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School Context and Educational Outcomes: Results from a Quasi-Experimental Study

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Abstract

In this study we draw on data from a quasi-experimental study to test whether moving into a subsidized housing development in an affluent suburb yields educational benefits to the children of residents, compared to the educations they would have received had they not moved into the development. Results suggest that resident children experienced a significant improvement in school quality compared with a comparison group of students whose parents also had applied for residence. Parents who were residents of the development also displayed higher levels of school involvement compared with the comparison group of non-resident parents, and their children were exposed to significantly lower levels of school disorder and violence within school and spent more time reading outside of school. Living in the development did not influence GPA directly, but did indirectly increase GPA by increasing the time residents spent reading outside of school.

Neighborhoods and schools can have significant effects on children's academic performance, though the strength and robustness of these effects vary across studies. Two landmark studies based on housing mobility programs—Gautreaux and Moving to Opportunity (MTO)—yielded conflicting findings. The Gautreaux studies showed improved educational outcomes among children who moved to non-segregated suburbs. The MTO studies, on the other hand, found little impact of moving out of high-poverty neighborhoods, though children in the MTO treatment group were not attending schools that were markedly better than children in the control group. Other “school transfer” programs that have sought to keep children in their neighborhoods but transfer them to better schools have yielded similarly mixed results. These prior studies all have methodological problems, however, which limit our ability to assess neighborhood and school effects. Moreover, we know very little about the processes and mechanisms that link social contexts to outcomes of interest.

This paper considers whether low-income children who reside in a subsidized housing development in a middle-class suburb and attend school there show improved academic performance relative to children whose families applied to live in the development but, for one reason or another, had not moved in. These new quasi-experimental data overcome many of the problems plaguing earlier research on neighborhood and school effects, such as selection into neighborhoods and schools, selective participation in housing mobility programs, and selective mobility out of schools and neighborhoods. We are also able to assess the degree to which the relationship between school context and academic performance is explained by a series of mediating factors.

NEIGHBORHOODS, SCHOOLS, AND EDUCATION

To examine the effect of neighborhood and school circumstances on educational outcomes, researchers have increasingly relied on experimental and quasi-experimental studies, which in principle are better equipped than simple observational studies to isolate causal effects. These studies can be broadly grouped into two categories: those such as Gautreaux and MTO which examine the influence of neighborhood conditions and others that examine the effect of school context (DeLuca & Dayton 2009). The Gautreaux study followed poor Chicago residents who were given vouchers to relocate out of segregated public housing developments. Early results found that children in families that moved into low-minority, suburban neighborhoods attended better schools, earned higher grades, and were more likely to go to college relative to those who stayed in Chicago (Rubinowitz & Rosenbaum 2000; Popkin, Rosenbaum & Meaden 1993). Although the existence of a control group for comparison gave the Gautreaux study an epistemological advantage over the purely observational studies that prevailed at the time, participants in the Gautreaux program were not randomly assigned to receive vouchers, so that selectivity constitutes a potential threat to internal validity. For example, those families who used their vouchers to move to the suburbs might have been different on certain unmeasured traits related to educational achievement compared with those who remained in the city, such as having higher aspirations and more motivation.

In an effort to dissect the relationship between neighborhood mobility and educational outcomes further, the U.S. Department of Housing and Urban Development sponsored a demonstration project that offered housing vouchers to residents of public housing projects in five cities using an experimental research design to correct for selection bias. The Moving to Opportunity (MTO) demonstration randomly assigned residents to one of three groups: one was offered vouchers that required them to move to a low-poverty neighborhood, another was offered vouchers that allowed them to move wherever they wished, and a third group was not offered vouchers at all. Researchers collected background information on members of each group prior to assignment and then at several follow-up points (Orr et al 2003).

Results from the MTO study indicated that children in households that moved into lower poverty neighborhoods experienced no improvement in academic performance relative to those who did not (Sanbonmatsu et al 2006). Nonetheless, several methodological and programmatic factors may have undermined the study's ability to find effects. Although participants in the experimental group may have moved into neighborhoods that were less poor, for example, they did not move to neighborhoods that were less segregated (Clampet-Lundquist and Massey 2008). Given the association of segregation with resource deprivation, it should not be surprising that the schools attended by children in the experimental group were only moderately better than the schools they would have attended without the MTO intervention (Sanbonmatsu et al 2006). In addition, the MTO program only required that participants stay in their new homes for a period of one year. By the time of the first follow up survey (4-7 years after the baseline) nearly 40 percent of those who had moved into low-poverty neighborhoods had moved back into high poverty areas. Clampet-

Lundquist and Massey (2008) argue that such selective mobility undermined the chances for finding neighborhood effects.

Other housing mobility programs have produced educational gains for low-income students. For instance, Montgomery County, Maryland's inclusionary zoning program allowed the county's public housing authority to purchase one-third of all homes within zoned subdivisions to be used as federally subsidized public housing. The housing authority then randomly assigned applicants from a waiting list to public housing apartments throughout the county (for an overview of the program and the evaluation, see Schwartz 2010). Since the catchment areas for elementary schools in Montgomery County are based on neighborhood of residence, housing officials are more or less randomly assigning students to different elementary schools, a programmatic feature that enables researchers to compare academic performance among students who live in public housing but attend low-poverty schools to students who live in public housing but attend high-poverty schools. A comparison of children in these two groups showed that, over a 5 to 7 year period, elementary school-aged children who lived in public housing but attended more affluent schools performed significantly better in reading and math than public housing residents who attended less advantaged schools.

Evaluations of other school transfer programs have yielded mixed results, however. For instance, students who received vouchers in Cleveland and Chicago to attend schools of their choosing did not fare better academically than students who did not, and in some cases fared worse (Belfield 2006; Cullen et al 2006). Results from a school choice program in Milwaukee revealed small gains in academic performance among students who received vouchers to attend private schools, but the program did not use random assignment and the size of the effects and the subject area in which students showed improvements varied across studies (DeLuca & Dayton 2009). Early results from evaluations of a program in which students were chosen by lottery to attend charter schools found that the selected students performed the same as their counterparts in traditional public schools (Gleason et al 2010; Akey et al 2009; Hanushek, Kain, Rivkin & Branch 2007), though there was some evidence that students in charter schools housing disadvantaged student populations did show some improvement in math (Gleason et al 2010).

Despite the foregoing efforts to demonstrate neighborhood and school effects, we still have much to learn about the mechanisms linking social context to academic achievement (Sampson et al 2002). For instance, we still know little about *why* the effect exists or *how* it operates. In this paper, we consider three potential mechanisms by which attending a middle class suburban school might improve academic performance relative to students in less advantaged schools: increased parental involvement in education; reduced exposure to disorder and violence at school; and more time spent reading per week.

Higher achieving schools are better at reaching out to individual parents and creating an environment of parental cohesion, two practices that encourage parents to be more involved in their children's schooling (Martin 2009). Involvement gives parents a chance to meet other parents, which in turn allows them to share information about school activities and resources and may even be a source of social control as parents are able to exchange

information about their own children's activities and whereabouts (Coleman 1988; Coleman 1990). Having more routine contact with school officials may also give parents knowledge of their children's academic performance and encourage them to take part in homework and other school-related activities. Parental involvement in turn boosts children's academic outcomes through these processes (Fehrmann, Keith & Reimers 1987; Jeynes 2007; Stewart 2008).

Students in higher quality schools also benefit from lower exposure to the stress, chaos and violence that characterize many low-quality, segregated schools (Massey 2006; Massey et al. 2003). Attending school in an environment that is relatively free of disorder and violence not only reduces students' stress and fear and their attendant consequences, but students in these environments presumably experience less social pressure to participate in these activities. In short, students who attend less violent and chaotic schools have fewer distractions and thus more time and mental energy to devote to school work (Charles et al. 2009).

Finally, higher quality schools also demand more of their students and promote norms that value high performance and achievement. We would thus expect that students attending these schools would be more likely to devote time and energy to academic pursuits and that this may also spill over to time spent reading outside of the classroom. The more independent reading students do on their own, the better their classroom performance.

The present paper uses data from the Monitoring Mt. Laurel Study, a new survey-based study that enables us to compare students living in a subsidized housing development in a middle-class New Jersey suburb to a comparable group of students whose parents applied to live in the development but had not moved in at the time of the survey, thus holding constant self-selection into the pool of people wishing to move into affordable suburban housing. We draw on data collected on children aged 12 to 18 who resided in the subsidized housing development or who lived with a parent or guardian who applied to live in the housing development.

This quasi-experimental design is well-suited for the study of school effects and overcomes some of the limitations of previous research. Unlike the MTO study, for instance, children living in the Mt. Laurel development clearly attend higher quality schools than children in the comparison group. In addition, many students have lived in the development for several years, thus allowing sufficient time for cumulative effects to emerge and thereby enabling us to disentangle the effects of a better school from the effects of moving, which is inherently disruptive. Finally, we had access to information from residents' and non-residents' initial applications to enter the development and we were able to draw on these data to estimate propensity scores that capture the likelihood of moving from the waiting list into the development. We use these propensity scores in multivariate models to control for factors that might influence entry into the development.

Using the Mt. Laurel data, we test the hypothesis that living in and attending school in a middle-class suburb improves a poor child's academic performance relative to what his or her performance would have otherwise been, and whether the improved performance can be

attributed, at least in part, to differences in parental involvement in school, exposure to disorder and violence at school, and hours spent reading per week. We begin by offering a brief history of the Mt. Laurel housing development and describe its present configuration before moving on to describe our data and measures and the results of multivariate analyses. We conclude with a discussion of our findings and their implications both for affordable housing and school policy and future research.

THE MT. LAUREL CASE

Mt. Laurel Township is located about eight miles east of Camden, New Jersey, a severely depressed former manufacturing center that lies just across the Delaware River from Philadelphia. Until the Second World War Mt. Laurel was a small farming community, but afterward it grew into a Philadelphia suburb with roughly 40,000 residents. The suburb's proximity to major highways also attracted extensive retail and commercial development and thousands of jobs. In many ways, it represents a classic suburban community. According to data from the 2000 Census, it is predominantly white (88% of the population) and composed mostly of homeowners (84% of households) living in single family housing (72% of all housing units). A significant proportion of residents live in age-restricted (55+) condominium or townhouse developments.

In 1971 the NAACP filed suit against the Township of Mount Laurel, New Jersey on behalf of Ethel R. Lawrence and other low income plaintiffs. The suit challenged the township's restrictive zoning regulations, which effectively prevented the construction of affordable housing within the community and thus excluded poor families from residence. After a prolonged legal battle, the state Supreme Court in 1975 found for the plaintiffs and articulated what has since come to be known as "the Mount Laurel Doctrine:" that municipalities throughout New Jersey have an affirmative obligation to meet their "fair share" of the regional demand for low income housing (Kirp, Dwyer, and Rosenthal 1995).

The favorable court decision (commonly known as Mt. Laurel I) did not immediately lead to the construction of affordable housing, however, as the township fought over what its "fair share" of low income units might be. In 1983 the court reaffirmed its earlier ruling in another decision (known as Mt. Laurel II) and ordered the township to permit the development to move forward (Haar 1996). Fair Share Housing Development, Inc., a nonprofit developer of affordable housing in South Jersey, began planning a development that came to be known as the Ethel Lawrence Homes.

Plans submitted to township authorities were subject to a long series of hearings and public challenges, however, and it was not until April of 1997 that the Township Planning Board finally granted its approval, but not before a series of public hearings attended by more than 500 angry citizens (Smothers 1997a, 1997b, 1997c). The Ethel R. Lawrence Homes were finally built on a 62 acre field and wooded site, adjacent to luxury, market-rate single family detached housing and a retirement community. The development opened in two phases, with 100 initial units in late 2000 and 40 other units early in 2004. It consists of one-, two-, and three-bedroom two-story townhouses that are 100% affordable to lower income households, defined as those with incomes below 80% of the regional median income, who pay no more

than 30% of their incomes for rent and utilities. These criteria yield a broad range of “affordability,” with units going to households having incomes that range from 10% to 80% of the median income, roughly \$6,200 to \$49,500 per year.

In 2000, Fair Share Housing Development began an affirmative marketing program in newspapers and local media, followed by three days during which applications were distributed to all who sought them. The applications were reviewed in the order in which they were returned within each income and bedroom category and evaluated with respect to several selection criteria, including third party verification of income; a five-year history of residence; and a search of public records for criminal, bankruptcy or landlord judgments. Those who met the entry criteria were interviewed separately to review the information in the file and, upon agreement to the terms of the lease, were offered a spot in the housing complex. Fair Share repeated the application process in 2003, 2006, 2007 and 2010 in order to refresh the waiting list.

METHODS AND DATA

We seek to determine whether low-income children who reside in and attend school in a middle-class suburb display improved academic performance relative to a comparable sample of children who attend less advantaged schools. To make this assessment, we draw on data from a survey of 12 to 18 year-old children residing in the Ethel Lawrence Homes (ELH) and a comparison sample of children whose parents applied but who, for one reason or another, had not been accepted into the development. The data were collected as part of a broader survey-based project that administered questionnaires to adult residents of the housing development and a comparison sample. Adults with children aged 12 to 18 were asked for permission to survey their children.

Of the 49 eligible children in this age range living in the Ethel Lawrence Homes, 37 participated in the study (response rate = 75.5%), while 34 of the 53 eligible non-resident children participated (response rate = 64.2%), yielding an overall response rate of 69.6%. By far the most common reason for not participating was the failure of a child to complete the written questionnaire. Of the 71 total cases, 10 were missing data on one or more key variables and we dropped these cases, yielding a final sample of 31 resident and 30 non-resident children. Figure A1 in Appendix A gives a visual presentation of participant response rates.

The children’s questionnaire asked basic questions about demographic characteristics, school courses and grades; parents’ involvement in school, discipline style and support for enrichment activities; number of hours spent on academic and non-academic activities outside of school; as well as a host of questions about extracurricular activities, self-esteem, views about school; and peers’ views about school. We supplement these data with data from the parents’ questionnaire, which asked respondents about race, marital status, age, educational background, employment status, and income, as well as a host of questions about residents’ neighborhood experiences.¹

Table 1 presents means on key background characteristics for resident and non-resident children. Residents are, on average, 14.5 years old, while non-residents are 14.9. Mean age among resident parents is 39.7 while mean age for non-resident parents is 39.1. Roughly 3% of both resident and non-resident parents are male. Six percent of resident parents are white, compared to 17% of non-resident parents. We control for each of these measures in the multivariate analyses.

Though residents and non-residents in our sample appear to be fairly comparable, it is possible that the two groups differ on underlying characteristics that may bear on the outcomes of interest. To control for this, we estimated a model predicting each applicant's likelihood, or propensity, of being accepted into the Ethel Lawrence Homes and then included these propensity scores in our final models. These models were estimated using data from applicants' initial applications to the Ethel Lawrence Homes, which were archived at Fair Share Housing Development, located on-site at the Homes. We used the files to create a database that included relevant data on all applicants, including their age, household size and composition, relationship status, sex, income, and location and type of residence. In addition to these variables, the applications also included several variables that helped us measure their purported reasons for wanting to move, their actual motivation to enter the development, as indicated by their number on the first-come-first-served waiting list, and their access to family resources, as indicated by whether they were currently living with a family member. Descriptions of these variables are available in Appendix B; the results from the propensity score analysis are available upon request.

For the sample used in this analysis, the average propensity score for residents (.18) was slightly higher than the average propensity score for non-residents (.12), but the difference was not particularly large. Originally we sought to compute the propensity scores for residents and then compute the propensity scores of non-residents and seek to interview those that most closely matched, but given the difficulty of tracking down and interviewing non-residents and the resources at our disposal, in the end we just sought to compile roughly the same number of non-resident interviews and use the propensity scores as a statistical control in multivariate models.

The propensity scores are a function of those variables found in the application files; despite our efforts to build a comprehensive dataset, it remains a possibility that selection into the Homes was affected by unmeasured characteristics that were omitted from the files. For instance, the administrators overseeing the selection process may introduce an additional source of unmeasured group differences if they discriminate against certain individuals and families on the basis of characteristics not contained in the applicants' files or simply apply arbitrary rules to the selection process. In this case, however, the reasons for non-selection were typically documented in the files and rejected applicants have the opportunity to appeal, which should reduce arbitrariness and discrimination by administrators selecting the residents.

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¹Throughout the text, we refer to these adult residents as "parents," though in a few cases (N=5) they were grandparents or aunts/uncles.

Some non-residents that we interviewed had previously been rejected for entry into the development. Applicants were considered “rejected for cause” if they had prior evictions, bad credit history, a bad landlord reference, or a criminal history. Among other reasons for being cut from the list, the most frequent was a failure to respond to written correspondence from the Homes, which we can generally assume means they were no longer interested. Other reasons include having an income that was too low or high for the unit that was available, not completing the application properly, or some other administrative infraction. Of the 30 non-resident families used in this analysis, one-third had been rejected for cause. In models not shown, we included a dummy variable indicating whether respondents were rejected for cause; the dummy variable did not affect the estimates.

SCHOOL QUALITY

One problem with the MTO study was that moving to a lower poverty neighborhood did not produce much of an improvement in the quality of the schools attended by children in the treatment group. Most of the families who moved into low poverty neighborhoods simply relocated to other neighborhoods within segregated minority communities, which fed into the same or similar schools yielding only marginal improvements in school quality. As part of the survey, students in the Mt. Laurel study were asked which school they presently attended and with this information we were able to access New Jersey’s 2009 Department of Education School Report Card File (<http://education.state.nj.us/rc/rc09/index.html>) and compute average characteristics of the schools attended by ELH residents and non-residents, which are summarized in Table 2.

On most indicators of school quality, ELH resident children show significantly improved educational circumstances compared with non-resident children. Whereas the student mobility rate was 14.6 at non-residents’ schools it was just 5.6 at residents’ schools, indicating a more stable learning environment. Likewise, although only 70% of students in schools attended by non-resident children passed the state language arts test with proficiency and just 57% passed the state math test, among ELH residents the figures were 88% and 80%, respectively. The average SAT score of 1513 in schools attended by resident children was 17% greater than the value of 1291 in schools attended by non-resident children. The schools of resident children also had a higher attendance rate (94% versus 89%), a lower dropout rate (0.6% versus 4.1%) and a higher graduation rate (96% versus 83%) than the schools of non-resident children. In short, moving into the Ethel Lawrence Homes afforded children an opportunity to attend markedly better schools.

MEDIATING FACTORS AND ACADEMIC PERFORMANCE

We test whether residence in the housing development is linked to academic performance through three mediators: parental involvement in school activities; children’s exposure to disorder and violence at school; and weekly time spent reading. Parental involvement is a measure of the extent to which children reported their parents being involved in the following school-related activities during the previous 12 months: checking homework, helping with homework, involvement in the PTA, talking to other parents, and talking to their children’s friends. Frequency of participation in these activities was measured using an

ordinal scale (never, rarely, sometimes, often, or very often) that we coded 0 to 4; and from these responses we constructed a Parental Involvement Scale ($\alpha = .782$), with higher scores indicating more involvement.

Table 3 shows mean differences between resident and non-resident parents with respect to involvement in school activities. Overall, parents of children who reside in ELH show slightly higher rates of involvement compared with non-resident parents ($t = 1.497$, $p = .140$), though the difference is statistically insignificant.

The children's questionnaire also asked a series of questions about children's exposure to disruptive and violent behaviors on school property during school hours over the previous three months. Examples of social disorder include students fighting, smoking, kissing or "making out," being late for class, cutting class, cutting school, shouting at or threatening a teacher or principal, pushing or hitting a teacher or principal, vandalizing school or personal property, theft of school property, consuming alcohol, taking illegal drugs, carrying knives, carrying guns, and robbery of students. Children were asked to indicate whether they observed each of these behaviors never, rarely, sometimes, often, or very often and the responses were coded 0 to 4 and summed to create a Disorder and Violence Scale ($\alpha = .861$), with higher scores indicating greater exposure to disorder and violence at school. Table 3 shows students' mean scores on the disorder and violence scale. Clearly, ELH are exposed to significantly less disorder and violence than non-residents. On average, residents scored .81 on the violence and disorder scale, whereas non-residents scored 1.18 ($t = 2.521$, $p = .014$).

The final mediating variable we considered was time spent reading. Specifically, we asked children to report the number of hours they spent in a typical seven-day week reading for information or pleasure. Responses were open-ended and ranged from 0 to 25 hours per week. Table 3 shows a rather substantial difference between ELH residents and non-residents. Whereas ELH children reported reading 5.53 hours per week, the average was only 2.93 hours among non-resident children, though there is considerable variance that undermines the precision of estimates ($t = -1.710$, $p = .093$).

We measure academic performance in terms of the grade point average (GPA) on the children's most recent report card. GPA poses some limitations as a measure of academic performance, since it is highly dependent on the competitiveness of a given school. Yet, high school GPA has been shown to strongly predict college grades and college completion, even when controlling for SAT scores, class rank, family background and high school quality (Geiser & Santelices 2007; see also Roderick, Nagaoka & Coca 2009; Massey and Probasco 2010).

Students in the sample were asked to report the number of As, Bs, Cs, Ds and Fs they received on their most recent report card. We used these grades to calculate GPA, with students receiving 4 points for each A, 3 points for each B, 2 points for each C, 1 point for each D, and 0 points for each F. To calculate GPA, we then divided the sum by the total number of possible points a participant could have received (equal to 4 times the total number of courses taken). Table 3 shows that, on average, residents' GPA of 2.77 was

slightly higher compared to the non-resident value of 2.66, but this difference is not statistically significant ($t = 0.494$, $p = .623$).

ANALYTIC STRATEGY

As illustrated in Figure 1, we propose a model whereby living in ELH increases parental involvement in school, decreases exposure to school violence and disorder, and increases hours spent reading; changes in these factors in turn improve academic performance. Our analysis demands that we estimate both point estimates for the direct and indirect effects linking ELH residence to GPA and run inferential tests to determine whether these effects are different from zero (see Preacher & Hayes 2008). We estimated all effects using ordinary least squares regression and ran the corresponding inferential tests simultaneously in SPSS using the INDIRECT macro (Preacher & Hayes 2008). All models include controls for the measures described above.

The total effect, c , of ELH residence on GPA (shown in Figure 1) is given by the coefficient on ELH residence (X) in a model predicting GPA (Y) from residence and the control measures, but excluding the proposed mediating variables—parental involvement (M_1), school disorder/violence (M_2), and hours spent reading (M_3). The total effect consists of four effects—a direct effect, c' , from X to Y and three specific indirect effects. The direct effect is given by the coefficient on X in a model predicting Y from X , M_1 , M_2 , and M_3 . The first specific indirect effect links X to Y through M_1 and is equivalent to the product of the a_1 and b_1 paths, where a_1 is the coefficient on X in a model predicting M_1 from X and b_1 is the coefficient on M_1 in a model predicting Y from X , M_1 , M_2 and M_3 . The second and third indirect effects link X to Y through M_2 and M_3 , respectively; their computations are similar to the computation of the first indirect effect. The sum of these three specific indirect effects is the total indirect effect of X on Y :

$$\text{Total indirect effect of } X \text{ on } Y = a_1b_1 + a_2b_2 + a_3b_3$$

To conduct inference tests for the indirect effects, we use a *bootstrapping* procedure that involves repeatedly drawing samples of size n (where n is equal to the original sample size) from the existing data, sampling with replacement, and then estimating the indirect effect in each resampled dataset. Repeating this process thousands of times creates an empirical approximation of the underlying sampling distribution of the indirect effect which is then used to construct confidence intervals for the indirect effect. Among the methods that allow for hypothesis testing of indirect effects, the consensus is that bootstrapping is superior in that it makes no assumptions about normality in the sampling distribution and has better control over Type I error (Preacher & Hayes 2004; MacKinnon, Lockwood & Williams 2004). Like all mediation tests, we assume that the causal order runs from the independent variable to the mediating variable to the dependent variable and that one or more omitted factors are not confounding the causal relationship between the mediator and the dependent variable (MacKinnon, Fairchild & Fritz 2007; Pearl 2011).

We used 5,000 bootstrap resamples to generate 95% bias-corrected confidence intervals for the path estimates and the indirect effects. Following convention, we consider an effect to be

“significant” (or non-zero) if zero is not contained in the 95% confidence interval. The estimated path coefficients are displayed in Figure 2 as well as in Table 4, which also shows estimates of indirect effects and confidence intervals. We then repeated the full analysis, substituting the binary ELH residence measure for a continuous measure indicating the number of years the respondent had lived in the development, with non-residents being coded as 0. Since the results of the models using the years in ELH are nearly identical to those using the binary measure, we do not show the path diagram for these models, though we show the estimates in Table 4.

RESULTS

The total effect, c , of ELH residence (X) on GPA (Y) is .189. In other words, controlling for the other variables in the model, ELH residents’ GPAs are, on average, .19 points higher than non-residents’ GPAs, though the effect insignificant. Calculating the indirect effects requires that we first compute the specific paths linking ELH residence to GPA. The relationship between ELH residence and parental involvement is given by a_1 and suggests that, controlling for the other variables in the model, living in the housing development is associated with a .453 point increase on the Parental Involvement Scale ($p=.089$). From the model estimating participants’ score on the Disorder and Violence Scale, we see that living in the housing development is associated with a small (.261 point) ($p=.067$) reduction (a_2). Lastly, controlling for the other measures in the model, ELH residents read 3.35 hours more per week than non-residents ($p=.041$) (a_3).

Results from the model predicting GPA from ELH residence and the mediating factors suggest that the direct effect of living in ELH on GPA is $-.185$ (c'), though this effect is insignificant. GPA increases roughly two-tenths of a point for every one point increase on the parental involvement scale ($p=.080$). A one unit increase on the disorder and violence scale (b_2) is associated with a .583 point decrease in GPA ($p=.007$) and every additional hour read per week (b_3) is associated with a .039 point increase in GPA ($p=.033$).

Having estimating these paths, we can now compute the indirect effects. The specific indirect effect of ELH residence on GPA through parental involvement is $a_1b_1 = .453 \times .200 = .091$. The specific indirect effect of residence on GPA through disorder is $a_2b_2 = -.261 \times -.583 = .152$, while the indirect effect through hours read is $a_3b_3 = 3.348 \times .039 = .131$. The sum of these specific indirect effects provides the total indirect effect of ELH residence on GPA: $.091 + .152 + .131 = .374$. As Table 4 suggests, the indirect effect of ELH residence on GPA through parental involvement (a_1b_1) is insignificant (zero is contained in the confidence interval), as is the indirect effect running through disorder (a_2b_2). However, the confidence interval on the a_3b_3 path suggests that the indirect effect through hours read is significant. In other words, ELH residence increases GPA by increasing the number of hours residents read per week. The total indirect effect (the sum of the specific pathways) is also significant at the 0.05 level.

As mentioned above, the results from the analysis linking years in ELH to GPA are nearly identical to the results from the models using the dichotomous ELH measure. Parental involvement and hours read each increase significantly with the number of years lived in

ELH (exposure to disorder and violence does not increase with years lived in ELH). However, the sole causal path linking years of residence to GPA runs through hours read (the so-called a_3b_3 path). The total indirect effect exceeds the direct effect by a ratio of nearly 5 to 1 ($=.042/.009$), suggesting that the link between years in ELH and GPA is primarily indirect.

SUMMARY AND DISCUSSION

Our analysis of data from a quasi-experimental study of housing mobility suggests that school context has important consequences for school quality and academic performance. A systematic comparison of the schools attended by Ethel Lawrence residents and non-residents indicated that moving into the subsidized housing development led to a substantial improvement in school quality. By moving to a more privileged suburban environment, resident children were able to attend schools with lower dropout rates, higher graduation rates, and more students testing at proficient levels on state math and language tests. The schools of ELH residents also experienced less in-and-out movement while exposing them to students with greater cognitive skills.

Other things equal, one might expect that moving students from poor quality to high quality schools might result in a drop in grades, at least temporarily, as poorly prepared students are suddenly faced with higher expectations and a more competitive academic environment, but this was not the case. If anything, ELH students earned higher grades than their non-resident counterparts, though the effect was more indirect than direct. Our analysis suggests that one of the reasons ELH children's grades did not suffer despite their attending more competitive schools is that they spent significantly more time reading each week than their non-resident counterparts, which indirectly improved their GPAs.

Our work offers further evidence of the importance of contextual effects in American society. Unfortunately, we are unable to disentangle the effects of living in a middle-class community from the effects of attending high quality schools since the residents' improvement in school quality was so strongly linked to their neighborhood mobility. Future research should continue to employ experimental and quasi-experimental designs that maximize variation along the dimensions of both school and neighborhood quality, as Heather Schwartz (2008) is able to do in her study of Montgomery Public Schools. Moreover, it is possible that children in ELH are faring better than non-resident children because the non-resident children are experiencing ongoing instability as a result of not living in affordable housing and not because living in a middle class community and attending higher quality schools confer any particular benefit. This is an additional limitation of the present analysis.

To summarize our findings, by moving into a subsidized housing development located in an affluent suburb, disadvantaged families increased the quality of the schooling their children received, lowered their exposure to within-school disorder and violence, and increased the time devoted to reading while not suffering a decline in grades. These results are consistent with findings from the Gautreaux project and contradict those of the MTO project, but we believe the design of the Mt. Laurel study improves on both earlier designs in several ways.

First, we control for self-selection into the treatment group by constructing a control panel of respondents who have similarly self-selected into the pool of people wishing to move into an affordable suburban housing development. Second, we build in additional controls for unmeasured heterogeneity by estimating propensity scores for members of the experimental and control groups and including the estimated propensities in the final model. Third, we selected a treatment group whose members exhibited considerable variation with respect to duration of ELH residence, enabling us to study the cumulative effects of residence and to disentangle them from the disruptive effects of the move itself.

Appendix A

Appendix B: Generating Propensity Scores

To generate propensity scores for each applicant, we created a dependent variable equal to 1 if the participant had ever lived in the Ethel Lawrence Homes and equal to 0 otherwise. We used Stata's `psmatch2` command to generate propensity scores from the following set of variables:

Position on Waiting List

All applicants to the Homes are placed on a waiting list in the order in which they submit their applications in-person. Hence, lower numbers on the waiting list are more favorable for entry into the Homes. An applicant's position on the waiting list could thus be considered an indicator of both the applicant's real likelihood of being selected to move into the development as well as his/her motivation for being selected, since more motivated applicants theoretically would submit their applications before less motivated residents. When management calls for a new round of applications, they begin a new waiting list, which means the applicants in our sampling frame were on one of five waiting lists: 2000; 2003; 2006; 2007; or 2010. Some waiting lists are much longer than others, which made it difficult to simply include applicants' waiting list number in the regression equation—a position of “200” on the waiting list may be more or less favorable depending on how long the actual list for that particular year is. Thus, for each of the five application rounds, we split the list into quartiles and then generated a set of dummy variables indicating in which quartile a given applicant falls. These dummies were included in the model (reference = Quartile 1). There were also a handful of applicants (roughly 2.6% of all cases) that could not be found on a waiting list. Their application files were discovered when we were going through the applications that were archived at the Fair Share Housing Development. These cases were added to the sampling frame, but not assigned a waiting list number. We assigned them a separate dummy indicating their status as “not assigned a waiting list number.”

Number of bedrooms requested at Ethel Lawrence Homes

The Homes have 1-, 2- and 3-bedroom units. According to management, the 3-bedroom units are in largest demand, which means that a family requesting a 3-bedroom unit has a

smaller probability of being selected to move in. We included a continuous variable, ranging from 1 to 3, indicating the number of bedrooms being requested

Lives with a family member

To gauge an applicant's access to family resources, we included a binary measure of whether he/she was living with a family member at the time they applied to the Homes.

Female

We included a dummy variable indicating whether the applicant was female.

Relationship status

We generated four dummy variables indicating an applicant's status: never married (reference group), married, divorced/separated/estranged, and widowed.

Age

Age is coded as a continuous variable.

Has children

We included a dummy variable indicating whether (yes = 1) the applicant listed children under 18 as potential residents on the application.

Income

Applicants were asked to self-report and provide documentation for their income, including non-wage income, like TANF or Social Security. Applicants who made it far enough in the application process also had their incomes verified by a Fair Share staff member. We drew on data from all available sources to create a measure of income at the time applicants applied to the Homes. For ease of interpretation, we standardized income for the propensity score analysis. For each case missing on income, we imputed income to the mean annual income of other cases that shared the same relationship status, age, and sex. We include a variable in the model indicating whether a respondent's income was imputed (N=8).

Neighborhood characteristics

Applicants were required to give a current address on their applications. Some applicants provided P.O. Boxes; we assigned these applicants an address equal to the post office corresponding to this P.O. Box. We then geocoded these addresses and attached relevant characteristics of applicants' Census tracts. The final models included measures of percent black, percent Hispanic, percent vacant units, percent rental units, and percent below the federal poverty line.

Reasons for applying to Ethel Lawrence Homes

At the end of the application, applicants were asked to provide the reason they were applying to live in the development. Responses were open-ended and were used to create two dummy variables indicating residents' motivations for moving: housing-related needs (needs affordable housing, homeless, lease is up, needs more space, etc.); and reasons related to safety and opportunity (wants better school district, wants safer/better environment, wants a better life for family, etc.). We also created a dummy variable indicating whether respondents did not provide a response to this question. Lastly, we created an interaction variable between whether an applicant has children and whether they cited reasons related to safety and opportunity, under the assumption that applicants who have children and are concerned about safety and opportunity issues may be particularly motivated to move.

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Figure 1.

Path diagram showing the hypothesized causal paths linking ELH residence to GPA

Figure 2.

Path diagram showing the direct effect and causal paths linking ELH residence to GPA.

Source: Children's Questionnaire. N=61.

Figure A1.
Participant response rates for Children's Questionnaire.

Table 1

Means of variables used in analysis of school outcomes for Ethel Lawrence Homes' residents and non-residents. Source: Children's Questionnaire.

Variables	ELH residents	Non-residents	Sig? ^a
CHILD CONTROLS			
Age	14.48	14.90	
PARENTAL CONTROLS			
Age	39.65	39.10	
Male	.03	.03	
White	.06	.17	
Propensity score	.18	.12	+
N	31	30	

⁺ p<.10, two-tailed test

^a Significance based on t-test on mean difference between residents and non-residents.

Table 2

School characteristics in 2009 by ELH resident status. Source: NJ School Report Card Database.

	Residents	Non-Residents	Sig? ^a
Student mobility rate	5.6	14.6	**
% students proficient on state language arts test ^b	88.3	69.7	**
% students proficient on state math test ^b	80.4	56.8	**
Average SAT score ^c	1512.5	1292.1	**
Attendance rate	94.4	89.2	**
Dropout rate ^c	0.6	4.1	*
Graduation rate ^c	96.2	83.2	*
N	30	27	

* p<.05,

** p<.01, two-tailed test

^a Significance based on t-test on mean difference between residents' and non-residents' schools.

^b High schools: HSPA scores; Middle schools: NJASK8 scores; Lower middle schools: NJASK6 scores

^c High school only

Table 3

Means for Mediating Factors and GPA by ELH residence status. Source: Children's Questionnaire.

	Residents	Non-Residents	Sig ^a
Parental Involvement in School	2.13	1.75	
Exposure to Disorder and Violence at School	0.81	1.18	*
Hours Spent Reading per Week	5.53	2.93	+
Grade Point Average	2.77	2.66	
N	31	30	

**
p<.01,

*
p<.05,

+
p<.10, two-tailed test

^a Significance based on t-test on mean difference between residents and non-residents.

Table 4

Path coefficients, indirect effects and 95% bias-corrected confidence intervals from OLS regressions predicting GPA (CIs based on 5,000 bootstrap resamples).^a Source: Children's Questionnaire.

Path	ELH Residence				Years in ELH			
	Estimate	S.E.	95% CI		Estimate	S.E.	95% CI	
			Lower	Upper			Lower	Upper
Total effect (<i>c</i>)	.189	.236	--	--	.051	.030	--	--
Direct effect (<i>c'</i>)	-.185	.229	--	--	.009	.031	--	--
<i>a</i> ₁	.453	.262	--	--	.080	.033	--	--
<i>a</i> ₂	-.261	.140	--	--	-.015	.018	--	--
<i>a</i> ₃	3.348	1.600	--	--	.606	.196	--	--
<i>b</i> ₁	.200	.118	--	--	.168	.117	--	--
<i>b</i> ₂	-.583	.207	--	--	-.552	.205	--	--
<i>b</i> ₃	.039	.180	--	--	.033	.019	--	--
Indirect effects								
<i>a</i> ₁ <i>b</i> ₁	.091	--	-.010	.315	.013	--	-.002	.046
<i>a</i> ₂ <i>b</i> ₂	.152	--	-.001	.408	.009	--	-.007	.039
<i>a</i> ₃ <i>b</i> ₃	.132	--	.013	.404	.020	--	.001	.058
Total indirect effect	.374	--	.113	.708	.042	--	.007	.088
N	61				61			
F value for full model	2.356 (p=.026)				2.267 (p=.032)			

^a Models include controls for propensity score, child's age, parent's age and sex, and whether parent was white.