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Contents lists available at ScienceDirect

## Social Science Research

journal homepage: [www.elsevier.com/locate/ssresearch](http://www.elsevier.com/locate/ssresearch)

## Coming and going: Explaining the effects of residential and school mobility on adolescent delinquency

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### ARTICLE INFO

#### Article history:

Available online 4 September 2009

#### Keywords:

Mobility  
Delinquency  
Substance use  
Adolescence  
Random effects

### ABSTRACT

Over the past half century, a large body of theoretical and empirical work in sociology and other social sciences has emphasized the negative consequences of mobility for human development in general, and youth outcomes in particular. In criminology, decades of research have documented a link between residential mobility and crime at both the macro and micro levels. At the micro level, mobility is associated with delinquency, substance use, and other deviant behaviors among adolescents. However, it is possible that the relationship between mobility and delinquency may be due to selection on pre-existing differences between mobile and non-mobile youth in their propensity for delinquency, and prior studies have not adequately addressed this issue. Specifically, the families that are most likely to move are also the most disadvantaged and may be characterized by dynamics and processes that are conducive to the development of delinquency and problem behavior in their children. This study uses data from the National Longitudinal Survey of Youth 1997 to assess the impact of residential and school mobility between the ages of 12 and 17 on delinquency and substance use. Random effects models control for selection on both observed and unobserved differences. Results show that mobility and delinquency are indeed spuriously related. Implications for future research on mobility and outcomes are discussed.

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Residential mobility and its consequences for human development have captured the attention of social scientists for more than a half century. However, opinions have cycled about whether residential mobility has positive or negative implications for the life course. While residential mobility had been historically considered a natural consequence of social mobility and increased economic opportunity (Kopf, 1977), by the early 20th century, mobility was seen as indicative of a character flaw—the inability to maintain social relationships in one's community. Research on social ecology in Chicago prompted concerns that residential transience was contributing to problems of urban decay, as studies noted associations between residential mobility and mental hospital admissions, juvenile delinquency, and crime in city neighborhoods (Faris and Dunham, 1939; Henry and Short, 1954; Shaw and McKay, 1942). With government funding aimed at “curing mobility”, Peter Rossi carried out a groundbreaking study in Philadelphia that overturned that common belief that mobile families are “pathological” and suggested that families move instead because of changing needs at different points in the life cycle, which lead to a need for “housing adjustment” (Rossi, 1955). Rossi showed that people moved to bigger homes and better neighborhoods as part of the broad pattern of upward economic mobility in the post World War II era. This was consistent with

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Blau and Duncan's (1967) idea that a dimension of social mobility is social "motility": residential mobility can be seen as a status attainment strategy on the part of parents to enhance their life chances and those of their children by acquiring better housing and social contexts such as communities and schools.

However, as Hagan et al. (1996) note, the structural and cultural changes that accompanied the 1970s ushered in a renewed concern about the *harmful* effects of moving—especially for children. While earlier work suggested that moves reflected moving "up" the socioeconomic ladder, demographic research on family transitions began to show that mobility rates are also higher among children of divorced families or stepfamilies (McLanahan and Sandefur, 1994; Speare et al., 1975) and scholars began to widely document the effects of family instability and divorce on the outcomes of children (Amato, 2000; Morrison and Coiro, 1999; Wu, 1996; Wu and Martinson, 1993). Around the same time, in his seminal paper on social capital theory, Coleman (1988b) suggested that geographic mobility was a strong predictor of high school dropout because moving broke the ties that provided intergenerational closure. Parallel developments in criminology during those years had also been documenting links between residential mobility and crime and delinquency at the individual and community levels (Crutchfield et al., 1982). Unsurprisingly, these compelling research traditions led to an explosion of empirical work on residential mobility and child and youth outcomes from the late 1980s through the present. Most of the attention has focused on how moving affects important aspects of youth development, especially problem behaviors like high school dropout, delinquency, drug use, suicide, violence, and social adjustment. Almost all of this work shows negative associations between residential mobility and youth outcomes (Adam and Chase-Lansdale, 2002; Astone and McLanahan, 1994; DeWit, 1998; Haynie and South, 2005; Hoffmann and Johnson, 1998; Wood et al., 1993).

However, most of this research has also been limited in several ways. First, most studies have only measured the consequences of residential mobility and not also the consequences of *school* changes that may occur when a family moves (or school changes that may occur independent of a residential change). It is possible that school changes are more closely related to changes in adolescent behavior than moving houses, given that youth have to adjust to new teachers, peers and curricular expectations, all of which are likely to affect an adolescent's emotional, social, and cognitive worlds (Kerbow, 1996; Rumberger and Larson, 1998). Second, most research has worked under the assumption that mobility is uniformly *bad* for young people, and has rarely considered whether it is not moving (or switching schools) per se that leads to negative educational or behavioral outcomes, but rather the *underlying reasons why the mobility occurred in the first place*.

This second limitation is the most serious because it calls into question the theoretical and empirical consensus in the literature that mobility is harmful to youth. Since youth do not move randomly, there may be important differences between mobile and non-mobile youth which account for the observed relationship between mobility and academic and behavioral outcomes. In other words, youth who move frequently come from families who are different from the families of non-mobile youth, and those underlying differences might explain the deleterious effects of mobility commonly found in the literature. For example, the motivations for moving, such as divorce, job change, or eviction, might represent family dynamics that are important for youth development. These might include the quality of parental relationships, caregiver mental health, families' ability to manage resources, or other characteristics related to family stability. Whether adolescents transition successfully into a new neighborhood or school depends in part on their relationships with parents and other family transitions (Crowder and Teachman, 2004; Hagan et al., 1996).

Therefore, youth who move may already be performing worse academically, less involved in school activities, at a higher risk of dropping out, and more involved in a variety of delinquent and problem behaviors. In fact, delinquency may even be a cause rather than a consequence of school mobility, as schools use zero tolerance policies to "push out" students with a history of suspensions and disciplinary problems. In these cases, any observed relationship between mobility and delinquency may be spurious rather than the causal effect of moving. We believe that prior research has not done an adequate job of examining whether mobile youth are selected into both mobility and problem behaviors. We are not the first, however, to raise the possibility that important selection effects may be driving the association between mobility and youth outcomes. Astone and McLanahan (1994) note that residential mobility may be a proxy for unobserved variables, such as personal instability, which may account for the observed association of mobility with educational outcomes. Priresh and Downey (1999) found that preexisting differences accounted for 90% of the difference in test scores between movers and non-movers. From this, they conclude that "Movers perform less well in school than non-movers in large part because the *kinds of families* that tend to move are also likely to have other disadvantages" (531).

In this paper, we examine the relationship between residential and school mobility and youth outcomes that have received a great deal of attention in the criminology and life course literature: delinquent behaviors and substance use. Using seven waves from the National Longitudinal Survey of Youth 1997 (NLSY97), we examine whether residential and school mobility have criminogenic effects, or whether both mobility and delinquency are related to unobserved pre-move differences in family and individual risk factors. We accomplish this in two ways. First, we include a wide array of controls designed to capture preexisting demographic, academic, and behavioral differences between mobile and non-mobile youth that might also be related to delinquency and problem behavior. Second, recognizing that the family dynamics and processes or personal characteristics that might lead to mobility and delinquency are difficult or impossible to measure, we employ panel data models that control for unmeasured selectivity. We believe that this strategy represents a more rigorous attempt to adjudicate between causal and selection hypotheses about the effects of mobility than we have seen in previous work.

Understanding whether residential mobility or family and individual differences triggers adolescent delinquency is significant. On the one hand, parents often decide to move in an effort to improve family conditions, especially if a job opportunity arises. However, if such mobility leads to significant problem behavior in their children, parents might want to

reconsider such moves. On the other hand, many parents are hesitant to relocate their children precisely because they think it will be traumatic or harmful to educational performance (DeLuca and Rosenblatt, 2010). However, children's educational needs are sometimes better served in another community, especially in the case of special education referral or gifted programs. Likewise, recent initiatives to relocate poor families from urban ghettos are premised on the idea that moving to safer neighborhoods relieves family stress, reduces the exposure of adolescents to violence, and even improves youth development through access to higher quality schools and positive adult role models (Ainsworth, 2006; Clampet-Lundquist et al., 2006; Sanbonmatsu et al., 2006). If residential mobility does not have negative effects on youth behaviors, then such moves to improved contexts might benefit youth in the long run.

## 1. Previous research

While national mobility rates have declined over the last half century (Fischer, 2002), residential mobility is still a common experience for families in the United States, with yearly mobility rates ranging from 14% to 20% over the last 10 years (Schachter, 2004). Changes in family composition, such as marriage, divorce, and remarriage lead to some of these moves. In addition, as companies relocate offices and expand, upper middle-class parents are forced to move every few years just to keep their jobs (Kilborn, 2005). These families also respond to changes in housing costs and a concern for school quality—two additional factors that might lead to more moving. Research suggests that at least some of these factors are putting youth on the move—by the time children are 12 years old, 80% will have moved at least once, while almost 40% will have moved four or more times (Long, 1992). Residential mobility is often accompanied by school change and is the most common cause for school mobility. Over 30% of elementary school students make more than one school change between 1st and 8th grade (Smith, 1995), and more than 25% of students make a non-promotional school change between grades 8 and 12 (Rumberger and Larson, 1998). Seventy-three percent of poor minority children change schools at least once in elementary grades and 20% change schools three or more times (Temple and Reynolds, 1999).

As Stokols and Shumaker (1982) point out, “moving, per se, is not necessarily bad for people or places, and staying is not necessarily good” (2). However, considerable interdisciplinary research, spanning psychology to criminology, has suggested that such moves are detrimental to individual youth outcomes, such as educational performance and social behavior (Haveman et al., 1991; Wood et al., 1993).<sup>1</sup> Scholars have found that mobility, especially when linked to school changes, reduces educational performance and hinders developmental outcomes, such as social functioning, on time age-grade progression, academic achievement test scores and high school dropout (Adam and Chase-Lansdale, 2002; Astone and McLanahan, 1994; Hagan et al., 1996; Haveman et al., 1991; Ingersoll et al., 1989; Pribesh and Downey, 1999; Straits, 1987; Temple and Reynolds, 1999; Tucker et al., 1998; Wood et al., 1993). It is theorized that breaking social ties and disrupting the home environment creates psychological stress for adolescents and deprives both families and young people of the resources that established social connections bring (Hagan et al., 1996; Kroger, 1980). Research on mental health and developmental psychology has long emphasized how residential mobility is associated with negative adjustment, depression and even suicide, in part because of the stress induced by broken attachments (Wood et al., 1993). In short, previous work points to moving as a significant negative event in the lives of young people.

The importance of residential mobility for outcomes is also pronounced in the field of sociological criminology, where there is a long history of research linking residential mobility to delinquent and criminal behavior. At the macro level, early social ecological research in Chicago showed that residential transience was associated with juvenile delinquency and crime in city neighborhoods (Henry and Short, 1954; Shaw and McKay, 1942). Subsequent work continued to focus on the relationship between residential mobility and crime rates in communities or other social units (Crutchfield et al., 1982; Sampson and Groves, 1989; Sampson et al., 1997). For example, empirical tests of social disorganization theory have suggested that residential turnover makes areas less safe for families and children because transient populations exhibit less social control and collective efficacy (Sampson et al., 1997).

Research also documents a link between residential mobility and delinquency at the individual level. For example, in their classic study of 500 delinquents and 500 non-delinquents, Glueck and Glueck (1950) found that delinquents tended to move more frequently than non-delinquents. They also found that delinquents tended to change schools more frequently than non-delinquents, a finding which they partially attributed to the delinquents' higher rates of residential mobility. Re-analyzing the Gluecks' data over four decades later, Sampson and Laub (1993) found that childhood residential mobility led to theft and property crimes during adolescence by eroding the social bonds to family and school that inhibit antisocial behavior.

Several contemporary longitudinal studies of delinquent behavior have also connected residential mobility to delinquency, drug use and other deviant behaviors. Using data from the Rochester Youth Development Study, Smith et al. (1995) identified residential mobility one of a set of nine family-related risk factors for delinquency and drug use. Additional research shows that moving also appears to place teens at greater risk for drug use (DeWit, 1998; Hoffmann and Johnson, 1998), as well as early sexual debut (Stack, 1994) and violent behavior (Haynie and South, 2005).

<sup>1</sup> Exceptions to this rule include recent research on unique or experimental housing programs where low income families from public housing projects are given a chance to move to more advantaged and less segregated communities through housing counseling and Housing Choice Vouchers (see Rubinowitz and Rosenbaum, 2000; DeLuca et al., forthcoming; Orr et al., 2003). We will return to a discussion of these programs in the conclusion.

## 2. Theoretical framework

### 2.1. Mobility as a cause of delinquency

Major criminological theories implicate mobility in the etiology of delinquency. According to general strain theory (Agnew, 1992) three general types of strain lead to delinquency: the failure (actual or anticipated) to achieve positively valued goals, the removal (actual or anticipated) of positively valued stimuli, and the presentation (actual or anticipated) of negatively valued stimuli. Strain engenders delinquency as a way of achieving goals or removing negative stimuli. A major goal of most adolescents is autonomy from parents and other adults (Agnew, 1997; Greenberg, 1977; Moffitt, 1993, 1997). Since teenagers usually do not have a say in the decision to relocate, mobile adolescents may turn to delinquency and other adult-like activities (e.g., smoking cigarettes, drinking alcohol) as a means of achieving their goal of autonomy.

Another potential source of strain for mobile adolescents is bullying and peer victimization. Research on bullying shows that victims tend to be unpopular and lonely (Farrington, 1993; Olweus, 1978), and such characteristics also describe mobile adolescents. There is a fine line between bullies and victims (Ma, 2001), and higher rates of victimization, or even the perception of possible victimization, might lead mobile adolescents to engage in delinquency to prevent the stress induced by such harassment or harm (Clampet-Lundquist et al., 2006). Furthermore, bullying may lead to problems at school, including poor grades, poor attendance, and avoidance of school—any of which may lead to additional strain and delinquency (Juvonen et al., 2000; Kochenderfer and Ladd, 1996).

Finally, school change, whether or not it accompanies a change of residences, may be a source of strain. Changing schools is a stressful process, and may result in lost classroom time, which may make it more difficult for mobile adolescents to catch up academically. Furthermore, when mobile adolescents arrive at their new schools, they must adjust to the new academic and social landscapes and forge new relationships with teachers.

Social control theory (Hirschi, 1969) also predicts that mobility increases the likelihood of delinquency. According to social control theory, weak bonds to the institutions of conventional society increase the likelihood of delinquency. These bonds take the form of attachment to and involvement with family and school, commitment to education, and belief in school rules. When an adolescent's bonds to society are weak or absent, involvement in antisocial behavior is more tempting because an adolescent has less to lose, believing that he will not be sanctioned. Parental preoccupations and demands associated with moving (e.g., settling into a new home and new job) may attenuate the bonds of youths to their parents, decrease parental supervision, and reduce parent-child contact, at least in the short-term (Sampson and Laub, 1993). Weakened bonds to parents in turn may prompt some adolescents to turn to deviant peers for recognition and approval. Social control theory parallels the social capital explanation (Coleman, 1988a) for the negative effects of mobility, in which mobility leads to negative outcomes because it severs the social relations that bind parents and other adults to children.

School change may also detract from attachment to school. Recently-mobile youth may be less connected to school than their non-mobile peers. In the wake of a school change, an adolescent must adjust to his or her new school setting, including a new curriculum and a different set of academic expectations. For example, mobile adolescents tend to be less involved in extracurricular activities than non-mobile adolescents (Pribesh and Downey, 1999), which may lead to weak academic performance, lowered educational aspirations, and less commitment to and satisfaction with school. If changing schools reduces school engagement, mobile adolescents will be more likely to participate in delinquent behavior because they are less strongly bonded to school and have little to lose from being delinquent.

### 2.2. Mobility and delinquency are caused by the same factors

Whereas strain and social control theory posit a causal relationship between mobility and delinquency, some criminological theories also suggest that youth are selected into both on the basis of underlying family dynamics and processes. In their General Theory of Crime, Gottfredson and Hirschi (1990) argue that all crime can be explained by an individual trait of low self-control. Individuals with low self-control tend to be impulsive and have trouble delaying gratification; as such they are unable to resist committing a crime when the opportunity presents itself. According to Gottfredson and Hirschi, the primary cause of low self-control is ineffective child-rearing. The family resources and processes that lead to residential mobility might also lead to ineffective child-rearing and the development of low self-control. The reasons why families move vary considerably. They may relocate for a new job, or to find better quality housing. Some moves are more involuntary; low income families might be evicted or asked to leave by other family members if they are sharing residences (Stack, 1974). Volatility in family structure or parental income can lead to moves, but may also reflect underlying instability in family dynamics, routines and psychological resources of parents. All of these processes may make it difficult for parents to recognize deviant behavior in their children and to discipline their children, and such children are likely to be lacking in self-control. Therefore, adolescents are selected into both moving and delinquency based on family resources and processes. From this perspective, family dynamics during early childhood—not residential mobility during adolescence—is the key factor in the etiology of criminal behavior.

Gottfredson and Hirschi (1990) also hypothesize a spurious relationship between school mobility and delinquency. They suggest that schools are unlikely to make up for deficits in family socialization by teaching children self-control. Individuals with low self-control are likely to perform poorly in school and to dislike school. They are also likely to engage in delinquency and a variety of other antisocial behaviors, including truancy, drug use, and early sexual activity. As a result of their poor school

performance and problem behavior, individuals with low self-control may find themselves the target of disciplinary policies at school, and may be expelled or even forced to transfer to an alternative school. In addition, schools frequently use administrative procedures such as age cut-offs, grade point average minimums, and attendance regulations to “push out” students with a history of academic and behavioral problems (Elliott and Voss, 1974; Gottfredson and Gottfredson, 1985; Jackson, 1983; Mann, 1987; Riehl, 1999). Transferring to a new school is unlikely to increase an individual's level of self-control, and such individuals are likely to continue to offend. From this perspective, school mobility is unlikely to change an individual's propensity for delinquency and crime, and may even be a consequence rather than a cause of delinquency. Therefore, it may be that early risk factors are more important than residential and school mobility in the etiology of delinquency.

### 3. Data source and variables

To examine the issue of whether mobility leads to adolescent delinquency and substance use, we use seven waves of data from the National Longitudinal Survey of Youth 1997 (NLSY97), sponsored by the US Bureau of Labor Statistics. The NLSY97 is a nationally representative longitudinal survey of youth who were 12–16 years old as of December 31, 1996. The NLSY97 is designed to document the transition from school to work and into adulthood. The NLSY97 sample is composed of two independent probability samples: (1) a cross-sectional sample of 6748 youths who are representative of the noninstitutionalized population of youths in the US, and (2) an oversample of 2236 black and Hispanic youths (for a sample total of 8984). Follow-up interviews are conducted annually. Over 86% (86.3% or 7755) of the original round 1 respondents also participated in round 7 (2003).

The NLSY97 offers several advantages over other data used to study mobility and behavioral outcomes. Beginning in round 2 (1998), the youth questionnaire collects retrospective information on each residential move to a different city, county, or state since the last interview, including the month of each move. The schooling section also queries respondents on each school that they attended since the last interview, including the start and stop dates of enrollment. Unlike most prior studies, which are limited by the fact that mobility is measured for only one wave in the study, the NLSY97 makes it possible to construct complete month-by-month residential school mobility histories through the last round in which a respondent was interviewed. Second, mobile youth are difficult to follow and are likely to be underrepresented in most studies. These groups are more likely to be included in the NLSY97 because it collects retrospective information on residential and school moves since the last interview at each round and updates event histories with this information (Pierret et al., 2007). This provides more complete information on mobility for respondents who drop out of the survey, provided that they return in a subsequent round. Finally, the supplemental sample of black and Hispanic youth means that groups that have higher rates of mobility are more likely to be included in the study.

#### 3.1. Dependent variables

##### 3.1.1. Delinquency and substance use

The Department of Justice, Office of Juvenile Justice and Delinquency, sponsors a set of questions within the NLSY97 that focus on criminal activity asked at every round (Center for Human Resource Research, 2007). These items are part of the *self-administered* portion of the Youth Questionnaire (Self-Administered Questionnaire, or SAQ). During this part of the interview, a respondent uses an audio computer-assisted self-interview (ACASI). The youth has the option of listening to the questions with earphones or turning off the audio and reading the questions from the computer screen. The use of the SAQ for sensitive items decreased interviewer error and increased response rates to sensitive questions (Zagorsky and Gardecki, 1998).

The NLSY97 items were modified from items used to measure delinquency and criminality in the National Youth Survey (Center for Human Resource Research, 2007: Appendix 9). Respondents were asked annually about their involvement since the last interview in six types of delinquent offenses: (1) theft of something worth less than \$50, (2) theft of something worth more than \$50, (3) vandalism, (4) selling and receiving stolen property, (5) aggravated assault, and (6) selling drugs. Using this information, we created a dichotomous measure indicating whether a youth was involved in any delinquency in each year. This measure is coded 1 if a respondent committed any delinquency since the last interview and 0 if they committed no delinquency since the last interview. Using this measure allows us to assess whether mobility leads to a change in delinquency (from no delinquency to any delinquency or vice versa) in the same year.<sup>2</sup>

The SAQ also collects information on respondents' use of licit and illicit substances. These questions were modified from questions in the National Survey of Family and Households (NSFH-2) (Center for Human Resources Research, 2003: Appendix 9). Youth are asked annually about their use of the following three substances: (1) tobacco, (2) alcohol, and (3) marijuana.<sup>3</sup> We constructed a dichotomous measure analogous to our delinquency measure indicating whether a respondent

<sup>2</sup> Another possibility would be to use the frequency of delinquency. However, we believe that the any delinquency versus no delinquency is the more theoretically meaningful distinction since we are testing whether mobility leads youth to participate in delinquency. The process causing youth who are already involved in delinquency to increase their delinquency is likely different. To examine this possibility, we ran a series of negative binomial regression models (including random effects) predicting the frequency of delinquency. Our results were unchanged. Results are available from the authors upon request.

<sup>3</sup> In addition to tobacco, alcohol, and marijuana, the NLSY97 also asks respondents about their use of hard drugs, including cocaine. However, for reasons unknown to us, this information was not collected in round 1 (1997), and the round 2 (1998) question refers to having ever used these drugs as opposed to use in the last year. For this reason, hard drug use is not included in the measure.

used any of the substances since the last interview (1 for yes, 0 for no). Again, the purpose of this measure is to indicate whether moving or changing schools is associated with the initiation or termination of substance use.

### 3.2. Independent variables

#### 3.2.1. Residential mobility

Beginning in round 2 (1998), the Youth History section of the Youth Questionnaire began collecting retrospective information on each move to a different city, county, or state since the last interview, including the precise month and year of each residential move.<sup>4</sup> We used this information to create a month-by-month residential mobility history for each respondent in the NLSY97. From these histories we constructed dummy variables for each round equal to 1 if a respondent experienced residential mobility since the last interview and equal to 0 if there was no residential mobility since the last interview.<sup>5</sup>

#### 3.2.2. School mobility

Most prior studies of mobility and problem behaviors have not considered that the observed negative effects of residential mobility may be primarily due to a change of schools. As suggested by Swanson and Schneider (1999), we use both residential and school mobility measures to account for the fact that youth do not always change schools because of neighborhood change. Beginning in the round 2 (1998), respondents are asked about every school that they attended since the last time they were interviewed. For each school, the survey collects information about the monthly start and stop dates of attendance and the type of school (e.g., elementary, middle, or high school), therefore providing complete schooling trajectories for the NLSY97 youth. From these trajectories, we can identify each time a school change occurred that was not the result of a promotion.<sup>6</sup> In our statistical models, residential and school mobility are used to predict delinquency and substance use in the same survey year. Because both the time-dependent residential and school mobility covariates are coded 1 only in the year in which they occur, they capture the contemporaneous or short-term effects of these events on delinquency and substance use (i.e., over the course of one year).

#### 3.2.3. Control variables

The kinds of students who experience residential or school mobility are not a random collection of youth. Rather, the characteristics of youth and their families that predict mobility are also likely to predict delinquency and criminal behavior. It is this selection effect with which we are most concerned. Although we use panel data models to control for unobserved heterogeneity, we adjust for as many background variables as we can that prior research has shown are related to mobility, delinquency, or both. Because our main focus is on unobserved selection factors, however, we assume that these variables might reduce, but not eliminate, the effects of mobility on delinquency. We include controls for demographic background, including gender, age, race/ethnicity, household income, and parental education, all measured in round 1 (1997), before our first measures of residential and school mobility.<sup>7</sup> We also include time-varying controls for family structure, household size, urbanicity, and the unemployment rate in the county of residence, (1 < 3.0%; 2 = 3.0–5.9%; 3 = 6.0–8.9%; 4 = 9.0–11.9%; 5 = 12.0–14.9%; 6 = 15.0%+) measured at every round of data collection. Time-varying control variables are lagged one year behind the measures of residential and school mobility, ensuring that any reduction in the association of mobility and delinquency or substance when these variables are included use is due to confounding rather than mediation.

Because many mobile youth, particularly those who change schools, may already be operating with a number of school-related risk factors for delinquency and problem behavior, we include controls for academic performance and school experiences. These include: a summary percentile score for four key subjects (Mathematical Knowledge, Arithmetic Reasoning, Word Knowledge, and Paragraph Comprehension) on the computer-adaptive form of the Armed Services Vocational Aptitude Battery (CAT-ASVAB) which was administered to most respondents at round 1; self-reports of the respon-

<sup>4</sup> Since our measure of residential mobility only counts moves to a different city, county, or state, one possible concern is that we may underestimate the extent of mobility by not including shorter distance moves *within* the same city, county, or state. The NLSY97 also includes a question on whether the respondent lived at more than one address since the last interview. We reran all of our models using this alternative measure of residential mobility, and although this resulted in a larger number of mobile youth, the findings on the effects of mobility were unchanged. However, we chose to present only the results from models using the measure of longer distance moves because we believe that such a measure provides stronger support for the finding that mobility does not lead to delinquency. When compared to shorter distance moves, moves to a different city, county, or state are more likely to be stressful for youth and their parents, sever social ties, and result in a change of schools. We would therefore expect stronger effects of longer distance moves on delinquent behavior.

<sup>5</sup> Another possible measure of mobility is the frequency of moves since the last interview. Since very few respondents reported more than one residential move or school change from one round to the next, we opted to use dichotomous measures instead.

<sup>6</sup> The schooling section of the NLSY97 also collects information on respondents' reasons for changing schools. The effect of school mobility is likely to depend on the reason for leaving. Such reasons are an important source of population heterogeneity. Unfortunately, there is a large amount of missing data on the reasons for leaving, and these data are not missing randomly. Therefore, we decided not to include these reasons in our analyses.

<sup>7</sup> There is some ambiguity surrounding the nature of the relationship between socioeconomic status (SES) and delinquency. Early studies based on official police records showed that social class was inversely related to arrest and police contact (Braithwaite, 1981; Tracy, 1990). Early self-report studies, however, told a somewhat different story, namely, that there was a weak or non-existent relationship between social class and delinquency (Tittle et al., 1978). More recent studies (Elliott and Ageton, 1980; Elliott and Huizinga, 1983) suggest that social class is unrelated to minor delinquency but that lower class youth commit a disproportionate share of serious delinquency. In the NLSY97, we have found that social class is inversely related to both residential and school mobility. However, SES was unrelated to delinquency but positive associated with substance use. The latter is not surprising, given that the items included in the substance use measure are relative minor (e.g., smoking, drinking, using pot). Nevertheless, because mobile youth come from more disadvantaged family backgrounds, and because our primary goal is to address selection, we air on the side of caution and control for SES.

dents' grades in middle school on an eight-point scale (1 = mostly below Ds, 2 = mostly Ds, 3 = half Ds/half Cs, 4 = mostly Cs, 5 = half Cs/half Bs, 6 = mostly Bs, 7 = half Bs/half As, 8 = mostly As); and academic track in high school measured for each round in high school and coded 0 for those not enrolled (i.e., dropouts and graduates). We also include a measure of the respondents' grade in school at each round relative to peers of his or her same age as a proxy for grade retention. A dummy variable indicating whether a respondent has been the victim of repeated bullying by age 12 was also included, in addition to school-level controls for school size (1 < 100, 2 = 100–299, 3 = 300–499, 4 = 500–749, 5 = 750–999, 6 = 1,000+) and student/teacher ratio, as school size and resources are related to delinquency (Gottfredson and Gottfredson, 1985; Hellman and Beaton, 1986).

We also control for a number of variables to account for differences in the propensity for delinquency. Specifically, we include a variable measuring the number of years since a respondent first reported having sexual intercourse. Previous research has established that delinquency often occurs in conjunction with other problem behaviors, including early sexual intercourse (Donovan and Jessor, 1985; Mott and Haurin, 1988), and such a measure may be a proxy for delinquent propensities. We also included lagged measures of delinquent offending and substance use to address the possibility that mobile youth may already be involved in these behaviors before moving. Finally, we controlled for the number of weeks that have elapsed since a respondent's last interview. There is considerable variability in the dates of NLSY97 interviews. It is necessarily the case that the probability of delinquent offending increases as time elapses. Since respondents who are mobile or involved in the juvenile justice system may be more difficult to follow up, it is important to include such a control. Our models also include controls for region of residence, birth cohort, and survey year. All analyses are weighted to ensure national representativeness.<sup>8</sup>

### 3.3. Sample size and missing data

Not all of the 8984 NLSY97 respondents are used in this study. We arranged data from five waves of the NLSY97 into a person-year format, where the unit of analysis is a respondent in a particular survey year. We then lagged the time-varying control variables (including the lagged dependent variables) one wave behind the measures of residential mobility, school mobility, delinquency, and substance use. Use of lagged variables resulted in the loss of one wave of data for each respondent. In an effort to maximize sample size, we used separate samples for delinquency and substance use. We deleted any record that had missing data on the outcome of interest. We applied two further restrictions to the sample. First, we deleted any observations for respondents who were older than age 17 or when they reached age 17, because most adolescents graduate or drop out of high school by age 18 and would not be expected to experience school mobility at or beyond this age. In addition, any residential mobility that is observed beyond at age 18 or older may not be due to parents' decision to move but rather to moving away to college, living on one's own, or moving in with a romantic partner. We would not necessarily expect this type of mobility to increase criminal behavior or substance use, and there is unfortunately no clear way in the NLSY97 to determine the circumstances surrounding each move. Second, we deleted all of the observations for a respondent if he or she did not have at least two observations available. We did this because the random effects models we used require at least two records per individual. The final delinquency sample consists of 4947 respondents, and the substance use sample consists of 4986. Each youth contributes between two and four person-year observations to the analysis. Since the majority of youth who were excluded from the sample were excluded because they were older than age 15 at round 1 rather than because of missing data on covariates, sample selection issues are not a major concern.<sup>9</sup>

We chose to handle missing data on the independent variables using multiple imputation techniques (Allison, 2002). Multiple imputation improves on conventional imputation methods by deliberately introducing random variation into the imputation process. Because software for performing multiple imputation with panel data or clustered data is not readily available and difficult to use, we used a method that takes into account the dependence among the multiple observations for each individual. While the data was still formatted so that there was only one record per individual, with distinct variables for measurements at different time points, we used all of the variables in the model as predictors to impute missing data on the other variables. In this way, an individual's value at one point in time is used to impute missing data for that individual at a later point in time. The dependent variables were used in the imputation process, although as we mentioned above, we did not impute them. Each missing value was imputed with five plausible values, producing five imputed data sets. These five data sets were then used to estimate our model five times—one for each imputed data set—and combined to produce the results. This involved averaging the coefficients and correcting the standard errors to account for the random variation introduced into the imputed values.

<sup>8</sup> SAS does not allow the calculation of design effects in random effects models. Since design effects were calculated based on the PSU in round 1 (1997), as respondents age, mobility will mix respondents from different geographic regions and reduce design effects in subsequent rounds. As this happens, the standard errors should approximate those that would be obtained from a random sample. Therefore, we believe that not correcting for design effects will not seriously bias the results, and that any resulting bias is least likely to affect the estimates of the effects of residential and school mobility.

<sup>9</sup> We conducted analyses to examine whether our analytic samples differed from the full NLSY97 sample, given that the most mobile youth might have dropped out between Wave 1 and any later waves. When comparing the two samples on twenty-one of the covariates used in the models, we found that there were almost no significant differences on mean values of the covariates. The samples had equivalent means on family income, parental education and the proportion of youth in two parent families, which reduces the concerns about attrition bias.

## 4. Research design and models

### 4.1. Rationale

After decades of empirical research by social scientists connecting residential mobility to criminal offending and other negative outcomes, it is in some way no surprise that these findings have gone relatively unquestioned. However, given our previous discussion, there is also good reason to reconsider the predominant assumption that mobility leads to delinquency. The rationale is both theoretical and empirical. Previous research in this area has been unable to rule out the possibility of selection effects that may render the relationship between mobility and delinquency spurious, in large part because it has not employed appropriate methodology. In a review of 30 of the most widely cited peer reviewed studies linking mobility and youth outcomes, we found none that attempted to account for the fact that unobserved between-youth differences might explain the relationship between mobility and behavioral outcomes, and only a few (Astone and McLanahan, 1994; Haynie and South, 2005; Pribesh and Downey, 1999) that mentioned that the possibility of such differences could account for the apparent causal effects they recovered in their results.<sup>10</sup>

While almost all of the studies used some form of multiple regression analysis and included controls for observed selection factors like family structure, socioeconomic status and academic performance (Alexander et al., 1996; Hagan et al., 1996; Hango, 2006; Rumberger and Larson, 1998), none attempted to adjust for omitted variables. In some cases, authors assumed that residential mobility was exogenous to youth outcomes and therefore, unobserved characteristics driving the relationship between youth outcomes and moving are not a threat to the findings (Haynie and South, 2005; South et al., 2005). In another case, the researchers used longitudinal data to protect against any ambiguity about the causal interpretation of the relationship between mobility and youth outcomes (Pribesh and Downey, 1999).<sup>11</sup> This strategy usually involves including a lagged measure of the dependent variable. On the one hand, it is reasonable to assume that adolescents do not cause a family's residential change. Under this assumption, a residential move can be considered an exogenous source of variation in youth behaviors. On the other hand, it is possible that the family dynamics (parenting styles, parents' relationships to each other, caregivers' mental health, emotional and financial resources) that led to the relocation in the first place are the driving force behind any negative associations between residential mobility and youth outcomes. It is also possible that when we observe school changes, these changes are actually the result of youth level characteristics—as is often the case in expulsions or transfers. In both cases, if we fail to account for all of these variables we could overstate the effect of residential or school changes or mistake the effect of family and youth level factors on problem behaviors for the effects of mobility.

### 4.2. Statistical models

In this study, we are testing whether mobility leads to delinquent behaviors or whether both mobility and delinquency are caused by the same factors (observed and unobserved). Because mobility and delinquency may be caused by many of the same factors, any observed relationships between the two may be spurious rather than reflect the causal effect of moving residence or changing schools. As mentioned above, prior studies that have examined this issue have relied on observational data and are generally unable to make causal inferences because the individuals observed were not randomly assigned to “treatment”, such as school, family or neighborhood contexts. Some of these important between group differences may be captured by including observed covariates, whereas other differences—such as parental motivations for moving or an underlying propensity to engage in delinquency—may be more difficult to measure. If these variables are omitted from the model and correlated with the included covariates, then the estimates of the effects of other variables will be biased. To remedy this problem, we estimate models that control for both observed as well as unobserved differences between mobile and non-mobile youth.

Concerns over omitted variable bias have led researchers to adopt random and fixed effects models for panel data. Random effects models and fixed effects models control for unobserved heterogeneity in slightly different ways. Random effects models make more restrictive assumptions than fixed effects models. In particular, they assume that the error term is normally distributed, making them more efficient to estimate than fixed effects models because one only has to estimate the standard deviation of the distribution. The random effects model also assumes that the independent variables are uncorrelated with the unobserved variables, an assumption that is highly problematic based on the likely nature of the omitted variables (i.e., that they are related to both mobility and delinquency). Because they rely on between-person variation, random effects models allow for the estimation of time-variant covariates, but they do not control for all stable individual differences. Fixed effects models relax some of these assumptions. In particular, they make no parametric assumptions about

<sup>10</sup> The authors compiled a list of articles from psychology, sociology, economics, education and policy studies from the late 1980s through 2007. While not exhaustive, the studies we reviewed were the ones most relevant to examining the effects of residential or school changes on youth behavioral outcomes and those published in peer reviewed journals. The list is available from the authors upon request.

<sup>11</sup> It is more common for studies of neighborhood effects to employ advanced methodological techniques to deal with the problem of families selecting into neighborhoods. These include instrumental variables approaches (cf. Crowder and Teachman, 2004; Foster and McLanahan, 1996), propensity score approaches (Harding, 2003), and siblings and fixed effects models (Aaronson, 1998). However, we did not see any similar approaches to handling “selection into moving”. One exception is a study by Pettit and McLanahan (2003), which used data from an experimental housing voucher program to explore whether moving affected parent and child social capital, using assignment to the experimental group as an instrument. Unfortunately, such research cannot pull apart the effects of the move to a low poverty neighborhood from the effects of the move itself.

the distribution of the unobserved heterogeneity, and individual-specific effects are allowed to be correlated with observed variables. For this reason, fixed effects models control for all unmeasured characteristics of individuals that are stable over time. Since fixed effects models rely only on the within-individual variation to estimate the coefficients, coefficients for variables that do not change over time (e.g., gender or race) cannot be estimated. A more technical discussion of these models can be found in Hsiao (2003) and Greene (2003).

In this study, we use a “hybrid” random effects model that combines the virtues of both fixed and random effects (Allison, 2005; Raudenbush and Bryk, 2002). The basic model can be written as follows:

$$y_{it} = \alpha_i + \gamma'Z_i + \beta'_1X_{it-1} + \beta'_2R_{it} + \beta'_3S_{it} + u_{it} \tag{1}$$

where  $\alpha_i$  is the intercept,  $Z_i$  is a vector of time-invariant characteristics associated with each individual (e.g., gender, race),  $X_{it-1}$  is a vector of time-varying individual characteristics (e.g., age) all measured at the previous wave,  $R_{it}$  is residential mobility status measured at the same wave,  $S_{it}$  is school mobility status measured at the same wave, and  $u_{it}$  is the error term. The error term can be decomposed into two parts:

$$u_{it} = \tau_i + \varepsilon_{it} \tag{2}$$

where  $\tau_i$  represents the individual-specific time-stable individual differences and  $\varepsilon_{it}$  represents individual- and time-varying random error term. The time invariant error term,  $\tau_i$ , is assumed to follow a normal distribution. The random error term,  $\varepsilon_{it}$ , is assumed to be uncorrelated with the predictors  $Z_i$ ,  $X_{it-1}$ , and  $\tau_i$ .

This last assumption of the random effects model is problematic, since it means that the model does not control for unmeasured stable individual differences. The hybrid approach decomposes the time-varying independent variables in the random effects model into two parts: one representing the between-person variation and one representing the within-person variation. The between-person component is simply the mean of the variable for each individual across time points or group mean and is expressed as follows:

$$\bar{X} = \frac{1}{T} \cdot \sum_{i=1}^T X_{it} \tag{3}$$

The within-person component is the difference between each individual's group mean and his or her variable value at each time point:

$$\Delta X_{it} = X_{it} - \bar{X}_i \tag{4}$$

These decomposed variables are then used as predictors in a random effects model. The hybrid model can be written as follows:

$$y_{it} = \alpha_i + \gamma'Z_i + \beta'_{b1}\bar{X}_i + \beta'_{w1}\Delta X_{it-1} + \beta'_{b2}\bar{R}_i + \beta'_{w2}\Delta R_{it} + \beta'_{b3}\bar{S}_i + \beta'_{w3}\Delta S_{it} + u_{it} \tag{5}$$

This approach has several advantages over traditional random effects or fixed effects estimation. First, it provides coefficient estimates for the between-person effects as well as for any measured time-invariant variables. Second, the decomposition ensures that the within-individual estimates are uncorrelated with the time-constant part of the error term, and the coefficient should be a consistent estimate of the within-individual relationship between mobility and delinquency. In other words, the within-individual estimates should be identical to those obtained in a fixed effects model. This method, however, cannot control for the effects of unmeasured variables that change over time.

Our main focus here is on the within-person coefficients for residential and school mobility. The between-person coefficients for time-varying covariates are confounded by average between-person differences in the outcomes. That is, they show us how mobile and non-mobile youth differ across all years in terms of delinquency and substance use. Mean differences between mobile and non-mobile youth in terms of delinquency do not lend themselves to causal interpretation, since they may be attributable to preexisting differences rather than to moving or changing schools. A positive and statistically significant between-person coefficient for mobility can be interpreted to mean that mobile youth are more likely to be involved in delinquency than non-mobile youth. The within-individual coefficient for mobility, on the other hand, shows how changes in mobility are associated with changes in delinquency. Because they rely only on the within-individual change, they cannot be confounded by preexisting differences. That is, any change in delinquency that follows a residential or school move cannot be due to preexisting differences. The within-person coefficients therefore approximate the causal effect of mobility on delinquency. A positive and significant within-person coefficient tells us that mobility leads to changes in delinquency, whereas a coefficient that is not significantly different from 0 indicates that mobility and delinquency are spuriously related. A formal test of the presence of unobserved person-specific effects can be obtained by calculating a Wald test for the difference between the mean and deviation coefficients. If the difference is statistically significant, it indicates that there is unobserved heterogeneity driving the relationship between mobility and problem behavior. Between-person effects can be calculated for all covariates, but within-person effects can only be calculated for time-varying covariates. Our main focus here is on the within-individual coefficients. For examples of this method used in the literature, see Osgood et al. (1996) and Paternoster et al. (2003).

We model the effects of residential and school mobility on prevalence of delinquency and substance use using random effects logistic regression models. Outcomes in 1998–2003 are predicted using measures of residential and school mobility

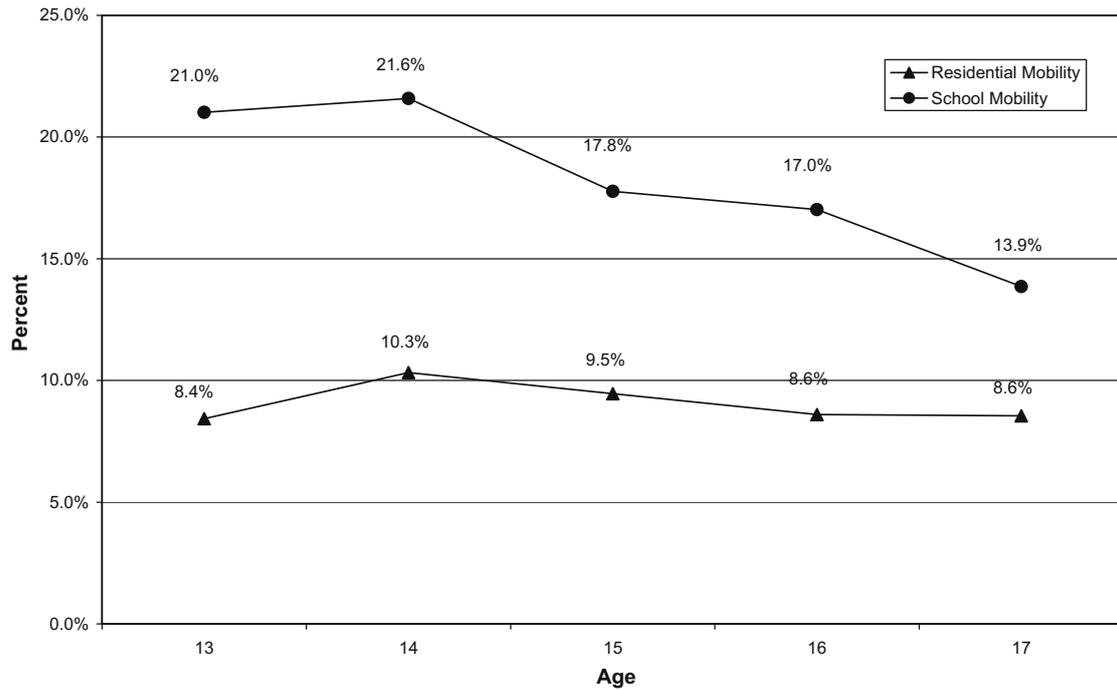


Fig. 1. Residential and school mobility rates by age.

and observed time-varying controls in the same year. Non-time-varying variables (e.g., sex, race, socioeconomic status) are measured in 1997 only. Before we present the results of the random effects models, we present the results from a series of stepwise models which gradually add observed controls for selection. We expect that results from models that include controls for observed covariates only—including those that add a lagged dependent variable—will largely replicate the findings of previous research and show an “effect” of mobility on youth outcomes. However, if youth who move frequently are systematically different from those who do not move, we expect that this relationship will disappear once controls for unobserved between-person differences are included in the random effects models. We also show each set of models separately by gender, given the fact that males are more likely to offend and offend more frequently than females (Chesney-Lind and Pasko, 2004).

## 5. Results

### 5.1. Descriptive findings

Fig. 1 shows average residential and school mobility rates for NLSY97 sample members from ages 13 to 18. Since the data are weighted, these are nationally representative estimates of mobility rates for youth ages 12–16 on December 31, 1996. Fig. 1 shows that the rate of school mobility is considerably higher than the rate of residential mobility at every age. About 8–10% of 13 and 14 year olds in the sample have experienced a residential move and over 20% have changed schools. Less than 10% of 15 and 16 year olds have moved, and about 17% of them have changed schools. Adolescents change schools more frequently than they move, supporting the idea that school change often occurs for reasons other than a change of residence. With the exception of the period from ages 13 to 14, the rate of residential mobility declines with age.<sup>12</sup> School mobility also exhibits a general decline with age.<sup>13</sup>

Table 1 presents descriptive statistics (means and standard deviations) for all variables used in the analysis by mobility status. Although the unit of analysis in the statistical models is the person-year, the descriptive statistics in Table 1 give a cross-sectional slice of youth in the first year they appear in our analytic sample in order to ease interpretation. For the majority of youth (over 97%), these data refer to round 2 (1998). Because the sample sizes are slightly different for the delinquency and substance use outcomes, Table 1 uses the delinquency sample. Table 1 shows that about 11% of the sample report moving, while 19% report changing schools. It is also worth noting that there is a connection between the two types of

<sup>12</sup> Although not shown in the table, we found that residential mobility increased dramatically at age 18. This increase may be due to adolescents moving out of the parental home—going to college, living on their own, or moving in with a boyfriend or girlfriend—rather than relocating because their parents decide to move.

<sup>13</sup> Age is undoubtedly an important issue to consider when examining the effects of mobility on youth outcomes, particularly delinquency. The effects of mobility might not be the same for middle school students as it is for high school students. We reran all of the models (logit and random effects logit) including interactions between residential and school mobility and age. None of the interaction terms was significant.

**Table 1**  
Descriptive statistics for all variables used in the analysis in 1998, by residential and school mobility.

Variable	All Youth		Residential Mobility						School Mobility			
	(N = 4890)		Yes (N536)		No (N = 4354)				Yes (N = 1001)		No (N = 3889)	
	Mean or %	S.D.	Mean or %	S.D.	Mean or %	S.D.	Mean or %	S.D.	Mean or %	S.D.		
<i>Problem Behavior</i>												
Delinquency	27.9%		37.0%		26.7%		34.9%		26.2%			
Substance use	53.3%		62.2%		52.1%		61.7%		51.2%			
<i>Residential and School Mobility</i>												
Residential move	11.2%		100.0%		0.0%		33.3%		5.9%			
School change	19.6%		58.1%		14.8%		100.0%		0.0%			
<i>Demographics</i>												
Age	14.99	0.91	15.05	0.92	14.99	0.91	14.92	0.93	15.01	0.91		
Race/ethnicity												
White	71.0%		74.2%		70.6%		66.7%		72.1%			
Black	15.3%		13.7%		15.5%		17.6%		14.7%			
Hispanic	12.5%		10.9%		12.7%		13.9%		12.1%			
Other	1.3%		1.2%		1.3%		1.9%		1.1%			
1996 Household income (Log)	10.39	1.46	10.08	1.55	10.43	1.44	10.15	1.44	10.45	1.45		
Parental education (1997)	13.83	3.95	13.36	3.73	13.89	3.97	13.41	4.30	13.93	3.85		
Residence												
Urban	69.7%		66.8%		70.0%		74.8%		68.4%			
Rural	30.3%		33.2%		30.0%		25.2%		31.6%			
Family structure												
Both biological parents	53.7%		30.9%		56.6%		37.8%		57.6%			
Other living situation	46.3%		69.1%		43.4%		62.2%		42.4%			
Household size	4.41	1.43	4.45	1.71	4.40	1.40	4.50	1.60	4.39	1.39		
Unemployment rate in county	1.99	0.79	1.98	0.77	1.99	0.80	2.01	0.83	1.99	0.78		
<i>School Performance, Experiences, and Characteristics</i>												
ASVAB math-verbal percentile score	50.06	29.06	44.59	28.06	50.75	29.11	40.89	27.78	52.30	28.93		
8 <sup>th</sup> grade GPA, 8-point scale	5.75	1.75	5.28	1.79	5.81	1.73	5.14	1.79	5.90	1.70		
Track in high school												
General	71.8%		80.6%		70.7%		82.5%		66.2%			
College prep	25.4%		18.2%		26.3%		14.8%		28.0%			
Vocational	2.8%		1.3%		3.0%		2.6%		2.8%			
Grade in school relative to same-age peers	-0.02	0.69	0.18	0.80	-0.05	0.67	0.17	0.74	-0.07	0.67		
Victim of bullying as a child	19.5%		25.7%		18.7%		23.8%		18.4%			
School size	4.94	1.41	4.83	1.40	4.96	1.41	4.84	1.43	4.97	1.40		
Student-teacher ratio	2.23	1.04	2.27	1.03	2.23	1.04	2.28	1.04	2.22	1.04		
<i>Individual Heterogeneity</i>												
Years since first sexual intercourse	0.50	1.38	0.78	1.63	0.47	1.34	0.80	1.69	0.43	1.28		
<i>Survey Structure</i>												
Weeks since last interview	85.15	12.63	89.79	12.50	84.56	12.52	87.98	12.10	84.45	12.65		

S.D. = standard deviation.

Note: Descriptive statistics are based on the delinquency sample of 4,890 for 1998.

mobility: over half (58%) of residential movers change schools, and one third (33.3%) of school changers also change addresses. As shown in previous research, youth who report ever moving or changing schools are more likely to be delinquent and use substances. Youth who report residential and school mobility are also more disadvantaged and come from households where parents have lower levels of education and lower incomes. Black and Hispanic youth are more likely to change schools, as are students with poor academic performance and lower test scores. Students who report changing schools are more likely to have been bullied as children and to have had sex at earlier ages.

### 5.2. Predicting delinquency and substance use

Table 2 shows results from the logistic regression models predicting delinquent behavior. These models indicate whether mobility in one year leads to a change in delinquency in the following year. Models 1–3 are not random effects models but rather conventional logistic regression models, which attempt to equate mobile and non-mobile youth by including controls for between-person differences in the form of observed covariates. Model 1 includes only a measure of residential mobility, and shows the expected positive and significant relationship between residential mobility and delinquency. In Model 2, we add the measure of school mobility and find that the coefficient for residential mobility is reduced but is still positive and significant. Therefore, both residential and school mobility are independently associated with delinquency.

Model 3 adds all of the observed controls, including the lagged measure of delinquency, and the coefficients for residential and school mobility are reduced but still highly significant. The odds of delinquency for youth who change residences are 23% [(exp(.21)) - 1] × 100 higher than for youth who do not experience residential mobility. The relationship between

**Table 2**  
Logistic regression models predicting delinquency (N = 4947, person-years = 14438).

	Model 1 Logit Move Only	Model 2 Logit Move + Change Only	Model 2 Logit Move + Change + Controls	Model 3 Random Effects Logit	
				Between	Within
<i>Residential and School Mobility</i>					
Residential move	.55*** (.06)	.37*** (.07)	.21** (.08)	.29* (.14)	.14 (.10)
School change		.42*** (.05)	.20*** (.06)	.37*** (.11)	.09 (.07)
<i>Demographics</i>					
Male			.26*** (.04)	.31*** (.06)	
Black			-.26*** (.07)	-.31*** (.08)	
Hispanic			-.05 (.07)	-.06 (.08)	
Other			.03 (.18)	.03 (.23)	
Log household income			.02 (.02)	.03 (.02)	
Highest parental education			.01 (.01)	.01 (.01)	
Urban			.07 (.05)	.16* (.07)	-.16 (.19)
Living with both biological parents			-.16** (.05)	-.22*** (.07)	-.03 (.18)
Household size			-.02 (.02)	-.05* (.02)	.01 (.03)
Unemployment rate			.00 (.03)	-.03 (.04)	.03 (.06)
<i>School Performance, Experiences, and Characteristics</i>					
ASVAB percentile score			.00 (.00)	.01*** (.00)	
8 <sup>th</sup> grade GPA, 8-point scale			-.14*** (.02)	-.18*** (.02)	
College prep track in h.s.			-.02 (.05)	-.11*** (.09)	.06 (.07)
Vocational track in h.s.			.13 (.11)	.06 (.19)	.06 (.13)
Grade in school relative to peers			-.01 (.03)	-.05 (.05)	.03 (.06)
Bullied by age 12			.32*** (.05)	.50 (.07)	
School size			.02 (.02)	-.01 (.03)	.07* (.03)
Student/teacher ratio			-.02 (.03)	-.02 (.04)	-.07 (.05)
<i>Individual Heterogeneity</i>					
Years since first intercourse			.10 (.01)	.17 (.02)***	-.24*** (.05)
Lagged delinquency			1.63*** (.04)		
Constant	-1.00*** (.05)	-1.07*** (.06)	-.54 (1.04)	-1.07 (1.84)	

Standard errors shown in parentheses. Standard errors are survey corrected. Two-tailed tests.

Note: All models also include dummy variable controls for survey year, age, region of residence, and birth year. All models also include a control for weeks elapsed since the last interview. Coefficients have been omitted to simplify presentation.

\*\*\* p < .001.

\*\* p < .01.

\* p < .05.

school mobility and delinquency is similarly strong, although the coefficient was reduced by about half. The odds of delinquency for youth who change schools are 22% [(exp(.20)) - 1] × 100 higher than for those who do not change schools. Therefore, both residential and school mobility still appear to have an influence on delinquency even in the face of a host of controls designed to capture preexisting differences between mobile and non-mobile youth, including a lagged measure of offending. These results largely replicate those of prior studies.

However, Model 3 is still vulnerable to criticisms of selection bias, as there may be unobserved characteristics driving the relationship between mobility and delinquency. Model 4 is a random effects logistic regression model predicting delin-

quency. This model provides the key test of whether the relationship between mobility and delinquency is attributable to preexisting differences.<sup>14</sup> We begin by examining the “between” coefficients, which give the between-person differences in delinquency for mobile and non-mobile youth averaged across all time periods. Consistent with the findings from Model 3, the between-person coefficients for both residential school mobility are positive and significant, suggesting an association between both moving residences and changing schools and delinquency at the between-person level. That is, the positive and significant between-person coefficients for both residential and school mobility tell us that youth who move residences or change schools are more likely to be involved in delinquency, on average, than their non-mobile counterparts. The between-person coefficients, however, do not tell us anything about whether moving residences or changing schools puts youth at risk for delinquency.

Our main interest, therefore, is in the “within-person” coefficients, which give the change in delinquency (from no delinquency to any delinquency or vice versa) that follows from a change of residence or school and provides the best evidence of a causal effect of mobility. The within-person coefficient for residential mobility is half the size of the between-person coefficient and not significantly different from zero. This means that changing residences does not lead to a change in delinquency. Rather, the association between residential mobility and delinquency is attributable to unobserved between-person differences in delinquency. Youth who move are more likely to be delinquent, but not because of their mobility. A more formal test of the importance of individual unobserved heterogeneity can be performed by a statistical test of the difference between the deviation and mean coefficients. The difference between these two coefficients for school mobility is significant ( $p < .05$ ), indicating that there are person-specific unobservables driving the school mobility–delinquency relationship. However, the difference between the two coefficients for residential mobility does not reach conventional standards for statistical significance ( $p < .31$ ).

While not our main focus, it is worth noting the within-person results for some of the time-varying control variables in Model 4. Few time-varying control variables have significant within-person effects on delinquency. While living with both biological parents is negatively associated with delinquency at the between-person level ( $p < .001$ ), changes in family structure do not lead to delinquency at the within-person level. Family structure, aspects of parenting from before elementary school, such as the level of supervision and disciplinary style, and other sources of unobserved heterogeneity may be more important for delinquency in adolescence than changes in family structure during adolescence. Also, while the between-person coefficient for years since sexual intercourse is positive and significant ( $p < .001$ ), the within-person coefficient is actually negative and significant ( $p < .001$ ). This indicates that the association of sexual precocity and delinquency is driven by selection. Youth who have a predisposition to engage in delinquency are likely to be drawn into sex at earlier ages. However, once these delinquency-prone youth have sex, their delinquency is inhibited. While it is unclear why this would be the case, one possibility is that sex may lead to having a child, which in turn may increase social control and reduce delinquency (Hope et al., 2003). Finally, the within-person coefficient for school size is positive and significant, indicating that increases in school size lead to delinquency ( $p < .05$ ).<sup>15</sup>

Turning to the effects of mobility on substance use, Table 3 presents the results from the logistic regression models. Model 1 shows the expected positive and significant relationship between residential mobility and substance use. For youth who move, the odds of using tobacco, alcohol, or marijuana are about 71.6 [( $\exp(.54) - 1$ )  $\times$  100]% higher than for non-movers. When school mobility is added in Model 2, the coefficient for residential mobility remains positive and highly significant, and school mobility is also strongly associated with substance use. The coefficients for both residential and school mobility remain significant in Model 3 when observed controls for selection are introduced, although both are reduced by roughly half. When we decompose our measures of residential and school mobility into their between-person and within-person components in the random effects model (Model 4), the results are consistent with those obtained when delinquency was the outcome: while the between-person coefficient is positive and statistically significant, indicating that youth who move residences or change schools are more likely to engage in substance use than their more non-mobile counterparts, the within-person coefficient is non-significant, indicating that changes in mobility are not associated with changes in substance use. In other words, the observed positive relationship between mobility and substance use is due to differences before moving residences or changing schools, not to residential or school mobility.<sup>16</sup>

The within-person results for the time-varying control variables are similar to those when delinquency was the outcome. One exception is that the within-person coefficient for college preparatory track in high school is positive and significant ( $p < .05$ ), indicating that changing from a regular to a college prep curriculum leads to substance use. One possible reason for this finding is that while youth in a college prep track are no more or less likely to engage in substance use, for a substance use-prone youth, who is likely at risk for academic failure, being placed in a college track is likely to lead to stress and strain. This psychological distress may lead to alcohol or marijuana use as a way of coping.

<sup>14</sup> We do not include lagged delinquency in the random effects models because we believe that our strategy of decomposing each covariate into its between-person and within-person components is a better strategy for addressing selection effects. Moreover, use of a lagged dependent variable when fixed effects are already included in a model could lead to potential bias in the estimates of the effects of other covariates (Allison, 1990).

<sup>15</sup> Unfortunately, due to limitations of the NLSY97, we were unable to examine within-person associations between our measures of school performance and experiences and delinquency and substance use.

<sup>16</sup> We also ran all of our models separately for males and females. Male adolescents in the NLSY97 have significantly higher rates of school change than female adolescents at nearly every age, a finding that we believe is attributable to boys' greater involvement in delinquency. Boys' behavior problems in school, particularly if accompanied by academic problems, may make them the target of school discipline policies designed to get rid of troublesome students. However, we did not find any differences in the effects of school (or residential) mobility by gender.

**Table 3**  
Logistic regression models predicting substance use (N = 4986, person-years = 14542).

	Model 1 Logit Move Only	Model 2 Logit Move + Change Only	Model 2 Logit Move + Change + Controls	Model 3 Random Effects Logit	
				Between	Between
<i>Residential and School Mobility</i>					
Residential move	.54*** (.06)	.41*** (.07)	.22** (.08)	.37** (.14)	.06 (.08)
School change		.31*** (.05)	.13* (.06)	.28** (.11)	.06 (.06)
<i>Demographics</i>					
Male			-.19*** (.04)	-.26 (.06)	
Black			-.78*** (.07)	-1.09 (.08)	
Hispanic			-.21** (.07)	-.26 (.08)	
Other			-.28 (.18)	-.53 (.28)	
Log household income			.05* (.02)	.07 (.03)	
Highest parental education			.01 (.01)	.01 (.01)	
Urban			.09 (.05)	.14* (.07)	-.08 (.14)
Living with both biological parents			-.17*** (.05)	-.21** (.06)	-.03 (.13)
Household size			-.07*** (.01)	-.14*** (.02)	.03 (.03)
Unemployment rate			.03 (.03)	-.01 (.04)	.03 (.04)
<i>School Performance, Experiences, and Characteristics</i>					
ASVAB percentile score			.00 (.00)	.00 (.00)	
8 <sup>th</sup> grade GPA, 8-point scale			-.11*** (.01)	-.19 (.02)	
College prep track in h.s.			.06 (.05)	-.13 (.08)	.14** (.05)
Vocational track in h.s.			-.11 (.11)	-.18 (.18)	-.07 (.10)
Grade in school relative to peers			-.08* (.03)	-.17*** (.04)	-.02 (.05)
Bullied by age 12			.10 (.05)	.24 (.07)	
School size			.00 (.02)	-.05 (.03)	.05 (.03)
Student/teacher ratio			-.03 (.02)	-.04 (.04)	-.04 (.04)
<i>Individual Heterogeneity</i>					
Years since first intercourse			.11*** (.02)	.25*** (.03)	-.18*** (.04)
Lagged substance use			2.20*** (.04)		
Constant	-.26*** (.05)	-.31*** (.05)	-.49 (.98)	-.94 (1.78)	

Standard errors shown in parentheses. Standard errors are survey corrected. Two-tailed tests.

Note: All models also include dummy variable controls for survey year, age, region of residence, and birth year. All models also include a control for weeks elapsed since the last interview. Coefficients have been omitted to simplify presentation.

\*\*\* p < .001.

\*\* p < .01.

\* p < .05.

## 6. Discussion

We find that many youth move during adolescence and even more change schools, and thus it is important to understand the implications of these changes for adolescent development. Residential mobility is often accompanied by a change of

schools, although children may change schools for reasons other than moving. These include expulsion for disciplinary reasons, school transfers if a school cannot meet a student's special learning needs, or parents' perception that a school is too dangerous for their child to attend. Schools may also close or become too crowded, forcing children to attend other district schools. Research has generally found that such mobility puts youth at risk for a host of educational and developmental problems, including involvement in delinquent and criminal behavior. However, little attention has been paid to whether the possible effects of residential and school mobility on delinquency are driven by the move itself, or reflective of underlying differences between individual adolescents. Given the relatively high levels of mobility among American families, it is important to know whether the choice to relocate or change schools might put adolescents on a path to criminal behavior.

Consistent with prior research, we found that mobility is a common experience for members of the NLSY97 cohort, particularly younger respondents. Overall mobility decreases with age, until respondents reached age 18, when many adolescents move out of their parents' houses and into college dorms or into their own apartment. Our multivariate models also suggest that any association between residential mobility and problem behaviors is driven by school mobility, not necessarily the move itself.

This conclusion is supported for both males and females by the findings from the hybrid random effects models. We found large and significant differences in delinquency and substance use between mobile and non-mobile adolescents—mobile adolescents were more likely than non-mobile adolescents to exhibit problem behaviors across the span of time during which we observed them. However, we found no evidence for the claim that mobility puts adolescents at an *increased* risk for either of these behaviors. Although the models that controlled only for selection on observed covariates showed that mobility was related to delinquency and substance use in most instances, once we controlled for unobserved differences between mobile and non-mobile adolescents, the positive and significant relationship that we observed between mobility and these behaviors disappeared. The relationship between mobility and problem behaviors appears to be spurious rather than causal, the result of selection on unobserved individual and family differences between mobile and non-mobile youth. This finding is clearly at odds with the consensus in the literature that mobility is an important factor in the etiology of educational and behavioral problems.

How do we interpret these findings? Adolescents who are most likely to experience residential and school change are those already operating with many risk factors for delinquency and other problems. Mobile students often come from low-income families where parents have little education, and the students themselves are already performing at low academic levels, putting them at risk for delinquency (for a review, see Maguin and Loeber, 1996). Furthermore, many mobile youth already exhibit problem behaviors, which may actually place them at an increased risk of being expelled from school. Indeed, concern over such students being “out on the streets” has led to the proliferation of alternative school programs to deal with problem students. Thirty-nine percent of public schools had alternative school programs in the 2000–2001 school year, and roughly half of all school districts reported that disruptive behavior alone was a sufficient reason to send students to these programs (Kleiner et al., 2001). This suggests that there are important, stable differences between mobile and non-mobile youth that put them at risk for future criminal behavior.

## 7. Limitations, future research and implications

While our research utilizes better data and methods than many prior studies, this does not mean that we have fully explained how mobility and delinquency are related in the lives of adolescents. Much of the current research on mobility assumes that the relationship is unidirectional, with residential and school mobility leading to delinquency and other developmental outcomes. However, the relationship between mobility and delinquency may well be reciprocal, since delinquency and other problem behaviors, poor school performance, and low educational attachment may influence mobility, which in turn may affect delinquency. Unfortunately, our models cannot account for this possibility.

Moreover, the youngest members of the sample were 12 years old, so it is possible that any negative effects of frequent moving occur years before the earliest observation for many of the youth in the NLSY97. We opened this paper with a striking statistic: by the time they are 12 years old, 80% of children will have moved at least once. Therefore, our findings do not necessarily preclude the importance of early childhood mobility on delinquency. Frequent childhood mobility may lead to the early development of delinquency, and both patterns of frequent mobility and delinquency would continue into adolescence. Since the random effects models control for all time-invariant, individual differences, they by definition control for any differences in mobility that occurred before the survey began. Therefore, one preexisting difference between mobile and non-mobile youth in adolescence may well have to do with prior moves—teens may simply be exhibiting a continued pattern of family disruption. If this were the case, early childhood mobility would be driving the relationship between adolescent mobility and delinquency. Therefore, the residential moves and school changes we can observe with the current data are unlikely to affect the delinquency of the most mobile and developmentally at-risk members of the sample. Future research should explore the possible reciprocal relationship between mobility and delinquency using younger cohorts of children.

As mentioned above, we believe that these differences may be primarily driven by family-specific risk factors related to moving and delinquency, such as family-level financial or emotional instability. It is possible that mobile youth bring these differences with them into their new neighborhoods and schools, putting them at a greater risk for problem behavior. However, we were unable to measure these processes in our study. Our findings suggest that there is a need for future research on

mobility and outcomes—whether criminal behavior, academic performance, or high school dropout—to take a closer look at the differences between youth that may lead them to be *selected* into both mobility and undesirable developmental outcomes.

Our findings should be tempered by a number of other limitations. First, although our measures of residential and school mobility are more precise than those used in most prior studies, there is still room for improvement. Future research should explore the cumulative impact of residential moves and school changes over time on delinquency and other outcomes. Second, we were unable to examine data on the reasons that respondents left a school, which might help us distinguish between different kinds of mobility and help explain what the unobserved heterogeneity means. Middle class families often choose to move to increase social status or meet changing consumption needs; mobility under these circumstances might be less detrimental for adolescents, since the process is characterized by parental motivation. However, poor families often move unexpectedly, or from one disadvantaged neighborhood to another, and may have little choice over the conditions of relocation; moving under these conditions might lead to an increase in delinquent behavior.

Third, we have not considered the neighborhood and school contexts into which mobile adolescents move. If mobility does not independently lead to delinquency, then it's possible that teenagers who move from dangerous neighborhoods to safer ones, or who leave an underperforming school to attend a higher quality school may experience long-term reductions in risk for problem behaviors, despite initial disruptions in social ties and routines. Research examining the effects of residential mobility experiments, where poor families move into better neighborhoods with housing vouchers, suggests that moving from disadvantaged neighborhoods to more affluent and safer areas can sometimes *improve* children's educational and behavioral outcomes as well as the mental health and economic prospects for heads of household (Orr et al., 2003; Rubiowitz and Rosenbaum, 2000). Future research should examine whether any consequences of mobility for problem behaviors might be conditional on large changes in neighborhood and school quality.

Fourth, it may be that any negative effects of childhood mobility on delinquency and crime do not manifest themselves until years after the mobility occurs. In this study, we examined delinquency only in the immediate wake (one year) of mobility—a condition imposed by our models and data. We believe that this is appropriate, since developmental change occurs at a very fast pace during adolescence. However, future research should focus on the long-term effects of mobility. Additionally, little is known about how the relationship between mobility and delinquency interacts with other life events. Mobility dynamics and their implications are complicated, since the changes that accompany mobility occur alongside changes in family context that may affect social resources. Adolescence is a period of active identity development, and if a residential move or school change occurs at the same time as a parental divorce, the transition to high school, or the onset of puberty, the effects may be exacerbated.

In terms of practical significance, our findings seem to suggest that interventions to reduce problem behaviors and substance use might target more resources toward assisting youth who relocate to new schools, since these youth are more likely to already have behavioral problems before coming into school. These programs will likely also be of help to very poor families, considering the collection of risk factors that characterize mobile youth and their families. While the data do not contain a large enough high poverty sample to examine variation in the types of residential mobility among these youth, we know that the poorest youth in the sample are the most likely to experience school change, and these families are more likely to move unexpectedly or involuntarily. For example, social policies, such as welfare reform, have compromised the ability of families to maintain quality housing (Nichols and Gault, 1999), and HOPE VI initiatives displace large numbers of families, for better and for worse (Clampet-Lundquist, 2004; Scanlon and Devine, 2001). While our findings suggest that on average, moving does not lead to delinquency for a nationally representative sample of youth, we do not know what the effects of residential and school change will be under these conditions and how they will differ for poor families relative to middle class families.

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