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# Measuring racial/ethnic inequality of context:

## racial residential segregation measures and impacts on health

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EPA Strengthening Environmental Justice Research and Decision  
Making Symposium

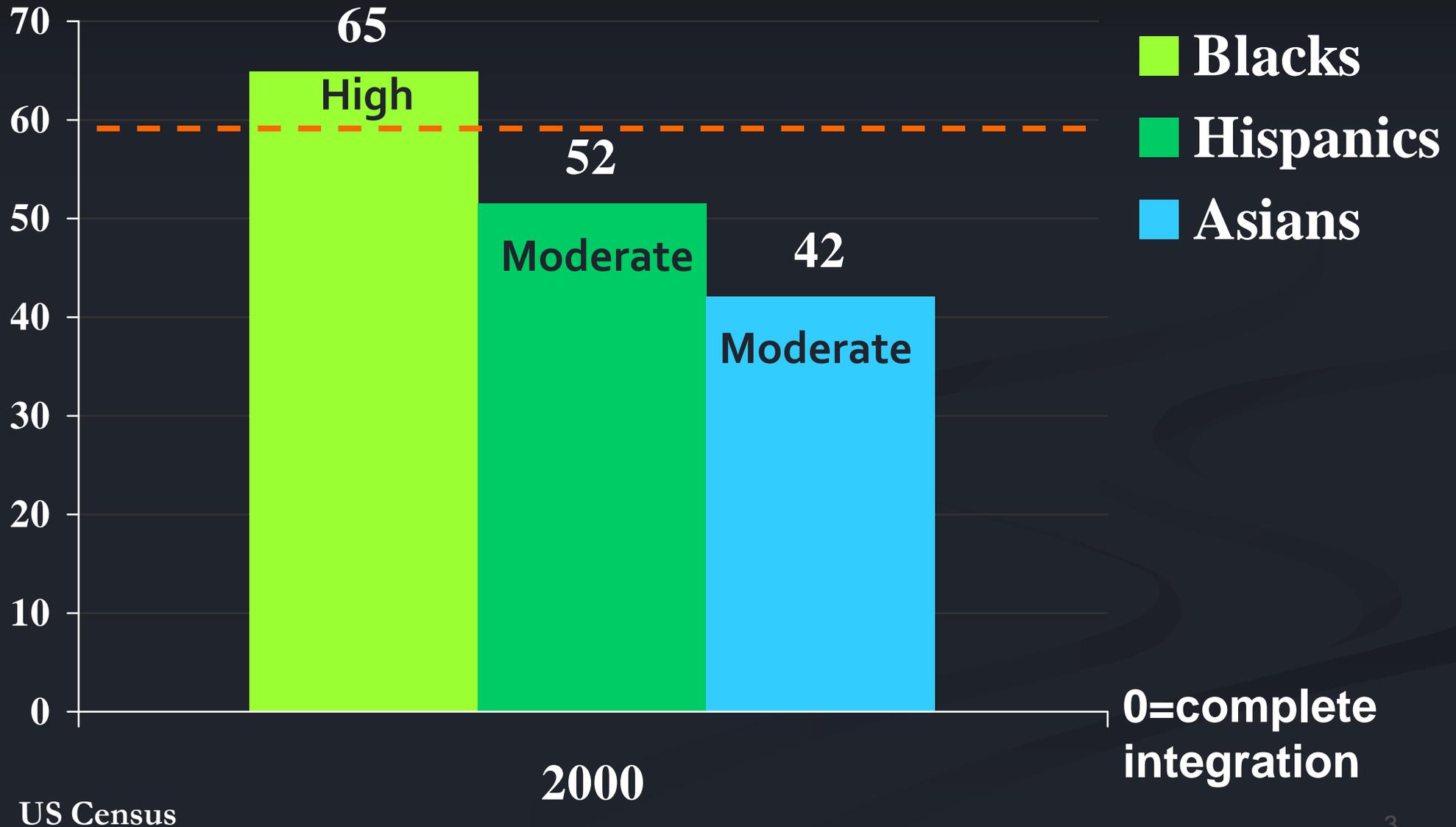
March 18, 2010

# Agenda

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- Measures for calculating racial separation of neighborhood context
  - Traditional and Adaptations of Racial Residential Segregation Indices
- Examples linking contextual inequality measures with health

# Residential Segregation: Dissimilarity vs. Whites. Theoretical range: 0-100



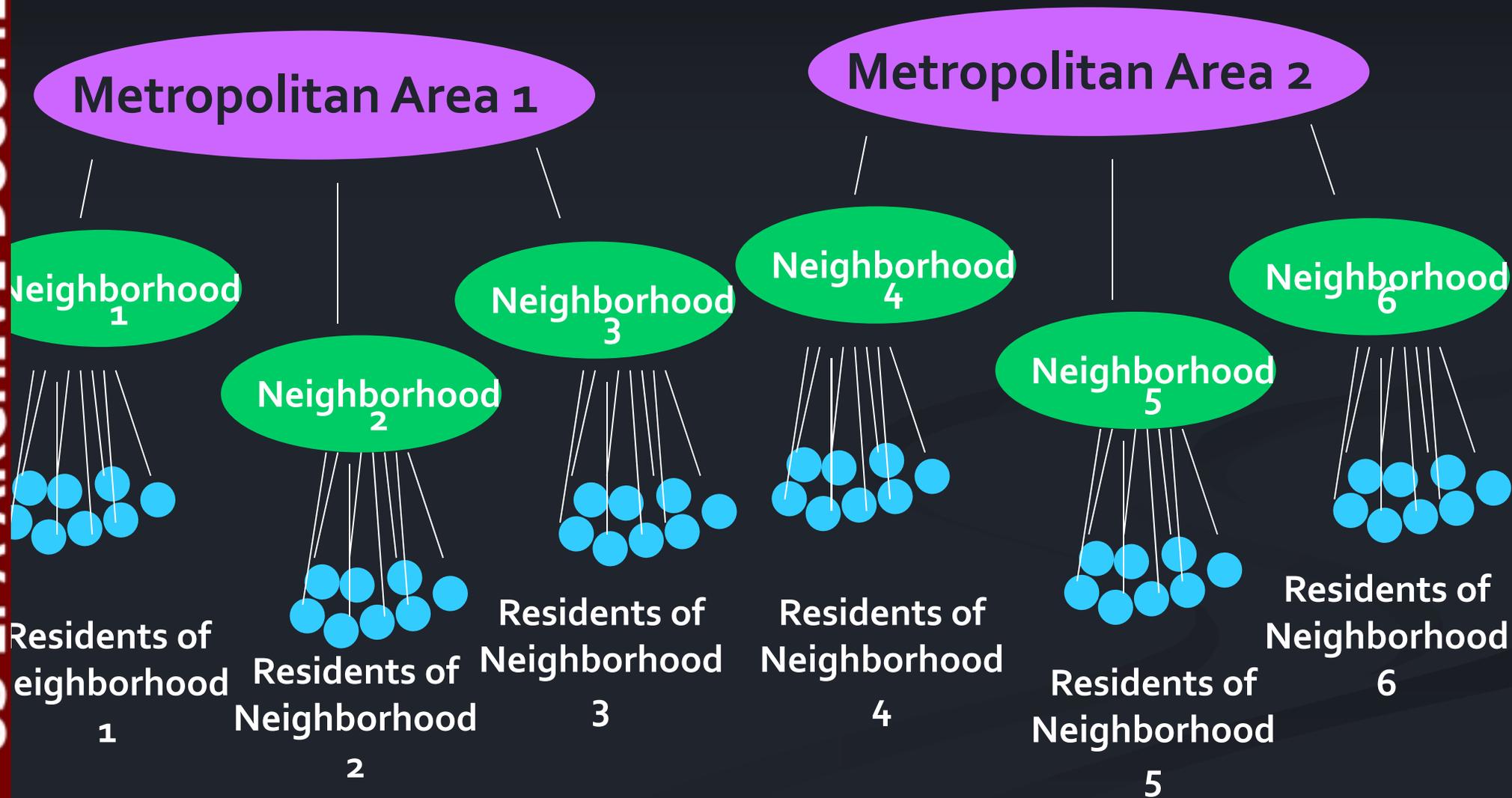
# Racial residential segregation may be a fundamental cause of racial health disparities

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- Associated with worse health among minorities
  - Mortality, infectious disease, birth outcomes, CVD, self rated health, mental health, obesity, physical activity, environmental toxicants (ambient air toxicants)
- Racial Residential Segregation
  - constrains socioeconomic advancement of minorities,
  - Increases exposure of minorities to unfavorable neighborhood environments,
  - Leads to segregation in health care settings, which is associated with disparities in quality of treatment

Acevedo-Garcia 2000, 2001; Acevedo-Garcia & Lochner 2003; Acevedo-Garcia et al. 2003, 2004, 2008; Acevedo-Garcia & Osypuk, 2008; Osypuk & Acevedo-Garcia, 2008; Subramanian, Acevedo-Garcia & Osypuk, 2005; Williams & Collins 2001; Morello-Frosch & Jesdale 2006

# Residential Segregation: Multilevel Measures of Context



Scale matters: lower/smaller "neighborhood" levels → higher segregation

# Ways to Conceptualize Racial Neighborhood Separation: Dimensions of Residential Segregation

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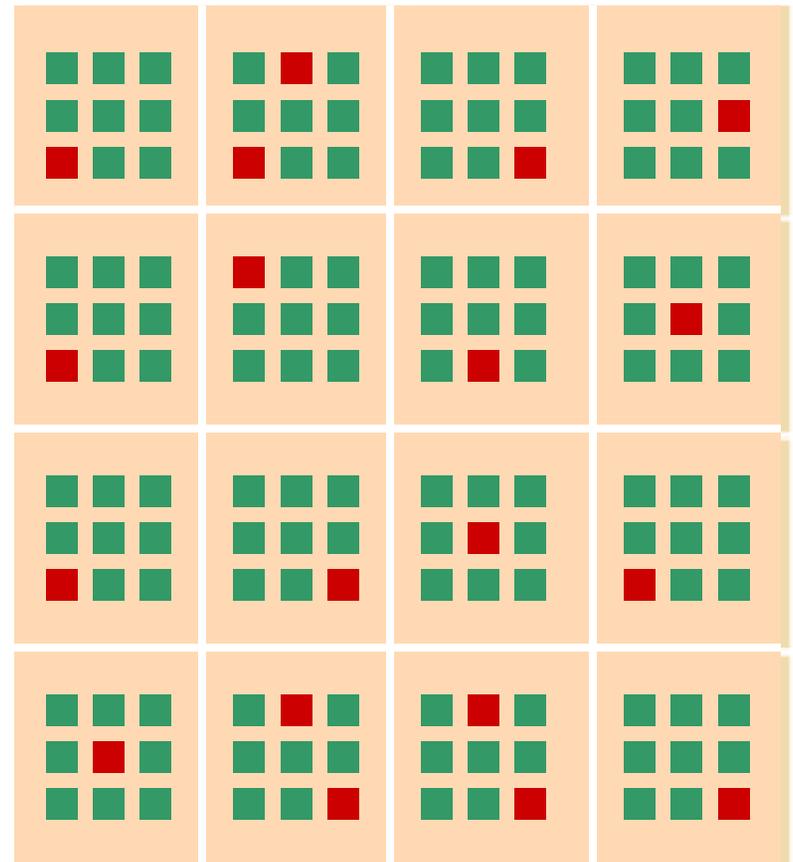
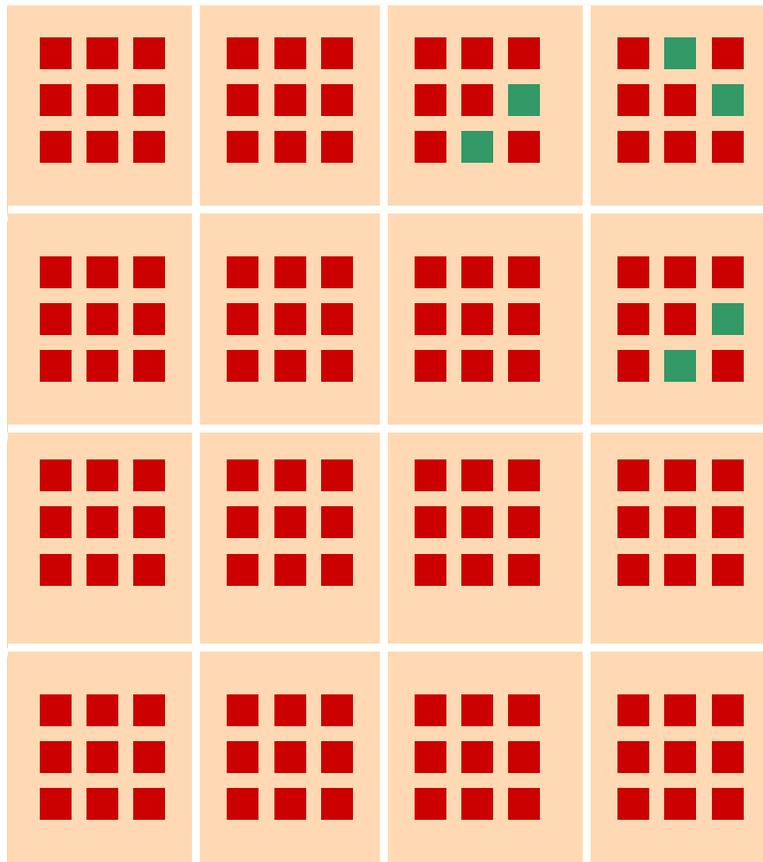
- Absolute
  - What are the absolute (average) conditions of neighborhood context for different racial/ethnic groups in different metro areas?
  - Based on Exposure segregation measure:
    - ✱ the average neighborhood racial composition for a certain racial group
- Relative
  - How separate are the distributions of neighborhood context in different metro areas?
  - Based on Evenness segregation measure:
    - ✱ how evenly are different racial groups distributed across neighborhoods in the metro area?

# Traditional Segregation Measure Exposure (Isolation Index)

## Metro 1: High Segregation

## Metro 2: Low Segregation

 White  
 Minority



# Adapted Neighborhood Inequality Measure

## Exposure

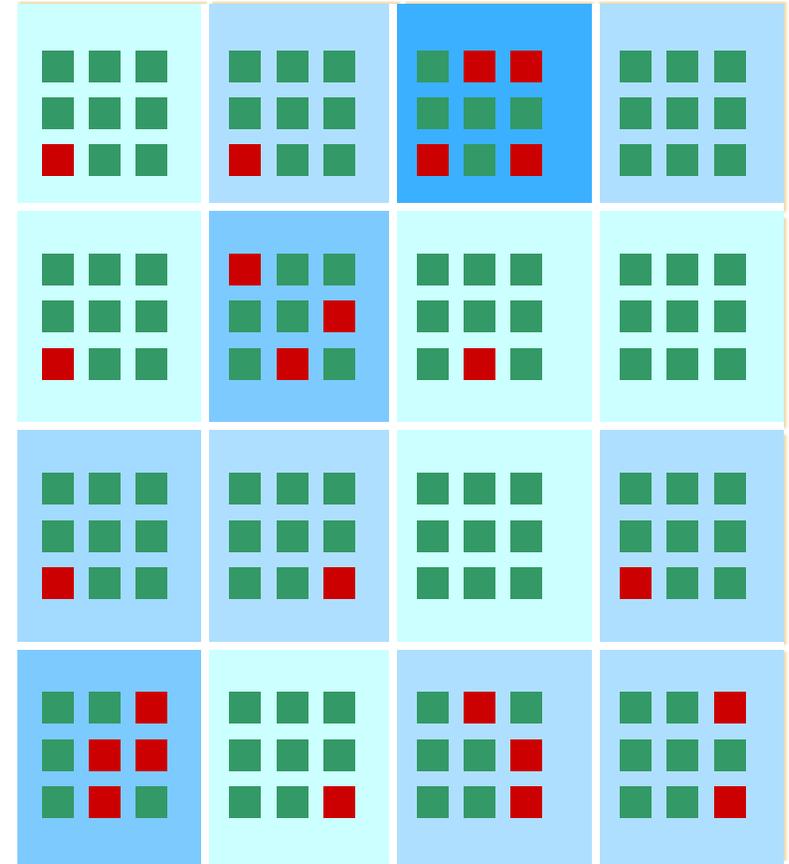
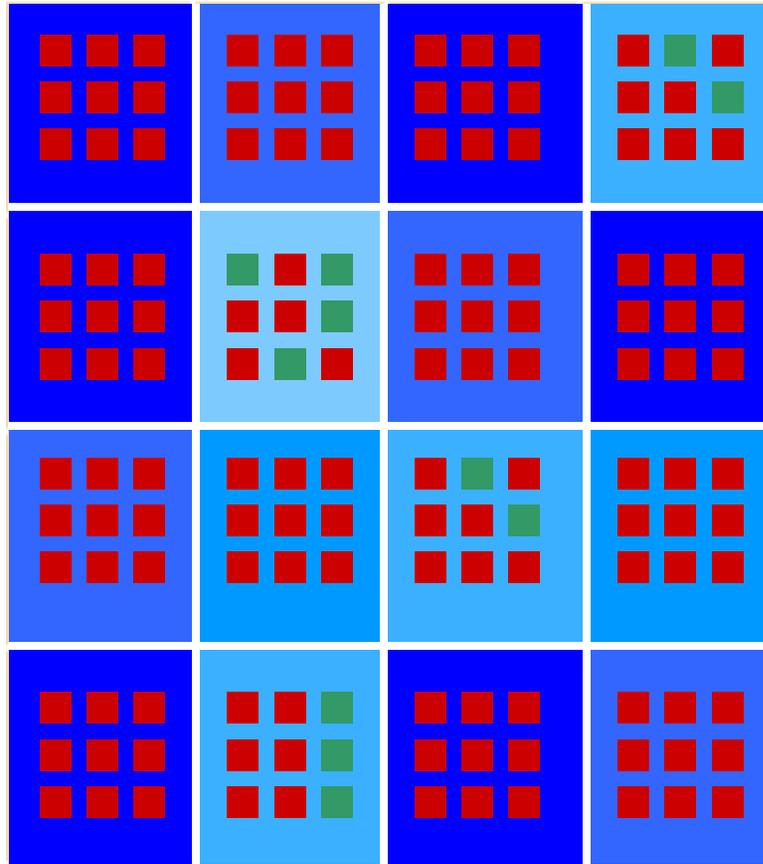
### (Neighborhood Exposure Index)

Metro 1: Minorities live in worse quality neighborhoods on average

Metro 2: Whites in better quality neighborhoods on average

White  
Minority

Neighborhood Quality Scale  
Worst  
Best



# Neighborhood Exposure Measures

- Absolute neighborhood quality for each group for each metro measured
  - Range 1-7; 1=best

	Metro 1	Metro 2
Minorities 	<b>5.9</b>	<b>2.5</b>
Whites 	<b>3.8</b>	<b>1.8</b>

Neighborhood  
Quality Scale



# Ways to Conceptualize Racial Separation: Dimensions of Residential Segregation

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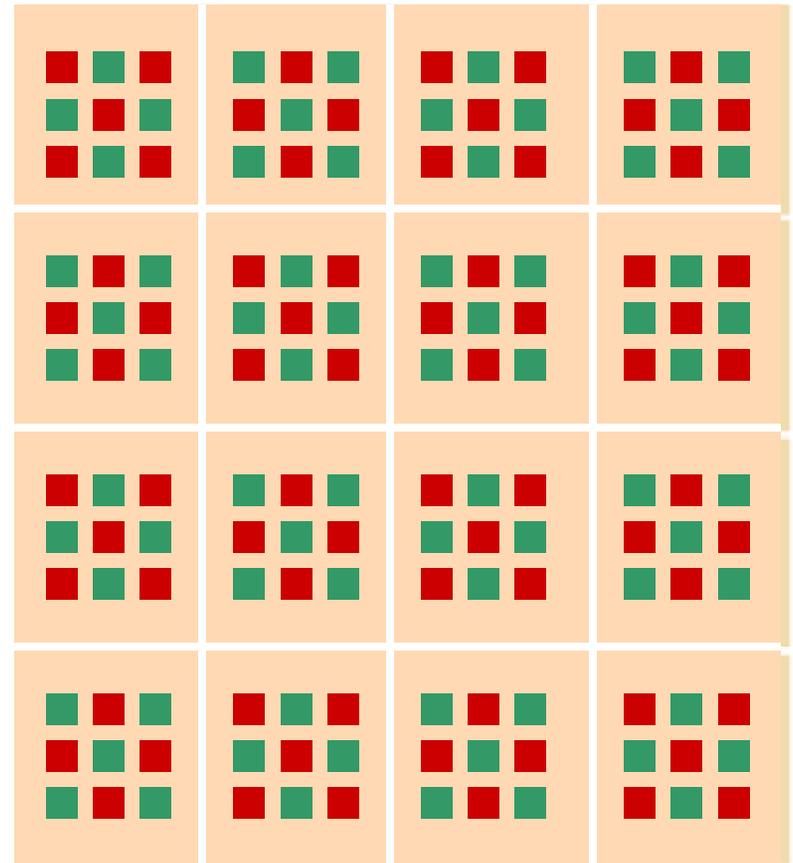
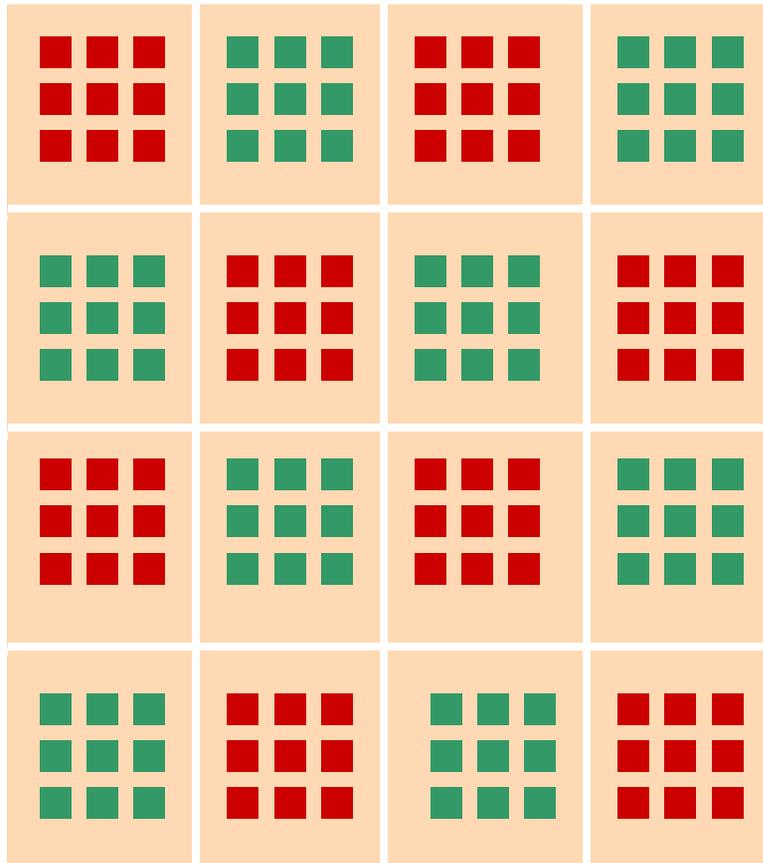
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  - Evenness segregation measure:
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# Traditional Segregation Measure Evenness (Dissimilarity Index)

## Metro 1: High Segregation

## Metro 2: Low Segregation

 White  
 Minority



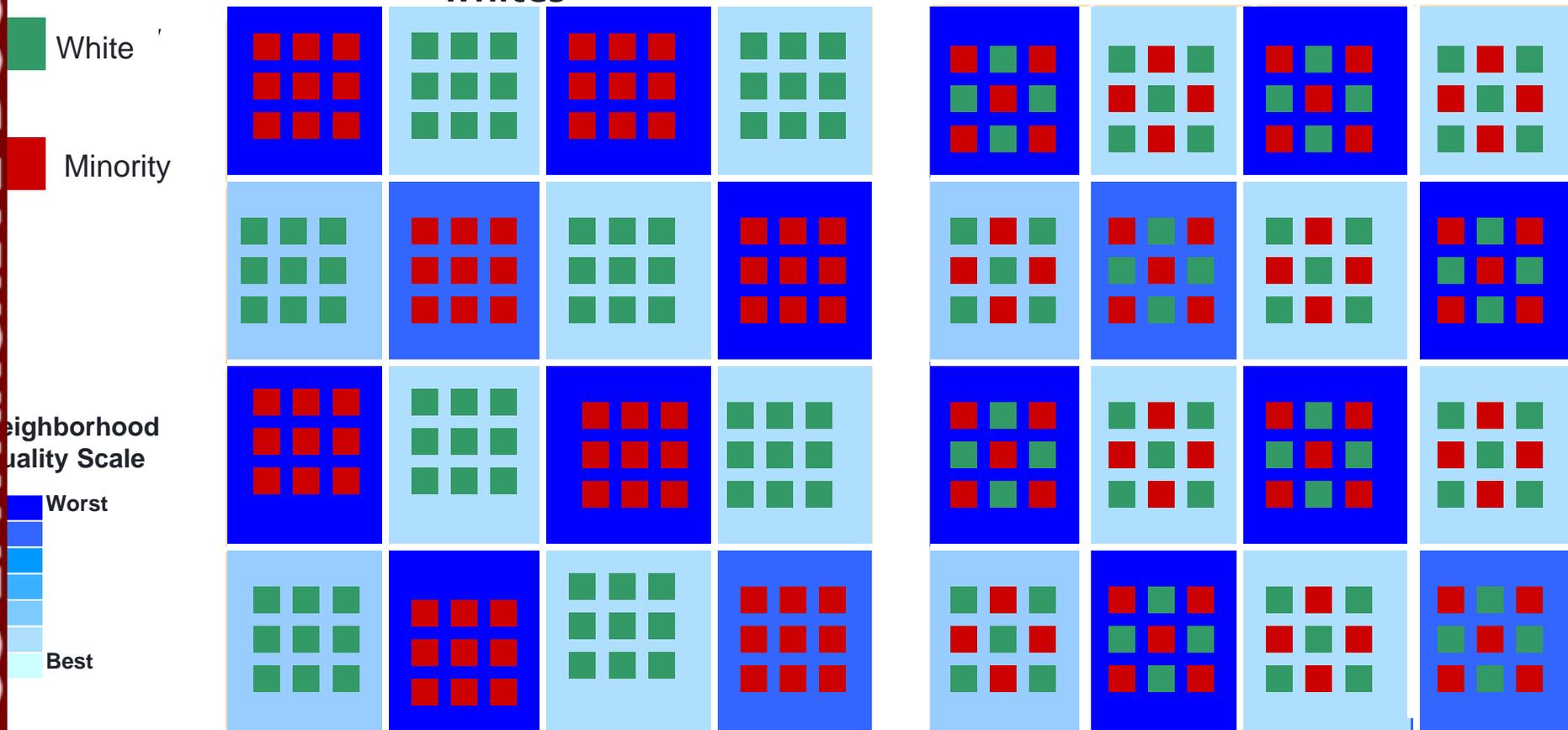
# Adapted Neighborhood Inequality Measure

## Evenness

(Neighborhood Dissimilarity)

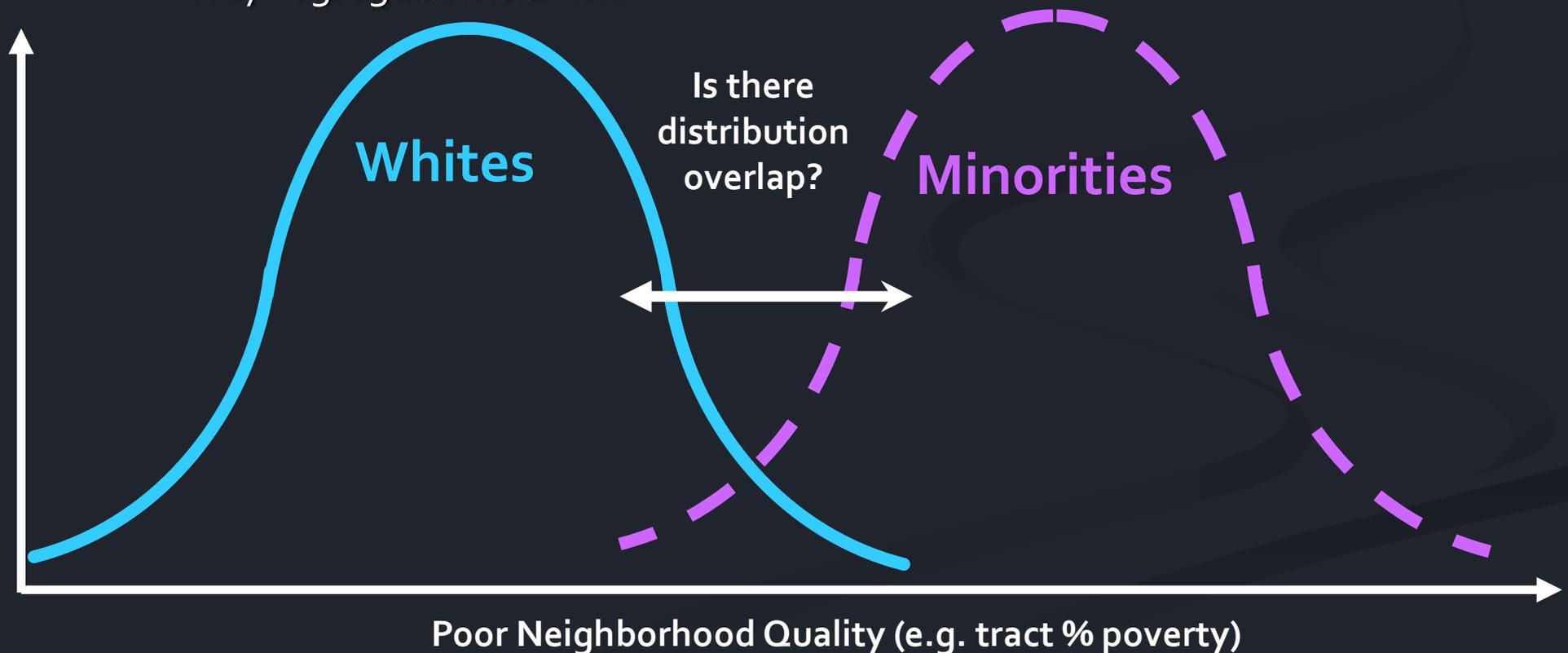
Metro 1: Minorities live in separate & the entire distribution is "bad" vs. whites

Metro 2: Whites and minorities live in the exact same neighborhoods, so distributions of neighborhood quality are identical



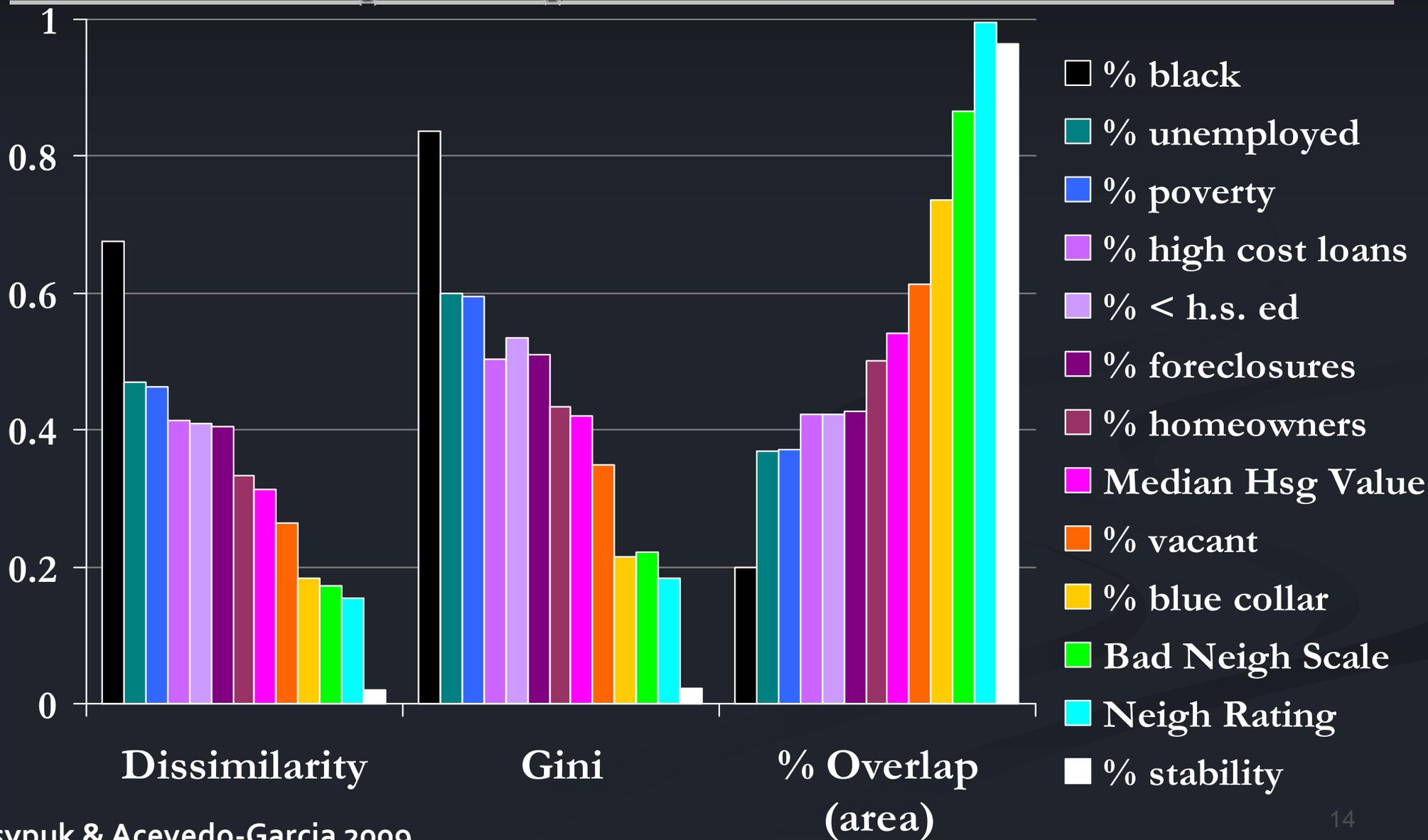
# Neighborhood % Overlap & IQR-Overlap Statistic: Racial Overlap of Distributions of Tract % Poverty

- To what extent do neighborhood “quality” distributions overlap for two racial groups?
  - % Overlap: calculated based on inflection point where tails of the distributions are balanced on either side
  - Why segregation matters



# Evenness: Racial Neighborhood

## Inequality (100 Largest MSAs; 2000)



# Traditional & Adapted Residential Segregation Measures

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- Adapted segregation measures used
  - To understand why residential segregation matters
    - ✱ Social determinants of health
  - To monitor residential inequality
    - ✱ To what extent does separate remain unequal?
    - ✱ [www.diversitydata.org](http://www.diversitydata.org) indicator website of racial inequality across metropolitan regions, including neighborhood inequality
- Both traditional and adapted segregation measures used
  - As exposure variables to predict health outcomes in multilevel, multiple regression models
  - Along with other mediators of interest



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## Profiles by Metro Area

1. First select a state.
2. Then, select a metropolitan area.

## Rankings & Maps by Indicator

Ranking  Map

- Population Demographics and Diversity
- Health
- Housing Opportunities
- Economic Opportunities
- Education
- Residential Integration and Neighborhood Characteristics
- Crime
- Physical Environment

diversitydata.org allows users to explore how metropolitan areas throughout the country perform on a diverse range of social measures that comprise a rounded life experience.

These data call attention to the quality of opportunity and diversity of experiences for different racial and ethnic groups in America. [Learn more about the project.](#)

### Largest Metro Areas

Select a metro area below to view its profile, or [view the entire list.](#)

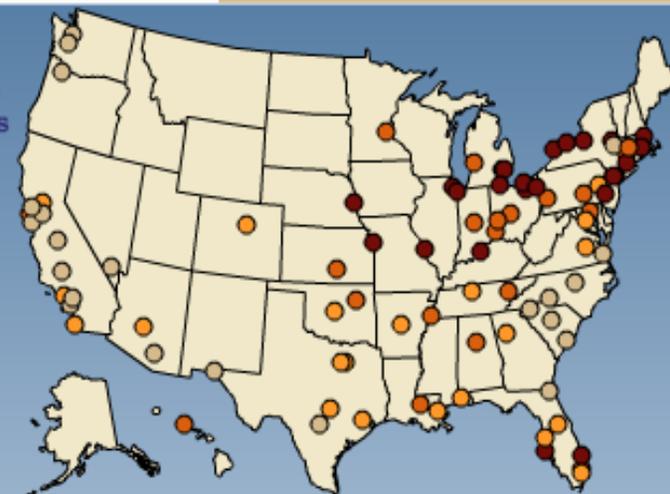
- Los Angeles-Long Beach, CA
- New York, NY
- Chicago, IL
- Philadelphia, PA-NJ
- Washington, DC-MD-VA-WV

## Data spotlight on...

Share of Children Living in Low-Income Neighborhoods by Race/Ethnicity

For year: 2000; Data for: Non-Hispanic Black

- 72.7% - 87.7%
- 61.6% - 72.6%
- 53.4% - 61.2%
- 19.5% - 53.2%



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## Spotlight

- **[Disparities in Neighborhood Poverty of Poor Black and White Children](#)** -- download a PDF of the first diversitydata brief, May 2007
- **[Children Left Behind: How Metropolitan Areas Are Failing America's Children](#)** -- download a PDF of the first in a series of reports from DiversityData.org, January 2007
- **[Chartbook](#)** -- download a PDF of the tables and charts related to Children Left Behind: How Metropolitan Areas Are Failing America's Children, January 2007



# Traditional & Adapted Residential Segregation Measures

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- Adapted segregation measures used
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# Another Mexican Birthweight Paradox? The Role of Residential Enclaves and Neighborhood Poverty in the Birthweight of Mexican Origin Infants.

Example 1: Metropolitan Residential Segregation

Osypuk, Bates, et al. 2010. *Social Science & Medicine*. 70(4):550–560.

# Immigrant Enclaves & Health

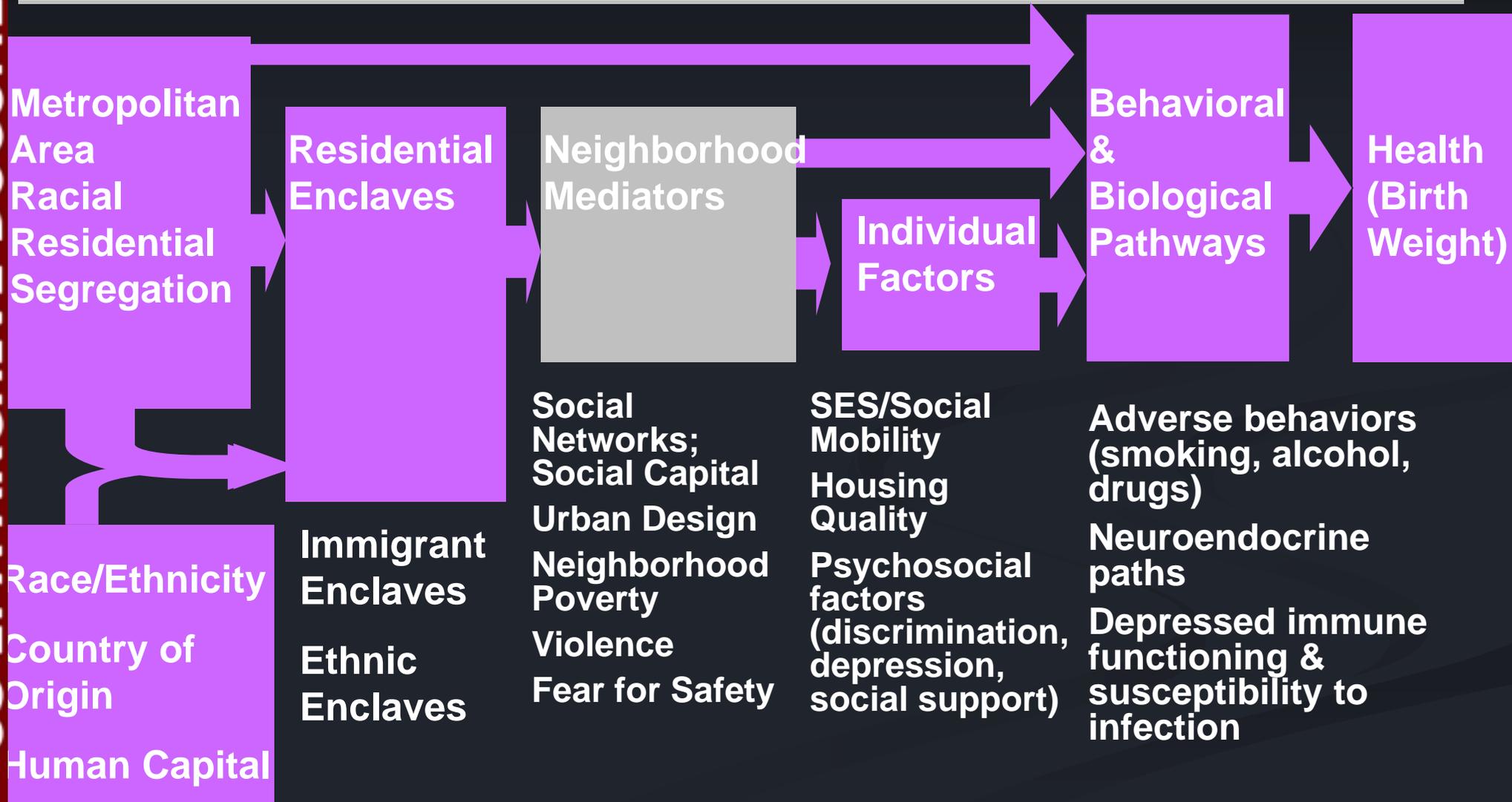
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- Is residence in an immigrant or ethnic enclave beneficial for birth weight?
  - Immigration sociologists have long highlighted the role of immigrant enclaves in facilitating successful immigrant adaptation
    - ✦ Social networks
    - ✦ Lower communication costs
    - ✦ Cultural goods
  - Immigrants encounter structural inequality associated with receiving context, and racial group membership (segmented assimilation theory)
    - ✦ enclaves are high poverty

Osypuk, Bates, Acevedo-Garcia (2010). *Social Science & Medicine*.

Portes & Stepick, 1993; Wilson & Portes, 1980; Fernandez Kelly 1996; Zhou 1996; Portes 2006

# Hypothesized Pathways: Racial Residential Segregation, Neighborhood Enclaves, & Health



Osypuk & Acevedo-Garcia 2008, *American Journal of Epidemiology*; Osypuk, Bates, et al., 2010, *Social Science & Medicine*

# Predictor of Interest: Enclaves

(Exposure Measures of Metropolitan Segregation of Mexican-born, & US-born Mexican-origin residents)

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- Provides a metropolitan-level summary measure (mean) of the average neighborhood (tract) environment for any specific group

$$\sum_{i=1}^n \left[ \left( \frac{x_i}{X} \right) (C_i) \right]$$

$i$  = tract (based on tract data)

$x_i$  = number of a certain group (e.g. Mexican Immigrants) in tract  $i$

$X$  = total population of a certain group (e.g. Mexican Immigrants) in the metro area

$C_i$  = a tract-level summary measure (e.g. % Mexican Immigrants)

# Example: Enclave Predictor Measure: Theoretically Derived Metropolitan Area Segregation Measures

- Calculate 6 residential segregation “Exposure” measures using Census 2000 tract-level data
  - Group-specific measures

← Individual-level Nativity →

Interpreted as the average neighborhood environment for the average group member

E.g. The average neighborhood % Mexican Immigrant for the average Mexican Immigrant

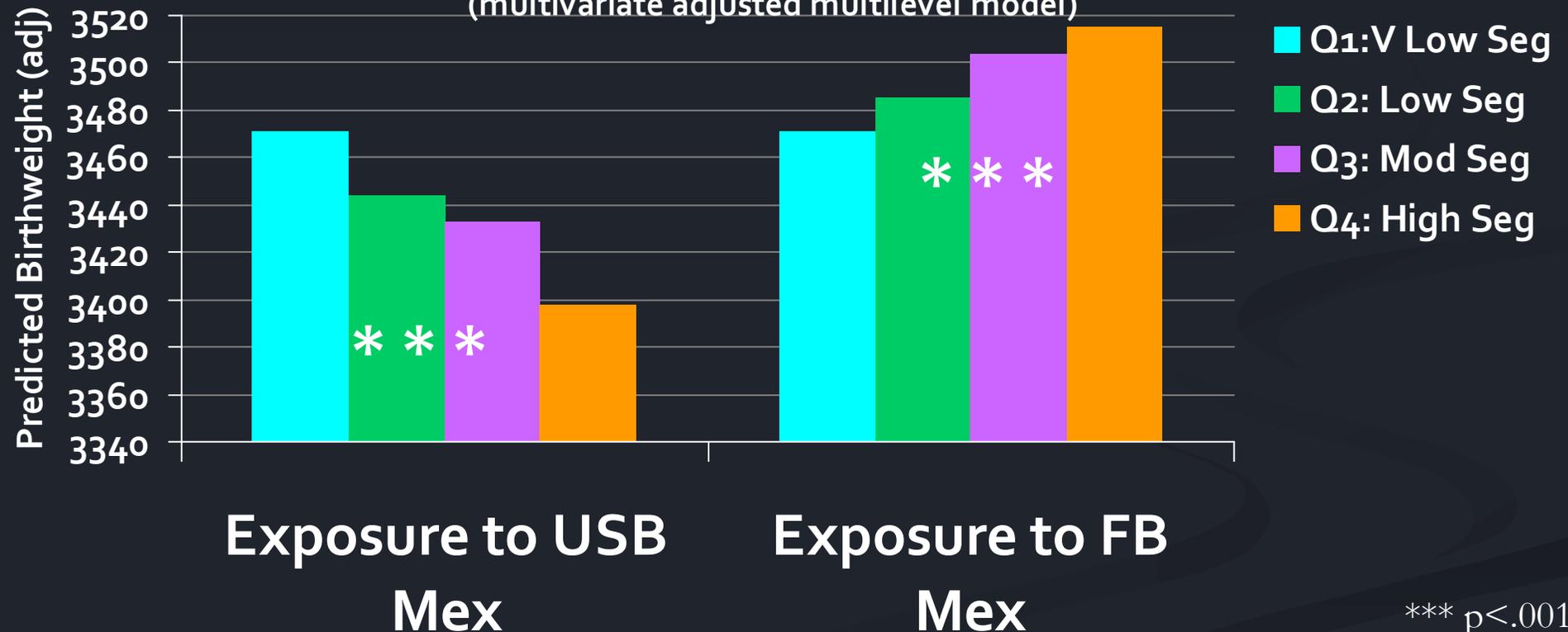
← Neighborhood Context →

	Mexican immigrants	US-Born Mexican Origin Residents
<b>Immigrant Enclaves</b> (Tract % Mexican Immigrants)	X	X
<b>Ethnic Enclaves</b> (Tract % US Born Mexican Origin)	X	X
<b>Poverty</b> (Tract % Poverty)	X	X

# Mexican segregation may be both harmful and beneficial for birthweight, depending on nativity of neighbors

## Exposure to Mexican Neighborhoods & Birthweight among US-Born Mexican Origin Women 2000

(multivariate adjusted multilevel model)



\*\*\* p<.001

# “Are Immigrant Enclaves Healthy Places to Live? The Multi-ethnic Study of Atherosclerosis”

Example: Neighborhood Effects

Osypuk, Diez Roux, Hadley, Kandula. *Social Science & Medicine*,  
2009, 69(1): 110-120.

# Do residents in immigrant enclaves exhibit better health behaviors?

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- What specific social and structural features of neighborhoods may mediate the associations between immigrant enclaves and health?

# Hypothesized Pathways: Racial Residential Segregation → Health for Latinos



# Methods: Ecometrics

## Perceived Neighborhood Quality Measures

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- MESA questionnaires, residential informants
- 4 scales and 2 indices
  - Multi-item scales and indices
    - Scales: 4 or 5 point Likert scales, mean values used, internal consistency reliability acceptable
  - Scales: social cohesion, safety, healthy food availability, walking environment
  - Indices: neighborhood-based social capital, recreational facilities availability.
  - Derived from published work including from prior MESA analyses

# Data and Measures

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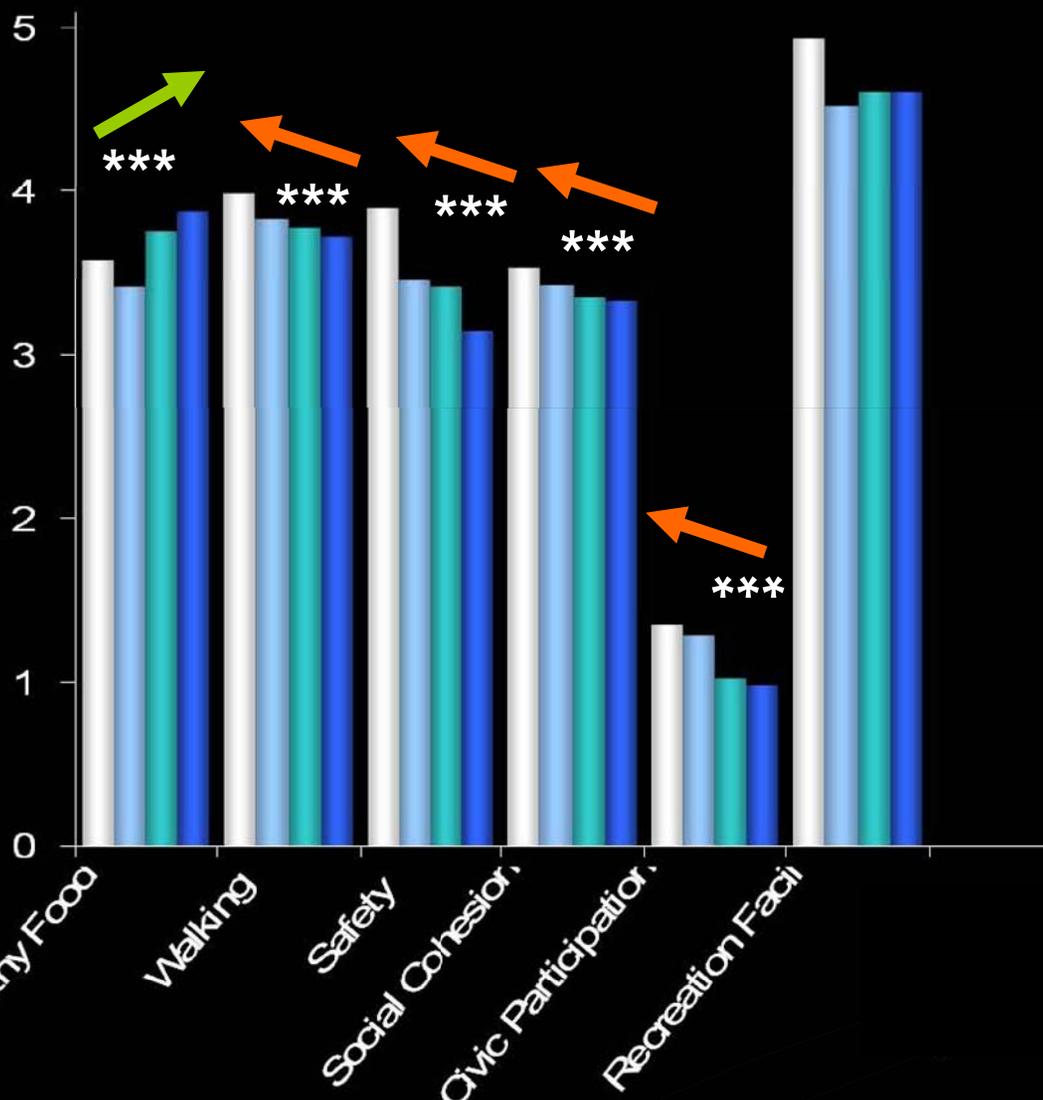
- Multiethnic Study of Atherosclerosis (MESA)  
10-year longitudinal study of risk factors for atherosclerosis
- MESA cohort is 6814 men and women aged 45-84 and free of clinical cardiovascular disease at baseline 2000-2002
- Today: Restricted to Latino participants

# Analytic Methods

- Creation of neighborhood exposure values
  - Country-specific immigrant enclave variables
  - Ecometric methods to create perceived neighborhood quality
- 2-level hierarchical multiple linear regression models
  - Model 1: Age-Gender Adjusted % Immigrant Quartiles
  - Models 2-5: Add Nativity , SES, Neighborhood SES, Acculturation
  - Model 6: Add neighborhood mediators
  - $y(\text{physical activity})_{ij} =$   
 $B_0j + B_1(\text{Neighborhood Immigrant Enclave, indicator var})_j +$   
 $B_2(\text{Neighborhood Perceived Environment, Ecometric})_j +$   
 $B_3(\text{Neighborhood Poverty})_j +$   
 $[\text{vector of individual level variables}]_{ij}$
  - Tested enclave linear trends

**Fig 1. Mean Neighborhood Quality by Quartile of Neighborhood Immigrant Composition**

■ Q1 low % immigrants      ■ Q2 low-mod % immigrants  
■ Q3 mod-high % immigrants      ■ Q4 high % immigrants

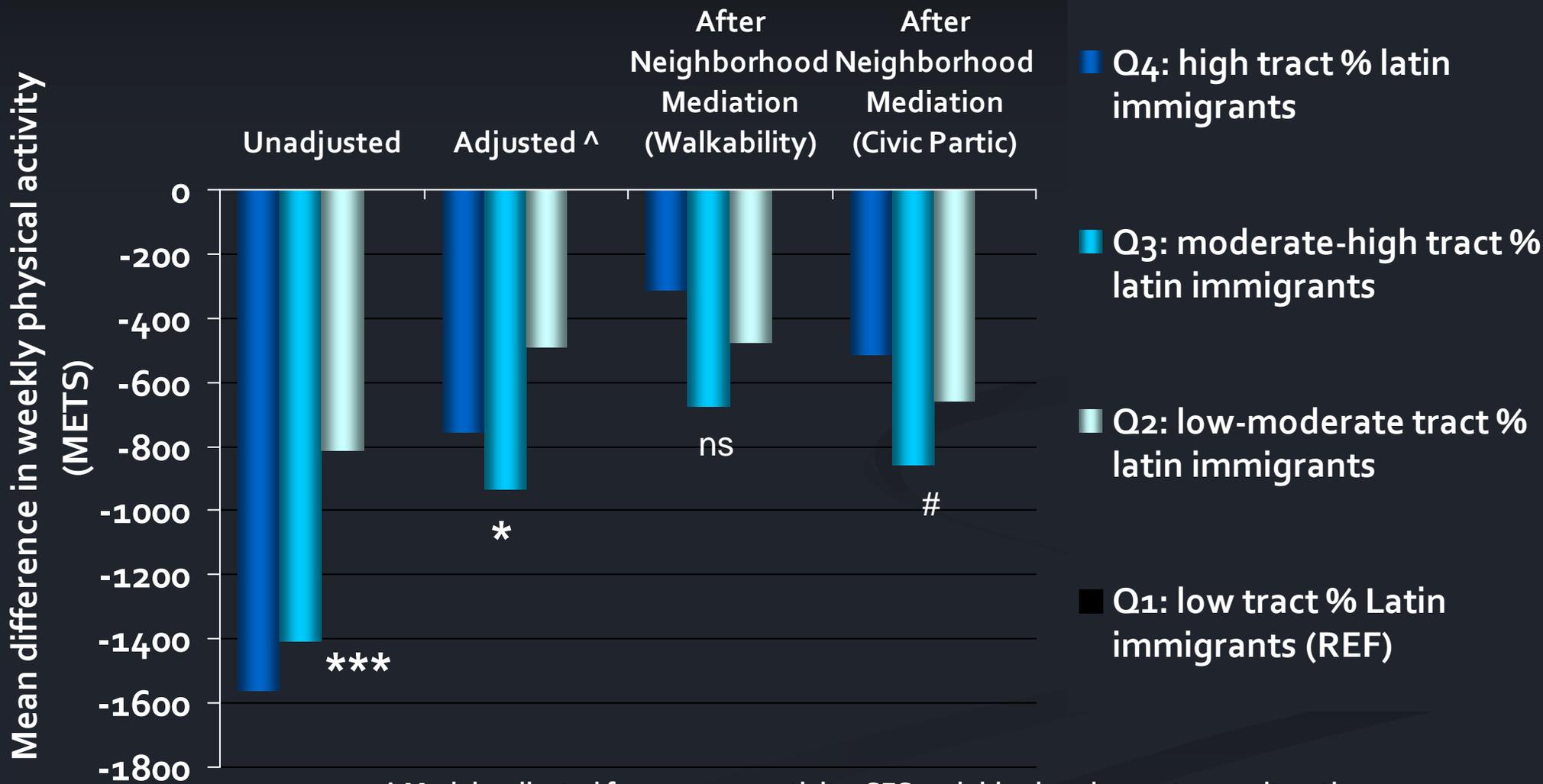


Hispanics

Neighborhood Attributes

Osypuk, Diez Roux, et al. 2009, Social Science & Medicine

# Adjusted Mean Differences in mean weekly physical activity (METS) by tract % Latin Immigrants (immigrant enclaves) for Hispanics. MESA Data.



^ Models adjusted for age, sex, nativity, SES, neighborhood poverty, acculturation  
 Trend test: \*\*\* p<.001 \*\*p<.01 \*p<.05 #p<.10

# Conclusions

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- Are immigrant enclaves health promoting because of social environments?
  - Our findings do not support this;
  - We found worse social environments for immigrant neighborhoods

# Conclusion

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- Social determinants patterned by place matter for health
- Different metro areas offer different distributions of “opportunity” neighborhoods on absolute & relative basis
- High racial segregation:
  - Separate but also unequal contexts
  - Quantifiable in absolute and relative terms using traditional & adapted segregation measures of racial inequality of neighborhood “quality”
- Place & Race-Based Exposure Assessment
  - Conceptualizing “place” exposures using social theory

**Thank you!**