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The Impact of the Built Environment on Children's School Conduct Grades: The Role of Diversity of Use in a Hispanic Neighborhood

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Abstract

A population-based study examined the relationship between diversity of use of the built environment and teacher reports of children's grades. Diversity of use of the built environment (i.e., proportion of a block that is residential, institutional, commercial and vacant) was assessed for all 403 city blocks in East Little Havana, Miami—a Hispanic neighborhood. Cluster analysis identified three block-types, based on diversity of use: Residential, Mixed-Use, and Commercial. Cross-classified hierarchical linear modeling was used to examine the impact of diversity of use, school, gender, and year-in-school on academic and conduct grades for 2857 public school children who lived in these blocks. Contrary to popular belief, mixed-use blocks were associated with optimal outcomes. Specifically, follow-up analyses found that a youth living on a residential

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block had a 74% greater odds of being in the lowest 10% of conduct grades (conduct GPA <2.17) than a youth living on a mixed-use block. In fact, an analysis of the population attributable fraction suggests that if the risk associated with residential blocks could be reduced to the level of risk associated with mixed-use blocks, a 38% reduction in Conduct GPAs <2.17 could be achieved in the total population. These findings suggest that public policy targeting the built environment may be a mechanism for community-based interventions to enhance children's classroom conduct, and potentially related sequelae.

Keywords

Built environment; New urbanism; Hispanic; Latino; Children; Cross-classified hierarchical linear modeling

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The built environment, or the way humans design and build communities and neighborhoods, is increasingly recognized as a predictor of psychological and physical health (Dannenberg *et al.*, 2003; Evans, 2003; Leyden, 2003; Northridge, Sclar, & Biswas, 2003; Saelens, Sallis, Black, & Chen, 2003; Srinivasan, O'Fallon, & Dearry, 2003). The study of the built environment in its association with human behavior and health is an emerging, transdisciplinary field involving the collaboration of architects, city planners, behavioral and social scientists, biologists, health scientists, environmental scientists, and urban historians (for reviews, see Cummins & Jackson, 2001; Diez Roux, 2003; Evans, 2003; Humpel, Owen, & Leslie, 2002; Northridge *et al.*, 2003; Srinivasan *et al.*, 2003). Findings suggest associations between characteristics of the built environment (e.g., community design) and precursors of illness such as obesity (Ewing, Schmid, Killingsworth, Zlot, & Raudenbush, 2003), through their association with physical activity (Davison, Ford, Cogswell, & Dietz, 2002; Handy, Boarnet, Ewing, & Killingsworth, 2002). Specific built environment character istics have been found to enhance opportunities for beneficial social interactions (Abu-Ghazzeh, 1999; Skjaeveland & Garling, 1997). Leyden (2003) found that persons living in walkable, mixed-use urban neighborhoods had higher levels of social capital than individuals living in car-oriented suburbs.

The relationship between the built environment and health may be particularly salient for children who are vulnerable to their environmental context. Early work in environmental psychology examined topological models (Lewin, 1935) and behavior settings, particularly schools (Barker, 1968; Barker & Gump, 1964), as mediators of behavior. However, little research has examined theoretically-based built environment features of neighborhoods' public space as risk or protective factors for children's behavioral outcomes (cf., Cummins & Jackson, 2001; Heimstra & McFarling, 1974). Instead, research examining behavioral outcomes for children and adolescents has often focused on psychosocial predictors, such as neighborhood crime (Bowen & Bowen, 1999; Simons, Simons, Conger, & Brody, 2004), gang activity (Cox, 1996; Thornberry, Krohn, Lizotte, & Chard-Wierschem, 1993), and parental monitoring (Beyers, Bates, Pettit, & Dodge, 2003; Gorman-Smith, Tolan, & Henry, 1999; Walker-Barnes & Mason, 2001).

This article represents the first study within a larger program of research that examines the risk and protective aspects of the built environment for psychosocial and health outcomes in Hispanic populations. The present study examines the role of one aspect of the built environment, diversity of use, in predicting school grades among 2857 Hispanic children within East Little Havana, an urban-poor neighborhood in Miami, Florida, that at the time of the study was over 94% Hispanic (U.S. Census Bureau, 2000).

Diversity of use

Diversity of use of the built environment refers to the extent to which the buildings within a neighborhood serve multiple purposes (e.g., are businesses located in close proximity to residential housing?). Sometimes diversity of use occurs within a single building with storefronts at the street level and apartments above. Blocks and streets with multiple building uses provide the possibility that residents live in close proximity to places of work, shopping, and recreation (Duany, Plater-Zyberk, & Speck, 2000; Jacobs, 1992; Leccese & McCormick, 2000). Recent findings on diversity of use include the reports that neighborhoods high in diversity of use are associated with more walking (Saelens *et al*., 2003) and more social capital (Leyden, 2003) than neighborhoods low in diversity of use. Although not tested in this study, a basic assumption of this work is that diversity of use, through increased walking and social capital, may influence collaboration around parenting functions such as increased social support for families and collaboration with regard to monitoring of children.

The belief that diversity of use may play a role in child developmental outcomes derives in part from New Urbanist theory (Szapocznik *et al*., 2005). New Urbanism is a neo-traditional movement to encourage building of communities along the lines of traditional—i.e., early twentieth century—town planning. The Congress for the New Urbanism, established in 1993, encourages the design of communities that are less dependent on automobiles while encouraging pedestrian life (Leccese & McCormick, 2000). The Charter for the New Urbanism defines two levels of community that are relevant to the current work —the neighborhood/district and the block/building—both of which are thought to affect community and social connectivity. At the neighborhood/district level, New Urbanist theory encourages compact, pedestrian environments that promote social interaction. At both the neighborhood and block/building levels, New Urbanism encourages diversity of use because the integration of housing, retail, and civic uses promotes walking and thereby social interaction. New Urbanist theory predicts that child outcomes will be better in neighborhoods with diversity of use, due to greater pedestrian traffic and interactions among neighbors (Leyden, 2003; Saelens *et al*., 2003), which in turn may lead to increased social capital (Frumkin, Frank, & Jackson, 2004; Leyden, 2003) and increased collaboration among families and supervision of children (Szapocznik *et al*., 2005). It has been suggested that the increased activity creates an extended network of connections among people that can translate into increased monitoring, support, and social responsibility (Leccese & McCormick, 2000; Leyden, 2003; Jacobs, 1992). It can serve to cement the connections across a community and therefore to create a social net for children and families (Plas & Lewis, 1996). Such a social network may help to promote child adjustment.

In an initial effort to test the assumptions of New Urbanist theory, this study examines the association between built environment features and child outcomes. It would appear that if New Urbanist theory is correct, children's developmental outcomes would be better in more diverse environments. Given that school functioning is an important predictor of multiple developmental outcomes, we have selected it in this study for examination in the context of the built environment. For example, previous work has shown that child behavior problems in the classroom (e.g., teachers' reports of child conduct problems) are associated with increased risk of future adolescent substance use and juvenile delinquency (Hops, Davis, & Lewin, 1999; Williams, Ayers, Abbott, Hawkins, & Catalano, 1999). In addition, adolescent students' own reports of school behavior problems (e.g., skipping class, on-campus substance use) are associated with concurrent delinquency and unsafe sexual behavior (Gruber & Machamer, 2000). Moreover, teachers' reports of poor academic performance in eighth-grade girls are associated with increased risk of teen pregnancy by the end of high school (Manlove, 1998). Finally, teachers' reports of child behavior problems and low achievement test scores are associated with increased future risk of dropping out of high school (Jimerson, Egeland, Sroufe, & Carlson, 2000). It would appear then, that the evidence suggests that children's academic and behavioral functioning in the classroom are important predictors of children's future developmental behavioral trajectories, but to our knowledge, no studies to date have examined the relationship of children's built environment to their school functioning.

In this initial report, we hypothesize that mixed-use blocks, when compared to residential blocks, will be associated with better school grades. In addition to New Urbanist principles, our rationale for this hypothesis is based on our understanding of mediating mechanisms. For example, the literature shows a relationship between mixed-use and social capital (Leyden, 2003). In addition, a related construct, collective efficacy (cf., Sampson, Morenoff, & Earls, 1999), although not yet systematically examined in its relation to diversity of built-environment use, has been shown to be an important predictor of health and social outcomes at the neighborhood level such as violence and crime (Sampson, Raudenbush, & Earls, 1997) and child outcomes (Sampson *et al.*, 1999).

It is possible to conclude that mixed use may have beneficial impact on child outcomes based on the following series of related findings: a) mixed use improves social capital and possibly collective efficacy (Katyal, 2002; Leyden, 2003), b) social capital and collective efficacy impact support for parenting functioning (Frumkin *et al.*, 2004; Sampson *et al.*, 1999), c) support for parenting functioning influences parenting behavior (Swick & Broadway, 1997), and d) parenting behavior affects children's outcomes (Beyers *et al.*, 2003; Walker-Barnes & Mason, 2001), including children's school outcomes (Eamon, 2005; Voydanoff, 2004). In this study, we have used a child outcome that is readily available, school grades, because as indicated earlier, school grades are a predictor of important child developmental outcomes, and secondarily because they are readily available at a population based level. However, given the initial exploratory nature of this study, we did not investigate mediating mechanisms such as social capital and supervision of children (Ainsworth, 2002; Beyers *et al.*, 2003; Coley, Morris, & Hernandez, 2004; Duncan, Duncan, Okut, Strycker, & Hix-Small, 2003; Leventhal & Brooks-Gunn, 2003; Sampson *et al.*, 1997, 1999; Simons *et al.*, 2004).

In addition to the primary hypothesis described above, we test whether any observed patterns vary across gender and age of youth, based on findings that neighborhood and built environment features may affect boys and girls differently (Kroneman, Loeber, & Hipwell, 2004; Ramirez-Valles, Zimmerman, & Juarez, 2002) and may affect older adolescents more than younger adolescents (Hipwell *et al.*, 2002).

Method

Design

Approvals from the University of Miami's Institutional Review Board (IRB) and Miami-Dade Public Schools were obtained. The study received a waiver of informed consent requirement from the University of Miami's IRB as specified under 45 CFR 46.116(d), because only de-identified student data were used.

The study was conducted in East Little Havana, a community located within the City of Miami, which in 2002 was the single poorest large city in the United States (defined as cities with population over 250,000) (U.S. Census Bureau, 2002). School grades were obtained for every child living who attended public school between Fall 2001 and Spring 2002 and whose records showed an East Little Havana address. Built environment data were obtained from every lot in every block in East Little Havana during this same time period. Blocks constituted the unit of analysis, with children nested within blocks.

Participants

Participants were 2857 public school children enrolled in the Miami-Dade Public School System grades 1 through 12. The Miami-Dade Public School provided gender, age, addresses and grade information on all children attending public school, living within the project catchment area. Addresses were recoded as block numbers to further de-identify the data before linking it with the built environment data. The sample of participants was 47.2% female and 52.8% male, with 53.0% of the sample enrolled in elementary school, 23.3% in middle school, and 23.7% in senior high school. The racial/ethnic composition of the sample was as follows: 95.2% Hispanic, 3.3% African-American, 1.1% White Non-Hispanic, and 0.4% other racial/ethnic identity. Participants' mean year-in-school was 5.79 years (SD = 3.19), or approximately the sixth grade. Participants' mean age at the end of the academic year was 11.96 years of age (SD = 3.66).

Setting

East Little Havana has been a place of arrival for Hispanic immigrants since 1960. Over 91% of housing consisted of rental properties at the time of the study (U.S. Census Bureau, 2000), indicating that East Little Havana is a low-income and transient area. In addition, East Little Havana has one of the highest concentrations of poverty in Miami, with over 35 percent of residents living below the poverty level (U.S. Census Bureau, 2000). Both the median household income of $17,033 and per capita income of $9,255, are half the county average. East Little Havana has a low level of educational attainment, with only 40% of the residents having completed high school (U.S. Census Bureau, 2000).

East Little Havana is located immediately south of the Miami River, which separates the neighborhood from the downtown core of the city. The current study defined the boundaries of East Little Havana as follows: 17 Avenue Southwest on the West, the Miami River and I-95 on the East, 8th Street Southwest in the South, and in the North, 7th Street Northwest, 14th Ct Northwest and SR 836. The bounded area includes 3857 lots in 403 blocks. This setting is remarkable in that even in blocks that are completely residential, residents are within a five-minute walking distance of commercial blocks. Thus, at the neighborhood level (i.e., for East Little Havana as a whole) there is mixture of use, even when it does not occur at the block level. In this regard, even 100% residential blocks in East Little Havana are considerably different than suburban residential blocks.

Measures

Diversity of use—Diversity of use of the built environment was measured using a subscale of a comprehensive coding system developed to assess New Urbanist constructs (Duany *et al.*, 2000; Leccese & McCormick, 2000), the University of Miami Built Environment Coding System (UMBECS; Spokane *et al.*, 2005). UMBECS is organized into 7 domains, one of which is “diversity of use.” Inter-rater reliabilities of .80 were required of architecture students to qualify them to conduct the ratings as well as to permit them to continue to conduct ratings throughout the study. Each of the 3857 lots in East Little Havana was coded on the following categories comprising the Diversity of Use domain of the UMBECS system:

Residential: People live at that property.

Institutional: Churches, schools, hospitals, libraries, museums, concert halls, and theatres. Institutions serve the public and usually are either in the public domain or a not-for-profit enterprise.

Commercial: Shops, restaurants and service businesses. These cover a broad range of commercial activities including video rentals, drycleaners, repair shops, offices, and auto dealerships.

Vacant: No building or designated use.

Most lots were characterized by only one type of use. However, in some instances a lot could be coded into more than one category. Frequently, this corresponded to lots with a commercial enterprise in the first floor and an apartment on the second floor. A vacant lot could only be coded as vacant.

The coded lots were aggregated into 403 blocks, with a block defined as all lots on both sides of a block bounded by intersections (e.g., all addresses between 600 and 699 Northwest 12th Ave). For each block, four block-level variables were created, indicating the proportion of a block frontage that was residential, commercial, institutional, and vacant, with the total sum across all uses adding to at least 1.0. Sums above 1.0 indicated the presence of dual-use lots on that block. Most of these data were collected in 2000–2002.

School Grades—School grades were teacher reports of children's classroom conduct and academic performance for the year 2001–2002 for all 2857 public school children living in East Little Havana. The grades used for this study were what appeared in the electronic records of the Miami-Dade County Public School System. As noted earlier, data were de-identified and pooled at the block level. Each youth was identified as living on one of the previously defined 403 blocks. Teachers rated children's conduct and academic performance using a 5-point scale (A=Excellent, B=Good, C=Satisfactory, D=Improvement Needed, F=Unsatisfactory). For the purpose of analyses, these were recoded with higher numbers reflecting better conduct and academic performance. For this study, the annual average for each student across all classes was used. The Miami-Dade Public School System refers to these teacher reports as conduct grades and academic grades.

Determination of block types: Cluster analysis

Blocks were categorized using *k* means cluster analysis of the four built environment diversity variables: Proportion residential, proportion commercial, proportion institutional, and proportion vacant. A three-cluster solution was selected over a two- or a four-cluster solution. The two-cluster solution failed to capture a distinction between general mixed-use blocks and blocks that were largely commercial that was evident in the other solutions, while four-or more cluster solutions resulted in some clusters with too few blocks. The three block-types identified by the cluster analysis corresponded to *Mixed-Use*, *Residential*, and largely *Commercial* blocks. Means and standard deviations for the diversity of use variables across all 403 blocks are presented in Table 1, and these differences are illustrated visually in Fig. 1.

As expected, a majority of youth lived on Residential blocks. Based on this analysis, a total of 208 blocks on which 2372 youth lived were classified as Residential, with 88 of these blocks being 100% residential. In contrast, a total of 53 blocks on which 181 youth lived were classified as Commercial, with 8 of these blocks being 100% commercial (possibly some buildings were both commercial and residential). Finally, a total of 46 blocks on which 303 youth lived were classified as Mixed Use. No blocks on which a child lived were 100% institutional.

Analytic strategy

Given the focus on academic outcomes, it was necessary to also consider possible effects of schools on grades such as differences between schools in grading. Youth attended a total of

94 different schools, although this included a variety of out-of-community placements, with small numbers of students attending magnet schools, alternative schools, and children of school personnel opting to attend schools where their parents work. This list also reflects potential structural differences within schools, where, for example, a special education program may be identified by a separate school ID. Because school IDs were de-identified, we were unable to aggregate "school IDs" within each school.

Individual youth data were nested within both blocks and schools; however, blocks were not nested within schools, creating a cross-classified random effects model (Raudenbush & Bryk, 2002). Therefore, the relationship between block-diversity type and conduct/academic grades was examined through a cross-classified hierarchical linear model, using HLM Version 6.0.

In traditional hierarchical linear modeling, nested data are analyzed by essentially creating separate equations for each of these levels, with level two (i.e., blocks), predicting parameter values in level one (i.e., individual children). For example, a level-one equation for predicting child-level outcomes based upon child characteristics is

$$y_{ij}=\beta_{0j}+\beta_{1j}W_{ij}+r_{ij} \quad (1)$$

where y_{ij} is the outcome for child *i* on block *j* and W_{ij} is a child-level predictor for child *i* in block *j*. Each level-two unit (i.e., block) has its own regression equation: β_{0j} is the intercept term for all youth on block *j*, and β_{1j} is the slope reflecting the effect of W for all youth on block *j*. The r_{ij} term is the unique error associated with child *i* on block *j*.

Each of the regression coefficients in Eq. (1) can then be modeled as the outcome variable in a regression equation where level-two features serve as the predictor variables. For example, in the level-two equation

$$\beta_{0j}=\gamma_{00}+\gamma_{01}X_j+\mu_{0j} \quad (2)$$

β_{0j} reflects the *j* intercept terms in the level-one equation and X_j is a block-level predictor for each of the *j* blocks. γ_{01} is therefore the slope reflecting the degree to which the level-one intercepts vary based upon the block-level feature, and γ_{00} is the intercept of the regression equation that predicts the level-one intercepts based upon X. The μ_{0j} is the unique error in β_{0j} associated with block *j*.

In the cross-classified hierarchical linear model tested in this study, individual children are nested within a specific block and a specific school. Given that each block-school combination can be viewed as a cell within a cross-tabulation of all blocks by all schools, the level-one model is also referred to as the "within cell" model. Note that in this type of application, the number of possible cells can be quite large, with most cells being empty. The level-one model examines the variability among children in a specific block-school cell. For example, a level-one equation for predicting school outcomes based upon gender is

$$y_{i\,jk}=\pi_{0\,jk}+\pi_{1\,jk}\text{Gender}_{i\,jk}+e_{i\,jk} \quad (3)$$

where y_{ijk} is the school outcome and Gender_{ijk} is the gender for child *i* on block *j* attending school *k*. Also note that the notation and symbols used change in order to incorporate the increased complexity of the cross-classified model over a traditional hierarchical linear model. The intercept within a cell (i.e., a given block-school combination) is π_{0jk}, which, assuming gender is dummy coded with male = 0 and female = 1, corresponds to the predicted score for that cell for males (i.e., gender = 0). The gender effect within a cell is π_{1jk}, which corresponds to the predicted difference between females and males within that cell. The random error for child i on block j attending school k after controlling for gender is e_{ijk}.

Each of the regression coefficients in Eq. (3) can then be modeled as the outcome variable in a regression equation where level-two features serve as the predictor variables. For example, in the level-two equation

$$\pi_{pjk}=\theta_p+(\beta_p+b_{p1\,j})\ \mathrm{SchoolFeature}_{\,j}+(\gamma_p+c_{p1k})\ \mathrm{BlockFeature}_k+b_{p0\,j}+c_{p0k}+d_{pjk} \quad (4)$$

π_{pjk} is regression coefficient p for the block j × school k cell (i.e., $p = 0$ for the intercept, $p = 1$ for the gender effect). θ_p is the overall intercept for π_{pjk}, or the predicted value for π_{pjk} when BlockFeature and SchoolFeature equal zero. β_p is the fixed effect of SchoolFeature on the value of π_{pjk}, across all blocks. b_{p1j} is the random effect of block j on the effect of SchoolFeature upon π_{pjk}. Similarly, γ_p is the fixed effect of BlockFeature on the value of π_{pjk}, across all schools, while c_{p1k} is the random effect of school j on the effect of BlockFeature upon π_{pjk}. Finally, b_{p0j}, c_{p0k}, and d_{pjk}, are the residual random effects for corresponding block, school, and block × school effects.

Model development

In the first of these analyses, conduct grades served as the level 1 outcome, with gender as the level 1 predictor grand-mean centered. Year-in-school was also considered as a level 1 predictor; however, it was not significant—a likely result of a cross-classified analysis incorporating school-level nesting. The three block-types were examined at level 2 through a pair of dummy coded variables corresponding to Mixed-Use and Commercial blocks, making Residential block the referent. Block-type was modeled as a predictor of both the level 1 intercept and gender coefficients. School-level predictors were unavailable; however, the school random effect was included in the model.

Preliminary analyses were conducted to determine whether the block-type variables should be modeled as randomly varying effects (the c_{p1k} terms included for the Mixed-Use and Commercial dummy variables). The random effects model provided no improvement in fit and so block-type was treated as a fixed effect. In addition, the block x school residual random error term was not included due to the small cell sizes. This resulted in the following final model…

$$y_{i\,jk}=\pi_{0\,jk}+\pi_{1\,jk}\mathrm{Gender}_{i\,jk}+e_{i\,jk} \quad (5)$$

$$\pi_{0\,jk}=\theta_0+\gamma_{01}\mathrm{MixedUse}_k+\gamma_{02}\mathrm{Commercial}_k+b_{00\,j}+c_{00k} \quad (6)$$

$$\pi_{1\,jk}=\theta_1+\gamma_{11}\mathrm{MixedUse}_k+\gamma_{12}\mathrm{Commercial}_k+b_{10\,j}+c_{10k} \quad (7)$$

This series of analyses was then repeated for academic grades. For succinctness, only the final model for each outcome is presented below.

Conduct grades

The result for the model predicting conduct grades is presented in Table 2. Differences in conduct grades based upon block-type and gender are presented visually in Fig. 2. By grand-mean centering the level 1 gender effect, the model predicting the level 1 intercept term examines the overall effect of block-type, controlling for gender. The model predicting the level 1 gender coefficient then examines whether the overall effects noted in the intercept model, in fact differ based on gender.

The model was statistically significant compared to a null cross-classified model that included the b_{p0j} and c_{p0k} residual random effects, but did not include the block diversity variables ($X^2(4) = 9.54$, $p < .05$). Results predicting the level 1 intercept term indicate that controlling for gender, an overall difference in conduct grades was found between youth living on Residential blocks and youth living on Mixed-Use blocks ($\gamma = 0.11$, $t(2850) = 2.42$, $p < .05$), with gender-adjusted means for Residential blocks equal to 3.11, and gender-adjusted means for Mixed-Use blocks equal to 3.22. While the intercept model indicated no statistically significant overall difference between Residential blocks and Commercial blocks ($\gamma = 0.04$, $t(2850) = 0.82$, $p = .415$), the model predicting the level 1 gender coefficient indicated that the effect associated with living on a Commercial block varied by gender ($\gamma = -0.20$, $t(2850) = 1.97$, $p < .05$). Specifically, for males living on a Commercial block, this translated to an approximate .13-point increase relative to males living on a Residential block; while for females living on a Commercial block, this translated to a .06-point *decrease* relative to females living on a Residential block.

Follow-up tests were conducted in which the effect of block-type was examined separately for males and females. In an analysis based solely upon data from male youth, the overall effect of block-type was significant ($X^2(2) = 6.097$, $p < .05$), with Mixed-Use blocks associated with conduct grades 0.13 points higher than Residential blocks ($t(1504) = 2.010$, $p < .05$). Commercial blocks were also associated with conduct grades that were 0.13 points higher than Residential blocks, although this effect was not statistically significant ($t(1504) = 1.636$, $p = .10$). In a separate analysis based solely upon data from female youth, neither the overall effect of block-type ($X^2(2) = 3.074$, $p > .10$) nor the Mixed use ($\gamma = 0.064$, $t(1346) = 1.342$, $p > .10$) or the Commercial coefficients ($\gamma = -0.062$, $t(1346) = 1.005$, $p > .10$) were significant.

Academic grades

An identical series of analyses was performed predicting academic grades. No significant effects were found for the diversity of use variables.

Post hoc epidemiological analyses

A final series of post hoc analyses were performed to examine the relationship between block diversity and conduct grades from an epidemiological perspective. These analyses examined differences in the proportion of extreme cases between Mixed-Use and Residential blocks, and the impact of block diversity on population rates of conduct problems.

While the differences in mean conduct grades based on block diversity were modest, a small difference in group means can result in a much larger difference in the proportion of cases in the tails of their distributions (Scott, Mason, & Chapman, 1999). Therefore, an additional analysis examined the degree to which the lower conduct grades observed among youth living on Residential blocks translated to an increase in the proportion of youth with relatively high levels of conduct problems (defined as conduct grades below the 10th percentile). This was tested by applying a Bernoulli model to the cross-classified hierarchical linear analysis, in which conduct grades were dichotomized at the 10th percentile (conduct GPA = 2.17), with “1” indicating a conduct grade below the 10th percentile, and a “0” indicating a conduct grade above or equal to the 10th percentile. For this analysis, Mixed-Use block served as the referent group, and two dummy coded variables corresponding to Residential block and Commercial block were used. Gender was grand mean centered and included as a level 1 predictor. The block type variables were not significant predictors of gender at level 2; however, Residential block was a significant predictor of the level 1 intercept ($\gamma = 0.55$, $t(2852) = 2.158$, $p = .031$). This corresponded to an odds-ratio 2.158, of 1.74, indicating that the odds that a child living on a Residential block was identified as having conduct problems (defined as a conduct GPA<2.17), was 1.74 times the odds for a child living on a Mixed-Use block.

A final analysis examined the population-level association between block diversity and conduct problems (again, reflected in conduct grades below the 10th percentile). In behavioral research, studies typically focus on individual-level measures of effect, such as a beta or mean difference. However, a risk factor may have a very large effect on the individuals who experience it, and yet, if it is uncommon and thus experienced by few people, this large individual-level effect may result in a negligible impact on the actual number of cases of a disorder in a population. In contrast, a risk factor may have a modest effect on individuals who experience it, and yet if it is common and thus widely experienced, may have a large impact on the actual number of cases in the population (Scott *et al.*, 1999; Mason, 2003).

Therefore, to evaluate the impact of block diversity on population rates of behavior problems, a population attributable fraction (PAF) was estimated indicating the proportion of youth with conduct problems, as defined above, that was associated with living on a Residential block. Using the observed proportion of youth living on Residential blocks (83%) and using the odds-ratio for the Residential block effect obtained in the previous analysis as an estimate of the Residential block risk-ratio, a PAF of .38 was obtained (see Tu, 2003; Mason, Scott, Chapman, & Tu, 2000, for a more detailed discussion of PAF estimation). This indicates that 38% of the cases where youth are identified as having conduct problems are associated with the specific risk of living in a Residential block, above and beyond the risks associated with living in a Mixed block. In other words, if all of the youth that had been living in Residential blocks, had instead been living in Mixed-Use blocks, we would expect a 38% decrease in the number of youth with conduct problems (defined as Conduct GPA<2.17) in the overall population—assuming a direct causal effect and all other effects being equal.

Discussion

This study examined the relationship between diversity of use in the built-environment and children's school grades (i.e., teachers' reports of children's conduct and academic performance) in a population of Hispanic school children in an urban neighborhood of Miami, Florida. Based on a cluster-analysis, blocks were categorized into three types: Residential, Commercial, and Mixed Use. Contrary to popular lore, yet predicted by New Urbanism (Duany *et al.*, 2000; Jacobs, 1992; Leccese & McCormick, 2000), mixed-use blocks were found to be associated with positive effects for children. Mixed-use blocks should be considered in the context in which they occur. None of the blocks in East Little Havana were more than 5 min walking distance from a block with very high levels of commercial use. Therefore, even solely residential blocks were not embedded in a purely residential neighborhood, as may occur in a suburb. The relative detrimental impact of residential blocks was observed even when these blocks occurred in a mixed-use context.

The impact of mixed-use blocks was particularly true among males, for whom living on a mixed-use block was associated with mean conduct grades 0.13 points higher than conduct grades observed among males living on residential blocks. The effect among females was more tenuous. While an analysis controlling for gender found a significant Mixed-Use effect (Table 2, intercept model), and while this effect did not differ based on gender (Table 2, gender model), follow-up analyses based only on female participants were not significant. In essence, while the effect observed among females did not significantly differ from males, it also did not significantly differ from zero, or no effect. The finding that conduct was less related to the neighborhood environment for girls than for boys is consistent with prior research (e.g., Kroneman *et al.*, 2004).

In addition, it is worth noting the gender difference in the effect associated with living on a commercial block. While in balance or when combined, the commercial block effect was not statistically significant, the effect did differ statistically for males and females. In other words, while the exact degree or net direction of the effect is unclear, the effect associated with living on a commercial block is more positive for males than females. This finding was both unexpected and surprising. Although the present data do not explain this gender difference, it is known that in traditional Hispanic culture, adolescent boys are more likely to be allowed to spend time out of the home, while girls are more likely to be kept home (Rafaelli & Ontai, 2004). It is therefore possible that boys, compared to girls, may have had a greater opportunity to be exposed to the benefits of commercial blocks. We would speculate that such benefits of blocks with commercial use, reflected in conduct grades, may have resulted from increased opportunity of adolescent boys to be out in the neighborhood and thus be exposed to the increased collaboration around adult supervision and support of children. In contrast, girls' opportunity to be out in the neighborhood may have been particularly constricted in commercial blocks.

While on average, the absolute magnitude of the observed effects may appear modest; they translate into a larger increase in risk at the tail of the distribution—those youth in the lowest range of conduct grades. For example, follow-up analyses found that a youth living on a residential block had a 74% greater odds of being in the lowest 10% of conduct grades (conduct GPA<2.17) than a youth living on a mixed-use block. Furthermore, given that the majority of youth lived on residential blocks—which were associated with poorer conduct grades—from a public health perspective, the impact can be relatively large. The situation is akin to lead in the drinking water: the impact on the individual person who is exposed may be modest, but given widespread exposure, the impact on a population may be great. Applying an epidemiological model, 38% of cases below the 10th percentile were associated with living on a residential block. Given that this measure of effect is not familiar to many researchers in psychology, it is worth noting that this does not indicate that 38% of youth with conduct problems lived on residential blocks—in fact nearly all did. Instead, it indicates that if the rate of conduct problems (i.e., conduct scores in the lowest 10th percentile) observed among youth living on a residential block was the same as the rate observed among youth living on a mixed-use block, the total number of youth with conduct problems in the total population would be reduced by 38%. This is a large public health effect.

It is also worth noting that not unexpectedly, girls had higher conduct grades than did boys. This is consistent with a large body of research that suggests that problem behaviors are much more common in boys than girls (Fergusson & Horwood, 2002; Keenan & Shaw, 1997; Moffitt, Caspi, Rutter, & Silva, 2001; Offord, Adler, & Boyle, 1986) and this is likely to be more pronounced in adolescence, when problem behaviors increase (Fergusson & Horwood, 2002; Loeber, Stouthamer-Loeber, Van Kammen, & Farrington, 1989; Moffitt, 1993).

Implications

As suggested earlier, the inter-related constructs of social capital and collective efficacy may have an impact on child outcomes. The literature would suggest that more is better than less. New Urbanism may be a strategy for increasing social capital and collective efficacy

(Sampson *et al*., 1997, 1999), by fostering mixed-use blocks and neighborhoods (Duany *et al*., 2000; Leccese & McCormick, 2000). Mixed-use areas may represent places where individuals can live and work, where there are commercial and institutional destinations to which residents will want to walk, and in which residents may develop increased collaborations around parenting functions.

In the post World War II era, a major impediment to mixed-use areas has been the popular view that geographically separating commercial, institutional and residential use is most desirable (Corburn, 2004; Duany *et al*., 2000). In part, this popular lore is based on the belief that such separation is better for children, who are safer in residential-only neighborhoods. The purpose of the present study was to determine whether the relationship between built-environment use and children's conduct and academic grades supported popular lore or New Urbanism theory. Popular lore was not supported. These findings support and inform a trend in many parts of the world toward development of communities built following New Urbanist principles. New Urbanist principles have been used in the design of towns such as Seaside that were initiated as moderate-income developments but increased in price because of their design and appeal as communities. For example, the initial average home price in Seaside, Florida, was $64,890 when development began in 1983 and escalated to an average home price of $989,086 in 2002 (Urban Land Institute, 2005). This trend of increasing value of New-Urbanist developments has occurred both in the U.S. (Eppli & Tu, 1999), as well as internationally (Plaut & Boarnet, 2003): That is, after controlling for size of home and quality of neighborhood, similar homes in New Urbanist communities sell for more than comparable homes in other communities not designed along New Urbanist principles (Eppli & Tu, 1999; Plaut & Boarnet, 2003). However, New Urbanism is not limited to wealthy developments, given its recent use in the design of urban core public housing projects (e.g., HOPE VI). Moreover, the apparently beneficial effects of New Urbanist design on residents' well-being do not appear to be simply due to high SES alone: For instance, a recent study showed that the Kentlands (a New Urbanist community in Gaithersburg, MD) had a greater sense of community among residents as compared to a nearby, similarly-priced development not designed along New Urbanist principles (Kim & Kaplan, 2004).

Strengths

There are several important strengths of the study. First, this is the first study of which we are aware that has examined block-level built environmental characteristics as a predictor of protection/risk in children. Second, this study addressed a pervasive public health risk, which is particularly problematic in Hispanic youth: poor school adjustment in children. Nationally, Hispanics have a school dropout rate that exceeds 40% (Greene & Forster, 2003). Third, this study is based on actual conduct and academic grades as provided by teachers in the Miami-Dade County Public School System. Many other studies on risk and protection of school performance have tended to rely on child or parent reported school performance (Plybon, Edwards, Butler, Belgrave, & Allison, 2003; Stanger, Achenbach, & McConaughy, 1993; Voydanoff, 2004). Fourth, this study was theory-driven, motivated by the Charter of the New Urbanism, which suggests that placing housing in proximity to shopping and workplaces enhances children's well-being by increasing social capital and providing more “eyes on the street” to monitor children's safety and activity (Leccese & McCormick, 2000; Szapocznik *et al*., 2005). A fifth strength is that, despite the restricted range that occurs with the high concentration of poverty in this neighborhood (one of the highest poverty rates in the country at the time of the study; U.S. Census Bureau, 2000), lawful relationships between built environment characteristics and children's school functioning could be identified, suggesting that there is sufficient variability in each of these variables. Sixth, the effects appear robust given the relatively restricted range of built environment characteristics and population that occurs in a single neighborhood (i.e., 100%

of residential blocks are within 5 min walking distance from mixed use or commercial streets). Finally, the use of cross-classified hierarchical linear modeling allows the analyses to adjust for school-level differences in conduct grades.

Limitations and future directions

Nevertheless, we must note several limitations with the current study. First, youth could not be randomly assigned to blocks, and thus self-selection may bias the results. However, it is worth noting that to whatever degree selection bias impacts the results, based on the dominant view that residential blocks are preferred to mixed-use blocks, these effects would work against the proposed hypotheses. That is, given popular beliefs in the superiority of residential blocks, families with more resources might have been more likely to move to the residential-only blocks. However, the unavailability of socioeconomic data at the block level prevented analyses that examined the degree to which families with higher economic means select blocks that were perceived as more desirable. Specifically, socioeconomic data from the U. S. Census Bureau are only available at either the “block-group” level or Census-tract level as the smallest geographic unit. Second, both built environment and school grades data were collected at approximately the same time. These combine to limit our ability to infer causality; however, it was assumed that design and construction of the neighborhood built environment preceded in time the children's adjustment. Moreover, it would be difficult to imagine that children's grades caused the built environment. Third, it is important to note that these findings must be interpreted in the context of the unique aspects of this urban built environment (Duany, 2000). In this setting, even completely residential blocks are within five minutes walking distance of commercial buildings. Consequently, findings regarding largely residential blocks may not generalize beyond similar urban environments. Once more, however, this bias works against our hypotheses, providing a conservative test of New Urbanist premises. This is the case because, even in the neighborhood context of mixed-use, residential blocks were associated with deleterious effects when compared to mixed-use blocks. Fourth, data are lacking on which variables (e.g., social capital, collective efficacy, and support for parenting functions) might have mediated the relationships observed between diversity of use and children's school outcomes. Finally, it is not possible to rule out third variables that may be associated with both diversity of use and children's grades, such as overall block-level population density, child block-level density, and socioeconomic status.

Future research should compare or investigate neighborhoods with greater range of diversity of use. Longitudinal studies on relationships between the built environment and children's developmental outcomes, and that assess variables that may mediate this relationship such as collective efficacy, parental monitoring and residential stability, will permit better estimation of the relationship between these domains (Ainsworth, 2002; Beyers *et al.*, 2003; Bowen & Bowen, 1999; Duncan *et al.*, 2003; Gorman-Smith *et al.*, 1999; Sampson *et al.*, 1999; Simons *et al.*, 2004; Voydanoff, 2004; Walker-Barnes & Mason, 2001). Preliminary results suggest that judicious planning of the built environment, with an appropriate within-block combination of commercial, residential, and institutional use (Duany, 2000), may enhance behavioral school outcomes among boys.

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References

Abu-Ghazzeh TM. Housing layout, social interaction, and the place of contact in Abu-Nuseir, Jordan. Journal of Environmental Psychology. 1999; 19:41–73.

Ainsworth JW. Why does it take a village? The mediation of neighborhood effects on educational attainment. Social Forces. 2002; 81:117–152.

Barker, RG. Ecological psychology. Stanford University Press; Stanford, CA: 1968.

Barker, RG.; Gump, PV. Big school, small school: High school size and student behavior. Stanford University Press; Oxford, England: 1964.

Beyers JM, Bates JE, Pettit GS, Dodge KA. Neighborhood structure, parenting processes, and the development of youth's externalizing behaviors: A multilevel analysis. American Journal of Community Psychology. 2003; 31(1–2):35–53. [PubMed: 12741688]

Bowen NK, Bowen GL. Effects of crime and violence in neighborhoods and schools on the school behavior and performance of adolescents. Journal of Adolescent Research. 1999; 14:319–342.

Coley RL, Morris JE, Hernandez D. Out-of-school care and problem behavior trajectories among low-income adolescents: Individual, family, and neighborhood characteristics as added risks. Child Development. 2004; 75(3):948–965. [PubMed: 15144496]

Corburn J. Confronting the challenges in reconnecting urban planning and public health. American Journal of Public Health. 2004; 94(4):541–546. [PubMed: 15053998]

Cox RP. An exploration of the demographic and social correlates of criminal behavior among adolescent males. Journal of Adolescent Health. 1996; 19(1):17–24. [PubMed: 8842856]

Cummins SK, Jackson RJ. The built environment and children's health. Pediatric Clinics of North America. 2001; 48(5):1241–1252. [PubMed: 11579672]

Dannenberg AL, Jackson RL, Frumkin H, Schieber RA, Pratt M, Kochtitzky C, Tilson HH. The impact of community design and land-use choices on public health: A scientific research agenda. American Journal of Public Health. 2003; 93(9):1500–1508. [PubMed: 12948970]

Davison KK, Ford ES, Cogswell ME, Dietz WH. Percentage of body fat and body mass index are associated with mobility limitations in people aged 70 and older from NHANES III. Journal of the American Geriatrics Society. 2002; 50(11):1802–1809. [PubMed: 12410898]

Diez Roux AV. Residential environments and cardiovascular risk. Journal of Urban Health. 2003; 80(4):569–589. [PubMed: 14709706]

Duany A. A new theory of New Urbanism. Scientific American. 2000; 283(6):90–91. [PubMed: 11103464]

Duany, A.; Plater-Zyberk, E.; Speck, J. Suburban nation: The rise of sprawl and the decline of the American dream. North Point Press; New York: 2000.

Duncan TE, Duncan SC, Okut H, Strycker LA, Hix-Small H. A multi-level contextual model of neighborhood collective efficacy. American Journal of Community Psychology. 2003; 32(3/4): 245–252. [PubMed: 14703260]

Eamon MK. Social-demographic, school, neighborhood, and parenting influences on the academic achievement of Latino young adolescents. Journal of Youth and Adolescence. 2005; 34(2):163–174.

Eppli, MJ.; Tu, CC. Valuing the new urbanism: The impact of the new urbanism on the prices of single-family homes. ULI-The Urban Land Institute; Washington, DC: 1999.

Evans GW. The built environment and mental health. Journal of Urban Health. 2003; 80(4):536–555. [PubMed: 14709704]

Ewing R, Schmid T, Killingsworth, Zlot A, Raudenbush S. Relationship between urban sprawl and physical activity, obesity and morbidity. American Journal of Health Promotion. 2003; 18(1):47–57. [PubMed: 13677962]

Fergusson DM, Horwood LJ. Male and female offending trajectories. Developmental Psychopathology. 2002; 14(1):159–177.

Frumkin, H.; Frank, L.; Jackson, R. Urban Sprawl and Public Health: Designing, Planning, and Building for Healthy Communities. Island Press; Washington, DC: 2004.

Gorman-Smith, D.; Tolan, PH.; Henry, D. The relation of community and family to risk among urban-poor adolescents. In: Cohen, P.; Slomkowsi, C.; Robins, LN., editors. Historical and geographical influences on psychopathology. Lawrence Erlbaum; Mahwah, NJ: 1999. p. 349-367.

Greene, JP.; Forster, G. Public High School Graduation and College Readiness Rates in the United States. Manhattan Institute for Policy Research; New York: 2003. Education Working Paper No. 3

Gruber E, Machamer AM. Risk of school failure as an early indicator of other health risk behaviour in American high school students. Health, Risk & Society. 2000; 2:59–68.

Handy SL, Boarnet MG, Ewing R, Killingsworth RE. How the built environment affects physical activity: Views from urban planning. American Journal of Preventive Medicine. 2002; 23(2S):64–73. [PubMed: 12133739]

Heimstra, NW.; McFarling, LH. Environmental Psychology. Brooks/Cole; Oxford, UK: 1974.

Hipwell AE, Loeber R, Stouthamer-Loeber M, Keenan K, White HR, Kroneman L. Characteristics of girls with early onset disruptive and antisocial behaviour. Criminal Behavior and Mental Health. 2002; 12(1):99–118.

Hops H, Davis B, Lewin LM. The development of alcohol and other substance use: A gender study of family and peer context. Journal of Studies on Alcohol, Suppl. 1999; 13:22–31.

Humpel N, Owen N, Leslie E. Environmental factors associated with adults' participation in physical activity: A review. American Journal of Preventive Medicine. 2002; 22:188–199. [PubMed: 11897464]

Jacobs, J. The Death and Life of Great American Cities. Vintage Books; New York: 1992. Original work published in 1961

Jimerson S, Egeland B, Sroufe LA, Carlson B. A prospective longitudinal study of high school dropouts examining multiple predictors across development. Journal of School Psychology. 2000; 38:525–549.

Katyal NK. Architecture as crime control. Yale Law Journal. 2002; 111(5):1039–1140.

Keenan K, Shaw D. Development and social influences on young girls' early problem behavior. Psychological Bulletin. 1997; 121(1):95–113. [PubMed: 9000893]

Kim J, Kaplan R. Physical and psychological factors in sense of community: New Urbanist Kentlands and nearby Orchard Village. Environment and Behavior. 2004; 36(3):313–340.

Kroneman L, Loeber R, Hipwell AE. Is neighborhood context differently related to externalizing problems and delinquency for girls compared with boys? Clinical Child and Family Psychology Review. 2004; 7(2):109–122. [PubMed: 15255175]

Leccese, M.; McCormick, K., editors. Charter of the New Urbanism. McGraw-Hill; New York: 2000.

Leventhal T, Brooks-Gunn J. Children and youth in neighborhood contexts. Current Directions in Psychological Science. 2003; 12:27–31.

Lewin, K. A dynamic theory of personality. McGraw-Hill; New York: 1935.

Leyden KM. Social capital and the built environment: The importance of walkable neighborhoods. American Journal of Public Health. 2003; 93(9):1546–1551. [PubMed: 12948978]

Loeber, R.; Stouthamer-Loeber, M.; Van Kammen, W.; Farrington, DP. Development of a new measure of self-reported antisocial behavior for young children: Prevalence and reliability. In: Klein, M., editor. Cross-national research in self-reported crime and delinquency. Kluwer-Nijhoff; Boston: 1989. p. 203-226.

Manlove J. The influence of high-school dropout and school disengagement on the risk of school-age pregnancy. Journal of Research on Adolescence. 1998; 8(2):187–220. [PubMed: 12294323]

Mason CA. Developmental epidemiology: Issues, Application, and relevance for Clinical Child Psychologists. Journal of Clinical Child and Adolescent Psychology. 2003; 32:178–180. [PubMed: 12679274]

Mason CA, Scott KG, Chapman DA, Tu S. A review of some individual- and community-level effect size indices for the study of risk factors for child and adolescent development. Educational and Psychological Measurement. 2000; 60:385–410.

Moffitt, TE.; Caspi, A.; Rutter, M.; Silva, P. Sex differences in antisocial behavior. Cambridge University Press; Cambridge, UK: 2001.

Moffitt TE. Adolescence-limited and life-course-persistent antisocial behavior: A developmental taxonomy. Psychological Review. 1993; 100(4):674–701. [PubMed: 8255953]

Northridge ME, Sclar ED, Biswas P. Sorting out the connections between the built environment and health: A conceptual framework for navigating pathways and planning healthy cities. Journal of Urban Health. 2003; 80(4):556–568. [PubMed: 14709705]

Offord DR, Adler RJM, Boyle MH. Prevalence and sociodemographic correlates of conduct disorder. American Journal of Social Psychiatry. 1986; 6:272–278.

Plas JM, Lewis SE. Environmental factors and sense of community in a planned town. American Journal of Community Psychology. 1996; 24:109–143.

Plaut PO, Boarnet MG. New Urbanism and the value of neighborhood design. Journal of Architectural and Planning Research. 2003; 20(3):254–265.

Plybon LE, Edwards L, Butler D, Belgrave FZ, Allison KW. Examining the link between neighborhood cohesion and school outcomes: The role of support coping among African American adolescent girls. Journal of Black Psychology. 2003; 29:393–407.

Rafaelli M, Ontai LL. Gender socialization in Latino/a families: Results from two retrospective studies. Sex Roles. 2004; 50:287–299.

Ramirez-Valles J, Zimmerman MA, Juarez L. Gender differences of neighborhood and social control processes: A study of the timing of the first intercourse among low-achieving, urban, African-American youth. Youth & Society. 2002; 3:418–441.

Raudenbush, SW.; Bryk, AS. Hierarchical linear models: Applications and data analysis methods. 2nd edn.. Sage Publications; Thousand Oaks, CA: 2002.

Saelens BE, Sallis JF, Black JB, Chen D. Neighborhood-based differences in physical activity: An environment scale evaluation. American Journal of Public Health. 2003; 93(9):1552–1558. [PubMed: 12948979]

Sampson RJ, Morenoff JD, Earls F. Beyond social capital: Spatial dynamics of collective efficacy for children. American Sociological Review. 1999; 64:633–660.

Sampson RJ, Raudenbush SW, Earls F. Neighborhoods and violent crime: A multilevel study of collective efficacy. Science. 1997; 277(5328):918–924. [PubMed: 9252316]

Scott KG, Mason CA, Chapman DA. The use of an epidemiological methodology as a means for influencing public policy. Child Development. 1999; 70:1263–1272.

Simons LG, Simons RL, Conger RD, Brody GH. Collective socialization and child conduct problems: A multi-level analysis with an African American sample. Youth & Society. 2004; 35:267–292.

Skjaeveland O, Garling T. Effects of interactional space on neighboring. Journal of Environmental Psychology. 1997; 17:181–198.

Spokane AR, Lombard J, Martinez F, Plater-Zyberk E, Szapocznik J, Mason C, Gorman-Smith D, Brown SC. Measuring architectural features of the neighborhood built environments. Manuscript under review. Journal of Architectural and Planning Research. 2005

Srinivasan S, O'Fallon LR, Dearry A. Creating healthy communities, healthy homes, healthy people: Initiating a research agenda on the built environment and public health. American Journal of Public Health. 2003; 93(9):1446–1450. [PubMed: 12948961]

Stanger C, Achenbach TM, McConaughy SH. Three-year course of behavioral/emotional problems in a national sample of 4- to 16-year-olds: 3. Predictors of signs of disturbance. Journal of Consulting and Clinical Psychology. 1993; 61(5):839–848. [PubMed: 8245281]

Swick K, Broadway F. Parental efficacy and successful parent involvement. Journal of Instructional Psychology. 1997; 24:69–75.

Szapocznik, J.; Spokane, A.; Lombard, J.; Martinez, F.; Mason, C.; Brown, SC.; Cruza-Guet, MC.; Greenfeld, R-B. Designing healthy communities: The culture-centered science of built environment, behavior and health. In: Quraeshi, S., editor. Reimagining West Coconut Grove. Space-maker Press; Washington, D.C.: 2005. p. 164-175.

Thornberry TP, Krohn MD, Lizotte AJ, Chard-Wierschem D. The role of juvenile gangs in facilitating delinquent behavior. Journal of Research in Crime and Delinquency. 1993; 30:55–87.

Tu S. Developmental epidemiology: A review of three key measures of effect. Journal of Clinical Child and Adolescent Psychology. 2003; 32:187–192. [PubMed: 12679276]

Urban Land Institute. [Accessed on September 3, 2006] The Town of Seaside: Seaside, Florida. 2005. Available: http://www.uli.org/AM/Template.cfm?Section=Archives4&CONTENTID=9464&TEMPLATE=/CM/ContentDisplay.cfm.

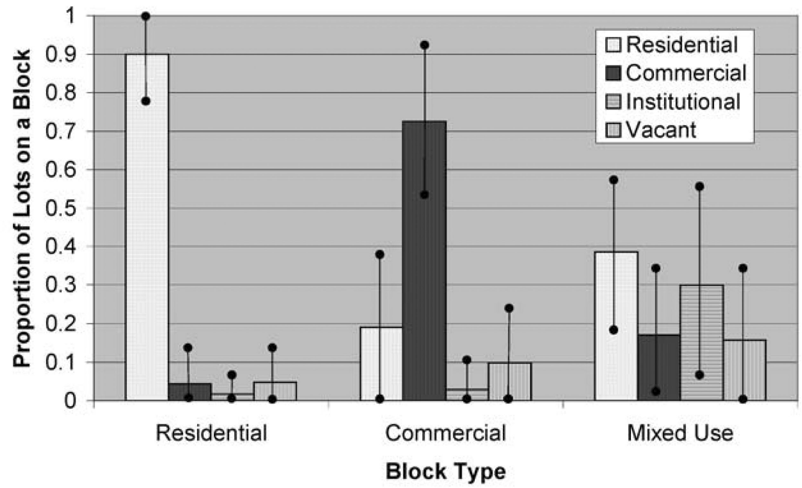
U.S. Census Bureau. United States Census. 2000.

U.S. Census Bureau. [Accessed on September 3, 2006] Percent of people below poverty level. 2002. Available: http://www.census.gov/acs/www/Products/Ranking/2002/pdf/R01T160.pdf.

Voydanoff P. Work, community, and parenting resources and demands as predictors of adolescent problems and grades. Journal of Adolescent Research. 2004; 19:155–173.

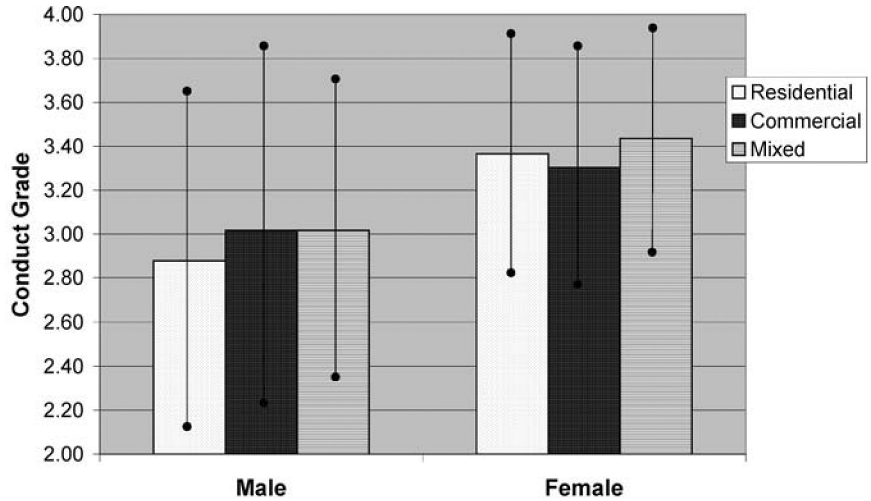
Walker-Barnes CJ, Mason CA. Ethnic differences in the effect of parenting on gang involvement and gang delinquency: A longitudinal, hierarchical linear modeling perspective. Child Development. 2001; 72(6):1814–1831. [PubMed: 11768147]

Williams JH, Ayers CD, Abbott RD, Hawkins JD, Catalano RF. Racial differences in risk factors for delinquency and substance use among adolescents. Social Work Research. 1999; 23:241–256.



Note: Bars indicate the mean proportion of lots on a block classified as a given lot-type. Whiskers indicate +/- one standard deviation for the proportion of lots on a block classified as a given lot-type.

Fig. 1.
Built-environment diversity of use by block-type



Note: Whiskers indicate +/- one standard deviation for conduct grades based on gender and block type.

Fig. 2.
Youth conduct grades, by built-environment use block-type and gender

Table 1

Built-environment diversity of use by block-type

	Proportion of Block				
	Commercial	**Residential**	**Institutional**	**Vacant**	***N*-Blocks**
Mixed Use	0.17	0.38	0.30	0.16	69
Residential	0.04	0.90	0.02	0.05	230
Commercial	0.73	0.19	0.03	0.10	104
Total	0.24	0.63	0.07	0.08	403

Table 2

Model predicting conduct grades. Level 1 Model $y_{ijk} = \pi_{0jk} + \pi_{1jk}\text{Gender}_{ijk} + e_{ijk}$. Level 2 Model $\pi_{0jk} = \theta_0 + \gamma_{01}\text{MixedUse}_k + \gamma_{02}\text{Commercial}_k + b_{00j} + c_{00k}$, $\pi_{1jk} = \theta_1 + \gamma_{11}\text{MixedUse}_k + \gamma_{12}\text{Commercial}_k + b_{10j} + c_{10k}$

Fixed effect	**Coeff**	**Standard error**	**Approx. *T*-ratio**	***p***
Intercept, π_{0jk}				
Intercept, θ_0	3.11	0.04	$t(2850)=76.73$	$p < .001$
Mixed-Use, γ_{01}	0.11	0.04	$t(2850)=2.42$	$p=.016$
Commercial, γ_{02}	0.04	0.05	$t(2850)=0.82$	$p=.415$
Gender slope, π_{1jk}				
Intercept, θ_1	−0.49	0.04	$t(2850)=13.79$	$p < .001$
Mixed-Use, γ_{11}	0.07	0.08	$t(2850)=0.84$	$p=.403$
Commercial, γ_{12}	0.20	0.10	$t(2850)=1.97$	$p=.049$