Intergenerational Transmission of Social Inequality in Children's Cognitive Skills

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Family and Neighborhood Sources of Socioeconomic Inequality in Children's Cognitive Skills

Social origins have a substantial effect on adults' social position (Hauser et al., 2000, Biblarz et al., 1996; Grusky and DiPrete, 1990). Cognitive skills (e.g., reading, problem solving) and non-cognitive skills (e.g., organizing, interpersonal skills) appear to play a central role in this intergenerational reproduction of social class (Farkas, 2003; Bowles and Gintis, 2002; Kerckhoff et al., 2001). These skills begin to develop early in life and are shaped by children's social and physical environment (Guo and Harris, 2000; Duncan and Brooks-Gunn, 1997). Cognitive and non-cognitive skills, in turn, have a substantial effect on status attainment in adulthood. For example, Farkas et al. (1997) show that cognitive skills in adolescence and young adulthood significantly affect occupation and income years later, even when work experience, educational attainment, and other factors are controlled.

Although the effect of skills on status attainment is well established, much less is known about *how* childhood disadvantage affects children's skills development. The literature suggests two potential pathways.[1] The first, which Farkas (2003: 546) labels "family resources theory," posits that social class affects the amount of resources that parents invest in childrearing. The most important resources are parents' human capital (e.g., education), financial resources, and time used to create a cognitively stimulating, warm, and supportive home environment (Haveman et al., 2004; Bianchi et al., 2004). Family resources may also include cultural capital, e.g., parental skills and knowledge about social institutions (Swidler, 1986; Farkas, 1996) and social capital, e.g., control of and support for children achieved through parental social ties (Coleman, 1988; Portes, 2000). In this paper, we focus on parents' human capital and financial resources. Poor families have fewer of both resources and may also make different choices than non-poor families about resource allocation (Lareau, 2002). For example, disadvantaged parents may be less likely to read to their children either because they themselves have poorer reading skills or because they place a lower priority on reading to children given other demands for their time. Socioeconomic differentials in parents' resource allocation decisions may be partly due to differential exposure to chronic stress. Disadvantaged parents may experience more chronic stress than other parents, because they have less control over, and frequent experience with, negative events such as unemployment, economic hardship, eviction, crime, and marital dissolution (Amato and Zuo, 1992; Conger et al., 1992; Evans, 2004). High stress levels, in turn, are associated with less parental warmth and responsiveness, more harsh and inconsistent discipline, and less monitoring of children's behavior (McLoyd, 1990, 1998).

A second pathway through which childhood disadvantage may affect children's skills is residential segregation by socioeconomic status. Residential segregation concentrates poor families into poor neighborhoods and thus potentially compounds family socioeconomic disadvantage with neighborhood-level disadvantage (Mayer, 2002, Leventhal and Brooks-Gunn, 2000; Sampson et al., 2002; Ainsworth, 2002). Neighborhood residence is, in part, a parental choice and can therefore be thought of as a parental input to childrearing. However, residential segregation places bounds on the neighborhood choices that are available to parents based on their economic status and race/ethnicity. For example, the factors that shaped residential segregation between 1970 and 1990 were largely beyond parental control, i.e., deindustrialization of cities, structural changes in labor demand, racial discrimination, fewer middle class neighborhoods in inner city areas, and public policies regarding residential segregation, public housing, and highway systems (Wilson, 1987 and 1996; Massey and Denton, 1993; Jargowsky, 1997a).

Social theory suggests several ways that neighborhood conditions may affect children's development. Social disorganization and social capital approaches argue that neighborhood characteristics (e.g., concentrated poverty, high turnover) make it harder for residents to establish social ties required for social control and support of children (Sampson et al., 1999; Coleman, 1988; Portes, 2000). Collective socialization, oppositional culture, and segmented assimilation perspectives suggest that residents of poor neighborhoods – particularly disadvantaged ethnic minority or immigrant communities – perceive that members of their own ethnic group or social class have such limited opportunities that they devalue school and employment-related skills (Wilson, 1996; Fordham and Ogbu, 1986; Portes and Zhou, 1993; Farkas, 2003). Lower societal investment in poor neighborhoods also means that they frequently have worse schools, child care, and children's services, which can be easily overwhelmed by the greater needs of poor families (Phillips and Chin, 2004). Crime and other hazards in poor neighborhoods can also heighten parent and child stress – over and above the stresses associated with family poverty – and can divert time and energy away from skills development (McLoyd, 1998; Furstenberg, 1993). Empirical research to date on neighborhood effects has been seriously hampered by methodological limitations and inadequate data, as described below

In this paper, our objective is to determine whether neighborhood environments affect children's cognitive development, over and above the effects of family characteristics. We focus on the development of two major cognitive skills in children ages 3 to 17: reading-related skills and mathematics-related skills. The paper makes several contributions. First, unlike most prior studies, our analysis includes a measure of parental cognitive skills and more extensive measures of family background and socioeconomic status. "Neighborhood effects" identified in earlier studies may, in fact, be due to unmeasured family characteristics (Duncan and Raudenbush, 1999). The omission of parental cognitive skills in previous neighborhood effects research is particularly problematic because of its strong effect on children's cognitive skills acquisition (Guo and Harris, 2000) and its potential influence on parents' residential choice. We also use more appropriate multilevel statistical methods that take unobserved family and neighborhood effects into account and new data that were designed to study family and neighborhood effects.

A second contribution is that we evaluate sensitivity of our results to alternative neighborhood definitions. Research on neighborhood effects generally focuses on a single set of neighborhood boundaries, typically census tracts, zip codes, or researcher-defined communities. Thus, these studies yield no information about the sensitivity of neighborhood effects estimates to the authors' choice of neighborhood definition. Moreover, individuals and families may be affected not only by their immediate neighbors, but also by the social ecology of the larger area in which they live because social interactions (e.g., safety, crime, interpersonal contacts) are not constrained by neighborhood boundaries (Sampson et al., 1999). We test the sensitivity of our findings to three different neighborhood definitions. Our goal is *not* to identify which boundaries best capture neighborhood effects nor to test all possible neighborhood definitions, but rather to conduct a sensitivity analysis of our results.

Our results also contribute to public policies aimed at improving skills acquisition for disadvantaged children. For example, "parenting education" programs – which seek to improve parenting and the home environment -- and programs such as Head Start, universal preschool, and school enrichment programs -- which attempt to redress deficiencies in parents' skills and the home environment -- are both predicated on evidence that *home* environment is the key to improving children's skills acquisition. Yet these programs may be undermined by the negative consequences of living in a disadvantaged neighborhood, if neighborhood environments also significantly influence skills development. Our results provide clearer evidence than past research about the effects of parents' resources and skills and the effects of neighborhoods – net of family effects – on children's skills acquisition.

As outlined below, we find that neighborhood of residence is significantly associated with children's test scores even when a comprehensive set of family and child characteristics is held constant. Neighborhood median income is particularly important in predicting children's performance. These findings are consistent with the idea that social origins affect development of cognitive skills and, thus, adult status attainment, *both* through the resources that families invest in children and through residential segregation by socioeconomic status.

Parents, the Home Environment, and Child Development

Research on socioeconomic status and children's skills acquisition has focused primarily on the role of the family. The associations between family poverty and children's cognitive development, school performance, and related outcomes are well documented (e.g., Duncan and Brooks-Gunn, 1997). Several studies have examined the mechanisms underlying this association (Guo and Harris, 2000; Guo, 1998; Conger et al., 1997; Bradley and Corwyn, 2002), although most examine only one mechanism at a time.

Guo and Harris (2000) develop a comprehensive conceptual framework and test several mechanisms which may account for family social class effects on children's cognitive development, using data from the National Longitudinal Survey of Youth (NLSY). They identify five mediators through which family income and maternal education may affect children's cognitive development: (1) the home physical environment, especially housing quality and safety, (2) cognitive stimulation at home, (3) children's health at birth and during childhood, (4) child care quality, and (5) parenting style, i.e., disciplinary style, warmth, and support.

Their results show that cognitive stimulation – a latent variable reflecting how often the mother reads to the child, museum visits, books and magazines in the home, and whether the child has a tape recorder and records – is by far the most important mediator between family poverty and children's cognitive development. Moreover, they show that household factors combined completely account for the effects of family poverty on children's intellectual development. Guo and Harris (2000) also show that maternal cognitive ability, as measured by the Armed Forces Qualification Test (AFQT), and maternal educational attainment have a strong effect on children's development primarily through cognitive stimulation. These effects remain significant even when the mediating variables are held constant. Guo and Harris' analysis provides compelling evidence that maternal cognitive ability and cognitive stimulation are key mediating factors in the association between disadvantage and children's skills development.

Neighborhood Environments and Child Development

Evidence of increasing income inequality and rising levels of residential segregation during the 1970s and 1980s spawned a wave of research on concentrated poverty neighborhoods and their effects on children's development (Sampson et al., 2002). This research grew primarily out of Wilson's (1987, 1996) argument that concentrated poverty neighborhoods offer few positive adult role models and little support for children and from Coleman's (1988) work on the importance of social capital for children's socialization. Subsequently, Sampson and colleagues (Sampson et al., 1997, 1999) have argued that neighborhood collective efficacy is essential for social control of and support for children. All three of these perspectives suggest that good neighborhoods for childrearing are those that offer physical safety, some minimum level of social ties and trust among neighbors, shared norms which favor child development, and collective action to effect social control over neighborhood residents and outsiders. Moreover, social disorganization theory argues that in neighborhoods with high poverty rates, high residential turnover, few homeowners, ethnic heterogeneity, and a high concentration of recent immigrants, neighbors are less likely to develop the minimum social ties and trust required for social control and collective action.

Observational and experimental studies often suggest that children in poor neighborhoods perform more poorly in school and have lower skills levels, even when family characteristics are held constant (Pebley and Sastry, 2004). For example, the "Moving to Opportunity" (MTO) study randomly assigned low-income public housing residents to continued public housing or residence in low-poverty neighborhoods in five U.S. cities. MTO-based research has shown that, over the short run, the lives of children who moved to low-poverty neighborhoods changed in many ways (Katz et al., 2001; Ludwig et al., 2001, 2005). However, a recent MTO-based study found no significant differences in test scores between children in the experimental and control groups (Sanbonmatsu et al., 2006). In observational studies, neighborhood effects on developmental outcomes are much smaller than family effects. Stronger and more consistent effects are found for children's cognitive and achievement outcomes than for their behavior and mental health (Duncan and Raudenbush, 1999). Observational studies have also shown that the presence of affluent neighbors has a greater effect on children's outcomes than neighborhood poverty (Pebley and Sastry, 2004), although we have found in other research on L.A.FANS that neighborhood median income is a stronger predictor of children's test scores than measures of neighborhood concentrated affluence or poverty in Los Angeles and for the U.S.

A problem faced by all studies of neighborhood effects is that unmeasured family characteristics may affect both neighborhood choice (or take-up of treatment in experimental studies) and children's outcomes -- an issue known as endogenous neighborhood choice (Duncan and Raudenbush, 1999). For example, parents who are most concerned about their children's development may both choose better neighborhoods and engage in various (unmeasured or unmeasurable) activities to promote children's learning. Complex associations between measured and unmeasured factors may lead to biased estimates of neighborhood effects. Strategies for reducing the effects of endogenous neighborhood choice in observational studies include obtaining more complete measures of family characteristics (including previously unmeasured factors), statistical methods, and experimental designs. A few studies which use statistical controls for endogeneous choice (Aaronson, 1997, 1998; Solon et al., 2000) have found important neighborhood effects on children's outcomes, when neighborhood choice is taken into account.

In this paper, we use data from the 2000-2001 Los Angeles Family and Neighborhood Survey (L.A.FANS) to investigate the contributions of family human capital and financial resources and neighborhood socioeconomic characteristics to children's reading and math skills. L.A.FANS was designed to overcome many of the methodological limitations in prior studies of neighborhood effects (Sastry et al., 2006). L.A.FANS sampled multiple children per family and multiple families per neighborhood, which allows us to use multilevel random effects models as a means of controlling for unobserved family characteristics in our analysis of neighborhood effects. L.A.FANS also collected extensive data on children, parents, and families which permit us to incorporate in our models a comprehensive set of family characteristics which mitigates problems of endogenous residential choice. In the next section, we describe the methods and data in greater detail.

Data and Methods

The Los Angeles Family and Neighborhood Survey (L.A.FANS) is a household survey conducted in 2000-2001 in a stratified probability sample of 65 census tracts in Los Angeles County, the second largest metropolitan area in the United States. L.A.FANS was based on a multistage clustered sampling design (Sastry et al., 2006). In the first sampling stage, 1990 census tracts in Los Angeles County were divided into three strata based on the percent of the tract's population in poverty in 1997: very poor (those in the top 10 percent of the poverty distribution), poor (tracts in the next 30 percent of the poverty distribution), and non-poor (tracts in the bottom 60 percent of the distribution). To oversample poor neighborhoods, 20 tracts were sampled in the poor and very poor strata while 25 tracts were sampled in the non-poor stratum. Second, census blocks were sampled within each tract and all dwelling units were listed in sampled blocks. Third, households were sampled within each block and screened. Approximately 40-50 households were interviewed in each census tract, for a total sample size of 3,090 households. The availability of multiple households per tract provides the information to estimate neighborhood-level random effects.

Within each tract, households with children (≤17 years old) were oversampled. In these households, one child was chosen at random from all household members age 17 and younger. If the child had siblings, one sibling was chosen at random as a second sampled child. Sampling up to two children per family allows us to identify family-level effects. Interviews were conducted with sampled children's primary caregiver, who was nearly always the children's mother and hence referred to in this paper simply as the "mother". Response rates were 83% for sampled children and 89% for mothers (Sastry and Pebley, 2003). The survey used standard, well-tested batteries of questions from national surveys such as the Panel Study of Income Dynamics (PSID) and the National Longitudinal Survey of Youth (NLSY) to collect data on family socioeconomic status and many other topics. Sampled children three years and older and their mothers completed subtests of Woodcock-Johnson Revised standardized assessments (Woodcock and Johnson, 1989) to assess reading and mathematics skills. Our analysis is based on 2,404 children aged 3-17 years who completed the reading assessment and 2,390 who completed the mathematics assessment. These children provide a representative sample of children in this age range in Los Angeles County.

Children's Skills Development

To measure children's skills levels, we use test scores from subtests of the Woodcock Johnson-Revised Test of Achievement (WJ-R ACH), a battery of tests designed to assess individual scholastic achievement (Woodcock and Johnson, 1989; Woodcock and Mather, 1989). We use two subtests of the WJ-R ACH: Letter-Word Identification and Applied Problems. The Letter-Word Identification (LWI) test assesses symbolic learning and reading identification skills. The Applied Problems (AP) test assesses mathematics reasoning. Tests were administered in English or Spanish depending on language ability and preference of the respondent. Although different versions of the test were administered in Spanish and English, the two tests are designed to produce comparable scores for the same skills level, regardless of the test language. Raw scores were converted to standardized scores based on the subject's age and a set of national norms (McGrew, Werder, and Woodcock, 1991). Norming by age allows us to compare scores among children of different ages. The standard scores have a population mean of 100 and standard deviation of 15. The mean standardized scores on the reading and mathematics tests for children in L.A.FANS are 102.4 and 101.8, respectively, slightly higher than the national norms of 100 for each test.

(Table 1: Unweighted Mean (and Std. Dev.) or Percent by Category for Analytic Variables in Samples of L.A.FANS Children Completing the Reading and Math Achievement Tests)

The sample standard deviations of 18.4 for reading and 17.5 for mathematics are slightly above the standard deviation of 15 based on national norms.

Child, Family and Neighborhood Characteristics

The analysis includes characteristics of children, their families, and neighborhoods in which they live. The means and percent distributions of variables in the analysis are shown in Table 1 for the samples of children who took the reading test and the math test. As Table 1 shows, the distributions of variables in these two samples are virtually identical. All models include a set of children's characteristics, including age, sex, ethnicity, and the language in which the tests were taken. We also include the child's birthweight, because low birthweight is associated poorer cognitive development net of the effects of socioeconomic status (Power et al., 2006). The average age of children in the sample is 9.7 years. The sample includes roughly equal numbers of males and females. The majority of children (63%) are Latinos, because of the L.A.FANS oversample of very poor and poor neighborhoods and the demographic composition of Los Angeles. Whites are the second largest group at 19% of the sample. Blacks are just under 10% and Asians are 7%. Four out of five children took the assessments in English and the remainder in Spanish. The mean birthweight is 3.4 kilograms (7.5 pounds).

Guo and Harris (2000) suggest that children in a cognitively stimulating, warm, and supportive home environment score more highly on tests of intellectual development. They show that maternal cognitive skills, maternal educational attainment, and family poverty are, in turn, important determinants of the quality of the home environment. In our analysis, we include family income and assets to identify family poverty. Assets (i.e., the monetary value of savings, investments, vehicles, real estate, etc.) measure family resources which may affect both parents' investment in children and their choice of neighborhood, but are rarely included in neighborhood effects analyses. Assets may provide a better measure of the longer term financial well-being of the family than annual income because they fluctuate less from year to year. Preliminary analysis (not shown) indicated that log transformations of income and assets improve fit. We also include maternal educational attainment (years of schooling completed) and, as a measure of maternal cognitive skills, the mother's WJ-R Passage Comprehension test score.[3] Previous research on neighborhood and family effects also rarely includes measures of parental cognitive skills. As with family assets, this omission may bias estimates of neighborhood effects upwards, because parents' cognitive skills may be associated with both neighborhood choice and children's skills development. L.A.FANS mothers had a mean score of 85 on the WJ-R Passage Comprehension test -- one standard deviation below the population mean. On average, they completed 11.5 years of education.

The mother's immigrant status and height are included as measures of the mother's own social origins and family background. Height reflects health and nutrition in childhood, which may have been poor particularly among immigrant mothers. Net of income and educational attainment, maternal immigrant status and duration in the U.S. may also reflect a mother's cultural capital (e.g., knowledge of the American school system, class-specific behaviors, etc.). If so, we might expect that children of immigrants, particularly recent immigrants, would be disadvantaged in skills acquisition. The majority of children's mothers (63%) are immigrants, two-thirds of whom arrived prior to 1990. Maternal height averaged 161 centimeters, compared with the U.S. national average of 162 centimeters for women 20 years and older between 1999 and 2002 (Ogden et al., 2004).

Following social disorganization theory, our models include four neighborhood-level variables: tract median family income,[4] residential stability, immigrant concentration, and racial/ethnic diversity.[5] These measures are based on tract-level 2000 census data. Initial analyses (not shown) indicated that a log transformation of tract median income produced a poorer model fit than the untransformed variable.

(Table 2: Factor Patterns for Tract Summary Measures in L.A.FANS)

The residential stability and immigrant concentration are indices based on factor analyses of tract measures that were highly intercorrelated. The residential stability index includes the percents of: dwellings in multiple-unit structures, owner-occupied households, non-family households, and households that did not move between 1995 and 2000. The immigrant concentration index includes the percent of the population that was foreign born (total, post-1990 arrivals, and post-1995 arrivals), non-citizens, Spanish-speakers, and Latinos. On average, L.A.FANS tracts include 40% foreign-born neighborhood residents, although there was very wide variation among these tracts. The tract ethnic diversity score reflects the probability that any two people chosen at random from the tract were of different ethnicities. For this measure, we define ethnic groups as: Latino, white, African American, Asian, and Native American.

These neighborhood variables reflect the characteristics of the neighborhood the child lived in at the time of the survey, because residential history data was only available for the two year period prior to interview in the first wave of L.A.FANS. Using these data, Jackson and Mare (2005) show that over this period, residential mobility does not play an important role in determining children's exposure to poor neighborhoods. However, a study of longer residential histories by Quillian (2003) suggests that the amount of variation in neighborhood type experienced by a child varies considerably by ethnicity. African Americans and, to a lesser extent, Latinos are more likely to remain in poor neighborhoods, while whites in poor neighborhoods have a much better chance of eventually moving out of poor neighborhoods. This is an issue we will investigate in the future as data from L.A.FANS-2, including longer residential histories, become available.

Multilevel Model Results: Family and Neighborhood Effects

The results of multilevel linear regression models for children's reading scores and math scores are presented in Tables 3 and 4, respectively. Each model incorporates family-level and tract-level random effects, to control for unobserved family- and tract-level heterogeneity and to provide standard errors that account for the clustering of observations.

(Table 3: Multilevel Linear Regression Model Results of Children's *Reading* Achievement Scores in L.A.FANS)

(Table 4: Multilevel Linear Regression Model Results of Children's *Mathematics* Achievement Scores in L.A.FANS)

The first column in each table presents results for models which include only children's characteristics. Although the child's age is not significantly associated with reading skills, it is significantly and negatively related to math skills: i.e., older children do more poorly on the math test than younger children. Girls score significantly better on the reading test but not the math test than boys. Latinos and African Americans score significantly worse on both tests than whites, while Asians score significantly better than whites. The language of the test is also significantly related to the scores. We believe that this result is an artifact of the differences between the separate versions of the tests given in the two languages, rather than an indication that children taking the tests in Spanish performed better on the reading test and worse on the math test than English speakers. We therefore treat the test language as a control variable throughout the analysis. Birthweight is unrelated to reading test scores, but significantly related to math scores: higher birthweight is associated with significantly better math scores. In Models 2, 3, and 4, the birthweight coefficient remains significant even when family and neighborhood variables are held constant.

The bottom of each table shows the estimated proportions of total variance in test scores that are accounted for by *unobserved* family and neighborhood factors (i.e., factors not included in the model). We can estimate the overall effects of neighborhood and family characteristics on children's reading and math skills using a random effects model without any covariates for each outcome (not shown). When neighborhood and family factors are not considered simultaneously, 9% of the overall variation in reading scores and 19% in math scores is associated with neighborhood of residence while 35% of the overall variation in reading scores and 43% in math scores is associated with family membership. When family and neighborhood membership is considered simultaneously—and hence variance components are additive—9% of the variance in reading skills is associated with neighborhood effects and 27% with family effects leaving 64% of the variation to be accounted for by individual-level factors. For math skills, 18% of the total variance was accounted for by neighborhood factors, 25% by family factors, and 57% by individual factors. These results show that a considerable proportion of the observed correlation in reading and math outcomes at the family level is actually accounted for by neighborhood-level factors, and thus point to the importance of controlling for measured and unmeasured neighborhood-level factors even when the focus is on the effects of family factors on children's reading and math skills. Also notable is the considerably higher neighborhood-level correlation in math achievement, which is roughly twice as large as the correlation for reading achievement. In Model 1, which adds child-level predictors to the intercept model, family effects account for 23% of the variance in reading scores and 24% of the variance in math scores. Neighborhood effects account for 6% of reading scores and 7% of math scores.

In Tables 3 and 4, Model 2 adds family resource variables to Model 1. Doing so does not change the coefficients on children's characteristics, with one exception: the size of the negative coefficients for Latino and African American children is substantially reduced, suggesting that differences in family resources account for a lot, though not all, of the test score differences between these two groups and whites. The advantage that Asian children have over whites remains essentially the same when family resources are held constant.

Among family characteristics, mother's immigration status, reading score, and education are all significantly related to reading and math scores. The largest effect is for maternal reading scores: a single point increase in maternal reading scores increases children's reading scores by 0.24 points and children's math scores by 0.17 points. By comparison, an entire additional year of maternal education yields a 0.40 point increase in reading scores and a 0.39 point increase in math scores. Maternal immigration status is strongly related to reading scores and less strongly, but still significantly, to math scores. Holding other variables constant, children of immigrant mothers have substantially higher reading achievement and somewhat higher math achievement than children of native-born parents. In fact, children of recent immigrants have the highest scores on both tests. Another indicator of maternal social origins, maternal height, is unrelated to reading skills but marginally significant and positively associated with math skills. Family income is not significantly related to either reading or math skills for children,[6] but assets are: children in families with more assets perform significantly better on both skills tests. The family income result is consistent with findings of other researchers (Guo and Harris, 2000; Jencks and Phillips, 1988; Mayer, 1997) who finding that poverty has no direct effect on children's intellectual development once measures of family background (e.g., mother's cognitive skills and education) are held constant.

The inclusion of family characteristics in the model reduces the percent of variance accounted for by unobserved family characteristics to 18% for reading and 20% for mathematics. Because family and neighborhood characteristics are correlated, the percent of variance due to unobserved neighborhood characteristics is also smaller in these models: 2 % for reading and 3% for mathematics.

Model 3 in Tables 3 and 4 includes only child and neighborhood characteristics. Like family characteristics in Model 2, the inclusion of neighborhood characteristics has little effect on the coefficients of children's characteristics, except for ethnic differences. Holding constant neighborhood social characteristics again reduces the size of Latino and black children's disadvantage relative to white children. The Asian advantage over white children remains constant or increases when neighborhood characteristics are included.

Among neighborhood characteristics, tract median family income has a large and significant effect on both test scores. Each additional $10,000 in tract median income is associated with a 1.5 point increase in reading scores and a 1.8 point increase in math scores. Immigrant concentration is not significantly associated with either reading or math scores. Tract ethnic diversity is negatively related to test scores, but is not significant for reading and only marginally significant for math scores. One surprise is that the coefficients on tract-level residential stability are large, negative, and significant for both reading and math scores, implying that children living in *less* residentially stable neighborhoods perform more poorly than children living in higher mobility neighborhoods – a finding which contradicts theoretical predictions that neighborhood residential stability provides a better context in which to raise children. The inclusion of neighborhood attributes in the model reduces the percent of variance accounted for by unobserved neighborhood characteristics to 2% each for reading and mathematics scores.

Model 4 in Tables 3 and 4 includes all child, family and neighborhood level variables. Inclusion of both sets of variables changes the coefficients on child characteristics very little, except that the gap between whites, on one hand, and Latino and black children, on the other hand, is further reduced. Family assets are no longer a significant predictor of reading skills in

Model 4, but they remain significantly related to math skills. The other change in family-level coefficients is that maternal immigration prior to 1990 is now not a significant predictor of math scores, although it remains significant for reading scores. At the neighborhood level, residential stability is no longer significantly associated with reading scores, but is significantly and negative associated with math scores, once family variables are included in the model.

Of central interest in this analysis is whether neighborhood characteristics affect children's skills acquisition over and above the effects of family resources (i.e., parents' human capital and financial resources). The results in Model 4 indicate that children in poorer neighborhoods perform significantly worse on both reading and math skills tests than children in less poor neighborhoods, even when an extensive set of family and parental characteristics are held constant. In the case of mathematics scores, the results also suggest that children living in *less* residentially stable neighborhoods—that is, in neighborhoods with higher levels of turnover and multiple-dwelling housing units and lower rates of homeownership—perform better on skills tests, *ceteris paribus.*

Sensitivity to Neighborhood Size

Previous studies of neighborhood effects are generally based on a single definition, typically census blocks or tracts or zip codes. However, there is little empirical evidence indicating the size or type of neighborhood which is likely to be important for children's development. Although a comprehensive assessment of the effects of alternative spatial definitions on child development is beyond the scope of this study, in this section we assess the sensitivity of the results shown in Tables 3 and 4 to three definitions of neighborhood size.

The three definitions are defined as following. Area 1 is the census tract in which the child lives (the same areal unit used in Tables 1 through 4). Area 2 is this tract plus the first contiguity of tracts around it (i.e., the tract in which the child lives plus all tracts which share a boundary with that tract). Area 3 is the tract in which the child lives plus the first and second contiguity of tracts around it. Like census tracts themselves, the surface area covered by Areas 2 and 3 vary considerably within Los Angeles County depending on population density. For the sample of 65 tracts in L.A.FANS, the first contiguity averages 6.5 adjacent tracts and the second contiguity averages an additional 15.0 tracts. The average surface area for tracts in L.A.FANS (Area 1) is 6.8 square miles. It is 32 square miles for Area 2 and 82 square miles for Area 3. By comparison, Los Angeles County is a total of 4,084 square miles. The average population size of L.A.FANS tracts in 2000 was approximately 8,000 inhabitants. For Area 2 it was approximately 50,000 and for Area 3 it was 143,000.

To test the effects of varying the definition of neighborhood, we reestimated Model 4 in Tables 3 and 4, including neighborhood characteristics calculated for the three areas described above. The results are shown in Tables 5 and 6. The first model includes characteristics of the tract in which each child lives (area 1) and is identical to Model 4 in Tables 3 and 4. The second model includes the characteristics of Area 2 and the third model includes those of Area 3.

(Table 5: Multilevel Linear Regression Model Results of Children's *Reading* Achievement Scores in L.A.FANS, Variation by Neighborhood Size)

(Table 6: Multilevel Linear Regression Model Results of Children's *Mathematics* Achievement Scores in L.A.FANS, Variation by Neighborhood Size).

We assess the sensitivity of the models to alternate neighborhood definitions in two ways. First, we look for difference in effect size, direction, and significance among the three models. The coefficients in all three models are virtually identical, with two exceptions. One exception is a modest change in coefficients for Latinos for reading scores. As the neighborhood size increases, the Latino coefficients become smaller and less significant. A more substantial change is in the coefficient for residential stability. As described above, residential stability is *negatively* associated with math scores for models based on Area 1. However, for larger neighborhood definitions (Areas 2 and 3) residential stability is *positive* and significantly associated with both reading and math scores. Unlike the finding for Area 1, this result is consistent with theoretical predictions about the importance of residential stability for neighborhood social cohesion and, indirectly, children's well-being.

A second method of assessing spatial sensitivity is to compare the fit of each model to the data. Standard methods of assessing relative model fit (i.e., F-tests and likelihood ratio tests) require nested models and therefore are not appropriate in this case. Instead we calculate the deviance information criterion (DIC) for each model, which does not require nested models (Spiegelhalter et al., 2002; Gelman et al., 2004). DIC is a generalization of the Bayesian information criterion (BIC) and the Akaike information criterion (AIC) for hierarchical modeling and is used in Bayesian model selection. Smaller DICs indicate better fit. Although formal tests of the statistical significant of differences between two DIC are not yet available, a common rule of thumb is that differences above 5-7 are considered important, while differences below 5 indicate that neither model is clearly superior to the other (Spiegelhalter et al., 2002; Burnham and Anderson, 1998). The differences between models in each table are all less than 2 and in one case, less then 1, suggesting negligible differences in fit among the three models.

Summary of Results

The results presented in this analysis show that both family effects and neighborhood effects are important in accounting for the variation in children's reading and math skills. At the family level, maternal reading skills and educational attainment are most strongly associated with children's skills, while family income is not significantly associated with either of these outcomes. Ethnicity and maternal immigrant status are also important predictors of children's skill levels, although the gap between whites and Latinos and blacks narrows considerably when family characteristics are held constant. Girls perform significantly better than boys on reading scores and children with higher birthweights and maternal heights perform better on math tests.

Our results suggest that neighborhood of residence is significantly associated with children's test scores even when a comprehensive set of family and child characteristics is held constant. A key finding of this study is the importance of neighborhood economic status in predicting children's skills. Holding constant a comprehensive set of child and family characteristics, each increment of $10,000 in neighborhood median income increased children's reading scores by 0.9 points and math scores by 1.2 points. Thus, a $125,000 difference in neighborhood median income is associated with a full standard deviation (i.e., 15 points) in math scores. Neighborhood residential stability is also associated with test scores. Surprisingly, when neighborhoods are defined as census tracts, the findings suggest that *less* residential stability is associated with better math scores. However, when we consider larger areas as neighborhoods, the residential stability index is significantly and *positively* associated with better math and reading scores, as we had expected. We speculate that the residential stability index may be subject to tract level variations for idiosyncratic reasons (e.g., the presence on a single large apartment building) whereas larger neighborhood areas are better representations of the level of residential stability experienced in the neighborhood. Previous studies that found negative effects on achievement of neighborhood stability have speculated that these are stagnant neighborhoods with little attraction for in-movers.

Our variance decomposition analysis suggests that, overall, family effects (both observed and unobserved) account for 27% of the observed variation in reading scores and 25% in math scores. Neighborhood membership appears to be twice as important for math skills (accounting for 18% of the variation) than for reading skills (9%). For both achievement measures, however, individual-level factors account for the majority of the variation (57% for math and 64% for reading). The measured child, family, and neighborhood covariates in the model explain essentially all of the neighborhood-level correlation in reading and math scores, but a much smaller fraction (about one-quarter) of the family-level correlation.

Except for this change in residential stability effects, the final portion of the analysis suggests that our results are not sensitive to which of the three definitions of neighborhood is used in the analysis.

Discussion

In this paper, we examined the association of family and neighborhood characteristics with children's cognitive skills, to assess whether residential sorting of families into neighborhoods may play a significant role in the intergenerational transmission of social class. Our results are consistent with the idea that social origins do affect development of cognitive skills and, thus, adult status attainment, *both* through the resources that families invest in children and through residential segregation by socioeconomic status. This finding is important because it extends our knowledge of the mechanisms behind the intergenerational transmission of social class. It also suggests that studies of social mobility must take into account the processes leading to residential segregation and families' residential choices.

Our results clearly demonstrate the importance of maternal reading skills for children's cognitive skills development, consistent with Guo and Harris' (2000) results. This result is likely due to the intergenerational transmission of ability as well as effects of the home learning environment. Using L.A. FANS data, Lara-Cinisomo et al., (2004) found that mothers with higher reading scores were more likely to read to children regularly, to have children's books in the house, and to enjoy reading themselves—all behaviors that can contribute to children's learning to read. These results suggest that programs aimed at reducing socioeconomic inequality in children's skills acquisition should focus specifically on children whose parents have poor reading skills (and perhaps numeracy skills, which we do not measure)—by targeting higher quality early childhood and school-based programs to these children and/or by providing adult literacy training and education to parents.

However, the results also suggest that a high degree of residential segregation by social class and economic status may undermine programs designed to decrease skills inequality which focus exclusively on families. Reducing income inequality across neighborhoods – either by creating more economically integrated neighborhoods or through improvements in the median income of poor neighborhoods -- would appear to make an important contribution to equalizing reading and math achievement among children.

Neighborhood level variables included in the analysis were drawn from the neighborhood effects and the social disorganization literatures. Our results provide support for social disorganization theory in that the residential stability of the larger areas surrounding the child's home was strongly and positively associated with children's skills acquisition, even when tract median income (which is often correlated with turnover rates) was held constant. On the other hand, our results suggest that two other neighborhood variables derived from social disorganization theory, immigrant concentration and ethnic diversity, were not significant predictors of children's skills acquisition, at least in the Los Angeles context.

Contrary to earlier studies of neighborhood effects on children's outcomes, we found that tract median family income is an important predictor of children's test scores in multilevel models which included a comprehensive set of family and child characteristics and controlled for unmeasured family effects. Previous neighborhood effects research has generally focused on the effects of the extremes of the income distribution, examining the effects of concentrated poverty and concentrated affluence (Brooks-Gunn, et al. 1997; Sampson et al., 1997). As described above, in a separate analysis (not shown) we found that tract median income was more strongly associated with children's test scores than these other neighborhood income measures.

There are several mechanisms through which neighborhood income may affect children's skills acquisition, and examining these mechanisms is an important topic for future research. First, selection effects may lead to sorting of families by neighborhood, with families who place a higher value on their children's achievement being more concentrated in middle or higher income neighborhoods. Although our analysis mitigates this potential bias by controlling for a larger set of family characteristics related to child development than many previous analyses, it does not eliminate it. Second, the association may be due to the fact that higher income neighborhoods often have higher quality schools, day care centers, and better infrastructure and services for families. Third, more affluent neighborhoods may have more supportive and less stressful social environments for families and children which protect children, monitor their behavior, and promote learning and academic achievement. For example, Sampson et al. (1997) have shown that the lack of social cohesion and cooperation among neighbors in poor Chicago neighborhoods helped to explain the association between neighborhood poverty and levels of violence. Our analysis shows that social compositional characteristics (e.g., neighborhood income, high residential turnover) are significantly related to children's reading and math scores. However, analyses of more direct measures of social cohesion, trust, and collective efficacy would be necessary to assess the importance of these hypothesized mechanisms in children's skills development. Understanding the role of these factors in determining children's reading and math skills is essential for efforts to reduce inequality in skills and in children's chances of success in life.

Notes

1. A third pathway, not considered here directly, is genetic inheritance of innate ability. Genetic research increasingly shows the importance of children's social and physical environment for gene *expression* rather than simple genetic inheritance of traits and abilities (Shonkoff and Phillips, 2000; Guo and Stearns, 2002). Hence, even inherited ability is likely to be affected by a child's environment.

2. However, other ethnic minorities or immigrant groups may view education as a pathway to socioeconomic advancement and hence may highly value—and encourage and facilitate—educational success.

3. Like children's scores, mothers' scores were transformed into standardized scores (with a population mean of 100 and standard deviation of 15).

4. Previous analyses (Brooks-Gunn et al., 1997; Sampson et al., 1997) include either the proportion of affluent and poor residents or measures of concentrated poverty or concentrated affluence. In a separate analysis, we tested both of these strategies, including replicating the concentrated poverty and affluence indices used in Brooks-Gunn et al. (1997). Our results (not shown) indicate that neighborhood median income is more closely associated with children's test scores than these other variables.

5. In preliminary analyses (not shown), models also included neighborhood educational attainment, percent of households speaking English, and population density in the neighborhood. These variables are strongly correlated with the other neighborhood level variables and therefore did not add statistically significant explanatory power to the models.

6. Family income is a significant and sizeable determinant of children's scores in models which include only this variable and children's characteristics. For reading skills, adding maternal education and maternal reading scores makes the coefficient on family income much smaller

and no longer significant. For math scores, the family income coefficient remains significant in these models, but loses significance once maternal immigrant status and family assets are added to the model.

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Table 1. Unweighted Mean (and Std. Dev.) or Percent by Category for Analytic Variables in Samples of L.A.FANS Children Completing the Reading and Math Achievement Tests

Variable	Sample Completing Reading Test	Sample Completing Math Test
Standardized Test Scores		
Reading (Letter Word Identification) Score	102.4 (18.4)	--
Math (Applied Problems) Score	--	101.8 (17.5)
Child Characteristics		
Child age (years)	9.7 (4.2)	9.7 (4.2)
Child sex (%)		
Male	51%	51%
Female	49%	49%
Ethnicity (%)		
Latino	63%	63%
Black	9%	9%
White	19%	19%
Asian	7%	7%
Other	2%	2%
Language of test (%)		
English	82%	82%
Spanish	18%	18%
Birthweight (kg)	3.4 (.6)	3.4 (.6)
Family Characteristics		
Mother's immigrant status (%)		
Native-born	37%	37%
Pre-1990 immigrant	41%	41%
Post-1990 immigrant	22%	22%
Mother's reading score	84.5 (18.1)	84.6 (18.1)
Mother's reading score missing (%)	2%	2%
Mother's height (cm)	161.4 (7.5)	161.4 (7.5)
Mother's height missing (%)	4%	4%
Mother's schooling (years)	11.4 (4.4)	11.4 (4.4)
Mother's schooling missing (%)	<.1%	<.1%
Log family income ($)	9.9 (2.3)	9.9 (2.2)
Log family assets ($)	7.8 (4.2)	7.8 (4.2)
Neighborhood Characteristics		
Tract median family income ($10,000)	4.4 (2.6)	4.4 (2.6)
Tract immigrant concentration score	.02 (.97)	.01 (.97)
Tract residential stability score	.01 (.96)	.01 (.96)
Tract racial/ethnic diversity score	0.5 (.2)	0.5 (.2)
Observations (Children)	2404	2390

Table 2. Factor Patterns for Tract Summary Measures in L.A.FANS

Variable	Factor loading	Mean
Residential stability		
Same house as in 1995	.75	50%
Owner-occupied house	.84	43%
Multiple-unit housing	-.97	39%
Non-family households	-.52	26%
Immigrant concentration		
Non-citizens	.99	27%
Foreign-born	.94	40%
Post-1990 immigrant	.91	15%
Post-1995 immigrant	.86	7%
Spanish-speakers	.83	47%
Latino	.79	50%

Table 3. Multilevel Linear Regression Model Results of Children's *Reading* Achievement Scores in L.A.FANS

Variable	1	2	3	4
Child Characteristics				
Child age (years)	-.04 (.09)	-.05 (.09)	-.01 (.09)	-.04 (.09)
Child sex				
Male[a]				
Female	2.69 (.70)***	2.68 (.68))***	2.65 (.70))***	2.64 (.68))***
Child Race				
Latino	-6.69 (1.13)***	-3.88 (1.19)***	-4.24 (1.21)***	-2.65 (1.26)**
Black	-6.12 (1.63)***	-3.75 (1.57)***	-3.74 (1.65)**	-2.27 (1.61)
White[a]				
Asian	3.30 (1.73)*	3.38 (1.76)*	4.37 (1.71)**	4.05 (1.77)*
Other	-1.03 (3.02)	0.82 (2.90)	-0.92 (3.00)	1.05 (2.89)
Language of test				
English[a]				
Spanish	6.94 (1.09)***	7.66 (1.11)***	7.46 (1.08)***	7.73 (1.10)***
Birthweight (kg)	.80 (.59)	.53 (.58)	.82 (.59)	.59 (.59)
Family Characteristics				
Mother's immigration status				
Native-born[a]				
Pre-1990 immigrant		4.04 (1.12)***		3.72 (1.13)***
Post-1990 immigrant		5.96 (1.31)***		5.77 (1.32)***
Mother's reading score		.24 (0.03)***		.22 (.03)***
Mother's education (yrs)		.40 (.11)***		.36 (.11)***
Mother's height (cm)		.02 (.05)		.01 (.05)
Log family income		.10 (0.20)		.07 (.20)
Log family assets		.26 (.12)**		.19 (.12)
Neighborhood Characteristics				
Tract median family income($1000)			1.54 (.32)***	.89 (.30)***
Tract immigrant concentration score			-.65 (1.00)	.21 (.92)
Tract residential stability score			-1.67 (.64)***	-.80 (.59)
Tract race/ethnic diversity score			-6.51 (3.61)*	-3.51 (3.29)
Constant	102.04 (2.48)***	67.84 (9.23)***	96.39 (3.74)***	68.32 (9.49)***
Fraction of variance due to unobserved characteristics of:				
Family	.23***	.18***	.23***	.18***
Neighborhood	.06***	.02**	.02**	.01*
-2 log likelihood	20548.47	20400.09	20504.63	20385.94

N= 2404 children, 1619 families, and 65 neighborhoods.

*p < .10 **p < .05 ***p < .01; standard errors in parentheses.

Source: Authors' calculations using data from the 2000-01 L.A.FANS Wave 1.

[a]Indicates omitted category.

Note: dummy variables were included to control for missing values of the mother's reading score, education and height.

Table 4. Multilevel Linear Regression Model Results of Children's *Mathematics* Achievement Scores in L.A.FANS

Variable	1	2	3	4
Child Characteristics				
Child age (years)	-.28 (.08)***	-.27 (.08)***	-.26 (.08)***	-.25 (.08)***
Child sex				
Male[a]				
Female	-.03 (.63)	-.12 (.62)	-.07 (.62)	-.15 (.62)
Child Race				
Latino	-6.68 (1.06)***	-3.72 (1.12)***	-4.44 (1.11)***	-2.26 (1.16)*
Black	-6.07 (1.51)***	-5.28 (1.46)***	-4.29 (1.51)***	-3.82 (1.49)**
White[a]				
Asian	3.86 (1.59)**	4.40 (1.64)***	4.22 (1.56)***	4.82 (1.63)***
Other	-1.02 (2.77)	.15 (2.67)	-.57 (2.74)	.59 (2.66)
Language of test				
English[a]				
Spanish	-7.12 (1.00)***	-5.97 (1.02)***	-6.62 (.99)***	-5.80 (1.01)***
Birthweight (kg)	1.43 (.54)***	1.13 (.53)**	1.46 (.53)***	1.19 (.53)**
Family Characteristics				
Mother's immigration status				
Native-born[a]				
Pre-1990 immigrant		1.78 (1.03)*		1.40 (1.04)
Post-1990 immigrant		2.88 (1.21)**		2.52 (1.22)**
Mother's reading score		.17 (.02)***		.15 (.02)***
Mother's education (yrs)		.39 (.10)***		.33 (.10)***
Mother's height (cm)		.09 (.05)*		.09 (.05)*
Log family income		.07 (.18)		.04 (.18)
Log family assets		.40 (0.11)***		.33 (0.11)***
Neighborhood Characteristics				
Tract median family income($)			1.77 (.31)***	1.22 (.30)***
Tract immigrant concentration score			-0.58 (0.96)	0.47 (.92)
Tract residential stability score			-1.95 (.62)***	-1.31 (.59)**
Tract race/ethnic diversity score			-2.81 (3.46)	-.80 (3.30)
Constant	105.42 (2.28)***	65.68 (8.51)***	97.01 (3.49)***	63.46 (8.79)***
Fraction of variance due to unobserved characteristics of:				
Family	.24***	.20***	.24***	.20***
Neighborhood	.07***	.03***	.02***	.02**
-2 log likelihood	19955.16	19820.23	19898.53	19797.08

N= 2390 children, 1614 families, and 65 neighborhoods.

*p < .10 **p < .05 ***p < .01; standard errors in parentheses.

Source: Authors' calculations using data from the 2000-01 L.A.FANS Wave 1.

[a]Indicates omitted category.

Note: dummy variables were included to control for missing values of the mother's reading score, education and height.

Table 5. Multilevel Linear Regression Model Results of Children's *Reading* Achievement Scores in L.A.FANS, Variation by Neighborhood Size

Variable	**(1) Area 1 (tract)**	**(2) Area 2**	**(3) Area 3**
Child Characteristics			
Child age (years)	-.04 (0.09)	-.03 (0.09)	-.03 (0.09)
Child sex			
Male[a]			
Female	2.64 (.68) ***	2.67 (.68)***	2.66 (.68)***
Child Race			
Latino	-2.65 (1.26)**	-2.40 (1.26)*	-2.34 (1.26)
Black	-2.27 (1.61)	-2.16 (1.61)	-2.12 (1.60)
White[a]			
Asian	4.05 (1.77)**	4.26 (1.78)**	4.35 (1.78)**
Other	1.05 (2.89)	.96 (2.89)	.96 (2.89)
Language of test			
English[a]			
Spanish	7.73 (1.10)***	7.81 (1.10)***	7.82 (1.10)***
Birthweight (kg)	.59 (.59)	.59 (.58)	.60 (.58)
Family Characteristics			
Mother's immigration status			
Native-born[a]			
Pre-1990 immigrant	3.72 (1.13)***	3.92 (1.13)***	3.87 (1.13)***
Post-1990 immigrant	5.77 (1.32)***	6.00 (1.32)***	5.89 (1.31)***
Mother's reading score	.22 (.03)***	.22 (.03)***	.22 (.03)***
Mother's education (yrs)	.36 (.11)***	.35 (.11)***	.36 (.11)***
Mother's height (cm)	.01 (.05)	.01 (.05)	.01 (.05)
Log family income	.07 (.20)	.07 (.20)	.07 (.20)
Log family assets	.19 (.12)	.18 (.12)	.18 (.12)
Neighborhood Characteristics			
Tract median family income($)	.89 (.30)***	.71 (.34)**	.82 (.36)**
Tract immigrant concentration score	.21 (.92)	-.95 (.90)	-.94 (.91)
Tract residential stability score	-.80 (.59)	1.54 (.73)**	1.28 (.64)**
Tract race/ethnic diversity score	-3.51 (3.29)	-4.55 (3.20)	-4.46 (3.81)
Constant	68.32 (9.49)***	69.86 (9.59)***	69.02 (8.73)***
Fraction of variance due to unobserved characteristics of:			
Family	.18***	.18***	.18***
Neighborhood	.01*	.01*	.01*
Deviance Information Criterion[b]	20322.17	20320.34	20320.56
Difference from Area 1	--	-1.83	-1.61

N= 2404 children, 1619 families, and 65 neighborhoods. Area 1 is the census tract; Area 2 is the census tract plus first contiguity; Areas 3 is the census tract plus first and second contiguities.
*p < .10 **p < .05 ***p < .01; standard errors in parentheses.
Source: Authors' calculations using data from the 2000-01 L.A.FANS Wave 1.
[a]Indicates omitted category. [b]Based on models estimated using the MCMC algorithm.
Note: dummy variables were included to control for missing values of the mother's reading score, education and height.

Table 6. Multilevel Linear Regression Model Results of Children's *Mathematics* Achievement Scores in L.A.FANS, Variation by Neighborhood Size

Variable	(1) Area 1 (tract)	(2) Area 2	(3) Area 3
Child Characteristics			
Child age (years)	-.25 (0.08)***	-.25 (0.08)***	-.25 (0.08)***
Child sex			
Male[a]			
Female	-.15 (0.62)	-.14 (0.62)	-.15 (.62)
Child Race			
Latino	-2.26 (1.16)*	-2.09 (1.17)*	-2.18 (1.17)*
Black	-3.82 (1.49)**	-3.71 (1.49)**	-3.85 (1.49)***
White[a]			
Asian	4.82 (1.63)***	5.30 (1.64)***	5.24 (1.64)***
Other	.59 (2.66)	.45 (2.66)	.44 (2.66)
Language of test			
English[a]			
Spanish	-5.80 (1.01)***	-5.73 (1.01)***	-5.75 (1.01)***
Birthweight (kg)	1.19 (.53)**	1.20 (.53)**	1.19 (.53)**
Family Characteristics			
Mother's immigration status			
Native-born[a]			
Pre-1990 immigrant	1.40 (1.04)	1.43 (1.04)	1.45 (1.04)
Post-1990 immigrant	2.52 (1.22)**	2.60 (1.22)**	2.55 (1.22)**
Mother's reading score	.15 (.02)***	.15 (.02)***	.15 (.02)***
Mother's education (yrs)	.33 (.10)***	.33 (.10)***	.34 (.10)***
Mother's height (cm)	.09 (.05)*	.09 (.05)*	.09 (.05)*
Log family income	.04 (.18)	.03 (.18)	.04 (.18)
Log family assets	.33 (.11)***	.33 (.11)***	.33 (.11)***
Neighborhood Characteristics			
Tract median family income($)	1.22 (.30)***	1.01 (.33)***	1.01 (.36)***
Tract immigrant concentration score	.47 (.92)	-.73 (.88)	-.80 (.92)
Tract residential stability score	-1.31 (.59)**	2.33 (.71)***	1.73 (.64)***
Tract race/ethnic diversity score	-.80 (3.30)	-4.40 (3.25)	-3.11 (3.86)
Constant	63.46 (8.79)***	66.22 (3.25)***	65.09 (9.06)***
Fraction of variance due to unobserved characteristics of:			
Family	.20***	.20***	.20***
Neighborhood	.02**	.02**	.02**
Deviance Information Criterion[b]	19690.59	19688.75	19690.84
Difference from Area 1	--	-1.84	.25

N= 2390 children, 1614 families, and 65 neighborhoods. Area 1 is the census tract; Area 2 is the census tract plus first contiguity; Areas 3 is the census tract plus first and second contiguities.
*p < .10 **p < .05 ***p < .01; standard errors in parentheses.
Source: Authors' calculations using data from the 2000-01 L.A FANS Wave 1.
[a]Indicates omitted category. [b]Based on models estimated using the MCMC algorithm.
Note: dummy variables were included to control for missing values of the mother's reading score, education and height.