HHS Public Access

Author manuscript

Soc Sci Res. Author manuscript; available in PMC 2016 September 01.

Published in final edited form as:

Soc Sci Res. 2015 September ; 53: 218–230. doi:10.1016/j.ssresearch.2015.05.004.

Residential Mobility During Adolescence: Do Even "Upward" Moves Predict Dropout Risk?

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Abstract

This paper uses the National Longitudinal Study of Adolescent Health to investigate the impact of housing instability in adolescence on the likelihood of subsequent graduation from high school. Combining census data, self-reports, and information about respondents' residential changes, we use the variation in the number of moves and neighborhood quality to predict whether participants obtain a high school diploma. Controlling for major predictors of housing mobility, students experiencing at least one move over a 12-month period have a roughly 50% decreased likelihood of obtaining a high school diploma by the age of 25. These associations are identified regardless of whether students move to a poorer or less-poor neighborhood. Our results carry implications for the development of housing policies and interventions designed for disadvantaged populations.

Keywords

housing mobility; moving; neighborhood; adolescence; high school graduation; Add Health

The United States of the 21st century is a highly unequal society, in which the residential segregation of economic groups continues to grow (Reardon & Bischoff, 2011). Following from a history of racially exclusive policies and practices, combined with a host of policies promoting urban sprawl, this economic segregation is strongly tied to patterns of racial segregation (Dreier, Mollenkopf, & Swanstrom, 2014). At the broadest level, two strategies exist to address persistent racial and economic segregation; these strategies might be termed "preservation" and "mobility," respectively (Crowley & Pelletiere, 2012). The preservation approach emphasizes the stabilization and improvement of low-income neighborhoods

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(Hartman, 1984; Imbroscio, 2011; Pattillo, 2009). According to this perspective, affordable housing is in short supply and should be preserved where it exists. Those in favor of preservation argue that low-income households should not have to uproot themselves in order to access decent goods, services, and educational opportunities. Instead, housing and community development policy should focus on comprehensive investment in low-income communities, building on existing social capital and other community assets (Kretzmann & McKnight, 1996).

By comparison, the mobility approach, which has received greater attention within recent social science research, emphasizes the strategy of moving low-income households to non-poor areas. For instance, programs such as the Gautreaux Assisted Housing Program, the Moving to Opportunity (MTO) experiment, and others have utilized specialized housing vouchers to help households move from public housing to neighborhoods that would be unaffordable to them otherwise (Popkin et al., 2003; de Souza Briggs, Popkin, & Goering, 2010). A significant research effort has been dedicated to the task of identifying the causal effects of these programs on low-income households. This body of research has found the impacts of such programs to vary widely based on the program, the analytic strategy, and the outcome under consideration (Ludwig et al., 2008; Rosenbaum & Zuberi, 2010).

One major obstacle to estimating neighborhood effects via a mobility program is that the potential benefits of moving to a non-poor neighborhood occur alongside the potential disruptiveness of a residential transition. Regarding the most prominent mobility program of recent years, MTO, Robert Sampson (2008, p. 197-198) observes that:

> [A]lthough moving is a major life event associated with negative outcomes for youth (Hagan, MacMillan, and Wheaton 1996; Haynie and South 2005), neighborhood change is coupled with moving by the MTO design. Hence, MTO cannot (experimentally) separate the impact of moving itself from differences in neighborhood context.

This methodological challenge remains unresolved within the existing literature (Burdick-Will et al., 2010). Moreover, while mobility interventions have focused on households moving from public housing, there is a relative dearth of research using broader population-based samples.

The present study provides a novel statistical approach to the intersection of mobility effects and neighborhood effects, estimating the relative predictiveness of mobility and neighborhood characteristics with regard to adolescents' likelihood of achieving high school graduation. High school graduation is a critical developmental milestone, predicting a range of social and economic outcomes that benefit both the individual and society (Tyler & Lostrom, 2009). Based on prior literature, we hypothesize that the experience of moving is a risk factor for academic underachievement above and beyond observable predictors of moving. However, we seek to identify whether this risk differs between "downward," "parallel," and "upward" moves—in other words, moves to poorer, equally poor, or less-poor neighborhoods.

The paper begins with a review of the literature regarding the patterns and correlates of residential mobility in the United States. We then describe our analytic approach and results, which utilize the Add Health data set, a longitudinal, population-based survey that includes extensive information on neighborhood characteristics. In short, using a logistic regression approach, we find that the experience of moving during adolescence is associated with decreased odds of graduating from high school, even for adolescents moving to less-poor neighborhoods. We conclude with a discussion of these findings with respect to the "preservation versus mobility" debate.

Prior Literature

Residential Mobility and Socioeconomic Status

Overall, Americans' rates of residential mobility have declined markedly over the past decades. During 1948, the first year of data collection in the annual Current Population Survey (CPS), 20.4% of Americans moved (U.S. Census Bureau, 1949). That figure dropped steadily, falling to 11.9% as of 2008 (Taylor et al., 2008), and then rising to 15.4% in more recent estimates (U.S. Census Bureau, 2011). While the nation as a whole has seen a general decline in mobility, significant numbers of children continue to be affected by residential transitions. Between 2008 and 2009, almost 11 million children experienced housing relocation (U.S. Census Bureau, 2011).

Moreover, low-income families with children continue to experience higher moving rates than the general population. The most recent American Community Survey (ACS) demonstrated a negative correlation between mobility rates and income among families with children: while less than 12% of households earning above 150% of the federal poverty level moved during 2011, households living below the poverty line moved at a rate of 26.5% (U.S. Census Bureau, 2011). Moreover, according to the annual CPS surveys, residential mobility rates among high school dropouts and service workers actually increased after 1980, while those of blue- and white-collar workers continued to decline in parallel with the overall national trend (Fischer, 2002). Low-income households were more likely to move within their counties than to move between counties or states. This pattern may reflect a higher incidence of involuntary or less-voluntary relocations, as opposed to planned moves in pursuit of better economic opportunities (Fischer, 2002; DeLuca, Rosenblatt, & Wood, 2009).

Housing instability among families has worsened with the financial crisis of the late 2000s and early 2010s. Increased foreclosure rates have led to larger numbers of families experiencing residential instability, including a rise in the number of households "doubling up," or residing with other households within a single housing unit (Institute for Children, Poverty, & Homelessness, 2013; Leventhal & Newman, 2010). "Doubling up" increased among families in the nation's 324 largest metropolitan areas during the recession, with the timing and frequency of moves correlated directly with changes in local markets during this time period (Winkler & Rodgers, 2013). Although rates of chronic homelessness among individuals decreased from 2008 to 2012, the U.S. Office of Housing and Urban Development (HUD) reported increases in family homelessness over the same time period

(Cortes, Henry, de la Cruz, & Brown, 2012). Families with children appear to have been uniquely affected by the financial crisis, with housing instability presenting a major concern.

Residential Mobility and Educational Outcomes

Prior literature has shown mobility to negatively predict subsequent educational outcomes such as high school graduation rates and college attendance, even when rigorous longitudinal research designs were used. For instance, in a six-year nationally representative study of U.S. high school sophomores, Astone and McLanahan (1994) found that school mobility in the five years prior to baseline predicted higher high school dropout rates; among youth in single-parent homes, the relationship between mobility and dropout was even stronger. A prospective study of secondary school students in Toronto found that those who moved from outside the city during the three years prior to baseline were significantly less likely to graduate from high school or college; moving also predicted worse performance on a standardized measure of educational attainment 13 years later (Hagan, MacMillan, & Wheaton, 1996).

Children and adolescents who experience numerous residential transitions have been shown to be at particular risk regarding educational outcomes. A recent study tracked changes in school performance over a five-year period among third through eighth grade students in a large urban school district, comparing the achievement patterns for the following groups: highly mobile or homeless youth (those receiving homeless services or moving at least three times during the study), low-income youth (those eligible for free or reduced-priced school lunches), and non-economically disadvantaged youth (Cutuli et al., 2013; Obradovic et al., 2009). Longitudinal analyses found that highly mobile youth had the lowest initial scores, and showed significantly slower progress over three years, compared to their less mobile classmates. Another longitudinal study using standardized test scores in an urban school district showed that moves predicted poorer reading and math scores, with especially pervasive effects of mobility in kindergarten on reading development (Voight, Shinn, & Nation, 2012).

While the majority of studies on this topic find a negative association between mobility and educational attainment, a smaller set of studies suggests a spurious or even a positive relationship. For instance, Pribesh and Downey (1999) found that most of the apparent “effect” of moving is explained by preexisting differences between movers and non-movers. Swanson and Schneider (1999) found that mobility in the early high school years, while correlated with negative outcomes in the short term, was actually predictive of positive outcomes with regard to longer-term educational attainment. Likewise, Hango (2006) found that, in a Canadian sample, the effects of moving during childhood might be positive with regard to academic outcomes once a host of variables were controlled. These studies call into question the hypothesis that moving should be considered a risk factor for educational success, and motivate additional research on this issue.

Neighborhood Characteristics and Educational Outcomes

Neighborhood socioeconomic status is a strong predictor of educational outcomes, including the likelihood of high school graduation (Aaronson, 1998; Ainsworth, 2002). Possible

pathways by which neighborhoods matter may include neighborhood resources and school funding, social networks and norms, and exposure to crime; these influences may have differing effects on particular subgroups of children (Harding, Gennetian, Winship, Sanbonmatsu, & Kling, 2010). Furthermore, these effects may operate cumulatively across generations (Sharkey & Elwert, 2011). However, some studies attempting to separate neighborhood and household factors suggest a more limited causal role for neighborhoods (Duncan, Boisjoly, & Harris, 2001; Solon, Page, & Duncan, 2000).

The MTO experiment was developed in part to provide a stronger test of the causal effects of neighborhoods. With regard to children's and adolescents' educational achievement, the MTO intervention has not demonstrated statistically significant effects (Sanbonmatsu, Kling, Duncan, & Brooks-Gunn, 2006). However, these null findings are difficult to interpret, considering that the intervention combined the potential benefit of a better-resourced neighborhood with the potential risk of residential transition. Moreover, a neighborhood transition may or may not coincide with a school transition, further complicating the task of estimating neighborhood effects on educational outcomes.

Prior research has suggested the particular importance of neighborhood social capital with regard to child outcomes (Coleman, 1990; Sampson, 2012; Sampson, Morenoff, & Earl, 1999). Social capital is conceptualized as the accumulation of interconnected relationships that may support children's cognitive and social development (Coleman, 1988; 1990). Household moves may disrupt the social networks in which children develop, including connections with parents and extended family, teachers, and community supports.

Hagan and colleagues (1996) examined the loss of social capital associated with residential transition. Incorporating a life course perspective (Elder, 1974; 1994), the researchers hypothesized that supportive parents could mitigate losses in social capital associated with residential mobility. The study followed high school students in Toronto, Canada over a 13-year period. Findings suggested that youth who moved to a new city during childhood exhibited higher rates of dropout, lower rates of college completion, and lower scores on achievement tests when they experienced lower levels of parental support, measured by youth perceptions of closeness with caregivers in adolescence (Hagan et al., 1996). Family resources thus functioned as stress buffers to compensate for losses in social capital associated with mobility.

Extending the logic of social capital to the community level, social disorganization theory has emphasized the effect of neighborhood-level rates of residential mobility on child outcomes (Sampson, 2012; Sampson, Morenoff, & Earls, 1999). Investigating variation in social capital of neighborhoods, Sampson and colleagues (1999) found that communities experiencing higher residential turnover exhibited lower aggregated levels of social control. Neighborhood instability hindered social capital by disrupting connections between neighbors that supported child development. Moreover, moves often reinforce patterns of segregation and inequality. Tracking patterns of residential mobility in Chicago, Sampson (2012) found that low-income families consistently moved between neighborhoods marked by concentrated disadvantage, whereas higher income families churned within areas with greater social advantages.

Changes in schools and peer networks represent another potential mechanism through which housing mobility can threaten child development (Coulton, Crampton, Irwin, Spilsbury, & Korbin, 2007). Residential moves may force youth to navigate new schools and friend networks during the developmental period in which peers take on more saliency. In a nationally representative sample of adolescents, youth who recently changed both addresses and schools were more likely to drop out over a one-year period, and the effect functioned through disruptions in peer networks (South, Haynie, & Bose, 2007). In particular, mobile youth experienced more tenuous connections with lower achieving friends, which partially explained increased probabilities for dropout in the next year. The research provides an intriguing glimpse into the processes triggered by mobility; however, research has yet to investigate longer-term influences of these disruptions, as well as other aspects of peer connections that may be meaningful in explaining mobility effects. For example, little empirical work has examined the connection between mobility and peer substance use in adolescence (Fomby & Sennott, 2013). Mobility may lead youth to befriend peers engaging in alcohol and drug use: behaviors that may interfere with academic attainment.

The present study extends prior research by investigating the role of housing mobility on high school graduation in the context of neighborhood and peer changes. Longitudinal data on a nationally representative sample captured a wide range of neighborhood transitions associated with moving, as well as fluctuations in peer substance use before and after mobility. Moves were measured over a 12-month period after the grade 7-12 baseline assessment. Census data identified whether the neighborhoods to which youth moved were structurally similar or characterized by higher or lower levels of unemployment, poverty, income, and educational attainment. Graduation from high school was assessed 13 years after baseline; in particular, graduation was defined as receipt of a high school diploma because of prior literature that shows the relative value gained beyond graduate equivalency degrees (GED; Heckman & LaFontaine, 2006).

Hypotheses tested whether 1) mobility related to lower high school graduation accounting for various reasons youth moved, including sociodemographic characteristics, family structure, perceived connection to neighborhoods, and neighborhood risk; 2) neighborhood risk moderated the relationship between mobility and graduation, such that youth experienced the lowest graduation rates when moving to poorer neighborhoods, 3) changes in schools and peer substance use explained (mediated) the moderating effect of neighborhood change on graduation. Sensitivity analyses expanded the definition of graduation to include receipt of GED to explore whether mobility and other predictors provided similar influence on different pathways to educational attainment. Together, our models tested potential selection processes into adolescent housing mobility, associations between moving and graduating from high school, and potential moderating and mediating factors.

Methods

Survey Design

The data for this study come from the National Longitudinal Study of Adolescent Health ("Add Health"), a nationally representative study following adolescents into early adulthood

(Harris, 2012). Our analyses utilized data from Wave 1 (participants in grades 7-12 in 1994-5), Wave 2 (grades 8-12 in 1996), and Wave 4 (ages 24-32 in 2007-08). The Wave 1 participants originated from a stratified random sample of 20,745 adolescents attending 80 public and private high schools and 52 middle schools. The schools were stratified into 80 clusters, by variables including region (Northeast, Midwest, South, West), urbanicity (urban, suburban, rural), school type (public, private, parochial), and other characteristics. In addition to the surveys of the adolescents themselves, 17,670 parents also completed interviews at Wave 1. The Wave 2 follow-up included 71% of the Wave 1 respondents (n=14,738), with the response rate improving to 76% for the Wave 4 follow-up (n=15,701). Outcomes were measured at Wave 4, rather than Wave 3, because at Wave 3 participants were 18-26 years old. Therefore most—but not all—of the sample was past the age of "on time" high school graduation by Wave 3. Because we were interested in risk factors for high school dropout, we chose to measure independent variables prior to possible high school graduation (Waves 1 and 2), and to measure the dependent variable at a point when even the youngest participants in the cohort were old enough for an "on time" high school diploma (Wave 4).

Measures

High school graduation—The dependent variable, high school graduation, was self-reported at Wave 4. Specifically, participants answered the question, "What is your high school graduation status?" Response options included receiving a high school diploma, GED, other certificates of completion, or none of these. Those who had received a high school diploma were assigned a value of "1"; those who did not complete high school and those who had received GED certificates were assigned a value of "0."

Residential mobility—The independent variable of interest, residential mobility, was measured at Wave 2. Participants reported the number of times they had moved between Waves 1 and 2, an interval of approximately one year. Adolescents were asked, "How many times have you moved between now and [date of first interview]?" Responses were strongly right-skewed, ranging from zero to ten. This variable was recoded into two dummy variables, differentiating those who moved once and only once from those who moved two or more times. Additional interaction terms were also calculated, which are described in further detail below.

Subjective neighborhood measures—Four measures of neighborhood quality were included in the analyses. The first measure, "Neighborhood Disorder," was comprised of the mean of three parent-reported items measured at Wave 1 (Raudenbush & Sampson, 1999). Items were chosen from a broader set of parent-reported neighborhood items using exploratory factor analysis (α = .66). The first two neighborhood disorder items read, "In this neighborhood, how big a problem is litter or trash on the streets and sidewalks?" and "In this neighborhood, how big a problem are drug dealers and drug users?" (for both items, 1 = no problem at all, 2 = small problem, 3 = big problem). The third neighborhood disorder item read, "How much would you like to move away from this neighborhood?" (1 = not at all, 2 = some, 3 = very much).

The second neighborhood measure, "Social Cohesion," was reported by adolescents in Wave 1 (Raudenbush & Sampson, 1999). As with the neighborhood disorder measure, items were chosen using exploratory factor analysis ($\alpha = .60$). Social cohesion was calculated as the sum of three dichotomous (true/false) items: "You know most of the people in your neighborhood," "In the past month, you have stopped on the street to talk with someone who lives in your neighborhood," and "People in this neighborhood look out for each other."

Census neighborhood measures—The third and fourth neighborhood measures originated from 1990 Census data at the block group level. "Neighborhood Risk" was measured as the sum of four z-scored items ($\alpha = .86$): median income (reversed), unemployment rate, poverty rate, and percent of residents aged 25 or over without a high school diploma or equivalency. While some previous research has included neighborhood-level mobility rates within a neighborhood risk index, we chose to analyze neighborhood mobility as a separate indicator, due to its unique relevance to our research question. Specifically, the fourth neighborhood measure, "Neighborhood Mobility," was measured using a single census item: the percent of occupied housing units which were moved into between 1985 and March 1990.

Peer networks and school characteristics—Peers' substance use was measured as the sum of three items, asked at Waves 1 and 2 ($\alpha = .76$ at each wave). Specifically, adolescents were asked, of their three closest friends, how many of them (1) smoked at least one cigarette every day, (2) drank alcohol at least once a month, and (3) used marijuana at least once a month. Due to their sensitive nature, these questions were asked via a computer-assisted self-interviewing (Audio CASI) module.

An indicator for private school attendance at Wave 1 was also included. This indicator took a value of "1" if the adolescent attended Catholic school, a private schools with another religious affiliation, or a private school without no religious affiliation.

School change was measured at Wave 2 by asking adolescents if their current school (or most recent school, for data collected in the summer) was the same school they had attended at Wave 1. The school change variable was coded as "1" if participants were not currently attending either the original sample school or the "sister school" feeding into that sample school.

Additional control variables—A robust set of control variables was created, with each variable measured at Wave 1 unless otherwise noted. This list of controls was based on prior literature predicting the likelihood of residential mobility (Clark, 2010; Tucker, Marx, & Long, 1998; South, Crowder, & Trent, 1998; Fomby & Sennott, 2013; Carlson, Haveman, Kaplan, & Wolfe, 2012). These control variables included adolescent-reported age, sex, race/ethnicity, immigrant status, whether the adolescent had ever been suspended from school, whether the respondents' parents had ever been married to one another, divorce or other family change (mother or father entering or exiting the household between Waves 1 and 2 due to separation, divorce, or other change in family structure), and number of siblings. Parent-reported control variables included the parent's highest level of educational attainment, whether the household received public assistance, and whether the family

received any type of housing subsidy. An additional control variable measured respondents' urbanicity (urban, suburban, or rural). Finally, we included adolescents' performance on the Add Health Picture Vocabulary Test (PVT), an 87-item, computer-based version of the Peabody Picture Vocabulary Test-Revised (Dunn & Dunn, 1981). PVT scores were standardized by age.

Analytic Strategy

The dependent variable tested in this study was whether youth received a high school diploma 13 years after initial assessment in adolescence. Independent variables included number of moves; adolescent characteristics such as age at baseline, gender, and ethnicity; family characteristics, including family size, receipt of public assistance, family changes, parental marital status and education; and the contextual factors of peer substance abuse, school change, neighborhood characteristics, and change in neighborhood characteristics. Analysis proceeded in three phases. Phase 1 entailed a set of logistic models predicting respondents' likelihood of moving. Separate models were run predicting one move or more than one move, respectively. These initial models examined the selection process by which some families moved once or more than once, compared to those remaining in the same home between Waves 1 and 2. Phase 2 entailed a set of logistic regression models predicting the likelihood of graduating from high school, as predicted by residential mobility between Waves 1 and 2 and the host of control variables established in Phase 1.

Phase 3 entailed a further analysis of the key independent variable of residential mobility. Dummy variables were created reflecting moves to a "same-risk" neighborhood (change in the Neighborhood Risk Index of less than .2 standard deviations), a "lower-risk" neighborhood (decline of .2 standard deviations or more), or a "higher-risk" neighborhood (increase of .2 standard deviations or more), as compared to a reference group who did not move between Waves 1 and 2. The .2 standard deviation cutpoint was chosen to ensure sufficient sample size in the "same-risk," "lower-risk," and "higher-risk" mover categories. Change in the Neighborhood Risk Index was used—as opposed to change in the subjective neighborhood measures—due to the fact that parent-reported items were only available at Wave 1. Adolescent-reported items, while available at both Wave 1 and Wave 2, are more apt to change idiosyncratically as a function adolescents' maturation between waves, as well as any underlying changes in neighborhood social cohesion. Therefore the census-reported neighborhood risk was selected as the most feasible and reliable means of measuring neighborhood change across moves. Sensitivity analyses were also conducted to test whether mobility functioned similarly with an expanded definition of educational attainment. In particular, youth who reported receiving a GED were added to those who received a high school diploma; the reference group became youth who neither finished high school nor received a GED. Models were rerun on this dichotomous dependent variable.

Complete data were available for 7,285 respondents. All analyses were implemented in Stata (Version 12, StataCorp, College Station, TX) and utilized Add Health's longitudinal sampling weights ("pweights"), which adjust for complex sample design, selection, and non-response (Chantala, 2006). Logistic regressions were estimated using maximum likelihood. Table 1 presents the weighted means and standard errors for the outcome measure

(percentage having a high school diploma by Wave 4) as well as neighborhood characteristics, number of moves, and demographic variables.

Results

Modeling the Selection Process

Table 2 reflects the relationships between all predictor variables and the number of household moves. The two models shown examined the relationship between the independent variables and one move (Model 1) and two or more moves (Model 2). In each case, the reference group was "no moves." Table 2 and subsequent tables present adjusted odds ratios, where values greater than one indicate a positive relationship and values less than one indicate a negative relationship.

In Model 1, where the outcome is the likelihood of one move, several relationships were significant and of large magnitude. Notable significant relationships included divorce or other family change: Respondents whose families had experienced a change in resident parents were almost five times more likely to experience at least one move. "Ever suspended from school" also emerged as a significant predictor (AOR = 1.56, $p < .01$). Neighborhood collective efficacy, having married parents, and parent education beyond college all demonstrated negative and statistically significant relationships with the likelihood of moving once.

Models 2 reflects the same statistical model, but with two or more moves as the dependent variable. As in Model 1, "divorce or other family change" demonstrated a large and statistically significant relationship with two or moves (AOR =10.40, $p < .01$). Neighborhood collective efficacy, having married parents, and parent education beyond college again demonstrated negative and statistically significant relationships with moving twice or more. However, in Model 2, age was positively associated with moving and vocabulary test score and self-reporting as Asian were negatively associated with moving, while having been suspended did not show a significant relationship.

Mobility Predicting High School Graduation

Table 3 presents models predicting the receipt of a high school diploma by Wave 4. Model 1 shows the relationship between moving (once or more than once) and the outcome, unadjusted for any control variables. Our primary predictors of interest, having moved once, or having two or more moves, were both significantly associated with a lower likelihood of having obtained a high school diploma (AOR = .37 and .31, respectively; $p < .01$).

Model 2 included all of the control variables in the analysis to predict high school diploma receipt. Our key predictors of interest, having experienced one move or two or more moves, remained negatively associated with obtaining a high school diploma (AOR = .52 and .39, respectively; $p < .01$). Another significant relationship of interest was the level of neighborhood disorder: Increased levels of neighborhood disorder were independently associated with a decreased likelihood of receiving a high school diploma (AOR = .84, $p < .01$). Additional factors that were negatively associated with receiving a high school diploma, accounting for the other independent variables, were being male, having ever been

suspended from school, and receiving public assistance. Being Black, Asian, or Native American, age, number of siblings, and parents' education were all positively associated with high school graduation.

The final models tested two possible mediating variables: peer networks and school change. In Model 3, peers' substance use was negatively associated with high school graduation (AOR = .89, $p < .01$) but was not a significant mediator of moving once or more than once (p(Sobel) > .10). In Model 4, changing schools was also negatively associated with high school graduation (AOR = .61, $p < .01$) and partially mediated the relationship between two or more moves and high school graduation (p(Sobel) < .05).

An additional model (not shown) included an interaction term for age multiplied by each of the two "move" variables, testing for the possibility that age at the time of moving might moderate the relationship between moving and high school graduation. These interaction terms were not statistically significant.

Neighborhood Change and Mobility Effects on Graduation

Table 4 presents the relationships between specific types of moves and the likelihood of obtaining a high school diploma by Wave 4. The variables of interest in these models were whether the move was to a higher-, lower-, or same-risk neighborhood. A "lower-risk neighborhood" reflects a decrease in neighborhood risk of at least .2 standard deviations, while a "higher-risk neighborhood" reflects an increase in neighborhood risk of at least .2 standard deviations. Model 1 included only the type of move, and no controls. Statistically significant negative relationships were found between each type of move and the likelihood of obtaining a high school diploma. Adjusted odds ratios were .36 ($p < .01$) for moves to same-risk neighborhoods, .42 ($p < .01$) for moves to lower-risk neighborhoods, and .27 ($p < .01$) for moves to higher-risk neighborhoods. When control variables were included (Model 2), odds ratios associated with each type of move were attenuated, but remained statistically significant: .52 ($p < .01$) for moves to same-risk neighborhood, .48 ($p < .01$) for moves to lower-risk neighborhoods, and .34 ($p < .01$) for moves to higher-risk neighborhood. Adjusted Wald tests comparing these results suggested that the odds ratios for each of the three types of moves were not statistically different from one another.

Model 3 tested peer networks as a mediating variable. Inclusion of peer substance use attenuated the AOR for moves to same-risk neighborhoods only slightly (p(Sobel) < .10), and did not mediate the relationships between the other types of moves and high school graduation. Model 4 tested school change as a mediating variable. Changing schools between Waves 1 and 2 appeared to partially mediate relationship between lower-risk moves (p(Sobel) < .05) and higher-risk moves (p(Sobel) < .05) with high school graduation.

Models were rerun on the dependent variable that indicated whether youth received a high school diploma or a GED at Wave 4. Similar to the models predicting receipt of a high school diploma, moving once within the 12-month period (AOR = .53, p < .05) and moving to similar-risk neighborhoods (AOR = .52, p < .01) significantly lowered probability of graduation or GED after controlling for covariates. These findings suggest that mobility matters when including GED as part of the outcome. However, multiple moves in the 12-

month period (AOR = .72) and moves to lower- or higher-risk neighborhoods (AOR = .79and AOR = .52, respectively) no longer significantly lowered the probability of educational attainment. Findings suggested the more disruptive aspects of residential mobility might be less influential on high school equivalency measures. However, the small cell sizes of youth who obtained GEDs and either moved repeatedly or changed neighborhoods limited interpretation of the these findings. Given the similar direction and relative size of effects, power limitations might best explain lack of significant findings.

Discussion

This study investigates the relationship between housing mobility experienced in adolescence and educational attainment among a nationally representative sample of youth followed over 13 years. A major finding suggests that residential mobility during a 12-month period in adolescence predicts a reduced probability of high school graduation after accounting for individual and family risk for housing instability and poorer educational outcomes. Furthermore, educational attainment gaps appear regardless of whether an adolescent moves to an economically stronger or weaker neighborhood. Findings extend prior theoretical conceptualization of housing mobility as a disruptive context in which development occurs, and could inform federal housing policies that promote mobility. The following section discusses each in turn.

Our findings provide further evidence that housing mobility represents a developmental risk for educational outcomes beyond the socioeconomic circumstances surrounding the reasons for moves (Astone & McLanahan, 1994; Fowler et al., under review; Wood et al., 1993). Not only does instability in adolescence relate to dropout after one year in this nationally representative sample (South et al., 2007), but also negative predicts high school graduation by young adulthood. Inclusion of an extensive selection model strengthens evidence that differences emerge beyond socioeconomic circumstances that precede moves (Hagan et al., 1996; Pribesh & Downey, 1999). Furthermore, the lack of differential effects between “downward” and “upward” moves points to mobility as a risk beyond socioeconomic influences. Youth moving to economically healthier neighborhoods—neighborhoods with higher median incomes, lower unemployment, lower poverty rates, and smaller fractions of adults without a high school diploma—experience the same decreased odds of graduation as youth making parallel moves or moves to riskier neighborhoods. Similarly, multiple family moves within 12 months equally disrupt educational outcomes as single moves. It is less likely that multiple moves represent pursuit of economic opportunity, and instead, may reflect household financial necessities, such as families being unable to afford or maintain stable housing. If socioeconomic circumstances drive mobility effects, then educational outcomes should be worse for this group of adolescents. However, findings from this study suggest mobility as a unique risk.

The present study also provides some evidence on the mechanisms through which mobility threatens adolescent educational outcomes. The lack of differential effects of “upward” and “downward” mobility points to more proximal ecological contexts to explain school problems. A developmental-ecological model of risk for mobility hypothesizes that adolescent outcomes depend on influences of environmental supports and strains at multiple

levels (Bronfenbrenner, 1979; Fowler et al., under review). The effects of more distal systems (e.g., neighborhoods) function through more proximal influences (e.g., peers). Using the Add Health data, South and colleagues (2007) identify less dense and more peripheral positions within social networks as the primary mediator of the association between mobility and dropout in adolescence. Because those specific variables were not available in Wave 2 of the Add Health study, our study tests a different set of potential mediators: peer substance use and school change. We find evidence that a change in school partially mediates the association between mobility and dropout, motivating further research on how school changes are disruptive and how that disruption can be minimized (Cunningham, Harwood, & Hall, 2010).

Our study findings carry implications for the goals of housing policy. Housing mobility—even upward mobility—threatens healthy child and adolescent development (Leventhal, Brooks-Gunn, 2005; Sharkey & Sampson, 2007). Mobility programs in the vein of Gautreaux, Moving to Opportunity, and Housing Choice Vouchers in general, which often require families to move, must consider more holistic family needs, especially during periods of transition. Connection to timely and appropriate educational resources and mental health supports may prevent educational deficits associated with mobility; however, future research needs to illuminate processes to effectively do so. This is especially relevant to youth transitioning to adulthood who tend to lean on informal supports more than institutional resources. Additionally, a wide range of homelessness service system opportunities could prevent housing instability due to eviction, domestic violence, or other experiences with inadequate housing, yet these remain underutilized. Early identification of housing instability through systematic assessment across social service providers may maximize housing assistance, supporting access to resources for upwardly and downwardly mobile families.

Although beyond the scope of this study, inferences regarding community preservation policies also must be considered. These programs that focus on strengthening neighborhoods that adequately support households may inherently avoid mobility disruptions. Stability in household residency may translate to broader benefits for communities in terms of educational achievement and the associated benefits in future earnings and economic status. Dynamics involved in community building, including population inflow and outflow over time, make it difficult to assess these potential advantages. Future research on policy and programmatic changes that measures individual outcomes over time will illuminate these processes.

Limitations

Interpretation of findings from this study must occur in context of a number of limitations. Imprecision exists in measurement of changes in neighborhood risk that warrant further exploration in future research. For one, neighborhood changes reflect relative differences to prior experiences; youth who move from lower to middle income neighborhoods fall in the same category (“upward” moves) as adolescents moving from middle to higher income areas. Likewise, in this nationally representative sample, most mobility occurs among middle-income youth. Differences may exist for more dramatic mobility, such as low-

income minority youth moving to upper income and primarily white neighborhoods. Future research that explores mobility patterns by race and ethnic composition of neighborhoods will greatly inform theory.

Another limitation is the lack of data on experiences of mobility before the Wave 1 assessment of adolescents. Although covariates extensively modeled potential selection mechanisms, the observational design cannot rule out the possibility of unobserved pathways toward graduation. Housing instability patterns across childhood may place youth on different developmental trajectories that complicate re-experiences of instability in adolescence (Fowler et al., under review). This possibility of cumulative mobility effects introduces other potential developmental explanations of the educational deficits found in this study, and future research will enhance theory on mobility effects.

Finally, while we have conceptualized mobility as the key independent variable, it is possible that mobility could also act as a mediating variable in other important relationships. For instance, divorce or school suspension could each potentially lead to residential changes for adolescents, which in turn could lead to high school dropout. Likewise, parental job loss could precede moves and trigger a host of family changes that threaten educational outcomes. Switching schools due to behavior problems represents another potential mechanism that could contribute to poorer graduation rates. The complex inter-relationships between our independent variables should be explored in future work.

Summary

This study investigates the role of adolescent housing mobility on educational attainment into young adulthood among a nationally representative sample of youth. Findings support prior research that demonstrates the strain mobility places on academic attainment after accounting for other academic risk factors at multiple levels of context. Evidence suggests that mobility in adolescence hampers chances of high school graduation regardless of whether youth move to a relatively poorer or less-poor neighborhood. Results suggest housing policies and programs that promote mobility must consider potentially meaningful unintended consequences for youth and families.

Acknowledgements

This project was supported by Grant Number R01HD053731 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development of the National Institutes of Health. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the National Institutes of Health. This research uses data from Add Health, a program project directed by Kathleen Mullan Harris and designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris at the University of North Carolina at Chapel Hill, and funded by grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 23 other federal agencies and foundations. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Information on how to obtain the Add Health data files is available on the Add Health website (http://www.cpc.unc.edu/addhealth). No direct support was received from grant P01-HD31921 for this analysis.

The authors also wish to thank Kate Marcal, Jane Oliphant, Jennifer Threlfall, and Wynette Whitegoat for their helpful comments on earlier drafts of this paper.

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Highlights

- Researchers use the Add Health data set to estimate the impact of residential mobility on attaining a high school diploma.
- We find moving during adolescence to cut the likelihood of attaining a diploma by roughly half.
- The risk associated with residential mobility persists even when adolescents move to relatively socioeconomically advantaged neighborhoods.

TABLE 1

Descriptive statistics for analytic sample

	Min	Max	Mean or %	Standard Error
High School Diploma by Wave 4	0	1	84.6%	1.0%
W1 to W2: One Move	0	1	5.6%	0.4%
W1 to W2: ≥Two Moves	0	1	2.2%	0.3%
Adolescent Characteristics				
Age	11	21	15.5	0.1
Male	0	1	49.6%	0.9%
Picture Vocabulary Test	14	138	102.4	0.6
Ever Suspended from School	0	1	25.3%	1.4%
Immigrant	0	1	4.4%	0.7%
White	0	1	70.9%	2.8%
Black	0	1	13.6%	1.9%
Hispanic	0	1	11.4%	1.6%
Asian	0	1	2.7%	0.7%
“Other”	0	1	0.7%	0.1%
Native American	0	1	0.7%	0.3%
Family Characteristics				
Parents Married	0	1	73.9%	1.3%
Divorce or Other Family Change	0	1	12.3%	0.6%
Number of Siblings	0	12	1.42	0.04
Public Assistance	0	1	8.6%	0.9%
Housing Subsidy	0	1	3.5%	0.5%
Parent Education - Less than High School	0	1	13.0%	1.1%
Parent Education - High School Graduate	0	1	30.6%	1.3%
Parent Education - Some College	0	1	20.8%	0.8%
Parent Education - College	0	1	24.3%	1.1%
Parent Education - More than College	0	1	11.3%	1.1%
Context Characteristics				
Peer Substance Use	0	9	2.34	0.10
Private School	0	1	6.3%	1.9%
W1 to W2: Changed Schools	0	1	23.1%	1.9%
Neighborhood Disorder (Parent Report)	1	3	1.53	0.02
Collective Efficacy (Student Report)	0	3	2.29	0.02
Neighborhood Risk (Census)	−2.73	4.15	0.01	0.06
Neighborhood Mobility (Census)	.00	1.00	0.46	0.01
Rural	0	1	16.7%	4.6%
Urban	0	1	25.4%	3.9%
Suburban	0	1	57.8%	5.0%

N=7,285

Note: W1 = Wave 1, W2 = Wave 2. All statistics reflect Wave 1, unless otherwise specified.

TABLE 2

Adjusted odds ratios from logistic regression models of moving between Waves 1 and 2

	DV: One Move	DV: Two or More Moves
Age	1.08	1.31**
Male	.70*	.71
Picture Vocabulary Test (z-score)	1.06	1.43*
Ever Suspended from School	1.56**	1.17
Immigrant	1.40	.28
White (OMITTED)	---	---
Black	1.00	.68
Hispanic	.80	1.17
Asian	.80	.10**
"Other"	.55	.71
Native American	.29	1.53
Parents Married	.57**	.35**
Divorce or Other Family Change	4.85**	10.40**
Number of Siblings	1.05	.97
Public Assistance	1.25	.75
Housing Subsidy	.55	.58
Parent Education - Less than High School (OMITTED	---	---
Parent Education - High School Graduate	.93	.77
Parent Education - Some College	.78	1.16
Parent Education - College	.83	.68
Parent Education - More than College	.50*	.32*
Peer Substance Use	1.02	1.09
Private School (Wave 1)	.79	.53
Neighborhood Disorder (Parent Report; z-score)	1.15	1.08
Collective Efficacy (Student Report; z-score)	.86*	.68**
Neighborhood Risk (Census; z-score)	.94	1.16
Neighborhood Mobility (Census; z-score)	1.08	1.22
Rural (OMITTED)	---	---
Urban	1.33	.99
Suburban	.94	1.53
Constant	.02**	.00**
N	7,130	6,856

All models employ sample weights.

*.05

**.01.

TABLE 3

Adjusted odds ratios from logistic regression models of high school graduation

	Model 1		Model 2		Model 3		Model 4	
	OR	***d***	***OR***	***d***	***OR***	***d***	***OR***	***d***
One Move	.37**	.20	.52**	.29	.52**	.29	.52**	.29
≥2 Moves	.31**	.17	.39**	.22	.40**	.22	.42**	.23
Age			1.14**	.63	1.15**	.64	1.11*	.61
Male			.79*	.44	.77*	.43	.78*	.43
Picture Vocabulary Test (z-score)			1.77**	.98	1.79**	.99	1.77**	.98
Ever Suspended from School			.37**	.20	.39**	.22	.38**	.21
Immigrant			1.41		1.38		1.42	
White (OMITTED)			---		---		---	
Black			1.76**	.97	1.66**	.92	1.82**	1.01
Hispanic			1.15		1.17		1.16	
Asian			1.86*	1.03	1.74		1.93*	1.07
“Other”			1.66		1.57		1.67	
Native American			2.50*	1.38	2.42*	1.34	2.56*	1.41
Parents Married			.96		.95		.95	
Divorce or Other Family Change			.81		.80		.81	
Number of Siblings			1.12**	.62	1.11*	.61	1.12**	.62
Public Assistance			.70*	.39	.70*	.39	.69*	.38
Housing Subsidy			.92		.90		.88	
Parent Education - Less than High School (OMITTED)			---		---		---	
Parent Education - High School Graduate			1.86**	1.03	1.89**	1.04	1.87**	1.03
Parent Education - Some College			2.19**	1.21	2.27**	1.25	2.23**	1.23
Parent Education - College			3.39**	1.87	3.46**	1.91	3.35**	1.85
Parent Education - More than College			4.67**	2.58	4.67**	2.58	4.68**	2.59
Peer Substance Use (Wave 1)			.85**	.47	.90**	.50	.85**	.47
Private School (Wave 1)			1.78		1.75		1.86	
Neighborhood Disorder (Parent Report; z-score)			.84**	.46	.84**	.46	.85**	.47
Collective Efficacy (Student Report; z-score)			.97		.99		.98	
Neighborhood Risk (Census; z-score)			.97		.96		.97	
Neighborhood Mobility (Census; z-score)			.92		.92		.93	

	Model 1		Model 2		Model 3		Model 4	
	OR	***d***	***OR***	***d***	***OR***	***d***	***OR***	***d***
Rural (OMITTED)			---		---		---	
Urban			.93		.94		.97	
Suburban			.95		.98		.99	
Peer Substance Use (Wave 2)					.89**	.49		
School Change							.61**	.34
Constant	6.12		.99		1.07		1.65	

N=7,285.

OR = Odds Ratio. d = Cohen's d presented for significant effects

All models employ sample weights.

*.05

**.01.

TABLE 4

Adjusted odds ratios from logistic regression models of high school graduation

	Model 1		Model 2		Model 3		Model 4	
	OR	***d***	***OR***	***d***	***OR***	***d***	***OR***	***d***
Move to Same-Risk Neighborhood	.36**	.20	.53**	.29	.54**	.30	.53**	.29
Move to Lower-Risk Neighborhood	.42**	.23	.48*	.27	.49*	.27	.52*	.29
Move to Higher-Risk Neighborhood	.27**	0.15	.34**	.19	.35**	.19	.36**	.20
Age			1.13**	.62	1.15**	.64	1.11*	.61
Male			.79*	.44	.77*	.43	.78*	.43
Picture Vocabulary Test (z-score)			1.78**	.98	1.79**	.99	1.77**	.98
Ever Suspended from School			.37**	.20	.39**	.22	.37**	.20
Immigrant			1.40		1.35		1.41	
White (OMITTED)			---		---		---	
Black			1.73**	.96	1.62*	.90	1.77**	.98
Hispanic			1.15		1.16		1.15	
Asian			1.88*	1.04	1.76		1.95	
“Other”			1.65		1.56		1.65	
Native American			2.41*	1.33	2.31*	1.28	2.47*	1.36
Parents Married			.97		.94		.95	
Divorce or Other Family Change			.80		.79		.81	
Number of Siblings			1.12**	.62	1.11*	.61	1.12**	.62
Public Assistance			.70*	.39	.69*	.38	.69*	.38
Housing Subsidy			.92		.90		.88	
Parent Education - Less than High School (OMITTED)			---		---		---	
Parent Education - High School Graduate			1.87**	1.03	1.90**	1.05	1.88**	1.04
Parent Education - Some College			2.19**	1.21	2.28**	1.26	2.24**	1.24
Parent Education - College			3.44**	1.90	3.53**	1.95	3.41**	1.88
Parent Education - More than College			4.76**	2.63	4.81**	2.66	4.78**	2.64
Peer Substance Use (Wave 1)			.85**	.47	.90**	.50	.85**	.47
Private School			1.80		1.78		1.88	
Neighborhood Disorder (Parent Report; z-score)			.84**	.46	.84**	.46	.84**	.46
Collective Efficacy (Student Report; z-score)			.97		.98		.98	
Neighborhood Mobility (Census; z-score)			.92		.92		.93	

	Model 1		Model 2		Model 3		Model 4	
	OR	***d***	***OR***	***d***	***OR***	***d***	***OR***	***d***
Rural (OMITTED)			---		---		---	
Urban			.94		.96		.98	
Suburban			.96		.99		1.00	
Peer Substance Use (Wave 2)					.89**	.49		
School Change							.61**	.34
Constant	6.12**		.99		1.06		1.63	

N=7,285 for all models.

OR = Odds Ratio. d = Cohen's d presented for significant effects

*.05

**.01.