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# Residential Mobility and Delinquent Behaviors in Adolescence

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RESIDENTIAL MOBILITY AND DELINQUENT BEHAVIORS IN  
ADOLESCENCE

By

BRANDI PARKER COTTON

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

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## **Abstract**

Residential mobility has been associated with a host of negative outcomes for children. For low-income families, the context of the move is often unrelated to significant gains; instead, mobility is driven by negative external forces. The term “residential instability” has been used to describe this type of mobility pattern, yet the concept is vague and poorly defined in extant literature. Three separate studies were conducted. Study 1 was a systematic review using The Guidelines for Meta-Analyses and Systematic Reviews of Observational Studies. Study 2 used the Wilsonian method to develop a definition of residential instability. Study 3 was an empirical study to examine the effect of residential mobility and housing instability on delinquent behaviors among at-risk sample of adolescents with prenatal exposure to cocaine and/or opiates who participated in the longitudinal Maternal Lifestyle Study (MLS). The systematic review of 23 studies supported the research aim of Study 3. The Wilsonian analysis resulted in a definition of residential instability. Secondary analysis of 736 adolescents in the MLS demonstrated an association between residential mobility and housing instability and delinquent behaviors among adolescents across the sample, including crimes against people, vandalism, and school delinquency. Together, these three studies present a synthesis of the science, clarification of concepts, and demonstrate that housing problems are a compelling risk factor for delinquent behaviors among youth. Findings from these studies highlight the critical contextual influences that vulnerable families routinely encounter. These findings inform clinical practice and emphasize the role of housing as an important determinant for adolescent wellbeing.

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## Preface

When children move frequently, there is a disruption in all things familiar in their homes, neighborhoods, and schools. Residential mobility has been associated with a host of negative outcomes for children, ranging from problems with social adjustment to lower-than-expected academic progress (Adam & Chase-Landsdale, 2002; Herbers et al., 2012). Scientific inquiry on this topic spans various academic disciplines and uses a variety of methodological approaches. Due to the multi-disciplinary scope of interest, and the broad range of research questions, a systematic review of the literature is needed to evaluate evidence and summarize findings on the association between residential mobility and social behaviors of adolescents.

Creating additional stress on families, moving potentially disrupts social relationships and academic learning trajectories. Yet not all residential mobility is negative; many families move to increase social, academic, or financial capital; in these cases, relocation brings invaluable benefits. For low-income families, however, the context of the move is often unrelated to significant gains; instead, mobility is driven by negative external forces. For these families, mobility offers little benefit and requires selecting a new residence with little planning, time, or resources. The term “residential instability” has been used to describe this type of mobility pattern, yet the concept is vague and poorly defined in extant literature.

Lastly, while there is research showing correlational effects between highly mobile families and social adjustment problems in children (Adam & Chase-Landsdale, 2002), research gaps remain. Particularly, the impact of residential mobility and housing instability on delinquent behaviors among adolescents with in-utero exposure to cocaine

and/or opiates has yet to be explored. As a population at-risk for adverse outcomes, it is unknown how residential mobility influences behaviors such as substance use initiation and delinquency for youth with prenatal exposure.

This dissertation, in manuscript format, will address the following aims: 1) to systematically review the topic of residential mobility and social behaviors of adolescents; 2) to apply the Wilsonian method for concept analysis to develop a definition of residential instability with contextual sensitivity for use within research and clinical practice; and 3) to determine the influence of residential mobility and housing instability on delinquent behaviors among an at-risk sample of adolescents with prenatal exposure to cocaine and/or opiates.

The first two studies are explorative given the state of knowledge on residential mobility, therefore posing hypotheses is inappropriate. The hypothesis for study 3 poses that higher rates of residential mobility and housing instability are more likely to increase delinquent behavior among adolescents prenatally exposed to cocaine and/or opiates.

The methodology was chosen according to the best fit for the research question. For Study 1, a systematic review was conducted using the MOOSE Guidelines for Meta-Analyses and Systematic Reviews of Observational Studies. For Study 2, The Wilsonian method offered a compelling technique for developing a definition of a concept and was used to develop a definition of residential instability. For Study 3, logistic regression was used to determine the association between residential mobility and housing instability and delinquent behaviors among adolescence using longitudinal data from The Maternal Lifestyle Study.



Together, these three studies contribute to the scientific literature through synthesis of the science, clarification of concepts, and by demonstrating that housing problems are a compelling risk factor for delinquent behaviors among adolescents. Findings from these studies highlight the compelling contextual influences that vulnerable families routinely encounter and emphasize the important intersection of housing and wellbeing.

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**MANUSCRIPT – 1**

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**Residential mobility and social behaviors of adolescents: A systematic literature  
review**

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## **Abstract**

The association between residential mobility and negative behaviors in adolescence has attracted multi-disciplinary attention. The purpose of this paper is to conduct a systematic literature review to identify research published between 1995 – 2015 that measured residential mobility and at least one social behavior among participants age 11 thru 18 years. A systematic search strategy within four major databases yielded a total of twenty-three studies. Results indicate that both residential and school mobility are associated with negative behaviors among adolescents. Potential mediating effects are also identified and discussed. Findings suggest the need for improved screening measures in clinical and educational settings in order to identify at-risk youth.

## **1.1 Introduction**

Recent interest in the effect of residential mobility and housing context has grown substantially and represents a broad range of interdisciplinary interest. The sociological determinants of health are compelling; integrating care with a focus on these social determinants, however, is a challenge within clinical practice.

Two literature reviews on residential mobility and health correlates have been previously published. The first, Jellyman and Spencer (2008), focused on studies of residential mobility within a broad range of health outcomes while Leventhal and Brooks-Gunn (2010) reviewed literature pertaining to housing and child development. In the past several years, however, numerous studies have been published which explored this topic further, with improved methodology and more targeted questions.



The aim of this review is to synthesize literature related specifically to residential mobility and social behaviors of adolescence including peer networking, school victimization, externalizing behaviors, delinquency, adolescent pregnancy, and substance abuse initiation. Only studies which measured individual-level residential mobility (as opposed to neighborhood-level residential mobility) are the subject of this review.

## **1.2 Methods**

### *Search Strategy*

The following search engines were used: Web of Science, CINAHL, Pubmed, and PsychINFO using the following search terms: “residential mobility” OR “residential instability” OR “housing instability” AND adolescent OR adolescence. Articles were selected for review based on the following inclusion criteria: 1) studies published between 1995 and 2015 which measured residential mobility during 0 – 18 years of age as an independent variable 2) included at least one social behavior (either observed or self-reported) measured between 11 and 18 years of age and 3) published in English within peer-reviewed journals. Exclusion criteria included studies which 1) explored the effect of residential mobility as a covariate within a statistical model and 2) explored solely mental health outcomes, cognitive abilities or academic achievement (including high school attrition/drop out). Studies which measured multiple variables are included, but only findings that meet inclusion criteria are discussed. Due to the interdisciplinary scope of this topic, and the broad use of surrogate terminology, the reviewer hand-searched references of included articles to identify studies excluded from the initial search strategy described above.

### 1.3 Results

A Total of 500 titles and abstracts were reviewed in full. (Pubmed n = 117, Web of Science n =143, CINAHL n =75, and PsychINFO n =165 ). Articles were selected for topical relevance (Pubmed n = 24, Web of Science n = 11, CINAHL n =3, and PsychINFO n = 15) and were screened for duplicates. References were hand-searched and one additional article was identified which yielded a total of 23 articles meeting inclusion criteria.

Table 1.1 Residential Mobility and Social Behaviors among Adolescents

Authors, Date	(N=)/Ages	Mobility Measurement	Research Design/ Statistical Method	Strengths	Limitations	Findings
Adam and Chase-Landsdale (2002)	N= 267/ 15-18 years	# of moves in previous 5 years	Cross-sectional/ Hierarchical Linear Regression	Controlled for familial relationships (parental separations in detail) and quality of relationships (peers and family) networks	Small sample size, cross-sectional design	Residential mobility increased risk for externalizing and sexual behaviors
Anderson, Leventhal, Dupéré, (2014)	N= 1,056/ 3 group (birth - 54 month grade K - 6 and grade 7 - age 15 years)	At least one change in block group within each of three periods	Longitudinal/ Structural Equation Modeling	Controlled for family process and family structural changes, developmental perspective	Only measured mobility between block groups, not within, therefore potentially underestimating mobility measurements	Residential mobility associated with internalizing behaviors among adolescents
Boon, (2011)	N= 1,050/ 12 – 15 years	# of students who moved once	Cross-sectional/ Structural Equation Modeling	Controlled for family problems	Cross-sectional design precludes determination of causality, lack of context for	Suspensions higher for students associated with school transfers

					reason for move	
Brown, Benzeval, Gayle, Macintyre, O'Reilly, and Leyland (2012)	N=850/ 18 years	# of address changes 0-18 years/ # of school changes	Longitudinal /Multi-level Re-gression	Controlled for family process and socioeconomic status	Lack of contextual information regarding moves/ did not distinguish between school moves which accompanied residential moves	3 or more moves increased risk for illegal substance use
Buu DePiaa, Wang, et al., (2009)	N=220/ 18-20 years	# of lifetime moves	Longitudinal/ Poisson regression model	Controlled for family processes	Small sample size, lack of generalizability	Mobility increased nicotine use
Coley, Leventhal, Lynch, and Kull (2013)	N= 2,437/ Mean Age 10.33 years (SD 5.36)	Moved during the past year	Longitudinal/Hierarchical linear model	Controlled for between-child effects as well as within-child effects, decreasing selection bias, controlled for confounding	Sample targeted high-poverty neighborhood therefore less generalizable	Mobility increased externalizing behaviors for between-child effects/ mobility, decreased externalizing behaviors within-child effects
Crowder and Teachman (2004)	N= 1,361 /Age 15.26 (SD 1.87)	Number of moves between neighborhoods	Longitudinal / Discretionary event history models/ Logistic regression	Design utilized geocodes, allowing for rich contextual data regarding quality of neighborhoods and degree of disadvantage	Only measured moves between neighborhoods, not within	Number of inter-neighborhood residential changes was associated with premarital pregnancy
Dong, Anda, Felitti, Williamson, Dube, Brown, and Giles (2005)	N= 3,753 0-18 years	# of moves during childhood: 1-3; 4-7; or ≥ 8 moves	Retrospective Cohort Study	Large sample size	Data not collected on when moves occurred, recall bias, lacking data on temporal ordering of variables (i.e. did moves	Mobility not associated with early sexual initiation, adolescent pregnancy, suicide attempts or

					occur before or after adverse experience)	additive behaviors; attenuated by adverse childhood experiences
Flouri, Marvovelli, and Midouhas (2013)	N=23,162/ Mean Age Mean5.20 (SD 3.05) 0-18 years	Moved between Wave 1 and Wave 2 (span of approximately two years)/?	Longitudinal /Multi-level modeling	Large sample size, Controlled for quality of neighborhood and housing conditions	No data on school mobility	Mobility increased externalizing behaviors
Foster and Brooks-Gunn (2013)	N=1,425/8 and 11 years	# of moves between waves (0-5 moves)	Longitudinal / Hierarchical Linear Modeling	Strong theoretical framework, ecological approach of individual, family, school, and neighborhood factors	School victimization relied on caregiver reports therefore potentially underestimating effect size	Mobility increased risk for school victimization, neighborhood residential mobility further increased risk for mobile students
Fowler, Henry, Schoeny, Taylor, and Chavira, (2014)	N=2,422/ Ages 4-16 years	>3 moves during infancy; # of moves within past 12 months at baseline	Longitudinal / Linear Mixed Modeling	Categorical age variable: preschool 4-6 years; middle 7-10 years and adolescent 11-14 years offered developmental perspective,	Unique sample of children under investigation for abuse or neglect limits generalizability	Mobility associated with externalizing behaviors for 1)preschoolers and adolescents, no effects for school-age children, 2) mobility within first year of life, and 3) more recent moves
Fomby and Sennott (2013)	N=1,260/ Ages 12 – 14 years (n=460) and 15-	# of local, long-distance moves; # of school changes before age 14	Longitudinal / Poisson regression	Measured school mobility and long-distance moves; controlled for peer and familial issues	Data lacking on timing of both residential moves and school moves	School mobility increases risk for problem behaviors among

	17 years (n=800)	and during ages 15-17				young, adolescent females (not males), also attributable to peer pressure for negative behaviors
Gasper, DeLuca, and Estacion (2010)	N=4,947 Ages 12-17 years	1 residential move vs no move and 1 non-normative school change vs no change since last interview	Longitudinal / Random Effects Model	Measured both residential and school mobility; measured both between-child and within-child changes	Lack of data on timing of school or residential moves	School mobility increased odds for delinquent behaviors between-child (those who changed schools vs those who did not), but did not demonstrate a relationship within-child effects (did not increase risk on an individual level)
Gillespie (2013)	N=2835/Ages 6-15	Did not move/ moved locally/ long-distance move	Longitudinal /Linear Mixed Modeling	Develop-mental perspective, analyzed local vs long-distance move	Only children of female respondents interviewed	Negative effects of mobility are more pronounced when adolescents are relocating to a new city, country, or state
Haynie and South (2005)	N=4,862/ Grade7-12	Moves with past year vs no moves	Longitudinal/ Regression analysis	Strong theoretical framework, Large, diverse sample	Measured only recent moves, cross-sectional design	Mobile adolescents more likely to experience premarital intercourse

						between first and second wave of survey
Haynie and South (2005)	N=8,038/ Grade7 -12	Moves with past year vs no moves	Longitudinal / Multivariate analysis	Strong theoretical framework, Large, diverse sample	Measured only recent moves, cross-sectional design	Mobility associated with higher rates of violence; association with friends involved in social deviance an important mediator
Haynie, South, and Bose (2006)	N=12,000/ Grade7 -12	Moved with the past year vs no moves	Longitudinal/Regression analysis	Strong theoretical framework, Large, diverse sample	Measured only recent moves, cross-sectional design	Social networks of mobile peers demonstrate less engagement with school and more deviant behavior that persists for years. Effects were equal among boys/girls and younger/older teens
Lee (2007)	N=2,621/ Ages 12-17	Number of residential moves in past 5 years	Cross-sectional/Logistic regression	Large sample size	Cross-sectional design and lack of information regarding neighborhood context.	Hispanic adolescents who moved four or more times more likely to smoke and use marijuana compared to non-movers
Norford and Medway (2002)	N=408 Ages Grade1 0-12	“any residential relocation during	Cross-sectional/Multi-variate analysis	Controlled for adolescent shyness, SES,	Did not measure residential mobility that	No evidence of school mobility

		school-age years that necessitated a change in schools;" early pattern movers as students who moved before 7 <sup>th</sup> grade		and family cohesion	did not result in school change, small sample size, sample limited to 1 US city so lack of generalizability	effect on social support or extracurricular activities
Porter and Vogel (2014)	N=11,464 Grade7-12	Moved between census tracts during Waves of Study	Longitudinal/ Propensity Scores	Included participants' desire to move, satisfaction with housing and neighborhood, propensity scores allowed the measure of unobserved variables between movers and non-movers	Measured single moves only without measuring effect of multiple moves	Mobility determinants differ between movers and non-movers. Mobility and association with delinquency and violence attenuated by controlling for these differences
Sharkey and Sampson (2010)	N=1,645 Ages cohort of 9 and 12 years	Mobility defined as change in census tracts	Longitudinal/ Cross-classified model	Cross-classified model which allowed for data clustering of time points within subjects and within neighborhoods; extensive control of individual and neighborhood confounders	No available data on contextual reason for move	Youth moving within Chicago metropolitan area demonstrated an increased risk of violence exposure: moving outside Chicago decreased risk
South and Haynie (2004)	N=12,931 Ages Grade7-12	Mobility measured as having lived in residence for the past 2 years or having moved	Cross-sectional/ Logistic regression and linear regression	Large, diverse sample size, controlled for confounding variables such as two-parent family versus single parent family	Cross-sectional design, broadly defined measurement of moves (within the past 2 years), lack of	Students who moved recently had smaller friendship networks, less prestigious positions within

					context for move	networks, and parents were less knowledge able about their friendships
Thorlindsso n, Valdimarsdo tti, and Jonsoon (2012)	N= 6,818 15 and 16 years	Mobility measured as changes in neighbor- hood in past 12 months	Hierarchical regression models	Measured individual and neighbor-hood variables, included social capital variables (parental engagement, involvement in community)	Cross- sectional design, lack of generaliz- ability to rural areas	Residential mobility on individual and neighborho od level associated with adolescent smoking

## 1.4 Data Analysis

### *Assessment of Articles*

Each article meeting inclusion criteria was appraised using the MOOSE Guidelines for Meta-analysis and Systematic Reviews for Observational Studies (Stroup, Berlin, Morton, Olkin, Williamson, Rennie, & Moher, 2000). Studies were assessed for methodological soundness, bias, confounding, and generalizability and are discussed below. Strengths and weaknesses of each study reviewed are listed on Table 1.1.

### *Social Networks*

Several studies have measured residential mobility and the effect on adolescent peer networks. South and Haynie (2004) used cross-sectional data (N=12,931) from the National Longitudinal Study of Adolescent Health (*Add Health*) which sampled participants representing middle schools and high schools across the U.S. Adolescents who had moved were more likely to be isolated, less popular, have fewer friends, and occupy less prestigious or central social positions within the friendship network. However, contrary to this, Norford and Medway (2002) found no significant association



between residential mobility and degree of social support in a group of adolescents (n=408) attending grades 10-12. Both studies controlled for confounding such as adolescent shyness, socio-economic status, and family cohesion, but several key differences are noted in the research design. First, there was a considerable sample size difference between the two studies: N=408 (Norford & Medway, 2002) compared to N=13,000 (South & Haynie, 2004). Secondly, Norford and Medway (2002) summed only moves which required a non-normative school transfer, but not residential moves. Additionally, the timing of moves was defined broadly as “early pattern movers” (students who moved before the 7<sup>th</sup> grade), versus “later pattern movers” which is problematic when attempting to capture temporality between mobility and outcomes. Finally, the Add Health data sampled 132 schools across the U.S. while the comparative study was localized to one U.S. city.

In addition to peer networking, one study looked at the rate of school victimization and association with mobility. Foster and Brooks-Gunn (2013) conducted a study of participants (n=1425) and used hierarchical linear modeling to demonstrate that school victimization is indeed associated with residential mobility on both an individual and neighborhood level. Specifically, researchers found that mobile children were at increased risk for school victimization and that mobility within residentially unstable neighborhoods (e.g. percentage of residents who have moved in the past five years and percentage of homeowners) further increased risk to approximately 20%. This study had several strengths including a strong theoretical framework (Social Disorganization Theory and Ecological Systems Theory) which supported a longitudinal perspective and ecological approach to hierarchical modeling. Researchers controlled for confounding

factors on both the individual and neighborhood level. One limitation to this study is that reports of school victimization relied on primary caregiver reports and were potentially underestimated.

### *Delinquent and Externalizing Behaviors*

Nine studies explored the relationship between mobility and delinquent and/or externalizing behaviors, with eight studies supporting a significant association and one study finding no relationship. Fomby and Sennott (2013) used data from two interconnected surveys: The National Longitudinal Survey of Youth (NSLY) (N=12,686), and the children of participants from the NLSY, converged to create a new longitudinal study the CNSLY, offering a unique vantage points on controlling for intergenerational characteristics. Researchers calculated both residential and school changes as well as changes within familial processes (maternal marriage, separation), and children's relationships with peers, and problem behaviors such as theft, vandalism, and physical aggression towards others. Findings suggest that school mobility increased risk for problem behaviors among younger adolescent females, although more robust effect sizes were found for other contributing factors, namely peer pressure which increased negative behaviors. Residential mobility, however, was not significantly associated with outcome measurements. One strength of this study is that researchers had access to both residential moves and school transfers, transitions which are posited to have different potential effects on experiences (Gasper et al., 2010.) One limitation of this study is that data were not available on timing for either school or residential mobility preventing a temporal account of transitions and problem behaviors.

Coley et al. (2013) also explored residential mobility longitudinally with participants ( $n=2,437$ , mean age, 10.33, SD 5.36) using data from *The Three-City Study* to assess the association between housing contexts and externalizing behaviors. Results supported that children who moved more frequently demonstrated more externalizing problems than other children, partially mediated by maternal stress. However, contrary to researchers' hypothesis, within-child residential mobility was associated with a decline in behaviors from the child's baseline symptoms, unexplained by family processes. The within-child and between-child comparison was a strength of this study to help eliminate selection bias. The study also had measures of housing context, including condition of the residence and burden of rent, adding important attention to context. Researchers found that poor quality housing was the most significant predictor of children's outcomes for both within-person and between-person shifts above that of residential mobility. There were two limitations to this study: first, the sample included only participants from high poverty neighborhoods, therefore limiting generalizability, and research design did not measure non-normative school changes.

School delinquency has been explored through several studies. Boon (2011) analyzed the impact of school mobility on school delinquency using Structural Equation Modeling. Results found that suspensions were higher for mobile students than for non-mobile students, and found that coping strategies were an important mediating factor for mobile students to maintain high achievement. The study design controlled for familial structure problems and was limited by an absence of contextual reasons for moves, as well as unmeasured variables, such as cognitive limitations that may have impacted results. Similarly Gasper, DeLuca, and Estacion (2010) conducted a study of almost

5000 participants and found that both residential mobility and school mobility were associated with delinquent behavior, capturing contemporaneous effects of both housing and school mobility on adolescent delinquency. School mobility increased the odds for delinquent behaviors to approximately 22 %. However, researchers used a random effects model to test for a causal relation, which captured both the differences between-person changes and within-person changes and concluded that the increase in delinquency is related to unobserved characteristics in mobile, delinquent youth but found no evidence that mobility actually *increases risk*. Strengths of this study include a longitudinal design and selection of a hybrid random effects model which tested between student differences as well as individual-specific changes. Finally, the data allowed for researchers to assess the impact of both residential and school mobility within one large sample.

A study conducted within the United Kingdom demonstrated similar findings. Flouri et al., (2013) sought to explore the association between residential mobility and neighborhood deprivation on behavior and found that mobility was associated with externalizing behaviors. A large sample size (n=23,162) and longitudinal design were strengths of the study. Researchers also attempted to measure confounding including quality of neighborhood and housing condition. One significant limitation to this study was lack of data measuring school mobility.

Using data from *Add Health* (described above), Haynie, South, and Bose (2006) explored a similar question with adolescents (n=12,000). Findings support that mobile adolescents are at higher risk for behavioral problems and are often networked with peers who demonstrate less school engagement and higher rates of problem behaviors. One

unique finding in this study was that both males and females were effected as well as both younger and older adolescents. In a similar study, again using data from Add Health, Haynie and South (2005) found that mobile adolescents exhibited higher rates of violence when compared to non-movers. Researchers found that effects were stronger for females than for males and for older adolescents when compared to younger. Researchers also determined that schools with higher levels of mobility effect both newly-admitted and tenured students with both groups demonstrating smaller networks, fewer friendship nominations, and less prestige compared with less mobile schools. Strengths of this study were the large sample size, and strong theoretical framework. Another strength of this study was the utilization of *Add Health*, a longitudinal, multi-site study with used a large, diverse sample of over 132 middle and high schools across the U.S. The large sample and degree of geographical and socio-economic diversity allows for more generalizability than observed in other studies.

One study using *Add Health* data found the relationship between residential mobility and delinquent behaviors was attenuated by differences between mobile and non-mobile participants. Porter and Vogel (2013) sampled participants (n=11,464) and demonstrated that the association between residential mobility and delinquency and violence was attenuated once the statistical model controlled for inherent differences between movers and non-movers. Using propensity scores to adjust regression models for these differences, results supported the null hypothesis. This study had several strengths: research design included the desire to move and satisfaction with home and neighborhood as a measure of likelihood of moving. Using both a longitudinal design

and propensity scores allowed for rich contextual data that assists in explaining previously unmeasured variables inherent between movers and non-movers.

Two additional studies examined the relationship between mobility and violent behaviors. First, Sharkey and Sampson (2010) posed an important question to determine the effect of both mobility and neighborhood context to assess the effect on violent behavior in Chicago among adolescents (n=1,645). Results support that adolescents who moved out of the Chicago metropolitan area into other areas within Chicago demonstrated an increased risk for exposure to violence whereas those who moved into suburban areas demonstrated a decreased risk of violence exposure as well as violent offending. This study had several strengths including longitudinal design, a cross-classified model which allowed for data clustering of time points within subjects and within neighborhoods, and an extensive modeling of covariates which controlled for a broad scope of possible confounders. Additionally, South and Haynie (2005) found that mobility was associated with higher rates of violence, and that socially-deviant peers were an important mediator. This study, however, did not have extensive control over neighborhood factors as demonstrated in Sharkey and Sampson (2010).

#### *Adolescent Substance Use*

A study in Scotland (Brown, Benzeval, & Gayle, 2012) analyzed the impact of residential mobility from birth to 18 years using multilevel regression to assess for residential mobility and relationship to substance use. Researchers sought to explore the impact of residential mobility beyond school mobility. Findings from the sample (n=850) indicate that three or moves was associated with illegal substance compared to those with no moves. Strengths of this study include an effort to control for confounding

variables such as family structure and socioeconomic status. One limitation of this study is that data did not distinguish between residential moves that contemporaneously occurred with school moves. Another study by Lee (2007) also found an association between high frequency mobility and gateway drug use among Hispanic adolescents. Limitation to this study was a cross-sectional design and lack of information regarding neighborhood context.

Residential mobility and smoking has also been explored by two studies: Buu et al., (2009) sampled children of parents with alcoholism and demonstrated that residential moves were associated with nicotine use but not other substance abuse. Although a strength of this study was a birth -18 longitudinal research design which minimized the potential for recall bias, the sample was relatively small (n=220), participants were all white males, and stringent recruitment criteria potentially created selection bias. In a much larger sample population (n=6,818), Thorlindsson, Valdimarsdottir, and Jonsson (2012) studied Icelandic adolescents and found that residential mobility was associated with daily smoking on both the individual level (adolescents who had moved within the past 12 months) and on the neighborhood level (greater percentage of newcomers). A strength of this study was the consideration of both micro- and macro-level factors of tobacco use, large sample set, and control of confounding. One limitation is cross-sectional design and lack of generalizability to adolescents outside large Icelandic cities.

Three studies examined residential mobility as it relates to developmental timing from a longitudinal perspective. Fowler, Henry, Schoeny, Taylor, and Chavira (2014) conducted a study (n=2,422) using data from the National Survey of Child and Adolescent Well-Being. The sample targeted children at risk for abuse and neglect who

were under on-going investigation from the Department of Child Welfare. Researchers measured mobility at three time points during 36 months and compared mobility rates with externalizing behaviors. The analysis resulted in several significant findings: preschool children and adolescents were more at risk with increased externalizing behaviors when exposed to residential mobility. Effects were not significant among school children, 7 to 10 years of age, suggesting a developmental sensitivity for typically-vulnerable transitional periods of childhood. Additionally, early mobility (within the first year of life) increased risk for behavioral problems for preschool children that held constant over time. The study also demonstrated that immediacy (moves occurring within the previous 12 months) was significant for problem behaviors. One Limitation of this study is that the specific target population limits generalizability. Gillespie (2013) found that non-local moves (versus local moves) were associated with behavioral problems in children for a large sample (n=2,385). Using linear mixed modeling, author explored the effect of social capital on mobility for families who changed towns, cities, or countries. Findings suggest that geographic mobility is mediated in-part with families' social capital and that effects on adolescent behaviors lessens as children approach young adulthood.

Anderson, Leventhal and Dupéré (2014) analyzed a longitudinal data set of over 1,000 students to explore the effect of mobility with a focus on contextual family influences within a developmental context. Authors defined mobility as at least one change in block group (which represents approximately 600 to 3,000 inhabitants) (US Census Bureau, 1999) within early childhood, middle childhood, and adolescence and compared outcomes with non-movers. Using Structural Equation Modeling, researchers



found a relationship between residential mobility and internalizing behaviors in adolescence. This study controlled for confounding (both family process and structure) and the longitudinal context reduced recall bias. One strength was a longitudinal perspective which examined effects in early, middle childhood and adolescence, offering a developmental context. One limitation was that the definition of mobility (i.e. within block move) potentially underestimates the degree of mobility within the sample since only movement between –not within – block groups were measured.

### *Sexual Behaviors and Adolescent Pregnancy*

Three studies explored the association between adolescent sexual activity and adolescent pregnancy. Crowder and Teachman (2004) explored residential mobility and found that the number of inter-neighborhood residential changes was significant for premarital pregnancy. Authors controlled for confounders while also utilizing geocodes which allowed for measurement of quality of neighborhoods and degree of disadvantage. One limitation was that only moves between neighborhoods were observed as authors maintained that such neighborhood changes would have more potential disruption. Omitting moves within the same neighborhood, however, might have underestimated effect size. Research by South and Haynie (2005) also supported this finding that mobile adolescents were at increased risk for onset of sexual activity when compared to non-movers. Researchers found evidence that this risk was attributable to increased odds for delinquency among movers' friendship networks. Lastly, Adam and Chase-Landsdale (2002) also found that moving was associated with increased externalizing behaviors and sexual activity, even after controlling for quality of familiar relationships and peer networks.

## **1.5 Discussion**

A review of this literature highlights significant findings that reflect different theoretical and methodological approaches geared toward disentangling a complex and multi-faceted experience. First, the majority of studies have examined residential mobility as it impacts individuals with a focus on residential or school mobility, and, in some cases, both. Other studies have grappled with the effect of neighborhood context and concentrated disadvantage to explore the topic. Furthermore, it should be noted that several recent studies which made important contributions to this area of research were excluded from this review because of failure to meet criteria: for example, instead of measuring residential mobility as an independent variable, it was measured as one indicator within a broader cumulative risk index (Boynton-Jarrett et al., 2013; Bernburg & Thorlindsson, 2007) While these studies were not included in the review, and therefore, not discussed in detail, the extant literature suggests a new trajectory in this field of research which attempts to disentangle the effect of residential mobility within the broader ecological and psychosocial context.

## **1.6 Conclusion**

In spite of the different approaches, findings are consistent across disciplines and suggest that residential and school mobility are predictors of adolescent delinquency as either a direct consequence of mobility in and of itself or as an indirect consequence of other variables inherent within mobile families. In either case, the issue remains relevant to clinical practice. This review supports that screening for residential mobility and non-normative school transfers in children and adolescents will assist in identifying risk factors that pose barriers for health and wellbeing. Within clinical practice, routine

screening for depression and substance use is often a part of standard quality of care, yet screening for housing problems is not routinely included within a comprehensive care assessment in either the clinical or educational setting. This bespeaks the necessity of improving routine screening to include a housing history in order to identify at-risk youth. More broadly, it challenges current perspectives, policies and programming that have overlooked residential mobility as a determinant of health and at-risk behavior. The findings presented in this literature review suggest the need to improve holistic care for adolescents with a broader focus on these important health determinants.

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**MANUSCRIPT – 2**

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Residential instability among low-income families: A concept analysis

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## **Abstract**

Residential instability is relatively common among low-income families and is associated with a host of negative outcomes, especially for children and adolescents. Psychiatric nurses, especially those in the advanced practice role, observe the consequences of residential instability within the clinical setting. Yet, to-date, the concept is somewhat vague and its essential meaning and definition remain unclear. The aim of this paper is to develop a definition of residential instability using Wilson's method of concept analysis. An overview of historical perspectives is included. The paper concludes with recommendations for future research and application within clinical practice.

## **2.1 Introduction**

Difficulties securing and maintaining adequate housing in preferred neighborhoods is relatively common among low-income families. This is reflected in the clinical setting where it is not unusual to see school age children with histories of multiple residential changes experiencing the ripple of effects that ensue from parental loss of employment, unit deterioration, and escalating neighborhood violence. As a consequence, residential instability is associated with a host of adverse outcomes. The potential for disrupted peer relationships, adjustment problems and academic difficulties are serious. The commitment within nursing practice to provide holistic care with attention to the physical, psychological, and environmental domains confirms the need to clearly define and contextualize residential instability as a potential barrier to health and healing. This is particularly important for psychiatric nurses serving children and families within the advanced practice role. Yet, to-date, the concept of residential

instability is somewhat vague as various terms are used to refer to this phenomenon and its essential meaning and definition remain unclear. The purpose of this article is to develop a definition of residential instability based on an extensive review of multidisciplinary literature and the use of Wilson's concept analysis technique. Additionally, influencing factors and potential consequences of residential instability will be identified. The paper will end with a discussion of the potential implications for clinical practice.

## **2.2 Historical Overview**

The place, context, and tenure where one resides is deeply embedded within sociological and culture spheres. Developing a definition of residential instability requires attention to these shifting historical currents. Nomadic cultures have existed for centuries with impermanence of location an identifying characteristic of life and community. Traditional residentially-stable communities, such that populated medieval Europe, were marked by strong kinship and community ties (Oishi, 2010). Referencing the German philosopher and sociologist Ferdinand Tonnies's description of *gemeinschaft* (a non-mobile, traditional community) and *gesellschaft* (a modern, mobile community), Oishi (2010) explores this historical turning point as a shift from the relatively unchanging village life to the modern-day industrialized community with an increased emphasis on obtainment of individual goals and wishes. This sociological shift ripened communities for transience.

Residential mobility was eventually viewed as a contributor to social deviancy. Sociologists Shaw and McKay (1942) explored the role of residential mobility as a contributor to crime and deviant behavior. This ideology culminated in an effort to

distinguish causal links between higher rates of residential mobility and unwanted social outcomes. However, this trajectory changed in 1955, when Rossi published his now famous book, *Why families move: a study in the social psychology of urban residential mobility*. Residential mobility was then viewed as a typical response to life-stage events with the intent to increase satisfaction under dynamic contextual circumstances (Rossi, 1955).

Within this new scholarly trajectory, researchers attempted to describe models of migratory patterns, motivation, and predictors for moving (Walport, 1965). These early studies examined variables such as renter vs home-owner status and life cycle transitions (Spear, 1970). Spear (1974) applied the stress-threshold model to describe mobility as a response to environmental stress or dissatisfaction (Spear, 1974), positing that amenities and location such as size of home and yard, as well as distance from school, shopping, etc. were examples of driving forces behind residential change. This ideological framework assumed that opportunity-seeking behavior is the driving factor behind most residential mobility. The population moves to secure a higher-wage position or improve quality of life (Cadwallader, 1992; Cushing, 1999).

As a result of this change in perspective, the majority of research on this topic reflects the experiences of the nuclear family. This narrow focus omits relevant considerations. “Military families,” for example, illustrate atypical mobility patterns, moving as often as once every three years (Kelley, Finkel, & Ashby, 2003). Yet research exploring outcomes on military children have produced mixed findings. Several researchers found that frequent mobility creates more difficulties with academics and psychosocial domains while other researchers found that mobility promoted adaptation

and appreciation for other cultures (Jeffreys, Leitzel, & Cabral, et al. 1997; Kelley et al., 2003).

In spite of a century-long research interest, the contextual reasons that perpetuate residential instability for low-income, resource-constrained families have been largely overlooked. Building deterioration, eviction, financial hardship, and/or neighborhood violence reflect the contextual circumstances and external forces that precede moving (Bartlett, 1997; Deluca, Rosenblatt, & Wood, 2013; Schafft, 2006). More recently, Deluca, Wood, & Rosenblatt (2013) described the context of residential movement patterns among poor African Americans by reporting the contingent circumstances that motivate relocation, defined by the authors as *reactive mobility*. Unit failure was attributed to more than 25 % of all relocations and more than 80% of the population had moved for reasons beyond their control (Deluca, Rosenblatt, & Wood, 2013). Defined as an unexpected move, responsive moving typically necessitates a hasty selection of an alternative, affordable residence. This pattern often perpetuates neighborhood churning, defined as the phenomenon of families moving short distances for minimal gain. These families typically do not gain an improvement in amenities or increased satisfaction with housing or neighborhood (Coulton, Theodus, & Turner, 2012).

Residential instability as a phenomenon impacting low-income families challenges the more traditional understanding of residential movement as opportunity-seeking behavior. This shifting landscape exposes it as a concept that is inadequately defined in spite of ubiquity.

### **2.3 Residential instability: Current Uses and definitions of the Concept**

The concept of residential instability is ubiquitous yet the meaning is frequently taken for granted. Terminology applied to this phenomenon includes a broad range of surrogate terms. Terms such as *housing instability* (Reid, Vittinghoff, & Kushel, 2008), *churning movers* (Coulton et al., 2012) *high residential mobility* (Herbers et al, 2012), and *hyper-mobility* (Cohen & Wardrip, 2011), refer to an atypically higher rate of occurrence. Other researchers choose more neutral terms such as *residential mobility* (Coulton, Theodos, & Turner, 2012; Jellyman and Spencer, 2008; Oishi, 2010; Parente and Mahoney, 2009; Roy, McCoy, & Raer, 2014; Schafft, 2006; and South & Haney, 2004) or *school mobility* (Carson, Esbensen, & Taylor, 2013; Herbers, Reynolds, & Chin, 2013; Reem, 2005; Schafft, 2006, South & Haynie, 2004) to describe rates of residential relocation.

Housing instability and the above related terms capture various ways of describing and measuring the frequency of changes in residence without providing a definition of the concept itself. Most commonly, frequency of residential changes within a determined time frame is used without any reference to an existing definition of the phenomenon being measured. The exact number of moves indicating instability varies and depends on the research design. Walls (2003) and Black (2006) defined highly mobile students as those who changed residences six times from kindergarten through 12th grade. Other studies have defined housing instability as greater than three moves over the child's lifetime (Ziol-Guest & McKenna, 2014). In such cases, residential instability is defined a priori as a numerical value, without attention to the context of the move.

Several authors have defined residential instability within the larger concept of homelessness. Herbers et al. (2012) defined homelessness and high residential mobility as “living in a nonpermanent residence (e.g. shelter, hotel), on the street, in an abandoned building or other inadequate accommodation, doubled up with friends and family because they could not find or afford housing, or due to frequent changes of residence.” Ma, Gee, and Kushel (2008) created a 3-level variable to describe the housing status of participants in their study: 1) “housing stability” 2) “housing instability without being doubled up” and 3) “housing instability with being doubled up” (Ma et al., 2008). Similarly, Frederick, Chwalek, Hugher, Karabanow, and Kidd (2014) define housing stability as a spectrum of access: At one end of the spectrum is “complete stability,” defined as “access to housing of reasonable quality in the absence of threats.” At the other end is the extreme form of “complete instability” and is defined as “no access to housing of reasonable quality.” These measurements attend more to context, though do not reference any standard definition of the phenomenon.

The lack of a definition that is independent of time and space makes it difficult to compare findings across different settings and over time (Reynolds, 2007, p.52) and creates challenges when referencing this phenomenon as a risk factor for various health outcomes. The inconsistency in definition and measurement present in the literature creates ambiguity. Residential instability is not adequately defined by numeric counts of moves nor is it necessarily related to homelessness. Given the above, it became clear that a definition of residential instability needed to be developed.

## **2.4 Developing a definition of Residential Instability using Wilson's Concept**

### **Analysis**

Wilson (1963) offers a compelling technique for developing a definition of a concept. Wilson borrowed from real-world examples, drawing from situations which clearly reflected, contrasted with or closely aligned with the concept to develop a definition. These situations were labeled as model, contrary, borderline, and related cases. In this paper, illustrative examples from the principal author's clinical experiences as an advanced practice nurse are used to develop a definition of residential instability. The model case contains each of the essential components. However, what makes it a model case is clarified by the contrary case, which does not at all illustrate the concept, and the borderline case, which contains some – but not all – of the essential components. The related case further contributes to the development of the definition by illustrating a concept that is importantly connected to it. By describing each of these four cases, the essential components in the model case are clarified and converge into a theoretical definition.

### **Model Case**

Elijah is a 10 year old male living with his mother, maternal grandmother, and 13 year-old-sister. The family struggles financially with no savings and minimal income, but they have never experienced homelessness. They are behind on utility payments and have to apply food stamps with great care in order to secure food for the month. Elijah has moved 3 times in the past 2 years: the first move was due to deteriorating housing conditions in the rental unit the family had resided in since Elijah was born. The building was assigned for renovation and the family was given little notice to begin searching for



an alternative residence. The only available apartment that was affordable with the family's monthly income was outside of Elijah's school district which resulted in a school transfer and required that he share a bedroom with his mom and sister. After 6 months, Elijah's mom accepted a new job at higher pay working as a nursing assistant at a retirement home. Unfortunately, the facility was too far to walk and the family's apartment was not located on the bus route which prompted a hasty exploration of alternative apartments. The family's housing options were further restricted after learning that the security deposit would be not refunded as a consequence of early termination of the rental agreement. With few available options, the family selected a larger space in an attached row house close to mom's new job in a neighborhood with a reputation for high crime. The landlord agreed to waive the initial security deposit, instead allowing payment distribution over a six-month period. The crime rate was concerning and the move met another school transfer for the children, but Elijah's mom was relieved to find an apartment that would allow her to start the new job and receive sorely needed income that could be applied to past-due bills. Elijah's mom developed strict rules for him and his sister: the children were prohibited from playing outside alone and ever venturing out at night. Just after one year, Elijah and his mother were mugged on the street just before nightfall. Elijah began experiencing frequent nightmares, a startle response triggered by noise and strangers, and was afraid to leave his house for school. Mom decided that the current living situation was untenable and the family began another search for a new home.

As the model case for understanding the concept, it is clear that this family was experiencing residential instability. Each of the family's relocation was quickly followed

by another abrupt and unforeseen relocation. Unit deterioration, restricted housing choice, and neighborhood violence resulted in an unanticipated move which resulted in short-tenure. An essential component of the model case suggests that residential instability is marked by *abrupt, unforeseen changes in residence that result in short-tenure occupancies*.

### **Contrary Case**

Morgan is nine years old and lives with her biological mother and two siblings. Her mom is a single parent; while finances are tight, she receives financial and emotional support from Morgan's grandparents. Morgan's family has experienced high rates of residential mobility. The first move followed an offer for employment for her mom. The family was happy in their community but felt that the benefits of the job – and the opportunity for promotion - off-set the stress of relocating. The family arrived in the new city during the summer and rented a temporary apartment so that they could research neighborhood and schools before selecting a long-term rental. Morgan's mom selected a neighborhood within a promising school district and chose an upstairs apartment on a quiet street near a park where Morgan could skateboard. After one year, Mom received a considerable promotion at work. With her new salary, she qualified for a low-interest mortgage. Morgan's grandparents cosigned a loan in the same neighborhood and the family became first-time homeowners.

The contrary case is an example that does not reflect the essential components of the concept; by describing what residential instability *is not*, it further clarifies elements essential to the definition. From this example, a family has established a pattern of residential changes that resulted in short-tenure occupancies. Yet one critical difference

is clear: the changes in residence reflect moves of opportunity. Viable options were considered and decisions were made preferentially with control over location and timing of moves. In contrast to the model case, this family did not experience residential instability. As a result of this contrary case, another important component of the concept emerges: residential instability is defined as *changes in residence that are driven by imperative need*.

### **Borderline Case**

Alex is an 8-year-old Cape Verdean male who lives with his biological mother, Antonio, her partner of 5 years, and his 4 year old half-sister. His family has moved frequently. The first move was in response to an appointment with the pediatrician, who informed Alex's parents that his sister, 1 year of age at the time, had mildly elevated lead levels. The family attributed the lead exposure to exterior peeling paint. The landlord committed to repainting, but could not guarantee a completed project for another few months. It was winter and the children were not often outside, but the family decided it was best to move and established residence within one of the city's best school districts. Alex began attending his new school and adjusted well. One year later, Mom was delighted to learn that she was pregnant with her third child. The family's current apartment was large enough to accommodate a new family member, but mom preferred more outdoor space so they relocated to a home with a larger backyard. After several months in the new residence, the family became disgruntled when conflicts with neighbors ensued, largely due to late-night noise. After months of efforts to address the problem, the family began searching for another rental. It took several months before an

affordable apartment became available near Alex's school, but the family eventually secured a home that each member found satisfying.

This is a borderline case that reflects some – but not all – of the essential components of the concept. The family's mobility pattern reflects changes in residence that resulted in short-tenure occupancies. Two moves reflected an imperative need (lead hazards within the unit and escalating conflicts with neighbors). However, one relocation was intended to increase outdoor space - a desired, but unnecessary amenity. In this example, the borderline case highlights one additional feature present in the model case: residential instability is **a *patterning of moves driven by imperative need***.

### **Related Case**

Jessi is a six-year old female who is currently residing with her mom in a shelter for homeless families. She and her mother were referred to the shelter eighteen months ago after Jessi reported to the school social worker that the two had been living in the family's car for several days. Prior to this, the family had been living with mom's previous partner, with whom she had been involved with for the past two years until the physical abuse toward mom began to escalate. Worried about Jessi's safety and her own, mom left the home with Jessi and the two slept on a friend's couch for several weeks. Mom knew that it was not a permanent solution but was wary to enter a shelter. Eventually, the friend's landlord questioned why there were extra tenants in the rental and mom and Jessi left immediately, fearing eviction threats for her friend if they stayed. Mom presented to a women's domestic violence center for emergency placement. After one week, they were transferred to a family shelter where they will reside until a

subsidized apartment becomes available. The waitlist is long, and mom is prepared for an extended stay while awaiting permanent housing.

This related case further classifies a critical component of the concept of residential instability: the role of *residence* as an essential feature. Defined by Merriam-Webster, residence is “the place where one actually lives as distinguished from one's domicile or a place of temporary sojourn.” A homeless shelter, friend's couch, and automobile are temporary dwellings. Patterns of abrupt changes in residences are therefore not possible when no established residence exists. This case illustrates an important related concept: homelessness. Just as residential instability has not been clearly defined, the concept of homelessness has been reconceptualized. In a study examining the impact of life shocks on homelessness, Curtis, Corman, Noonan, and Reichman (2013) included a measurement of homelessness as defined by the Homeless Emergency Assistance and Rapid Transition to Housing (HEARTH) Act of 2010 which expands the traditional definition. The broader definition includes families with children who “(A) have experienced a long term period without living independently in permanent housing, (B) who have experienced persistent instability as measured by frequent moves over such period, and (C) can be expected to continue in such status for an extended period of time...” (HEARTH Act, 2010). This further distinguishes residential instability – which involves an actual residence, not a temporary dwelling or accommodation - from the related concept of homelessness.

## **2.5 Theoretical Definition**

Applying Wilson's method of concept analysis uncovers the essential nature of the concept in order to develop a definition. As a result of this literature review and

borrowing from relevant examples that reflect real-world clinical cases, residential instability is defined as: *a patterning of abrupt, unforeseen changes in short-tenure occupancies that are driven by imperative need.*

## **2.6 Influential Factors**

Consistent with the literature, the model case contains factors that reflect both push mechanisms and economic factors that perpetuate residential instability. The family experienced forced relocation due to unit deterioration, inadequate income to support family, and neighborhood violence. This is consistent with the literature which has identified factors such as eviction and inability to pay rent (Cohen & Wadrip, 2011; Coulton et al., 2012; Deluca et al., 2013; Shafft, 2006), unit failure, problems with landlord, Housing and Urban Development protocol problems, romantic break-ups, receipt of public housing opportunities (Deluca et al. 2013), transportation problems, and poor housing quality (Boyd, Edin, Duncan & Clampet-Lundquist, 2010) as push mechanisms. Residential instability is therefore conceptualized within four domains that influence relocation:

*Financial imperative* (housing is no longer unaffordable, changes in income)

*Safety imperative* (domestic violence, unsafe neighborhood, or damaged/deteriorating facility),

*Legal imperative* (eviction, incarceration)

*Social imperative* (overcrowding, conflict with landlords, or romantic break-up).

Further, the family in the model case struggled due to economic factors which considerably restricted housing choice. This is also consistent with the literature. In general, children living in poverty experience a higher rate of mobility than non-poor

children (Schmitt, Finders, & McClelland, 2015; US Census Bureau, 2011), a phenomenon that holds true for rural regions as well as urban (Shaffi, 2006). As a result of resource constraint, patterns of relocation often reflect short-distance moves, offer minimal advantage for families when compared to previous dwelling, and do not substantially increase housing satisfaction (Coulton, et al., 2012). Decision-making strategies reflect individual preference among competing priorities and require low-income families to make strategic trade-offs to exercise housing choice with limited resources (Wood, 2015).

## **2.7 Potential Consequences of Residential Instability**

Although the cases presented in this paper did not include consequences of residential instability, such repercussions are easily imagined. Researchers have begun to identify associations between higher rates of mobility and consequences for children. Although most authors have explored residential instability without sensitive attention to context, it is suggestive of a compelling correlation between residential instability and adverse outcomes. For example, higher rates of mobility have been correlated with poorer academic performance including measurements such as attentional problems (Roy, McCoy & Raver, 2014; Ziol-Guest & McKenna, 2014), lower rates of high school graduation (Herbers et al., 2013), and lower academic achievement in the first grade that contributed to lower academic achievement over time (Herbers, et al., 2012). Additionally, there is support for negative social consequences, such as higher rates of school victimization (Foster & Brooks-Gunn, 2012), disrupted social networks (South and Haynie, 2004 & Pribesh & Downey, 1999), decreased social cohesion for adolescents

(Kingston, Huizinga, & Elliott, 2014), and increased aggressive behaviors for adolescent males (Duncan & Zuber, 2006).

Residential mobility has also been correlated with behavioral problems in a number of studies (Fowler, Henry, Schoeny, Taylor, & Chavira, 2014; Flouri, Mavroveli, & Midouhas, 2013). Poor children with a history of residential mobility were more likely to demonstrate both internalizing and externalizing behaviors compared to non-poor mobile children (Ziol-Guest and McKenna, 2014), behavioral problems, especially for moves occurring during developmental transitional periods (Fowler et al., 2014), and increased adjustment problems among adolescent females (Adam & Chase-Landsdale, 2002). Roy et al. (2014) found that residential instability was associated with decreased self-regulation in fifth graders for children moving to higher-poverty neighbors.

Residential mobility in childhood has also been correlated with higher rates of depression in adulthood (Herbers, et al. 2013). Physical health is also compromised with residential instability among children posing an increased risk of hypertension and poorer subjective health in adulthood (Metzner, Harburg, & Lamphiear, 1982), a decline in overall well-being for introverted highly mobile children (Oishi & Schimmack, 2012), poorer health in adolescents (Brown et al., 2012), and poor access to health care, postponed medication, and increased acute care utilizations (emergency department visits) (Ma, et al., 2008).

## **2.8 Clinical Implications**

The definition of residential instability developed through this literature review challenges current clinical practice. Particularly for children, housing instability and subsequent mobility is a risk factor for academic, social, and mental health consequences,



yet research findings indicate that screening efforts are far from adequate (Hassen et. al., 2013). Proper screening, therefore, is necessary for referral and collaborative treatment planning. Increasing efforts for screening and assessment to identify residentially unstable families is a high priority, yet is difficult in the absence of a universal screening tool. Assessing for homelessness is important, but does not adequately capture all at-risk families.

A standardized screening tool is needed for implementation into the screening practice. Until now, the lack of a precise definition of the concept of residential instability has created barriers toward screening and measurement. One screening tool in particular - the Housing Instability Index (HII) - was developed for use within a study that explored the relationship between intimate partner violence and housing instability (Rollins, Gladd, Perrin, Billhardt, Clough, Barnes, & Hanson, 2012). Researchers Rollins et al. (2012) created a standardized assessment that measures 10 indices assessing housing difficulties within the previous 6 months: number of moves, living somewhere the patient did not wish to live, difficulty paying for housing, situations where borrowing money for housing was necessary, landlord threatening eviction, receiving an eviction notice, expectations for remaining in current housing for next 6 months, difficulty in securing housing, and likelihood that rent funds will be available (Rollins, et al., 2012). Higher scores suggest a high degree of residential instability. One significant limitation is that the HII screens only for the previous six months; therefore it is unlikely to capture all families struggling with residential instability.

Yet until a standardized screening tool is developed, clinicians and school personnel can assess for a history of residential instability during routine office visits.

Assessing for number of moves, impetus for moves, and expectations for future moves provides information into the contextual circumstances that increase risk for residential instability and associated outcomes. Families identified as residentially unstable warrant further counseling and referral. To provide holistic care requires attentiveness to dynamic housing needs, especially in the cases of low-income children and families who are disproportionately impacted.

## **2.9 Future Research**

Future research is needed to deepen our understanding of the impact of residential instability on low-income families. Particularly important is the need to understand the impetus driving residential movement patterns and both the direct and indirect consequences on mental health for families across the lifespan.

### **Limitations**

Due to the multidisciplinary interest in this topic and the ubiquitous use of surrogate terminology, it is possible that relevant research was inadvertently excluded. This paper highlights the need for future qualitative research that explores the experience of housing instability with attention to context and influencing factors.

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**MANUSCRIPT – 3**

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**Residential mobility and adolescent delinquency: Lessons from the Maternal  
Lifestyle Study**

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## **Abstract**

Infants born to mothers using substances are a particularly at-risk group and encounter various physical, psychological, and sociological challenges. Difficulty securing and maintaining stable and affordable housing is one of these challenges. This purpose of this study is to examine the association between residential mobility and housing instability and later adolescent delinquency among participants enrolled in the Maternal Lifestyle Study (MLS). The MLS is a 16-year longitudinal, multi-site study which explored the short- and long-term effects of in-utero exposure to cocaine and/or opiates (N=1,388). The present study aim is to determine the impact of housing problems on adolescents with and without prenatal exposure to cocaine and/or opiates. Logistic regression was used to measure the association between residential mobility and housing instability with delinquent behaviors such as crimes against people and property and substance use at age 11, 15, and 16 years of age. Results indicate that the majority of delinquent behaviors among adolescents are not associated with in-utero substance exposure; instead, housing problems are a more compelling risk indicator for delinquency. Findings suggest that improved screening measures are needed in order to identify housing problems as a potential antecedent for conduct behaviors among adolescents. Implications for clinical practice and policy are discussed.

### **3.1 Introduction**

Infants born to mothers struggling with substance abuse are particularly vulnerable, and outcomes for these high-risk children have been well-documented (Dunn, Tarter, Mezzich, Vanyukov, Kirisci, & Kirillova, 2002, Ziotnick, Robertson, & Ta, 2003; Cowal, Shinn, & Weitzman, 2002; Barrow & Lawinski, 2009). Research suggests that the psychosocial forces encountered by such families are compelling risk indicators; in some cases, more powerful than the physiological effects that result from in-utero drug exposure. Among the various challenges these families encounter, problems with housing is common, including both high-frequency residential mobility (i.e. frequently changing residence) and housing instability (i.e. homelessness). Adolescent delinquency has been associated with both in-utero cocaine exposure as well as residential mobility within the general population. Yet the degree to which housing context impacts the behaviors of adolescents with in-utero exposure to cocaine and/or opiates has not been explored. Given the myriad of stressors that complicate addiction and related struggles, understanding the effect of residential movement patterns as a potential risk factor for this high-risk group is even more salient.

The present study explores the effect of residential mobility on participants enrolled in the Maternal Lifestyle Studies (MLS). The aim of this study is to determine the association between two independent variables - residential mobility and housing instability - with delinquent behaviors among adolescents in a sample of children born with in-utero exposure to cocaine and/or opiates. The study will test the following two hypotheses: 1) Higher rates of residential mobility are more likely to increase delinquent behaviors in a sample of children with prenatal cocaine and/or opiate exposure; and 2)

Exposure to housing instability is more likely to increase delinquent behaviors among adolescents in this same sample.

### **3.2 Review of the Literature**

A burgeoning body of literature focuses on various aspects of residential mobility, housing instability, and child development. Within the past two decades, this volume has increased rapidly (Jellyman & Spencer, 2008; Leventhal & Brooks-Gunn, 2000) and represents a broad range of theoretical frameworks and methodological approaches, many of which target the effect of residential mobility on adolescent social and behavioral outcomes. Adolescence is a particularly vulnerable transition time between childhood and adulthood and residential mobility has been associated with adolescent delinquency in several studies. Mobile adolescents are at risk for externalizing behaviors (Fowler, Henry, Schoeny, Taylor, and Chavira, 2014), substance abuse (Brown, Benzeval, Gayle, Macintyre, O'Reilly, & Leyland, 2012; Lee, 2007) adolescent pregnancy (Crowder & Teachman, 2004; South & Haynie, 2005), higher rates of violence (Haynie & South, 2005), and school suspensions (Boon, 2011). Additionally, residential mobility disrupts relationships with peers (South, Haynie, & Bose, 2006), and increases likelihood of school victimization (Foster & Brooks-Gunn, 2013).

The effects of prenatal exposure to cocaine and/or opiates on adolescent delinquency have been studied, in-part, due to the broad scope of research utilizing MLS data. For example, MLS participants at age 15 years demonstrated increased odds of arrests compared to controls (Lambert, Bann Bauer Shankaran, Bada, & Lester et al.,

2013). Yet, psychosocial and environmental factors have also demonstrated critical influence: Bada, Bann, Whitaker, Bauer, Shankaran, Lagasse, & Lester (2012) found that prenatal cocaine exposure was associated with externalizing behaviors in adolescence but that important protective factors such as caretaker involvement lowered overall risk. While these findings suggest the importance of biophysical and sociological effects on adolescent delinquency that are of particular interest to this study, they also highlight a significant gap in extant research. The degree to which residential mobility and housing instability within the MLS sample is predictive of delinquent behaviors in adolescence has yet to be explored. Adolescent delinquency is a complex issue, driven by a constellation of biological, sociological, and psychological influence. Distinguishing the individual effects of various environmental adversities is compelling and the degree to which housing problems influence adolescent behaviors requires further inquiry.

### **3.3 Theoretical Framework**

The relationship between social processes and human behavior is not novel. Evidence is noted from as early as 19th century Europe when writings suggested the early field of criminology sought to understand this relationship as a possible explanation for crime (Vowell, 2007; Vold, Bernard & Snipes. 1998). Social Disorganization Theory, first developed by Shaw and McKay (1942), has been used to understand residential mobility and related outcomes, particularly in the field of criminology. Social Disorganization Theory posits that residential movement in and out of neighborhoods weakens social control, increasing risk for crime. In this way, residential mobility poses increased risk for conduct-disordered behaviors among adolescents through contextual social processes weakened by non-normative mobility patterns.

### **3.4 Methods**

#### **Participants**

The Maternal Lifestyle Study (MLS) is a longitudinal, multisite study aimed to explore the long-term health and developmental outcomes of children with a history of prenatal cocaine or opiate exposure (National Institute of Health Grant # NO1-HD-2-3159). Women with exposure to cocaine and/or opiates during pregnancy and who recently delivered an infant were recruited for the MLS based on in-person interview or on meconium samples results. The 2-group design consisted of infants exposed to cocaine and/or opiates and a control group of infants without prenatal exposure to cocaine or opiates. Both groups allowed exposures to tobacco, alcohol and marijuana. The control group was matched by gender, race, ethnicity, and gestational age (Lester Tronick, LaGasse, Seifer, Bauer, Shankaran, & Bada, 2008). The study was conducted at 4 sites (Brown University, University of Miami, University of Tennessee at Memphis, and Wayne State University) and in 2 phases - Phase I targeted acute outcomes and Phase II examined longitudinal outcomes (beginning at age 1 month). Cohorts were enrolled at birth between the years 1993 – 1995. Initially, 11, 811 mothers consented to participate. By phase II, the number of participants were as follows: 1) 658 participants in the exposed group and 730 participants in the control group (total n= 1388). The comprehensive assessment protocols included 15 years of tracking residential movements for each child as well as 16 years of information relevant to the child's health including psychiatric symptomatology and health behaviors.

#### **Measures**

*Residential Mobility and Housing Instability*

Residential mobility was measured by the Administration on Children, Youth, and Families (ACYF) Environmental Questionnaire, a multi-item questionnaire developed specifically for the Maternal Lifestyle Study for data collection purposes. For the present study, variables of interest included two items from the ACYF: whether or not the child had changed addresses since the last visit, and if so, how many times. Data were collected at 1 month, 4 months, 8 months, and then annually until age 15 years. Mobility was measured within three developmentally sensitive time periods determined a priori: Period 1: 1m – 5 years, Period 2: 6 – 10 years, and Period 3: 11 – 15 years. A similar developmentally-sensitive method of measurement has been used in prior research (Anderson, Leventhal & Dupéré, 2013 & Fowler, Henry, & Schoeny et al., 2014), demonstrating that timing of moves is important. The ACYF Environmental questionnaire also asked participants' primary caregiver to select "which best describes the kind of housing the child currently lives in: owner-occupied house or condominium; 2) rented apartment or house; 3) hotel/motel 4) congregate care/social service facility or 5) no stable residence." Participants were recorded as experiencing housing instability if caregivers described their current living situation as residing in a hotel/motel, congregate care/social service facility, or "no stable residence" at any visit within each of the three time periods. This descriptor captures a continuum of homelessness and housing instability which is often attributable to "doubling-up" or seeking emergency shelters when no other accommodations are available.

#### *Demographics and Contextual Risk*

Demographic variables and contextual risk factors were defined a priori and included gender of the child, maternal race, maternal education (>HS, =HS, and <HS),

and maternal age (mean with standard deviation). Postnatal maternal substance use was measured: cocaine (lifetime history y/n), marijuana (lifetime history y/n), opiates (lifetime history y/n), and any report of daily average alcohol intake of >0.6 oz. Adverse childhood experiences was measured by referrals to Child Protective Services for allegations of physical and/or sexual abuse and any changes in the child's primary caregiver. Additionally, because parenting and supervision practices vary and are likely to exert influence on adolescent behaviors, parental supervision was measured via questionnaires administered at age 11 and 15 years.

#### *Low-income Status*

Poverty was determined by maternal self-report of annual income. Income was dichotomized as less than or greater than 150 % of the established Federal Poverty Limit (FPL) for year of visit (U.S. Department of Health and Human Services). Any report of annual income < 150% of the FPL during 1m-5y, 6y-10y or 11-15y was recorded as exposure to poverty.

#### *Parental Supervision*

Parental supervision was measured by two separate questionnaires: The Child Report of Parental Monitoring (Capaldi & Patterson, G.R., 1989; Sandoval, J.M., 2011) was administered at age 11 and the Supervision Questionnaire (Loeber, Farrington, Stouthamer-Loeber & Van Kammen, 1988) was administered at age 15. The Child Report of Parental Monitoring was an 11-item questionnaire assessing degree of caregiver involvement such as caregiver knowledge of child's plans and whereabouts, degree of supervision after school, and consultations with parents regarding child's activities. The Supervision Questionnaire is an 18-item instrument, which measures the

degree of parental involvement, discussion of daily activities, and the establishment and enforcement of curfews.

### *Delinquent Behaviors*

Behaviors related to adolescent delinquency were measured using the screening instrument “Things You Have Done,” (Elliot, Ageton, & Huzinga, 1985), a 27 - item instrument for measuring adolescent delinquent behaviors, aggregated into delinquency subscales, nine which were used for the present study (See Table 1) and a measure of police contact, which questioned participants on how many times during the past 12 months the participant had been arrested. The “Things You Have Done” questionnaire assessed for nine domains of delinquency and participants completed a computer-version of the form in private to minimize response bias. For the present study, aggregate subscale scores were used based on previous work by Elliot, et al., (1985). Although no psychometrics are available for this instrument, questions posed are similar to other instruments used to explore adolescent delinquency. Item responses were dichotomous yes/no for behaviors within the past 12 months, followed by an open response of “how many times?” In the MLS, “Things You Have Done” was administered at age 11 and age 16. To assess interactions with law enforcement, participants were asked, “How many times in the past 12 months were you arrested?” Data was collected via in-person interviews.



**Table 3.1** “Things You Have Done” Measures of Delinquent Behaviors

1) Crimes against people is defined as yes to any of five items addressing physical aggression toward others including hitting, slapping, threatening, attacking, and gang-related fighting.
2) Theft was assessed with 5 items addressing trespassing and stealing behaviors, ranging from low- to high-cost items.
3) Vandalism was defined by 3 items relating to fire-setting (or attempted fire-setting), intentional damage or destruction of property, and graffiti.
4) School delinquency was assessed with 3 items defined as skipping classes without excuse, stealing behaviors at school, or a history of suspension or expulsion.
5) Alcohol use was assessed with three questions addressing consumption of beer, wine, or liquor.
6) Tobacco use was measured with 1 question assessing for smoking cigarettes or chewing tobacco.
7) Marijuana use was measured as 1 item to distinguish this substance from other drugs of abuse.
8) Drug use was assessed with 7 items at age 11 with a more expanded version at age 16 with a total of 16 items assessing for the use of commonly-abused drugs.
9) General delinquency was assessed as an aggregated variable assessing for crimes against people, theft, vandalism, and school delinquency.

### **3.5 Analytic Strategy**

Distribution frequency was used to determine the impact of missing data, and inclusion criteria were established based on results. Chi-square analysis was then applied to test for significance of each categorical covariate and One Way ANOVA was used to test for significance with continuous variables (maternal age) (See Table 1). Due to the fact that these variables are conceptually distinct, they were modeled separately. Although gender was not significantly associated with either independent variable, due to potential gender effects related to delinquency, it was added a priori as a covariate to the final model for each dependent variable.

To test the hypotheses that higher rates of residential mobility and housing instability are likely to increase delinquent behaviors in children with prenatal cocaine

and/or opiate exposure, regression models were designed based on the Chi-square and ANOVA results and tested separately with each of the two independent variables. Separate age categories were created to capture developmentally-sensitive transitions of childhood which were determined a priori: Period 1: 1m – 5 years, Period 2: 6 – 10 years, and Period 3: 11 – 15 years. Three or more moves and exposure to housing instability during Period 1 and 2 were compared with delinquent behaviors at age 11; three or more moves and exposure during housing instability during period 1, 2, and 3 were compared with delinquent behaviors at age 16. Each model was determined to be a good fit for the data via Hosmer and Leemshow Test. To further capture longitudinal effects of mobility, (for example, did three or more moves during all age periods increase risk compared to three or more moves during only one period), interactions between periods were tested using a stratified analysis between each of the categorical age periods to test for cumulative effects. Lastly, a measure of parental supervision was added to the regression model to determine if parental engagement and monitoring is a potential mediating factor in the association between housing problems and delinquent behaviors among adolescents.

### **3.6 Results**

The present study included a complete sample of participants who attended both the 11 year and 16 year visit. After analyzing the distribution frequency to determine the impact of missing data, criteria were established to include only those participants who attended more than 50% of all possible visits during each of three categorical age periods: specifically, participants must have attended 5 of 8 possible visits between age 1 month – 5 years; at least 3 of 5 visits between age 6 – 10 years; and at least 3 of 5 visits during

ages 11-15 years. As a result of the established inclusion criteria, no missing data imputation was required, and the final sample was N = 736. The sub analysis which tested residential mobility and housing instability against police arrests at age 15 used the same criteria as outlined above, but missing data resulted in a modest decrease in sample size (N=710) for this variable.

**Table 3.2** Participants from The Maternal Lifestyle Study included in analysis

	Included	Not Included	
	N=736 (53%)	N=652(47%)	p
Male	372 (51.2)	355 (48.8)	0.146
<b>*Cocaine Exposure</b>	300(49.5)	306(50.5)	0.021
<b>*Opiate Exposure</b>	49(41.9)	68(58.1)	0.012
Maternal Education	49(41.9)	68(58.1)	0.547
<HS	280(51.4)	265(48.6)	
HS	300(54.6)	257.3(45.4)	
>HS	156(53.6)	135(46.4)	
<b>*Minority</b>	649(55.6)	519(44.4)	<.001
Postnatal Marijuna Use	206(58.7)	145(41.3)	0.079
Postnatal Marijuna Use	91(60.7)	59(39.3)	0.118
Postnatal Opiate Use	31(49.2)	32(50.8)	0.371
Postnatal Alcohol Use	86(59.3)	59(40.7)	0.236
Poverty during 1m - 5y	673(55.7)	535(44.3)	<.01
Poverty during 6y - 10 y	597(65.7)	311(34.3)	<.01
Poverty during 11y - 15y	571(68.4)	264(31.6)	0.01
<b>*History of Child Abuse</b>	38(53.5)	33(46.5)	0.006
<b>*Change in primary caregiver</b>	294(49.3)	302(50.7)	0.013
Mean (Standard Deviation)			
Maternal Age	28.48(49.3)	28.19(5.1)	p = .353

### Descriptive Statistics

Of the total number of participants who moved at least 3 times during Period 1, 11 % of this group had reported housing instability at the time of visit (p value of <.001). Significance was also observed for moves during Period 2: Of the participants (n=184) who moved at least three times between this time period, 15% of families reported at

least one instance of housing instability ( $p < .001$ ). During Period 3, the number of high-frequency movers increased again ( $n=236$ ), with 18% reporting housing instability ( $p < .001$ ).

The correlation between residential mobility and housing instability during Period 1 was  $r = 0.146$ ;  $p < .001$ ; Period 2:  $0.195$ ;  $p < .001$ ; and Period 3:  $.169$   $p < .001$ . Given these correlations, the two independent variables were modeled separately. Correlations among the dependent variables - delinquency subscales - were small to medium in effect (range  $.04 - 0.5$ ) with two notable exceptions: crimes against people and general delinquency had a higher correlation of  $r = 0.9$ ;  $p < .001$  and marijuana use was correlated with other drugs abuse at  $r = .707$ ;  $p < .001$ .

Among the sample, 91% of children ages 1m-5 years were low-income ( $< 150\%$  of the FPL). This percentage decreased to 81 percent during Period 2, and to 77.6 percent during Period 3. The overwhelming majority of the participants remained within low-income status and these families were more likely to move when compared with families with higher income. This pattern held constant over time.

**Figure 3.1:** Residential Mobility and Measures of Poverty

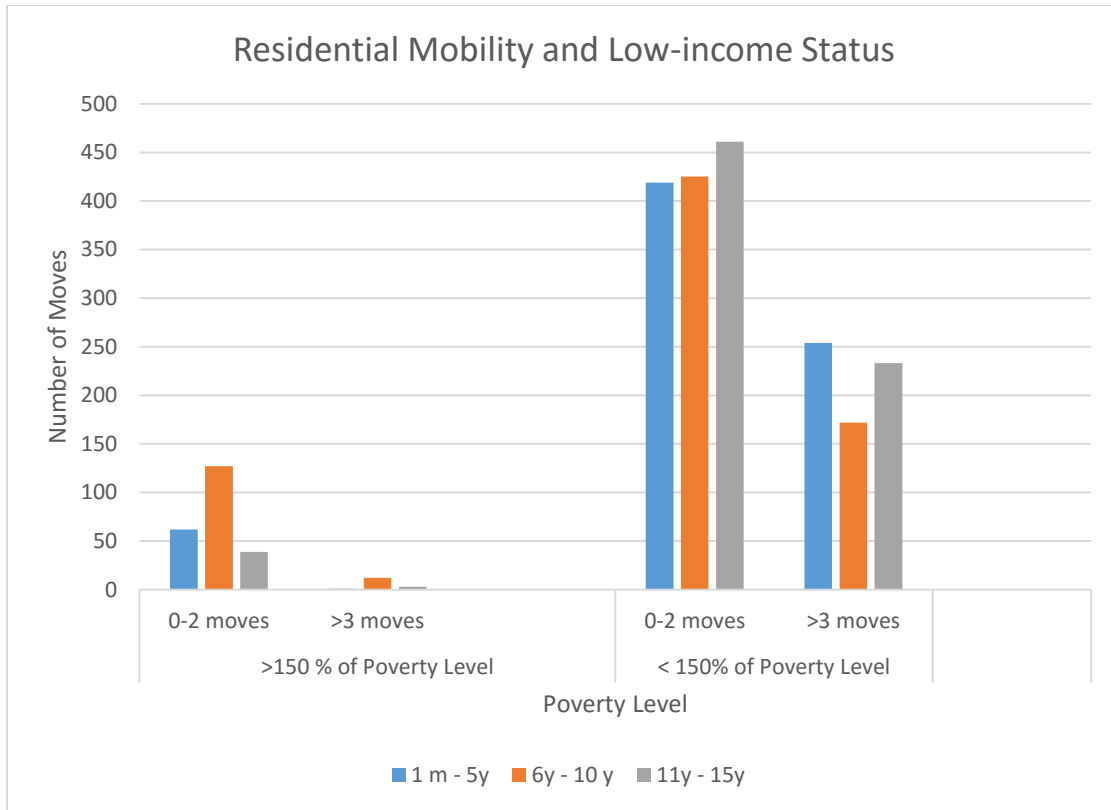


Table 3.3 Demographics for Study Participants from the Maternal Lifestyle Study

		<b>Residential Mobility</b>								
		1m - 5 years			6 y - 10 years			11y - 15 years		
		n(%)		P Value	n(%)		P Value	n(%)		P Value
		0-2 Moves	≥ 3 Moves		0-2 moves	≥ 3 Moves		0-2 moves	≥ 3 Moves	
Male		232 (62.4)	140 (37.6)	0.085	273 (73.4)	99 (26.6)	0.307	244 (65.6)	128 (34.4)	0.169
Minority		414(63.8)	235(36.2)	0.015	481(74.1)	168 (25.9)	0.129	441 (68)	208(32)	0.98
<i>Exposure Status</i>										
Cocaine Exposed		177(59%)	123 (41%)	0.003	222 (74)	78 (26)	0.603	213 (71)	87 (29)	0.139
Opiate Exposed		29(59.2)	20(40.8)	0.348	39 (79.6)	10 (20.4)	0.442	31 (63.3)	18 (36.7)	0.469
<i>Maternal Education</i>										
<HS		157(56.1)	123(43.9)	<.001	198(70.7)	82(29.3)	0.003	182(65)	98(35)	0.011
HS		196(65.3)	104(34.7)		221(73.7)	79(26.3)		205(68.3)	95(31.7)	
>HS		128(82.1)	28(17.9)		133(85.3)	23(14.7)		113(72.4)	43(27.6)	
<i>Poverty Status</i>										
Any Poverty 1m-5y		419(62.3)	254(37.7)	<.001	491 (73)	182 (27)	<.001	445 (66.1)	228 (33.9)	0.001
Any Poverty 6y - 10 y		-	-		425 (71.2)	172(28.8)	<.001	385 (65.4)	212 (35.5)	<.001
Any Poverty 11y - 15y		-	-		-	-	-	366 (64.1)	205 (35.9)	<.001
History of Abuse		19 (50)	19 (50)	0.041	19 (50)	19(50)	<.001	16 (42.1)	22 (57.9)	<.001
Change in Primary Caregiver		172(58.5)	122 (41.5)	0.001	208 (70.7)	86 (29.3)	0.03	200 (68)	94 (32)	0.965
Maternal Age at Delivery Mean (SD)		29.2 (5.8)	27.1 (5.5)	<.001						
<b>Housing Instability</b>										
		1m - 5 years			6 y - 10 years			11y - 15 years		
		n(%)		P Value	n(%)		P Value	n(%)		P Value
		No	Yes	p	No	Yes		No	Yes	
<i>Gender</i>										
Male		352 (94.6)	20 (5.4)	0.424	365 (98.1)	7 (1.9)	0.967	365(98.1)	7(1.9)	0.762
Minority		618(95.2)	31(4.8)	0.941	636(98)	13(2)	0.584	640(98.6)	9(1.4)	0.001
<i>Exposure Status</i>										
Cocaine Exposed		268 (89.3)	32 (10.7)	<.001	291 (97)	9 (3)	0.071	290(96.7)	10 (3.3)	0.039
Opiate Exposed		44(89.8)	5(10.2)	0.064	48 (98)	1(2)	0.941	47(95.9)	3(4.1)	0.295
<i>Maternal Education</i>										
<HS		266(95)	14(5)	0.904	273(97.5)	7(2.5)	0.11	273(97.5)	7(2.5)	0.772
HS		287(95.7)	13(4.3)		298(99.3)	2(0.7)		295(98.3)	5(1.7)	
>HS		148(94.9)	8(5.1)		151(96.8)	14(1.9)		153(98.1)	3(1.9)	
<i>Poverty Status</i>										
Any Poverty 1m-5y		638 (94.8)	35 (5.2)	0.064	659 (97.9)	14(2.1)	0.248	659(97.9)	14(2.1)	0.791
Any Poverty 6y - 10 y		-	-		584(97.8)	13(2.2)		582(80.7)	15(2.5)	0.059
Any Poverty 11y - 15y		-	-		-	-		559(97.9)	12(2.1)	0.82
History of Abuse		37 (97.4)	1(2.6)	0.528	38 (100)	0	0.378	36 (94.7)	2(5.3)	0.149
Change in Primary Caregiver		272 (92.5)	22 (7.5)	0.005	287 (97.6)	7(2.4)	0.438	280(95.2)	14(93.3)	<.001
Maternal Age: Mean (SD)		28.4 (5.8)	30.4 (4.7)	0.041	28.5(5.8)	28.5(5.3)	0.991	28.5(5.8)	27.5(4.8)	0.496

Table 3.4 Crude and Adjusted Regression Models for  $\geq 3$  Residential Moves and Delinquency

		N=736			
	n(%)	Unadjusted Odds Ratio (95% CI)	p	Adjusted Odds Ratio (95% CI)	p
<b>Crimes against people, Age 11</b>					
	194(26.4)				
$\geq 3$ moves 1 month - 5 years		1.343 (.949 - 1.900)	0.096	1.270(.89-1.82)	0.329
$\geq 3$ moves 6 years - 10 years		<b>1.622 (1.12-2.35)</b>	0.01	<b>1.57 (1.05-2.25)</b>	0.044
<b>Crimes against people, Age 16</b>					
	286(38.9)				
$\geq 3$ moves 1 month - 5 years		1.121 (.814-1.543)	0.484	.981(.706-1.36)	0.981
$\geq 3$ moves 6 years - 10 years		1.009(.700-1.454)	0.961	.931(.641-1.35)	0.928
$\geq 3$ moves 11 years - 15 years		<b>1.622 (1.164-2.260)</b>	0.004	<b>*1.567 (1.12-2.2)</b>	0.009
<b>School Delinquency, Age 11</b>					
	156(21.1)				
$\geq 3$ moves 1 month - 5 years		<b>2.222(1.54-3.2)</b>	<.001	<b>1.967 (1.32-2.92)</b>	0.001
$\geq 3$ moves 6 years - 10 years		1.37 (.918-2.043)	0.123	1.180 (.77-1.181)	0.444
<b>School Delinquency, Age 16</b>					
	302(41)				
$\geq 3$ moves 1 month - 5 years		1.343 (.979-1.842)	0.068	1.221 (.884-1.69)	0.262
$\geq 3$ moves 6 years - 10 years		1.030 (.717-1.481)	0.872	.967 (.669-1.4)	0.906
$\geq 3$ moves 11 years - 15 years		<b>1.603 (1.152-2.23)</b>	0.005	<b>1.613(1.16-2.3)</b>	0.005
<b>General Delinquency, Age 11</b>					
	222(30.2)				
$\geq 3$ moves 1 month - 5 years		<b>1.479 (1.06 - 2.064)</b>	0.021	1.325 (.94-1.88)	0.123
$\geq 3$ moves 6 years - 10 years		<b>1.581 (1.104 - 2.264)</b>	0.012	<b>1.451 (1.001-2.1)</b>	0.047
<b>General Delinquency, Age 16</b>					
	423(57.5)				
$\geq 3$ moves 1 month - 5 years		1.26(.92-1.74)	0.15	1.173(.844-1.629)	0.343
$\geq 3$ moves 6 years - 10 years		1.049(.728-1.512)	0.78	1.03(.71-1.5)	0.88
$\geq 3$ moves 11 years - 15 years		<b>1.43(1.02-1.99)</b>	0.037	1.4(.997-1.97)	0.23
<b>Tobacco, Age 16</b>					
	58(7.9)				
$\geq 3$ moves 1 month - 5 years		1.428 (.817-2.497)	0.211	1.70 (.92-1.9)	0.125
$\geq 3$ moves 6 years - 10 years		1.08 (.58 - 2.011)	0.809	.947 (.465 - 1.93)	0.852
$\geq 3$ moves 11 years - 15 years		<b>2.128 (1.202-3.768)</b>	0.01	<b>2.094 (1.11 - 3.96)</b>	0.025
N=710					
<b>Police Arrests, Age 15</b>					
	54(12)				
$\geq 3$ moves 1 month - 5 years		<b>2.256 (1.263-4.028)</b>	0.006	1.642(.906-2.978)	0.102
$\geq 3$ moves 6 years - 10 years		1.144(.607-2.159)	0.677	1.04 (.54-2.02)	0.964
$\geq 3$ moves 11 years - 15 years		<b>2.373 (1.306-4.311)</b>	0.005	<b>*2.492 (1.3-4.6)</b>	0.01
Covariates in model: prenatal cocaine exposure, gender, maternal age					
*Attenuated by parental supervision					

Table 3.5 Crude and Adjusted Regression Models for Housing Instability and Delinquency

		N=736			
	n(%)	Unadjusted Odds Ratio (95% CI)	p	Adjusted Odds Ratio (95% CI)	p
<b>Crimes against people, Age 11</b>					
	194(26.4)				
1 month - 5 years		1.12 (.522-2.4)	0.772	1.001(.441-2.273)	0.998
6 years - 10 years		2.76 (.93-8.194)	0.067	<b>3.19 (1.006-10.111)</b>	0.049
Covariates significant in adjusted model: clinic site, gender					
<b>Vandalism, Age 11</b>					
	18(2.4)				
1 month - 5 years		<b>5.015 (1.37-18.4)</b>	0.015	<b>*4.554 (1.219-16.392)</b>	0.019
6 years - 10 years		inestimable		inestimable	
No covariates significant in model					
<b>Vandalism, Age 16</b>					
	44(6)				
1 month - 5 years		.753(.163-3.483)	0.753	.741(.160-3.44)	0.753
6 years - 10 years		3.107(.633-15.257)	0.163	3.137(.636-15.463)	0.163
11 years - 15 years		<b>4.313 (1.168-15.930)</b>	0.028	<b>*4.368 (1.179-16.178)</b>	0.028
No covariates significant in model					
<b>School Delinquency, Age 11</b>					
	156(21.2)				
1 month - 5 years		<b>2.209 (1.051-4.64)</b>	0.036	2.167(.974-4.821)	0.088
6 years - 10 years		.457(.097-2.167)	0.324	.441(.008-2.211)	0.423
<b>School Delinquency, Age 16</b>					
	302(41)				
1 month - 5 years		1.621(.806-3.262)	0.176	1.516(.747-3.076)	0.29
6 years - 10 years		.693 (.223-2.159)	0.527	.703(.223-2.213)	0.53
11 years - 15 years		2.9 (.98-8.53)	0.055	<b>*2.997 (1.005-8.936)</b>	0.07
Covariates Significant in model: postnatal marijuana use					
<b>General Delinquency, Age 11</b>					
	222(30.2)				
1 month - 5 years		1.373(.668-2.823)	0.389	1.246(.042-10.331)	0.637
6 years - 10 years		2.871(.961-8.581)	0.059	<b>3.281 (1.042-10.331)</b>	0.044
Covariates significant in model: clinic site, postnatal marijuana use					
<b>Alcohol Use, Age 11</b>					
	13(1.8)				
1 month - 5 years		<b>7.58 (1.97-29.1)</b>	0.003	<b>5.473 (1.19-25.2)</b>	0.029
6 years - 10 years		inestimable		inestimable	
Covariates significant in model: postnatal marijuana use					
N=710					
<b>Police Arrests, Age 15</b>					
	54(12)				
1 month - 5 years		1.373(.668-2.823)	0.389	1.246(1.042-10.331)	0.637
6 years - 10 years		1.305(.162-10.54)	0.803	1.063(.122-9.293)	0.959
11 years - 15 years		<b>4.4 (1.146-16.9)</b>	0.031	<b>*4.693 (1.020-21.590)</b>	0.029
Covariates significant in model: gender, cocaine use					
*Attenuated by Parental Supervision					



Table 3.6 Delinquency Outcomes According to Age of Exposure for  $\geq 3$  Residential Moves

Age 1m – 5years	Age 6y - 10 years	Age 11y – 15years
School Delinquency, Age 11	Crimes Against People, Age, 11 General Delinquency, Age 11	*Crimes Against People Age 16 School Delinquency, Age 16 Tobacco, Age 16 Police Arrests, Age 15
* Attenuated by Parental Supervision		

Table 3.7 Delinquency Outcomes According to Age of Exposure for Housing Instability

Age 1m – 5years	Age 6y - 10 years	Age 11y – 15years
Alcohol Use, Age 11 Vandalism, Age 11	Crimes Against People, Age, 11 Vandalism, Age 11 General Delinquency, Age 11	*Vandalism, Age 16 *School Delinquency, Age 16 *Police Arrests, Age 15
* Attenuated by Parental Supervision		

The results partially support the hypotheses: three or more moves and exposure to housing instability were significantly associated with several delinquent behaviors across the entire sample, however, our results supported only one delinquent outcome that was associated with prenatal cocaine exposure. In other words, three or more moves and housing instability increased risk for several delinquent behaviors across the sample for both children with prenatal substance exposure *and those without* with one notable exception: police arrest was associated with both housing instability and prenatal cocaine exposure at age 15. For the remaining outcomes, in-utero cocaine exposure no longer

demonstrated a significant relationship with delinquency measures once housing problems were considered.

Residential mobility of three or more moves was significant for crimes against people for both the exposed and control group at age 11 and 16; participants with three or more moves during Period 2 demonstrated elevated risk at age 11 and children with three or more moves during Period 3 were at increased risk at age 16. Maternal postnatal cocaine use, and poverty (during Period 1 only) were also significant for the outcome at age 11 with less effect for females. Postnatal marijuana and poverty were associated with crimes against people at the 16 year visit. However, increased parental supervision attenuated crimes against people at age 16, and the relationship between three or more moves and crimes against people was no longer significant. Housing instability during Period 2 was also significant for Crimes against people at age 11, but not at the 16 year visit.

To explore the possibility of cumulative effects that increase risk over time, a stratified analysis was used to test for significance across the entire sample between periods to determine if children who moved 3 or more times in more than one period – or in all three periods - were at increased risk compared to children with three or more moves during only one period. Only one outcome, crimes against people, observed a statistical difference: children who moved three or more times during Period 1 and again during Period 2 demonstrated *decreased* odds of delinquent behavior when compared to children who moved 0-2 times for Period 1 and then three or more times for Period 2.

Vandalism was not associated with residential mobility in either the exposed or control group. However, vandalism at age 11 was associated with housing instability

during Period 1 at age 11 across the entire sample. Housing instability during Period 3 increased risk for vandalism at age 16 for the first model, but this effect was attenuated by the child's report of parental supervision. School delinquency at age 11 was associated with 3 or more residential moves during Period 1 and significant at age 16 for 3 or more moves during Period 3. Additionally, housing instability during Period 3 was associated with school delinquency at age 16 but this effect was also attenuated by parental supervision. General delinquency was associated with 3 or more moves during Period 2 at age 11. For children with high frequency mobility in the early years, minority children, children exposed to a change in primary caregiver, low-income status, and maternal postnatal marijuana were also at increased risk. Males were at elevated risk compared to females.

Tobacco use at age 16 was associated with 3 or more moves during Period 3 across the sample, with no observed difference between those with prenatal exposure and those without. Minority status, exposure to childhood abuse and postnatal maternal alcohol use was also significant ( $p < .05$ ). Tobacco use demonstrated no association with housing instability. Risk for alcohol use at age 11 was increased for the entire sample for children with early housing instability; however, odds decreased over time with no significance at age 16. Finally, police arrests were significant for three or more moves and housing instability at the 15 year assessment; however, risk was attenuated by the presence of parental supervision.

### **3.7 Discussion**

Although there is an impressive breadth of MLS data already in publication, this is the first study to examine the degree of housing instability within this high-risk sample. The rate of mobility is exceptionally high and provides further evidence that chronic

mobility is highly correlated with poverty, a finding demonstrated in prior work (Fowler et al., 2015). Disadvantaged families, as well as minority youth, are more likely to report both school and residential mobility (Gasper, DeLuca, & Estacion, 2010). In the general population, a recent estimate indicates that approximately 28% of families living below the FPL move compared to only 12% of families living above the FPL (U.S. Census Bureau, 2009). Although exposure to poverty in this sample was measured slightly differently (<150% of the poverty level), the trend is similar: families with less financial resources move more frequently. Among low-income families, relocation rarely results in significant financial gain or upward mobility.

Cotton & Schwartz-Barcott (2016) developed a concept analysis of residential instability among low-income families, defining it as a “patterning of abrupt, unforeseen changes in short-tenure occupancies that are driven by imperative need.” Push mechanisms explain why low-income families move short-distances and gain little, often for reasons beyond their control (Coulton, Theodos, & Turner, 2012; Deluca, Wood, & Rosenblatt, 2013). This patterning of residential movement often persists over time and is unlikely related to the attainment of social, financial, or educational capital; rather, it perpetuates neighborhood *churning* (Coulton et al., 2012). Unplanned relocations are commonly driven by financial, safety, legal, or social concerns that restrict the timing and context of the move (Cotton & Schwartz-Barcott, 2016). Participants in the MLS exemplify this pattern; the overwhelming majority moved frequently without obvious financial gain, sustaining an income below 150 percent of the FPL throughout the study.

This is also the first study to explore residential mobility and housing instability within a sample of participants born to mothers with prenatal substance use. These

findings suggest that neither prenatal cocaine nor opiate exposure is consistently associated with delinquent behaviors in adolescence; instead, residential mobility and/or housing instability is the more compelling risk indicator, not prenatal exposure. There was one exception to this finding: police arrest at age 15 was associated with *both* exposure to housing instability and prenatal cocaine exposure, suggesting a cumulative effect of risk. For the other significant delinquent behaviors, high-frequency mobility and/or housing instability were independent predictors of adverse outcomes, above that of physiological risk due to in-utero exposure.

Residential mobility was associated with several delinquent behaviors among adolescents, including crimes against people and behavioral problems within school. This confirms prior work which demonstrated residential mobility was associated with externalizing behaviors in adolescence (Fowler et al, 2014, Flouri, Marvovelli, & Midouhas, 2013; and Adam & Chase-Landsdale, 2002). Additionally, residential mobility was associated with nicotine use, a finding supported in previous studies (Buu, DPiazza, Wang, Puttler, Fitzgerald, & Zucker, 2009; Thorlindsson, Valdimarsdotti, & Jonsoon, 2012).

High-frequency mobility and housing instability were tested in a comparative approach and contextualized with sensitivity to developmental stages of childhood.

Other studies have measured residential mobility with respect to child and adolescent development, demonstrating that the increased risk for mobility is potentially related to the timing of when moves occur (Fowler et al., 2014). In the present study, recent moves had a stronger effect on delinquent behaviors. Children were more likely to commit crimes against people at age 11 if they moved three or more times between ages

6 – 10 years. Similarly, moving three or more times between 11 and 15 years increased the odds for crimes against people at age 16, though this risk was attenuated with adequate parental supervision.

Exposure to housing instability was tested within the context of families experiencing homelessness or residing in temporary accommodations. Patterns were similar when compared with residential mobility in that more recent exposure demonstrated greater effect. Reports of living in a shelter or a facility between ages 6 – 10 years were associated with an increased risk for crimes against people at age 11. General delinquency demonstrated the same pattern with more recent moves increasing risk.

However, this pattern was not without exception. In the case of high-frequency residential movement and housing instability, moves during early years were associated with later delinquent behavior. For instance, alcohol use at 11 years of age was associated with housing instability during Period 1 but not Period 2. Vandalism at age 16 was associated with more recent housing instability; however, it was also associated with housing instability during early childhood (Period 1) for vandalism at age 11. Similarly, early childhood moves of three or greater were associated with school delinquency at age 11. These results support an equally compelling argument that instability during a child's early years increases odds for behavioral problems that persist over time (Fowler et al., 2014).

Lastly, delinquency among adolescents with three or more moves during one period compared to those who experienced three or more moves during multiple periods were compared with only one significant finding. Children who moved three or more

times only during Period 2 were more likely to commit crimes against people when compared to children who moved three or more times in *both* Period 1 and 2. This finding was unexpected. One possible explanation is that the finding reflects unobserved characteristics within the sample such as maternal characteristics not measured within MLS protocol.

Parental supervision is important when exploring the contextual influences on delinquent behaviors and the present study's findings demonstrate that the association between high-frequency mobility and delinquency is only partially mediated by parental supervision. While association between housing problems and police arrests were attenuated by parental monitoring and engagement, only one of the delinquency domains – crimes against people at age 16 – was attenuated by the presence of parental supervision. School delinquency (age 11 and 16), general delinquency (age 11), and crimes against people (age 11) remained significant, in spite of parental monitoring. Conversely, findings suggest that parental supervision is *more* compelling as a protective factor when families are residentially unstable, such as living in a shelter or motel. For these participants, parental supervision attenuated the increased odds for police arrest, vandalism and school delinquency at age 16. One explanation is that families utilizing shelters or temporary accommodations are more likely to be experiencing a type of housing crisis that would make them eligible for emergency social services. Such services might include supportive programming which attenuates the consequences of trauma related to homelessness, decreasing the odds of negative behaviors among at-risk adolescents. Conversely, families who demonstrate a patterning of short-tenure moves, are likely experiencing a degree of instability will be overlooked and underestimated.

However these findings regarding the importance of parental supervision demonstrate a slight discrepancy. Parental engagement mediated the association between housing problems and police arrests yet only partially mediated the association between housing problems and other delinquent behaviors. One possible explanation is that police arrests are likely resultant from more extreme and dangerous behaviors; the domains of delinquency assessed within “Things You Have Done” are more likely to remain under the radar of law enforcement personnel yet remain suggestive of conduct disordered-behavior.

#### Limitations of this Study

Although the measurement of residential mobility and housing instability included frequency across three developmental ages, we did not have information pertaining to the reason for each individual move, in order to determine the impetus and contextual influences. Additionally, measuring school changes is important because school mobility is associated with delinquency and often occur for reasons other than a residential move (Gasper, DeLuca, & Estacion, 2010). Measuring neighborhood disadvantage through census data and poverty indices is also important in that the degree of disadvantage has been linked to delinquent outcomes in adolescents (Sharkey & Sampson, 2010). These data, however, were not collected within the MLS protocol. While the research design controlled for childhood abuse, changes in primary caregivers, parental supervision, and ongoing maternal substance use – all factors that create additional risk for adolescent delinquency - the degree and duration, as well as the influence on residential mobility trajectories and behavioral outcomes is not definitive. Lastly, due to limitations in study designs, police arrests were measured at age 15 –



instead of age 16 as other measures. It is therefore possible that confounding for this outcome influenced results, since researchers cannot guarantee that exposure occurred before police arrests. However, results were congruent with other measures and further strengthen study results. In spite of these limitations, the novel data available in the MLS created the opportunity for critical inquiry into the impact of housing problems on delinquent behaviors among a high-risk group of adolescents.

### **3.8 Conclusion**

Results of this study challenge current clinical practice guidelines in both pediatric primary care and mental health. The context and timing of high-frequency residential mobility is predictive of delinquent behaviors among adolescents, yet screening efforts are minimal at best. While practitioners routinely assess for homelessness in a more traditional context, residential mobility is frequently overlooked. This study demonstrates the importance of including a housing history during adolescent well-child visits. Screening for antecedents and risk associated with conduct behaviors is necessary in order to identify and refer at-risk families and those in need of supportive housing services. More broadly, results from this study challenge current sociological currents, which too often fail to consider the importance of safe, affordable, and stable housing as a necessary condition for overall mental health. Future research is needed to further our understanding of this critical connection and to inform programming, policy, and clinical practice.

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## Summary and Implications

The three studies presented in this dissertation reflect the role of housing as an important determinant for adolescent wellbeing. Given that the context and timing of high-frequency residential mobility is associated with delinquent behaviors among adolescents, screening efforts must improve within the clinical setting to identify at-risk youth. While practitioners routinely assess for homelessness in a more traditional context, findings from these studies demonstrate the importance of obtaining a housing history during both adolescent well-child visits and when the presenting problem involves externalizing behaviors. Applying the theoretical definition of residential instability as “*a patterning of abrupt, unforeseen changes in short-tenure occupancies that are driven by imperative need*” will assist providers in facilitating appropriate referrals.

More broadly, results from this study challenge sociological currents. Policy makers, health insurers, and clinical providers often underestimate the importance of safe, affordable, and stable housing as a necessary condition for overall mental health. Highlighting the critical need for a structural approach to housing policy, nurses, especially in the advanced practice role, must contribute to the political conversation, policy adjustments, and service provisions that further a collective understanding of the critical intersection between housing and health.

## **Appendix A: Protocol and Publications from the Maternal Lifestyle Study**

The Maternal Lifestyle Study (MLS) is a longitudinal study funded by the National Institute of Health, National Institute on Child Health and Human Development. The multisite study aimed to explore the long-term health and developmental outcomes of children with a history of prenatal cocaine or opiate exposure compared with matched mother/child dyads. Participants were enrolled from the years 1993-1995. Women with exposure to cocaine and/or opiates during pregnancy and who recently delivered an infant were recruited for the MLS based on in-person interview or on meconium samples results. Both groups allowed exposures to tobacco, alcohol and marijuana. Visits began when infants were 1 month of age and were followed-up at 4, 8, 12, 18, 24, 30, 36, 42, 48, and 60 months and then annually until 16 years of age. Initially, 11, 811 mothers consented to participate however, by Phase II, the number of participants had decreased to 658 participants in the exposed group and 730 participants in the control group (total n= 1388), and were matched by gender, race, ethnicity, and gestational age, and adjusted for preterm birth. (Lester et al., 2008). Additionally, prenatal cocaine exposure was measured at three levels: high (those who used more 3 or more times per week during the first 13 weeks of gestation, those who used none, and “some” for any amount in between (Bada, Das, Bauer, Shankaran, Lester, LaGasse & Hammond, 2012). During the 16 year study, five phases were implemented and a total of 181 protocols were used to measure biological, neurological, sociological, psychological, physical, cognitive, social, and academic measures. Surveys, instruments, and interviews were conducted and administered with participants, caregivers, and teachers at various points within the study.



### *Summary of Findings from The Maternal Lifestyle Study*

The Maternal Lifestyle Study has supported research for over two decades with an impressive breadth and volume of research inquiry. Below is a summary of select studies which have implications for the research presented within this dissertation.

#### *Prenatal Cocaine Exposure and Childhood Adversity*

A study of 15 year-old adolescents found that prenatal cocaine exposure was associated with risk-taking behaviors including later arrests and early sexual initiation (Lambert, Bann, Bauer, Shankaran, Bada, Lester, & Whitaker et al., 2013). In a similar study, prenatal cocaine exposure, when compounded with prenatal and postnatal tobacco and alcohol use, was associated with an increase in behavioral problems among school age children (Bada, et al., 2012). MLS participants were assessed at age 15 years and adolescents in the exposed group demonstrated increased odds of arrests compared to controls (Lambert, Bann Bauer Shankaran, Bada, & Lester et al., 2013). This finding persisted over time: prenatal exposure compounded with early childhood adversity (i.e. ongoing caregiver substance use, poverty, exposure to community violence, or childhood abuse) was associated with behavioral dysregulation in both childhood and adolescence (Fisher Lester, DeGarmo, LaGasse, Lin, Shankaran, & Bada, 2011).

Exposure to violence increased poor outcomes for participants exposed to childhood adversity such as postnatal drug use, poverty, or parental psychopathology. However adolescents who developed positive relationships with others were less likely to experience truancy, school suspension, or mental health issues such as depression or conduct disorder (LaGasse, Hammon, Liu, Lester, Shankaran, Bada, & Bauer et al.,

2006). Similarly, caregiver characteristics were found to be associated with adverse outcomes among participants in MLS. For example, early caregiver stress was associated with negative behaviors: in children as young as 4 months, caregiver stress was associated with problem behavior at age three (Bagner, Sheinkopf, Miller-Loncar, LaGasse, Lester, Liu, & Bauer, 2009).

### *Protective Factors*

In addition to research highlighting the risk of in-utero exposure, studies have also demonstrated that these adverse outcomes are potentially mediated by other factors. Resilience, for example, is an important factor. Bada, Bann, Whitaker, Bauer, Shankaran, Lagasse, & Lester (2012) found that prenatal cocaine exposure was associated with externalizing behaviors in adolescence but that protective factors, such as caretaker engagement and positive social networks for youth lowered overall risk. Findings from this study assist in disentangling the complex relationship between in-utero exposure and psychosocial stressors.

### *Biochemical Factors*

Biochemical influence has also been a topic of inquiry as researchers have sought to further understanding of in-utero exposure and biophysical consequences. A study of MSL participants at age 11 found that children with prenatal cocaine exposure demonstrated a blunted cortisol response to stress encounters via the hypothalamic-pituitary-adrenal axis. The study found that cortisol reactivity was more likely to be blunted for prenatally-exposed children as well as for children exposed to violence; for those children with both prenatal-exposure and witnessing domestic violence, cortisol

response was more blunted than those children who had only prenatal exposure or only exposure to domestic violence alone, suggestive of cumulative risk (Lester, LaGasse, Shankaran, Bada, Bauer, Lin, & Das 2010).

These studies offer examples of the rich research possible within The Maternal Lifestyle study which allows for a longitudinal exploration of a broad scope of inquiry among a high-risk sample of youth. These studies offer preliminary justification for exploring how residential mobility and housing instability effect odds for adolescent delinquency among those with prenatal cocaine and/or opiate exposure.

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Appendix B:

Table 3.8 Prenatal Exposure and Delinquency Outcomes

Prenatal Exposure and Delinquency Outcomes										
Unadjusted Model										
Cocaine Exposed										
Opiate Exposed										
n(%)										
YES NO P Value										
YES NO P Value										
N=736										
<b>School Delinquency, Age 11</b>	156(21.2)			75(48.1)	81(51.9)	0.036		11(22.4)	145(77.6)	0.824
OR (CI 95%)				<b>1.460(1.022-2.084)</b>		0.037		1.082(.540-2.169)		0.824
<b>Drug Use Legacy, Age 16</b>	128(17.4)			63(49.2)	65(50.8)	0.032		15(30.6)	34(69.4)	0.011
OR (CI 95%)				<b>1.498(1.02-2.2)</b>		0.04		<b>2.194(1.15-4.2)</b>		0.017
<b>Marijuana Use, Age 16</b>	121 (16.4)			59(48.8)	62(51.2)	0.5		15(30.6)	106(69.4)	0.006
OR (CI 95%)				1.456(.982-2.158)		0.062		<b>2.37(1.245-4.515)</b>		0.009
N=710										
<b>Police Arrests, Age 15</b>	54(7.6)			30(55.6)	24(44.4)	0.021		4(7.4)	50(92.6)	0.773
OR (CI 95%)				<b>1.913 (1.093-3.347)</b>		0.023		1.131(.388-3.297)		0.822

## Appendix C

Table 3.9 Contextual Risk Factors for Study Participants from The Maternal Lifestyle Study

Residential Mobility	1m - 5 years						6 - 10 years						11 - 15 years					
	n(%)			n(%)			n(%)			n(%)								
	0-2 Moves	≥3 Moves	P Value	0-2 Moves	≥3 Moves	P Value	0-2 Moves	≥3 Moves	P Value	0-2 Moves	≥3 Moves	P Value						
<b>N=710</b>																		
Postnatal Marijuana Use	106 (51.5)	100 (48.5)	<.001	136 (66)	51.5 (34)	<.001	133 (64.6)	73 (35.4)	0.222									
Postnatal Cocaine Use	47 (51.6)	44 (48.4)	0.003	61 (67)	22.8 (33)	0.061	62 (68.1)	29.2 (31.9)	0.966									
Postnatal Alcohol Use >0.60	51 (59.3)	35 (40.7)	0.21	60 (69.8)	26 (30.2)	0.233	61 (70.9)	25 (29.1)	0.527									
Postnatal Opiate Use	18(58.1)	13 (41.9)	0.384	23 (74.2)	8 (25.8)	0.916	18 (58.1)	13 (41.9)	0.229									
<b>N=710</b>																		
<b>Housing Instability</b>																		
n(%)			n(%)			n(%)												
0-2 Moves	≥3 Moves	P Value	0-2 Moves	≥3 Moves	P Value	0-2 Moves	≥3 Moves	P Value										
Postnatal Marijuana Use	193 (93.7)	13 (6.3)	0.216	202(98.1)	4(1.9)	0.961	202(98.1)	4(1.9)	0.908									
Postnatal Cocaine Use	78 (85.7)	13 (14.3)	<.001	87 (95.6)	4 (1.7)	0.063	88(96.7)	3(3.3)	0.364									
Postnatal Alcohol Use >0.60	74 (86)	12 (14)	<.001	84 (97.7)	2(2.3)	0.76	84(97.7)	2(2.3)	0.841									
Postnatal Opiate Use	28(95.2)	3(9.7)	0.188	31(100)	0	0.428	31(100)	0	0.412									