Directly observed neighborhood attributes associated with poor diet and inadequate weight gain during pregnancy in an urban area of the U.S. south

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Abstract

Healthy diet, physical activity, smoking and adequate weight gain are all associated with maternal health and fetal growth during pregnancy. Neighborhood characteristics have been associated with poor maternal and child health outcomes yet conceptualization of potential mechanisms are still needed. Census data have long served as proxies for area level influences. Unique information captured by neighborhood inventories, mostly conducted in northern US and Canadian urban areas, has been shown to reveal important aspects of the community environment that are not captured by the demographic quantities in census data. This study used data from the Pregnancy, Nutrition and Infection (PIN) prospective cohort study to estimate the influences of individual- and neighborhood-level characteristics on health behaviors and adequacy of weight gain during pregnancy. In this paper we also describe a neighborhood data collection effort tailored to a southern urban area. Women who participated in the PIN study and who resided in Raleigh, NC and its surrounding suburbs were included (n=703). Findings suggest that neighborhood attributes distinguished among areas in which low-income pregnant non-Hispanic white and non-Hispanic black women live and are associated with poor health behaviors and outcomes during pregnancy. Neighborhood constructs of physical incivility and territoriality were not associated with smoking or diet quality. Physical incivility was crudely associated with decreased odds in participating in vigorous leisure activity before pregnancy and with inadequate gestational weight gain after controlling for several individual confounders.

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INTRODUCTION

In the last two decades, research assessing neighborhood characteristics has expanded from exclusive reliance upon administrative records such as census data to directly observed measures. Census data, used as a proxy for neighborhood characteristics, have been critical for identifying important associations between socioeconomic disadvantage and a variety of adverse maternal and child outcomes such as maternal mortality (Hertz, 1994), birthweight (Buka, 2003; Krieger, 2003; Morenoff, 2003; Pearl, 2001; Rauh, 2001; Gorman, 1999; O'Campo, 1997; Roberts; 1997; Wilcox, 1995; Parker, 1994), preterm birth (Ahern, 2003; Kaufman, 2003; Pickett, 2002; Herrick, 1996), neural tube defect (Wasserman, 1998), and infant mortality (Clarke, 1994; Hertz, 1994). Associations between poor neighborhood socioeconomic environment, as measured by census data, and important health behaviors that may influence the course of pregnancy were also identified such as less physical activity (Yen 1998), higher fat diets (Block 2004; Diez-Roux 1999), overweight among women but not men (Mujahid, 2005; Robert, 2004), and increased smoking (Chuang 2005; Kleinschmidt 1995); however, in one study no association was found between the interaction of neighborhood socioeconomic status and smoking and preterm birth (Ahern 2003).

While census variables might approximate a neighborhood socioeconomic context their utility is limited for several reasons. First, census data are available only at decennial intervals in the US,

whereas neighborhood conditions can change within the span of a few years. Second, the exclusive use of census variables, which are produced by aggregating individual responses to census questions, implies that the important features of 'neighborhoods' can be captured by aggregating individual measures, ignoring the important role of contextual community features including the presence of facilities, the nature of social interactions, the quality of shared space, and the investments in infrastructure and community life that facilitate healthful activities, choices and interactions (Macintyre, 2002; Yen, 1999). Third, while census variables continue to function as crude surrogates for neighborhood attributes, other aspects of the neighborhood need to be measured directly to more clearly understand pathways through which neighborhoods might influence health outcomes (O'Campo, 2003).

The shortcomings associated with census data have led to renewed appreciation of observational methods utilized outside the public health field and to the development of new tools designed to directly assess characteristics of the social and physical neighborhood environment (Caughy, 2001; Cohen, 2000; Raudenbush, 1999; McGuire, 1997; Perkins, 1992; Taylor, 1985). Direct observation for data collection emerged largely from urban ecologic models that described the patterns and consequences of the growth and development of cities in the early part of the 20th century (Park, 1925; Shaw, 1942; Yen, 1999). Previous research suggests direct observation of neighborhoods can be reliably measured and may offer specific insights into the neighborhood dynamics contributing to physical disorder, housing condition, territoriality expressions, social disorder, human interactions and evidence of alcohol, drug and tobacco use (Sampson, 2002). By selecting indicators of the probable mechanisms, directly observed data can more accurately define the populations at risk for adverse health outcomes, and can more validly identify the

elements in this etiologic pathway that may be targeted by public policy interventions. Further, as the health impacts of neighborhood characteristics may vary by race and social class, we explicitly considered directly observed neighborhood attributes in the context of explaining racial or social class health disparities (Boslaugh, 2004; Block, 2004).

Three gaps in the literature were identified. First, direct observation of neighborhood attributes has mainly occurred in Northern urban areas (Kohen, 2002; Caughy, 2001; Raudenbush, 1999; McGuire, 1997; Perkins, 1992; Taylor, 1985) and has yet to be conducted on urban areas of the new south; with the exception of New Orleans (Cohen, 2000). The new south is a term that describes the change in the US southern states from a largely agricultural to an urban/suburban region marked by social and economic changes, and rapid population growth due mainly to immigration of Hispanic and Asians to the region since the 1970s (Schmid, 2003). Second, research utilizing this approach, while generally collecting similar types of information (i.e., litter, broken windows), has not been standardized across localities, making comparison of the types of neighborhood attributes considered to influence health outcomes difficult. Third, association between directly observed data and health behaviors related to reproductive health has been limited.

We sought to address these research gaps by directly measure neighborhood characteristics in Raleigh, NC and its surrounding suburbs for the Pregnancy, Infection and Nutrition study; a cohort study of risk factors for preterm birth. The purpose of this paper is to 1) describe the direct observation data collection effort conducted in the urban and suburban areas representative of the new south; 2) describe neighborhoods and assess if neighborhood attributes differ by race;

3) compare prevalence of street level neighborhood attributes that comprise social and physical constructs between Baltimore, MD and Raleigh, NC; and 4) assess the relationship between neighborhood characteristics and health behaviors and health outcomes during pregnancy.

METHODS

Study Sample

Individual data and directly observable neighborhood attributes were collected as part of the Pregnancy, Infection, and Nutrition (PIN) cohort, a prospective study of determinants of preterm birth (Savitz, 1999). Participants were recruited from four prenatal care clinics in two settings: the University of North Carolina Residents' and Private Physicians' Obstetrics Clinics, the Wake County Department of Human Services, and Wake Area Health Education Center Prenatal Care Clinics. Between 1995 and 1999, 3,163 women were recruited into the study at 24 to 29 weeks' gestation, of whom, 973 reported their last address as within Wake County. Of these, 703 women whose addresses were within the city limits of Raleigh and its surrounding suburbs were included. Residential addresses were geo-coded by Geographic Data Technology (GDT), Inc., assigning latitude and longitude coordinates and census designations. Neighborhood-level data were collected on physical attributes such as housing condition, commercial property, and observable social interactions. Study procedures were in accord with the ethical standards of the Institutional Review Board of the University of North Carolina School of Medicine and Wake Medical Center.

Data collection

Individual Level PIN participants completed a self-administered 120-item modified NCI-Block Food Frequency Questionnaire between 26 and 28 weeks' gestation followed by a telephone interview at 26 to 31 weeks' gestation that solicited information on sociodemographic characteristics, health behaviors, and previous as well as current medical history. Chart review was conducted on all women to record weight gain and health during pregnancy.

Neighborhood instrument and protocol development and data collection

The Neighborhood Attributes Inventory was modified from a street survey developed in Baltimore, MD for a study to examine how neighborhood factors affected the cognitive and behavioral development of preschool age children (Caughy 2001). PIN team researchers and maternal outreach veteran home visitors; lay health advisors who visit and assist pregnant women with prenatal care, reviewed the instrument which resulted in a 39-item survey representing four categories of neighborhood attributes: neighborhood physical conditions; social interactions; nonresidential land use (commercial property); and public, residential and nonresidential space. The survey was pilot tested during five site visits. Ten students participated in a 30-hour training session focusing on inter-rater reliability focused on rating consistency across time, space and person. Operational definitions for each item were established in the Neighborhood Data Collection Protocol. Inter-rater reliability tests were conducted twice during training and three times during data collection. Eighty-three percent agreement was achieved during training and maintained throughout data collection among pairs of raters.

PIN women were located in 115 of 263 (44%) Wake County block groups, which formed the sampling frame for street segment selection. Ten percent of all street segments were randomly selected within the 115 block groups using Arcview ArcView 3.2a software (Arcview software, ESRI, 380 New York Street, Redlands, CA 92373-8100). Street segments were elongated to the nearest natural break or intersection. PIN participants' street segments were added to the sample if they were not included in the original 10% sample. A total of 2771 street segments (21% of all street segments contained in the 115 block groups) comprised the final sample. Block groups were of variable size; the mean number of block group street segments was 24 (range, 6-66 street segments). Baltimore, MD, is typical of the urban northeast with jobs concentrated in the central city, areas of concentrated poverty, and most neighborhood streets are organized in a grid system, while Raleigh, NC, is typical of the new south with a small downtown area mostly made up of government buildings, new development drawing commuters away from the city center, less concentrated poverty, lower living density and streets that are long and meandering. The average area of census block groups for Raleigh and its suburbs is 1.26 square miles (range, 0.10 to 15.64), considerably larger than the average area of 0.1 square miles (range, 0.02, 0.45) in Baltimore. Defining the end point of a street was particularly challenging due to inconsistent street lengths on opposing sides of the street. Street endings were defined as a natural break or intersection. Because of the longer length and non-grid nature of streets, the larger geographical area for each block group of Raleigh, NC compared to Baltimore, MD, and the random sampling scheme, a windshield survey was undertaken to observe each sampled block face. The raters worked in pairs, driving each street segment between 9 am and 4 pm. Each street segment survey took 5-10 minutes to finish. Data collection was completed in 3 months during the summer of 2001.

Measures

Individual Level Three pregnancy related health behaviors important to maternal health and fetal growth were modeled. First, any smoking during pregnancy (yes/no) was characterized by dichotomizing the response to the average number of cigarettes smoked per day during pregnancy, and any vigorous leisure activity three months prior to pregnancy (yes/no) was constructed as a dichotomous variable. Both were obtained by self-report through the phone interviews. Diet quality index during pregnancy (DQI-P) was the third important health behavior that was assessed at about six months gestation. DQI-P was based on ten points each for eight categories: servings of grains, fruits and vegetables, percent of energy from fat, adequacy of iron, folate and calcium intake and a meal pattern score, for a total of 80 points (Bodnar 2002). DQI-P was constructed as tertiles to compare women scoring the worst compared to the best tertile. Finally, weight gain adequacy was categorized by the Institute of Medicine recommendation for gestational weight gain based on prepregnancy BMI status (IOM 1990). Women categorized as achieving inadequate or excessive weight gain were compared to women who had adequate weight gain.

Neighborhood definition

For this research, neighborhood was defined as the census block group because it represents the smallest census unit that may approximate one's neighborhood while still providing stable exposure estimates. Previous research in perinatal and children's health has found the block group to be an appropriate level of analysis for similar outcomes (Krieger, 2003).

Neighborhood scale development

Two theoretically informed scales were constructed based on previous research in Baltimore, MD: physical incivilities and territoriality (Caughy, 2001). The first, signs of physical incivilities, a combination of physical disorder and poor housing condition, are theorized to communicate decreased local social control and may contribute to crime and further neighborhood deterioration (Perkins, 1992). Items comprising the physical incivilities scale include condition of housing, yards, commercial and public spaces, vacant or burned property, litter and graffiti. The second scale, territoriality, is comprised of indicators including fences, hedges, decorations, and signs, which serve as physical and symbolic demarcations of residential property, and are thought to communicate ownership and social control that lead to protective effects against crime and adverse community events (Perkins, 1992; Taylor 1985, 1984). Each scale was constructed through factor analysis using the loading value from the first factor for each item to weight how much the item contributed to the latent construct.

Statistical Methods

Counts of each street level neighborhood attribute were calculated, and a dichotomized indicator for presence/absence of each attribute was constructed. Block group proportions, the number of streets with the attribute divided by the total number of segments rated, were calculated. In race-stratified analyses, proportions of block group attributes were compared using t-tests to explore how neighborhood attributes varied by race. Neighborhood scales were tested for internal reliability with a maximum likelihood tests to assess the hypotheses of 0 true factors and no more than one factor for each scale using a $\chi 2$ test with $p=<0.05$, and with Cronbach's alpha. Spearman's correlation coefficient was used to assess association between the two scales.

Multivariate logistic regression analysis assessed the association between the two scales and any smoking during pregnancy and vigorous leisure activity three months prior to pregnancy. Multinomial logistic regression was used to estimate the influence of incivilities and territoriality on falling into the worst compared to the best DQI-P tertile. Finally, multinomial logistic regression was used to estimate the influence of these constructs on adequacy of weight gain recommended by the Institute of Medicine (IOM 1990). Adjusted models controlled for race/ethnicity (non-Hispanic white, non-Hispanic black or other race); an indicator variable for: marital status (married or not married), education (above/below high school), income (above/ below 185% of poverty) and any children (yes/no); and continuous variable for age and BMI. A robust variance estimator was used to account for clustering of neighborhood characteristics at the block group level (Rogers 1993, Williams 2000). The robust variance estimator is used for correlated data, for example, one might expect that women living in the same neighborhood (i.e., block group) might be similar to each other in some unmeasured way. The robust variance estimator accounts for these correlations if they exist, being robust to the assumption that observations are independent, resulting in the same point estimate generated from a standard model, but with a change in the confidence intervals. Analyses were conducted using Stata 8.2 (Stata/SE 8.2 for Windows, StataCorp LP, College Station, TX).

RESULTS

Description of PIN participants

Among the 703 Wake County Pin participants with complete address files, 27% were non-Hispanic white, 66% were non-Hispanic black and 7% were of other races. The mean age of PIN participants was 24 years (range, 16-40 years). Sixty-two percent were married and 60%

had a high school education or less. The socioeconomic status of the group suggests that this is a relatively low-income population. The mean income, as a percentage of the poverty level was 142% poverty (range, 8-857% poverty); 79% of the sample had incomes at or below 185% of the poverty level (WIC income eligibility criteria). Twenty five percent smoked and only 13% engaged in vigorous leisure activity three months before pregnancy. The average diet quality score was 56 (range, 14 to 79 out of a possible 80). Twenty percent gained inadequate and 61% gained excessive gestational weight.

As a result of the economic and racial segregation typical of the new south, we anticipated non-Hispanic white and non-Hispanic black women would live in qualitatively different neighborhoods in Raleigh. Table 1 compares the prevalences of selected neighborhood characteristics between non-Hispanic white women and non-Hispanic black women. Non-Hispanic white women were more likely to live in single family dwellings (60.4 versus 50.0%) and in block groups with sidewalks (61.0 versus 49.6%) whereas non-Hispanic black women were more likely to live in block groups with litter (63.0 versus 41.4%) and no trespassing signs (21.1 versus 11.1%). These differences persisted despite the PIN sample comprising mostly low-income women of both races.

The neighborhood attribute data suggest that the new south differs from the urban northeast in important ways. Items measuring physical incivilities, including graffiti, moderate/considerable litter, vacant/burned properties, poorly maintained yards, housing, and public spaces, were strikingly less prevalent in Raleigh than in Baltimore (e.g., 4% compared to 31% vacant residence, respectively). Items measuring territoriality, including neighborhood watch/no

trespassing signs, neighborhood name, reaction of residents to raters, presence of borders and decorations, had similar prevalence rates for Raleigh and Baltimore (Table 2).

The two scale appeared to represent two unique latent constructs since we could not reject the null hypotheses of 0 true factors and more than 2 factors since the maximum likelihood χ^2 statistic was significant at p=0.05, suggesting that there were more than 0 but less than 2 factors represented by the items measured. Furthermore, the Cronbach's alpha for items represented in the physical incivility scale was 0.81 and that for territoriality was 0.56 suggesting high and moderate internal reliability of the scales. We therefore, used the items that represented the scales previously published (Caughy 2001). The two scales were weakly correlated at 0.02 indicating the scales represent two distinct latent constructs. These findings suggest that there are fewer overt physical signs of incivilities in the south, or that incivilities might be manifested in other ways.

Table 3 shows the description of selected individual characteristics and outcomes by the tertile of block group physical incivility and territoriality. In bivariate analysis there were a higher percentage of non-Hispanic black women, women who did not engage in vigorous leisure activity and who gained inadequate weight during pregnancy, living in block groups of the highest tertile for physical incivilities. Contrary to our expectations, in bivariate analysis territoriality was not positively associated with healthy behaviors and negatively associated with unhealthy behaviors. The proportion of women falling into the poorest diet quality tertile increased with increasing tertiles of territoriality.

Neighborhood scales of physical incivilities and territoriality were modeled as exposures that might influence health behaviors of smoking, diet, leisure activity and the health outcome of gestational weight gain. We did not find an association between physical incivility or territoriality and smoking during pregnancy (Table 4). We did find about a 50% decrease in engaging in vigorous leisure activity among the worst compared to the best tertile of neighborhood physical incivility (OR 0.49, 95% CI 0.28, 0.88) and evidence of a dose response relationship with increasing levels of physical incivilities; however, this association was attenuated and became insignificant after adjusting for confounders. With regard to diet quality, living in a neighborhood characterized by signs of territoriality was associated with increased odds of falling into the lowest compared to highest DQI-P tertile and evidence of a dose response relationship; however, this relationship was attenuated after adjusting for confounders. No association was found between physical incivility or territoriality and excessive weight gain (data not shown); however, a significant association was found between living in neighborhoods characterized by signs of physical incivilities and inadequate weight gain, and remained significant after controlling for age, children, education, income, marital status and race (adjusted OR 2.32, 95% CI 1.04, 5.14).

DISCUSSION

This research sought to describe a relatively understudied region of the US – the new south. Conducting a windshield tour of Raleigh, NC and surrounding suburbs was necessary because of the large geography and low density living typical of the new cities of the south. Although direct observation data was collected via driving, we found the method to be adequate to capture the neighborhood attributes through a data collection instrument previously used in Baltimore, MD.

The second objective of this paper was to analyze race-stratified neighborhood attributes, indicating that within the PIN sample low-income non-Hispanic white and non-Hispanic black women live in qualitatively distinct neighborhoods. Based on theories of psychosocial etiology for adverse reproductive outcomes (Dole, 2003; Dole, 2004), these very different environments may have important effects on racial disparities in preterm birth, a profound health disparity in the US, especially in the US south.

The research further sought to compare the attributes of a city typical of the new south, Raleigh NC and its suburbs, with those of Baltimore MD, a city characteristic of the northern urban industrial center. Despite the scarcity of items representing incivilities in the Raleigh area, both the incivilities and territoriality scales appeared internally reliable (based on Cronbach's alpha scores). The low correlation estimates between the scales suggested that the scales captured distinct constructs and provided unique information about neighborhood attributes. We hypothesize that physical incivilities and territoriality are importantly associated with reproductive health outcomes in Raleigh, NC and its surrounding suburbs, largely through psychosocially mediated pathways (Dole, 2004).

The fourth objective of this paper was to demonstrate that the unique neighborhood information obtained through direct observation may help us understand how neighborhoods influence health behaviors during pregnancy. Our null finding between physical incivilities or territoriality and smoking was surprising since 25% of women in these analyses smoked at some point during pregnancy. Our findings; however, most likely support previous findings that although

neighborhood environment has been shown to influence smoking status (Chuang 2005, Kleinschmidt 1995), the association between neighborhood effects on smoking has not been shown to influence birth outcomes (Ahern 2003). Although the results of the association between physical incivilities and vigorous leisure activity were attenuated, the crude negative association and evidence of a dose response relationship suggests that physical incivilities may influence vigorous leisure activity. It may be that our sample size was too small both with regards to the number of women in these analyses and the study area that was limited to one geographic area within a county. Other researcher has found that neighborhoods characterized by poor physical environments associated with decrease physical activity, possibly because of fear of crime (Boslaugh 2004). Physical incivility was also associated with inadequate weight gain in these data. Adequacy of weight gain could be influenced by perceptions of crime, anxiety or through other psychosocially mediated pathways (Dole 2004).

Disadvantaged neighborhoods may influence reproductive health outcomes through a variety of material and psychosocial pathways, including exposure to stressful and restrictive environments, lack of economic opportunity, class-based residential segregation, and race-based residential segregation. Although newly developed southern US cities are notably less segregated than the industrial centers of the northeast (Massey, 1989), the recent establishment of these communities may provide fewer social resources that could help to buffer effects of harmful environments. Furthermore, cities in which major growth has occurred since the automobile became ubiquitous are more geographically dispersed and may reduce easy access to facilities and amenities compared to cities with concentrated population centers and long-established urban transit systems. Reduced service concentration may be especially burdensome

for poor individuals and families who may not own a car or have hours to devote to traveling between service facilities. Future research can expand on the neighborhood survey tools by incorporating checklists to capture area resources, or by augmenting with geographic information system information of area resources. Furthermore, recent growth in new south centers such as Raleigh, Charlotte and Atlanta has occurred since the era of suburban flight, meaning that center-city areas were never abandoned, since the center city never gained prominence in this later era. This implies a lower prevalence of the 'incivilities' that emerge when populations abandon decaying areas of the city for opportunities in newer suburbs. Patterns of poverty and neighborhood development are different in the newly urbanized regions of the US south because of the growth of these areas in an era since the demise of heavy industry as the basis for economic organization (Cooke, 1999).

Future research is needed to corroborate data collection methods and findings. Analysis using the physical incivilities and territoriality scales both weighted and unweighted to predict health outcomes, particularly adverse birth outcomes is needed and forthcoming.

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Table 1: Street segment attribute prevalence rates, standard deviation (sd) and range within block groups and by race, Raleigh, NC (n=115)

Neighborhood Attribute	Prevalence	Range	non-Hispanic white	non-Hispanic black
HOUSING & STREET ITEMS				
Presence of multiple dwellings	32.2 (24.8)	0-91%	27.7 (22.6)	41.8 (24.8)*
Presence of only single dwellings	59.2 (24.0)	9-100%	60.4 (19.8)	50.0 (23.4)*
Good housing condition	81.5 (21.6)	12-100%	85.3 (15.3)	73.1 (26.5)*
Presence of yards	92.7 (13.3)	57-100%	92.0 (11.7)	90.2 (11.7)
Good condition of yards	74.4 (22.1)	8-100%	77.4 (17.2)	68.0 (22.9)*
Presence of any litter	48.1 (30.4)	0-100%	41.4 (26.5)	63.0 (27.5)*
Presence of graffiti	1.4 (0.3)	0-17%	1.1 (1.9)	3.1 (4.5)*
Presence of sidewalks	54.4 (26.0)	0-100%	61.0 (23.4)	49.6 (19.9)*
Presence of street lamps	89.0 (16.8)	26-100%	80.6 (21.5)	91.2 (10.6)*
SOCIAL INTERACTION				
People present	28.6 (16.8)	0-70%	27.2 (12.5)	40.4 (19.1)*
Presence of parks	6.3 (9.9)	0-46%	4.3 (4.8)	6.8 (8.4)*
Presence of porches	44.5 (20.0)	9-90%	38.4 (15.0)	45.9 (20.2)*
SYMBOLIC AND PHYSICAL BOUNDARIES				
Presence of decorations	57.6 (15.2)	11-82%	59.9 (12.3)	51.2 (12.5)*
No Trespassing Sign	13.0 (15.5)	0-83%	11.1 (8.5)	21.8 (17.4)*

Neighborhood Sign	11.8 (10.0)	0-50%	14.1 (8.3)	15.7 (9.8)*
Community Watch Sign	18.0 (13.8)	0-57%	17.5 (11.7)	21.1 (11.6)*
Security Warning Signs	10.5 (6.7)	0-29%	9.6 (5.7)	13.5 (7.6)*
Presence of borders (hedges or fences)	36.3 (12.8)	0-71%	35.0 (12.6)	37.0 (12.3)
COMMERCIAL AND PUBLIC SPACES				
Presence of commercial buildings	23.6 (20.8)	0-94%	19.3 (15.2)	26.8 (17.3)*
Abandoned commercial building	3.9 (9.4)	0-50%	2.2 (8.0)	6.0 (11.0)*
Security bars on commercial buildings	13.0 (20.7)	0-100%	9.2 (15.0)	17.7 (18.6)*
Presence of new home construction	1.8 (5.2)	0-33%	2.9 (7.2)	1.9 (5.3)
Good condition of public spaces	87.3 (14.0)	12-100%	87.5 (11.0)	83.9 (17.7)*

* Probability of difference in scores ($p = <0.05$) using two sided t-test for mean differences compared to non-Hispanic white women

Table 2: Prevalence of neighborhood attributes at the street level for Baltimore, MD and Raleigh, NC

Prevalence of physical incivility items among streets in two cities		
	Baltimore, MD (n=1135)	Raleigh, NC (n=2771)
Vacant residences	31.0	4.0
Poor ground condition	9.8	0.6
Moderate/considerable litter	25.0	4.5
Graffiti	39.0	1.4
Poor commercial building condition	11.0	1.8
Vacant commercial buildings	9.0	4.5
Poor condition of public spaces	33.0	1.8
Prevalence of territoriality items among streets in two cities		
	Baltimore, MD (n=1135)	Raleigh, NC (n=2771)
Resident's reactions to raters	61.0	28.0
Neighborhood sign	2.5	13.0
Community watch sign	Not published	18.0
Security warning sign	74.0	46.0
No trespassing sign	Not published	12.0
Security bars on homes	25.0	Not present
Borders—fences, shrubs	41.0	58.0
Decorations	61.0	91.0

Table 3: Sociodemographic and health behaviors by tertiles of incivility and territoriality

	Low Incivility	Mid Incivility	High Incivility	Low Territoriality	Mid Territoriality	High Territoriality
non-Hispanic white	31%	48%	21%	36%	35%	29%
non-Hispanic black	18%	35%	47%*	35%	30%	35%
Other	25%	48%	27%	50%	20%	30%
Smoke	22%	38%	40%	34%	32%	34%
No P.A.	21%	38%	41%†	36%	31%	33%
Worst DQI	38%	24%	38%	30%	34%	36%†
Inadequate	13%	40%	47%†	32%	32%	36%
Excessive	26%	42%	32%	38%	31%	32%

* Probability of significant difference at $p < 0.001$ compared to non-Hispanic white women in low physical incivility neighborhoods
† Probability of significant difference at $p < 0.02$ compared to women in low physical incivility or low territoriality neighborhoods

Table 4: Association between scales and health behaviors and inadequacy of weight gain

	Smoking		Vigorous leisure activity		Worst DQI tertile		Inadequate weight gain	
	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted	Crude	Adjusted
Low incivil	1.0	1. 0	1.0	1.0	1.0	1.0	1.0	1.0
Mid incivil	1.02 (0.62, 1.68)	0.93 (0.52, 1.64)	0.83 (0.51, 1.36)	0.90 (0.56, 1.44)	1.02 (0.69, 1.50)	0.92 (0.61, 1.38)	1.79 (0.86, 3.72)	1.81 (0.81, 4.05)
High incivil	1.09 (0.66, 1.81)	1.18 (0.66, 2.09)	0.49 (0.28, 0.88)*	0.65 (0.38, 1.13)	0.97 (0.64, 1.48)	0.95 (0.58, 1.55)	2.26 (1.16, 4.38)*	2.32 (1.04, 5.14) *
Low territ	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Mid territ	1.13 (0.69, 1.85)	1.01 (0.58, 1.75)	1.26 (0.75, 2.13)	1.26 (0.79, 2.00)	1.27 (0.84, 1.92)	1.31 (0.86, 1.99)	1.66 (0.99, 2.77)	1.66 (0.92, 2.98)
High territ	1.08 (0.68, 1.74)	0.97 (0.56, 1.69)	1.06 (0.63, 1.79)	1.22 (0.76, 1.96)	1.76 (1.13, 2.72) *	1.53 (0.94, 2.49)	1.21 (0.62, 2.34)	0.98 (0.45, 2.12)
non-Hispanic white		1.0		1.0		1.0		1.0
non-Hispanic black		0.25 (0.15, 0.40)		0.91 (0.50, 1.66)		0.54 (0.33, 0.89)		0.71 (0.31, 1.63)
Other race		0.15 (0.05, 0.44)		2.35 (1.18, 4.66)		0.62 (0.29, 1.34)		0.42 (0.11, 1.66)
> High school		1.0		1.0		1.0		1.0
≤ High school		2.18 (1.42, 3.37)		0.69 (0.40, 1.19)		1.23 (0.81, 1.86)		1.08 (0.55, 2.12)
> 185% poverty		1.0		1.0		1.0		1.0
≤ 185% poverty		1.18 (0.68, 2.06)		0.69 (0.40, 1.19)		0.99 (0.56, 1.75)		0.97 (0.48, 1.97)
Maternal age		1.04 (0.99, 1.08)		1.00 (0.95, 1.05)		0.97 (0.93, 1.02)		1.07 (1.00, 1.14)
Married		1.0		1.0		1.0		1.0
Not married		0.65 (0.41, 1.02)		1.32 (0.84, 2.07)		0.86 (0.52, 1.40)		0.28 (0.13, 0.57)

No children	1.0	1.0	1.0	1.0
Any children	0.90 (0.58, 1.39)	0.70 (0.42, 1.17)	1.85 (1.26, 2.74)	1.49 (0.78, 2.84)
BMI	N/A	N/A	N/A	1.14 (1.07, 1.21)

* Significant test for trend using a z statistics with $p \leq 0.05$