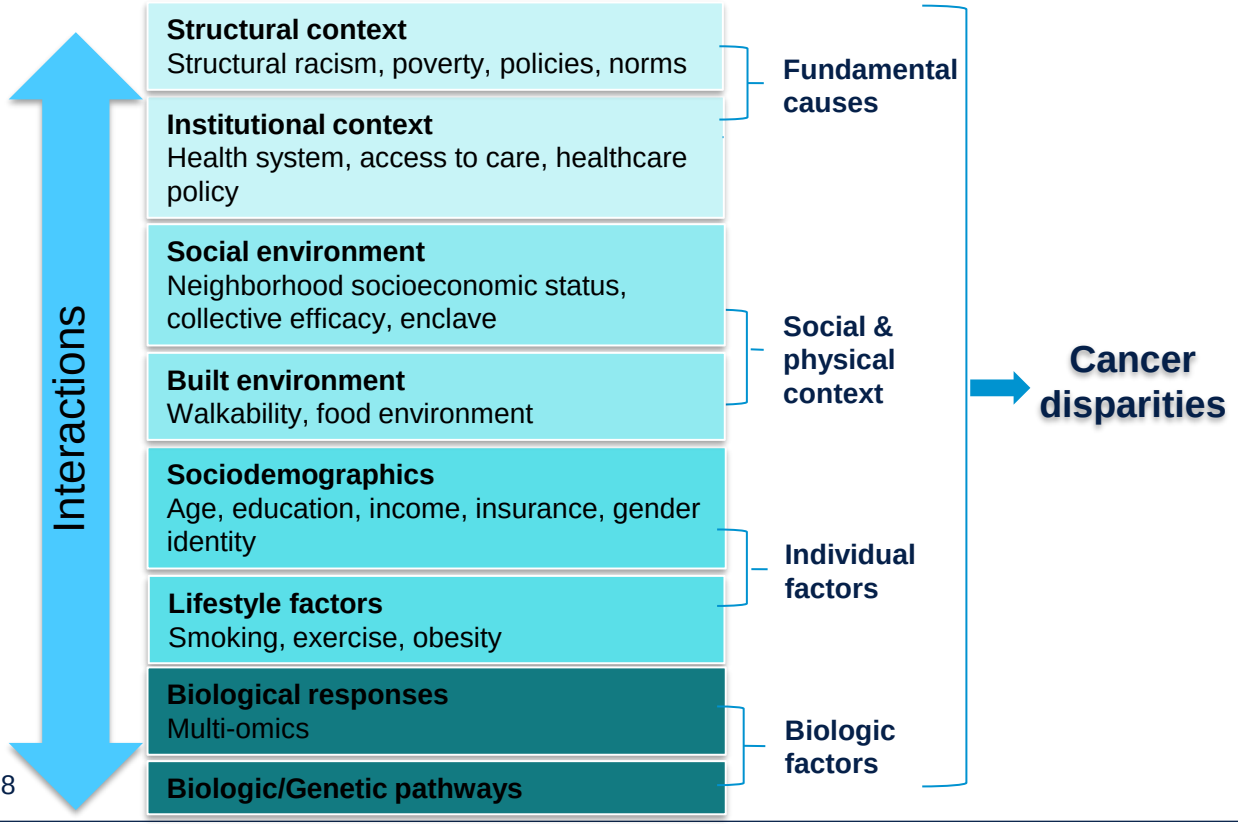


Diez Roux, A.V. and Mair, C. (2010), Neighborhoods and health. Annals of the New York Academy of Sciences, 1186: 125-145. https://doi.org/10.1111/j.1749-6632.2009.05333.x

Cells-to-Society Model for Health Disparities Research

A framework for multilevel research

Centers for Population Health and Health Disparities, NIH



Adapted from Warnecke et al. AJPH 2008

Pathways Participants' Neighborhoods

Pathways: A study of breast cancer survivorship

MPIs: Larry Kushi, Christine Ambrosone (U01CA195565, R01CA105274)

- 4,504 breast cancer survivors
  - Kaiser Permanente Northern California, 2005-2013
  - Data: surveys, electronic health records, biospecimens, genetic data
  - 97% (n=4,354) geocoded address at or near time of diagnosis
- Neighborhood
  - Block group (~1800 residents)
  - Census tract (~4000 residents)
  - 1600 meter buffers/street network distances

pathways
a study of
breast cancer
survivorship

Pathways: Neighborhood Data Resource

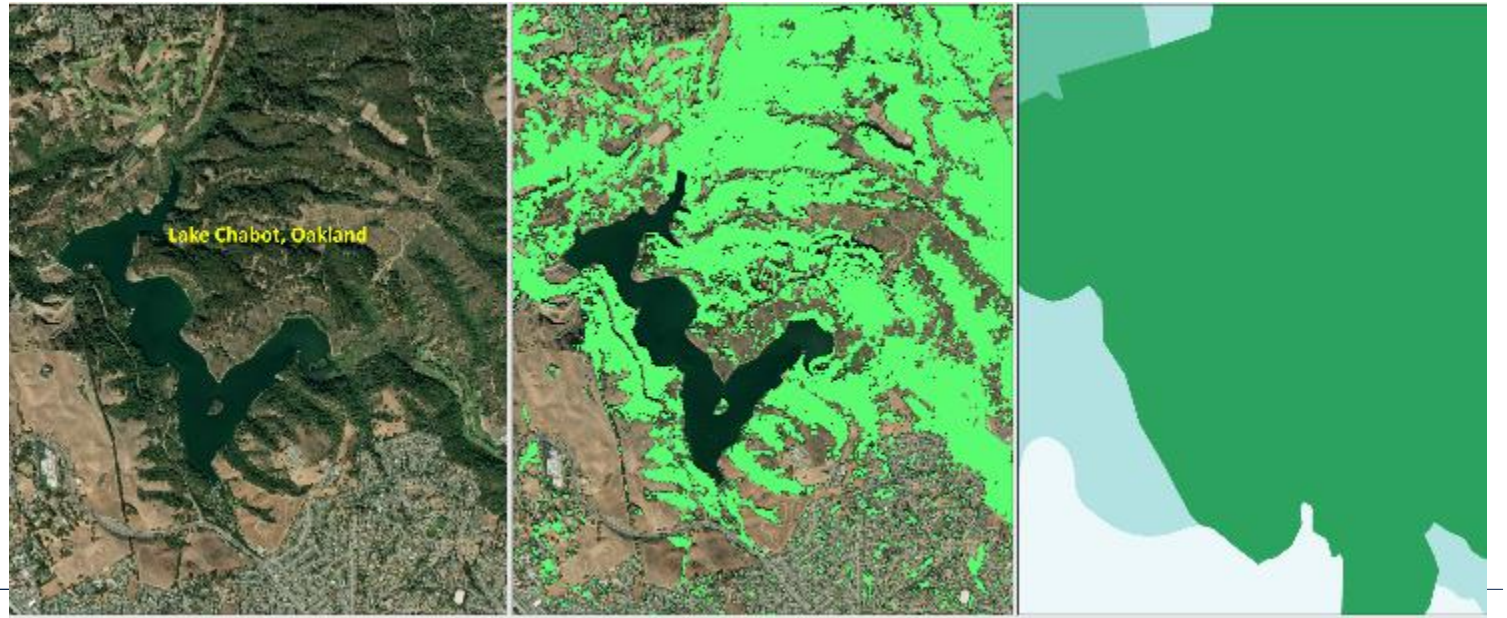
- Existing geospatial data

Table 1. Description of neighborhood social and built environment measures

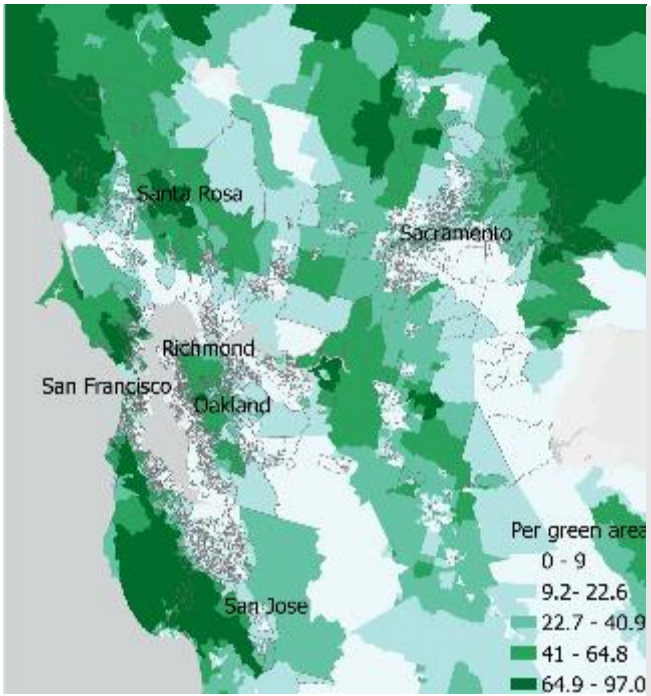
Contextual data	Data source	Description of measure
Socioeconomic status	2007–2011 ACS (29)	Block group-level composite measure for income, education, poverty employment, occupation, housing, and rent values (53)
Racial/ethnic composition	U.S. Census 2010 short-form data (54)	Block group-level measures of % of each racial/ethnic group
Immigration/acculturation characteristics	2007–2011 ACS	Block group-level measures of residential composition on % foreign-born; tract-level measure of ethnic enclave (Hispanic, Asian)
Population density	U.S. Census 2010 short-form data	Block group-level measures of population size per square mile
Urbanization (rural/urban)	U.S. Census 2010 short-form data	Block group-level composite measure based on census defined urbanized area, population size, and population density
Businesses	Dunn & Bradstreet annual business listings (1990–2008), via Walls & Associates (35)	Residential buffer (1,600 m) measures of total businesses, total numbe of recreational facilities, retail food environment index (38), and restaurant environment index
Commuting by car	2007–2011 ACS	Tract-level measures of proportion of population who drive to work (ca motorcycle, taxicab, and other)
Street connectivity	NAVTEQ (32)	Block group-level measure of walkability, using the gamma index (31
Parks	NAVTEQ (32)	Residential buffer (1,600 m) measure of total number of parks
Farmer's markets	California Department of Food and Agriculture (36)	Tract-level counts of farmers' markets
Traffic density	California Department of Transportation (33)	Residential buffer (500 m) measure of volume of traffic (34)

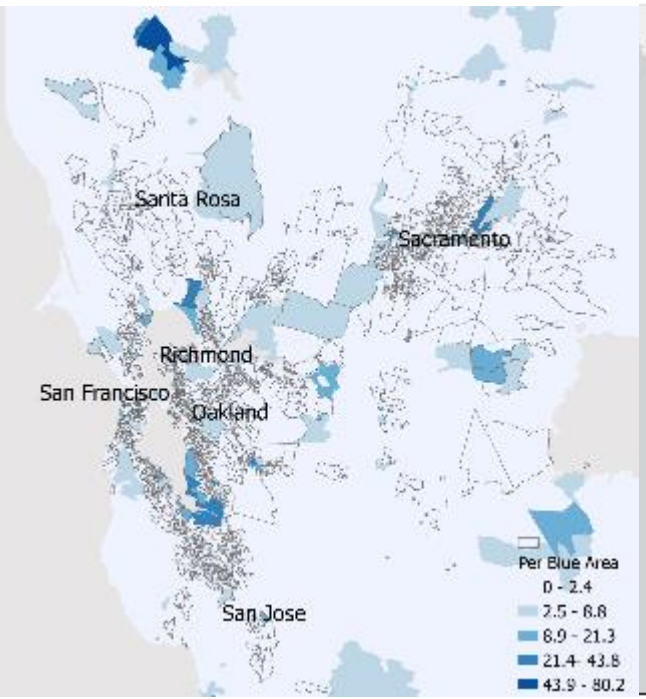
Pathways: Neighborhood Data Resource

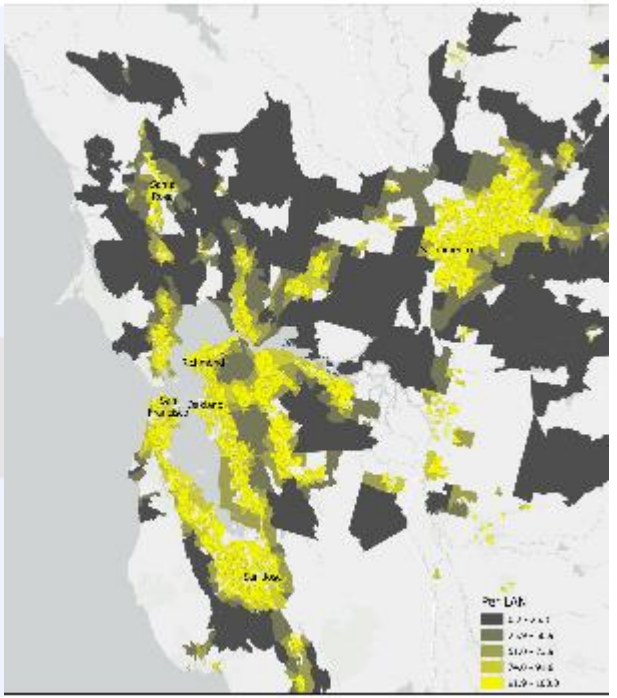
- Existing geospatial data
- Remote sensing/machine learning methods



Green space, blue space, and light at night







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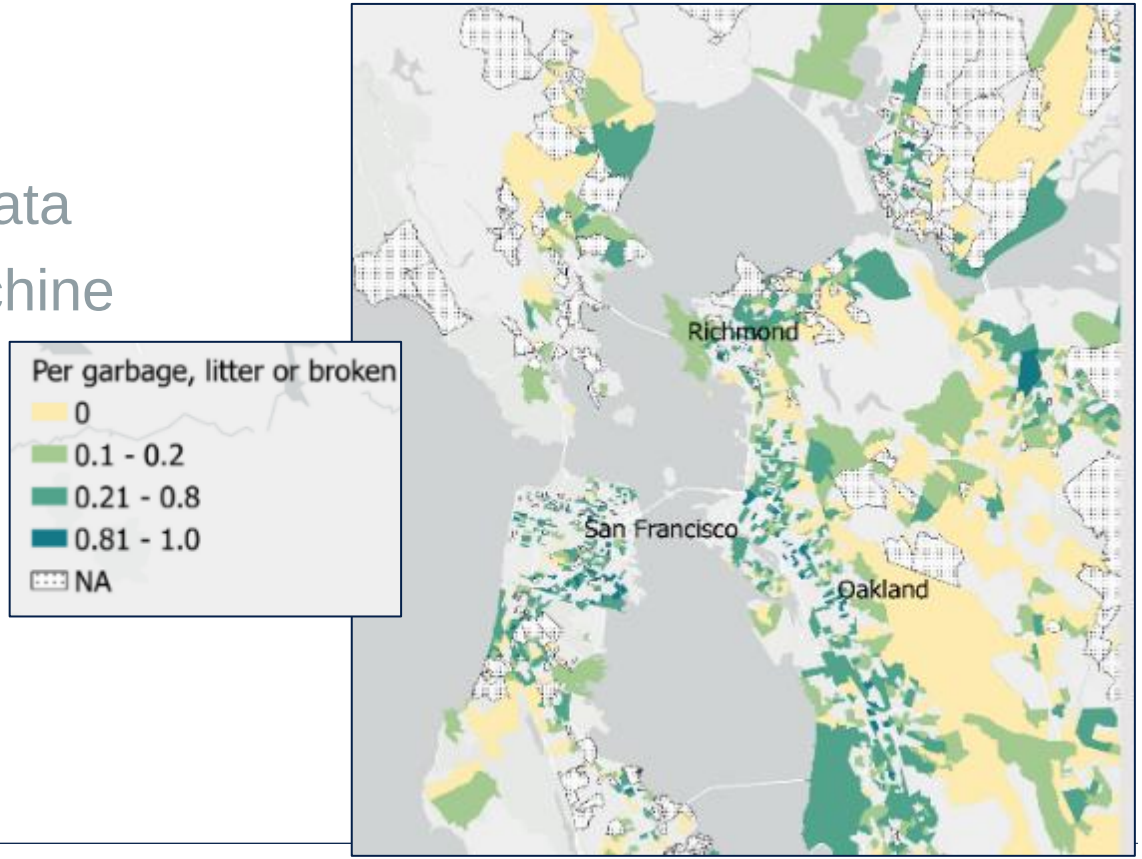
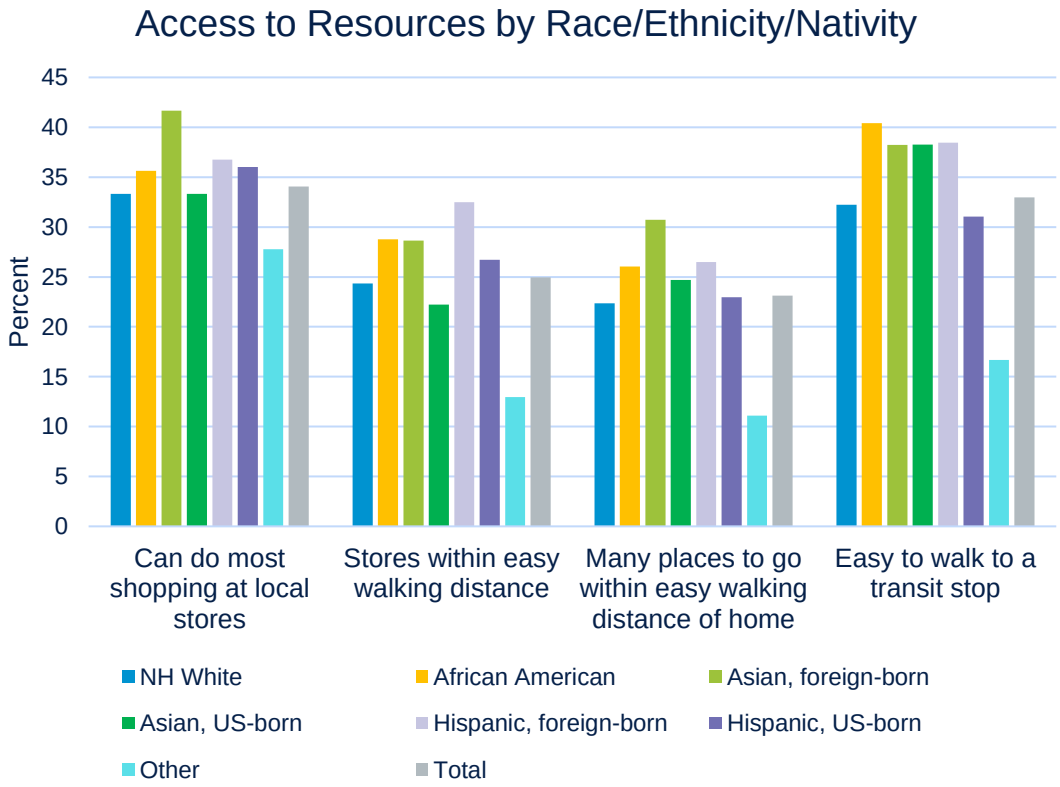
Pathways: Neighborhood Data Resource

- Existing geospatial data
- Remote sensing/machine learning methods
- Virtual street audits



Pathways: Neighborhood Data Resource

- Existing geospatial data
- Remote sensing/machine learning methods
- Virtual street audits
- Self-report data on neighborhood attributes
  - 72-month follow-up survey



Pathways: Neighborhood Data Resource

- Existing geospatial data
- Remote sensing/machine learning methods
- Virtual street audits
- Perceived neighborhood attributes (72-month)
- Residential histories

- Physical environment
  - Air pollutants: ozone, $PM_{2.5}$, diesel,
  - Ground pollutants: agricultural pesticides, toxic releases from facilities, toxic clean-ups, solid waste sites
  - Water pollutants: groundwater, hazardous waste facilities, impaired water bodies
  - Source: Cal EnviroScreen 3.0, California Communities Environmental Health Screening Tool

Findings from the Pathways Study

- Neighborhood attributes associated with overweight/obesity:
  - Lower socioeconomic status
  - High minority composition
  - High traffic density
  - High prevalence of commuting by car/motorcycle
  - Higher number of fast-food restaurants

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ORIGINAL ARTICLE

Neighborhood attributes and cardiovascular disease risk in breast cancer survivors: The Pathways Study

Shannon M. Conroy PhD, MPH[1] | Julie Von Behren MPH[2] |
Marilyn L. Kwan PhD[3] | Lawrence H. Kushi ScD[3] | Mi-Ok Kim PhD[2,4] |
Carlos Iribarren MD, PhD, MPH[3] | Janise M. Roh MSW, MPH[3] |
Cecile A. Laurent MS[3] | Catherine Thomsen MPH[5] | Janet N. Chu MD, MPH, MAS[6] |
Heather Greenlee ND, PhD, MPH[7,8] | Scarlett Lin Gomez PhD, MPH[2,4] |
Salma Shariff-Marco PhD, MPH[2,4]

- Neighborhood attributes and risk of cardiovascular disease
  - Highest crime score: 50% increased risk
  - Lowest % of Asian American residents: 85% increased risk

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Original Contribution

Impact of Racial/Ethnic Discrimination on Quality of Life Among Breast Cancer Survivors

The Pathways Study

Salma Shariff-Marco*, Meera Sangaramoorthy, Libby Ellis, Catherine Thomsen, Janise M. Roh, Candyce Kroenke, Emily Valice, Marilyn L. Kwan, Christine Ambrosone, Lawrence Kushi, and Scarlett Lin Gomez

* Correspondence to Dr. Salma Shariff-Marco, Department of Epidemiology and Biostatistics, School of Medicine, University of California, San Francisco, 550 16th Street, MH-2633, San Francisco, CA 94158 (e-mail: salma.shariff-marco@ucsf.edu).

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- Discrimination was associated with worse quality of life

- Varied by attributes of place:
  - Segregation
  - Ethnic enclave
- Residing in neighborhoods with more residents from shared racial or ethnic group may buffer impact

Social stressors and embodiment of stress

- Neighborhood stressors
  - Low SES
  - Nighttime light
  - Crime
  - Traffic density
  - Household crowding
  - Unhealthy food environment (convenient stores, liquor stores, fast food restaurants)
- Potential buffers
  - Green space
  - Blue space

How do these stressors get under your skin?

- Allostatic load: a biological measure of the wear and tear of chronic and cumulative stress on the body
  - Intermediary survivorship outcome → morbidity and mortality
- Biological pathways
  - Cardiovascular
  - Metabolic
  - Immune/inflammatory
  - Neuroendocrine

Neighborhood factors associated with allostatic load

- Increased odds of high allostatic load was associated with
  - **Neighborhood socioeconomic status**
  - Household crowding
  - Unhealthy Food Environment
  - Crime
  - Traffic density
  - Light at night
- Decreased odds of high AL was associated with
  - Green space

Neighborhood SES –allostatic load associations

	Model 1 (age, stage)	Model 2 (+ neighborhood)	Model 3 (+ stress, physical activity, smoking, alcohol)	Model 4 (+ race/ethnicity, education, income, marital status, parity, comorbidity)
Neighborhood Socioeconomic Status (quintiles) [d]	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Q1: <-0.76 (low)	**2.07 (1.48-2.89)**	**1.73 (1.19-2.50)**	**1.59 (1.07-2.35)**	1.25 (0.81-1.93)
Q2: -0.76- -0.13	**2.01 (1.55-2.62)**	**1.80 (1.36-2.39)**	**1.58 (1.19-2.11)**	1.21 (0.87-1.67)
Q3: -0.14-0.43	**1.68 (1.33-2.11)**	**1.58 (1.25-2.00)**	**1.58 (1.23-2.04)**	**1.45 (1.09-1.92)**
Q4: 0.44-1.08	**1.51 (1.22-1.87)**	**1.47 (1.18-1.82)**	**1.41 (1.11-1.78)**	1.29 (1.00-1.67)
Q5: >1.08 (high; reference)	1.0	1.0	1.0	1.0
p-trend	**<0.01**	**<0.01**	**<0.01**	0.15

Summary across neighborhood studies

- Neighborhood factors: not as highly correlated
- Results varied by racial, ethnic and nativity groups
- Multilevel interventions: consider neighborhood attributes that can promote health

Discussion

- Pathways Study: a unique resource
- Neighborhood studies: multilevel factors influence survivorship outcomes
- Data dissemination: communities

Acknowledgements

- Kaiser Permanente Northern California
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- University of California Davis
- University of California San Francisco
- Zero Breast Cancer

- Study participants and CAB

pathways
a study of
breast cancer
survivorship

Thank you!
Questions?

DREAM.LAB
https://dreamlab.ucsf.edu/

UCSF

Salma.Shariff-Marco@ucsf.edu