

Multilevel Analysis of the Role of Residential Segregation on Perinatal Outcomes in The South: The Effects of Space and Place

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Presenter Disclosure Tabia Henry Akintobi, PhD, MPH

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No relationships associated with this research to disclose

Overview of the Problem


- The Healthy People 2010 objective to reduce infant deaths to 4.5 per 1,000 live births
 - 6.9 National, 5.7 White, 13.6 Black (per 1,000 live births)
- Healthy People 2010 objectives to reduce low birth weight to 5.0 % and preterm deliveries to 7.6% represent leading causes of neonatal death and compromised quality of life to infants and families
- Largest disparities in adverse perinatal outcomes are by maternal ethnicity
- Ethnic disparities in adverse perinatal outcomes persist across socioeconomic strata



Review of Literature

Determinants of Perinatal Outcomes


- Traditional emphasis on micro level, individual risk factors
 - Behavioral, demographic and economic characteristics of individuals
- Increased focus on mezzo level, contextual characteristics
 - Social, physical environmental markers that are products of structural effects
- Multilevel analyses reveal unique individual and contextual risk factors associated with PTD and LBW



Review of Literature

Residential Segregation and Perinatal Outcomes

- Residential Segregation Correlated with Higher Rates of Infant Mortality
- Lack of Research on Adverse Perinatal Outcomes Associated with Increased Infant Mortality



Purpose of Study

- To investigate the relationship between residential segregation and perinatal outcomes in Florida, Georgia and Louisiana, with a specific emphasis on the moderating roles of ethnicity and median income

Structural Variables

Residential Segregation

- Definition
 - Physical separation of Blacks and Whites in residential contexts; the differentiation of two or more groups among dimensions of a given social space


Hypotheses

- Hypothesis 1: The level of residential segregation is positively associated with the likelihood of adverse perinatal outcomes after controlling for contextual and individual factors.
- Hypothesis 2: The relationship between residential segregation and the increased likelihood of adverse perinatal outcomes is moderated by ethnicity.
- Hypothesis 3: The relationship between residential segregation and the increased likelihood of adverse perinatal outcomes is moderated by median income.

Methods

Study Design

- Multilevel
- Observational
- Cross-sectional study
- Secondary data sources




Methods

Study Sample

- White and Black non-Hispanic Women
- Singleton Live Birth Deliveries
- Primiparous Women

- Exclusion Criteria
 - Foreign residents at the time of delivery
 - Births to women less than 15 years old or greater than 49 years old
 - Births delivered at greater than or equal to 45 weeks
 - Stillbirths
 - Births with improbable birthweight and gestational age combinations




Methods

Data Sources

- Birth Certificates (Florida, Georgia, and Louisiana)
 - Micro-level Control Variables
 - Moderating Variable-Ethnicity
 - Individual Perinatal Outcomes

- U.S. Census Bureau
 - Macro level variables-Residential Segregation
 - Evenness - Degree of spatial separation between Blacks and Whites
 - Index of Dissimilarity
 - Exposure - Degree of contact with members of same ethnic group
 - Isolation Index
 - The 2000 Neighborhood Change Database (1970-2000)
 - Mezzo-level Control Variable-Median Income

- Examination of live births occurring between 1999-2001



Methods

Analysis Plan

- Univariate Statistics
 - Means and Distributions
- Bivariate Statistics
 - Associations
- Multilevel Modeling
 - Three-level Nested Data Structure
 - Level 1-Birth Certificates, Individual
 - Level 2-Census Tracts, Contextual
 - Level 3-Metro/Micro Statistical Areas, Structural
- Sample Size: 255,548 women (Level 1) nested in 4,360 census tracts (Level 2) within 63 metropolitan or micropolitan statistical areas (Level 3)

Results

Distribution of Individual Covariates

VARIABLE	TOTAL (N=255,548)
Maternal Age, mean (SD)	24.70 (6.07)
Prenatal Care Adequacy, mean (SD)	1.34 (0.74)
Maternal Education, n (%)	
< High School	50,923(19.93%)
≥ High School	204,625 (80.07%)
Marital Status, n (%)	
No	116,614 (45.63%)
Yes	138,934 (54.37%)
Tobacco Use n (%)	
No	232,249 (90.88%)
Yes	23,299 (9.12%)

Results

Distribution of Adverse Perinatal Outcomes

VARIABLE	N (%)	OR (95% CI)
LBW (9.12%)		
White	10,721 (5.99%)	1.00
Black	9,537 (12.45%)	2.23 (2.17-2.30)
Preterm Delivery (9.77%)		
White	15,309 (8.55%)	1.00
Black	9,656 (12.61%)	1.54 (1.50-1.58)
SGA (11%)		
White	15,440 (8.63%)	1.00
Black	13,555 (17.70%)	2.28 (2.22-2.33)

Results

Hierarchical General Linear Models

- There was no evidence of an association between residential segregation and each perinatal outcome (Hypothesis 1)
- The relationships between residential segregation and perinatal outcomes were not moderated by median income (Hypothesis 3)
- Findings were similar for all models testing hypotheses

Results Example: Main Effects

	SGA		LBW		PTD	
	Odds Ratio	95% CI	Odds Ratio	95% CI	Odds Ratio	95% CI
Level 3 Intercept	0.06	0.05, 0.07	0.05	0.04, 0.06	0.11	0.08, 0.14
Area Size						
Metropolitan	1.00	1.00, 1.00	1.00	1.00, 1.00	1.00	1.00, 1.00
Micropolitan	1.02	0.95, 1.10	1.03	0.93, 1.13	0.94	0.84, 1.06
Dissimilarity Index	1.09	0.65, 1.82	0.80	0.42, 1.53	0.50	0.22, 1.17
Isolation Index	0.88	0.48, 1.62	1.26	0.54, 2.92	1.69	0.56, 5.01
Proportion Black	1.44	0.77, 2.67	1.15	0.53, 2.48	1.15	0.38, 3.49

Results Hierarchical General Linear Models

- Findings indicated mixed findings for the moderating effects of ethnicity on relationships between residential segregation and adverse perinatal outcomes in cross-level interactions.
 - Increased segregation (Isolation Index) significantly associated with decreased LBW for Black women (OR 0.36, 95% CI: 0.15, 0.87, p=0.02).
 - Residence in micropolitan statistical areas was significantly associated with increased risk of preterm delivery among Black women (OR 0.87, 95% CI: 0.77, 0.99, p=0.01).

Discussion

- The lack of an association between residential segregation and adverse perinatal outcomes in this study may be a function of several factors:
 - Ethnic stratification of residential segregation in the United States may be overestimated
 - Residential segregation in the South, in general, and for this study, in particular, are lower than national average
 - Historic and current influences of residential segregation may differ



Discussion

- The proportion of individuals with high school diplomas and proportion of owner-occupied homes in census tracts had positive and statistically significant associations with each adverse perinatal outcome.
- The inverse significant association between prenatal care adequacy, low birth weight and preterm delivery may be due to intensive prenatal care services targeted to women at heightened risk for poor outcomes.



Study Limitations

- The presence of an association (not causation) between the macro level factors and perinatal outcomes will be examined
- Reliability and Validity of Birth Certificate Reporting
- No psychosocial, attitudinal or stress measures examined
- Data did not permit examination of temporal effects, length of residential exposure, perceptions or residential preferences



Public Health Implications

- Disentangles the contribution of respective levels of causation on specific perinatal outcomes
- Increases awareness of factors, beyond the micro level, that should be considered in public health planning and interventions
- Findings point to the importance of contextual factors, that should be considered in the planning and targeting of perinatal interventions
- Potential justification for future multilevel, multi-method examinations of the subjective experience of macro level structures and their association with health outcomes



Recommendations for Future Research

- Conduct longitudinal, prospective studies, multilevel studies among cohorts of expectant mothers with mixed method assessments at several points throughout pregnancy
- Mixed method assessment should include examination of the following:
 - Psychosocial assessment of perceived stress and residential preferences
 - Biological testing
 - Multilevel modeling of individual and contextual risk factors
 - Duration of residential exposure
- Heterogeneity in the health outcomes of Blacks indicate the importance of research to increase understanding of both the protective and deleterious effects of cultural contexts



Thank You

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