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Residential Mobility across Early Childhood and Children's Kindergarten Readiness

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Abstract

Understanding residential mobility in early childhood is important for contextualizing family, school, and neighborhood influences on child well-being. We examined the consequences of residential mobility for socioemotional and cognitive kindergarten readiness using the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), a nationally representative longitudinal survey that followed U.S. children born in 2001 from infancy to kindergarten. We described individual, household, and neighborhood characteristics associated with residential mobility for children aged 0–5. Our residential mobility indicators examined frequency of moves, nonlinearities in move frequency, quality of moves, comparisons between moving houses and moving neighborhoods, and heterogeneity in the consequences of residential mobility. Nearly three quarters of children moved by kindergarten start. Mobility did not predict cognitive scores. More moves, particularly at relatively high frequencies, predicted lower kindergarten behavior scores. Moves from socioeconomically advantaged to disadvantaged neighborhoods were especially problematic, whereas moves within a ZIP code were not. The implications of moves were similar across socioeconomic status. The behavior findings largely support an instability perspective that highlights potential disruptions from frequent or problematic moves. The study contributes to literature emphasizing the importance of contextualizing residential mobility. The high prevalence and distinct implications of early childhood moves support the need for further research.

Keywords

Early childhood; residential mobility; inequality; ECLS-B; kindergarten readiness; instability

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Introduction

Residential moves are common yet consequential events in young children's lives. A nationally representative study found that 70% of U.S. children born in 2001 moved residences between birth and kindergarten start and 25% moved three or more times (Lawrence, Root, & Mollborn, 2015). These residential mobility estimates are considerably higher than in middle childhood and adolescence (Haynie, South, & Bose, 2006; Root & Humphrey, 2014). Early childhood appears to be an especially mobile life stage—but it is also an age at which stability may be particularly important for development (Shonkoff & Garner, 2012). Past research on the developmental consequences of early childhood residential mobility has been mixed (Coley & Kull, 2016; Coley, Lynch, & Kull, 2015; Schmitt & Lipscomb, 2016). Our study addresses the implications of residential mobility for children's kindergarten readiness, focusing on socioemotional functioning but also examining cognitive development. Our longitudinal approach captures the complex dynamics of mobility across the first five years of life.

Although research has yet to fully identify the consequences of early childhood mobility, it is important to study because earlier life shapes later life (DiPrete & Eirich, 2006; Willson, Shuey, & Elder, 2007). The link between childhood circumstances and health and well-being in adulthood is well established (Haas, 2007; Hayward & Gorman, 2004). The school transition is crucial for understanding later socioeconomic attainment, in part because of its strong correlation with high school academic achievement (Weller, Schnittjer, & Tuten, 1992). Because of potential disruptions to the family system, early residential mobility may be especially important for children's socioemotional development, which links to later life outcomes. The socioemotional dimension of school readiness is important for understanding children's educational trajectories (Entwisle, Alexander, & Olson, 2004). Beyond shaping academic performance, socioemotional behavior in early childhood is predictive of risky or delinquent behaviors later in life (Moffitt, 1993). Examining both behavior and cognition is therefore key to understanding the implications of mobility for school readiness.

Consistent with theoretical principles from the life course perspective (Elder, 1994), we use dynamic longitudinal measures of residential mobility that account for the frequency, potential nonlinear effects, distance, and quality of residential moves, as well as heterogeneity of effects, to examine the socioemotional and cognitive consequences of mobility in early childhood. Our theoretical perspective views a residential move as an event that can trigger or result from other changes in a child's life, potentially contributing to instability or chaos in a child's social context. Instability/chaos occurs when a child's environment changes repeatedly, at particularly high frequencies, or across multiple domains. Early literature focused on instability in mothers' union status (e.g., Cavanagh & Huston, 2006; Fomby & Cherlin, 2007), but the construct has since been expanded (Mollborn 2016). Environmental chaos predicts children's development and health (Dush, Schmeer, & Taylor, 2013), but residential mobility has only recently been included as a measure of environmental chaos (Coley, Lynch, & Kull, 2015).

Background

Early Childhood Residential Mobility

Previous nationally representative estimates, which followed children regardless of their residential mobility, found that most children moved during early childhood (Lawrence, Root, & Mollborn, 2015). Compared to nonmovers, early childhood movers came from and remained in *households* that were more socioeconomically disadvantaged, yet movers improved their average *neighborhood* socioeconomic status relative to nonmovers. This suggests that residentially mobile families may strategize to relocate to more advantaged neighborhoods (which typically have higher-quality schools; Borman & Dowling, 2010), even as their own socioeconomic resources remain limited. People move for both economic and noneconomic reasons in ways that vary across subpopulations (Rogers, 1967). Moves can be undertaken for a new job or to live in a preferred neighborhood, or in response to negative conditions such as pollution (Downey, Crowder, & Kemp, 2016; Geist & McManus, 2008). Given that reasons for moving vary, it is no surprise that the implications of moves vary depending on family financial resources and neighborhood characteristics (Anderson, Leventhal, & Dupéré, 2014; Pettit, 2004).

Early childhood may be a unique life stage for residential mobility processes. Childbearing can lead to moves as families' space needs expand and neighborhood preferences change (Mulder & Hooimeijer, 1999; Rabe & Taylor, 2010). Moving into a neighborhood to access a particular school is a common strategy that may have positive implications for educational success (Goyette, 2008; Holme, 2002). The implications of early childhood moves may also differ because different social contexts matter. Families and child care settings, but not schools, are key socialization agents in early childhood (Entwisle, Alexander, & Olson 2004). Neighborhood settings may have largely indirect effects in early childhood because children are not as mobile and are often not exposed to their neighborhood independent of family members. Therefore, if the family system remains stable, a residential move may have less impact on a younger child because of the lesser impact of neighborhoods and schools.

Limited research has examined the consequences of *early childhood* mobility. Studying Head Start-eligible children, Schmitt and Lipscomb (2016) found that 30 percent moved in the prekindergarten year, with small but consistent negative implications for math and language skills in prekindergarten and the school transition. Coley, Lynch, and Kull (2015) conceptualized moves as part of "environmental chaos" and found no relationship between a count of moves in early childhood and children's health or behavior in a high-risk urban sample. Coley and Kull (2016) used retrospective, nationally representative reports and found that two thirds of children moved before kindergarten with a range of 0 to 6 moves. Residential mobility was higher in early childhood than in later childhood or early adolescence. Each additional early childhood move had small but negative implications for psychosocial functioning but not for kindergarten cognitive skills. A larger body of research has found negative associations between residential mobility and the educational achievement and functioning of *older children and teenagers* (Leventhal & Newman, 2010; Pribesh & Downey, 1999). Residentially stable children have more favorable behavioral and

emotional health and educational outcomes than more mobile children (Coley, Leventhal, Lynch, & Kull, 2013; Jelleyman & Spencer, 2008; Ziol-Guest & McKenna, 2014). Residential mobility has been shown to have negative implications for adolescents' mental health, health behaviors, internalizing behavior, and criminal activity (Anderson & Leventhal, 2016; Fowler, Henry, & Marcal, 2015).

Some research has explored *mechanisms*, though rarely for younger children. Involvement with peers who have weaker academic achievement and more deviant behaviors is one explanation for negative impacts of residential mobility among teens (Haynie et al., 2006; South, Haynie, & Bose, 2005). Disruptions in institutional supports such as health insurance or medical facilities are also linked to residential mobility (Busacker & Kasehagen, 2012). Another possible explanation is that moves result from family structure transitions. Although residential moves sometimes co-occur with household structure transitions such as a divorce or the addition of an extended family member, their implications for children and teens have been found to be independent of these transitions (Fomby & Sennott, 2013; Mollborn, Fomby, & Dennis, 2012).

In sum, previous research suggests a negative or nonsignificant association between residential mobility and kindergarten readiness, but evidence on young children's mobility indicates that some moves could be positive because of increases in neighborhood quality. Given the average improvements in mobile children's neighborhood status and potentially different motivations underlying mobility in early childhood compared to later life, under what conditions are residential moves associated with children's kindergarten readiness? This is our study's driving question.

Selection into Residential Mobility

Confounding factors that shape both children's selection into residential mobility and their well-being complicate causal inference in answering this question. Some research has found that selection bias accounts for observed associations between residential mobility and teen delinquency (Porter & Vogel, 2014). Adverse childhood experiences such as childhood abuse and household dysfunction are related to residential mobility, partially explaining its association with health risks (Dong et al., 2005). Differences between mobile and nonmobile families make diverse controls for selection crucial in estimating the implications of residential moves (Gasper, DeLuca, & Estacion, 2010; Pettit & McLanahan, 2003; Pribesh & Downey, 1999). To account for selection, some research has used techniques such as instrumental variables, random effects models, and propensity score weighting. Such work has found no effect of moves on adolescent delinquency (Gasper, DeLuca, & Estacion, 2010) but an independent negative effect of mobility on older children's social capital (Pettit & McLanahan, 2003), self-regulation (Roy, McCoy, and Raver 2014), and adolescents' internalizing problems (Anderson & Leventhal, 2016). We control for a wide variety of potential selection factors but focus our primary contribution on operationalizing residential mobility in dynamic ways that help us understand the conditions under which moves have implications for children.

Hypotheses

Ideas about instability in children's environments drive an integrated series of hypotheses about the implications of residential instability for children's kindergarten behavior and cognition. We operationalize residential instability using move frequency, nonlinearity of move frequency, changes in neighborhood quality, distance of moves, and moves among socially disadvantaged groups. Child socioemotional behavior is the most closely linked aspect of early development to various types of instability in young people's environments, including mothers' partners (Cavanagh & Huston, 2006) and child care arrangements (Morrissey, 2009). Residential instability has also been linked to teenagers' behavior (Fowler, Henry, & Marcal, 2015). Socioemotional behavior is also important because it is a crucial aspect of school readiness, which has important implications for later development and educational attainment (Entwisle, Alexander, & Olson, 2004). Although children's cognitive outcomes have not been linked as frequently to residential mobility and other types of instability (e.g., Coley & Kull, 2016), they are important for children's later development (Entwisle, Alexander, & Olson, 2004), and some research has found cognitive implications of early residential mobility (Schmitt & Lipscomb, 2016). We therefore focus on behavior but also report results for cognitive outcomes.

Move Frequency—Residential moves may alter children's key attachments and change social networks. Residential mobility is also a fundamental element of broader *instability* in children's environments (such as family relationships, neighborhoods, peers, and child care or school settings) because place of residence is the factor that perhaps most determines those environments. Instability in children's environments is a stressor that can have implications for psychological, neural, and physiological development (Coley et al., 2015). This instability perspective is rooted in insights from family systems theory and family stress theory (Hill, 1949; McCubbin & Patterson, 1983), which emphasize problems caused by repeated disruptions to the family system and to children's relationships without enough time to restore equilibrium between changes. Indeed, Anderson, Leventhal, and Dupéré (2014) found that family processes mediated the relationship between residential mobility and child outcomes in early childhood, although not adolescence. Because of the high developmental pace and sensitivity of early childhood (Shonkoff & Garner, 2012) and the important implications of various types of instability in early childhood (Cavanagh & Huston, 2008), it is a particularly important life stage for understanding instability. Thus, the instability perspective suggests that residential moves should have negative consequences for child behavior and perhaps for their cognition because of resultant disruptions to the family system, even if neighborhood quality increases. We therefore expect that *the frequency of residential moves in early childhood will be associated with compromised kindergarten readiness (Hypothesis 1).* Previous work has conceptualized residential mobility using a move count as we do (e.g., Coley & Kull, 2016; Coley, Lynch, & Kull, 2015; Vernon-Feagans, Willoughby, & Garrett-Peters, 2016).

Unusually High Residential Mobility—Because they result in greater instability, disproportionately high levels of residential mobility may have disproportionately problematic effects. Reviewing the literature, Leventhal and Newman (2010) found evidence of a nonlinear relationship between mobility and child outcomes, with particularly frequent

moves having stronger negative implications. Anderson and Leventhal (2016) also found negative behavioral consequences in adolescence for those who had moved at least 4 times. There is limited evidence from local samples that repeated moves in the first 2 or 3 years of life predict compromised development (Cutts et al, 2011; Rumbold et al., 2012). We therefore anticipate that *the relationship between residential mobility and kindergarten readiness will be nonlinear, with negative associations most concentrated among children with the highest frequency of moves (Hypothesis 2).*

Move Distance—Although the instability perspective suggests that residential mobility may be detrimental for development, some moves may be especially problematic because of external factors that could exacerbate disruptions to the family system. A residential move between neighborhoods may result in greater family and social capital disruption than a within-neighborhood move (Hagan, MacMillan, & Wheaton, 1996; Jelleyman & Spencer, 2008). The latter move changes the family's housing but not neighborhood ties (including peer relationships) and institutions (including child care settings). For example, Pribesh and Downey (1999) found that changing both schools and residences, as in an inter-neighborhood move, resulted in decreased academic achievement in part due to declines in social relationships. Thus, we anticipate that *residential moves to a different neighborhood will be associated with compromised kindergarten readiness compared to moves within the same neighborhood (Hypothesis 3).*

Move Quality—Moves also differ by the characteristics of the origin and destination neighborhoods. Moving from a more resource-advantaged to a more disadvantaged neighborhood could have negative implications because of resultant increases in neighborhood risk factors and decreases in school quality. Parente and Mahoney (2009) found that young boys who had moved from typical to high-crime neighborhoods had higher levels of aggressive behavior. Conversely, moves that improve neighborhood quality may have positive implications that provide a counterweight to resultant family disruptions. Pettit and McLanahan (2003) found that the negative implications of moves out of public housing for older children's social capital were attenuated when the move was to a middle-class neighborhood. Chetty, Hendren, and Katz (2016) found in the Moving to Opportunity experiment—which randomly assigned housing vouchers for families to move to less disadvantaged neighborhoods—that, for children under age 13, moving out of a high-poverty neighborhood predicted higher college attendance rates and earnings. Qualitative investigation of Moving to Opportunity families found that adult movers reported increased stress, but also positive changes stemming from moving to a less disadvantaged neighborhood. Ultimately, the positive factors outweighed the negative, resulting in mental health benefits for adults (Turney, Kissane, & Edin, 2013). Roy, McCoy, and Raver (2014) found both that early and middle childhood moves out of low-poverty and into high-poverty neighborhoods decreased self-regulation in fifth grade and that moves out of high-poverty and into low-poverty neighborhoods improved it. Therefore, we expect that *children moving from more resource-advantaged to more disadvantaged neighborhoods will experience stronger negative effects of residential moves, and those moving from more disadvantaged to more advantaged neighborhoods will have weaker negative effects, than those whose move between socioeconomically similar neighborhoods (Hypothesis 4).* Because U.S. movers in

early childhood typically transition to more advantaged neighborhoods (Lawrence, Root, & Mollborn, 2015), understanding the implications of changes in neighborhood characteristics is important.

Heterogeneity in Implications of Residential Mobility—Finally, it is possible that socioeconomically disadvantaged children may experience different implications of residential mobility than advantaged children. This moderating relationship could take two different forms. First, advantaged children could be relatively protected from negative consequences of residential mobility. Childhood adversities and instability may accumulate across domains, making multiple disadvantages (such as poverty together with family structure change and residential instability) disproportionately problematic for development. Felitti and colleagues (1998) and Bauman and colleagues (2006) have found support for this idea in the health domain. Alternatively, children from disadvantaged contexts may be able to absorb residential mobility as "one more change in a context defined by turbulence" (Fomby et al. 2010:235), making the implications of residential mobility weaker for less advantaged children. This socioeconomic stress hypothesis, articulated by McLoyd and colleagues (2000), was supported in Fomby and colleagues' (2010) analysis of mothers' union instability and adolescent risk behavior. We explore both possibilities here by analyzing interactions between residential mobility and socioeconomic status, but an instability perspective and one nonrepresentative study support the former (Ziol-Guest & McKenna 2014). Thus, we expect that *the negative implications of residential moves will be stronger for children from socioeconomically disadvantaged families than for those from less advantaged families (Hypothesis 5).*

Methods

Data and Sample

We analyzed data from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), which surveyed a nationally representative cohort of children born in the United States in 2001 at approximately 9 months, 2 years, 4 years, 5 years, and 6 years old. Depending on when the child started kindergarten, kindergarten variables were coded from either Wave 4 or 5, but all five waves of data were used for those who participated in Wave 5 (weighted response rates for parent interviews were 74, 93, 91, 92, and 93 percent respectively). All children were followed through Wave 3, but because of budgetary constraints a random 85 percent subsample was followed into kindergarten. The ECLS-B collected information from children; their parents; and their child care, early education, and kindergarten providers, gathering a wealth of data on children's development, health, education, and well-being. The ECLS-B is an excellent data source because it spans early childhood and, importantly and unlike some other data, follows all movers no matter how many times they move (Snow et al., 2009). About 5,050 children had both a valid kindergarten sampling weight with teacher responses and their biological mother responding at all waves (all numbers are rounded to the nearest 50 due to security requirements).[1] The ECLS-B includes ZIP code data for the child's residence at each wave, which is not as fine-grained as census tract "neighborhood" data but is an accepted proxy in the absence of other georeferenced data (Flowerdew, Manley & Sabel, 2008; Krieger et al., 2002).

Measures

Independent Variables—Individual and household socioeconomic measures were derived from constructed ECLS-B variables and parent interviews, at Wave 1 except as noted. Controlling for these early characteristics minimizes confounding and selection bias. We included child gender, race/ethnicity, and age in months at Wave 1 and the kindergarten wave as individual controls. We controlled for standardized Wave 1 (infant) cognitive and behavior scores to minimize endogeneity bias in predicting kindergarten behavior scores. Parent-reported child race/ethnicity was represented by mutually exclusive categories: non-Hispanic Black, non-Hispanic White, Hispanic, and other race/ethnicity, the latter of which includes categories too small to examine separately including multiracial children. The mother's marital status at birth was captured as married, cohabiting, or single. Household variables included the mother's educational attainment (less than a high school degree, high school degree, some college, Bachelor's degree, or postgraduate education), whether the child was born to a teen parent, a count of other children in the household, and the household's income-to-needs ratio (an ECLS-B-constructed variable, with the ratio as the proportion of the U.S. Census-defined poverty threshold for that year and household size).

Geographic characteristics were measured in kindergarten. We use the kindergarten wave to disentangle mobility from neighborhood effects and because location becomes very important for school selection at this age. Regions included the Northeast, West, Midwest, and South. Urbanicity defined urbanized areas as those with populations of 50,000 or greater, compared to urbanized clusters (populations of 2,500 or greater) or rural (<2,500). ZIP code of residence was used as a proxy for neighborhood, and ZIP code socioeconomic characteristics were extracted from the 2000 Census SF3 (U.S. Census Bureau, 2002). To capture neighborhood material deprivation, we used the Townsend Index, summing standardized z-scores for the proportions of the ZIP code's population that were unemployed, did not own their homes, did not own a car, and lived in overcrowded households (Townsend, 1988; Krieger et al., 2002). Greater values signify greater disadvantage. Indices of deprivation attempt to capture tangible material deprivation as a complement to differences in economic status, which are typically measured using the federal poverty line, income, and unemployment (e.g., the CDC's Index of Local Economic Resources [Casper et al., 2002]). We also used U.S. Census measures for the ZIP code's median household income (in tens of thousands of dollars) and percentage of adults with a college degree.

Residential Mobility—Our focal variable was residential mobility across early childhood. At Waves 2 through 5, parents were asked if they had moved since the last interview and, if they moved in Waves 2 through 4, how many times they moved. If respondents moved in the year between Waves 4 and 5, we assumed 1.33 moves, which was the average number of moves in the preceding year from Wave 3 to Wave 4 among those who moved (this was

[1]Supplemental analysis compared children who remained in the sample and those who were omitted because of attrition across waves or because of the mother not responding to the survey. There was no significant difference between the two groups in the number of early moves (from birth to Wave 1). Additional supplemental analyses omitted the approximately 350 children who had a valid kindergarten teacher weight but whose biological mother did not respond at one or more waves. Relationship direction and significance was identical, and coefficient size changed very little.

rounded to 1 for categorical measures). Respondents reporting at Wave 2 they had not moved since Wave 1 but had moved since the child's birth were assigned 1 move for the approximately 10 months between birth and Wave 1. Several longitudinal mobility measures were created from this information and examined in separate models. First, we summed responses across all waves, which likely undercounts moves slightly but captures birth to kindergarten start. The highest number of moves reported was 25. We top coded moves at 10 because just 0.4 percent of cases reported more than 10 moves. Second, to allow for nonlinearity in the effect of residential moves, we categorized the number of moves as 0, 1, 2, 3, and 4 or more (with 0 as the referent because all other categories represent some degree of residential mobility). Alternative specifications in supplementary analyses created categories for 5 or more, and 6 or more, moves. Third, we categorized residential mobility by move distance and quality. We compared residential location at Wave 1 and kindergarten, classifying children as nonmovers, experiencing "improvement" moves (a decrease in the ZIP code Townsend Index of material deprivation or an increase in median household income), experiencing "deterioration" moves (an increase in the Townsend Index of material deprivation or a decrease in median household income), or movers staying in the same ZIP code. The comparison between this group and the nonmovers allowed us to disentangle the consequences of moving houses from those of also moving neighborhoods (with ZIP codes as a proxy). Alternative specifications in supplemental analyses captured other cutoffs.

Dependent Variables—Our primary outcome is the ECLS-B-constructed socioemotional functioning scale measured at kindergarten start, based on teacher reports (see Najarian et al., 2010). Each child's kindergarten teacher answered 22 questions about how frequently the child acted in certain ways, using a 5-point scale from "never" to "very often" (Cronbach's alpha=0.9). To capture children's overall socioemotional functioning, constructs included in the scale by ECLS-B were approaches to learning, internalizing and externalizing problem behaviors/feelings, prosocial skills, temperament, emotional knowledge, and friendship. For example, teachers reported how frequently the child shares belongings or volunteers to help others. Some items were taken from the Preschool and Kindergarten Behavior Scales—Second Edition, the Social Skills Rating System, and the Family and Child Experiences Study, and some items were developed for ECLS-B. Negative behaviors were reverse coded to make higher behavior scores represent more positive behavior. Teachers' responses were averaged and standardized with a mean of 0 and standard deviation of 1.

Additional analyses used four subscales that we identified from the items comprising the overall behavior scale using principal component analysis. The subscales emerged from the data to represent four dimensions of socioemotional functioning: externalizing, internalizing, and social behaviors, and approaches to learning (higher values indicate more favorable behaviors; Cronbach's alpha=0.9 for all subscales except the two-item internalizing subscale with a correlation coefficient of 0.7). Both using the overall scale and conducting analyses to break it into constructs are strategies recommended by ECLS-B (Najarian et al., 2010). Finally, analyses of cognitive outcomes used ECLS-B's direct kindergarten assessments of children's early reading and math skills, measured as standardized scores (Najarian et al., 2010).

Analysis Plan

All analyses adjusted for complex survey design with Stata's *svy* commands using ECLS-B probability weights and corrections for clustering and stratification. Analyses included teacher-reported measures and restricted the sample to children with participating teachers. Although some children were lost to attrition or subsampling from budget constraints, the resulting analyses are representative of the cohort (Snow et al. 2009). All relationships reported in the text are statistically significant unless otherwise noted. Supplemental analyses found that the average number of residential moves was not different between eligible children whose teachers participated in the study and those without teacher reports. Because of the sample design of the study, there were not enough participants per ZIP code to permit multilevel analyses.

Descriptive analyses compared nonmovers to movers grouped by move frequency. The results of descriptive analyses made it clear that nonmovers, occasional movers, and frequent movers differed systematically, so multivariate models must account for confounding influences on residential mobility when estimating its consequences for early development.[2] We estimated weighted ordinary least squares regression models for the standardized socioemotional behavior outcome, including a variety of demographic and geographic controls as well as infant cognitive and behavior scores. Additional analyses assessed the behavior subscales and early reading and math. To test the hypotheses, different longitudinal measures of mobility were entered into the models separately. A move frequency measure tested Hypothesis 1, nonlinear (categorized) move frequency tested Hypothesis 2, and move distance and quality together tested Hypotheses 3 and 4. The final models included interactions between residential mobility and family socioeconomic status, testing Hypothesis 5.

We used multiple imputation (the *mi* commands in Stata) to fill in all missing data and retain the approximately 5,050 eligible cases. We implemented an MCMC approach using the *mi impute mvn* command, creating 10 datasets. Race/ethnicity, age, gender, region, mother's marital status, mother's education, income-to-needs ratio, number of other children in the household, and kindergarten behavior were missing less than 1% of cases, and teen parent status, urbanicity, mover status, Wave 1 behavior score, Wave 1 cognitive score, and all ZIP code measures were missing less than 5%. Behavior subscales at the kindergarten wave were missing between 1 and 4%. Auxiliary variables used for multiple imputation included Wave 3 behavior, household size, and household primary language.

[2]Because of our more complicated operationalizations of residential mobility that assess linear and nonlinear relationships, move quality, and move distance across early childhood, other approaches isolating causal estimates such as propensity scores cannot be implemented: There was not a single dichotomous treatment or exposure, and we have few pretreatment characteristics (from before the child's birth) to estimate the likelihood of mobility. Others have made great strides disentangling causality from selection in the implications of residential mobility, so we chose to focus on dynamic operationalizations of mobility instead, though we control for a host of characteristics that might shape mobility and behavior.

Results

Descriptive Analyses

Early childhood is a highly mobile life stage, with the average child experiencing 1.71 moves, 71 percent of children moving at least once, and 14 percent of children moving 4 or more times between birth and kindergarten (see descriptive information and significance tests in Table 1). Comparing the baseline characteristics of movers and nonmovers identifies selection processes. Nonmovers were disproportionately not Black, not teen parents, and had higher socioeconomic status (SES) compared to the overall population. In contrast, frequent movers (who moved at least 4 times) had the lowest SES, the highest proportions of single and cohabiting mothers at birth, and more frequently came from suburban and rural rather than urban areas. The most frequent movers disproportionately came from the West. Those who had moved once lived in the highest-income neighborhoods in kindergarten, and frequent movers had the lowest neighborhood income.

Continuous Move Frequency

Table 2 reports the association between a child's number of residential moves and behavior score in regression models, supporting *Hypothesis 1*. The unadjusted relationship (not shown) indicates that the predicted behavior score decreased by 0.07 standard deviations with each additional move, a coefficient that was reduced to 0.04 after including controls at the individual, family, and ZIP code levels (Model 1). To contextualize the size of this relationship, the effect of an additional residential move in Model 2 was larger than the effect of a 1-point increase in the household income-to-needs ratio.

Nonlinear Move Frequency

Hypothesis 2 expected nonlinearity in the negative relationship between residential moves and kindergarten readiness, with negative effects most concentrated among children with the highest frequency of moves. In Table 2, the adjusted Model 2 identified a nonlinear relationship between moves and behavior scores. Children who experienced 1 or 2 residential moves had behavior scores that were not significantly different from those of nonmovers. In contrast, children experiencing 3 moves had behavior scores that were 0.16 standard deviations lower, and children experiencing 4 or more moves had scores that were 0.25 standard deviations lower, than those of nonmovers. The latter was similar to the effect of having a single mother at birth or a mother with a high school diploma compared to an advanced degree. Supplemental post hoc F-tests (that assume the between-imputation variance is proportional to the within-imputation variance) found that differences between 1 or 2 moves and 3 or more moves were significant. Additional supplemental analyses introduced a category for 5 or more moves, then a category for 6 or more moves, but these categories had smaller coefficients than and were not significantly different from 4 moves. Finally, a supplemental model included a quadratic term for moves instead of categorizing the number of moves, finding a significant nonlinear relationship (linear term coefficient was −0.12 and quadratic term was 0.01).

Move Distance

Hypothesis 3 posited that within-neighborhood residential moves would be less consequential for children's kindergarten readiness than moves in which children changed neighborhoods. Children who moved between Wave 1 and kindergarten but whose ZIP code remained the same comprised 26 percent of the sample (supplemental analysis). Comparing children's ultimate residence at kindergarten start to their residence in infancy at Wave 1, Table 2 shows that initial negative associations between a within-ZIP-code move and behavior scores (not shown) were fully accounted for by controls (Models 3 and 4), making the behavior scores of children who moved within their ZIP code statistically indistinguishable from those of nonmovers. This finding supports the hypothesis.

Move Quality

The same models assess *Hypothesis 4*, which focuses on the quality of residential mobility, distinguishing between the neighborhood of origin and the neighborhood of destination. The hypothesis expects that children whose residential moves involve a change in neighborhood resources will experience stronger associations of residential moves with behavior than nonmovers, within-neighborhood movers, and movers between socioeconomically similar neighborhoods. Supplemental analysis showed that 26–27 percent of children experienced a "deterioration" move to a more disadvantaged neighborhood and 17–18 percent experienced an "improvement" move to a more advantaged neighborhood. A "deterioration" move was associated with significantly lower behavior scores compared to not moving: Children who moved to a ZIP code that had a higher level of deprivation compared to their origin had behavior scores in kindergarten that were 0.16 standard deviations below those of nonmovers, and those who moved to a ZIP code with a lower median income had behavior scores that were 0.14 standard deviations lower than nonmovers. Post hoc F-tests found that "deterioration" moves were also significantly more negative for behavior scores than within-ZIP-code moves. This negative, substantial effect of "deterioration" moves supports the hypothesis. Model 6 also shows that children moving from more disadvantaged to more advantaged ZIP codes ("improvement" moves) did not have significantly different behavior scores compared to nonmovers. These results imply that the socioeconomic context of a residential move is important for understanding its behavioral consequences.

Supplemental models (see Table A1) examined alternative operationalizations for deterioration and improvement. Results were similar for a model examining whether the destination neighborhood had a median household income that was $2,000 greater or lesser than the origin neighborhood, or within $2,000 of the origin. A similar approach adding a "stable" deprivation index category had slightly different results, with those moving to neighborhoods within 2 index points of their origin neighborhood demonstrating significantly lower behavior scores, and deterioration moves significant at $p<.10$.

Differences by Socioeconomic Status

Anticipating that social advantage will buffer negative implications of residential mobility, *Hypothesis 5* states that socioeconomically advantaged children should experience fewer negative effects of residential moves than those with less advantage. Table 3 summarizes the interaction models. The findings did not support the hypothesis. Interactions between the

count of residential moves and family SES (parental education and income-to-needs ratio) were not significant. Instead, these models demonstrated that the negative relationship between residential moves and socioemotional behavior scores was similar for children with different SES levels. These findings do not support the hypothesis.

Additional Outcomes

Beyond the analyses of the composite behavior scale reported above, we analyzed its four subscales: externalizing, internalizing, and social behavior, and approaches to learning (see Table A2). Three subscales—externalizing and internalizing behavior and approaches to learning—had similar coefficient sizes in the expected directions for the continuous move measure in Model 1, Table A2 (coefficients of 0.04, 0.02, and −0.03 respectively). Social behavior was not significantly predicted by the move count. The same three subscales were significantly related to unusually high frequencies of moves in Model 2, with 4 or more moves predicting a 0.21-standard-deviation increase in the externalizing behavior scale, a 0.15-standard-deviation increase in the internalizing behavior scale, and a 0.18-standard-deviation decrease in the approaches to learning scale. The fairly similar effects across multiple dimensions of socioemotional behavior, together with the overall measure's high reliability, support the appropriateness of the overall behavior score for the main analyses.

Beyond the realm of behavior, additional analyses examined cognitive outcomes: early reading and math scores in kindergarten (see Table A3). Unlike behavior scores, neither was related at $p<.05$ to the main (continuous and categorical) residential mobility measures after accounting for controls.

Alternative Sources of Instability

A final set of supplemental analyses (not shown in tables) examined other sources of instability in children's environments to assess whether they could explain the relationship between residential mobility and behavior. When counts of changes to coresident adults of various types, coresident children, mother's paid work status, type of child care arrangement, and time spent in nonparental child care were introduced into Table 2, Model 2, none of the other types of instability were significant predictors and the coefficient for the count of moves was only slightly smaller than in Table 2, Model 2. Thus, we do not find evidence that other types of instability are connected to the relationship between residential moves and child behavior.

Discussion

Previous research in the U.S. has found that residential mobility in early childhood is different than in other life stages. Moving is more common (Coley & Kull, 2016), and families tend to move to more advantaged neighborhoods (Lawrence, Root, & Mollborn, 2015). Even in middle childhood, moves do not look the same (Root & Humphrey, 2014) as in early childhood. Thus, early childhood residential moves may have distinct developmental implications. Our nationally representative analyses found that despite the typically upwardly mobile moves in terms of neighborhood quality, there was a negative relationship between moving and socioemotional behavioral functioning—but not cognitive scores—

across different subgroups of children. Ziol-Guest and McKenna (2014) and Coley and Kull (2016) also found that moving more often in earliest childhood predicted compromised behavior, but for the former study the relationship held only among poor children. This study's negative associations between mobility and behavior, but not cognition, echo Coley and Kull's (2016) findings. This may be because family disruptions often have stronger implications for behavior than for cognitive or academic outcomes, as discussed above. The net effect sizes of move frequency counts on child behavior were very similar between our study and the other nationally representative study measuring early childhood moves, despite its retrospective reports that likely undercounted short-term moves (Coley & Kull, 2016).

By operationalizing residential mobility in different ways, our analyses discovered that residential mobility only predicted young children's socioemotional behavior scores when they experienced high levels of mobility, changed neighborhoods, or moved to a neighborhood with lower socioeconomic status. These findings further support the need to examine residential mobility in early childhood as a distinct phenomenon.

Similar to others' findings, our measures of the neighborhood-, family-, and child-level selection of children into residential mobility partially explained the initially negative relationships between mobility and behavior scores. This held true across all dynamic measures of residential mobility: total number of moves, nonlinearity of move counts, move distance, and neighborhood quality of moves. Yet there were significant negative relationships between each measure of mobility and behavior scores, even after including individual- and neighborhood-level controls. Interestingly, socioeconomically advantaged children were not protected from the negative implications of moves. Because of the competing implications of socioeconomic status for the effects of instability described above, it is possible that opposing processes canceled each other out in their effects. It is also possible that the instability implications of repeated moves are similar regardless of children's background.

The observed consequences of mobility appear to be driven by families who moved unusually frequently or to different neighborhoods that were more socioeconomically disadvantaged. Research incorporating single, linear measures of residential mobility is likely grouping together diverse events that have different consequences, and a more nuanced approach is key. Future research should work to integrate these dynamic operationalizations of residential mobility with more nuanced methods for isolating causal effects, such as propensity scores or instrumental variables. Although some effect sizes were modest, others (such as high move frequency) were larger and were similar in size to important demographic predictors known to shape child behavior.

An additional consideration for future research is potential differences in the implications of moves at different points in early childhood, a life course stage marked by considerable physiological, developmental, and social change. We were unable to disentangle effects of move timing from move frequency given our data. Hopefully future research will investigate potential heterogeneity in the implications of residential moves at different developmental phases of early childhood. Future research should also examine how kindergarten behavior

resulting from residential mobility changes or persists as children grow. School readiness has important implications in general (Entwisle, Alexander, & Olson, 2004), but the early negative effects of nonparental child care on behavior did not persist as positive cognitive effects did (NICHD Early Child Care Research Network, 2016; Vandell et al., 2010), showing that some early contextual effects on behavior can fade out over time.

In several ways, these findings support the growing body of theory that articulates an instability perspective for understanding child development. Some residential moves should be more likely than others to result in greater instability to children's contexts and resultant disruptions to family processes, and we found that it was indeed such moves that were associated with compromised behavior scores. Repeated moves (at least three during early childhood), moves to a different neighborhood, and moves from more resource-advantaged to resource-disadvantaged neighborhoods were all expected to introduce instability, and each predicted lower behavior scores. In contrast, infrequent moves and moves within the same neighborhood or to a socioeconomically similar or more advantaged neighborhood did not have significant implications for children's kindergarten behavior scores compared to not moving, which makes sense given the lower levels of instability in which such moves would likely result. Because any residential move does introduce some element of instability in a child's life, though, it is interesting that some types of moves were not detrimental for kindergarten behavior. This speaks potentially both to the upwardly mobile nature of many early childhood moves and to children's resilience in dealing with the high levels of change that are a statistically normative aspect of early childhood in the United States today (Mollborn 2016). Future research should incorporate a broader instability perspective that encompasses both residential moves and other kinds of change. Some new work, such as that by Coley, Lynch, and Kull (2015) and Mollborn (2016), is beginning to make strides in this area.

This study suggests that a blanket proscription against residential mobility is not a promising policy solution, but neither is an unequivocal promotion of moves as a way out of social disadvantage and its negative developmental implications. Housing policies that promote stability while encouraging upwardly mobile moves for those who desire them seem promising. For example, the Moving to Opportunity experiment conducted a lottery among interested families to facilitate upwardly mobile moves, resulting in some positive effects for children despite the attendant instability (Chetty et al., 2016). Our findings suggest that by identifying children who are particularly at risk for a compromised kindergarten start based on their residential mobility history, early educators could target children for extra support. Unfortunately, it is the frequent and inter-neighborhood movers who are both most at risk and least likely to stay in the same place long enough to reap the benefits of an intervention. Thus, targeting the underlying social conditions and disadvantages that cause both childhood moves and behavior issues may be a more promising route for policy.

Our findings also suggest that neighborhood social and structural conditions have a measurable impact on child well-being. The finding that children living in more disadvantaged neighborhoods have poorer behavioral outcomes is not new (Leventhal & Brooks-Gunn, 2000). But much of the research on neighborhoods has not examined the *combined* implications of mobility and neighborhood context for early childhood well-

being. New research has found that residential instability among one's neighbors, not just in one's own family, matters for children and adolescents, decreasing the quality of parent-child relationships (Riina, Lippert, & Brooks-Gunn, 2016). Our findings show that residential mobility itself–especially high levels of residential mobility–negatively predicts children's socioemotional development. But residential mobility also continually shapes and reshapes the structures, conditions, and composition of the neighborhoods within which families live. This suggests that there may be an impact of moving above and beyond what is expected by the instability perspective, which focuses on the disruption to traditional family processes. Moving can also translate into a different neighborhood environment within which a family must navigate unfamiliar social structures, develop new social ties, and discover available resources. This "neighborhood chaos," while not adequately measured in this study's data, could add a new dimension to the potentially negative effect of high levels of early childhood mobility. Not only do high levels of residential mobility throughout early childhood matter, but our study suggests an additive influence of moves to socioeconomically disadvantaged neighborhoods.

Future research should continue to examine the motivations for and consequences of residential moves in early childhood. Understanding the other life stages and changes in which moves are embedded for a family may contribute to a more nuanced understanding of their implications. As we know, families are embedded in neighborhood environments that provide social and structural support mechanisms, and disrupting these mechanisms may add to the complexity of the relationship between mobility and child well-being. Because processes around selection into moves during early childhood are likely to be different than in later life stages, statistical methods and datasets that better account for selection and capture why families do or do not move would improve our understanding. Studying how residential mobility shapes children's selection into elementary schools is another promising avenue of research. As we begin to understand the many contingencies around the implications of the common experience of residential mobility, research will increasingly be able to inform education and housing policies.

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Table 1

Means of Wave 1 control, Wave K ZIP code, and outcome variables, overall and within each mover status

			Mover status				
	Overall Sample	**SD**	**Nonmover**	**Moved once**	**Moved twice**	**Moved 3 times**	**Moved 4+**
Proportion of sample			0.29	0.28	0.18	0.11	0.14
Number of moves (0–10)	1.71	1.79	0.00	1.00	2.00	3.00	5.14
ZIP Code Characteristics (Wave K)							
Deprivation index (−5.12 – 16.62)	1.25	2.52	1.26	1.20	1.31	1.26	1.26
Median HH income (6.96 – 185.47)	4.57	1.76	4.71	4.77*	4.50	4.41	4.10*
% with college degree+ (0 – .81)	0.23	0.15	0.25	0.23	0.21*	0.21*	0.25
Controls							
Race/Ethnicity							
NH White°~	0.54		0.61	0.56	0.48	0.46	0.50
Non-Hispanic Black°	0.13		0.10*	0.12	0.17*	0.16*	0.15
Hispanic°	0.26		0.23	0.24	0.27	0.31*	0.29
Other°	0.07		0.06	0.08	0.08	0.07	0.06
Teen parent°	0.13		0.04*	0.07*	0.15*	0.17*	0.35*
Male°	0.52		0.51	0.50	0.55*	0.53	0.53
Child age in months (Wave 1)	10.47	1.95	10.24*	10.44	10.47	10.71*	10.65*
Child age in months (Wave K)	68.15	4.42	67.82*	68.12	68.00	68.53*	68.73*
Mom’s education							
Less than high school°	0.18		0.13*	0.13*	0.21*	0.23*	0.31*
High school diploma/GED°	0.33		0.28*	0.33	0.34	0.34	0.39*
Some college°	0.24		0.24	0.26	0.22	0.28*	0.21*
College degree°	0.16		0.22*	0.17	0.15	0.11*	0.07*
Advanced degree°~	0.09		0.13	0.11	0.08	0.04	0.02
Income-to-needs (.06 – 19.02)	2.88	2.78	3.49*	3.39*	2.46*	2.06*	1.91*
Relationship status at birth							

			Mover status				
	Overall Sample	**SD**	**Nonmover**	**Moved once**	**Moved twice**	**Moved 3 times**	**Moved 4+**
Married°~	0.65		0.81	0.73	0.59	0.53	0.44
Cohabiting°	0.22		0.12*	0.18*	0.26*	0.31*	0.33*
Single°	0.13		0.07*	0.09*	0.15*	0.16*	0.23*
# other children (Wave 1)	0.15	0.60	0.07*	0.09*	0.24*	0.20*	0.29*
Region (Wave K)							
Northeast°~	0.16		0.22	0.18	0.14	0.10	0.10
Midwest°	0.22		0.23	0.20	0.21	0.20	0.24
South°	0.38		0.33*	0.37	0.41*	0.46*	0.38
West°	0.24		0.22	0.25	0.24	0.24	0.28*
Urbanicity (Wave K)							
Urban area°~	0.72		0.71	0.76	0.70	0.71	0.64
Urban cluster°	0.12		0.10	0.10	0.14	0.15*	0.16*
Rural°	0.17		0.19	0.15	0.17	0.14*	0.21*
Cognitive score (Wave 1; −3.39 – 4.95)	0.18	0.98	0.13	0.18	0.17	0.22	0.25
Behavior score (Wave 1; −3.75 – 1.96)	0.10	0.96	0.11	0.14	0.07	0.12	0.07
Not biomom at one wave or more°	0.07		0.05*	0.07	0.06	0.06	0.09*
Outcomes (Wave K)							
Overall behavior (−3.8 – 2.0)	0.03	1.00	0.15*	0.12*	0.04	−0.15*	−0.26*
Externalizing behavior (1 – 5)	1.90	0.77	1.81*	1.83*	1.90	2.07*	2.11*
Internalizing behavior (1 – 5)	1.98	0.78	1.92*	1.96	1.93*	2.07*	2.12*
Approaches to learning (1 – 5)	3.93	0.85	4.02*	3.99	3.92	3.79*	3.71*
Social behavior (1 – 5)	3.61	0.76	3.65	3.65	3.62	3.60	3.47*

Source: ECLS-B

Notes: Adjusted for complex sampling design. Range for continuous variables given in parentheses. SD = standard deviation.

°Denotes yes/no variable.

~Referent, no significance tests.

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*Mean is outside 95% confidence interval of overall sample mean.

N≈5,050. Means are given within each of the mover status categories.

Table 2

OLS regression coefficients predicting standardized kindergarten behavior scores by move frequency and move quality

	Model 1	Model 2	Model 3	Model 4
Number of moves total	−0.04*** (0.01)			
Number of moves (nonmover)				
Moved once°		0.00 (0.05)		
Moved twice°		0.01 (0.07)		
Moved three times°		−0.16**a (0.06)		
Moved 4+°		−0.25***a (0.06)		
Move quality (nonmover)				
Improvement in deprivation index°			−0.06 (0.05)	
Deterioration in deprivation index°			−0.16**b (0.05)	
Move within same zip code°			0.01 (0.05)	
Move quality (nonmover)				
Improvement in median household income°				−0.07+ (0.04)
Deterioration in median household income°				−0.14*b (0.06)
Move within same zip code°				0.01 (0.05)
ZIP Code at Wave K				
Deprivation index	−0.01 (0.01)	−0.01 (0.01)		−0.01 (0.01)
Median household income	0.00 (0.02)	0.01 (0.02)	0.02 (0.02)	
% college degree	−0.01** (0.00)	−0.01* (0.00)	−0.01 (0.00)	−0.01** (0.00)
Controls				
Race/Ethnicity (NH White)				
Non-Hispanic Black°	0.02 (0.07)	0.01 (0.07)	0.00 (0.07)	0.02 (0.07)
Hispanic°	0.10* (0.05)	0.10* (0.05)	0.08 (0.05)	0.11* (0.05)
Other°	0.01 (0.05)	0.00 (0.05)	0.00 (0.05)	0.01 (0.05)
Male°	−0.49*** (0.04)	−0.48*** (0.04)	−0.48*** (0.04)	−0.49*** (0.04)
Teen parent°	0.03 (0.08)	0.04 (0.08)	0.00 (0.07)	0.00 (0.07)

	Model 1	Model 2	Model 3	Model 4
Age at Wave 1	−0.10*** (0.02)	−0.09*** (0.01)	−0.10*** (0.02)	−0.10*** (0.02)
Age at Wave K	0.03*** (0.00)	0.03*** (0.00)	0.02*** (0.00)	0.02*** (0.00)
Relationship status at birth (Married)				
Cohabiting at birth°	−0.16* (0.06)	−0.16* (0.06)	−0.18** (0.06)	−0.18** (0.06)
Single at birth°	−0.30*** (0.07)	−0.30*** (0.07)	−0.32*** (0.07)	−0.32*** (0.07)
Income-to-needs at Wave 1	0.03*** (0.01)	0.03*** (0.01)	0.03*** (0.01)	0.04*** (0.01)
Mom's education at Wave 1 (Advanced degree)				
Less than high school°	−0.16+ (0.09)	−0.15 (0.09)	−0.18+ (0.10)	−0.18+ (0.10)
High school diploma/GED°	−0.23** (0.08)	−0.22** (0.08)	−0.24** (0.08)	−0.24** (0.08)
Some college°	−0.16* (0.08)	−0.15+ (0.08)	−0.17* (0.08)	−0.17* (0.08)
College degree°	0.00 (0.08)	0.00 (0.08)	0.00 (0.08)	0.00 (0.08)
# other children at Wave 1	0.03 (0.03)	0.03 (0.03)	0.03 (0.03)	0.03 (0.03)
Region at Wave K (Northeast)				
Midwest°	−0.11 (0.07)	−0.11 (0.07)	−0.10 (0.07)	−0.12+ (0.07)
South°	−0.11+ (0.06)	−0.11+ (0.06)	−0.09 (0.06)	−0.11+ (0.06)
West°	−0.05 (0.07)	−0.05 (0.07)	−0.06 (0.06)	−0.06 (0.07)
Urbanicity at Wave K (Urban area)				
Urban cluster°	0.01 (0.07)	0.02 (0.07)	0.02 (0.06)	−0.01 (0.07)
Rural°	−0.07 (0.07)	−0.06 (0.07)	−0.06 (0.06)	−0.08 (0.06)
Cognitive score at Wave 1	0.21*** (0.03)	0.21*** (0.03)	0.21*** (0.03)	0.20*** (0.04)
Behavior at Wave 1	0.04* (0.04)	0.04* (0.02)	0.05* (0.02)	0.04* (0.02)
Not biomom at one wave or more°	−0.31*** (0.06)	−0.31*** (0.06)	−0.29*** (0.06)	−0.29*** (0.06)
Constant	−0.10 (0.33)	−0.17 (0.33)	−0.12 (0.33)	−0.02 (0.33)

Source: ECLS-B.

Notes: Adjusted for complex sampling design. N≈5,050. Standard errors in parentheses.

[a] Significantly different from 1 or 2 moves.

[b] Significantly different from within-ZIP-code moves.

° Denotes yes/no variable.

+ p<.10

* p<.05

** p<.01

*** p<.001

Table 3

OLS regression coefficients predicting standardized kindergarten behavior scores, with interactions

	Model 1	Model 2
Number of moves total	−0.06 (0.05)	−0.02^{+} (0.01)
Mom's education at Wave 1 (advanced degree)		
Less than high school$^{\circ}$	−0.17 (0.10)	
High school diploma/GED$^{\circ}$	−0.25** (0.09)	
Some college$^{\circ}$	−0.18^{+} (0.10)	
College degree$^{\circ}$	0.00 (0.08)	
Mom's education*moves		
Less than high school*moves	0.01 (0.05)	
High school diploma/GED*moves	0.02 (0.05)	
Some college*moves	0.02 (0.05)	
College degree*moves	0.01 (0.05)	
Income-to-needs at Wave 1		0.04*** (0.01)
Income-to-needs*moves		−0.01 (0.01)

Source: ECLS-B. N≈5,050. Standard errors in parentheses. Models include full set of controls (deprivation index, median household income, % in ZIP with college degree, male, race/ethnicity, teen parent status, age at Wave 1, age at Wave K, relationship status at birth, income-to-needs at Wave 1, mother's education at Wave I, region at Wave K, urbanicity at Wave K, cognitive score at Wave 1, behavior at Wave 1, and not biological mother at one wave or more).

$^{\circ}$Denotes yes/no variable.

Notes: Adjusted for complex sampling design.

$^{+}$p<.10

*p<.05

**p<.01

***p<.001

Table A1

OLS regression coefficients predicting standardized kindergarten behavior scores, by alternative move quality specifications

	Model 1	Model 2
Move quality (nonmover)		
Improvement in deprivation index of 2+	−0.07	
Deterioration in deprivation index of 2+	−0.12+	
Deprivation index stayed within 2 points	−0.14*	
Same ZIP code	0.01	
Move quality (nonmover)		
$2000 increase in median household income		−0.09+ (0.04)
$2000 decrease in median household income		−0.17** (0.06)
Difference in income is between −$2000 and +$2000		−0.01 (0.08)
Same ZIP code		0.01 (0.05)
ZIP Code at Wave K		
Deprivation index		−0.01 (0.01)
Median household income	0.02 (0.02)	
% college degree	−0.01** (0.00)	−0.01** (0.00)
Controls		
Race/Ethnicity (NH White)		
Non-Hispanic Black°	0.00 (0.07)	0.02 (0.07)
Hispanic°	0.08+ (0.05)	0.11* (0.05)
Other°	−0.01 (0.04)	0.01 (0.05)
Male°	−0.49*** (0.04)	−0.49*** (0.04)
Teen parent°	−0.01 (0.08)	−0.01 (0.08)
Age at Wave 1	−0.09*** (0.02)	−0.09*** (0.02)
Age at Wave K	0.02*** (0.00)	0.02*** (0.00)
Relationship status at birth (Married)		
Cohabiting at birth°	−0.17** (0.06)	−0.17** (0.06)
Single at birth°	−0.31*** (0.07)	−0.31*** (0.07)

	Model 1	Model 2
Income-to-needs at Wave 1	0.04*** (0.01)	0.04*** (0.01)
Mom's education at Wave 1 (Advanced degree)		
Less than high school°	−0.18+ (0.10)	−0.18+ (0.10)
High school diploma/GED°	−0.23** (0.08)	−0.24** (0.08)
Some college°	−0.16* (0.08)	−0.17* (0.08)
College degree°	0.01 (0.08)	0.00 (0.08)
# other children at Wave 1	0.03 (0.03)	0.03 (0.03)
Region at Wave K (Northeast)		
Midwest°	−0.10+ (0.07)	−0.12+ (0.07)
South °	−0.09+ (0.06)	−0.11+ (0.06)
West°	−0.06 (0.06)	−0.06 (0.07)
Urbanicity at Wave K (Urban area)		
Urban cluster°	0.01 (0.06)	−0.01 (0.06)
Rural°	−0.05 (0.06)	−0.08 (0.06)
Cognitive score at Wave 1	0.20*** (0.03)	0.20*** (0.03)
Behavior at Wave 1	0.05* (0.02)	0.05* (0.02)
Not biomom at one wave or more°	−0.29*** (0.06)	−0.30*** (0.06)
Constant	−0.16 (0.33)	−0.06 (0.33)

Source: ECLS-B.

+ p<.10

* p<.05

** p<.01

*** p<.001

Notes: Adjusted for complex sampling design. N≈5,050. Standard errors in parentheses.

° Denotes yes/no variable.

Table A2

OLS regression coefficients predicting kindergarten behavior subscales

	EXTERNALIZING		INTERNALIZING		APPROACHES TO LEARNING		SOCIAL	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Number of moves total	0.04*** (0.01)		0.02* (0.01)		−0.03*** (0.01)		0.00 (0.01)	
Number of moves (nonmover)								
Moved once		0.01 (0.04)		0.03 (0.04)		0.00 (0.05)		0.02 (0.04)
Moved twice		0.02 (0.05)		0.00 (0.05)		0.00 (0.05)		0.05 (0.05)
Moved three times		0.19*** (0.05)		0.12* (0.06)		−0.12* (0.05)		0.04 (0.05)
Moved 4+		0.21*** (0.05)		0.15* (0.06)		−0.18*** (0.04)		−0.07 (0.06)
ZIP Code at Wave K								
Deprivation index	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	0.00 (0.01)	−0.01 (0.01)	−0.01 (0.01)	−0.02+ (0.01)	−0.02+ (0.01)
Median household income	−0.02 (0.01)	−0.02 (0.01)	−0.02 (0.02)	−0.02 (0.02)	0.00 (0.02)	0.00 (0.02)	−0.01 (0.02)	−0.02 (0.02)
% college degree	0.00** (0.00)	0.00** (0.00)	0.00 (0.00)	0.00 (0.00)	0.00* (0.00)	0.00* (0.00)	0.00 (0.00)	0.00 (0.00)
Controls								
Race/Ethnicity (NH White)								
Non-Hispanic Black	0.05 (0.06)	0.05 (0.06)	−0.14* (0.05)	−0.13* (0.05)	0.00 (0.06)	−0.01 (0.06)	0.04 (0.05)	0.04 (0.05)
Hispanic	−0.10* (0.04)	−0.10* (0.04)	−0.10* (0.04)	−0.09* (0.04)	0.03 (0.04)	0.03 (0.04)	0.05 (0.04)	0.04 (0.04)
Other	−0.06 (0.05)	−0.05 (0.05)	−0.06 (0.04)	−0.06 (0.04)	0.01 (0.04)	0.00 (0.04)	−0.06 (0.04)	−0.06 (0.04)
Male	0.40*** (0.03)	0.40*** (0.03)	0.09** (0.03)	0.09** (0.03)	−0.33*** (0.03)	−0.33*** (0.03)	−0.28*** (0.03)	−0.28*** (0.03)
Teen parent	0.00 (0.06)	0.00 (0.06)	0.03 (0.06)	0.02 (0.06)	0.05 (0.06)	0.06 (0.06)	0.02 (0.05)	0.04 (0.05)

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	EXTERNALIZING		INTERNALIZING		APPROACHES TO LEARNING		SOCIAL	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Age at Wave 1	0.04** (0.01)	0.04** (0.01)	0.01 (0.02)	0.01 (0.02)	−0.10*** (0.02)	−0.10*** (0.02)	−0.07*** (0.01)	−0.07*** (0.01)
Age at Wave K	−0.01*** (0.00)	−0.01*** (0.00)	0.00 (0.00)	0.00 (0.00)	0.03*** (0.00)	0.03*** (0.00)	0.02*** (0.00)	0.02*** (0.00)
Relationship status at birth (Married)								
Cohabiting at birth	0.11* (0.05)	0.10* (0.05)	0.07 (0.04)	0.06 (0.04)	−0.13* (0.05)	−0.13* (0.05)	−0.09* (0.04)	−0.09* (0.04)
Single at birth	0.21** (0.06)	0.21*** (0.06)	0.09+ (0.05)	0.09+ (0.05)	−0.26*** (0.06)	−0.26*** (0.06)	−0.15** (0.06)	−0.15** (0.06)
Income-to-needs at Wave 1	−0.02* (0.01)	−0.02* (0.01)	−0.02** (0.01)	−0.02** (0.01)	0.02** (0.01)	0.02** (0.01)	0.02*** (0.01)	0.03*** (0.01)
Mom's education at Wave 1 (Advanced degree)								
Less than high school°	0.05 (0.07)	0.05 (0.07)	−0.02 (0.08)	−0.02 (0.08)	−0.18* (0.08)	−0.17* (0.08)	−0.14* (0.07)	−0.13+ (0.07)
High school diploma/GED°	0.12+ (0.06)	0.12* (0.06)	0.07 (0.06)	0.06 (0.06)	−0.23** (0.07)	−0.22** (0.07)	−0.13* (0.07)	−0.13+ (0.06)
Some college°	0.11+ (0.06)	0.10+ (0.06)	0.05 (0.06)	0.04 (0.06)	−0.16* (0.07)	−0.16* (0.07)	−0.07 (0.06)	−0.06 (0.06)
College degree°	0.02 (0.06)	0.02 (0.06)	0.01 (0.06)	0.01 (0.06)	−0.03 (0.07)	−0.03 (0.07)	0.05 (0.06)	0.05 (0.06)
# other children at Wave 1	−0.03 (0.03)	−0.03 (0.03)	−0.09** (0.03)	−0.09** (0.03)	−0.01 (0.03)	−0.02 (0.03)	0.00 (0.03)	0.00 (0.03)
Region at Wave K (Northeast)								
Midwest°	0.03 (0.05)	0.03 (0.06)	−0.01 (0.04)	−0.01 (0.04)	−0.07 (0.07)	−0.08 (0.07)	−0.11* (0.05)	−0.11* (0.05)
South °	0.08 (0.05)	0.08 (0.05)	−0.01 (0.04)	−0.01 (0.04)	−0.05 (0.06)	−0.05 (0.06)	−0.07 (0.05)	−0.08 (0.05)
West°	0.03 (0.06)	0.03 (0.06)	−0.01 (0.04)	−0.01 (0.04)	0.03 (0.07)	0.03 (0.07)	−0.08+ (0.05)	−0.08+ (0.05)
Urbanicity at Wave K (Urban area)								
Urban cluster°	−0.04 (0.06)	−0.04 (0.05)	0.00 (0.05)	−0.02 (0.05)	0.00 (0.06)	0.01 (0.05)	−0.03 (0.05)	−0.02 (0.05)
Rural°	0.03 (0.05)	0.03 (0.05)	0.05 (0.05)	0.05 (0.05)	−0.07 (0.06)	−0.06 (0.06)	−0.03 (0.05)	−0.02 (0.05)

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	EXTERNALIZING		INTERNALIZING		APPROACHES TO LEARNING		SOCIAL	
	Model 1	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Cognitive score at Wave 1	−0.10*** (0.03)	−0.10** (0.03)	−0.01 (0.03)	−0.01 (0.03)	0.20*** (0.03)	0.20*** (0.03)	0.15*** (0.03)	0.15*** (0.03)
Behavior Wave 1	−0.02 (0.02)	−0.03 (0.02)	−0.01 (0.02)	−0.01 (0.02)	0.03* (0.02)	0.04* (0.02)	0.03+ (0.02)	0.03+ (0.02)
Not biomom for one wave or more°	0.28*** (0.06)	0.30*** (0.06)	0.09 (0.07)	0.09 (0.07)	−0.19*** (0.05)	−0.20*** (0.05)	−0.13* (0.05)	−0.12* (0.05)
Constant	2.00*** (0.24)	2.05*** (0.24)	1.87*** (0.30)	1.94*** (0.30)	3.64*** (0.27)	3.62*** (0.27)	3.67*** (0.31)	3.64*** (0.31)

Source: ECLS-B.

Notes: Adjusted for complex sampling design. N≈5,050. Standard errors in parentheses.

°Denotes yes/no variable.

+ p<.10

* p<.05

** p<.01

*** p<.001

Table A3

OLS regression coefficients predicting child cognitive scores

	EARLY READING						EARLY MATH					
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Number of moves total	−0.01 (0.01)				0.01 (0.04)	−0.02 (0.01)	−0.01 (0.01)				0.02 (0.05)	−0.03* (0.01)
Number of moves (nonmover)												
Moved once		−0.01 (0.04)						−0.02 (0.04)				
Moved twice		0.02 (0.05)						0.07 (0.05)				
Moved three times		0.06 (0.06)						0.06 (0.06)				
Moved 4+		−0.08 (0.05)						−0.06 (0.06)				
Move quality (nonmover)												
Improvement in deprivation index			−0.03 (0.05)						−0.04 (0.04)			
Deterioration in deprivation index			−0.04 (0.05)						−0.02 (0.05)			
Move within same zip code			0.02 (0.05)						0.05 (0.04)			
Move quality (nonmover)												
Improvement in median household income				−0.03 (0.05)						−0.04 (0.04)		
Deterioration in median household income				−0.03 (0.05)						0.00 (0.04)		
Move within same zip code				0.02 (0.05)						0.05 (0.04)		
Mom's education at Wave 1 (advanced degree)												
Less than high school°					−0.69*** (0.11)						−0.63*** (0.10)	
High school diploma/GED°					−0.43*** (0.09)						−0.42*** (0.08)	
Some college°					−0.29** (0.10)						−0.29** (0.09)	

	EARLY READING						EARLY MATH					
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
College degree°					−0.17+ (0.09)						−0.18* (0.08)	
Mom's education * moves												
Less than high school * moves					0.00 (0.05)						−0.03 (0.05)	
High school diploma/GED * moves					−0.04 (0.05)						−0.05 (0.05)	
Some college * moves					−0.03 (0.05)						−0.01 (0.05)	
College degree * moves					0.00 (0.05)						0.00 (0.05)	
Income-to-needs at Wave 1						0.04*** (0.01)						0.03** (0.01)
Income-to-needs * moves						0.00 (0.00)						0.01* (0.00)

Source: ECLS-B.

Notes: Adjusted for complex sampling design. Standard errors in parentheses. Models include full set of controls (deprivation index, median household income, % in ZIP with college degree, male, race/ethnicity, teen parent status, age at Wave 1, age at Wave K, relationship status at birth, income-to-needs at Wave 1, mother's education at Wave I, region at Wave K, urbanicity at Wave K, cognitive score at Wave 1, behavior at Wave 1, and not biological mother at one wave or more), except Models 3 do not include the deprivation index at Wave K and Models 4 do not include the median household income at Wake K. N≈5,050.

°Yes/no variable.

+p<.10

*p<.05

**p<.01

***p<.001