

The Diverging Trajectories of Child Externalizing Behavior by Family Economic Status at Birth: The Mediating Role of Neighborhood

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Submitted to the Graduate Faculty of the
School of Social Work in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy

University of Pittsburgh

2024

UNIVERSITY OF PITTSBURGH
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Over recent decades, the United States has witnessed a concerning rise in economic inequality, posing challenges in mitigating the disparities that emerge during childhood. With a focus on understanding the processes and consequences of inequality, this dissertation examines how children's economic status at birth and residential environment interplay in shaping their trajectories of externalizing behavior. Externalizing behavior (i.e., aggressive, impulsive, and harmful behaviors) are associated with adverse outcomes, such as reduced social skills, academic achievement, and future socioeconomic status.

Grounded in the ecological systems theory and the cumulative dis/advantage theory, this study examines three hypotheses: (1) A child born into poverty will have a more adverse trajectory of behavior problems than a child not born into poverty; (2) Compared to a child not born into poverty, a child born into poverty will live in a neighborhood with a higher poverty level as they get older; (3) For a child born into poverty in comparison to a child not born into poverty, higher poverty level of their neighborhood will result in more externalizing behavior problems.

The first hypothesis was partially rejected as I found higher levels of externalizing behavior at ages 3 and 15 among children born into poverty, with no significant differences at ages 5 and 9. The second hypothesis was supported, with children born into poverty consistently residing in neighborhoods with higher poverty levels across all time points. The third hypothesis

was contradicted, as children not born into poverty displayed greater vulnerability to the impact of high neighborhood poverty on externalizing behavior. This effect was particularly evident at age 3.

This study highlights the persistent challenges faced by children born into poverty, underscoring the importance of social work practice and policy interventions to support these marginalized children. Recommendations include expanding Head Start programs and school-level interventions, particularly during early childhood and adolescence. Moreover, comprehensive policy measures are needed to facilitate children's transition out of high-poverty neighborhoods and to eliminate economic segregation. Ultimately, a holistic approach integrating family support and neighborhood interventions is essential to promote healthy development for all children, regardless of their economic status at birth.

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1.0 Introduction

For the last several decades, the U.S. has been experiencing growing economic inequality, making it difficult to reduce the gaps between the haves and have-nots that start in childhood. With an interest in the processes and consequences of inequality, this dissertation study investigates the trajectories of child development—particularly, how children’s economic status at birth and residential context interplay in the trajectories of child externalizing behavior. The Introduction section provides the background of this study by briefly discussing rising economic inequality in the U.S. and children from poor families, as well as the associations among economic deprivation, residential context, and child development. Then, this chapter demonstrates the dissertation aims and research questions. It concludes with a brief overview of the organization of this dissertation.

1.1 Background

1.1.1 Rising Economic Inequality in the U.S. and Children from Poor Families

The United States is among the richest countries, while concomitantly, it ranks as one of the countries with greater economic inequality. The U.S. economy is one of the largest in the world (OECD, 2024a) and has the highest number of billionaires, with 614 (29%) out of the world’s total of 2,095 (Forbes, 2020). However, these statistics obscure the reality that many Americans do not share in this wealth. In fact, the U.S. has one of the most unequal distributions

of incomes in the world. The Gini coefficient—a common measure of income inequality measured by the comparison of cumulative proportions of the population against cumulative proportions of their disposable income, ranging from 0 (perfect equality) to 1 (perfect inequality)—shows that in 2022 the U.S. level of income inequality was 0.395, a score higher than most of the Organization for Economic Cooperation and Development (OECD) nations (OECD, 2024b). Since the 1970s, the level of economic inequality in the U.S. has been rising on any number of indicators and has now reached the worst level in U.S. history (Guzman & Kollar, 2023; Piketty & Saez, 2014; Stone et al., 2020).

In a market economy, some degree of inequality is inevitably generated as a result of individuals' different talents, efforts, or luck including socioeconomic backgrounds, and any uncertain events happening in a market economy system (IMF, 2017). However, high economic inequality leads to various detrimental outcomes in a society. Such outcomes include poor population health (such as higher prevalence of obesity, higher blood pressure, and lower life expectancy (Hill & Jorgenson, 2018; Kim et al., 2008)), higher rates of violent crime (Hsieh & Pugh, 1993), less earnings mobility across the generations (Corak, 2013), and lower economic growth (Berg & Ostry, 2011). Economic inequality is also strongly associated with geographic segregation that contributes to the concentration of poverty, which in turn results in social problems and structural barriers that limit opportunities for lower-income populations to overcome their economic disadvantages (Ludwig et al., 2001; Massey & Fischer, 2000; Reardon, 2016; Reardon & Bischoff, 2011).

The increasing economic inequality in the U.S. makes it difficult to reduce the gaps between households who are financially well-off and households who are less well-off; these challenges result in diverging destinies between economically advantaged and disadvantaged

children based on their family origins (McLanahan, 2004). Compared to children who are not born in poverty, children who are born into poor or low-income families and/or spend multiple years in poverty have worse outcomes in their adulthood (Ratcliffe & McKernan, 2010); these outcomes include a lower likelihood of completing high school and being consistently connected to work or school as young adults, and a greater likelihood of living in poverty into their late 20s (Ratcliffe & Kalish, 2017).

In the U.S., as a group, children have been disproportionately poor over the last six decades. In 2022, 14.9% of children under 18 years old lived in families that fell below the poverty line, compared with 10.6% of adults between 18 and 64 years old (Shrider & Creamer, 2023). Children born into a poor household are particularly vulnerable to persistent poverty, as nearly half are persistently poor during their childhood; they will spend at least half of their first 17 years in poverty (Ratcliffe & McKernan, 2010). Children poor at birth have a lower chance of overcoming poverty in their later life largely due to structural inequities, than their non-poor counterparts; thus, the gaps created at birth fail to be reduced later.

1.1.2 Economic Deprivation, Residential Context, and Children

Studies have found a significant influence of a family's economic status on a child's cognitive, psychological, and behavioral development. Many of these studies were based on either the family stress model or the family investment model. A group of studies based on the family stress model found that family economic deprivation, particularly when severe and persistent, is related to developmental difficulties for children through elevated parental stress and adverse family and parental functioning (Conger et al., 1992; Conger & Donnellan, 2007; Sosu & Schmidt, 2017). Another group of studies based on the family investment model, found

that economically deprived families also lack access to financial, social, and human capital, and the inability to invest these resources in their children hinders the successful development of their children (Conger & Donnellan, 2007; Simons & Steele, 2020).

Since the publication of sociologist William Julius Wilson's (1987) book, *The Truly Disadvantaged*, many studies have paid attention to the influence of residential context independent of family effects. Studies report that the negative influence of disadvantaged residential context—often characterized by high rates of poverty, unemployment, welfare receipt and female-headed households, and few well-educated adults within a certain residential area—on child development operates largely through social and cultural isolation; a lack of collective cohesion among residents; limited institutional resources; and environmental health risks (Bischoff & Reardon, 2014; Sharkey & Faber, 2014; Wodtke et al., 2011; Wodtke & Parbst, 2017).

In particular, neighborhood poverty—measured by the percentage of residents falling below the federal official poverty line (FPL)—is often utilized as a proxy for neighborhood socioeconomic status (Vutien et al., 2019; Wolf et al., 2017). Neighborhood poverty is of interest in studies examining residential context, as it is closely related to other indicators of neighborhood-level socioeconomic disadvantages, such as residents' educational attainment, employment, household income, material hardships, and health (Benzow & Fikri, 2020). Further, neighborhood poverty is linked to limited neighborhood resources, including the lack of job opportunities, cohesive relationships among neighbors, and community institutions (Benzow & Fikri, 2020; Finighan & Putnam, 2017), thereby contributing to structural barriers to the healthy development of resident children (Haider, 2021).

Many studies have explored both the influences of family income and neighborhood poverty on child development. However, as Maguire-Jack (2014) and Maguire-Jack and Font (2017) pointed out, these studies largely focused on examining the relative importance of family to neighborhood, or vice versa, while not sufficiently considering the interaction between neighborhood poverty and the characteristics of resident families. Harding and colleagues (2010) argued that the vulnerability of children to the effects of neighborhood poverty may vary depending on the characteristics of their families. As such, for research on the relationship between family income and child development, the independent influence of neighborhood needs to be considered, while how family and neighborhood effects interact should not be overlooked.

1.2 Study Aims and Research Questions

Given the current economic inequality and its negative effects, it is imperative to explore the effects and processes of inequality. With an interest in the effects of disparities generated at birth, this study analyzes trajectories of child development, particularly, trajectories of behavior problems by children's economic origin. Children's behavior problems, or externalizing behavior, refers to a cluster of aggressive, impulsive, and harmful behaviors that are negatively related to the ability to get along with others (Achenbach & Edelbrock, 1978; Duncan & Magnuson, 2011). Children's behavior problems are negatively associated with children's future socioeconomic status by adversely influencing their social skills, friendships, cognitive ability, and school achievement in their childhood (Bub et al., 2007; Campbell et al., 2006; Duncan & Magnuson, 2011; Okano et al., 2020; Zimmermann et al., 2013) as well as educational attainment, employment, welfare use, occupational status, and earnings in their adulthood

(Alatupa et al., 2013; Colman et al., 2009; Fergusson et al., 2013; Hammerton et al., 2020; Martin et al., 2010). Hence, by analyzing the trajectories of child externalizing behavior by children's economic status at birth, this study sheds light on how economic status at birth influences future socioeconomic disparities.

Specifically, this research compares the trajectories of externalizing behavior between children born in poverty and those who were not. In addition to describing these trajectories, the study examines the processes by which children's economic origins influence their externalizing behavior trajectories and the mediating role of residential context in these processes.

Accordingly, this study addresses the following two research questions: 1) Does a child born into a poor family have a more adverse externalizing behavior trajectory than one born in more favorable circumstances? 2) How do economic origins and neighborhood poverty interact to shape a child's externalizing behavior trajectory?

1.3 Organization of the Dissertation

The following chapters expand on the aforementioned research questions. Chapter 2 provides a comprehensive review of the existing literature, addressing: 1) ecological systems theory and cumulative dis/advantage theory, the theoretical frameworks of this study, 2) the meaning and importance of children's externalizing behavior, 3) the relationship between economic deprivation and child outcomes, including externalizing behavior, 4) the relationship between neighborhood and child outcomes, including externalizing behavior, 5) family and child background factors associated with child externalizing behavior, and 6) gaps in the literature. This chapter concludes with the study's three research hypotheses.

Chapter 3 discusses the details of the methods used to test the hypotheses. These details include data, sample, variables, measures, and analytic strategies including the research model and statistical methods applied to test the three hypotheses. Chapter 4 presents the findings of this dissertation study. Finally, Chapter 5 includes a summary of findings, discussion, social work implications, study limitations, and suggestions for future research.

2.0 Literature Review

The literature review section commences by discussing the two theoretical frameworks underpinning this dissertation study: ecological systems theory and cumulative dis/advantage theory. Ecological systems theory provides the overarching theoretical framework for this study, as I examine the development of children in relation to their surrounding environments. The cumulative dis/advantage theory is the theoretical framework supporting the study's analyses. The section proceeds to review existing literature on child externalizing behavior, exploring the influences of economic deprivation, neighborhood factors, and other family background factors. Following this comprehensive review, identified gaps in the literature are presented. Finally, three research hypotheses are outlined.

2.1 Theoretical Framework

2.1.1 Bronfenbrenner's Ecological Systems Theory

Bronfenbrenner's (1979) ecological systems theory posits that human development is embedded in and expressed through behavior grounded in one's environmental context. Bronfenbrenner (1994) conceptualized the ecological environment as four interdependent structures, or systems—micro-, meso-, exo-, and macro-systems—that are nested around a focal individual “like a set of Russian dolls” (p. 39). Later, Bronfenbrenner introduced the chronosystem.

At the inner-most level is the microsystem, that is, the immediate setting including the focal individual; for example, a child's family. Next, the mesosystem, within which microsystems are nested, consists of social interactions between two or more microsystems; for example, a meeting between a child's parent and the child's teacher. The exosystem, within which mesosystems are nested, includes settings that the focal individual does not participate in but indirectly influence the focal individual; for example, the relationship between a child's family and the parent's workplace. The macrosystem, within which exosystems are nested, is made up of broad cultural and socioeconomic environments that influence all three aforementioned systems and have long-term consequences for the focal individual; for example, a severe economic crisis whose impact on child development may vary depending on the child's age when his/her family suffers economic strain. Finally, the chronosystem reflects the effects of consistency or change across time on each of the other systems; for example, a child's move from middle to high school (Bronfenbrenner, 1979, 1994; Neal & Neal, 2013).

Ecological systems theory has been widely adopted in explaining an individual's development in the context of the systems comprising their ecological environment (Neal & Neal, 2013). In particular, the theory provides a useful framework to understand contextual factors associated with the development of a child's externalizing behavior (Mason et al., 1994; Ogg & Anthony, 2019; Pereyra et al., 2019; White & Renk, 2012; Womack et al., 2019). As Stacks (2005) pointed out, many studies have focused on the influences of microsystemic factors on externalizing behavior, such as home/school environment, quality of childcare, parenting, parent-child interactions, parents' divorce, and parents' mental health. However, recent studies have examined the influences of the broader ecological environment on child externalizing behavior. For example, Akcinar and Baydar (2016) found a significant role for the mesosystem

in reducing child externalizing behavior, including the father's involvement in household responsibilities and the extended families' and neighbors' support for issues related to the child. Focusing on exosystems, Mason and colleagues (1994) found that parents' work environment and their support networks are indirectly related to decreased externalizing behavior through decreased family conflict, and White and Renk (2012) found that a child's positive perception of their neighborhood is associated with decreased externalizing behavior.

This dissertation study investigates the influence of all five systems within the ecological systems theory on children's externalizing behavior. Within microsystems, the study explores parental and family factors, encompassing family's economic status, parental incarceration, marital status of parents at a child's birth, as well as mother's age, race/ethnicity, and educational attainment. Regarding mesosystems, the study includes the dynamics within a child's biological parents, considering whether they are married, cohabiting, or neither. The exosystems component includes the poverty rate of a neighborhood where a child resides. This study also examines the interaction between family economic status at a child's birth and neighborhood poverty rate, highlighting the interplay between micro- and exo-systems. For chronosystems, it analyzes trajectories of children's externalizing behavior over a 15-year period. Additionally, the study explores household income, parental incarceration, the dynamics within a child's biological parents, and neighborhood poverty rate at different points in time, illustrating the interactions between micro- and chrono-systems, meso- and chrono-systems, and exo- and chrono-systems. Macrosystems indirectly come into play, given the study is conducted in the context of U.S. society characterized by high economic inequality.

2.1.2 Cumulative Dis/advantage Theory

Cumulative advantage/disadvantage (CAD) theory demonstrates a mechanism of how early life advantages/disadvantages and the successive addition of subsequent circumstances shape diverging life trajectory patterns or increasing inequality over the life course (Hatch, 2005; O’Rand, 1996). CAD is embedded in commonsense notions, such as “the rich get richer, the poor poorer,” “success breeds success,” “virtuous cycles,” and “vicious cycles” (Blau & Duncan, 1967; Dannefer, 2003, 2020; Diprete & Eirich, 2006). The concept of CAD traces back to the work of Robert Merton (1968). Merton (1968) found that two published works of the same intrinsic merit received different recognition depending on scientists’ preceding fame; in other words, prestigious scientists can get further recognition more easily than unknown scientists. Merton (1968) associated this inequality-generating process within science with the Bible verse in Matthew,¹ calling it the “Matthew effect” (Allison et al., 1982; Dannefer, 2003; Diprete & Eirich, 2006; Merton, 1968).

According to CAD theory, relatively favorable or adverse characteristics (e.g., money, health, position, or status) in early life become resources that produce further relative gains or disadvantages, respectively, resulting in widening gaps between advantaged and disadvantaged people over time (Dannefer, 2003; Diprete & Eirich, 2006; O’Rand, 1996). Dannefer (2020) defined CAD as “the systemic tendency for interindividual divergence in a given characteristic to increase with the passage of time” (p. 1249). This definition highlights two key aspects: systemic

¹ For to the one who has, more will be given, and he will have an abundance, but from the one who has not, even what he has will be taken away (Matthew 13:12).

tendency and interindividual divergence. "Systemic tendency" implies that divergence results from forces and mechanisms that are embedded in the ongoing dynamics of social interaction, rather than a mere extrapolation of individual positions at the starting point. "Interindividual divergence" indicates that CAD is a property of collectivities, such as populations and cohorts, for which a set of members can be ranked (Dannefer, 2003, 2020). Accordingly, CAD theory is concerned with structural forces that create differences in resources allocated to cohorts as well as widening intracohort gaps over the life course (Dannefer, 2003).

In particular, the Blau-Duncan approach to CAD, which is often found in sociology literature, focuses on between-group inequality and demonstrates direct and indirect effects of early dis/advantages. Hence, it explores how early dis/advantages lead to later-life outcomes, as well as how early dis/advantages influence difference in the returns on socioeconomic resources—for example, lower returns among highly educated Blacks than highly educated Whites (Blau & Duncan, 1967; Brüderl et al., 2019; Diprete & Eirich, 2006).

Empirical studies employing CAD theory commonly identify a wide range of early life advantages or disadvantages that influence different kinds of life trajectories. Studies illuminate cumulative dis/advantages associated with racism that results in diverging life trajectories in health, academic achievement, imprisonment, and neighborhood attainment. For example, both Brown (2018) and Shuey and Willson (2008) found that Blacks are more likely to experience adverse health trajectories than Whites. Mickelson (2015) found that Black students who were exposed to high levels of elementary and middle school segregation in particular have lower academic achievement, compared to White students. Wooldredge and colleagues (2015) found that Black felony defendants tend to have more adverse experience in case processing, which results in longer prison sentences than White counterparts. Furthermore, South and colleagues

(2016) found that benefits from living in an economically advantaged neighborhood during adolescence are larger among Whites than Blacks, which in turn enables Whites to move to more affluent neighborhoods over the adult life course. Jackson (2015) demonstrated cumulative dis/advantages associated with prenatal environment, by finding that children's prenatal smoking exposure is negatively associated not only with their academic achievement at age 7 but also with a slower rate of progress in academic achievement between ages 7 and 16.

Socioeconomic status is an important source of cumulative dis/advantage. For example, Seabrook and Avison (2012) demonstrated that socioeconomic-based health inequalities increase over the life course largely through differential exposure to risk factors and access to protective resources. Willson and colleagues (2007) found diverging health trajectories by socioeconomic resources, particularly education level, income, and wealth. Furthermore, Wildman's (2020) qualitative study conducted in the United Kingdom demonstrated that the social position a person was born into largely affects their education in terms of which school they can go to or how long they can be educated, and further affects the person's future opportunities, such as employment.

Based on the CAD theory, this dissertation study focuses on cumulative dis/advantages that a child's economic status at birth may induce. Specifically, the study tests whether poverty status at birth shapes different externalizing behavior trajectories between children born into poverty and those who were not. It also examines if these distinct trajectories can be attributed to the varying poverty rates of neighborhoods resulting from children's poverty status at birth.

2.2 Child Externalizing Behavior

Children's externalizing behavior, also referred to as behavior problems, encompasses a range of aggressive, impulsive, and harmful behaviors that hinder their ability to interact positively with others (Achenbach & Edelbrock, 1978; Duncan & Magnuson, 2011). These behaviors include throwing tantrums, teasing, fighting, attacking, lying, and cheating (Achenbach & Edelbrock, 1978; Campbell et al., 2000; Duncan & Magnuson, 2011). Externalizing behavior often peaks during the toddler and preschool years when children lack adequate communication skills, self-regulation abilities, and problem-solving skills. As children mature, externalizing behavior tends to decrease (Campbell et al., 2000; Duncan & Magnuson, 2011; Tremblay, 2010) until their adolescence, when it may experience an increase (Ellis et al., 2012).

Research indicates that children living in stressful environments may exhibit externalizing behavior as a way to adapt to such conditions (Ellis et al., 2012). However, the literature predominately demonstrates diverse short-term and long-term negative outcomes of children's externalizing behavior. In the short term, externalizing behavior has detrimental effects on children's schooling, including social skills, friendships, cognitive ability, and school achievement (Bub et al., 2007; Campbell et al., 2006; Duncan & Magnuson, 2011; Okano et al., 2020; Zimmermann et al., 2013). Particularly, longitudinal studies examining children from Grades 5 to 9 found a reciprocal relationship between externalizing behavior and school grades (Okano et al., 2020; Zimmermann et al., 2013), indicating a possible vicious circle of externalizing behavior and low school achievement during childhood. In the long run, externalizing behavior in childhood is associated with low educational attainment, a lack of financial plans and money-management strategies, unemployment, welfare use, low occupational

status, low earnings, and low socioeconomic status in adulthood (Alatupa et al., 2013; Colman et al., 2009; Fergusson et al., 2013; Hammerton et al., 2020).

Studies also explored the processes by which childhood externalizing behavior leads to adverse economic outcomes in adulthood. For example, Healey and colleagues (2004) found that childhood externalizing behavior is associated with low educational attainment and high risk for criminal conviction in early adulthood, which, in turn, lead to lengthy periods of being out of the labor market and unemployed as well as working for low-paying jobs. Converse and colleagues (2014) demonstrated a successive process whereby children's externalizing behavior leads them to have low educational attainment by adulthood, which results in their having a less complex job involving routine repetitive work, and, in turn, having low income. Furthermore, Vergunst and colleagues (2024) conducted a study on White males from low-income neighborhoods in Canada and found a significant relationship between externalizing behavior in kindergarten and lower earnings at ages 35-39. This relationship was explained by lower school performance, lower peer acceptance in childhood, and non-high school graduation by age 25.

2.3 Economic Deprivation and Child Externalizing Behavior

It is well established that family economic deprivation, which encompasses poverty, low income, negative financial events, and economic pressure, has detrimental effects on child well-being, including negative outcomes on children's cognitive development and academic performance achievement (Chaudry & Wimer, 2016; Masarik & Conger, 2017; Simons & Steele, 2020; Sosu & Schmidt, 2017). Studies on the relationship between economic deprivation and

child well-being often center on family-level factors, drawing from two primary theoretical frameworks: the family stress model and the family investment model.

The family stress model highlights the role of stress stemming from economic pressure. It posits that economic deprivation, including poverty, low income, and negative financial events such as job loss, influences child outcomes through various pathways, including parents' psychological distress, family conflicts, and parenting styles (Masarik & Conger, 2017; Sosu & Schmidt, 2017). The family investment model underscores the significance of resources invested in their children by their families, such as educational materials, food, healthcare, housing, and clothing, as well as parental behavioral investment, such as communicating with their child's teachers and spending time with the child engaged in academics. Poor children often lack access to these resources compared to their affluent counterparts, resulting in lower well-being (Martin et al., 2010; Schofield et al., 2011; Simons & Steele, 2020).

Similarly, previous studies reported that economic deprivation is related to externalizing behavior during childhood (Assing-Murray & Lebrun-Harris, 2020; Bøe et al., 2012; Church et al., 2012; Comeau & Boyle, 2018), and the mechanisms of the relationship were largely explained either by the family stress model or the family investment model. From the perspective of the family stress model, family economic deprivation elevates parents' mental/emotional distress or their conflicts, which lead to strict parenting and parenting stress, and in turn increases the risk of child externalizing behavior (Hong et al., 2021; Mazza et al., 2016; Neppl et al., 2016; Rijlaarsdam et al., 2013). For adolescents, parent-child conflict is a significant mechanism in addition to parental conflicts (Wang et al., 2022). From the viewpoint of the family investment model, economic strain is associated with a higher chance of child externalizing behavior via

parents' material and emotional investments (Martin et al., 2010) as well as via parents' investment in the child's education and cognitive ability (Sosu & Schmidt, 2017).

Other studies demonstrated the association between child developmental outcomes and when the child's family experiences economic strain. Researchers identified detrimental effects of being born in poverty or experiencing poverty in early childhood on child outcomes, such as early cognitive/socioemotional capacities and brain development (Shonkoff, 2010; Shonkoff et al., 2012), educational outcomes, that is, a lower chance of completing high school than those who experienced poverty later in their childhood (Ratcliffe & McKernan, 2012), and externalizing behavior in middle childhood (Votruba-Drzal, 2006). In addition, children who were born in poverty or experienced poverty in their early life were more likely to experience persistent poverty in their later life, which is associated with a higher chance of low earnings and poor health in adulthood, boys being arrested by young adulthood, and girls having unmarried births as teens and in adulthood (Chaudry & Wimer, 2016). Furthermore, volatile family income during childhood matters; children experiencing income loss have an increased risk of showing chronically high externalizing behavior (Miller & Votruba-Drzal, 2017).

It is important to recognize that structural racism disproportionately exacerbates economic deprivation among Black Americans. Redlining, a discriminatory lending practice by the Home Owners Loan Corporation (a federal agency) from the early 1930s to the late 1970s, systematically excluded Black Americans from accessing government-backed home loans and homeownership opportunities (Heard-Garris et al., 2021; Rothstein, 2017). Despite homeownership being a significant pathway to social and economic mobility through wealth accumulation and stable housing (Heard-Garris et al., 2021), Black Americans have a homeownership rate of 45.9% in 2023, significantly lower than the rate 73.8% among White

Americans (U.S. Census Bureau, n.d.-b). The Great Recession of the late 2000s further compounded racial disparities, particularly impacting the construction and manufacturing industries with higher minority representation, resulting in disproportionate housing and job losses for racial minority groups (Heard-Garris et al., 2021). As a result, poverty rates during the Great Recession were the highest among Black Americans (26%) compared to white Americans at 8% (Heard-Garris et al., 2021).

2.4 Neighborhood Poverty and Child Externalizing Behavior

Neighborhood poverty is typically operationalized by the poverty rate within a census tract (Jargowsky, 1997; Morrissey et al., 2016; U.S. Census Bureau, n.d.-a). While the term neighborhood can be loosely defined as a “physically bounded area characterized by some degree of relative homogeneity and/or social cohesion” (p.3), consensus regarding the precise geographical area or population size constituting a “sociologically meaningful” (p. 6) neighborhood is lacking (White, 1988). Nevertheless, researchers need a geographical unit approximating the notion of a neighborhood, for which nationwide data are available; census tracts are the only realistic option and a widely used proxy (Jargowsky, 1997; Morrissey et al., 2016; White, 1988). Census tracts represent small, relatively permanent subdivisions of a county or city that are updated prior to each decennial census depending on their population size; each tract generally contains a population size between 1,200 and 8,000 people, with an optimum size of 4,000 (U.S. Census Bureau, n.d.-a).

The poverty rate of a neighborhood provides a good measure to represent neighborhood poverty. The poverty rate is more desirable than mean or median income because it implicitly

incorporates information about mean family income and the variation of the neighborhood income distribution (Jargowsky, 1997). High-poverty neighborhoods, which are also referred to as poor neighborhoods or poverty areas, are usually defined by 20% or more residents living below the federal official poverty line (FPL) (Bishaw, 2011; Li et al., 2019; U.S. Census Bureau, n.d.-a).

Living in high-poverty neighborhoods has detrimental effects on resident families and children. Neighborhood poverty is a unique force in perpetuating poverty across generations and enlarging inequality of economic opportunity (Benzow & Fikri, 2020; Brooks-Gunn et al., 1993; Finighan & Putnam, 2017; Wodtke et al., 2011). Among children born in low-income families, about half have lived in a poor neighborhood and more than a third have spent most of their childhood in a poor neighborhood (Li et al., 2019). Hence, the effects of high-poverty neighborhoods on children need to be examined, independent of individual poverty.

Neighborhood poverty is closely intertwined with other indicators of neighborhood disadvantages, making it a useful proxy for neighborhood socioeconomic status (Vutien et al., 2019). In 2018, 24 million Americans lived in neighborhoods with a poverty rate of 30 percent or higher (Benzow & Fikri, 2020). Compared to residents living in low-poverty neighborhoods, the residents in high-poverty neighborhoods were more likely to be lower-educated, not working (i.e., either unemployed or out of the labor force), have lower household income, be rent-burdened, live in food deserts, be uninsured, and have shorter life expectancies (Benzow & Fikri, 2020). Furthermore, high-poverty neighborhoods often lack essential structural resources such as job opportunities, trusting neighbors, and strong community institutions (Finighan & Putnam, 2017). Given the diverse range of neighborhood disadvantages associated with high

neighborhood poverty rates, neighborhood poverty significantly affects resident families and children.

Structural racism has significantly contributed to the inequality of neighborhood poverty, with Black communities often bearing the brunt of this disadvantage. Redlining continues to have lasting effects on neighborhoods today. Research indicates that areas historically subjected to redlining still exhibit lower house values and rates of home ownership, alongside higher concentrations of Black residents and poverty rates (Aaronson et al., 2021). Furthermore, compounded with redlining, Black Americans have faced additional structural barriers such as higher mortgage interest rates, restrictive housing covenants, and neighborhood divestment, all of which have hindered their ability to move out of high-poverty neighborhoods and upwardly mobilize (Heard-Garris et al., 2021).

How poor neighborhoods influence their residents has been widely discussed, using four theoretical mechanisms: social isolation, social organization, resources, and environment (Wodtke et al., 2011). First, social isolation theories focus on social and cultural disconnections between poor neighborhoods and non-poor neighborhoods. These theories suggest that residents of poor neighborhoods are isolated from mainstream or middle-class social groups, institutions, and culture, which is linked to limited access to quality schools, jobs, marriageable partners, and adult role models (Harding, 2007; Wilson, 2012; Wodtke et al., 2011). Second, social organization theories emphasize processes within a poor neighborhood. These theories suggest that neighborhood poverty is associated with a disruption of mutual trust among residents, which leads to difficulties monitoring children's behavior within the neighborhood (Harding, 2007; Sampson et al., 2002; Wodtke et al., 2011).

Third, these residents disproportionately experience insufficient crucial institutional resources, such as high-quality childcare, schools, health care, grocery stores with healthy food options, and safe public parks (Bischoff & Reardon, 2014; Wodtke et al., 2011; Wodtke & Parbst, 2017). Fourth, these residents are more likely to reside in a neighborhood with higher health and environmental risks, such as air pollution, allergens, and toxins, which put the residents at risk of poor health (Sharkey & Faber, 2014; Wodtke et al., 2011; Wodtke & Parbst, 2017). As such, poor neighborhoods adversely influence their residents in diverse ways.

A large body of empirical studies examined the influence of high-poverty neighborhoods on child outcomes, revealing significant challenges to the physical and mental health of children. Neighborhood poverty is directly associated with higher rates of child abuse and neglect (McLeigh et al., 2018), child food insecurity (Morrissey et al., 2016), and adverse childhood experiences² (Maguire-Jack et al., 2021). It is also positively related to resident mothers' fear regarding children's outdoor play (Kimbrow & Schachter, 2011) as well as chances of being exposed to neighborhood danger, such as gangs, gunshots, and illegal drug use (Zuberi, 2012), which hampers healthy development of children.

In addition, neighborhood poverty has an adverse impact on children's cognitive development, as it is negatively associated with children's brain development (Taylor et al., 2020) and school achievement (Cushon et al., 2011; Morrissey & Vinopal, 2018; Pearman, 2017; Wolf et al., 2017). Longitudinal studies examined causal relationships between high-poverty neighborhoods and long-term child outcomes. Spending childhood in a high-poverty

² Adverse childhood experiences, or ACEs, include family violence and maltreatment, family dysfunction and loss, and involvement of child protective services, foster care, and criminal justice system

neighborhood increases the chances of children's teenage pregnancy, single parenthood, and dropping out of school, and decreases the chances of earning a college degree leading to lower earnings as adults (Chetty et al., 2016; Chetty & Hendren, 2018; Galster et al., 2007; Harding, 2003; Wodtke, 2013).

Empirical studies also examined the relationship between neighborhood poverty and child externalizing behavior. Many studies demonstrated that neighborhood disadvantage is directly related to an increase in child externalizing behavior above and beyond the influence of family factors (Grogan-Kaylor et al., 2020; Jocson & McLoyd, 2015; Palamar et al., 2015; Pei et al., 2022; Roy et al., 2014); conversely, socioeconomic advantage in a neighborhood, such as access to education/employment and economic resources, is related to a decrease in externalizing behavior (Rowe et al., 2016). Yoon and colleagues (2023) found that higher poverty rates in neighborhoods are associated with externalizing behavior, particularly during early childhood. Studies also showed that the relationship between poor neighborhoods and increased child externalizing behavior is moderated by parents' psychological distress and poor parenting behavior (Jocson & McLoyd, 2015; Mrug & Windle, 2009) or low social cohesion and safety of the neighborhoods (Li et al., 2019).

There are few studies exploring the interactive effect of family and neighborhood on children (Morrissey & Vinopal, 2018; Votruba-Drzal et al., 2021). Among those few studies, (Votruba-Drzal et al., 2021) found that higher family income is associated with living in a neighborhood with more resources (e.g., neighborhood advantage, cultural resources/parks) and fewer stressors (e.g., neighborhood disadvantage, violent crime), among which violent crime was related to higher child externalizing behavior.

2.5 Background Factors and Child Externalizing Behavior

In addition to family economic status and neighborhood poverty, child development and externalizing behavior can be influenced by other family- and child-level background factors, such as mother's age and educational attainment, parents' relationship and incarceration, as well as race/ethnicity and gender. Without controlling for background characteristics of families and children, research models of neighborhood effects on child outcomes may suffer from severe omitted variable bias, and the magnitude of relationships between neighborhood poverty and child outcomes may turn out to be spuriously large (Galster et al., 2007; Morrissey & Vinopal, 2018). Therefore, as in previous studies, these background factors are taken into account in this study.

Mothers' age and educational attainment are influential to children. Children's future economic status is related to parents' age and education. Smeeding (2015) found that children from undereducated and young parents tend to have a low chance of reaching the middle class. This may be partly due to a lack of maternal resources (i.e., employment and earnings) resulting from having a child before age 18, which is associated with a lower chance of graduating from high school or earning a college degree (Galster et al., 2007; McLanahan & Jacobsen, 2015). Similarly, empirical studies on child externalizing behavior largely report negative influences of a mother's young age and low educational attainment. Lee and colleagues (2020) conducted a meta-analysis with 18 studies from the U.S., Canada, Australia, and European countries, and found a small but significant association between being born to a teen mother and higher child externalizing behavior. In a study conducted by Bøe and colleagues (2012) focusing on children ages 11 to 13, it was found that lower parental education level predicts higher child externalizing behavior. Mothers' age and education are more important than fathers' age and education. In

Nagin and Tremblay's (2001) study examining trajectories of boys' physical aggression (fighting, kicking, biting, hitting, or bullying other children), teen mothers with low educational attainment predict their sons' high and consistent levels of physical aggression, whereas father's age and educational attainment do not.

Parental relationships are also influential factors. A child of a single parent is likely to have more externalizing behaviors than a child of two parents (Comeau & Boyle, 2018). Single mothers are more exposed to stressful experiences than married mothers, such as financial strain, caregiving load, and work-family conflict (Avison et al., 2007), which may contribute to compromising single mothers' parenting abilities and, in turn, lead to higher externalizing behavior of children from single mothers. Similarly, Humphrey and Root (2017) found that a child living with married parents tends to have a lower level of externalizing behavior than a child living with unmarried parents.

Parental incarceration is another important factor in studying child development. Parental incarceration is significantly associated with economic and residential instability for children (Geller et al., 2009), which may have negative effects on child development. Studies commonly demonstrate that both former and current parental incarceration is directly associated with a high level of child externalizing behavior (Kjellstrand & Eddy, 2011; Ruhland et al., 2020); children of currently incarcerated parents are likely to have more externalizing behaviors than those of formerly incarcerated parents (Ruhland et al., 2020). Parental incarceration also predicts an increase in externalizing behavior over time during adolescence (Kjellstrand et al., 2018). It is essential to consider the role of structural racism in incarceration, as Black Americans, particularly Black males, have been disproportionately affected by policies such as the "War on Poverty" and "War on Crime" in the 1960s as well as the "War on Drugs" in the 1980s-90s,

leading to higher rates of arrests and incarceration in impoverished Black communities (Heard-Garris et al., 2021).

Race/ethnicity and gender are also often examined in research on child outcomes and externalizing behavior. A non-white-householder family and a poor Black person have a higher risk of living in a high-poverty neighborhood than a white-householder family and a poor white person, respectively (Benzow & Fikri, 2020; Li et al., 2019); therefore, non-white children are more likely to encounter neighborhood disadvantages associated with a high poverty rate of a neighborhood, such as poor-educated, unemployed and low-income neighbors (Benzow & Fikri, 2020) as well as insufficient access to food, job opportunities, trusting neighbors and strong community institutions (Benzow & Fikri, 2020; Finighan & Putnam, 2017). Race/ethnicity and gender also interact with neighborhood poverty in influencing child outcomes. For example, in poor neighborhoods, African American males are more likely to drop out of high school than African American females, whereas white females are more likely to drop out than white males (Murry et al., 2011).

Empirical studies have commonly found no significant difference in the level of externalizing behavior between Black and white children (Comeau & Boyle, 2018; Humphrey & Root, 2017). However, it is crucial not to overlook the impact of racism on externalizing behavior. research on externalizing behavior. Loyd and colleagues (2019) studied juvenile justice-involved youth of color and found that ethnic/racial discrimination occurring between individuals, such as differential treatment from teachers and experiencing racial insults, is associated with increased externalizing behaviors. In addition, Reck and colleagues (2023) found that internalized racism, defined as the internalization of racist stereotypes perpetuated by the

dominant society about one's racial group, is associated with increased externalizing behavior among Black children.

Studies largely reported a significant impact of gender; male children tend to have a higher level of externalizing behavior (Comeau & Boyle, 2018; Geller et al., 2009; Humphrey & Root, 2017) and develop externalizing behavior at a faster rate than female children (Palamar et al., 2015). However, when Henninger and Luze (2012) examined children who participate in Head Start services and thus who are from families at or below the official poverty line, they found no difference in externalizing behaviors between boys and girls; instead, they found that time spent in poverty is associated with a higher level of externalizing behavior for girls, but not for boys.

2.6 Gaps in the Literature

Empirical studies consistently highlight the detrimental effects of high levels of child externalizing behavior on children's future socioeconomic status. Regarding family income and child development, previous research has extensively reported the negative impact of family economic deprivation on various facets of child well-being, including health, cognitive development, academic achievement, and externalizing behavior. Studies have also identified the adverse effects of being born into poverty or experiencing early childhood poverty on outcomes such as early cognitive and socioemotional capacities, brain development, educational attainment, externalizing behavior in middle childhood, and persistent poverty in later life that is associated with negative outcomes in adulthood. However, few studies have specifically focused

on understanding the influence of family economic status at a child's birth on the child's externalizing behavior.

Additionally, research has consistently underscored the importance of neighborhood poverty in child development. Neighborhood poverty exerts detrimental effects on the physical and mental health development of children and impacts various child outcomes, such as teenage pregnancy, single parenthood, low educational attainment, and reduced earnings as adults. Studies have also identified direct and indirect associations between high-poverty neighborhoods and the externalizing behavior of resident children. Given that children born into low-income families often reside in impoverished neighborhoods for more extended periods, it becomes imperative to examine the interactive effect of family income at a child's birth and neighborhood poverty. However, few studies have explored this interactive effect on children, representing a notable gap in the existing literature.

2.7 Research Hypotheses

As suggested in Bronfenbrenner (1979)'s ecological systems theory, human development needs to be understood in one's environmental context. As discussed earlier, the level of economic inequality in the U.S. has been rising, which contributes to structural barriers that hamper reducing the gaps between haves and have-nots that start in childhood. To deal with negative effects of this high economic inequality, it is imperative to understand specific mechanisms of inequality influencing people by delving into how individuals interact with ecological systems surrounding them. According to the cumulative dis/advantage (CAD) theory, relatively adverse (or favorable) characteristics in early life become resources that produce

further relative disadvantages (or gains), resulting in widening gaps between the advantaged and the disadvantaged over time (Dannefer, 2003; Diprete & Eirich, 2006; O’Rand, 1996). Drawing on both the ecological systems theory and the CAD theory, this dissertation study explores development trajectories of children born in advantaged and disadvantaged families, and how neighborhoods interact with the influence of family. Specifically, this study examines trajectories of children’s externalizing behavior, which is associated with diverse short-term and long-term outcomes that affect children’s human capital and, relatedly, their future economic opportunity.

With respect to family income and child development, previous studies found detrimental effects of family economic deprivation on child well-being and outcomes, including health, cognitive development, academic achievement and externalizing behavior (Assing-Murray & Lebrun-Harris, 2020; Chaudry & Wimer, 2016; Masarik & Conger, 2017; Simons & Steele, 2020; Sosu & Schmidt, 2017). Studies also identified detrimental effects of being born in poverty or experiencing poverty in early childhood on child outcomes, such as early cognitive/socioemotional capacities and brain development, educational outcomes, externalizing behavior in middle childhood, and persistent poverty in their later life that is linked to adverse outcomes in adulthood (Chaudry & Wimer, 2016; Ratcliffe & McKernan, 2012; Shonkoff, 2010; Shonkoff et al., 2012). Although few studies focused specifically on the influence of family economic status at a child’s birth on the child’s externalizing behavior, based on previous studies that found close relationships between childhood economic deprivation and child outcomes, it is plausible to hypothesize a child born in a poor family has a different trajectory of externalizing behavior than a child not born in a poor family. Hence, the first hypothesis (H1) of this dissertation study is:

H1. A child born into poverty will have a more adverse trajectory of behavior problems than a child not born into poverty.

Neighborhood poverty is also important to the child's development. As discussed above, neighborhood poverty has a detrimental effect on the physical and emotional development of children; it is also associated with negative child outcomes, such as teenage pregnancy, single parenthood, low educational attainment, and low earnings as adults. In addition, previous studies found that high-poverty neighborhoods are directly and indirectly associated with externalizing behavior of resident children (Grogan-Kaylor et al., 2020; Jocson & McLoyd, 2015; Li et al., 2019; Pei et al., 2022). Considering that children born into low-income families disproportionately live in a poor neighborhood for a longer period, the interactive effect of family income and neighborhood poverty needs to be examined; however, few studies have explored this interactive effect on children (Morrissey & Vinopal, 2018; Votruba-Drzal et al., 2021).

This study focuses in particular on the mediating role of neighborhood poverty in the processes by which children's economic origins influence their externalizing behavior trajectories; that is, what role does neighborhood poverty play in the vicious cycle of a child's being born into poverty and their adverse development trajectory? The study explores whether a child born into poverty, compared to the other child who was not born in poverty, has a more adverse development trajectory because the poor child is at greater risk of living in a poor neighborhood and because the child is more vulnerable to neighborhood poverty. Based on prior literature, this study tests the following two hypotheses:

H2. Compared to a child not born into poverty, a child born into poverty will live in a neighborhood with a higher poverty level as they get older.

H3. For a child born into poverty in comparison to a child not born into poverty, higher poverty level of their neighborhood will result in more externalizing behavior problems.

3.0 Research Design

This dissertation study is a longitudinal study analyzing data from the Future of Families and Child Wellbeing Survey (FFCWS). This Research Design section describes the data and the sample for this dissertation study. Then, it provides detailed information about the variables and their measurement as well as analytic strategies to test each hypothesis. This section concludes with strategies for conducting robustness checks on the findings.

3.1 Data and Sample

3.1.1 Data Sources

3.1.1.1 Future of Families and Child Wellbeing Survey (FFCWS)

The data for this study come from the Future of Families and Child Wellbeing Survey (FFCWS); this longitudinal panel study follows a cohort of 4,898 children born between 1998 and 2000 in large U.S. cities. The FFCWS offers previously unavailable insights into the circumstances of new unmarried parents and the well-being of their children (Reichman et al., 2001).

The probability sample of 4,898 births was obtained using stratified random sampling (Reichman et al., 2001). The sampling occurred in three stages: sampling cities, hospitals, and married/unmarried births. First, 20 cities were sampled from the 77 U.S. cities with a population of 200,000 or more. These 77 large cities were grouped into 9 strata based on their scores on

policy regimes measured by the generosity of welfare grants, the strictness of child support systems, and the strength of the local labor markets. In order for the sampled cities to be nationally representative and to have maximum variation in policy regimes, 20 cities were randomly selected to encompass all 9 strata, with each city's selection probability proportional to its population. Next, hospitals within each of the 20 cities were sampled. In 18 cities, all available hospitals that had maternity wards were selected. In the other two cities, because of the number of birthing hospitals, hospitals were randomly sampled among those with over 1000 non-marital births per year. Finally, both married and unmarried births were randomly sampled within each of the selected hospitals (Reichman et al., 2001).

The study oversampled non-marital births; the ratio of non-marital births to marital births in the original sample is 3 to 1, which made the data particularly well-suited to study socially and financially disadvantaged families (Gaydosch & McLanahan, 2021; Slack et al., 2014). The FFCWS has completed and published six waves of data. The Wave 1 study ("Baseline") interviewed a focal child's mother and father in person between 1998 and 2000 at the time of a focal child's birth; the five longitudinal follow-ups were conducted when the focal child was approximately 1, 3, 5, 9, and 15 years old.

3.1.1.2 Census Tract Data (FFCWS Restricted Use Contract Data)

This dissertation study also used the FFCWS Restricted Use Contract Data, which are the U.S. Census Bureau's Census-tract level data merged into the FFCWS data. These data include demographic, employment, housing, and income characteristics for the U.S. Census tracts where mothers, fathers, and/or primary caregivers lived at each wave. Waves 1-5 contract data are from U.S. 2000 Decennial Census data; Wave 6 contract data are from the U.S. 2010 Decennial Census and the American Community Survey 2015 5-year estimates.

3.1.1.3 Sample

The analytic sample for this study included families with children who were interviewed when their child was born (Wave 1) and about 3, 5, 9, and 15 years old (Waves 3, 4, 5, and 6, respectively). Each family included a child, born between 1998 and 2000, and his/her biological parent(s). Families who responded to all five waves were included in the analyses ($n=3,080$). Among these families, those with missing data in dependent variables of analyses—i.e., 866 cases missing on child behavior problems at Waves 3-6 and then additional 133 cases missing on neighborhood-level poverty rate—were excluded from the sample. Among the 2,081 cases after the aforementioned exclusions, the study analyzed complete cases that did not have missing values in covariates of the final analyses. Therefore, the final sample included 1,968 families ($N=1,968$).

As common with panel data studies, sample attrition was inevitable in this study. Since nonrandom sample attrition may result in biased results, I explored whether sample attrition in this study was systematically related to family characteristics (Park et al., 2011). I conducted a series of bivariate analyses comparing the characteristics of families at Wave 1 (family's low-income status, mother's age, mother's race, mother's educational attainment, and biological parents' marital status) between those lost to attrition and those not (Table A 1 in Appendix A). There was no significant difference in mother's age and biological parents' marital status by attrition status. However, family's low-income status, mother's race, and mother's education attainment were statistically significantly different.

Additionally, I compared participants included in the final sample and those excluded due to both attrition and missing values (Table A 2 in Appendix A). There was no statistically significant difference in mother's age and biological parents' marital status depending on

whether cases were included in or excluded from the final sample. There was also no significant difference in the proportions of White non-Hispanic mothers and Other racial group mothers. However, family's low-income status, the proportions of Black non-Hispanic mothers and Hispanic mothers, and mother's education attainment were statistically significantly different. These analyses of sample might pose some concerns, which were further addressed in the robustness check discussed in Chapter 3.3.3.

3.2 Variables and Measures

The variables used in this study and how they were measured are summarized on Table 1. The key variables for this dissertation study are: family economic status that a child was born into, neighborhood poverty, and child externalizing behavior. Analyses commonly include time-invariant covariates that were measured at Wave 1 (when a child was born), such as mother's age, race/ethnicity, and educational attainment, parents' marital status, and child's sex, as well as time-varying covariates that were measured at each of Waves 3 to 6 (when a child is about 3, 5, 9, and 15 years old, respectively), such as income to poverty threshold percentage, parents' relationship, and parent(s) ever incarcerated.

Table 1. Variables and Measures

	Variables	Measures
Key Variables	Child Externalizing Behavior	The average of scores for externalizing behavior items in a 0-2 scale from Child Behavior Checklist (CBCL) at each wave
	Economic Origin of a Child	Pre-tax household income below 200% of FPL at Wave 1: 0=not low-income ($\geq 200\%$ FPL); 1=low-income ($< 200\%$ FPL)
	Neighborhood Poverty	Poverty rate of a child's neighborhood at each wave
	Child's Age	Dummy-coded child's age at each wave: 3, 5, 9, 15 years old at Waves 3, 4, 5, and 6, respectively.
	Time-invariant Covariates	
	Mother's Age	Mother's age at child's birth
	Mother's Race/Ethnicity	Mother's race/ethnicity: 0=White non-Hispanic; 1=Black non-Hispanic; 2=Hispanic; 3=Other
	Mother's Educational Attainment	Mother's educational attainment at child's birth: 0=high school degree or less; 1=higher than high school degree
	Parents' Marital Status	Biological parents' marital status at child's birth: 0=married; 1=unmarried
	Child's Sex	A child's biological sex: 0=female; 1=male
Time-varying Covariates	Income to Poverty Threshold Percentage	Percentage of pre-tax household income to the FPL at Waves 3-6
	Parents' Relationship	Biological parents' relationship at Waves 3-6: 0=married; 1=not married but cohabiting, 2=not married and not cohabiting
	Parental Incarceration	Whether biological father is incarcerated at Waves 3-6: 0=no; 1=yes

3.2.1 Key Variables

3.2.1.1 Child Externalizing Behavior (Behavior Problems)

Child externalizing behavior problems indicate a child's aggressive, destructive, delinquent, and rule-breaking behaviors as rated by a primary caregiver of the child at each wave of Waves 3-6. Following the instructions in the FFCWS data user guide (FFCWS, n.d.-b), this study uses items and subscales of Child Behavior Checklists (CBCLs) for externalizing behavior problems (Achenbach, 1992; Achenbach & Rescorla, 2000, 2001; Caci et al., 2003; Gottfredson & Hirschi, 1990; McConaughy & Achenbach, 1988). The CBCL, widely utilized globally, is a parent-completed, empirically derived, user-friendly assessment tool for psychopathology (Biederman et al., 2020)

The FFCWS data user guide (FFCWS, n.d.-b) asks data users to create the externalizing behavior variable by using aggressive, destructive, delinquent and/or rule-breaking behavior items: 15 Aggressive items and 7 Destructive items in Wave 3; 18 Aggressive and 10 Delinquent items in Wave 4; 18 Aggressive and 17 Rule-breaking items in Wave 5; and 11 Aggressive and 9 Rule-breaking items in Wave 6. Each item was measured in a 0-2 scale, 0 indicating not true, 1 indicating sometime or somewhat true, and 2 indicating very true or often true. Appendix B presents the full list of these questions. Internal reliabilities (Cronbach's alpha) of external behavior subscales for Waves 3-6 are 0.88, 0.86, 0.91, and 0.89, respectively (FFCWS, n.d.-b; James et al., 2021).

According to the FFCWS data user guide (FFCWS, n.d.-b), scores for subscales can be calculated either by adding scores for each item or by averaging item scores. This study used the average of scores for externalizing behavior items.

3.2.1.2 Family Economic Status at a Child's Birth (Economic Origin of a Child)

Family economic status at a child's birth, or economic origin of a child, indicates whether or not a child was born into a low-income family. This variable was measured at Wave 1 by the percentage of pre-tax household income to the official poverty thresholds (Federal Poverty Line, FPL). The FFCWS dataset already has a household income poverty variable; the categories are: 1 indicating household income of 0-49% FPL, 2 indicating 50-99% FPL, 3 indicating 100-199% FPL, 4 indicating 200-299% FPL, and 5 indicating 300% FPL and above.

As I am interested in comparing development trajectories of children born in a poor family and those who were not, the household income poverty variable in the FFCWS data was recoded into a binary variable. Previous studies (Cole & Nguyen, 2020; Comeau & Boyle, 2018) have defined household income below 200% FPL as low income, as state eligibility thresholds for social welfare programs are up to 200% FPL. Hence, the economic origin of a child was measured by a binary variable, 0 indicating a child not born in a low-income family (household income of 200% FPL or above) and 1 indicating a child born in a low-income family (household income of below 200% FPL).

3.2.1.3 Neighborhood Poverty

In line with the U.S. Census Bureau and previous studies (Bishaw, 2011; Li et al., 2019; U.S. Census Bureau, n.d.-a), neighborhood poverty at each of Waves 3-6 was measured by the rate of residents living below the federal official poverty line in a census tract where a child resides. The FFCWS Restricted Use Contract Data were used to construct this variable.

3.2.1.4 Child's Age

A child's age at each of Waves 3-6 is another variable of interest as this study examined trajectories of children's externalizing behavior and residential poverty. Children's ages were coded as 3, 5, 9, and 15 for Waves 3, 4, 5, and 6, respectively. The Child's Age variable was included as a set of dummy variables, not as a continuous variable, to model the age-effect flexibly.

3.2.2 Control Variables

Confounding bias and overcontrol bias would distort the results of this study's analyses on the relationships of a child's economic origin, neighborhood poverty, and child externalizing behavior. Confounding bias occurs when a confounder, which is a common driver of both independent and dependent variables, is not controlled for (Elwert & Winship, 2014; Spector, 2021). In models of neighborhood effects on child outcomes, failure to control for background characteristics of families and children may lead to confounding bias and spuriously large relationships between neighborhood poverty and child outcomes (Galster et al., 2007; Morrissey & Vinopal, 2018). Overcontrol bias also needs to be considered; it occurs from controlling for a variable that is on a causal path between independent and dependent variables (Elwert & Winship, 2014; Spector, 2021). To avoid confounding bias and overcontrol bias, the analyses condition on time-invariant and time-varying confounders (background characteristics of families and children) but not on intervening mediating mechanisms (Elwert & Winship, 2014).

Time-invariant confounders are mother's age at a child's birth, mother's race/ethnicity (0=White non-Hispanic; 1=Black non-Hispanic; 2=Hispanic; 3=other), mother's educational attainment at a child's birth (0=high school degree or less; 1=higher than high school degree),

biological parents' marital status at a child's birth (0=married; 1=unmarried), and a child's biological sex (0=female; 1=male). All these time-invariant covariates were measured at Wave 1.

Time-varying confounders include the income to poverty threshold percentage, biological parents' relationship, and parental incarceration. The income to poverty threshold percentage is measured by the percentage of pre-tax household income to the official poverty thresholds (FPL). Biological parents' relationship is measured by three categories: 0 indicating married; 1 indicating not married but cohabiting; 2 indicating not married and not cohabiting. Finally, parental incarceration indicates whether the biological father is incarcerated at each wave of the survey (0=no; 1=yes).

3.3 Analytic Strategy

3.3.1 Research Model

This study describes life trajectories and examines explanatory factors by using an approach developed by Brüderl and colleagues (2019) (Figure 1). Studies on life course trajectories are often criticized for being descriptive by merely focusing on demonstrating typical patterns (Brüderl et al., 2019). In contrast, Brüderl and colleagues' (2019) approach provides a rigorous analytic model to not only describe life course trajectories but also to analyze their underlying processes.

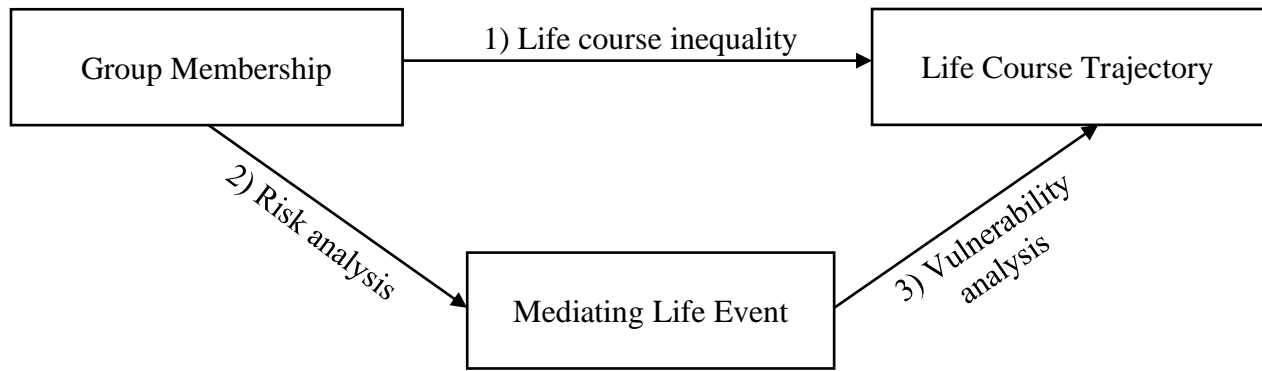


Figure 1. Brüderl et al. (2019)'s Approach to Life Course Research

Brüderl and colleagues' (2019) model consists of three steps. The first step is to describe trajectories of a specific outcome and how the trajectories differ by group. When significant differences in the trajectories between groups are found, a researcher moves on to the second step and investigates mediating life events (risks) that produce the inequality; by doing so, the researcher conducts a risk analysis on how the probabilities of experiencing negative life events differ by group. Then, in the third step, through a vulnerability analysis, the researcher examines how the effects of the mediating life events differ by group (Brüderl et al., 2019).

Figure 2 demonstrates how Brüderl and colleagues' (2019) model is applied to this study by connecting the constructs of the model to research hypotheses. As mentioned in an earlier chapter, this study compares the trajectories of externalizing behavior between children born into poverty and those who were not. It examines whether a child born into poverty experiences more adverse trajectories of behavior problems over time (Life Course Inequality, Hypothesis 1), because they are both likely to live in a higher-poverty neighborhood (Risk, Hypothesis 2) and suffer more from neighborhood poverty (Vulnerability, Hypothesis 3).

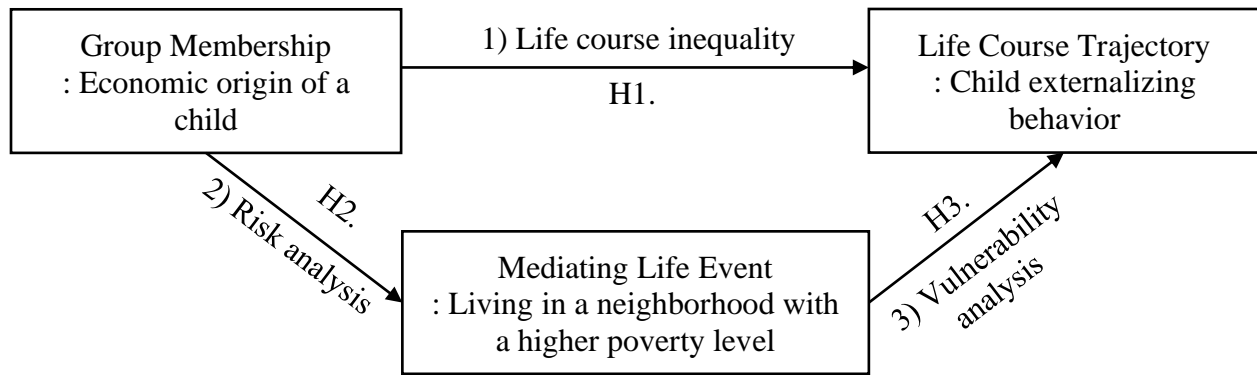


Figure 2. Research Model of the Current Study and Research Hypotheses

3.3.2 Analyses

Each of the three hypotheses is examined using a separate *population averaged* (PA) model. PA models analyze changes in the population mean given changes in covariates; the coefficients of these models are estimated using *generalized estimating equations* (GEE) (Liang & Zeger, 1986). PA models are particularly suitable for panel data analyses as they account for the within-panel non-independence of responses on dependent variables with diverse distributions (e.g., normal, binomial, and Poisson), by permitting specification of a within-panel covariance structure (“working covariance”). Specification of a certain working covariance structure only affects standard error estimation, not coefficient estimation. When GEEs are employed with the Huber/White/sandwich estimator of variance, they can produce valid standard errors even when the empirical within-panel (within-subject) covariances do not match the specified correlation structure (Ballinger, 2004; Hubbard et al., 2010; Liang & Zeger, 1986).

In this study, it is highly likely that the dependent variables (externalizing behavior for Hypotheses 1 and 3, and neighborhood poverty for Hypothesis 2) measured at adjacent

timepoints exhibit a stronger correlation compared to those measured at more distant timepoints. To address this within-panel correlation, each PA model in this study incorporates a first-order autoregression structure in the GEEs. Additionally, each model utilizes GEE with the Huber/White/sandwich estimator of variance for robustness. Analyses are conducted by using *xtgee* command in StataSE 18.

PA models are more appropriate for this study compared to other alternative statistical models. While fixed-effects models are commonly used for panel data analyses, they are not suitable when time-invariant independent variables are of a study's interest, as these models control for and do not estimate coefficients of such variables (Certo et al., 2017). In this study, one of the primary independent variables is the Economic Origin of a Child, which is time-invariant, making fixed-effects models inappropriate. Random-effects models can incorporate time-invariant independent variables. However, they have a restrictive assumption of no correlation between the individual-specific effect (unobserved individual differences) and the covariates of interest, which may not hold (Bartels, 2008; Clark & Linzer, 2015). Another possible approach for panel data analysis is a pooled Ordinary Least Squares (OLS) regression model. However, when there is a likelihood of within-subject correlations, GEE is preferred over OLS due to its ability to provide more efficient and unbiased parameter estimates (Ballinger, 2004).

3.3.2.1 Analysis 1. The Differential Development of Child Externalizing Behavior: A Comparison between Children Born into Poverty and Those Who Were Not

To test Hypothesis 1, the first analysis (Equation 1) examines the trajectories of externalizing behavior of children born into poverty and those who were not, to demonstrate how

differently externalizing behavior of these two groups of children develops throughout the first 15 years of their lives.

$$\ln(EB_{it}) = \alpha + \beta Poor_i + \sum_{t=4}^6 \gamma_t Age_t + \sum_{t=4}^6 \delta_t Age_t Poor_i + \lambda' X_i + \mu' X_{it} + \varepsilon_{it} \quad , \text{ where } corr(\varepsilon_{it}, \varepsilon_{it-s}) = \rho^{|s|} \quad (1)$$

EB_{it} stands for externalizing behavior of individual i at time t ; the variable takes a natural log to adjust its skewness. $Poor_i$ is a time-invariant dummy variable capturing a child's original economic status, which indicates whether a child was born into poverty. To model the age-effect flexibly, the equation includes a set of dummy variables ($\sum_{t=4}^6 \gamma_t Age_t$) capturing age-related externalizing behavior at a child's age of 3, 5, 9, and 15, which is equivalent to Waves 3, 4, 5, and 6, respectively (Wave 3 as a reference). This flexible estimation of age effects allows this study to find every turning point in externalizing behavior across the trajectory and to avoid predetermining the results (Brüderl et al., 2019; Kratz & Patzina, 2020; Manzoni et al., 2014). To allow for age variations in the effect of original economic status on externalizing behavior, this study uses the interaction of $Poor_i$ and Wave dummies. β captures the difference in externalizing behavior by economic origin at age 3, whereas δ_t captures the difference in externalizing behavior between the two economic origin groups over the life course. The equation also includes time-invariant (X_i) and time-varying (X_{it}) covariates. ε_{it} is a time-varying error term. As mentioned in the earlier section, a first-order autoregression covariance structure was applied to address within-panel covariances, and the Huber/White/sandwich estimator of variance was used for robustness.

3.3.2.2 Analysis 2. Comparing the Experience of Neighborhood Poverty Over Time: A Comparison between Children Born Into Poverty and Those Who Were Not

To test Hypothesis 2, the second analysis (Equation 2) explores the level of poverty in a child's neighborhood by their age and economic origin to demonstrate how differently children experience neighborhood poverty throughout the first 15 years of their lives, comparing children born into poverty and those who are not.

$$Nbrpov_{it} = \alpha + \beta Poor_i + \sum_{t=4}^6 \gamma_t Age_t + \sum_{t=4}^6 \delta_t Age_t Poor_i + \lambda' X_i + \mu' X_{it} + \varepsilon_{it} \quad , \text{ where } corr(\varepsilon_{it}, \varepsilon_{it-s}) = \rho^{|s|} \quad (2)$$

$Nbrpov_{it}$ indicates the level of poverty in a child's neighborhood at a given age. As in Equation (1), $Poor_i$ is a dummy variable for a child's original economic status; β captures the difference in the poverty rate of a child's residential area by their economic origin at age 3. To flexibly model the age effect, the equation includes Ages with dummy variables ($\sum_{t=4}^6 \gamma_t Age_t$). To allow for age variations in the effect of original economic status on the level of neighborhood poverty, the interaction of $Poor_i$ and Age dummies is included; δ_t captures the difference in neighborhood poverty levels between the two economic origin groups across the ages. The analytic model also includes time-invariant (X_i) and time-varying (X_{it}) covariates, as well as a first-order autoregression covariance structure and the Huber/White/sandwich estimator of variance.

3.3.2.3 Analysis 3. Exploring the Differential Impact of Neighborhood Poverty on

Externalizing Behavior: A Comparison between Children Born Into Poverty and Those Who Were Not

One might expect that children born in poverty suffer more from living in a high-poverty neighborhood due to a lack of resources as a buffer for adverse residential environment; such a pattern would contribute to the externalizing behavior differential according to economic origin. This is examined in the third analysis (Equations 3 and 4) that explores the differential impact of neighborhood poverty on externalizing behavior comparing children born into poverty and those who were not. This analysis provides a test of Hypothesis 3.

$$\ln(EB_{it}) = \alpha + \beta Poor_i + \gamma Nbrpov_{it} + \delta Poor_i Nbrpov_{it} + \sum_{t=4}^6 \zeta_t Age_t + \lambda' X_i + \mu' X_{it} + \varepsilon_{it}$$

, where $corr(\varepsilon_{it}, \varepsilon_{it-s}) = \rho^{|s|}$ (3)

EB_{it} indicates externalizing behavior of individual i at time t ; the variable takes a natural log to adjust its skewness. β captures the difference in child externalizing behavior by their economic origin at age 3 in a neighborhood with 0% poverty rate. γ captures the effect of neighborhood poverty level for children not born in poverty. The interaction of a time-invariant binary variable (a group variable, $Poor_i$) and a time-varying variable ($Nbrpov_{it}$) allows for heterogeneous effects by economic origin; δ captures the difference in the neighborhood effect between children born into poverty and those who were not. Age dummies ($\sum_{t=4}^6 Age_t$) are included for flexible age effect. The analytic model also includes time-invariant (X_i) and time-varying (X_{it}) covariates, as well as a first-order autoregression covariance structure and the Huber/White/sandwich estimator of variance.

3.3.3 Robustness Check

As discussed in Chapter 3.1.1.3, sample attrition was inevitable in this study. To assess whether sample attrition in this study was systematically related to family characteristics, I conducted a series of bivariate analyses comparing the attributes of families at Wave 1 between those lost to attrition and those not (Table A 1 in Appendix A). The analyses revealed statistically significant differences in family's low-income status, mother's race, and mother's education attainment based on attrition status. In addition, I compared participants included in the final sample with those excluded due to both attrition and missing values (Table A 2 in Appendix A). I found statistically significant differences in family's low-income status, as well as the proportions of Black non-Hispanic mothers and Hispanic mothers, along with mother's education attainment. To ensure the robustness of my findings and account for any sensitivity to sample attrition and missing data, I conducted robustness checks.

There were minimal missing data on variables of interest. Among the 2,081 families who responded to all five waves and did not have missing data in both child behavior problems and neighborhood poverty rate at Waves 3-6, 94.57% of the sample ($n=1,968$) were complete cases (See Appendix C for a summary table of missing data). Income to poverty threshold percentage at Wave 6 ($n=59$, 2.84%) was the most commonly missing variable, followed by parents' relationship at Wave 6 ($n=57$, 2.74%), income to poverty threshold percentage at Wave 5 ($n=43$, 2.07%), and parents' relationship at Wave 5 ($n=35$, 1.68%). There were 1 to 4 missing observations in mother's age, mother's educational attainment, mother's race/ethnicity, income to poverty threshold percentage at Waves 3 and 4, and parents' relationship at Waves 3 and 4. Considering the small amount of missing data, both multiple imputation and complete cases analyses are plausible (SSCC, 2013). In addition, there were some concerns posed by sample

attrition discussed in Chapter 3.1.1.3. Therefore, in addition to running analyses with complete cases, I explored the missingness mechanism, conducted multiple imputation, and ran sensitivity analyses with imputed data.

To figure out the missingness mechanism (SSCC, 2013), I created a set of binary variables indicating whether a given observation in the existing variable is missing or not (1=missing). Since 11 variables mentioned above (also in Appendix C) had missing observations, 11 binary indicator variables were created. Then, I ran a series of t-tests to check if the values of the existing variables (see Table 1) differ between missing and non-missing observations. I also ran logit models; each logit model had a binary indicator variable as a dependent variable and the other existing variables as covariates. In these analyses, if any of the other existing variables predict the missingness of a given variable, the data are missing at random (MAR) rather than missing completely at random (MCAR) (SSCC, 2013). T-tests and logit models indicated that mother's age, income to poverty threshold percentage at Waves 3 and 4, and parents' relationship at Waves 3 and 4 were MCAR, while the others were MAR (See Appendix D for significant t-test results).

I conducted sensitivity analyses for the main analytic models. To do so, I ran Equations 1-3 using imputed data in which missing observations on covariates were imputed by multiple imputation (MI) (Allison, 2009; Royston, 2004; Rubin, 1987), as done in previous longitudinal studies using the FFCWS data (Burdette & Pilkauskas, 2012; Lee & McLanahan, 2015; Park et al., 2011). MI is desirable when the data are missing at random (Allison, 2009). It involves creating a small number (e.g., 5-10) of different plausible imputed datasets, analyzing each dataset independently and averaging the estimates of a parameter of interest to obtain a single estimate (Allison, 2009; Royston, 2004). After deleting cases with missing data on the dependent

variable (externalizing behavior for Equations 1 and 3; neighborhood poverty for Equation 2), I conducted MI by chained equations with covariates included in analyses by using the *mi impute chained* command in STATA, in which I can specify imputation models for multiple variables all at once (SSCC, 2013). The success of the overall imputation model depends on the individual models; hence, I independently tested each model for convergence or misspecification outside the *mi impute chained* context, and then, ran the complete imputation model (SSCC, 2013).

According to the FFCWS data-use tutorial (FFdata Team, 2019), researchers can conduct unweighted multivariate analyses with the FFCWS data if they control for important baseline characteristics related to sampling design, such as mother's marital status and mother's age. Although the FFCWS provides diverse cross-sectional weights, including mother, father, couples, primary caregiver, and child weights (FFCWS, n.d.-a), it does not offer longitudinal weights as well as weights for a child-biological parents group, which is the unit of analysis in this dissertation study. Hence, following the FFCWS data-use tutorial and previous longitudinal studies using the FFCWS data (Burdette & Pilkauskas, 2012; Goetschius et al., 2021), this study does not use weights but does control for baseline characteristics.

4.0 Findings

4.1 Descriptive Results

Table 2 presents descriptive statistics for the full sample used in this study and the sample by economic origin of a child. The full sample includes 1,968 children: 59.96% ($n=1180$) were born into a poor family, that is a family whose income fell below the 200% poverty line. For the full sample, the average log-transformed externalizing behavior score is highest at age 3 ($M=0.46$, $SD=0.21$), decreases at age 5 ($M=0.35$, $SD=0.18$), reaches the lowest score at age 9 ($M=0.16$, $SD=0.15$), and slightly increases at age 15 ($M=0.19$, $SD=0.18$). The average neighborhood poverty rate is 18.19% ($SD=14.22$) at age 3, decreases at ages 5 ($M=17.12$, $SD=13.75$) and 9 ($M=15.64$, $SD=13.57$), and reaches its peak at age 15 ($M=22.00$, $SD=14.98$). Compared to children not poor at birth, children poor at birth show higher average externalizing behavior levels and live in neighborhoods with higher average poverty rates at all the four timepoints.

The average age of mothers at a child's birth is 25.30 ($SD=6.02$) for the full sample; children born into poor families have a younger mother ($M=24.07$, $SD=5.51$) than children not poor at birth ($M=27.14$, $SD=6.28$). Black non-Hispanic mothers make up the largest portion ($n=1,027$, 52.2%) of the full sample, followed by mothers who are Hispanic ($n=440$, 22.4%), White non-Hispanic ($n=436$, 22.2%), and other race/ethnicity ($n=65$, 3.3%). The composition of mothers' race/ethnicity differs by child's economic origin groups; among children from a poor family, Black mothers ($n=717$, 60.8%) are the majority, followed by mothers who are Hispanic ($n=296$, 25.1%), White ($n=136$, 11.5%), and other racial groups ($n=31$, 2.6%). In contrast,

among children from higher economic backgrounds, the percentage of Black ($n=310$, 39.3%) and White ($n=300$, 38.1%) mothers are similar, followed by Hispanic ($n=144$, 18.3%) and other racial groups ($n=34$, 4.3%). Only 769 (39.1%) mothers have had at least some post-high school education at a child's birth; the portion of mothers with such educational attainment is larger among children not born into poverty ($n=492$, 62.4%) than those born into poverty ($n=277$, 23.5%). Births outside marriage makes up a majority of the full sample ($n=1,471$, 74.7%), and the percentage is higher among children poor at birth ($n=1,047$, 88.7%) than children not poor at birth ($n=424$, 53.8%). Male children comprise 51.6% ($n=1,016$) of the full sample, and sex composition does not significantly differ by children's economic origin.

The average income to poverty threshold percentage among the full sample increases as children get older, from 195.30% ($SD=264.05$) at age 3 to 236.33% ($SD=249.39$) at age 15. For each age, there are statistically significant differences by children's economic origin, being around 2.5-3.2 times higher for children not born into poverty than children born into poverty. Among the full sample, about 30% of biological parents were married at a child's ages of 3, 5, and 9, but the percentage decreases to 24.90% ($n=490$) at a child's age of 15. The portion of unmarried cohabiting parents decreases from 19.82% ($n=390$) at a child's age of 3 to 5.59% ($n=110$) at a child's age of 15, whereas the portion of not married, not cohabiting parents increases from 48.42% ($n=953$) at a child's age of 3 to 69.51% ($n=1,368$) at a child's age of 15. Among children born into poverty, the percentage of married biological parents is lower, but the percentages of the other two types of parental relationships are higher at all ages, than children not born into poverty. Incarcerated biological fathers make up 8.3% ($n=164$) of the full sample at age 3 with a large increase when a child is 15 years old ($n=380$, 19.3%). The percentage of

incarcerated fathers is higher among children poor at birth at all time points compared to children not poor at birth.

Table 2. Descriptive Results of the Full Sample and the Sample by a Child's Economic Origin

Variables	Economic Origin of a Child		<i>p</i> *	
	Full Sample (<i>N</i> =1,968)	Poor (<i>n</i> =1,180)		Non-poor (<i>n</i> =788)
	<i>M</i> (<i>SD</i>) or <i>n</i> (%)	<i>M</i> (<i>SD</i>) or <i>n</i> (%)		<i>M</i> (<i>SD</i>) or <i>n</i> (%)
Child Externalizing Behavior (log transformed)				
at Age 3	0.46 (0.21)	0.48 (0.22)	0.42 (0.19)	<0.001
at Age 5	0.35 (0.18)	0.36 (0.19)	0.32 (0.17)	<0.001
at Age 9	0.16 (0.15)	0.17 (0.16)	0.13 (0.13)	<0.001
at Age 15	0.19 (0.18)	0.21 (0.20)	0.15 (0.15)	<0.001
Neighborhood Poverty				
at Age 3	18.19 (14.22)	22.32 (14.33)	12.01 (11.57)	<0.001
at Age 5	17.12 (13.75)	21.04 (13.87)	11.23 (11.26)	<0.001
at Age 9	15.64 (13.57)	19.10 (13.76)	10.47 (11.47)	<0.001
at Age 15	22.00 (14.98)	25.97 (14.75)	16.05 (13.26)	<0.001
Mother's Age at a Child's Birth	25.30 (6.02)	24.07 (5.51)	27.14 (6.28)	<0.001
Mother's Race/Ethnicity				<0.001
White non-Hispanic	436 (22.2%)	136 (11.5%)	300 (38.1%)	
Black non-Hispanic	1,027 (52.2%)	717 (60.8%)	310 (39.3%)	
Hispanic	440 (22.4%)	296 (25.1%)	144 (18.3%)	
Other	65 (3.3%)	31 (2.6%)	34 (4.3%)	
Mother's Education at a Child's Birth (Higher than high school)	769 (39.1%)	277 (23.5%)	492 (62.4%)	<0.001
Parents' Marital Status at a Child's Birth (Unmarried)	1,471 (74.7%)	1,047 (88.7%)	424 (53.8%)	<0.001
Child's Sex (Male)	1,016 (51.6%)	617 (52.3%)	399 (50.6%)	0.472
Income to Poverty Threshold Percentage				
at Age 3	195.30 (264.05)	103.46 (85.14)	332.83 (363.06)	<0.001
at Age 5	196.56 (226.68)	116.21 (141.08)	316.88 (272.82)	<0.001
at Age 9	202.57 (231.12)	123.92 (98.66)	320.34 (309.45)	<0.001
at Age 15	236.33 (249.39)	148.37 (130.06)	368.06 (318.02)	<0.001

Parents' Relationship				
at Age 3				<0.001
Married	625 (31.8%)	209 (17.7%)	416 (52.8%)	
Cohabiting, not married	390 (19.8%)	281 (23.8%)	109 (13.8%)	
Not married, not cohabiting	953 (48.4%)	690 (58.5%)	263 (33.4%)	
at Age 5				<0.001
Married	636 (32.3%)	224 (19.0%)	412 (52.3%)	
Cohabiting, not married	275 (14.0%)	210 (17.8%)	65 (8.2%)	
Not married, not cohabiting	1,057 (53.7%)	746 (63.2%)	311 (39.5%)	
at Age 9				<0.001
Married	596 (30.3%)	215 (18.2%)	381 (48.4%)	
Cohabiting, not married	191 (9.7%)	132 (11.2%)	59 (7.5%)	
Not married, not cohabiting	1,181 (60.0%)	833 (70.6%)	348 (44.2%)	
at Age 15				<0.001
Married	490 (24.9%)	166 (14.1%)	324 (41.1%)	
Cohabiting, not married	110 (5.6%)	77 (6.5%)	33 (4.2%)	
Not married, not cohabiting	1,368 (69.5%)	937 (79.4%)	431 (54.7%)	
Parental Incarceration				
at Age 3	164 (8.3%)	131 (11.1%)	33 (4.2%)	<0.001
at Age 5	149 (7.6%)	121 (10.3%)	28 (3.6%)	<0.001
at Age 9	142 (7.2%)	120 (10.2%)	22 (2.8%)	<0.001
at Age 15	380 (19.3%)	287 (24.3%)	93 (11.8%)	<0.001

* Note: Tests compare variables across child's economic origin groups

4.2 Analysis 1: Development of Child Externalizing Behavior

Table 3 presents results of the population-averaged model analyzing differential development of child externalizing behavior by their economic origin (Equation 1). As the dependent variable (externalizing behavior) in Equation 1 is log-transformed, the table presents both unstandardized coefficients and the exponentiated values of coefficients. This model tests study hypothesis 1: a child born into poverty will have a more adverse trajectory of behavior problems than a child not born into poverty.

Table 3. Development of Child Externalizing Behavior by Economic Origin (N=1,968)

	<i>B</i>	<i>Robust S.E.</i>	<i>z</i>	<i>exp(B)</i>
Economic origin of a child				
(Reference: Non-poor)				
Poor	0.04***	0.01	3.58	1.04
Age (Ref.: Age 3)				
5	-0.10***	0.01	-14.44	0.91
9	-0.29***	0.01	-44.84	0.75
15	-0.27***	0.01	-36.2	0.76
Economic origin x Age				
Poor x Age 5	-0.02*	0.01	-2.38	0.98
Poor x Age 9	-0.02*	0.01	-2.47	0.98
Poor x Age 15	-0.01	0.01	-0.51	0.99
Mother's age at a child's birth	-0.00**	0.00	-2.89	1.00
Mother's race/ethnicity (Ref.: White)				
Black	-0.02*	0.01	-2.09	0.98
Hispanic	-0.03***	0.01	-3.71	0.97
Other	0.00	0.02	0.03	1.00
Mother's education at a child's birth:	-0.02**	0.01	-3.12	0.98
Higher than high school				
Unmarried parents at a child's birth	0.02*	0.01	2.04	1.02
Male child	0.03***	0.01	4.21	1.03
Income to poverty threshold percentage	-0.00	0.00	-1.14	1.00
Parents' relationship (Ref.: Married)				
Cohabiting, not married	0.02**	0.01	2.66	1.02
Not married, not cohabiting	0.02***	0.01	3.52	1.02
Parental incarceration	0.04***	0.01	5.07	1.04
(Intercept)	0.46***	0.02	24.1	1.58

*** $p < .001$, ** $p < .01$, * $p < .05$

For both children born into poverty (“poor children”) and those who were not (“non-poor children”), externalizing behavior was the highest at age 3, decreased until age 9, and slightly increased at age 15 (also see Figure 3 for the illustration of externalizing behavior score at each age by a child's economic origin). At age 3, poor children had a 4% higher externalizing behavior

score than non-poor children ($exp(B)=1.04$, $SE=0.01$, $p<0.001$). Among non-poor children, externalizing behavior decreased by 9% between ages 3 and 5 ($exp(B)=0.91$, $SE=0.01$, $p<0.001$) and 17% between ages 5 and 9 ($exp(-0.19)=0.83$), and then increased by 2% between ages 9 and 15 ($exp(0.02)=1.02$). Among poor children, externalizing behavior decreased by 11% between ages 3 and 5 ($exp(-0.12)=0.89$) and 17% between ages 5 and 9 ($exp(-0.19)=0.83$), while it increased 3% between ages 9 and 15 ($exp(0.03)=1.03$). Figure 4 depicts the difference in the level of externalizing behavior between poor and non-poor children, indicating that poor children experienced significantly higher externalizing behavior than non-poor children at ages 3 and 15, whereas there was no significant difference at ages 5 and 9.

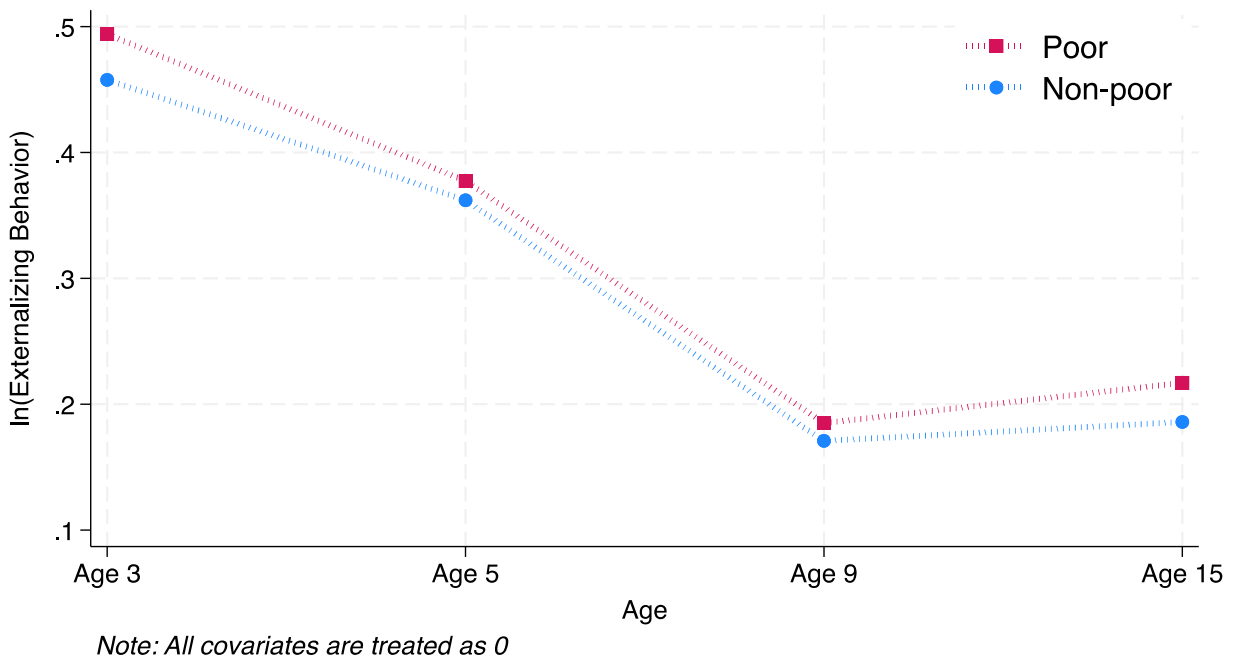


Figure 3. Predicted Log-Transformed Externalizing Behavior Score by a Child's Economic Origin

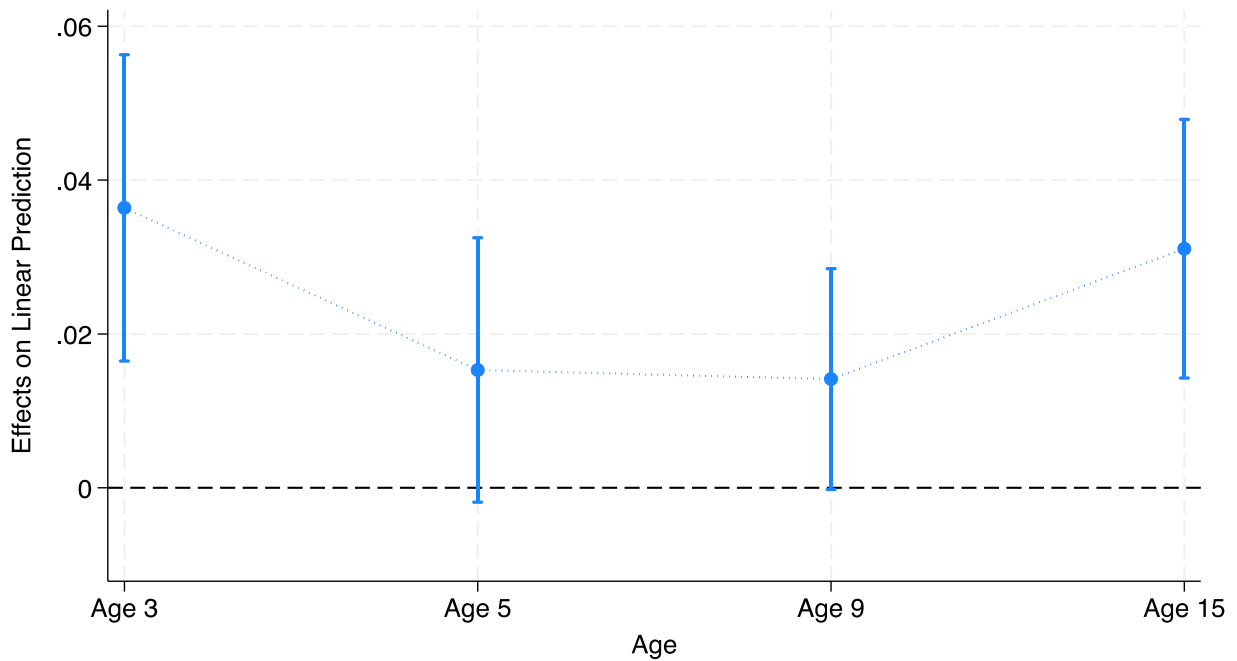


Figure 4. Difference in the Level of Externalizing Behavior by a Child's Economic Origin

Among control variables (Table 3), mother's age and educational attainment at a child's birth were negatively associated with child externalizing behavior scores. One year older in mother's age at a child's birth was associated with 0.2% lower child externalizing behavior ($exp(B)=0.998$, $SE=0.00$, $p<0.01$), and a mother with at least some education after the receipt of a high school diploma was associated with 2% lower child externalizing behavior ($exp(B)=0.98$, $SE=0.01$, $p<0.01$).

The children of White non-Hispanic mothers exhibited 2% more externalizing behaviors than Black non-Hispanic mothers' children ($exp(B)=0.98$, $SE=0.01$, $p<0.05$) and 3% higher than Hispanic mothers' children ($exp(B)=0.97$, $SE=0.01$, $p<0.001$). Children born to unmarried parents were likely to have 2% more externalizing behaviors than those born to married parents ($exp(B)=1.02$, $SE=0.01$, $p<0.05$). Male children tended to have 3% more externalizing behaviors than female children ($exp(B)=1.03$, $SE=0.01$, $p<0.001$). When a child's biological parents were

not currently married, in both cases of cohabiting ($exp(B)=1.02$, $SE=0.01$, $p<0.01$) and not cohabiting ($exp(B)=1.02$, $SE=0.01$, $p<0.001$) parents, a child was likely to have a 2% higher externalizing behavior score than a child living with married parents. Furthermore, father's incarceration was associated with 4% higher child externalizing behavior score ($exp(B)=1.04$, $SE=0.01$, $p<0.001$). There were no statistically significant differences associated with the income-to-poverty-threshold percentage.

In brief, Analysis 1 examined trajectories of externalizing behavior by children's economic origin for the first 15 years of their lives while controlling for family background information. While the study hypothesized that poor children would have a more adverse trajectory than non-poor children, the results showed more complex stories. At age 3, the level of externalizing behavior was higher among poor children. Then, poor children's externalizing behavior decreased at a greater rate than non-poor children between ages 3 and 5 and at a similar rate to non-poor children between ages 5 and 9, leading to no significant difference in externalizing behavior levels between poor and non-poor children at ages 5 and 9. However, poor children's externalizing behavior increased at a greater rate than non-poor children between ages 9 and 15, re-establishing the gap between poor and non-poor children.

4.2.1 Robustness Check

A sensitivity analysis was conducted by repeating Analysis 1 with imputed data. To create imputed data, I deleted cases with missing observations on the dependent variable (externalizing behavior) and conducted multiple imputation by chained equations ($N=2,234$). Results from the imputed data (Table 4) are largely consistent with the results from complete

cases (Table 3), indicating that there is little concern about bias caused by lost cases due to attrition and missing responses.

Table 4. Sensitivity Analysis: Development of Child Externalizing Behavior by Economic Origin (N=2,234)

	<i>B</i>	<i>S.E.</i>	<i>t</i>
Economic origin of a child (Reference: Non-poor)			
Poor	0.04***	0.01	4.05
Age (Ref.: Age 3)			
5	-0.10***	0.01	-15.68
9	-0.29***	0.01	-46.34
15	-0.27***	0.01	-37.53
Economic origin x Age			
Poor x Age 5	-0.02*	0.01	-2.26
Poor x Age 9	-0.02**	0.01	-2.91
Poor x Age 15	-0.01	0.01	-0.55
Mother's age at a child's birth	0.00**	0.00	-3.03
Mother's race/ethnicity (Ref.: White)			
Black	-0.02*	0.01	-2.14
Hispanic	-0.03**	0.01	-3.46
Other	0.00	0.02	-0.03
Mother's education at a child's birth: Higher than high school	-0.02**	0.01	-2.74
Unmarried parents at a child's birth	0.02**	0.01	2.67
Male child	0.02***	0.01	3.97
Income to poverty threshold percentage	0.00	0.00	-1.33
Parents' relationship (Ref.: Married)			
Cohabiting, not married	0.02*	0.01	2.02
Not married, not cohabiting	0.02**	0.01	3.41
Parental incarceration	0.03***	0.01	4.56
(Intercept)	0.46***	0.02	25.51

*** $p < .001$, ** $p < .01$, * $p < .05$

4.3 Analysis 2: Experience of Neighborhood Poverty

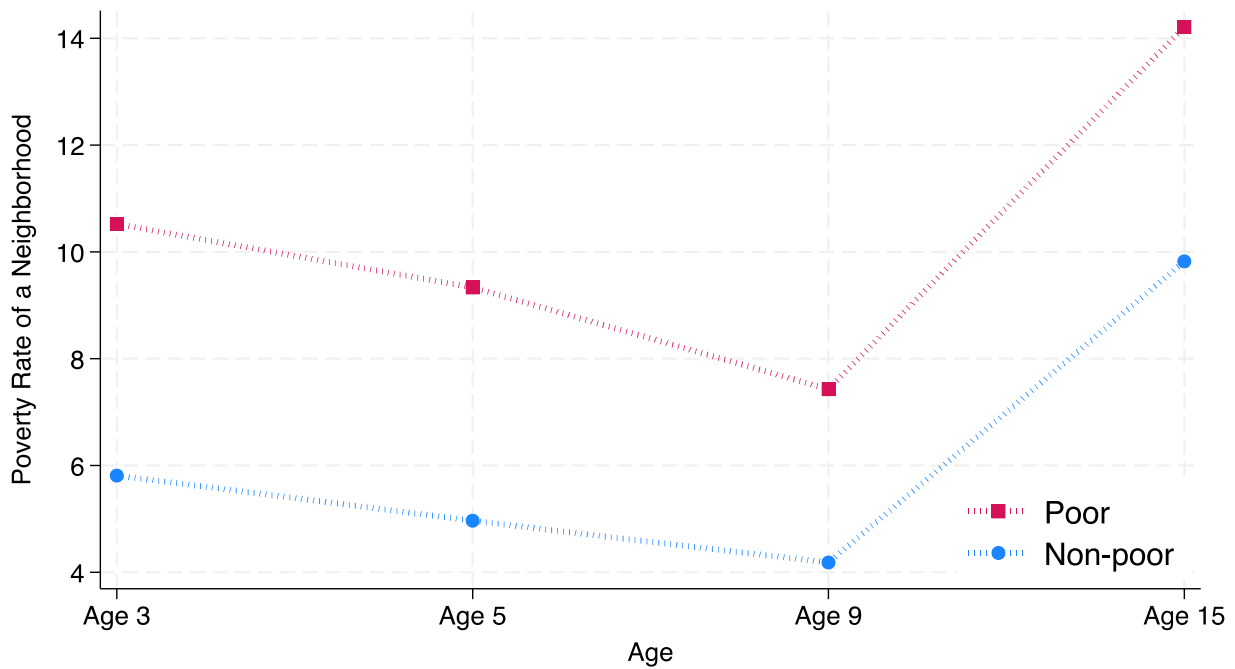
Table 5 presents the results of the population-averaged model analyzing differential poverty rates of neighborhoods where children reside by their economic origin (Equation 2). This model tests study hypothesis 2: compared to a child not born into poverty, a child born into poverty will live in a neighborhood with a higher poverty level as they get older.

Table 5. Experience of Neighborhood Poverty by Economic Origin (N=1,968)

	<i>B</i>	<i>Robust S.E.</i>	<i>z</i>
Economic origin of a child (Reference: Non-poor)			
Poor	4.71***	0.61	7.66
Age (Ref.: Age 3)			
5	-0.84**	0.28	-2.98
9	-1.63***	0.36	-4.53
15	4.01***	0.45	8.96
Economic origin x Age			
Poor x Age 5	-0.34	0.43	-0.8
Poor x Age 9	-1.47**	0.54	-2.71
Poor x Age 15	-0.32	0.65	-0.5
Mother's age at a child's birth	0.13**	0.04	2.98
Mother's race/ethnicity (Ref.: White)			
Black	9.91***	0.56	17.66
Hispanic	5.73***	0.63	9.09
Other	2.89**	1.12	2.58
Mother's education at a child's birth: Higher than high school	-3.50***	0.51	-6.89
Unmarried parents at a child's birth	1.77**	0.62	2.85
Male child	0.01	0.43	0.02
Income to poverty threshold percentage	-0.00***	0.00	-4.75
Parents' relationship (Ref.: Married)			
Cohabiting, not married	1.11*	0.54	2.04
Not married, not cohabiting	1.00*	0.43	2.3
Parental incarceration	1.19*	0.55	2.18
(Intercept)	5.81***	1.37	4.23

*** $p < .001$, ** $p < .01$, * $p < .05$

The results revealed that children born into poverty (“poor children”) consistently resided in neighborhoods with higher poverty rates across all four time points compared to children not born into poverty (“non-poor children”) (also see Figure 5). Specifically, the neighborhood poverty levels of poor children were 4.71, 4.37, 3.24, and 4.39 percentage points higher at ages 3, 5, 9, and 15 respectively, than the neighborhood poverty levels of non-poor children. Figure 6 illustrates the statistical significance of the difference in the level of neighborhood poverty rates between poor and non-poor children, indicating that poor children experienced statistically significantly higher neighborhood poverty across their first 15 years.



Note: All covariates are treated as 0

Figure 5. Predicted Neighborhood Poverty Experience by a Child's Economic Origin

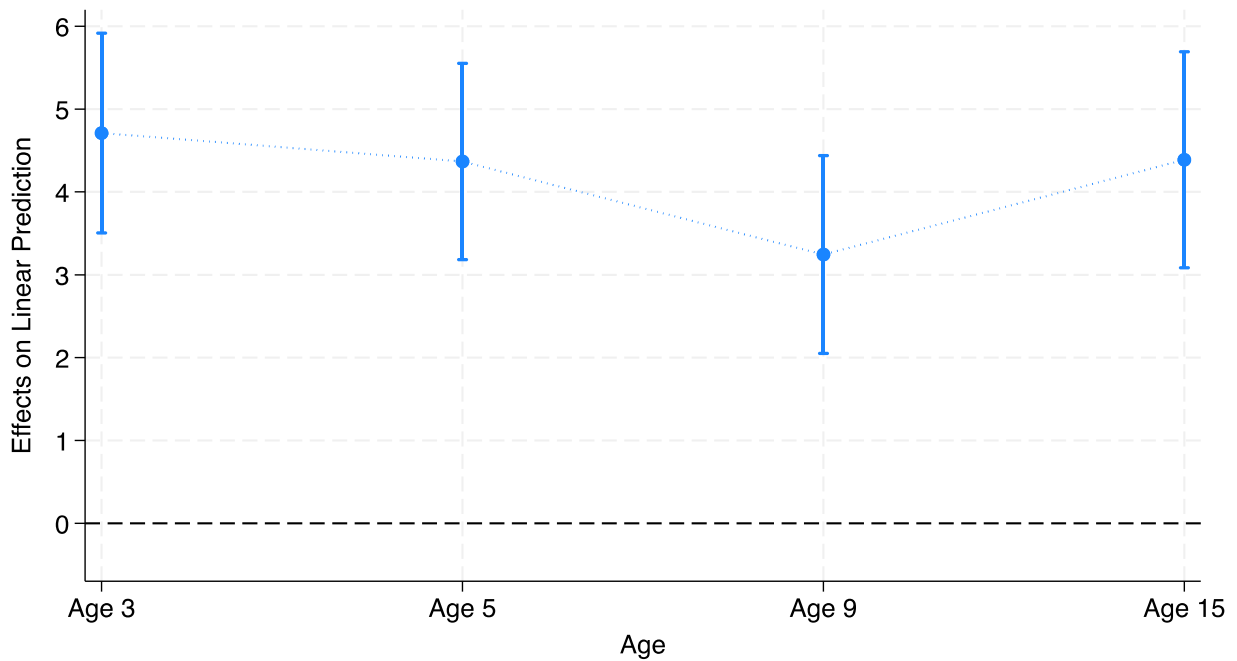


Figure 6. Differential Experience of Neighborhood Poverty by a Child's Economic Origin

Among control variables (Table 5), older mothers at a child birth ($B=0.13$, $SE=0.04$, $p<0.01$), mothers who identify as Black ($B=9.91$, $SE=0.56$, $p<0.001$), Hispanic ($B=5.73$, $SE=0.63$, $p<0.001$), and other races ($B=2.89$, $SE=1.12$, $p<0.01$) than White mothers, and unmarried parents at a child's birth than married parents ($B=1.77$, $SE=0.62$, $p<0.01$) tended to live in poorer neighborhoods. In contrast, mothers with higher educational attainment at a child's birth were likely to live in less poorer neighborhoods ($B=-3.50$, $SE=0.51$, $p<0.001$). A 100% increase in the income-to-poverty-threshold percentage was associated with a 0.5 percentage points reduction in the poverty rate of neighborhood where a child resided ($B=-0.005$, $SE=0.001$, $p<0.001$). When a child's biological parents were not currently married, in both cases of cohabiting ($B=1.11$, $SE=0.54$, $p<0.05$) and not cohabiting ($B=1.00$, $SE=0.43$, $p<0.05$) parents, a child was likely to live in a neighborhood with about 1 percentage point higher poverty level than a child living with

married parents. Furthermore, father's incarceration was associated with 1.19 percentage points higher neighborhood poverty rate. Child's sex was not related to the poverty level of their neighborhood.

In brief, Analysis 2 examined whether children live in a neighborhood with different poverty levels by their economic origin across the first 15 years of their lives. This study hypothesized a child born into poverty would live in a neighborhood with a higher poverty level. The hypothesis was confirmed. At all points in time, children born into poverty tended to live in neighborhoods with higher poverty rates than children not born into poverty. The gap between poor and non-poor children's neighborhood poverty levels was largely consistent; the gap was smallest at age 9.

4.3.1 Robustness Check

A sensitivity analysis was conducted by repeating Analysis 2 with imputed data. To create imputed data, I deleted cases with missing observations on the dependent variable (neighborhood poverty rate) and conducted multiple imputation by chained equations ($N=2,846$). Results from the imputed data (Table 6) are largely consistent with the result from complete cases in Table 5, suggesting that the associations are not driven by attrition and cases with missing observations.

Table 6. Sensitivity Analysis: Experience of Neighborhood Poverty by Economic Origin (N=2,846)

	<i>B</i>	<i>S.E.</i>	<i>t</i>
Economic origin of a child (Reference: Non-poor)			
Poor	4.90***	0.50	9.80
Age (Ref.: Age 3)			
5	-0.79**	0.24	-3.34
9	-1.54***	0.30	-5.19
15	3.74***	0.38	9.94
Economic origin x Age			
Poor x Age 5	-0.49	0.36	-1.34
Poor x Age 9	-1.53**	0.45	-3.40
Poor x Age 15	-0.43	0.54	-0.80
Mother's age at a child's birth	0.09**	0.03	2.70
Mother's race/ethnicity (Ref.: White)			
Black	9.53***	0.44	21.74
Hispanic	5.55***	0.50	11.18
Other	2.30**	0.83	2.77
Mother's education at a child's birth: Higher than high school	-3.16***	0.41	-7.72
Unmarried parents at a child's birth	1.56**	0.49	3.18
Male child	-0.28	0.35	-0.79
Income to poverty threshold percentage	0.00***	0.00	-6.67
Parents' relationship (Ref.: Married)			
Cohabiting, not married	1.20**	0.45	2.68
Not married, not cohabiting	0.91**	0.35	2.63
Parental incarceration	1.40**	0.46	3.01
(Intercept)	6.81***	1.11	6.11

*** $p < .001$, ** $p < .01$, * $p < .05$

4.4 Analysis 3: Impact of Neighborhood Poverty on Externalizing Behavior by Economic Origin

Table 7 presents results of the population-averaged model analyzing differential correlation between neighborhood poverty and externalizing behavior by children's economic origin (Equation 3). As the dependent variable (externalizing behavior) in Equation 3 is log-transformed, the table presents both unstandardized coefficients and the exponentiated values of coefficients. The model explores the influence of neighborhood poverty rate, testing Hypothesis 3 of this study: for a child born into poverty in comparison to a child not born into poverty, higher poverty level of their neighborhood will have more behavior problems.

This analysis shows that children born into poverty ("poor children") tended to have a 3% higher level of externalizing behavior compared to children not born into poverty ("non-poor children") ($exp(B)=1.03$, $SE=0.01$, $p<0.001$). Among non-poor children, a 10 percentage points higher neighborhood poverty rate was associated with a 0.7% higher level of externalizing behavior ($exp(0.0074)=1.007$, $SE=0.00$, $p<0.001$). Among poor children, a 10 percentage points higher neighborhood poverty rate was associated with a 0.3% higher level of externalizing behavior ($exp(0.007368-0.004617)=1.003$) (also see Figure 7). Figure 8 depicts the statistical significance of differences in the levels of externalizing behavior between poor and non-poor children across different neighborhood poverty rates. It indicates that poor children experienced significantly higher externalizing behavior than non-poor children in relatively lower-poverty neighborhoods (neighborhood poverty rates around 30% or lower), whereas there was no significant difference at higher-poverty neighborhoods.

Table 7. Differential Impact of Neighborhood Poverty Rate on Externalizing Behavior by Economic Origin (N=1,968)

	<i>B</i>	<i>Robust S.E.</i>	<i>z</i>	<i>exp(B)</i>
Economic origin of a child (Reference: Non-poor)				
Poor	0.03***	0.01	3.65	1.03
Neighborhood poverty	0.00074*	0.00	2.34	1.00
Economic origin x Neighborhood poverty				
Poor	0.00	0.00	-1.28	1.00
Age (Ref.: Age 3)				
5	-0.11***	0.00	-24.34	0.90
9	-0.30***	0.00	-64.02	0.74
15	-0.28***	0.01	-50.72	0.76
Mother's age at a child's birth	-0.00**	0.00	-2.97	1.00
Mother's race/ethnicity (Ref.: White)				
Black	-0.02**	0.01	-2.63	0.98
Hispanic	-0.04***	0.01	-4.05	0.96
Other	0.00	0.02	-0.08	1.00
Mother's education at a child's birth: Higher than high school	-0.02**	0.01	-2.87	0.98
Unmarried parents at a child's birth	0.02	0.01	1.88	1.02
Male child	0.03***	0.01	4.23	1.03
Income to poverty threshold percentage	0.00	0.00	-1.01	1.00
Parents' relationship (Ref.: Married)				
Cohabiting, not married	0.02**	0.01	2.58	1.02
Not married, not cohabiting	0.02***	0.01	3.39	1.02
Parental incarceration	0.04***	0.01	5.06	1.04
(Intercept)	0.46***	0.02	24.43	1.58

*** $p < .001$, ** $p < .01$, * $p < .05$

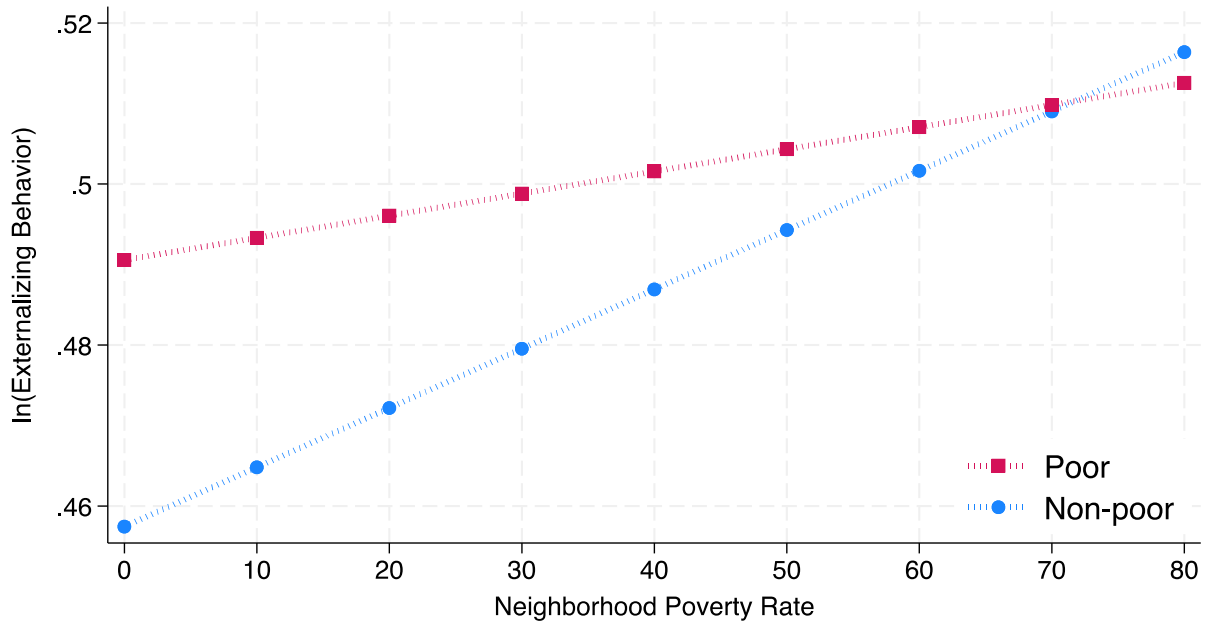


Figure 7. Predicted Externalizing Behavior by Neighborhood Poverty Rate and a Child's Economic Origin

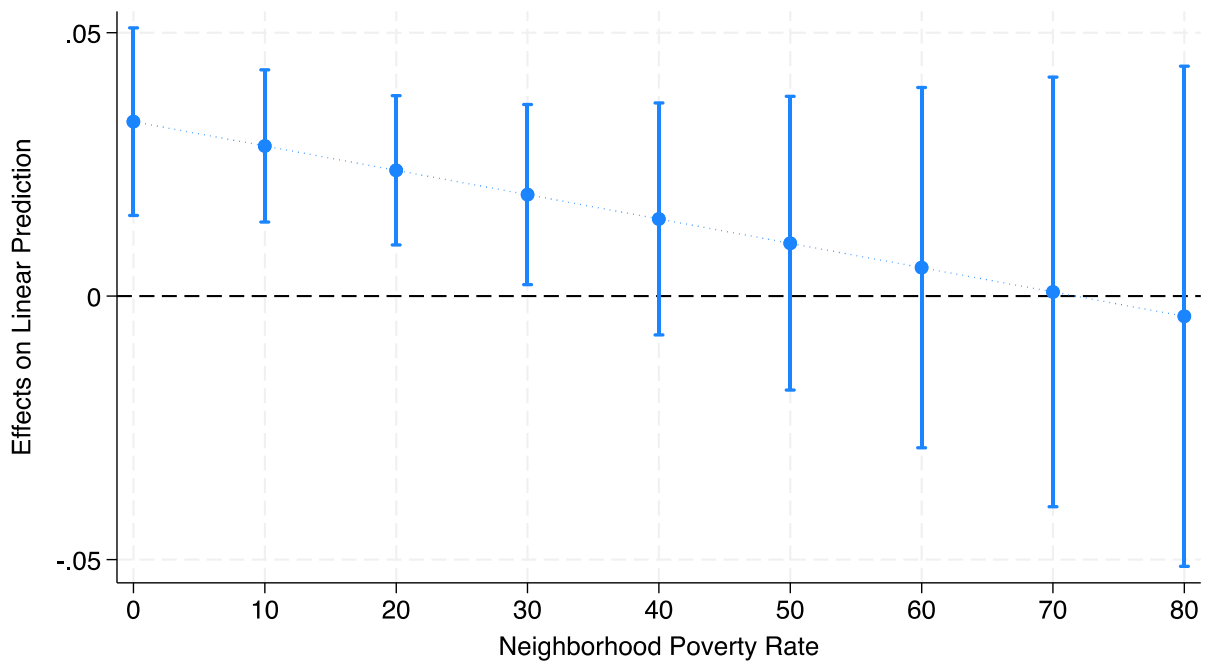


Figure 8. Effects of Neighborhood Poverty Rates among Children Born into Poverty Compared to Those Not Born into Poverty

Regarding other covariates (Table 7), children's externalizing behavior was the highest at age 3, decreased at ages 5 ($exp(B)=0.90$, $SE=0.00$, $p<0.001$) and 9 ($exp(B)=0.74$, $SE=0.01$, $p<0.001$), and slightly increased at age 15 ($exp(B)=0.76$, $SE=0.01$, $p<0.001$). A five year increase in mother's age at a child's birth was associated with a 1% reduction in the level of child externalizing behavior ($exp(-0.0016348 \times 5)=0.99$, $SE=0.00$, $p<0.01$). There was a negative relationship between mother's educational attainment at a child's birth and externalizing behavior: having at least some education after the receipt of a high school diploma was associated with a 2% reduction in child externalizing behavior ($exp(B)=0.98$, $SE=0.01$, $p<0.01$). Children of White non-Hispanic mothers were likely to have higher externalizing behavior: 2% higher than those from Black non-Hispanic mothers ($exp(B)=0.98$, $SE=0.01$, $p<0.01$) and 4% higher than Hispanic mothers ($exp(B)=0.96$, $SE=0.01$, $p<0.001$). Male children tended to have 3% higher externalizing behavior than female children ($exp(B)=1.03$, $SE=0.01$, $p<0.001$). When a child's biological parents are not currently married, in both cases of cohabiting ($exp(B)=1.02$, $SE=0.01$, $p<0.01$) and not cohabiting ($exp(B)=1.02$, $SE=0.01$, $p<0.001$) parents, a child is likely to have 2% higher externalizing behavior than a child living with married parents. Furthermore, father's incarceration is associated with 4% higher child externalizing behavior ($exp(B)=1.04$, $SE=0.01$, $p<0.001$). Biological parents' marital status at a child's birth and income to poverty threshold percentage had no statistical significance.

4.4.1 Robustness Check

A sensitivity analysis was conducted by repeating Analysis 3 with imputed data. To create imputed data, I deleted cases with missing observations on the dependent variable (externalizing behavior) and conducted multiple imputation by chained equations ($N=2,234$).

Results from the imputed data (Table 8) are largely consistent with the results from complete cases (Table 7), indicating that the associations are not driven by attrition and cases with missing observations.

Table 8. Sensitivity Analysis: Differential Impact of Neighborhood Poverty Rate on Externalizing Behavior by Economic Origin (N=2,234)

	<i>B</i>	<i>S.E.</i>	<i>t</i>
Economic origin of a child (Reference: Non-poor)			
Poor	0.04***	0.01	4.10
Neighborhood poverty	0.00*	0.00	2.20
Economic origin x Neighborhood poverty			
Poor	0.00	0.00	-1.30
Age (Ref.: Age 3)			
5	-0.11***	0.00	-26.27
9	-0.30***	0.00	-67.98
15	-0.28***	0.01	-52.96
Mother's age at a child's birth	0.00**	0.00	-3.07
Mother's race/ethnicity (Ref.: White)			
Black	-0.02**	0.01	-2.63
Hispanic	-0.03***	0.01	-3.77
Other	0.00	0.02	-0.13
Mother's education at a child's birth: Higher than high school	-0.02*	0.01	-2.52
Unmarried parents at a child's birth	0.02*	0.01	2.54
Male child	0.02***	0.01	3.98
Income to poverty threshold percentage	0.00	0.00	-1.23
Parents' relationship (Ref.: Married)			
Cohabiting, not married	0.02	0.01	1.92
Not married, not cohabiting	0.02**	0.01	3.27
Parental incarceration	0.03***	0.01	4.58
(Intercept)	0.46***	0.02	25.84

*** $p < .001$, ** $p < .01$, * $p < .05$

4.4.2 Supplemental Analysis

I reanalyzed the data using a different measure for neighborhood poverty (Table 9; Table E 1 for full results). Instead of exploring the marginal effect of neighborhood poverty rate as in Analysis 3, this analysis includes whether a child lives in a high-poverty neighborhood. High-poverty neighborhoods, or poor neighborhoods, are defined by census tracts with 20% or more residents living below the federal official poverty line (FPL), following criteria from the U.S. Census Bureau and other existing literature (Bishaw, 2011; Li et al., 2019; U.S. Census Bureau, n.d.-a).

Table 9. Supplemental Analysis (Partial Results): Differential Impact of High-poverty Neighborhood on Externalizing Behavior by Economic Origin (N=1,968)

	<i>B</i>	<i>Robust S.E.</i>	<i>z</i>	<i>exp(B)</i>
Economic origin of a child (Reference: Non-poor)				
Poor	0.03***	0.01	3.95	1.03
High-poverty neighborhood (20+%)	0.02*	0.01	2.13	1.02
Economic origin x High-poverty neighborhood				
Poor	-0.01	0.01	-1.34	0.99

*** $p < .001$, ** $p < .01$, * $p < .05$

The analysis demonstrates that non-poor children living in a high-poverty neighborhood had 2% more externalizing behaviors ($exp(B)=1.02$, $SE=0.01$, $p < 0.05$) than non-poor children not living in a high-poverty neighborhood. In a neighborhood whose poverty rate lower than 20%, poor children had 3% higher externalizing behavior ($exp(B)=1.03$, $SE=0.01$, $p < 0.001$) than non-

poor children. Poor children living in a high-poverty neighborhood exhibited 1% higher externalizing behavior ($\exp(0.02-0.01)=1.01$) than poor children not living in a high-poverty neighborhood. As illustrated in Figure 9, in a low-poverty neighborhood, poor children had statistically significantly higher externalizing behavior, whereas in a high-poverty neighborhood, poor and non-poor children exhibited similar level of externalizing behavior.

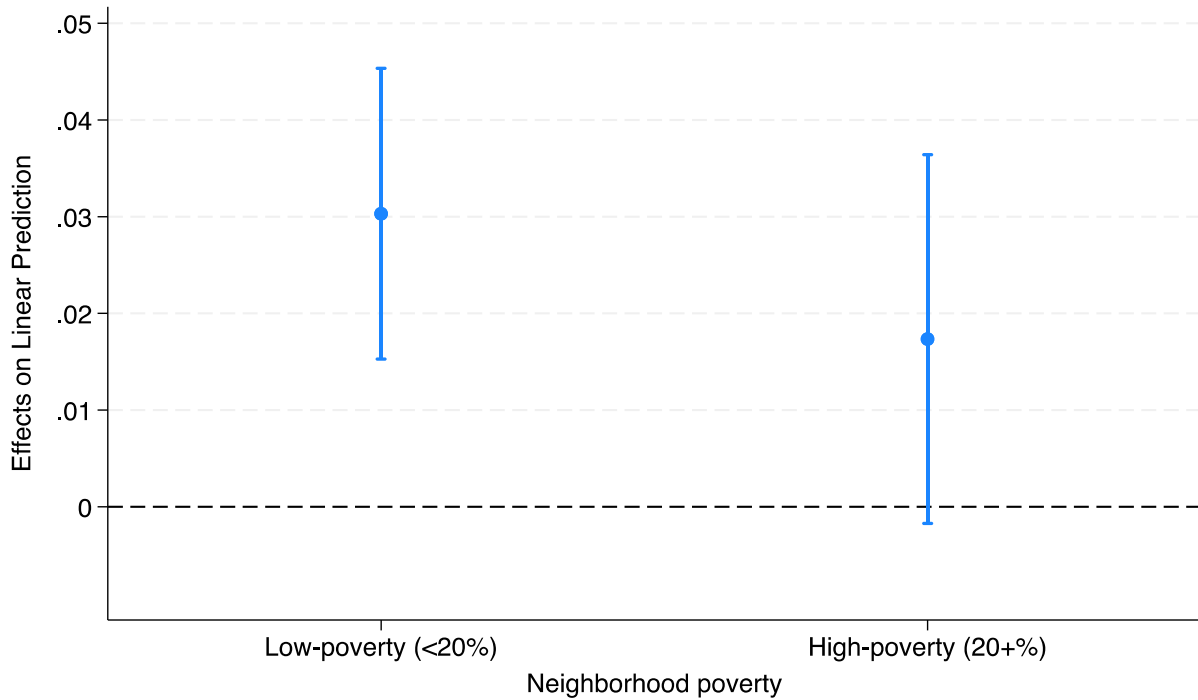


Figure 9. Differential Effects of Neighborhood Poverty by A Child's Economic Origin

Moreover, I examined whether the neighborhood effect varied not only by children's economic origin but also by their ages. Hence, this analytic model (Equation 4) includes an interaction term of a child's age and neighborhood poverty ($\sum_{t=4}^6 Age_t Nbrpov_{it}$), and the analyses were run for non-poor and poor children separately. Neighborhood poverty was measured in two different ways: one as neighborhood poverty rates (Model A) and the other as neighborhood poverty status (Model B) (Table 10; see

Table E 2 for full results).

For $Poor=0$ and $Poor=1$:

$$\ln(EB_{it}) = \alpha + \beta Nbrpov_{it} + \sum_{t=4}^6 \gamma_t Age_t + \sum_{t=4}^6 \delta_t Age_t Nbrpov_{it} + \lambda' X_i + \mu' X_{it} + \varepsilon_{it}$$

$$, \text{ where } corr(\varepsilon_{it}, \varepsilon_{it-s}) = \rho^{|s|} \quad (4)$$

Table 10. Supplemental Analysis (Partial Results): Differential Neighborhood Effect by Children's Economic Origin and Their Ages (N=1,968)

	Model A		Model B	
	Non-poor	Poor	Non-poor	Poor
	<i>B</i> (<i>Robust</i> <i>S.E.</i>)	<i>B</i> (<i>Robust</i> <i>S.E.</i>)	<i>B</i> (<i>Robust</i> <i>S.E.</i>)	<i>B</i> (<i>Robust</i> <i>S.E.</i>)
Neighborhood poverty rate	0.0019** (0.00)	0.00 (0.00)		
Age (Ref.: Age 3) x Neighborhood poverty rate				
Age 5	0.00 (0.00)	0.00 (0.00)		
Age 9	-0.0015* (0.00)	0.00 (0.00)		
Age 15	0.00 (0.00)	0.00 (0.00)		
High-poverty neighborhood (20+%)			0.05** (0.02)	0.01 (0.01)
Age (Ref.: Age 3) x High-poverty neighborhood				
Age 5			-0.03 (0.02)	-0.01 (0.01)
Age 9			-0.05* (0.02)	-0.01 (0.01)
Age 15			-0.04 (0.02)	0.00 (0.01)

*** $p < .001$, ** $p < .01$, * $p < .05$

Consistent with the previous analyses in Table 7 and 9, neighborhood poverty (both neighborhood poverty rates and neighborhood poverty status) had a significantly positive effect

on externalizing behavior of non-poor children. Furthermore, the current analyses provide additional insights: the significant effect of neighborhood poverty appeared at age 3 only but not the other ages (also see Figure 10). However, for poor children, there was no significant effect of neighborhood poverty (both neighborhood poverty rates and neighborhood poverty status) at all ages (also see Figure 11).

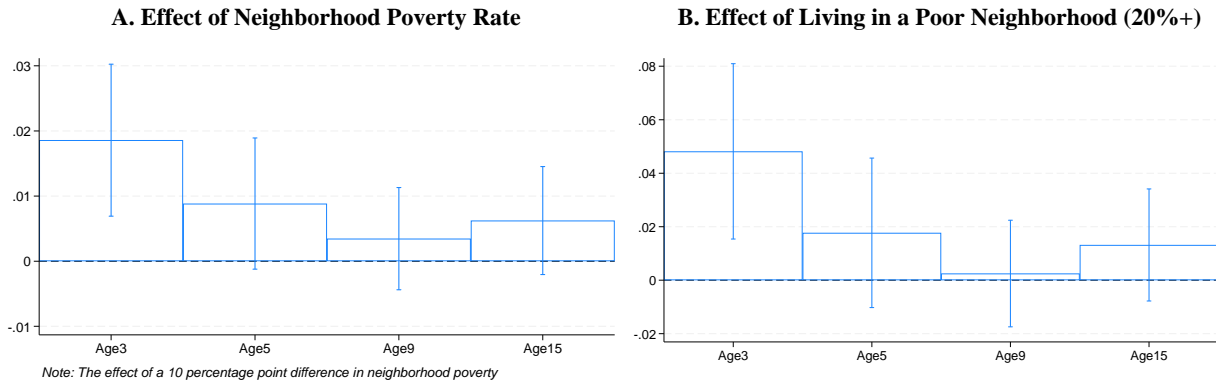


Figure 10. Neighborhood Poverty Effect among Non-poor Children by Their Ages

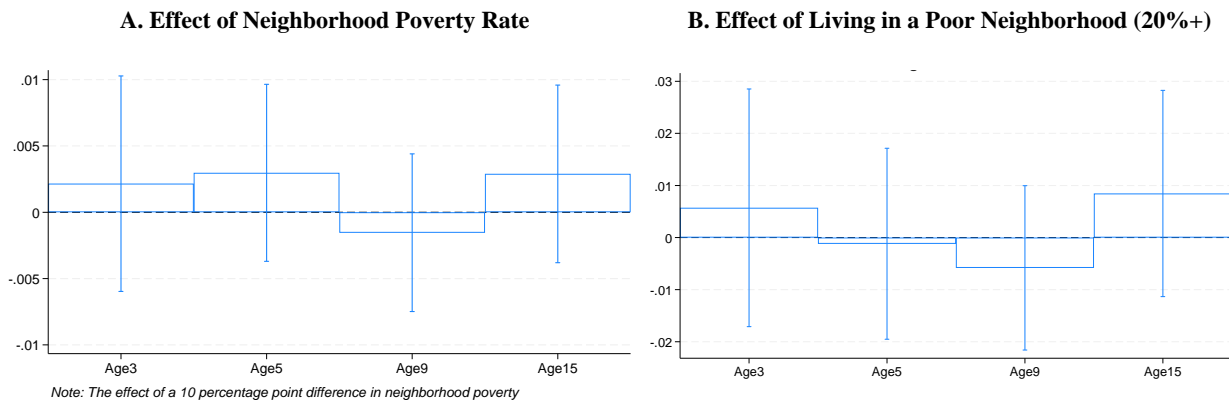


Figure 11. Neighborhood Poverty Effect among Poor Children by Their Ages

Furthermore, considering that one's socioeconomic status and race/ethnicity are structurally intertwined in the U.S. society, I conducted additional analyses to check if the correlation between a child's economic origin and mother's race skewed the findings. I ran

Equations 3 and 4³ with and without a child’s economic origin and mother’s race variables (Table 11; Table E 3 for full results). Specifically, I ran Equation 3 without both variables (Model C1), with the economic origin variable only (Model C2), with the race variable only (Model C3), and with both variables (Model C4). In addition, I ran Equation 4 without (Model D1 for non-poor children and Model E1 for poor children) and with (Model D2 for non-poor children and Model E2 for poor children) the race variable. Inclusion or exclusion of the two variables did not significantly change the coefficients of the other variables in each model, suggesting that there is little concern about skewness in results due to the correlation of the two variables.

Table 11. Supplemental Analysis (Partial Results): Economic Origin of A Child and Mother’s Race

	Equation 3				Equation 4: Non-poor		Equation 4: Poor	
	C1	C2	C3	C4	D1	D2	E1	E2
Economic origin of a child: Poor		1.03***		1.03***				
High-poverty nbr (20+%)	1.01	1.01	1.01*	1.02*	1.05**	1.05**	1.00	1.01
Economic origin x High-poverty nbr								
Poor		0.99		0.99				
Mother’s race/ethnicity (Ref.: White)								
Black			0.98*	0.98*		0.98*		0.98
Hispanic			0.97**	0.96***		0.97*		0.96**
Other			1.00	1.00		1.00		0.99

*** $p < .001$, ** $p < .01$, * $p < .05$

Note: Exponentiated coefficients are displayed; “nbr” indicates “neighborhood”

³ The binary neighborhood poverty variable (whether a child lives in a high-poverty neighborhood) is included in the analyses.

In brief, Analysis 3 examined whether the relationship between neighborhood poverty level and externalizing behavior would differ by a child's economic origin, and whether there would be more detrimental influence of neighborhood poverty among children born into poverty. This study hypothesized that a higher neighborhood poverty level would exacerbate a poor child's externalizing behavior more than a non-poor child's. The hypothesis turned out to be the opposite. When it comes to externalizing behavior, children not born into poverty were more vulnerable to high neighborhood poverty. This neighborhood poverty effect among non-poor children was particularly salient at their age of 3 but not the other ages.

5.0 Discussion and Conclusion

5.1 Summary of Findings

Economic and social inequities give rise to diverging trajectories in life outcomes for children based on their family backgrounds. Child externalizing behavior is a significant factor influencing future socioeconomic status. Based on the ecological systems theory and the cumulative dis/advantage theory, I compared the trajectories of externalizing behavior between children born in poverty and those not born into poverty. In addition, I analyzed the mediating role of neighborhood poverty in the relationship between a child's economic origin and externalizing behavior trajectories, aiming to explore the processes by which residential context influences these divergent trajectories. In line with an analytic model (Brüderl et al., 2019) for the cumulative dis/advantage theory, I tested three hypotheses.

The first hypothesis posited that a child born into poverty would exhibit a more adverse trajectory of behavior problems than a child not born into poverty. However, findings revealed a more nuanced narrative. Both children born into poverty and those not born into poverty exhibited a peak in externalizing behavior at age 3, followed by a gradual decrease with advancing age, until adolescence, when externalizing behavior slightly increased. When comparing the levels of externalizing behavior of the two groups, children born into poverty exhibited higher levels of externalizing behavior at ages 3 (4% higher) and 15 (3% higher), but no significant differences were observed at ages 5 and 9. The results were robust to missing data and sample attrition.

The second hypothesis posited that, compared to a child not born into poverty, a child born into poverty would reside in a neighborhood with a higher poverty level as they get older. This hypothesis was not rejected, as I found that children born into poverty consistently lived in neighborhoods with higher poverty levels than their counterparts across all time points. These results remained robust even after accounting for missing data and sample attrition.

Finally, the third hypothesis posited that, for a child born into poverty, a higher poverty level in their neighborhood would result in more externalizing behavior problems compared to a child not born into poverty. Surprisingly, the results contradicted this hypothesis. In terms of externalizing behavior, children not born into poverty were more vulnerable to the impact of high neighborhood poverty. This effect was particularly pronounced at the age of 3, but not at the other ages. The results were robust to missing data and sample attrition.

5.2 Discussion

This dissertation contributes to the existing literature on child externalizing behavior by investigating the interplay of family and residential context factors over the life course. Previous studies have taken two main approaches in examining this relationship. One line of research has focused on understanding the mechanisms through which concurrent economic strain within families influences child externalizing behavior problems. These studies have identified indirect pathways linking economic strain to child behavior problems, such as through factors like strict parenting, parenting stress, and parent-child conflict (Hong et al., 2021; Mazza et al., 2016; Neppl et al., 2016; Rijlaarsdam et al., 2013; Wang et al., 2022), as well as through parents' material and emotional investments in children (Martin et al., 2010; Sosu & Schmidt, 2017). The

other line of research has focused on the influence of high-poverty neighborhoods on increased child behavior problems (Jocson & McLoyd, 2015; Mrug & Windle, 2009; Yoon et al., 2023).

This dissertation study particularly focused on the enduring impact of poverty at a child's birth and its interaction with poverty rates of neighborhoods where the child resides, after controlling for concurrent family income. Drawing upon Bronfenbrenner (1979)'s ecological systems theory, the study examined child externalizing behavior within diverse inter-connected systems, including the family, neighborhood, time, and the broader context of U.S society characterized by high economic inequality. In addition, guided by the cumulative dis/advantage theory, this dissertation explored the vicious cycle linking poverty status at birth to neighborhood poverty rates to externalizing behavior, which is negatively associated with the child's future socioeconomic status.

The findings of this study underscored that children born into poverty exhibited higher levels of externalizing behavior at ages 3 and 15 compared to children not born into poverty. These findings align with previous research that has identified detrimental effects of being born into poverty or experiencing poverty in early childhood on various outcomes in early childhood or adolescence, such as early cognitive/socioemotional capacities, brain development (Shonkoff, 2010; Shonkoff et al., 2012), and a decreased likelihood of completing high school (Ratcliffe & McKernan, 2012). Additionally, the observed differences of 4% at age 3 and 3% at age 15 in externalizing behavior from this study are noteworthy, as they are comparable to the influences of parental incarceration (4% higher externalizing behavior) and gender (3% higher in males).

Moreover, this dissertation study revealed a consistent pattern where children born into poverty consistently resided in poorer neighborhoods throughout the study period. Previous literature on neighborhood attainment has primarily focused on adults, examining their

neighborhoods either at the time of establishing an independent household or within a few years thereafter (Britton & Goldsmith, 2013; Goldsmith, 2016), or tracking neighborhood conditions over the adult life course (South et al., 2016). The findings from this dissertation study shed light on the neighborhoods where children lived during their first 15 years, highlighting the persistent vulnerable circumstances among children born into poverty compared to children not born into poverty.

The interaction effect between poverty status at birth and neighborhood poverty was statistically significant only at age 3, but not at the other ages. This indicates that at age 3, children not born into poverty exhibited lower levels of externalizing behavior than their peers born into poverty in less impoverished neighborhoods; however, this gap in externalizing behavior diminished in poorer neighborhoods. This finding adds to the recent study by Yoon and colleagues (2023), in which the authors found an association between higher-poverty neighborhoods and increased externalizing behavior during early childhood. Specifically, this dissertation demonstrates that this association between high-poverty neighborhoods and elevated externalizing behavior during early childhood differs based on children's poverty status at birth.

Furthermore, this finding challenges the cumulative dis/advantage theory in explaining the vicious cycle linking poverty status at birth to neighborhood poverty rates and externalizing behavior. Instead, it suggests that the interplay among poverty status at birth, neighborhood poverty, and child externalizing behavior is most pronounced during early childhood. Previous studies have found that school bullying and a low sense of belonging at school are associated with higher externalizing behavior among school-aged children and adolescents (Arslan, 2022; Yoon et al., 2023). As children in those ages spend significant amount of time in school and with peers, school environments are the prime setting for their behavior development (Yoon et al.,

2023). The absence of an externalizing behavior gap at ages 5 and 9, but its emergence at age 15 between children born into poverty and those not born into poverty, could be because there might be a lack of differential gaps in children's school and peer experiences by poverty status at birth at ages 5 and 9, but these gaps might grow by age 15.

Among the family and child background characteristics included in the analyses as covariates, a mother's higher age and educational attainment at a child's birth were associated with decreased externalizing behavior in the child. These results align with previous research findings (Bøe et al., 2012; Lee et al., 2020; Nagin & Tremblay, 2001) regarding the relationship between mothers' age and educational attainment and child externalizing behavior. Additionally, the study found higher levels of externalizing behavior among male children compared to female children, a finding consistent with prior literature (Comeau & Boyle, 2018; Geller et al., 2009; Humphrey & Root, 2017).

Moreover, this study found that children whose biological parents were currently married exhibited lower externalizing behavior than children whose parents were unmarried, whether cohabiting or not. However, the marital status of biological parents at the child's birth was not associated with child externalizing behavior. These findings are consistent with previous research indicating that children living with married parents demonstrated lower levels of externalizing behavior compared to those living with unmarried parents (Humphrey & Root, 2017). Although this dissertation specified the status of parents' being unmarried by examining being unmarried but cohabiting and unmarried and not cohabiting, having unmarried parents was still associated with higher child externalizing behavior regardless of cohabitation status.

Furthermore, consistent with previous research (Kjellstrand & Eddy, 2011; Ruhland et al., 2020),

parental incarceration, specifically the father's, was significantly associated with higher child externalizing behavior.

The findings regarding race/ethnicity in this study reveal a noteworthy departure from previous research, indicating that children born to White non-Hispanic mothers exhibit higher levels of externalizing behavior compared to those born to Black non-Hispanic and Hispanic mothers. This contrasts with earlier studies (Comeau & Boyle, 2018; Humphrey & Root, 2017) that found no significant differences in externalizing behavior between Black and White children. Additionally, these findings prompt a reevaluation of whether the overrepresentation of Black and Hispanic youths in the juvenile justice system (Loyd et al., 2019) may stem more from racial stereotypes in the U.S. rather than the actual severity of disruptive behaviors exhibited by these groups. The association between race/ethnicity and externalizing behavior becomes clearer when considering race/ethnicity within the context, such as family economic situation and residential context (Benzow & Fikri, 2020; Li et al., 2019; Murry et al., 2011), or when taking into account potential biases from individuals (i.e., mothers, teachers, or children themselves) in reporting or measuring a child's externalizing behavior (Castagna et al., 2020; Zhang & Han, 2022). Since the primary focus of this study was not on race/ethnicity, I used race/ethnicity as a control variable without considering interplays between race/ethnicity and contextual factors although main effects of contextual factors were controlled for.

5.3 Implications for Practice and Policy

This study provides implications for social work practice and policy, highlighting the enduring challenges faced by children born into poverty. Specifically, it reveals persistent

disadvantages, such as higher externalizing behavior at ages 3 and 15 alongside a notable disparity in residential context from ages 3 to 15. Aligned with the ethical principles for social workers outlined in the National Association of Social Workers (NASW) Code of Ethics, which emphasizes the pursuit of social change and assistance for vulnerable and oppressed people (NASW, 2017), these findings underscore the critical need for social workers to address the long-term impacts of poverty at birth on children's lives. By recognizing the enduring gaps in behavioral development and residential circumstances between children born into poverty and those not, social workers can effectively advocate for and support vulnerable children. In doing so, they would ultimately contribute to reducing the disparities in children's development and future socioeconomic status.

The gaps in externalizing behavior between children born into poverty and those not suggests the importance of social welfare interventions in Head Start programs and schools. Lee and Kreutzer (2021) found that children participating Head Start exhibited fewer externalizing behavior problems compared to eligible children who did not enroll in the program. Expanding the reach of Head Start programs could contribute to bridging the behavioral gap in early childhood. Additionally, as discussed earlier, the externalizing behavior gap at age 15 may be linked to differential experiences with schools and peers based on poverty status at birth. This implies the need for targeted interventions by school social workers to support adolescents' school connectedness and peer relationships. Social workers can play a crucial role in facilitating such interventions to address the behavioral development gaps associated with poverty status at birth.

In addition, the consistent disparities in neighborhood poverty from ages 3 to 15 echo the shortcomings of housing policies targeting low-income households. As noted by Ellen (2020),

while the Housing Choice Voucher Program has been successful in alleviating rent burdens, reducing crowded homes, and mitigating homelessness among low-income families, it has struggled to facilitate their relocation to better neighborhoods and schools. Additionally, the program faces challenges such as long waiting lists, with only a quarter of eligible families receiving housing assistance. Given the array of negative outcomes associated with high-poverty neighborhoods for children, such as increased risk of child abuse and neglect (McLeigh et al., 2018), food insecurity (Morrissey et al., 2016), compromised brain development (Taylor et al., 2020), and lower school achievement (Morrissey & Vinopal, 2018), the inadequacy of housing policies to effectively facilitate the relocation of children born into poverty away from such neighborhoods may contribute to a range of adverse long-term consequences for these children.

Moreover, the study underscores the importance of adopting a holistic approach that considers family dynamics, neighborhood context, and schools in addressing children's behavioral development. It highlights a critical relationship between high neighborhood poverty and increased externalizing behavior among children not born into poverty at age 3, emphasizing the detrimental influence of neighborhood-level poverty during early childhood, beyond the influence of poverty at birth. Given the limited interaction children have with contexts beyond their family and neighborhood during this period (Yoon et al., 2023), interventions aimed at enhancing behavioral development should encompass both family dynamics and the residential environment, such as expanding the reach of Head Start programs (Lee & Kreutzer, 2021). Additionally, as discussed earlier, while there may be minimal differential gaps in children's school and peer experiences by poverty status at birth at ages 5 and 9, these gaps may widen by age 15. Thus, school environments should also be considered particularly when addressing school-age children's behavioral health. Adopting a comprehensive approach that considers

families, neighborhoods, and schools is essential for promoting the healthy development of all children, irrespective of their economic status at birth.

Furthermore, these study findings suggest the need for earlier and more impactful policy interventions for families with children. Criticisms have been levied against anti-poverty programs for families with children, which tend to be concentrated on the years of compulsory schooling, despite the importance of initiating family support in earlier years to reduce gaps in family environment and development between rich and poor children (Adema, 2012). This study reinforces the importance of early family support and underscores the need for policy interventions that help children born into poverty transition out of impoverished neighborhoods. By illustrating the long-term effects of children's economic status at birth on their residential context and behavioral development, this study emphasizes the importance of comprehensive and timely policy measures to support vulnerable families and mitigate the detrimental impacts of poverty on children's lives.

5.4 Limitations and Future Research

I acknowledge several limitations of this study that merit consideration. First, the descriptive nature of the study constrains the ability to draw causal inferences about the relationships among child economic status at birth, neighborhood poverty, and externalizing behavior. Although this study demonstrated a significant influence of high neighborhood poverty rates on a higher level of externalizing behavior among children not born into poverty at age 3, caution should be exercised when attempting to derive causal inferences from this finding. For future research, I recommend exploring the causal effect of neighborhood poverty on

externalizing behavior by incorporating the dynamics of children entering or exiting high-poverty neighborhoods into the analyses. Moreover, future studies should consider controlling for the influence of the previous level of externalizing behavior on the current one, thereby accounting for the potential confounding effect of a child's temperament.

In addition, the reliance on a primary caregiver's report for measuring child externalizing behavior introduces a potential limitation, as it is not clinically measured. Discrepancies may exist between children's actual levels of externalizing behavior and the levels reported in the analytic data. Indeed, studies have found variations in the levels of externalizing behavior reported by mothers, teachers, and the children themselves (Castagna et al., 2020; Zhang & Han, 2022). Moreover, the study identified 4% and 3% differences in externalizing behavior between children born into poverty and those not born into poverty at ages 3 and 15, respectively. However, the empirical significance of these differences in actual behavior among children remains unknown. I recommend that future research more carefully address the subjectiveness of externalizing behavior scores.

Furthermore, between ages 9 and 15, there was a noticeable increase in neighborhood poverty rates observed among both children born into poverty and those not born into poverty. Although this increase was not explained by the analyses in this dissertation study, it is likely influenced by external factors commonly affecting poverty rates in the neighborhoods where FFCWS participants reside. One such factor could be the recession in 2009. According to Benzow and Fikri (2020), between 2000 and 2010, the number of high-poverty neighborhoods (with poverty rates of 30% or higher) surged by 35%. Despite a decade of recovery from the 2009 financial crisis, efforts failed to diminish the prevalence of high-poverty neighborhoods or substantially enhance household incomes within these impoverished communities (Benzow &

Fikri, 2020). In other studies using FFCWS data, such as the research conducted by Yoon and colleagues (2023), the average neighborhood poverty rate was the highest at age 15, although the underlying factors were not elucidated. Therefore, I suggest future studies identify and account for the external factors influencing the high neighborhood poverty rates among FFCWS participants at age 15 who responded to the FFCWS survey between 2014 and 2017.

The large and inconsistent gaps between time points of FFCWS survey present another limitation. Specifically, there is a two-year gap between ages 3 and 5, a four-year gap between ages 5 and 9, and a six-year gap between ages 9 and 15. These gaps make it challenging for this study to capture subtle changes that might have occurred between these time points. Future research, utilizing data with more frequent and consistent data collection intervals, may provide a more nuanced understanding of the developmental trajectories examined in this study.

Finally, this dissertation study failed to elucidate the mechanisms behind the disappearance of the externalizing behavior gap between children born into poverty and those not born into poverty at ages 5 and 9, followed by its re-establishment at age 15. Future research, considering additional factors such as those associated with school and peers (Yoon et al., 2023) and social policy (Woods-Jaeger et al., 2021), may contribute to a more comprehensive understanding of these mechanisms and provide a more complete picture of the developmental trajectories examined in this study. Additionally, beyond neighborhood poverty, future research may take into account state-level factors, including state-level policies.

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Appendix A Tests for Randomness of Sample Attrition

Table A 1. Cases Lost to Attrition vs. Those Not

	Excluded	Included	<i>p</i> *
Low-income Status: Pre-tax household income below 200% of FPL (N=4,897)			0.019
Not low-income ($\geq 200\%$ FPL)	653 (35.9%)	1,211 (39.3%)	
Low-income ($< 200\%$ FPL)	1,164 (64.1%)	1,869 (60.7%)	
Mother's age (N=4,894)	25.406 (6.020)	25.199 (6.048)	0.248
Mother's Race (N=4,886)			
White non-Hispanic	341 (18.8%)	689 (22.4%)	0.003
Black non-Hispanic	756 (41.7%)	1,570 (51.1%)	< 0.001
Hispanic	624 (34.4%)	712 (23.2%)	< 0.001
Other	92 (5.1%)	102 (3.3%)	0.002
Mother's Educational Attainment (N=4,892)			< 0.001
High school or less	1,241 (68.3%)	1,938 (63.0%)	
Higher than high school degree	575 (31.7%)	1,138 (37.0%)	
Biological Parents' Marital Status (N=4,897)			0.430
Married	429 (23.6%)	758 (24.6%)	
Unmarried	1,388 (76.4%)	2,322 (75.4%)	

* Significance of the difference between excluded and included cases

Table A 2. Cases Excluded from the Final Sample vs. Cases Included

	Excluded	Included	<i>p</i>*
Low-income Status: Pre-tax household income below 200% of FPL (<i>N</i> =4,897)			0.020
Not low-income ($\geq 200\%$ FPL)	1,076 (36.7%)	788 (40.0%)	
Low-income ($< 200\%$ FPL)	1,853 (63.3%)	1,180 (60.0%)	
Mother's age (<i>N</i> =4,894)	25.257 (6.052)	25.303 (6.017)	0.792
Mother's Race (<i>N</i> =4,886)			
White non-Hispanic	594 (20.4%)	436 (22.2%)	0.131
Black non-Hispanic	1,299 (44.5%)	1,027 (52.2%)	<0.001
Hispanic	896 (30.7%)	440 (22.4%)	<0.001
Other	129 (4.4%)	65 (3.3%)	0.050
Mother's Educational Attainment (<i>N</i> =4,892)			<0.001
High school or less	1,980 (67.7%)	1,199 (60.9%)	
Higher than high school degree	944 (32.3%)	769 (39.1%)	
Biological Parents' Marital Status (<i>N</i> =4,897)			0.174
Married	690 (23.6%)	497 (25.3%)	
Unmarried	2,239 (76.4%)	1,471 (74.7%)	

* Significance of the difference between excluded (due to attrition and missingness) and included cases

Appendix B Full List of Questions for Child Externalizing Behavior

Wave	Questions
3	<ol style="list-style-type: none"> 1. Child can't concentrate, can't pay attention for long 2. Child is cruel to animals 3. Child is defiant 4. Child's demands must be met immediately 5. Child destroys his/her own things 6. Child destroys things belonging to his/her family or other 7. Child is disobedient 8. Child is easily frustrated 9. Child is easily jealous 10. Child gets in many fights 11. Child gets into everything 12. Child hits others 13. Child hurts animals or people without meaning to 14. Child has angry moods 15. Punishment doesn't change his/her behavior 16. Child quickly shifts from one activity to another 17. Child screams a lot 18. Child is selfish or won't share 19. Child has sudden changes in mood or feelings 20. Child has temper tantrums or hot temper 21. Child is unusually loud 22. Child is whiny
4	<ol style="list-style-type: none"> 1. Child doesn't seem to feel guilty after misbehaving 2. Child has sudden changes in mood or feelings 3. Child has temper tantrums or a hot temper 4. Child wants a lot of attention 5. Child argues a lot 6. Child brags or boasts 7. Child is cruel, bullies and shows meanness to others 8. Child destroys his/her own things 9. Child is disobedient at home 10. Child is disobedient at school or in childcare 11. Child is easily jealous 12. Child gets in many fights

	<ul style="list-style-type: none"> 13. Child hangs around with others who get in trouble 14. Child lies or cheats 15. Child physically attacks people 16. Child prefers being with older kids 17. Child runs away from home 18. Child screams a lot 19. Child sets fires 20. Child shows off or clowns around 21. Child steals at home 22. Child steals outside the home 23. Child swears or uses obscene language 24. Child talks too much 25. Child teases a lot 26. Child threatens people 27. Child is unusually loud 28. Child vandalizes
5	<ul style="list-style-type: none"> 1. Child argues a lot 2. Child is cruel, bullies, or shows meanness to others 3. Child demands a lot of attention 4. Child destroys his or her own things 5. Child destroys things belonging to family or others 6. Child is disobedient at home 7. Child is disobedient at school 8. Child gets in many fights 9. Child physically attacks people 10. Child screams a lot 11. Child is stubborn, sullen, or irritable 12. Child has sudden changes in mood or feelings 13. Child sulks a lot 14. Child is suspicious 15. Child teases a lot 16. Child has temper tantrums or a hot temper 17. Child threatens people 18. Child is unusually loud 19. Child drinks alcohol without parents' approval 20. Child doesn't seem to feel guilty after misbehaving 21. Child breaks rules at home, school or elsewhere 22. Child hangs around with others who get in trouble 23. Child lies or cheats 24. Child prefers being with older kids

	<ul style="list-style-type: none"> 25. Child runs away from home 26. Child sets fires 27. Child has sexual problems 28. Child steals at home 29. Child steals outside the home 30. Child swears or uses obscene language 31. Child thinks about sex too much 32. Child smokes, chews, or sniffs tobacco 33. Child is truant, skips school 34. Child uses alcohol or drugs for nonmedical purposes 35. Child vandalizes
6	<ul style="list-style-type: none"> 1. Child is cruel, bullies, or shows meanness to others 2. Child destroys things belonging to the family or others 3. Child is disobedient at home 4. Child is disobedient at school 5. Child gets in many fights 6. Child physically attacks people 7. Child is stubborn, sullen, or irritable 8. Child has temper tantrums or a hot temper 9. Child threatens people 10. Child is unusually loud 11. Child argues a lot 12. Child doesn't seem to feel guilty after misbehaving 13. Child hangs around with others who get in trouble 14. Child lies or cheats 15. Child runs away from home 16. Child sets fires 17. Child steals at home 18. Child steals outside the home 19. Child swears or uses obscene language 20. Child vandalizes

Appendix C Missing Data

Variable	<i>n</i>	<i>% (out of 2,081 cases*)</i>
Mother's age	1	0.05%
Mother's Race/Ethnicity	4	0.19%
Mother's Educational Attainment	3	0.14%
Income to Poverty Threshold Percentage at Wave 3	2	0.10%
Income to Poverty Threshold Percentage at Wave 4	1	0.05%
Income to Poverty Threshold Percentage at Wave 5	43	2.07%
Income to Poverty Threshold Percentage at Wave 6	59	2.84%
Parents' Relationship at Wave 3	2	0.10%
Parents' Relationship at Wave 4	1	0.05%
Parents' Relationship at Wave 5	35	1.68%
Parents' Relationship at Wave 6	57	2.74%

** Families who responded to all five waves and had no missing data in both child behavior problems and neighborhood-level poverty rate at Waves 3-6.*

Appendix D Tests for Missing Mechanisms: Two Sample T-tests by Missingness

Variable with Missing Observation	Existing Variable	<i>M</i> (Non-missing)	<i>M</i> (Missing)	<i>t</i>	<i>p</i>
Mother's Race/Ethnicity	Parents' Relationship at W3	1.18	0.25	2.1	0.03
Mother's Educational Attainment	Neighborhood Poverty at W3	18.42	40.12	-2.6	0.01
	Neighborhood Poverty at W5	15.78	42.88	-3.45	0
	Neighborhood Poverty at W6	22.01	51.26	-3.35	0
	Mother's Race/Ethnicity	1.07	2	-2.15	0.03
Income to Poverty Threshold Percentage at Wave 5	Neighborhood Poverty at W4	17.26	21.58	-2	0.04
	Income to Poverty Threshold Percentage at W3	192.54	133.95	1.45	0.14
	Income to Poverty Threshold Percentage at W4	193.6	123.49	2.05	0.04
	Income to Poverty Threshold Percentage at W6	235.92	161.65	1.95	0.05
	Parents' Relationship at W4	1.22	1.7	-3.45	0

	Parents' Relationship at W6	1.45	1.67	-1.7	0.09
Income to Poverty Threshold Percentage at Wave 6	Child Externalizing Behavior at W6	0.23	0.31	-2.55	0.01
	Neighborhood Poverty at W3	18.28	24.09	-3.05	0
	Neighborhood Poverty at W4	17.22	21.81	-2.5	0.01
	Economic Origin of a Child	0.6	0.76	-2.5	0.01
	Mother's Age	25.29	23.7	2	0.04
	Mother's Educational Attainment	0.39	0.22	2.65	0.01
	Parents' Marital Status at W1	0.75	0.92	-2.9	0
	Income to Poverty Threshold Percentage at W3	193.64	112.03	2.4	0.02
	Income to Poverty Threshold Percentage at W4	194.55	110	2.9	0
	Parents' Relationship at W3	1.17	1.44	-2.35	0.02
	Parents' Relationship at W4	1.22	1.56	-2.85	0.01
	Parents' Relationship at W5	1.3	1.71	-3.5	0
	Parental Incarceration at W6	0.19	0.02	3.4	0
Parents' Relationship at Wave 5	Neighborhood Poverty at W4	17.25	23.42	-2.6	0.01
	Child's Sex	0.52	0.69	-2	0.05

	Parents' Relationship at W4	1.22	1.89	-4.35	0
	Parents' Relationship at W6	1.45	1.89	-3	0
Parents' Relationship at Wave 6	Parents' Relationship at W6	0.23	0.31	-2.65	0.01
	Neighborhood Poverty at W3	18.3	23.78	-2.85	0
	Neighborhood Poverty at W4	17.24	21.42	-2.25	0.03
	Economic Origin of a Child	0.6	0.79	-2.9	0
	Mother's Educational Attainment	0.39	0.21	2.75	0.01
	Parents' Marital Status at W1	0.75	0.91	-2.8	0.01
	Income to Poverty Threshold Percentage at W3	193.8	103.51	2.6	0.01
	Income to Poverty Threshold Percentage at W4	194.54	107.37	2.9	0
	Parents' Relationship at W3	1.17	1.47	-2.6	0.01
	Parents' Relationship at W4	1.22	1.6	-3.1	0
	Parents' Relationship at W5	1.3	1.7	-3.35	0
	Parental Incarceration at W6	0.19	0.02	3.3	0

Appendix E Supplemental Analyses

Table E 1. Supplemental Analysis (Full Results): Differential Impact of High-poverty Neighborhood on Externalizing Behavior by Economic Origin (N=1,968)

	<i>B</i>	<i>Robust S.E.</i>	<i>z</i>	<i>exp(B)</i>
Economic origin of a child (Reference: Non-poor)				
Poor	0.03***	0.01	3.95	1.03
High-poverty neighborhood (20+%)	0.02*	0.01	2.13	1.02
Economic origin x High-poverty neighborhood				
Poor	-0.01	0.01	-1.34	0.99
Age (Ref.: Age 3)				
5	-0.11***	0.00	-24.39	0.90
9	-0.30***	0.00	-64.24	0.74
15	-0.28***	0.01	-50.86	0.76
Mother's age at a child's birth	-0.00**	0.00	-2.9	1.00
Mother's race/ethnicity (Ref.: White)				
Black	-0.02*	0.01	-2.43	0.98
Hispanic	-0.04***	0.01	-3.93	0.96
Other	0.00	0.02	-0.04	1.00
Mother's education at a child's birth: Higher than high school	-0.02**	0.01	-3.02	0.98
Unmarried parents at a child's birth	0.02	0.01	1.96	1.02

Male child	0.03***	0.01	4.21	1.03
Income to poverty threshold percentage	0.00	0.00	-1.11	1.00
Parents' relationship (Ref.: Married)				
Cohabiting, not married	0.02**	0.01	2.62	1.02
Not married, not cohabiting	0.02***	0.01	3.43	1.02
Parental incarceration	0.04***	0.01	5.1	1.04
(Intercept)	0.46***	0.02	24.8	1.59

*** $p < .001$, ** $p < .01$, * $p < .05$

Table E 2. Supplemental Analysis (Full Results): Differential Neighborhood Effect by Children's Economic Origin and Their Ages (N=1,968)

	Model A		Model B	
	Non-poor	Poor	Non-poor	Poor
	<i>B</i> (Robust <i>S.E.</i>)	<i>B</i> (Robust <i>S.E.</i>)	<i>B</i> (Robust <i>S.E.</i>)	<i>B</i> (Robust <i>S.E.</i>)
Age (Reference: Age 3)				
5	-0.08*** (0.01)	-0.12*** (0.01)	-0.09*** (0.01)	-0.11*** (0.01)
9	-0.27*** (0.01)	-0.30*** (0.01)	-0.28*** (0.01)	-0.30*** (0.01)
15	-0.26*** (0.01)	-0.28*** (0.01)	-0.27*** (0.01)	-0.28*** (0.01)
Neighborhood poverty rate	0.00** (0.00)	0.00 (0.00)		
Age (Ref.: Age 3) x Neighborhood poverty rate				
Age 5	0.00 (0.00)	0.00 (0.00)		
Age 9	-0.00* (0.00)	0.00 (0.00)		
Age 15	0.00 (0.00)	0.00 (0.00)		
High-poverty neighborhood (20+%)			0.05** (0.02)	0.01 (0.01)
Age (Ref.: Age 3) x High-poverty neighborhood				
Age 5			-0.03 (0.02)	-0.01 (0.01)
Age 9			-0.05* (0.02)	-0.01 (0.01)
Age 15			-0.04 (0.02)	0.00 (0.01)
Mother's age at a child's birth	0.00 (0.00)	-0.00** (0.00)	0.00 (0.00)	-0.00** (0.00)
Mother's race/ethnicity (Ref.: White)				

Black	-0.03*	-0.02	-0.02*	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)
Hispanic	-0.03*	-0.04**	-0.03*	-0.04**
	(0.01)	(0.01)	(0.01)	(0.01)
Other	0.00	-0.01	0.00	-0.01
	(0.02)	(0.03)	(0.02)	(0.03)
Mother's education at a child's birth: Higher than high school	-0.03**	-0.01	-0.03**	-0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Unmarried parents at a child's birth	0.02	0.01	0.02	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
Male child	0.03***	0.02*	0.03***	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)
Income to poverty threshold percentage	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Parents' relationship (Ref.: Married)				
Cohabiting, not married	0.02	0.02*	0.02	0.02*
	(0.01)	(0.01)	(0.01)	(0.01)
Not married, not cohabiting	0.02	0.02**	0.02*	0.02**
	(0.01)	(0.01)	(0.01)	(0.01)
Parental incarceration	0.06***	0.03***	0.06***	0.03***
	(0.02)	(0.01)	(0.02)	(0.01)
(Intercept)	0.42***	0.51***	0.43***	0.52***
	(0.03)	(0.03)	(0.02)	(0.03)

*** $p < .001$, ** $p < .01$, * $p < .05$

Table E 3. Supplemental Analysis (Full Results): Economic Origin of A Child and Mother's Race

	Equation 3				Equation 4: Non-poor		Equation 4: Poor	
	C1	C2	C3	C4	D1	D2	E1	E2
Economic origin of a child: Poor		1.03***		1.03***				
High-poverty neighborhood (20+%)	1.01	1.01	1.01*	1.02*	1.05**	1.05**	1.00	1.01
Economic origin x High-poverty nbr								
Poor		0.99		0.99				
Mother's race/ethnicity (Ref.: White)								
Black			0.98*	0.98*		0.98*		0.98
Hispanic			0.97**	0.96***		0.97*		0.96**
Other			1.00	1.00		1.00		0.99
Mother's age at a child's birth	1.00**	1.00**	1.00**	1.00**	1.00	1.00	1.00**	1.00*
Mother's education at a child's birth: Higher than high school	0.98**	0.98*	0.97***	0.98**	0.98*	0.97**	0.99	0.99
Unmarried parents at a child's birth	1.02*	1.01	1.02*	1.02	1.01	1.02	1.01	1.01
Male child	1.03***	1.03***	1.03***	1.03***	1.03***	1.03***	1.02*	1.02*
Income to poverty threshold percentage	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Parents' relationship (Ref.: Married)								

Cohabiting, not married	1.02**	1.02**	1.02**	1.02**	1.02	1.02	1.02*	1.02*
Not married, not cohabiting	1.02***	1.02***	1.02***	1.02**	1.02	1.02*	1.03**	1.02**
Parental incarceration	1.04***	1.04***	1.04***	1.04***	1.07***	1.07***	1.03***	1.03***
Age (Ref.: Age 3)								
Age 5	0.90***	0.90***	0.90***	0.90***	0.92***	0.92***	0.89***	0.89***
Age 9	0.74***	0.74***	0.74***	0.74***	0.76***	0.76***	0.74***	0.74***
Age 15	0.76***	0.76***	0.76***	0.76***	0.77***	0.77***	0.76***	0.76***
Age (Ref.: Age 3) x High-poverty nbr								
Age 5					0.97	0.97	0.99	0.99
Age 9					0.96*	0.96*	0.99	0.99
Age 15					0.97	0.97	1.00	1.00
(Intercept)	1.58***	1.56***	1.61***	1.59***	1.51***	1.53***	1.63***	1.67***

*** $p < .001$, ** $p < .01$, * $p < .05$

Note: Exponentiated coefficients are displayed; "nbr" indicates "neighborhood"