The Spatial Context of Health Disparities:

University of Connecticut

Findings from the UConn-DPH Geocoding Collaborative

Wednesday, December 10, 2008
1:00 to 4:00 PM
The Lyceum
Hartford, Connecticut

DPH
Connecticut Department of Public Health

The Spatial Context of Health Disparities: A Literature Review

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The Spatial Context of Health Disparities

- There is an emerging focus in health disparities literature that examines how the living environment can explain poorer health outcomes among certain population subgroups.
- Contextual variables – Structural or social characteristics of an area
- Compositional variables – Characteristics of individuals in an area
- Area-based socio-economic measures (ABSMs) – Areal units used to link contextual and compositional variables to health disparities (zip codes, census tracts)

Themes in the Literature

- Studies that have linked contextual variables to health disparities by constructing and comparing unique ABSMs.
- Research that has investigated the relationship between health disparities and residential segregation.
- Analyses that have examined and linked health disparities to compositional and contextual factors using multi-level modeling (MLM).

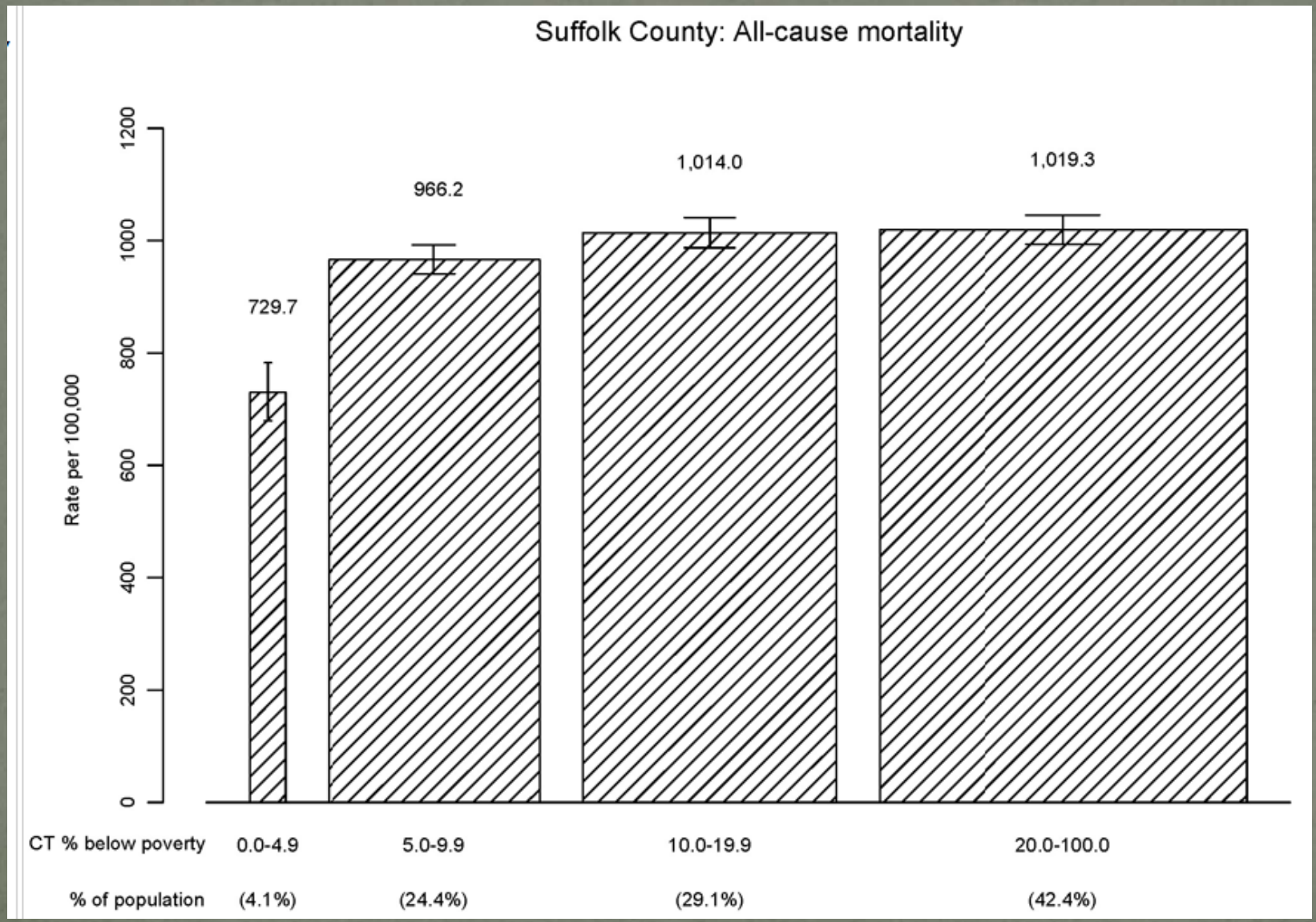
Is it Legitimate to use ABSMs to Analyze Health Disparities?

- Study by Dominguez-Berjan et al. (2006) found that ABSM-based odds ratios for many health outcomes were similar to those using individual level-variables.
- Spencer et al. (1999) concluded that the area-based Townsend Deprivation Index was an excellent predictor of low birth weight in newborns in the U.K.
- Use of aggregate measures can exaggerate the influence of individual-level measures for certain health outcomes (Geronimus et al., 2006).

The Public Health Disparities Geocoding Project

- Krieger et al. (2002) looked for health disparities in all-cause and cancer mortality rates by using eleven single variable measures and eight composite variable measures related to income, poverty, occupation, education and wealth.
- Measures related to economic deprivation (e.g. income and poverty) showed disparities in cancer and mortality rates that were not established by education or wealth measures.
- A later study by Krieger et al. (2003a) also found that measures relating to poverty rates showed more disparities in low birth weight and childhood lead poisoning than education, wealth, and occupation.

Findings from Krieger et al. (2002)



The Importance of Scale when Analyzing Health Disparities

- Krieger et al. (2002) found that gradients in health disparities were detected at finer geographic scales (census tracts and block groups) that were not evident at a zip code level of analysis.
- Later studies by Krieger et al. (2003a, 2003b, 2003c) and Thomas et al. (2006) concluded that disparities in health outcomes were best seen and predicted at a census tract level of analysis.

Segregation and Health Disparities

- Residential Segregation "refers to segregation in regard to the composition and spatial distribution of the population of an entire metropolitan area across its neighborhoods" (Acevedo-Garcia 2003: 215).
- According to William and Collins (2001) residential segregation is the "cornerstone" by which health disparities exist and grow.
- Segregated neighborhoods are "typically characterized by poverty, disempowerment, economic disinvestment, and limited availability of health care and other resources" (Jackson 2000: 615).

Latino Segregation in Metropolitan Areas

TABLE 1. LATINO/NON-LATINO RESIDENTIAL SEGREGATION: AREAS WITH HIGHEST AND LOWEST 1990 SCORES, AND GREATEST 1980–1990 INCREASES AND DECREASES

Rank	1990 Score	1980–1990 Change	Metropolitan Area	Largest Latino Group
Highest 1990 Segregation				
1)	71	+1	Reading	Puerto Rican
2)	66	+1	Lancaster	Puerto Rican
3)	66	0	Chicago	Mexican
4)	66	–1	Springfield, MA	Puerto Rican
5)	63	–1	Hartford	Puerto Rican
6)	62	+7	Providence	Puerto Rican
7)	61	+2	Allentown	Puerto Rican
8)	60	+1	Philadelphia	Puerto Rican
9)	60	–2	Naples	Mexican
10)	59	+1	Worcester	Puerto Rican
Greatest 1980–1990 Increase				
1)	36	+18	Reno	Mexican
2)	46	+15	Daytona Beach	Puerto Rican
3)	53	+9	Anaheim	Mexican
4)	38	+8	Atlanta	Mexican
5)	41	+8	Washington, DC	Other[a]
6)	33	+7	Santa Rosa	Mexican
7)	57	+7	Buffalo	Puerto Rican
8)	62	+7	Providence	Other[a]
9)	28	+7	Provo	Mexican
10)	52	+6	Lake County	Mexican

Source: Frey and Farley (1996)

Latino Segregation in Micropolitan Areas

		Dissimilarity index
Least segregated		
Wauchula	Florida	9
Grants	New Mexico	10
Lamesa	Texas	13
Deming	New Mexico	14
Edwards	Colorado	15
Clewiston	Florida	16
Eureka-Arcata-Fortuna[b]	California	17
Hood River	Oregon	17
Rio Grande City	Texas	17
Clearlake[b]	California	17
Most segregated		
Lufkin[b]	Texas	45
Nogales	Arizona	46
Emporia[b]	Kansas	46
Allegan[b]	Michigan	48
Palestine[b]	Texas	49
Sanford[b]	North Carolina	49
Payson	Arizona	50
Jamestown-Dunkirk-Fredonia	New York	52
Lexington[b]	Nebraska	60
Willimantic[b]	Connecticut	64

Source: Gonzalez et al. (2007)

Segregation and Health Disparities

- Jackson et al. (2000), Polednak (1991; 1993;, 1996a, 1996b), and Hart et al. (1998) found that all-cause mortality risk increased in areas with high levels of African American segregation.
- Morello-Frosch and Jesdale (2006) concluded that "increasing segregation amplified cancer risks associated with ambient air toxins for all racial groups combined."
- Acevedo-Garcia (2001) discovered that tuberculosis incidence was significantly related to residential segregation, especially among Hispanics and African Americans.

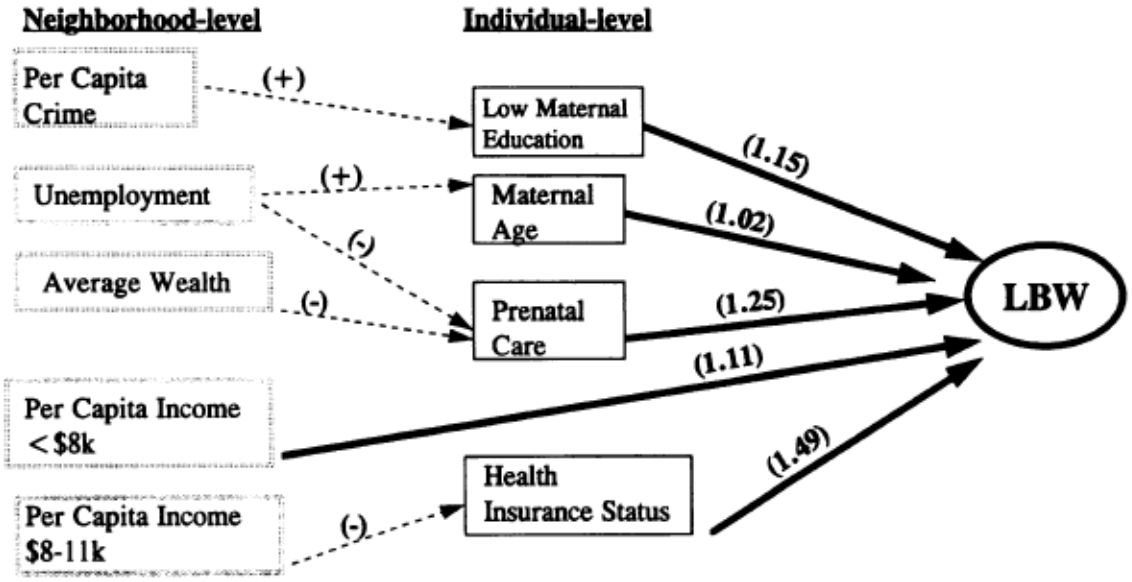
Multi-Level Modeling (MLM)

- Method of quantifying the impact of individual-level variables and contextual variables on particular health outcomes.
- Diez-Roux (2000) asserted that the added complexity that MLM offers might explain disparities in health conditions that cannot be found when modeling at a single level.
- Macintyre et al. (2002) concluded that MLM is a valuable tool in helping public health researchers explain why different health outcomes vary by location, even if they have similar population characteristics.

Public Health Studies using MLM

- O'Campo et al. (1997) used individual level variables and ABSMs at a census tract level to conclude that certain area-level variables (poor housing, high unemployment) could alter the relationship between individual risk factors and low birth weight in Baltimore.
- Yen and Kaplan (1999) found that "mortality risks were significantly higher in neighborhoods with a low social environment, even after accounting for income level, education, race/ethnicity, perceived health status, smoking status, body mass index, and alcohol consumption."
- Diez-Roux et al. (1997) used MLM to analyze individual-level health data and area-level data on education, income, and occupation at a block group level. The authors found that "living in deprived neighborhoods was associated with increased prevalence of coronary heart disease and increased levels of risk factors, with associations generally persisting after the adjustment for individual level variables."

O'Campo et al. (1997)



Note. Heavy arrows represent direct effects on low birthweight; odds ratios (ORs) for these direct effects are shown in parentheses. Interaction effects are indicated by broken-line arrows. These interaction effects modify the relationship between individual-level variables and low birthweight. For example, the increased risk of low birthweight for women with low levels of education (OR = 1.15 in neighborhoods with average crime rates) is stronger (+) in high-crime than in low-crime neighborhoods; the increase in risk with increasing maternal age (OR = 1.02 in neighborhoods with average unemployment levels) is stronger (+) in high-unemployment than in low-unemployment neighborhoods.

FIGURE 2—Risk of low birthweight (LBW) in Baltimore, Md, 1985 through 1989: direct and interaction effects of neighborhood-level and individual-level risk factors.

Issues with MLM

- O'Campo (2003) suggests that more qualitative research is needed to theorize how neighborhood environments influence health risks and outcomes.
- MLM techniques assume that neighborhood characteristics can influence an individual's health, even though it is impossible to know how long an individual has lived in a neighborhood.
- Many studies using MLM assume that neighborhoods are independent of one another and do not take into account the spatial interaction that occurs between them (Riva et al., 2003).
- Using census tracts for neighborhood analyzes assumes that individual tracts are cohesive communities, which may not be true in reality (Diez-Roux, 2003).

Public Health Disparities Projects

- Few public health disparities projects exist that look at the spatial context of the problem
- However, projects relating to spatial context of health disparities have been undertaken by the Washington Department of Public Health, New York State Department of Health, and the Pennsylvania State Department of Health.

Washington State Department of Public Health

- Largely replicated methodology used by the Public Health Disparities Geocoding Project to identify health disparities within the state.
- State researchers compiled census tract level variables that they grouped into several key perspectives including income inequality, social capital, racial discrimination, medical care, and others.
- These perspectives were used as explanatory variables for each of the major causes of death in the state.

New York State and Pennsylvania

- New York Community Assessment Clearinghouse – Each county in the state can be examined according to 14 health topic areas with each topic being represented by several explanatory variables.
- Pennsylvania Community Health Assessment Resources – Public can access county level health, behavioral, and socio-economic data. The website also provides information about hospital discharges, school violence, and air quality.

Conclusions

- Studies using contextual variables, residential segregation measures, and MLM have shown that it is important to analyze the spatial context of health disparities.
- Public Health Departments could learn much about the existence of health disparities if they replicated the methods of Krieger et al. (2002) and Washington State.
- Future research using cross-scaled approaches will add to our knowledge of how health disparities vary over space.