Neighborhood Context, Poverty, and Urban Children's Outdoor Play

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Abstract

Although research consistently demonstrates a link between neighborhood conditions and physical activity for adults and adolescents, less is known about residential context and young children's physical activity. Using data from the Fragile Families and Child Wellbeing Study (N=2,210), we explore whether outdoor play and television watching are associated with children's body mass indexes (BMIs) at age five; and whether subjective and objective neighborhood measures are associated with children's outdoor play and television watching. Hours of outdoor play and television viewing are associated with BMI. Higher maternal perceptions of neighborhood collective efficacy are associated with more hours of outdoor play, fewer hours of television viewing, and more trips to a park or playground. In addition, we find that neighborhood physical disorder is associated with more outdoor play and more television watching. Finally, we find that children living in public housing have one-third more outdoor play time than other children.

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Introduction

Despite trends indicating a recent stabilizing in the upward obesity trend for children and adolescents in the U.S., child overweight remains a significant public health issue, with 31.9% of children ages 2-19 overweight (Body Mass Index (BMI) >=85th percentile) and 16% obese (BMI>=95th percentile) (Ogden, Carroll, & Flegal, 2008). One prominent explanation for the overweight problem is that children are spending too little time playing outdoors and too much time watching television. In addition, some analysts also argue that low levels of outdoor play are due to mothers' concerns about neighborhood safety. Although some studies have examined these hypotheses, very few studies have used nationally representative data and few have attempted to integrate both objective and subjective measures of neighborhood quality (Foster & Giles-Corti, 2008; Sallis & Glanz, 2006), which is crucial for establishing a direct relationship between neighborhood context and young children's activities. Our paper fills this gap by using data from a large, nationally representative birth cohort study to address two questions: (1) are the activity patterns (outdoor play and television watching) of five-year-old children associated with their weight status, and (2) is children's residential context, as assessed by both subjective and objective measures, associated with their activity patterns?

Children's Physical and Sedentary Activities and Obesity

Although the exact mechanisms of the link between physical and sedentary activities and the regulation of child obesity are not precisely understood, it is clear from experimental intervention studies that regular exercise is beneficial for older children's

weight status (Goran et al, 1999). Moreover, children who spend more time engaged in sedentary activities like watching television or playing video games are more likely to be overweight (Dennison, Erb, & Jenkins, 2002; Escobar-Chaves & Anderson, 2008; Gable, Chang, & Krull, 2007; Gortmaker, Must, Sobol, Peterson, Colditz, & Dietz, 1996), although at least one study did not find a link between three-year-olds' television viewing and BMI (Burdette & Whitaker, 2005).

Most research on physical activity and overweight focuses on older children (ages 10-17), who are more likely to be engaged in organized sports or after-school programs. Younger children, who typically have more unstructured time, are more likely to be physically active just through outdoor free play. Less is known about the influence of physical activity or outdoor play on young children's weight status. We argue that understanding the determinants of young children's play is just as important understanding adolescents' activities if not more so. Physical and sedentary activity patterns, like nutrition habits, are likely to be set in early childhood (Lindsay, Sussner, Kim, & Gortmaker, 2006; Pérez-Rodrigo & Aranceta, 2001)..

Some of the studies cited above have examined the links between television viewing, physical activity, and BMI for young children, but most of this work is based on homogenous samples or samples from one geographic area that do not allow for rigorous controls. Our data allow us to test for associations between physical and sedentary activities and BMI in young children living in twenty U.S. cities, controlling for multiple determinants of obesity, including maternal weight status. Thus, in the first step of our analysis that follows, the associations among television-watching, outdoor play and children's BMI at age five are documented. We also test whether the *ratio* of outdoor

play to television time is a significant predictor of children's BMI to see whether the negative effects of television time may be counterbalanced by outdoor play. This first step of our analysis justifies the following steps, which seeks to evaluate the influence of neighborhood context on children's physical and sedentary activities.

Residential Context and Children's Physical Activity

Recently, scholarly attention has focused on neighborhood environments as determinants of weight status. Most of this work focuses on adults (e.g., Boardman, Saint Onge, Rogers, & Denney, 2005). Generally, individuals in more disadvantaged neighborhoods (typically defined by percent of households in poverty) have lower levels of physical activity and higher rates of obesity, controlling for individual-level SES (Boardman et al., 2005; Fisher, Li, Michael, & Cleveland, 2004; Humpel, Owen, & Leslie, 2002). These links may be due to safety concerns (crime; poorly lighted streets), the built environment (lack of parks, playgrounds, and walkable destinations typically found in dense, urban areas such as churches, restaurants, and grocery stores), access to and affordability of healthy foods (Lang & Caraher, 1998; Rose & Richards, 2007), or to differences in neighborhood social processes (how well the neighbors know and trust one another) (Bennett, McNeill, Wolin, Duncan, Puleo, & Emmons, 2007; Giles-Corti & Donovan, 2002; Gordon-Larsen, McMurray, & Popkin, 2000; Humpel et al., 2002; Huston, Evenson, Bors, & Gizlice, 2003; Moore, Diez Roux, Evenson, McGinn, & Brines, 2008). Research on children and adolescents is mixed, with some studies showing strong correlations between neighborhood context and physical activity and others showing little to no effect (e.g. Burdette & Whitaker, 2005; Carver, Timperio, & Crawford, 2008; Cradock, Kawachi, Colditz, Gortmaker, & Buka, 2009; Gómez,

Johnson, Selva, & Sallis, 2004; Molnar, Gortmaker, Bull, & Buka, 2004; Mota, Almeida, Santos, & Ribeiro, 2005). The mixed findings may have to do with study design; some studies ask about overall physical activity, which could occur within or outside of the neighborhood (Davison & Lawson, 2006), some focus on specific age groups (Burdette & Whitaker, 2004; Cradock et al., 2009; Molnar et al., 2004), some are cross-sectional (Burdette & Whitaker, 2005) rather than longitudinal (Lumeng, Appugliese, Cabral, Bradley, & Zuckerman, 2006), and some do not control for important potential confounders such as maternal BMI or individual-level SES (Gable et al., 2007; Lumeng et al., 2006). Importantly, none of these studies has attempted to simultaneously examine the influences of individual- and neighborhood-SES, the built environment, and the social dimensions of neighborhoods.

Safety

Adult residents of disadvantaged or resource-deficient (lacking activity-promoting amenities) neighborhoods are at increased risk of low levels of physical activity, probably due to perceived hazardous or stressful conditions (Bennett et al., 2007; Burdette, Wadden, & Whitaker, 2006; Geronimus, 2000; Miles & Panton, 2006; Ross & Mirowsky, 2001; Seefeldt, Malina, & Clark, 2002). There is conflicting evidence, however, about the specific correlation between perceptions of safety and adults' physical activity (Boslaugh, Luke, Brownson, Naleid, & Kreuter, 2004; Foster & Giles-Corti, 2008; Humpel et al., 2002). Parental concern about child safety is likely to be particularly relevant in determining children's outdoor activities. In higher socioeconomic areas, "stranger danger" and traffic safety concerns are most problematic; while in lower socioeconomic areas general physical safety concerns (e.g., violence) are

prevalent and associated with lower levels of physical activity for children and youth (Carver et al., 2008; Davison & Lawson, 2006; Timperio, Salmon, Telford, & Crawford, 2005; Weir, Etelson, & Brand, 2006). Small positive correlations between crime rates and children's indoor sedentary activities have been noted, such that higher crime rates (especially sex offender per capita rates) are associated with up to one hour more television, computer, and video-game time for fourth-grade children (Brown, Pérez, Mirchandani, Hoelscher, & Kelder, 2008). In a cross-sectional study of seven-year-olds, the odds of being overweight were linked to mothers' feelings about neighborhood safety (Lumeng et al., 2006). A longitudinal analysis using ECLS-K data on older children (ages 5-8), which accounted for an average of parental perceptions of safety across three time points, also found a positive association between parental concern about safety and child overweight (Gable et al., 2007). Thus, it seems clear that parental concerns about safety are one factor that is related to both outdoor activities and to weight status for children, but it is unclear whether this finding will hold up in the presence of controls for other aspects of neighborhood environments.

The Built Environment

Aspects of the physical environment in neighborhoods, including population density, well-maintained sidewalks, good lighting, and the availability of green and recreational spaces, are expected to influence the physical activity of residents (Handy, Boarnet, Ewing, & Killingsworth, 2002). For adults, research consistently shows that these aspects of the built environment are positively associated with physical activity (Booth, Owen, Bauman, Clavisi, & Leslie, 2000; Humpel et al., 2002). An exception is that residents of disadvantaged communities may actually walk more, perhaps due to

greater density in urban environments as well as necessity (Brownson, Baker, Housemann, Brennan, & Bacak, 2001; Ross, 2000). It is likely that the built environment influences the outdoor activities of children in similar ways. Adolescents in disadvantaged areas have reduced access to recreational facilities, and, in turn, higher prevalence of overweight (Gordon-Larsen, Nelson, Page, & Popkin, 2006). Busy streets and a lack of sidewalks discourage children's outdoor activities (Sallis & Glanz, 2006). Children living in poor, dense neighborhoods, however, may walk more as a means of transport (such as to school) than other children, and children who perceive *more* neighborhood hazards evidence more physical activity (Romero et al 2001), a finding which parallels that for urban adults living in disadvantaged areas.

Collective Efficacy

A neighborhood's level of collective efficacy, or the shared willingness to exert social control (Sampson, 2003), is emerging as a potentially important factor for predicting residents' health. Collective efficacy (CE) is a flexible and nuanced measure that may not correlate directly with the socioeconomic status of residents; very poor neighborhoods may have high levels of collective efficacy and wealthier neighborhoods may have low levels of CE. The measure does not require that residents know each other very well at all; rather, it depends upon the shared understanding that they will intervene in social or civic situations and act in each other's shared interests (Ross, Mirowsky, & Pribesh, 2002; Sampson, 2003; Sampson, Morenoff, & Earls, 1999; Sampson, Raudenbush, & Earls, 1997). Researchers who study CE are interested in the construct as a process underlying neighborhood disadvantage as well as a process that differentiates among poor neighborhoods.

Collective efficacy is positively associated with physical activity (Cradock et al., 2009; Echeverría, Diez-Roux, Shea, Borrell, & Jackson, 2008; Evenson, Sarmiento, Tawney, Macon, & Ammerman, 2003) and been shown to be associated with weight status among adults, net of neighborhood socioeconomic disadvantage characteristics (Cohen, Finch, Bower, & Sastry, 2006). It is likely that collective efficacy influences weight status indirectly, through less stressful experiences for residents (Cohen et al., 2006), environs that are more friendly to exercise (Cohen, Inagami, & Finch, 2008; Cohen, McKenzie, Sehgal, Williamson, Golinelli, & Lurie, 2007; Molnar et al., 2004) and through greater perceptions of safety (Molnar et al., 2004; Sampson et al., 1997). In neighborhoods where adults feel more connected to their neighbors, they are likely to spend more time exercising outdoors and walking to neighborhood destinations for recreation or other purposes.

Likewise, parents who perceive higher degrees of CE in their neighborhoods may be more likely to allow their children to play outside, and their children may engage in more frequent outdoor play. One study found that preschool-aged children of mothers who perceived their neighborhoods to have low collective efficacy had higher levels of television viewing but not lower levels of outdoor play, although this study was unable to account for neighborhood SES (Burdette & Whitaker, 2005). An analysis of Project on Human Development in Chicago Neighborhoods data (Cradock et al., 2009), with rich and detailed neighborhood data, investigated whether social cohesion, a concept similar to collective efficacy, at the neighborhood level was linked to physical activity for adolescents, and found that adolescents in neighborhoods with high levels of cohesion had higher physical activity levels. It is also possible that adults and children who spend

more time outside engaging in physical activity may rate their neighborhoods more positively (or negatively) because they observe neighborhood situations more often. We detail our strategy for handling this potential selection issue in the methods section below.

Thus, given the findings of prior research, we expect multiple neighborhood characteristics to influence children's physical and sedentary activities, including aspects of the built environment and collective efficacy. In the second part of our analysis, we test these multiple measures of residential context for their associations with children's physical activity – neighborhood socioeconomic disadvantage, type of living environment (building, number of residents in the household, and public housing), maternal perceptions of collective efficacy, as well as interviewer-assessed physical disorder of the immediate built environment outside the home, while simultaneously controlling for multiple individual-level determinants of children's activities. We hypothesize that maternal perceptions of neighborhood collective efficacy will be associated with children's outdoor play, such that mothers who perceive high levels of CE will have children who play outdoors more, and watch television less. We also hypothesize that children in areas of high physical disorder will play outside less than children in neighborhoods of lower physical disorder. We seek to understand whether associations between neighborhood and residential context and children's activities are primarily driven by the neighborhood socioeconomic context, or whether other factors – such as maternal perceptions of the neighborhood environment, type of housing, or high physical disorder – are more closely linked with children's outdoor time.

Research Methods

Data

The Fragile Families and Child Wellbeing Study (FFCWS) is a national survey that follows a birth cohort of urban parents and their children, and it is representative of all births in large cities in 1998-99. The Wave I interviews, conducted between 1998 and 2000, contain information on 3,712 births to unmarried parents and 1,188 births to married parents, in 20 large cities across the U.S. The survey over-sampled unmarried mothers and thus contains a large sample of minority and immigrant women. The data include information on the resources and relationships of new parents and their effects on children. Follow-up interviews were conducted at one, three, and five years. Data for this paper are from the FFCWS, wave IV, as well as the In-Home Longitudinal Study of Pre-School Aged Children, an in-depth survey administered when the children were five years old to a sub-sample of FFCWS respondents who agreed to participate (about 76% of the Wave IV respondents). In addition to sociodemographic and attitudinal information for both mothers and fathers in the Wave IV survey, the In-Home Survey includes interview responses, parent and child activities, parent and child anthropometric measures, and an observation of both parent-child interaction and the home environment (including the exterior of the home). The data for this project include the 2,210 Non-Hispanic white (20%), Non-Hispanic black (55%), and Hispanic (25%) mothers and children who completed all components of the In-Home Five-Year Survey and also completed the Five-Year Core Survey. For further information about the Fragile Families Study, please visit http://crcw.princeton.edu/ff.asp. These data are ideal for our research questions because they are, as far as we know, the only nationally-representative, longitudinal data on young children which incorporate both mother-

reported and objectively-measured neighborhood characteristics. In addition, the data include a large proportion of poor families, so a wide range of neighborhood conditions and experiences are represented.

Measures

The first outcome of interest is the child's body mass index percentile (BMI) at age five. Children were weighed and measured during the in-home visit using standard procedures and digital scales (6% of children (N =148) are missing this outcome, primarily due to implausible measurements or refusals, and are omitted from the first set of analyses). Outdoor activity is measured by three variables (all mother-reported): 1) child's average number of hours per weekday of outdoor play; 2) child's average number of hours per weekday of television viewing; and 3) the average number of days per week the mother takes the child out to play at a park or playground. Less than 0.5% of cases are missing any of the activity measures, and those children are dropped from the sample for that particular analysis. In the first set of analyses, we also test whether the *ratio* of outdoor play time to television time is a meaningful predictor of BMI.

Maternal and Child Background Characteristics

In our models, we control for a variety of background factors related to child weight status and to children's activities. We classify children into racial/ethnic/nativity categories based on mothers' status: Non-Hispanic White, Non-Hispanic Black, and Hispanic. We also control for the child's age in months at the time of the In-Home interview, child's gender (1 = male), and, in the models predicting BMI, whether the child was normal birthweight (2500-5000 grams), low birthweight (<2500 grams), or high birthweight (5000+ grams), as the influence of birthweight on physical development

reaches well into childhood (Hediger, Overpeck, McGlynn, Kuczmarski, Maurer, & Davis, 1999). We control for mothers' educational attainment (when the child was born) with a set of indicators for did not complete high school (reference group), completed high school, and some college or more, as well as mother's age. We include measures for mother's employment, with not employed outside the home as the reference category, compared to full-time and part-time work; as well as an indicator for whether the child is enrolled in any daycare, preschool, or kindergarten program. Because children with older siblings might be more likely to play outside, we include an older sibling indicator (1 = has older sibling). We also include a continuous measure of the income-to-needs ratio for the household (also the income-to-needs ratio squared as indicated below), as well as family structure indicators based on the mother's current relationship with a partner – married, cohabiting, or single. We also include an indicator for whether the mother is likely clinically depressed, which is an indicator based on the CIDI-SF (Kessler, Andrews, Mroczek, Ustun, & Wittchen, 1998), as mothers who are depressed may be less likely to take their child out to play. Finally, to account for other, unobserved factors (such as genetics or general household nutrition) that may influence children's weight status as well as their outdoor activities, we also control in our models for whether the child's mother is overweight or obese (BMI>=25.0). If the mother was pregnant at the time of the five-year follow-up (N=117), we used her BMI at the time of the three-year follow-up.

Residential Context Measures

The first set of residential context measures include (1) whether the family lives in public housing, (2) number of residents in the household, and (3) type of housing:

single-family home (reference), apartment, duplex/townhome/row house, or other housing type. We also include a neighborhood socioeconomic disadvantage index to control for tract-level differences in neighborhood context. The measure (which is taken from the three-year survey) consists of the sum of the percent of household in the tract who were below the poverty line, the percent of households headed by a single woman, the percent unemployment, and the percent of renter-occupied households (alpha = .83). To account for the fact that nearly half the sample has moved since the three-year survey, we include an indicator for whether the family as moved in the last two years in all the models along with the disadvantage index. About 7% (N = 155) of respondents are missing geocoded information necessary to link them to census tract data. The missing cases that are excluded from the models do not significantly differ on any of our independent measures from cases with geocoded data. We are confident of our measure since most of the Fragile Families respondents who move, move to similar neighborhoods (Leventhal & Brooks-Gunn, 2003).. In using this index, we follow the example of Robert and Reithner (2004) and Ross and Mirowsky (2001), who have used similar measures for an overall assessment of community socioeconomic context.

To measure neighborhood collective efficacy, we created a modified version of the Neighborhood Environment for Children Rating Scale (Coulton, Korbin, & Su, 1996), using questions from the core five-year sample. Ten items assessing the mother's perception of neighborhood safety and cohesion were summed to create the scale (Chronbach's alpha = 0.86). There were two types of questions. The first set of five questions gauged how likely the mother thought neighbors would intervene in certain situations, such as "If children were skipping school and hanging out on the street," and

"If a fight broke out in front of the house." Mothers chose one of four responses; from "very likely" to "very unlikely." The second set of five questions asked about how cohesive mothers felt their neighborhoods were, such as, "People around her are willing to help their neighbors," and "Gangs are a problem in this neighborhood." Mothers chose one of four responses, ranging from "strongly agree" to "strongly disagree." If mothers chose "don't know," her score on that item was coded as in the middle of the range (e.g., 2.5). Items were coded with higher scores representing less neighborhood cohesion to be consistent with our other neighborhood context measures, and summed to create the full scale.

As part of the In-Home study, interviewers were instructed to complete a series of questions immediately after leaving the respondent's home. The observations, intended to capture the immediate built environment surrounding the home, included, "Is there garbage, litter, or broken glass in the street or road, on the sidewalks, or in yards?" Responses were, "almost none," "yes, but not a lot," "yes, quite a bit," and "yes, almost everywhere." Next, "How would you rate the general condition of most of the buildings on the block?" Responses were, "well kept with good repair and exterior surface," "fair condition," "poor condition with peeling paint and in need of repair," and "badly deteriorated." Next, "Is there graffiti on the buildings or walls of the buildings on the block or within 100 yards of the respondent's home?" Responses were, "none," "yes, but not a lot," "yes, quite a bit," and "yes, almost everywhere." Next, "Are there vacant, abandoned, or boarded-up buildings, on the block or within 100 yards of the respondent's home?" Responses were, "No," "yes, one building fits this description," "yes, 2-3 buildings fit this description," and "yes, 4 or more buildings fit this description." And

finally, “Are there abandoned vehicles on the block or within 100 yards of the respondent’s home?” Responses were, “No,” “only one,” “2-3” and “4 or more.” This interviewer observation data was summed into a physical disorder index (alpha = 0.85), with higher values indicating more disorder. A number of cases are missing these measures (N = 233, 10.5% of the total sample). Another 5% of cases are missing one or two of the physical disorder measures, and these cases are assigned the midpoint value (2.5) for the missing item(s), and then summed with the remaining measures. The cases missing all five measures are excluded from the models which contain the physical disorder scale (those missing are slightly more likely to be Hispanic, but are otherwise similar to those not missing the physical disorder measures, so we do not expect the exclusion of these cases to affect these models). Most of the respondents missing on the physical disorder measures are also missing information on the type of home (N = 226).

Endogeneity

The causal direction for associations between maternal perceptions of neighborhoods and children’s physical activity is unclear; that is, mothers whose children play outdoors may develop more positive views of their neighborhoods. Similarly, mothers whose children watch a lot of television may have less positive views because they are indoors all the time. One strategy for dealing with this problem, and the strategy we employ in this paper, is to test associations between subjective *and* objective measures of neighborhoods and children’s activities. In other words, we do not have to rely only on mothers’ perceptions of their neighborhoods, which may be influenced by how often her child plays outside. Instead, we can incorporate both her perceptions *and* the observations of an objective interviewer. We expect that maternal report and

objective measures will show the same association with our outcomes of interest (see (Kohen, Brooks-Gunn, Leventhal, & Hertzman, 2002) for an example of how these factors work together in a Canadian sample of young children).

Methods

For the first part of the analysis, testing the association between the activity measures and body mass index (BMI) percentile, ordinary least squares regression is used. We tested several specifications of SES, and found that the income-to-needs ratio had a non-linear relationship with BMI percentile, so we also include a squared income-to-needs ratio term. We also created categories for BMI percentile (underweight, normal weight, overweight, and obese), and tested whether the relationships between the activity measures and weight status varied depending upon the specification of the dependent variable, using ordered logit models. The relationships between the activity measures and a four-category weight outcome were uniformly weaker than for the linear model, but the effects were in the same direction. We also tested different specifications for maternal weight status and results were similar across models.

For the second part of the analysis, each of the three activity measures (average hours per day spent playing outdoors; average times per week mother takes the child to a playground; and average hours per day spent watching television) is a count measure and each is marked by over-dispersion, so OLS regression would not be appropriate. Thus, negative binomial regression models were used. These models are increasingly common in physical activity research and they adjust standard errors for over-dispersion in the outcome measure (Slymen, Ayala, Arredondo, & Elder, 2006). We also tested several SES specifications for these models, and found that the relationship between SES and

hours of outdoor play had a non-linear relationship, such that the poorest and wealthiest children in the sample were playing outside the most. Subsequent analyses, however, revealed that this nonlinearity was actually a public housing effect (where many of the poorest children live), so in our hours of outdoor play models we include an interaction term between income-to-needs ratio and public housing.

Results

Table 1 presents descriptive statistics for the sample [Table 1 about here]. The mean BMI percentile in the sample is 66.2, and in categorical terms (not shown) approximately 19% of the sample is overweight (between the 85^{th} and 95^{th} percentiles), and 16% are obese (>=95^{th} percentile). On average, children are playing outside about two hours per day, and watching more than two and a half hours of television per day. Mothers are taking their children to the playground or the park nearly four times per week. The background characteristics show that the FFCWS sample is relatively disadvantaged, with more than one-third of mothers having not completed high school, and the mean income-to-needs ratio is just 1.74. In addition, just 31% of mothers are married to the child's father (or a social father), and just 38% are working full-time. Fully 17% of mothers are likely depressed, and 68% are overweight or obese.

The mean collective efficacy (CE) score is 10.22 (range = 1-31), with higher values indicating *lower* collective efficacy. The neighborhood socioeconomic index and physical disorder measures are also coded with higher values indicating more disadvantage (mean = 1.10) and disorder (mean = 7.00). Nearly one in five families (18%) live in public housing, and 42% live in a single-family home, compared to 28% in

apartments and 27% in a duplex, townhouse, or row house. The mean number of residents per household is 4.65.

Table 2 [Table 2 about here] presents results of the OLS analysis designed to test our first research question: Whether and how children's physical and sedentary activities are associated with BMI percentile at age five. First we see that, as expected, hours of outdoor play are negatively associated with BMI, and hours of television are positively associated with BMI. For each hour of outdoor play, children, on average, score half a percentile point lower on BMI. The corresponding increase for each hour of television is similar, about half a percentile point. Model 3 shows the results when the ratio of outdoor time to television time is included in the model. As expected, results indicate that the higher the ratio of outdoor time to television time on an average weekday, the lower the child's BMI. In fact, for each additional hour they play outside each day – over and above television watching – children score 1.5 percentile points lower on BMI. Contrary to expectations, we find that the number of playground trips with the mother per week is not a statistically significant predictor of BMI at age five. We tested alternate specifications for trips to the playground but the measure never achieved significance. Across the models, we see that Hispanic children have substantially higher average BMI percentiles than white children. Interestingly, and contrary to our expectations, the income-to-needs ratio is positively associated with BMI percentile– indicating that as this ratio increases, children have *higher* BMIs. We also see, however, that the ratio is associated in a nonlinear way with BMI percentile, such that it is lowest for the poorest and wealthiest children. In addition, children living with single mothers have higher average BMIs, and mother's weight status is a strong positive predictor of a higher BMI

percentile for children. This maternal weight status variable likely captures many of the unobserved factors that correlate with children's BMI percentiles, such as household dietary practices and genetic influences on weight status, and our ability to control for maternal weight is a strength of our study. We also tested interactions between maternal weight status and children's activity measures, reasoning that the activity measures might be related to maternal weight status, and thus to child weight. There were no significant interactions except for television watching – the BMI of the children of overweight mothers was unaffected by hours of television watching whereas the number of hours of television for the children of non-overweight mothers had a relatively large influence on child BMI – each additional hour was associated with about two additional percentile points of BMI.

Our second question, motivated by our findings that children's outdoor play and television-viewing significantly influence their average BMI, focuses on the association between neighborhood characteristics and children's activities. Table 3 [Table 3 about here] presents results of the negative binomial regression models for hours of outdoor play. In the basic model (Model 1), we see that black children have an expected count of outdoor hours of play about 19% lower (1-e^-0.21) than white children, similar to the result for Hispanic children. Working mothers, and those families interviewed in the winter, reported less time outside. In Model 2, we control for residential context, specifically the household measures, and include an interaction term between income-to-needs and public housing. We also see that children living in public housing, accounting for the fact (via the interaction term) that children in public housing tend to be poor, play outside about 36% more than other children. The interaction term demonstrates that this

public housing effect weakens as the income-to-needs ratio rises for households. This interaction is depicted in Figure 1, where we can see that children who live in public housing are more likely to report very high amounts of time spent playing outdoors, compared to other children, and that this association is most pronounced for children whose income-to-needs ratios are less than one (or, under 100% of the Federal Poverty Line). [Figure 1 about here] Neighborhood socioeconomic disadvantage is not significantly related to children's outdoor time, nor are the type of home or the number of residents in the household.

In Model 3, we see that lower levels of collective efficacy are associated with less outdoor play time, even after accounting for differences between neighborhoods in socioeconomic disadvantage and other residential context measures. The effect is significant but small; for a standard deviation increase in CE (2 points, which represents a worsening of CE), children's expected hours of play decline by 4%. In Model 4, we test the association between children's outdoor play and physical disorder in the immediate area around the home, and find that, counter-intuitively, higher physical disorder is associated with *more* time outdoors for children. This effect is a little stronger than the CE effect; a standard deviation increase in physical disorder is associated with a 7% increase in expected hours of play for children. In a model (not shown) which includes both CE and physical disorder (which are correlated 0.19), the coefficient for CE decreases slightly but the physical disorder coefficient is unchanged. We also tested an interaction term between income-to-needs and neighborhood physical disorder, as well as physical disorder and public housing. The interaction between income-to-needs ratio and physical disorder was only marginally significant, but indicated that the positive

influence of physical disorder on outdoor play declines as the income-to-needs ratio rises, indicating that the poorest children, who are also more likely to live in neighborhoods with high physical disorder, are driving the physical disorder main effect. The interaction between physical disorder and public housing was not significant.

In Table 4, we present results for our models examining children's television time [Table 4 about here]. In Model 1, we see that Black and Hispanic children watch more weekday television, on average, than white children (27% and 13% more, respectively). Similarly, poorer children watch more television; each standard deviation increase in the income-to-needs ratio results in about 8% less television time. Children of mothers who work full-time watch less television as do those children enrolled in kindergarten or a daycare program. Model 2 adds the residential context measures, and again we find a significant difference between children who live in public housing and those who do not – children living in public housing have a 12% increase in the expected number of hours of television per day. Poorer children, then, especially those living in public housing, are playing outside more *and* spending more time watching television, perhaps reflecting a greater amount of unstructured free time in lower-income homes. Children living in homes with more residents also have an elevated number of hours of television. In Model 3, we test the association between maternal perceptions of collective efficacy and children's television time, and find that the children of mothers who perceive worse collective efficacy in their neighborhoods (higher on the CE scale) watch more television. Each standard deviation increase in CE is associated with a 4% increase in the expected count of television time for children. In Model 4, the association between physical disorder and children's television time works in the expected direction – children living

in areas of higher physical disorder are spending more time watching television, about 6.5% more for each standard deviation increase in physical disorder. In a model which includes both CE and physical disorder (not shown), the CE coefficient decreases slightly and the physical disorder coefficient is unchanged. No interactions between income-to-needs ratio, public housing, and physical disorder reached significance for television viewing.

Finally, Table 5 [Table 5 about here] presents results of our negative binomial regression models of the number of times per week the mothers take the children to a park or playground. Single mothers, those who work full-time, those interviewed during the winter, and mothers who are likely depressed, take their child to the park or playground significantly less often. Model 2 tests associations between residential context and maternal outings, and again we find a significant association between children's activities and public housing – mothers living in public housing take their children to the playground about 13% more frequently than mothers in other types of housing. In Model 3, we see that, as for the other outcomes, collective efficacy is significantly related to mothers' outings, such that mothers perceiving worse collective efficacy (higher on our CE scale) take their children on outings less often. This coefficient equates to an 8% decline in the expected count of playground trips for each standard deviation increase in collective efficacy. In Model 4, we see that, unlike our other outcomes, physical disorder is not significantly associated with the number of trips per week to a park or playground. In a model which includes both CE and physical disorder (not shown), results are virtually identical to those presented in Models 3 and 4.

Similarly to television viewing, no interactions between income-to-needs and either physical disorder or public housing reached significance.

Discussion

Our analysis, which is the first to incorporate objective and subjective neighborhood characteristics in examining *young* children's physical and sedentary activities, revealed some surprising findings. Despite most recent research documenting a negative association between SES and the likelihood of overweight for children (Danielzik, Czerwinski-Mast, Langnase, Dilba, & Muller, 2004; Haas, Lee, Kaplan, Sonneborn, Phillips, & Liang, 2003; Mei, Scanlon, Grummer-Strawn, Freedman, Yip, & Trowbridge, 1998), we find a nonlinear effect – the poorest and wealthiest children in our sample have the lowest BMIs, while the children in the middle of the SES distribution have the highest BMIs. In addition, we find that hours of outdoor play and television watching are both associated with BMI at age five, as well as the ratio of outdoor play to television watching time. The magnitude of the relationships are similar to those of other studies (Dennison et al., 2002; Gable et al., 2007), showing small but statistically significant associations between physical and sedentary activities and BMI for children. In addition, we also found that maternal weight status influences the relationship between hours of television watching and children's BMI, such that there was no effect for the children of overweight mothers but that the children of non-overweight mothers had sharply increased BMIs for each additional hour of television watching. We did not, however, find any other interactions between maternal weight status, children's activities, and children's BMI.

A second surprising finding is that children living in public housing, and those living in the neighborhoods with higher levels of physical disorder, are playing outdoors *more* often than other children. These same characteristics are also associated with more television viewing, indicating that these activities are not substitutes for one another, at least in this study population. Qualitative research on children's leisure activities provides a rich picture of children's time management differences by class. Children in lower class households have much more unstructured time than do those in middle-class households, reflecting class differences not just in resources but also in child-raising philosophies (Lareau, 2003). The social environments surrounding families may also influence children's time regulation. Disadvantaged families, particularly African-Americans, often rely on in-home strategies for childrearing, given the uncertainties of the surrounding social environments (Furstenberg Jr, Cook, & Eccles, 2000). Thus, it seems likely that the poorest children in our sample have more unstructured time to fill with outdoor play and sedentary activities, such as television watching. These findings give rise to the idea that SES may differentially influence children's activities which may have implications for interpretations of the associations between activities and weight status.

The negative influences of social and physical environments on children's physical activity are often construed as a result of mothers' decisions to keep their children indoors for safety reasons. Instead, we demonstrate that in poor communities, specific social conditions may give rise to higher rates of physical activity. In public housing projects where parents (especially mothers) are likely to be home during the day, and where a cohesive – or at least a vigilant – community may arise, children may have

higher rates of outdoor physical activity. Moreover, these children of mostly non-working mothers may be less likely to be enrolled in preschool or daycare programs, and thus may have more unstructured time at home in which to play outdoors. It also is likely that public housing projects provide relatively safe and accessible places to play (e.g. courtyards or playgrounds) which are not available to poor children not living in public housing.

Our findings also dovetail with recent studies which find a positive effect of perceived collective efficacy on physical activity for adolescents and adults (Cradock et al., 2009; Echeverría et al., 2008). The children of mothers who perceive higher levels of collective efficacy in their neighborhoods are playing outside for longer periods each day, watching less television, and also visiting the park or playground more often each week. We also find that tract-level neighborhood socioeconomic disadvantage is not associated with any of our outcomes, lending support to the idea that maternal perceptions may matter more than objective measures of disadvantage in terms of neighborhood effects on children's outdoor play. Since this measure was from the three-year data, it is conceivable that, although we control for whether the family has moved between years three and five, we are not adequately capturing the socioeconomic environment. It seems likely, however, that maternal perceptions of neighborhood environments – both positive and negative – truly override objective measures like neighborhood poverty status when considering children's activities.

The agency of parents in selecting neighborhoods in which to raise their children must be considered in any investigation of the "effect" of neighborhood environments on children (Furstenburg, 1995, IRP). Typically, low-SES families have low agency in

choosing where to live. There is some evidence, however, that families who have low socioeconomic resources may benefit from access to social and community resources (Small, 2004). Moreover, residents of disadvantaged areas may have more at stake in terms of creating cohesive communities. They may also interact more frequently, particularly in dense, urban areas, and especially in communities where unemployment is high. These characteristics may have special salience for children's outdoor play. Mothers may be more comfortable sending their children outside, despite higher physical and social disorder, because they know that adults are around (and possibly monitoring activity). It is also possible that mothers go out more often with their children, simply because they have more unstructured time and are not working. In this way, they can monitor their children's safety despite what may be higher physical and psychosocial hazards. With our data, we are unable to disaggregate between time children may be spending outside alone vs. time they are spending outdoors with their parents (or other adults). Ideally, future analyses of this sort would have more detailed measures of outdoor time (and sedentary activities). Despite these limitations, we believe our paper, which draws upon both subjective and objective neighborhood measures, adds to the literature on children's weight outcomes, physical activity levels, and residential context.

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Table 1: Descriptive and Bivariate Statistics for Five-Year Core and In-Home FFCWS Samples

	M (SD)
Activity/Outcome Measures	
Mean BMI Percentile	66.2 (28.64)
Weekday Hours of Outdoor Play	2.04 (1.87)
Weekday Hours of Television	2.60 (1.84)
Days Per Week Mother Takes Child Outside to Play	3.80 (2.19)
Mother Interviewed In Winter, Cold City	0.21
Child Background Characteristics	
Child's age in months (In-Home)	63.78 (3.01)
Child is male	0.52
Child enrolled in kindergarten or other program	0.76
(White)	0.20
Black	0.55
Hispanic	0.25
Child was low birthweight (<2500 grams)	0.11
Child was high birthweight (>5000 grams)	0.01
Mother's Background Characteristics	
(Mother did not complete high school)	0.35
Mother completed high school	0.32
Mother completed at least some college	0.33
Household Income/Needs Ratio	1.74 (2.00)
Mother's age	30.0 (5.96)
Child Has Older Sibling	0.61
Mother is overweight/obese (BMI>=25.0)	0.68
Family Structure, Employment, and Mental Health	
(Mother married to child's father/social father)	0.31
Mother cohabiting with child's father/social father	0.27
Mother is single	0.42
(Mother does not work)	0.41
Mother works full-time	0.38
Mother works part-time	0.21
Mother is likely depressed	0.17
Residential Context	
Collective Efficacy (CE) Scale	10.22 (6.32)
Neighborhood SES Disadvantage Index (nindex)	1.10 (0.55)
Family moved since three-year survey	0.49
Physical disorder scale (outside home)	7.00 (2.54)
Family lives in public housing	0.18
(Family lives in house)	0.42
Apartment	0.28
Duplex/Townhouse/Row House	0.27
Other Housing Type	0.04
Number of Residents in Household	4.65 (1.73)
N	2,210

Table 2: OLS Regression of Child's BMI Percentile, Testing Association with Play Outcomes

	Model 1	Model 2	Model 3	Model 4
	Coef. (Std. Err.)	*Coef. (Std. Err.)*	*Coef. (Std. Err.)*	*Coef. (Std. Err.)*
Number of Hours of Weekday Play	**-0.57* (0.26)**			
Number of Hours of Weekday TV		**0.53* (0.23)**		
Ratio of Play to Television Time			**-1.51* (0.71)**	
Days per Week Mother Takes Child Outside to Play				**0.56# (0.31)**
Child Background Characteristics				
(White)				
Black	-1.22 (2.56)	-0.81 (2.57)	-1.43 (2.58)	-0.29 (2.55)
Hispanic	6.68** (2.27)	6.94** (2.40)	6.45* (2.32)	7.59** (2.34)
Child's age in months (In-Home)	-0.16 (0.21)	-0.08 (0.22)	-0.15 (0.22)	-0.13 (0.21)
Child is male	-0.76 (1.61)	-0.63 (1.56)	-0.55 (1.62)	-0.58 (1.50)
Low Birthweight	-7.38** (2.16)	-7.06** (2.21)	-7.48** (2.20)	-7.35** (2.13)
High Birthweight	13.61***(2.91)	13.33***(2.71)	13.34***(2.80)	13.43***(2.83)
Child in fair or poor health	-0.70 (5.36)	-0.82 (5.46)	-1.59 (5.59)	0.32 (5.27)
Mother's Background Characteristics				
(Mother did not complete high school)				
Mother completed high school	-0.22 (1.68)	-0.07 (1.71)	-0.16 (1.67)	0.08 (1.79)
Mother completed at least some college	-1.54 (1.43)	-1.26 (1.45)	-1.38 (1.44)	-1.07 (1.47)
Household Income/Needs Ratio	1.57** (0.52)	1.68** (0.54)	1.65** (0.54)	1.58* (0.58)
Household Income/Needs Ratio ^{2}	-0.07* (0.03)	-0.08* (0.03)	-0.07* (0.03)	-0.07* (0.03)
Mother's age	-0.07 (0.14)	-0.05 (0.14)	-0.07 (0.14)	-0.06 (0.13)
(Mother is married to father/social father)				
Mother is cohabiting with father/social father	1.50 (2.01)	1.40 (2.02)	1.46 (2.06)	1.31 (1.97)
Mother is no longer with father/social father	5.75** (1.95)	5.32* (1.41)	5.71** (1.94)	5.64** (1.93)
Child Has Older Sibling	1.34 (0.84)	1.15 (0.86)	1.44 (0.84)	1.51# (0.81)
(Mother does not work)				
Mother works full-time	1.07 (1.44)	1.22 (1.43)	1.05 (1.45)	1.44 (1.43)
Mother works part-time	0.53 (1.45)	0.45 (1.39)	0.31 (1.45)	0.78 (1.48)
Family lives in Public Housing	-0.14 (1.45)	-0.29 (1.41)	-0.20 (1.41)	-0.39 (1.36)
Mother is Overweight or Obese	10.85***(1.44)	10.73***(1.43)	10.94***(1.43)	10.48***(1.52)
Child enrolled in kindergarten/program	1.73 (1.45)	2.06 (1.48)	1.70 (1.41)	2.02 (1.62)
Mother likely depressed	-2.17* (0.96)	-1.82# (0.94)	-2.00# (0.96)	-1.74# (0.83)
Constant	65.7	56.8	65.0	58.6
N	1,970	1,974	1,960	1,970

Note: Standard errors were adjusted for clustering at the city-level.
#$p <$ .10; * $p <$ .05; ** $p <$ .01; *** $p <$ .001.

Table 3: Negative Binomial Regression Models for Hours of Weekday Outdoor Play

	Model 1	Model 2	Model 3	Model 4
Residential Context	*Coef. (Exp. Coef.)*	*Coef. (Exp. Coef.)*	*Coef. (Exp. Coef.)*	*Coef. (Exp. Coef.)*
Family lives in public housing		0.30*** (1.35)	0.31*** (1.36)	0.28** (1.32)
Neighborhood SES Disadvantage Index		0.01 (1.01)	0.01 (1.02)	-0.05 (0.95)
Family moved since three-year survey		-0.01 (0.99)	-0.01 (0.99)	0.01 (1.01)
(Family Lives in House)				
Apartment		-0.13# (0.88)	-0.12# (0.88)	-0.13* (0.88)
Duplex/Townhome/Row House		-0.06 (0.94)	-0.05 (0.95)	-0.10# (0.90)
Other Housing Type		0.04 (1.04)	0.03 (1.03)	0.06 (1.06)
Number of Residents in Household		0.02 (1.02)	0.02 (1.02)	0.02 (1.02)
Public Housing * Income/Needs Ratio		-0.18***(0.84)	-0.18***(0.84)	-0.16***(0.85)
Collective Efficacy (CE) Scale			**-0.01* (0.99)**	
Physical disorder scale (outside home)				**0.04** (1.04)**
Child Background Characteristics				
(White)				
Black	-0.21***(0.81)	-0.21** (0.81)	-0.20** (0.82)	-0.19** (0.83)
Hispanic	-0.18# (0.83)	-0.17 (0.85)	-0.16 (0.85)	-0.16 (0.86)
Child's age in months (In-Home)	-0.01 (0.99)	-0.01 (0.99)	-0.01 (0.99)	-0.01 (0.99)
Child is male	-0.01 (0.99)	0.04 (1.04)	0.04 (1.04)	0.03 (1.03)
Child in fair or poor health	-0.11 (0.89)	-0.15 (0.86)	-0.14 (0.87)	-0.04 (0.96)
Mother's Background Characteristics				
(Mother did not complete high school)				
Mother completed high school	0.01 (1.01)	0.02 (1.02)	0.01 (1.01)	0.02 (1.02)
Mother completed at least some college	-0.07 (0.93)	-0.04 (0.96)	-0.04 (0.96)	-0.02 (0.98)
Household Income/Needs Ratio	-0.02# (0.98)	-0.01 (0.99)	-0.01 (0.99)	-0.01 (0.99)
Mother's age	-0.01 (0.99)	-0.01 (0.99)	-0.01 (0.99)	-0.01 (0.99)
(Mother is married to father/social father)				
Mother is cohabiting with father/social father	0.06 (1.06)	0.06 (1.06)	0.06 (1.06)	0.02 (1.02)
Mother is no longer with father/social father	0.06 (1.06)	0.08 (1.08)	0.08 (1.08)	0.10# (1.10)
Child Has Older Siblings	0.03 (1.03)	0.01 (1.01)	-0.01 (0.99)	0.02 (1.02)
(Mother does not work)				
Mother works full-time	-0.14***(0.87)	-0.09* (0.91)	-0.09* (0.91)	-0.09* (0.92)
Mother works part-time	-0.13** (0.88)	-0.12** (0.88)	-0.12** (0.88)	-0.12* (0.89)
Mother is overweight/obese	0.06 (1.06)	0.04 (1.04)	0.05 (1.05)	-0.01 (0.99)
Mother interviewed in cold winter	-0.82***(0.44)	-0.78*** (0.46)	-0.78***(0.46)	-0.74***(0.48)
Child enrolled in kindergarten/program	-0.06 (0.95)	-0.08 (0.92)	-0.08 (0.93)	-0.08 (0.93)
Mother likely depressed	-0.07 (0.93)	-0.08# (0.92)	-0.07 (0.93)	-0.06 (0.93)
Constant	2.18	1.74	1.84	1.57
N	2,152	1,795	1,795	1,646

Note: Standard errors were adjusted for clustering at the city-level.; #$p < .10$; * $p < .05$; ** $p < .01$; *** $p < .001$.

Table 4: Negative Binomial Regression Models for Hours of Weekday Television

	Model 1		Model 2		Model 3		Model 4	
	Coef.	*(Exp. Coef.)*	*Coef.*	*(Exp. Coef.)*	*Coef.*	*(Exp. Coef.)*	*Coef.*	*(Exp. Coef.)*
Residential Context								
Family lives in public housing			0.11***	(1.11)	0.10***	(1.11)	0.12***	(1.13)
Neighborhood SES Disadvantage Index			-0.01	(0.99)	-0.01	(0.99)	-0.05	(0.95)
Family moved since three-year survey (Family Lives in House)			-0.01	(0.99)	-0.01	(0.99)	-0.01	(0.99)
Apartment			0.01	(1.01)	-0.01	(0.99)	0.01	(1.01)
Duplex/Townhome/Row House			-0.07	(0.93)	-0.08	(0.92)	-0.09#	(0.91)
Other Housing Type			-0.10	(0.91)	-0.10	(0.90)	-0.14*	(0.91)
Number of Residents in Household			0.02*	(1.02)	0.01*	(1.01)	0.01	(1.01)
Collective Efficacy (CE) Scale					**0.01****	**(1.01)**		
Physical disorder scale (outside home)							**0.02*****	**(1.02)**
Child Background Characteristics								
(White)								
Black	0.24***	(1.27)	0.23***	(1.26)	0.23***	(1.25)	0.25***	(1.29)
Hispanic	0.13*	(1.13)	0.13*	(1.14)	0.12*	(1.13)	0.16**	(1.17)
Child's age in months (In-Home)	-0.03**	(0.97)	-0.03**	(0.97)	-0.02**	(0.98)	-0.03**	(0.97)
Child is male	0.03	(1.03)	0.03	(1.03)	0.04	(1.04)	0.05	(1.05)
Child in fair or poor health	-0.14	(0.87)	-0.20#	(0.82)	-0.20#	(0.82)	-0.15	(0.86)
Mother's Background Characteristics								
(Mother did not complete high school)								
Mother completed high school	-0.02	(0.98)	0.01	(1.01)	0.01	(1.01)	0.03	(1.03)
Mother completed at least some college	-0.07	(0.93)	-0.08	(0.92)	-0.07	(0.93)	-0.03	(0.97)
Household Income/Needs Ratio	-0.04***	(0.96)	-0.03**	(0.97)	-0.03*	(0.97)	-0.03#	(0.97)
Mother's age	-0.01*	(0.99)	-0.01*	(0.99)	-0.01*	(0.99)	-0.01**	(0.99)
(Mother is married to father/social father)								
Mother is cohabiting with father/social father	0.05	(1.05)	0.05	(1.05)	0.05	(1.05)	0.03	(1.03)
Mother is no longer with father/social father	0.06	(1.06)	0.08	(1.09)	0.08	(1.09)	0.05	(1.05)
Child Has Older Siblings	0.07*	(1.07)	0.06#	(1.07)	0.07*	(1.07)	0.09**	(1.09)
(Mother does not work)								
Mother works full-time	-0.06*	(0.94)	-0.06	(0.95)	-0.06	(0.95)	-0.05	(0.95)
Mother works part-time	-0.01	(0.99)	-0.03	(0.97)	-0.03	(0.97)	-0.03	(0.97)
Mother is overweight/obese	0.02	(1.02)	0.03	(1.04)	0.03	(1.03)	0.01	(1.01)
Mother interviewed in cold winter	-0.04	(0.96)	-0.04	(0.96)	-0.04	(0.96)	-0.04	(0.96)
Child enrolled in kindergarten/program	-0.14**	(0.86)	-0.19***	(0.83)	-0.19***	(0.83)	-0.21***	(0.81)
Mother likely depressed	-0.07	(0.93)	-0.07	(0.93)	-0.07	(0.93)	-0.08	(0.92)
Constant	2.83		2.67		2.64		2.64	
N	2,157		1,799		1,799		1,651	

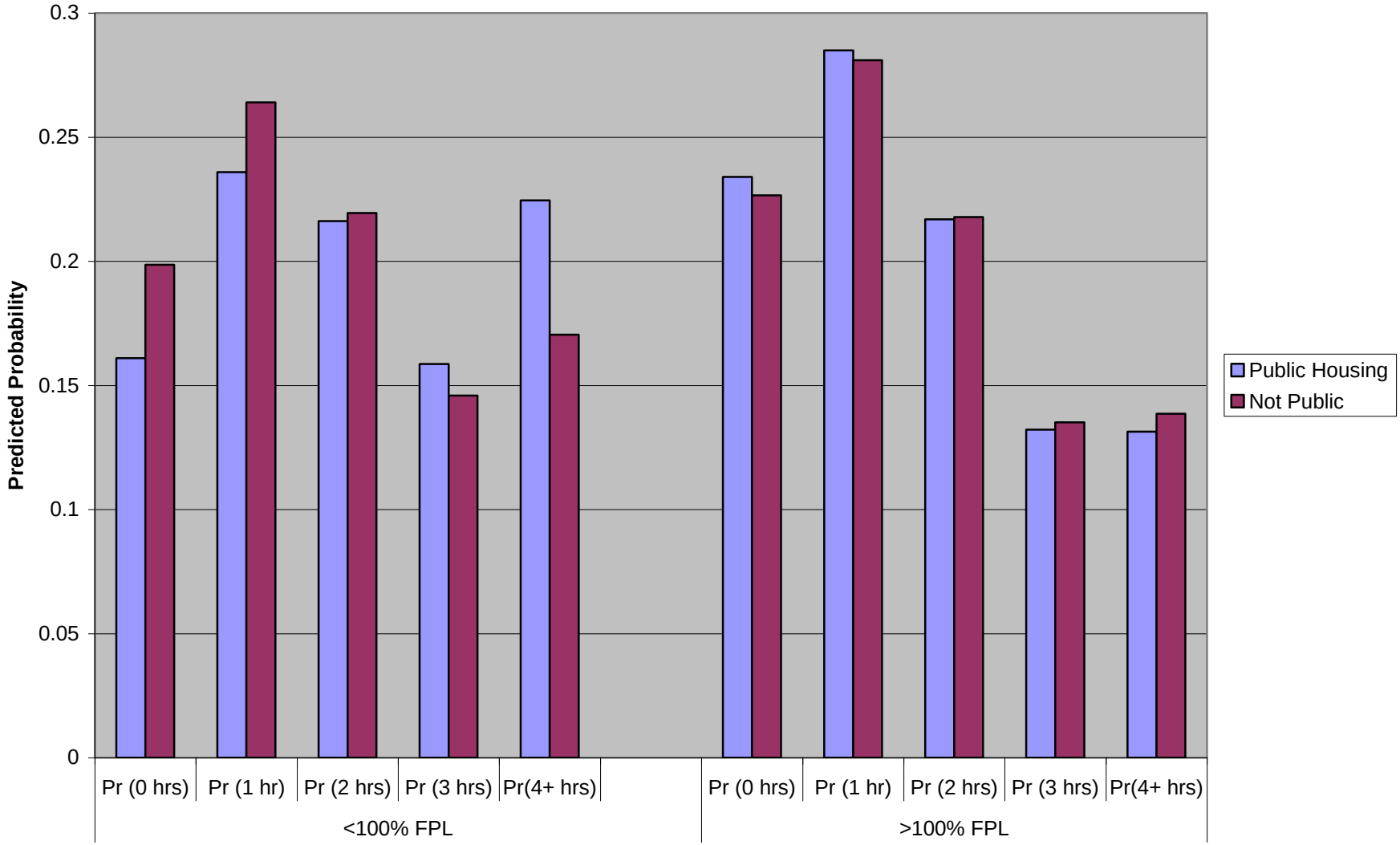
Note: Standard errors were adjusted for clustering at the city-level.; #$p <$ .10; * $p <$ .05; ** $p <$ .01; *** $p <$ .001.

Table 5: Negative Binomial Regression Models for Number of Playground Trips (with Mother) Per Week

	Model 1		Model 2		Model 3		Model 4	
	Coef.	*(Exp. Coef.)*	*Coef.*	*(Exp. Coef.)*	*Coef.*	*(Exp. Coef.)*	*Coef.*	*(Exp. Coef.)*
Residential Context								
Family lives in public housing			0.13**	(1.14)	0.14***	(1.15)	0.12**	(1.13)
Neighborhood SES Disadvantage Index			-0.02	(0.98)	-0.01	(0.99)	-0.03	(0.97)
Family moved since three-year survey (Family Lives in House)			-0.03	(0.97)	-0.03	(0.97)	-0.03	(0.97)
Apartment			-0.12*	(0.88)	-0.10#	(0.90)	-0.14*	(0.87)
Duplex/Townhome/Row House			-0.07	(0.93)	-0.06	(0.94)	-0.08	(0.93)
Other Housing Type			-0.03	(0.96)	-0.02	(0.98)	-0.03	(0.97)
Number of Residents in Household			0.01	(1.01)	0.01	(1.01)	0.01	(1.01)
Collective Efficacy (CE) Scale					**-0.01*** **	**(1.01)**		
Physical disorder scale (outside home)							**0.01**	**(1.01)**
Child Background Characteristics								
(White)								
Black	-0.08	(0.92)	-0.04	(0.96)	-0.02	(0.98)	-0.04	(0.96)
Hispanic	-0.17#	(0.84)	-0.13#	(0.87)	-0.12	(0.88)	-0.13#	(0.87)
Child's age in months (In-Home)	0.01	(1.01)	0.01	(1.01)	0.01	(1.01)	0.01	(1.01)
Child is male	0.01	(1.01)	0.02	(1.02)	0.01	(1.01)	0.02	(1.02)
Child in fair or poor health	-0.06	(0.94)	-0.06	(0.94)	-0.05	(0.95)	-0.12	(0.89)
Mother's Background Characteristics								
(Mother did not complete high school)								
Mother completed high school	-0.03	(0.97)	-0.04	(0.96)	-0.04#	(0.96)	-0.04	(0.97)
Mother completed at least some college	-0.04	(0.96)	-0.04	(0.96)	-0.05	(0.95)	-0.05	(0.95)
Household Income/Needs Ratio	-0.01	(0.99)	-0.01	(0.99)	-0.01	(0.99)	-0.01	(0.99)
Mother's age	-0.01	(0.99)	-0.01	(0.99)	-0.01	(0.99)	-0.01	(0.99)
(Mother is married to father/social father)								
Mother is cohabiting with father/social father	-0.03	(0.96)	-0.01	(0.99)	-0.01	(0.99)	-0.01	(0.98)
Mother is no longer with father/social father	-0.07*	(0.93)	-0.06#	(0.94)	-0.06#	(0.94)	-0.05#	(0.95)
Child Has Older Siblings	-0.01	(0.99)	-0.04#	(0.96)	-0.05*	(0.95)	-0.04	(0.96)
(Mother does not work)								
Mother works full-time	-0.10***	(0.90)	-0.08**	(0.92)	-0.09**	(0.92)	-0.09**	(0.91)
Mother works part-time	-0.07	(0.93)	-0.05	(0.95)	-0.05	(0.95)	-0.05	(0.95)
Mother is overweight/obese	-0.02	(0.98)	-0.03	(0.97)	-0.02	(0.98)	-0.03	(0.97)
Mother interviewed in cold winter	-0.15**	(0.86)	-0.14**	(0.87)	-0.15***	(0.86)	-0.15***	(0.86)
Child enrolled in kindergarten/program	0.02	(1.03)	0.01	(1.01)	0.01	(1.01)	0.01	(1.01)
Mother likely depressed	-0.11**	(0.89)	-0.13**	(0.87)	-0.11**	(0.89)	-0.15***	(0.86)
Constant	0.96		0.99		1.20		0.91	
N	2,153		1,799		1,799		1,649	

Note: Standard errors were adjusted for clustering at the city-level.; #$p <$ .10; * $p <$ .05; ** $p <$ .01; *** $p <$ .001.

Figure 1: Poverty, Public Housing, and Hours of Outdoor Play



Note: FPL = Federal Poverty Line