URBANICITY, INCOME, AND ACADEMIC AND BEHAVIORAL FUNCTIONING ACROSS CHILDHOOD: LONGITUDINAL ASSOCIATIONS AND MEDIATING MECHANISMS

by

Portia Miller

Bachelor of Science, University of Pittsburgh, 2002

Juris Doctor, University of Pittsburgh, 2005

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This dissertation was presented

by

Portia Miller

It was defended on

November 20, 2014

and approved by

Elizabeth Votruba-Drzal, Ph.D., Professor, Department of Psychology

Susan B. Campbell, Ph.D., Professor, Department of Psychology

Daniel S. Shaw, Ph.D., Professor, Department of Psychology

Heather J. Bachman, Ph.D., Professor, Department of Psychology in Education

Dissertation Advisor: Elizabeth Votruba-Drzal, Ph.D., Professor, Department of Psychology

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Economic disparities in academic and behavioral functioning are well documented in the U.S. Compared to more advantaged peers, low-income children begin kindergarten with fewer of the competencies that undergird school success. These disparities persist or grow as children age and ultimately relate to low educational attainment, worse psychological functioning, and intergenerational transmission of poverty in adulthood. In addressing income gaps in development, we must consider the changing geography of poverty. The last several decades have seen increases in the number of low-income families residing in suburbs and small towns, while poverty rates in urban centers and rural communities have remained high. Currently, low-income children are dispersed across communities spanning the urban-rural continuum. Urban, suburban, and rural areas represent unique contexts for development, which may alter relations between income and academic and behavioral functioning. In a series of studies using nationally representative data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998-1999 (N≈16,000) and data from the Early Steps Multisite Study of 731 low-income families with children, this dissertation explores (1) whether links between family income and achievement and behavior problems at kindergarten entry differ by urbanicity; (2) whether links between income and growth/decline in achievement and behavior problems across elementary school differ by urbanicity; and (3) the processes that explain why economic disadvantage is differentially related to development across urbanicity. Results show that income gaps in kindergarten achievement are attenuated in rural areas and exacerbated in urban cities. Conversely, economic disparities in externalizing problems at kindergarten are largest in rural areas and small cities and relatively small in large urban cities and suburbs. Looking from kindergarten through fifth grade, income is

more strongly linked to achievement growth and is more predictive of decreased risk of elevated behavior problems in rural areas and small cities compared to large cities and suburbs. Finally, within a sample of disadvantaged 5-year-olds, findings suggest that low-income rural children have better academic skills and fewer behavior problems than peers in urban areas, and this is partially explained by comparatively lower levels of pollution and neighborhood danger experienced by low-income rural children and families.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

The academic and behavioral skills acquired prior to elementary school are vital to children's abilities to adapt to and learn in the classroom (Duncan et al., 2007). Unfortunately, significant disparities in achievement and behavioral functioning related to family income exist in the U.S., with children from low-income homes possessing fewer academic skills and exhibiting increased problem behavior than more advantaged peers (e.g., Duncan & Magnuson, 2011; Gershoff, 2003). Moreover, income gaps in child functioning have grown over the past few decades, even as racial/ethnic disparities have declined (Reardon, 2011). Addressing these gaps is of serious concern since early disparities persist or grow as children progress through school and are related to low educational attainment, worse psychological functioning, and intergenerational transmission of poverty in adulthood (Duncan et al., 2007; Duncan & Magnuson, 2011; Heckman, 2000). First paragraph.

In addressing economic disparities in development, it is important to consider the changing geography of poverty. While inner-cities traditionally have been viewed as home to America's poor populations, the last several decades have seen a relocation of low-income families away from urban centers to suburban, small town, and rural communities. According to the 2010 U.S. Census, child poverty rates in urban cities and rural areas are similar, both approaching 30% (author's own calculations). And while 17% of suburban children are poor, suburban poverty is

rising at rates greater than those of central cities and rural areas (Kneebone & Garr, 2010). Moreover, since more Americans live in suburbs than cities or rural communities, suburbs are now home to the greatest number of poor people in the U.S. (Allard & Roth, 2010). Thus at present, economically disadvantaged children in the U.S. are living in communities spanning the urban-rural continuum.

Given the spatial dispersion of America's low-income children, it is increasingly important to consider the role of economic disadvantage in children's development across urbanicities. Yet, little is known regarding urbanicity-related differences in relations between family income and child functioning. As poverty is often thought of as an "urban problem," the majority of research on poverty's effects on children utilizes largely urban samples (e.g., Chase-Lansdale et al., 2003; Hamilton et al., 2001; Morris & Gennetian, 2003; Riccio et al., 2010). Similarly, extant research on poor rural families (e.g. Brody, Flor, & Gibson, 1999; Conger & Conger, 2002; Vernon-Feagans & Cox, 2013) lacks generalizability. Studies on income and development utilizing nationally representative datasets like the National Longitudinal Study of Youth and the Panel Study on Income Dynamics are exceptions, but these studies do not explicitly consider urbanicity's role in relations between income and child development.

This represents a significant gap in the literature; urban, suburban, and rural areas differ in terms of population density, resources, environmental stressors, and social and community capital. Rural areas are characterized by sparse population and decreased access to public transportation, health care, libraries, child care, and other social services (e.g. Vernon-Feagans, Gallagher, & Kainz, 2008). Furthermore, over the last few decades, high-quality jobs have disappeared in rural areas and their talented young people have migrated to urban areas and suburbs (O'Hare & Johnson, 2004; Vernon-Feagans et al., 2008). The dispersion of people, scarcity of services, and

recent departure of human capital may leave rural families without access to developmentally salient resources and support networks and increase stress in low-income rural homes, which may make it harder for poor rural parents to provide their children with enriching experiences and developmentally appropriate parenting. Conversely, in large cities access to public transportation, services, and resources may not be problematic, but the inner-city neighborhoods in which low-income families reside are often plagued by high rates of crime and poverty concentration, lack of green spaces, overcrowding, and pollution, all of which have negative developmental implications (Evans, 2006). While little empirical evidence exists regarding suburbs as contexts for early development, they may provide children and families proximity to numerous resources without the stress and chaos of inner-cities or isolation of rural areas. These unique aspects of urban, suburban, and rural areas may alter relations between family income and children's development across contexts (Miller, Votruba-Drzal, & Setodji, 2013).

The current dissertation enhances our understanding of links between urbanicity, income, and children's development by conducting two separate but related studies that explore *whether* and *why* economic disadvantage has differential relations with academic and behavioral skills across the urban-rural continuum. The first study addresses *whether* links between income and development vary across urbanicity. Using nationally representative data from the Early Childhood Longitudinal Study, Kindergarten Cohort (ECLS-K), study 1 aims to replicate prior findings of urbanicity differences in income gaps in kindergarten achievement (Miller et al., 2013) and extend these findings to domains of behavioral functioning. Moreover, it examines how income differentially relates to trajectories of achievement and behavior across urbanicity as children progress through elementary school. The second study builds on the first by asking *why* links between income and development vary across urbanicity. Using data from 731 low-income

families living in urban, suburban, and rural areas, study 2 examines differences in low-income children's early academic skills and behavior problems across urbanicity. Study 2 then considers the processes that may explain these differing relations between economic disadvantage and early child functioning. Specifically, it tests whether there are differences in community resources, family and environmental stress, and neighborhood disadvantage and socioeconomic integration across the urban-rural continuum, and whether these differences mediate urbanicity-related variation in low-income children's development. These studies give broader context to the literature on income and child development, which has traditionally relied heavily on urban samples. Moreover, this dissertation advances research by examining how the communities in which economically disadvantaged children live shape their home environments and family interactions and, in turn, their achievement and behavior. Together, the results extend our knowledge of how family economic resources interact with place to relate to child development.

1.1 INCOME AND CHILD DEVELOPMENT

Over the last several decades, a large body of literature has studied the effects of income on child development. Income gaps in early achievement are well-documented. Economic disparities in cognitive skills emerge when children are only 9 months old (Halle et al., 2009). By kindergarten entry, children from low-income households score approximately one-half of a standard deviation (SD) lower than peers from middle-class families and about .70 SD lower than peers from high-income families on measures of reading and math achievement (Lee & Burkham, 2002). Moreover, these disparities are unaffected by formal schooling; rather, they continue or grow as

children age (Duncan & Magnuson, 2011; Magnuson & Votruba-Drzal, 2009; Reardon, 2011). The preponderance of literature suggests that the relation between income and academic performance is, at least in part, causal (Dahl & Lochner, 2012; Duncan, Morris, & Rodrigues, 2011; Milligan & Stabile, 2008; Salkind & Haskins, 1982).

Associations between income and several dimensions of behavioral functioning in early childhood have been identified as well. Low-income children are typically rated by their parents and teachers as having more behavior problems than peers (Blau, 1999; Dearing, McCartney, & Taylor, 2006; Gershoff, Aber, Raver, & Lennon, 2007; Votruba-Drzal, 2006). In childhood, this is reflected in elevated levels of externalizing problems, such as aggression and acting out, and internalizing problems, such as depression and anxiety (Blau, 1999; Gershoff et al., 2007; Hao & Matsueda, 2006). Additionally, poverty has been linked to more serious conduct problems in children, like oppositional defiant disorder and attention deficit hyperactivity disorder (e.g. Costello et al., 2003; D'Onofrio et al., 2009; Lefebvre & Merrigan, 1998). Economic disadvantage also has negative links to children's self-regulatory and attentional abilities (Blair & Raver, 2012; Brody, Flor, & Gibson, 1999; Evans & English, 2002; Evans, Gonnella, Marcynyszyn, Gentile, & Salpekar, 2005).

Income's role in predicting longitudinal trajectories of behavior problems has not been as well researched. Studies that have used growth curve modeling to identify the role of family income on the growth or decline of behavior problems over time have generally found some evidence that higher family income relates to decreases in problem behavior over time (Keiley, Bates, Dodge, & Petit, 2000; Lansford et al., 2006; Leve, Kim, & Pears, 2005; Silver, Measelle, Armstrong, & Essex, 2005). A study by Fanti and Henrich (2010), which used group based trajectory modeling to examine behavioral trajectories, suggests that low SES (conceptualized as

low levels of family income and maternal education and living in a single parent home) is related to increased risk that children will exhibit high levels of behavior problems through middle childhood. Several experimental and quasi-experimental studies suggest some causal effect of income on children's behavioral functioning, especially externalizing problem behavior (Akee, Copeland, Keeler, Angold, & Costello, 2010; Blau, 1999; Costello et al., 2003; Dearing et al., 2006; D'Onofrio et al, 2009; Hao & Matsueda, 2006).

1.2 PATHWAYS BY WHICH INCOME AFFECTS EARLY DEVELOPMENT

Three different theoretical frameworks explain income's influence on children's development—resource and investment, stress, and cultural theories (Figure 1; Magnuson & Votruba-Drzal, 2009). In brief, according to the resource and investment perspective, economic disadvantage limits families' abilities to invest in materials and experiences that produce better child outcomes, like educational activities, adequate health services, and high quality neighborhoods and schools (Becker, 1991). Thus, children from economically disadvantaged households may lag behind more advantaged peers because their parents have fewer resources to invest in their development (e.g. Guo & Harris, 2000; Leventhal & Brooks-Gunn, 2000). Indeed, children from low-income families tend to experience lower quality home environments than nonpoor peers, and these differences explain some of income's influence on child development (Duncan & Brooks-Gunn, 2000). This pathway appears especially salient in predicting children's academic outcomes (Gershoff et al., 2007; Yeung et al., 2002).

Psychologists and sociologists have predominately relied on stress perspectives to explain income's role in development. First, economic disadvantage affects development by increasing conflict and stress in the home, which gives rise to less developmentally appropriate parenting (Conger et al., 1992; Conger et al., 2002; McLoyd, 1990). Economic pressure, coupled with other life stressors more commonly experienced by poor families, leads to increased psychological distress and inter-parental conflict. Parental distress and conflict are linked to harsher, more detached, and less nurturing, stimulating, and responsive parenting, in turn predicting numerous maladaptive outcomes for children like increased internalizing and externalizing problems and decreased cognitive and language skills (e.g. Brotman et al., 2009; Chazan-Cohen et al., 2009; Farah et al., 2008; Shaw, Owens, Giovanelli, & Winslow, 2001). Beyond the family system, low-income children face greater environmental stress in the forms of pollution, household chaos, substandard housing, and dangerous and dilapidated neighborhoods (Evans, 2004). Chronic stress produces physiological effects on children that threaten development including elevated levels of stress hormones, increased blood pressure, and the failure to attune (Evans, Brooks-Gunn, & Klebanov, 2011; Shonkoff & Phillips, 2000). Environmental stress appears especially harmful to children's self-regulatory skills, which have far reaching effects on multiple domains of development including academic and behavioral functioning (Evans & Kim, 2013). These stressors may also play a role in the development of mental health and conduct problems, causing children to become anxious, depressed, frustrated, and/or angry (e.g. Buckner, Beardslee, & Bassuk, 2004; Evans et al., 2005; Supplee, Unikel, & Shaw, 2007).

Lastly, cultural theories explaining poverty's impacts on children suggest that differences in values, frames, repertoires, narratives, and norms between low-income and more advantaged families may give rise to economic disparities in academic and behavioral functioning (Lamont &

Small, 2008; Lareau, 2003; Vaisey, 2010). The work of Wilson (1987) and others (e.g. Massey, 1990) highlight how structural and economic factors, like neighborhood poverty concentration, residential isolation of the poor, and job loss, can exacerbate differences in poor and nonpoor parents' norms, beliefs, and behaviors. Concentrated poverty and the lack of socioeconomic integration in communities isolate the poor from middle- and upper-class role models and norms, which may engender maladaptive community norms that, for example, deemphasize the importance of educational attainment and stimulating parenting and/or do not discourage antisocial behavior and harsh parenting (Coley et al., in press; Israel, Beaulieu, & Hartless, 2001). A host of studies ties neighborhood disadvantage and socioeconomic integration to children's academic and behavioral outcomes (e.g. Brooks-Gunn, Duncan, & Aber, 1997; Ingoldsby et al., 2006; Klebanov, Brooks-Gunn, McCarton, & McCormick, 1998; Kohen, Leventhal, Dahinten, & McIntosh, 2008), though the mechanisms driving observed associations remain uncertain.

1.3 TAKING URBANICITY INTO ACCOUNT WHEN THINKING ABOUT INCOME-DEVELOPMENT PATHWAYS

Given that urban, suburban, and rural areas vary widely in terms of access to resources, environmental stressors and the community-level human capital that engenders developmentally promotive norms, beliefs, and behaviors, it is plausible that the above mechanisms function differently across the urban-rural continuum. As discussed in depth below, the communities in which low-income urban, suburban, and rural families reside likely have varying risks and

benefits. Accordingly, it is unclear which or whether any of these contexts will be most pernicious for the development of economically disadvantaged children.

1.3.1 Resources and Investments

Based on the resource and investment perspective, urbanicity may be linked to differential investments in children due to differences in the availability and accessibility of community resources across urbanicity. In other words, increased income may have stronger relations to increased investments in children in communities where there are abundant resources in which to invest. In less urbanized areas, we may expect the presence of certain developmentally salient resources to be relatively limited, though little empirical work addresses this issue. Providing a notable exception, Gordon and Chase-Lansdale (2001) found that unmet need for center-based childcare is much higher in rural areas compared to urban areas. Educational activities (e.g. libraries, museums), health care, community centers, and other resources may be less available in rural areas as well (Miller et al., 2013). Beyond access to these broadly promotive community resources, there is evidence that the availability of resources that are particularly important to low-income populations, such as food banks and welfare offices, is lower in rural and suburban communities as compared to urban ones (Allard, 2004, 2008; Murphy & Wallace, 2010). Aside from availability, low-income families' access to resources may differ across the urban-rural continuum due to limited or non-existent public transit in less urbanized areas. While 90% of residents of large urban cities have access to public transportation, it is available to only 60% of suburban residents (Tomer, Kneebone, Puentes, & Berube, 2011). Only 32% of rural *counties* have public transit service, and within those counties, just a fraction of residents are served (Brown,

2008; Stommes et al., 2002). Limited public transit in suburbs and rural areas, coupled with physical settings that often do not accommodate pedestrians, may limit poor suburban and rural families' ability to access resources even if resources are technically available.

Limited availability and accessibility of important resources in rural areas, and to a lesser extent suburban areas, may have negative impacts on the early development of low-income rural and suburban children in comparison to urban peers. Low-income rural children may have worse academic skills compared to their more urban counterparts because they receive fewer educational experiences like trips to cultural attractions and libraries that have been linked to academic growth (Guo & Harris, 2000; Duncan & Brooks-Gunn, 2000). Similarly, limited access to mental health services, youth centers, and family support organizations may threaten low-income rural children's behavioral functioning (e.g. Manteuffel, Stephens, & Santiago, 2002). Lack of resources in rural areas may further inhibit low-income rural children's development if their parents are unable to draw from resources like libraries and family support centers to provide more stimulating, warmer, and responsive parenting that predicts better academic and behavioral outcomes (Gutman & McLoyd, 2000; Yeung et al., 2002). Resource unavailability may also negatively impact academic and behavioral development by increasing family stress in low-income households residing in less urbanized areas, which is discussed in detail below.

1.3.2 Family and Environmental Stress

Considering stress perspectives, urbanicity may moderate links between economic disadvantage and development by shaping the levels of stress experienced by low-income children and families. Differential access to social service providers and social support related to urbanicity may impact

stress in the home. Low-income rural and suburban families' stress levels may be heightened by the relative lack of social services, like food banks, job training and employment agencies, and health clinics (Allard, 2004, 2008; Murphy & Wallace, 2010). The lack of these resources may negatively impact parents' mental health directly, and also indirectly by increasing the financial stress experienced in low-income suburban and rural homes. Poor rural families are also less likely to participate in welfare programs than are poor urban families (Gennetian, Redcross, & Miller, 2002), which may exacerbate financial stress in poor rural homes. Social support also may differ across the urban-rural continuum. Despite the wide geographic dispersion often experienced by rural residents, low-income rural families have been characterized as having stronger social support networks and kinship ties than families in metropolitan areas (Beggs, Haines, & Hurlbert, 1996; Duncan, Whitener, & Weber, 2002; Lee, Netzer, & Coward, 1994). Compared to urban and suburban dwellers, rural residents may increasingly pool together to provide emotional, financial, and in-kind support to needy families (e.g. Hofferth & Iceland, 1998). Conversely, poor suburban families report feeling isolated from support networks due to distance from kith and kin and lack of public transportation to get to them (Boyd, 2008; Murphy, 2011).

Considering differences in family stress related to urbanicity, we may expect decreased access to social service providers to negatively impact the development of low-income suburban and rural children by increasing financial stress and, ultimately, raising levels of parental distress, leading to less optimal parenting practices (Conger et al., 2002; McLoyd, 1990). Harsher, more reactive and detached parenting would predict decreased achievement and worse behavioral functioning for disadvantaged suburban and rural children in comparison to low-income urban peers (Brotman et al., 2009; Chazan-Cohen et al., 2009; Farah et al., 2008; Shaw et al., 2001). Access to support from kith and kin, however, may buffer low-income rural families and children

from the negative consequences of financial stress (Simons & Johnson, 1996). Low-income suburban children may be at especially high risk for decreased academic and behavioral skills if the lack of support networks for poor suburban parents, coupled with lesser availability of social services, produces relatively high levels of family stress and harsh, overreactive, unresponsive parenting in poor suburban homes in relation to poor urban and rural homes (Conger et al., 2002; Simons & Johnson, 1996).

In addition to stress in the home, environmental stressors may differ across urbanicity. Poor children in large inner-cities and rural areas often experience chronic environmental risks that may not be as prevalent in suburbs (see Evans, 2004). Both low-income urban and rural children are disproportionately exposed to environmental toxins and pollutants. Though compared to suburban and rural peers, environmental stress faced by many low-income children in inner-cities is compounded by the dangerous and dilapidated neighborhoods with relatively high rates of random violence and crime in which they live. The abundance of environmental stressors typical in disadvantaged inner-city communities likely has negative impacts on the academic and behavioral development of low-income urban children in comparison to low-income rural and suburban children. These environmental risks may produce heightened maladaptive physiological responses and anxiety, depression, frustration, and other negative emotions in poor urban children (Evans et al., 2011; Shonkoff & Phillips, 2000; Supplee et al., 2007). They may also inhibit poor urban children's academic and behavioral functioning by increasing parental distress and, in turn, decreasing parenting quality (e.g. Evans & Saegert, 2000; Linares et al., 2001; Wachs & Camli, 1991). With respect to low-income children in rural areas, while they face some environmental risks, they enjoy relatively greater proximity to nature, which may buffer them from other sources of stress (Wells & Evans, 2003). Consequently, the physical environment of inner-cities likely

puts low-income urban children at a relative disadvantage compared to suburban and, to a lesser extent, rural peers.

1.3.3 Culture

Lastly, cultural models suggest that urbanicity may relate to differences in structural factors, like neighborhood poverty concentration and socioeconomic segregation that isolate economically disadvantaged families from middle class role models and norms, which may lead low-income residents to adopt maladaptive beliefs and practices (e.g. Massey, 1990; Wilson, 1987). Specifically, concentrated poverty and isolation of the poor are pervasive problems in inner-city urban areas (Massey, 1996; Wilson, 1987). Furthermore, deindustrialization of urban areas has increased unemployment and depleted human capital (Wilson, 1987). Suburbs, on the other hand, are generally more socioeconomically integrated (Massey, 1996). And while poverty concentration tends to be relatively high in rural areas (Lichter & Johnson, 2007), decreased population concentration gives rise to intermingling of lower- and upper-income families within the broader community (Evans & Kutcher, 2011). Poor and non-poor rural parents may shop at the same stores, belong to the same religious institutions, and have children at the same schools, which may limit social isolation of low-income rural families.

Accordingly, in urban areas where poverty is highly concentrated and socioeconomic integration is limited, the academic and behavioral outcomes of low-income urban children may be compromised by maladaptive community norms and practices that lead parents or children to adopt behaviors, like harsh parenting and aggression, that may threaten achievement and heighten behavior problems (Coley, Lombardi, Lynch, Mahalik, & Sims, in press; Israel et al., 2001;

Wilson, 1987). Conversely, increased socioeconomic integration in suburban, and perhaps rural, areas may be a source of resilience for economically disadvantaged families (e.g. Dupere, Leventhal, Crosnoe, & Dion, 2010; Rosenbaum, Reynolds, & Deluca, 2002; Turney, Kissane, Edin, 2012). In higher-SES neighborhoods, broad consensus at the community level regarding, for example, academic achievement or educational attainment shapes and/or restrains individual behavior through collective socialization (i.e. limiting exposure to negative role models and peers, exposing parents to middle class norms and practices, and enforcing informal social controls via the stigmatization of maladaptive/unconventional attitudes and behaviors). These factors affect young children through their influence on parents' norms, beliefs, and ultimately their parenting (Turney et al., 2012). It is worth noting that, contrary to cultural arguments, relative deprivation theories posit that increased socioeconomic integration would have *negative* implications for low-income children in suburban and rural communities. In more integrated neighborhoods, poor residents may face overt discrimination or experience resentment as a result of comparing their economic situation to that of more advantaged neighbors (Jencks & Mayer, 1990; Leventhal & Brooks-Gunn, 2000). This may affect even young children via parents; increased parental distress resulting from discrimination and negative social comparisons may decrease parenting quality, thereby threatening low-income children's development. As a result, low-income children in more economically integrated suburban or rural communities may exhibit worse academic and behavioral skills than urban peers living in areas of concentrated poverty (Collins, 1996; Jencks & Mayer, 1990; Marsh & Parker, 1984). This may be especially true for poor suburban children since evidence shows their neighborhoods have the highest concentration of affluent families (Massey, 1996).

1.4 DIFFERING INCOME ASSOCIATIONS WITH CHILD FUNCTIONING ACROSS URBANICITY

Recent evidence suggests that links between income and development may not be parallel in urban, suburban, and rural areas. Miller and colleagues (2013) considered whether the functional form and magnitude of relations between family income and kindergarten achievement differed across the urban-rural continuum. Using nationally representative data from the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B), they observed urbanicity-related differences in the functional form of the income-early achievement association, whereby income had nonlinear associations with achievement in large urban, small urban, and suburban communities but linear relations in rural areas. In addition, differences in the size of income's association with early achievement were identified. Family income had the strongest positive relations with kindergarten-entry reading and math skills in large urban areas (roughly .15 SD per $10,000 increase in income), and effect sizes decreased as locales got less urban. In rural areas, income had slight links to academic skills at kindergarten entry (.05 SD).

While that study provided initial evidence of urbanicity-related differences in income's associations with child development, or specifically academic development, it did not examine whether urbanicity also moderates links between income and other domains of functioning. Since some of the same processes explaining income's role in early academic development also drive income gaps in behavioral functioning, such as parenting quality, home environment, and parental investments (e.g. Magnuson & Votruba-Drzal, 2009), there may be similar differences in the form and magnitude of income's relations with children's early behavioral skills across the urban-rural continuum.

1.5 URBANICITY, INCOME, AND DEVELOPMENTAL TRAJECTORIES

Literature has examined the role of income in predicting trajectories of achievement and behavior, but no research has asked whether links between income and children's development over time differ as a function of urbanicity. Studies documenting how urbanicity moderates income's relations to achievement and behavior at kindergarten entry are important because the skills that children bring with them to kindergarten predict future school success (Duncan et al., 2008; Heckman, 2002; Magnuson & Votruba-Drzal, 2009). But we also know that there is great heterogeneity in children's developmental trajectories. Thus, it is vital to consider factors, like urbanicity, that may alter income's relations to achievement and behavior across development, since income gaps in functioning that persist through the school years tend to translate into disparities in educational achievement and attainment, as well as adult employment, earnings, and well-being (Duncan et al., 2008; Jantti, 2009).

Urbanicity-related differences in income's links to development may be exacerbated or attenuated as children age and gain more direct contact with peer, school, and neighborhood contexts. Prior to formal schooling, the main developmental context for most children lies within the home. Children under six have less interaction with peers and direct contact with their neighborhoods than do older children. In addition, during this developmental period rapid brain growth occurs and children gain socioemotional and regulatory skills (Shonkoff & Phillips, 2000). Thus, the academic and behavioral skills that children possess at kindergarten entry may be most susceptible to negative aspects of the family environment related to economic disadvantage (e.g. inconsistent and harsh parenting and unstimulating learning environments) during early childhood. School-aged children, on the other hand, have greater exposure to extrafamilial contexts like peer

groups, schools, and neighborhoods (McLoyd et al., 2009). Compared to very young children, they have increased opportunity to utilize community and school resources and are more heavily influenced by the norms and behaviors endorsed by peers and in schools and neighborhoods, which have implications for academic and behavioral development (Levanthal & Brooks-Gunn, 2000). For example, income gaps in academic growth may be attenuated in communities where schooling quality is high (or at least similar) for all children regardless of family socioeconomic status. In urban inner-cities, where concentrated disadvantage is pervasive, low-income children's access to models of positive, adaptive behavior may be limited, and they may have heightened exposure to norms from peers and adults that threaten healthy behavioral development (Lareau, 2003; Simons et al., 1996; Sinclair, Pettit, Harrist, Dodge, & Bates, 1994), which would exacerbate economic disparities in trajectories of behavioral functioning. On another note, as children approach adolescence they become more cognizant of familial economic hardship and their relative socioeconomic standing (McLoyd et al., 2009), and this could influence mental health and behavior problems. Perhaps in communities with greater levels of socioeconomic integration, like some suburban, small town, and rural communities, income gaps in behavior are exacerbated by low-income children's heightened feelings of relative deprivation (Leventhal & Brooks-Gunn, 2000). In summary, as children progress through elementary school, income-related differences in peer, school, and community contexts may exacerbate or attenuate existing economic disparities in development. To the extent that important differences in poor and nonpoor children's home, school, peer, or neighborhood contexts are greater in certain urbanicities, we would economic disparities in achievement and behavior to widen disproportionately in those areas as children age.

2.0 DIFFERENCES IN INCOME'S ASSOCIATIONS WITH ACADEMIC AND BEHAVIORAL FUNCTIONING ACROSS THE URBAN-RURAL CONTINUUM: A REPLICATION AND EXTENSION

2.1 RESEARCH AIMS AND HYPOTHESES

Research examining urbanicity's role in relations between income and child functioning is critical in light of the changing geography of poverty. While recent evidence suggests that income-achievement associations differ across urban, suburban, and rural communities, additional work is necessary to replicate findings and extend them across development and to other important domains of child development, like behavioral functioning.

2.1.1 Aim 1

Accordingly, using nationally representative data from the ECLS-K, this study aims to replicate prior findings of differences in income gaps in achievement at kindergarten entry across urbanicity (Miller et al., 2013) and determine whether similar moderation exists with respect to economic disparities in children's internalizing and externalizing behaviors. The replication of prior findings of urbanicity-related differences in income-kindergarten achievement associations, while the least novel part of this dissertation, is important nonetheless (Duncan, Engel, Claessens, & Dowsett, 2014). The analytic techniques used in the prior investigation are heavily data driven. Accordingly, results can be deemed reliable and valid only to the extent that they can be replicated

across datasets. It is also instructive to know whether prior findings generalize to a cohort of American kindergartners starting school nearly a decade earlier in 1998. Following the findings in Miller et al. (2013), it is hypothesized that associations between income and academic skills and behavior problems at kindergarten entry will be strongest in large and small urban city cores and comparatively smaller in suburban and rural areas.

2.1.2 Aim 2

Second, we aim to extend prior research by examining whether urbanicity moderates income's relation to children's achievement and behavioral trajectories as they move from kindergarten through fifth grade. It is expected that as children get older and gain more direct contact with their communities, factors hypothesized to contribute to urbanicity differences in economic disparities in kindergarten functioning, like increased environmental stress in urban areas and lack of resources in rural areas, will perpetuate disparities in development over time. In other words, links between income and growth in achievement/decline in behavior problems will be strengthened in contexts where links are comparatively larger at kindergarten and further tempered in contexts where income gaps are weaker at kindergarten. Given that prior results suggest income gaps in achievement are exacerbated in large inner-cities, I hypothesize that income's relations to change in achievement and behavior problems will be stronger in large and small urban areas and relatively weaker in suburbs and rural areas.

2.2 METHOD

2.2.1 Participants

Study 1 employs data from the Early Childhood Longitudinal Study – Kindergarten Cohort Class of 1998-1999 (ECLS-K), a nationally representative, longitudinal study of nearly 22,000[1] children entering kindergarten in the fall of 1998. It is a multi-source, multi-method prospective study following the cohort through eighth grade while assessing children's development trajectories and family, school, and classroom characteristics salient thereto (NCES, 2001). The ECLS-K used a multistage probability sample design, where the primary sampling units (PSU) were geographic areas consisting of counties or groups of counties, the second-stage sampling units were schools within PSUs, and the final stage sampling units were students within schools. Data were collected across several developmental domains and include direct assessments of children's achievement, teacher reports of children's behavior, as well as measures of family, school, and classroom characteristics that have been associated with development. The sample is nationally representative and large, with sizable subsamples of low-income children and children living in urban, suburban, and rural areas (approximately 38%, 39%, and 23%, respectively, of the sample at kindergarten). Population weights facilitate generalization of the results to a nationally representative cohort of children beginning kindergarten in 1998. Our analysis samples include the approximately 16,000 children who had valid data on outcomes and predictors at kindergarten

[1] NCES requires that all Ns be rounded to the nearest 50.

entry (kindergarten sample) and the 11,000 children who had valid data on outcomes and predictors from kindergarten through fifth grade (longitudinal sample).

2.2.2 Procedure

The ECLS-K collected data at seven waves: waves 1 and 2 corresponded to fall and spring of kindergarten; wave 3 and 4 data were collected fall and spring of first grade; wave 5 was spring of third grade; wave 6 was spring of fifth grade; and wave 7 was spring of eighth grade. This study uses data from kindergarten through fifth grade, which comprises most children's elementary school years. This translates to waves 1, 2, 4, 5, and 6 (wave 3 data were excluded because, by design, only 30% of the sample was assessed). Data from the eighth grade wave were not included because, given the immense developmental changes that occur during adolescence, the processes outlined herein driving income-child development links may operate very differently in adolescence. Response rates for waves 1, 2, 4, 5, and 6, were 92%, 97%, 89%, 75%, and 83% in sequential order. At each wave, children's academic, behavioral, and physical development were assessed directly, and survey data were collected from parents, teachers, and school administrators. Parent interviews were conducted by telephone or in person for families without a telephone, and teachers and administrators were surveyed via self-administered questionnaires.

2.2.3 Measures

Child Outcomes

Academic skills. At all waves of data collection, children were administered direct assessments in reading and math. Assessments combined questions from well-validated instruments, such as the Peabody Individual Achievement Test—Revised (PIAT-R; Markwardt, 1989) and the Woodcock-Johnson Psycho-Educational Battery (Woodcock & Mather, 1990), and included several items developed specifically for the ECLS-K (NCES, 2001). The reading assessment tested a broad range of language and literacy skills, including receptive vocabulary, letter recognition, reading comprehension, literal inference, extrapolation, and evaluation. The math assessment included items tapping general mathematical skills, such as number sense, measurement, and geometry. To facilitate longitudinal comparisons of children's achievement scores, the ECLS-K calculated IRT scores, which estimate children's performance as if they had been administered the entire set of questions (NCES, 2005). Calibrated IRT scores were used in analyses to ensure a consistent metric, which is necessary when examining growth over time (Singer & Willett, 2003). Average reliabilities of IRT scores from kindergarten through fifth grade were .94 for reading, ranging from .92 to .96, and .92 for math, ranging from .91 to .95 (NCES, 2005).

Behavioral functioning. To assess children's behavioral functioning, the ECLS-K developed the Social Rating System (SRS; NCES, 2001) based on the Social Skills Rating System (SSRS; Gresham & Elliot, 1990). The SRS was administered to children's teachers at waves 1 through 6. It includes many questions about the child's regulatory skills and behaviors, including items examining the frequency with which the child fights, argues, gets angry, the child's ability

to control temper, accept peers ideas, respect property rights, and respond appropriately to peer pressure, the child's impulsivity and activity levels. The SRS also asks about whether the child has problems with sadness, loneliness, and self-esteem. Items were answered using a "1" to "4" metric ("1" = *never*, "4" = *very often*). The SRS Internalizing Problem Behaviors scale was used to assess children's internalizing behaviors (4 items; α = .76-.78). A composite of externalizing problems was created by averaging scores on the Externalizing Problem Behaviors scale (5 items; α = .86-.90), the Self-Control scale (4 items; .79-.80), and the Approaches to Learning scale (6 items; α = .89-.91), which contains items tapping self-regulatory abilities. Overall reliability statistics for this composite cannot be calculated by the author because item-level SRS data are unavailable in the ECLS-K; only subscale scores are provided.

Income

At each wave of data collection, primary caregivers reported total household income for the prior year. Income was measured continuously at kindergarten (families making less than $35,000 reported continuously all waves) and categorically at later waves, with respondents selecting into which bin their household fell (bins rose in $5,000 increments until $40,000, then in increasingly larger increments). A continuous income measure was created by assigning cases to the midpoint of the selected income category. In models predicting urbanicity-differences in income gaps in functioning at kindergarten entry, income from the kindergarten wave was utilized. In analyses looking at urbanicity moderation of income's associations with academic and behavioral change over time, a measure of average family income from kindergarten through fifth grade was used as cumulative family income is a better predictor of child development (Blau, 1999). This cumulative measure was calculated using annual income reports that were escalated using the Consumer Price Index (CPI) to reflect constant 2003 dollars (corresponding to wave 6).

Urbanicity

Rural-Urban Commuting Area Codes (RUCA codes) created by the Economic Research Service of the U.S. Department of Agriculture were used to measure urbanicity. RUCA codes use measures of population density, urbanization, and daily commuting to identify urbanized areas and the adjacent territory that is economically integrated with those cores. Unlike other urbanicity classification schemes, RUCA codes use census tract data, which is preferable because census tracts are the smallest building block for which reliable commuting data are available. The RUCA code classification system provides a complete delineation of urbanized areas and clusters and adjacent, integrated settlements based on commuting patterns.

The ECLS-K data contain census tracts of residence for children at each wave of data collection. Accordingly, RUCA codes were calculated for children at each wave. Using RUCA codes coupled with the zip codes of the incorporated limits of U.S. cities, children were placed within four different geographic areas: large urban city; small urban city; suburb of large or small urban city; or rural area. Large urban cities are areas within the incorporated city limits of a large city, i.e. one anchoring an urbanized area with a population of at least 750,000. Small urban cities are areas within incorporated city limits of a city anchoring an urbanized area with between 50,000-749,999 people. Suburbs consist of places inside of urbanized areas but outside of principal city limits. Rural areas are places with fewer than 50,000 residents. Children's urbanicity at wave 1 was used in analyses of urbanicity-related differences in income gaps in child functioning at kindergarten entry. For trajectory models, children were assigned an urbanicity based on the urbanicity in which they resided for the majority of waves 1 through 6. In our analysis samples, there were no children who did not spend a majority of waves in any single urbanicity category.

Demographic Covariates

Analyses controlled for a limited set of child and household factors that may be correlated with child functioning, income, and families' residential decisions, but are not potential processes by which urbanicity may affect academic and behavioral skills. Child characteristics include gender and age at kindergarten entry. Child race/ethnicity, categorized as non-Hispanic White (reference), non-Hispanic African American, Hispanic, or other (Asian, Native American, or multiracial), were controlled. Several parental and household covariates were included. Parental education was represented as a series of dummy variables indicating whether the highest level of attainment was less than a high school degree (reference), high school degree/GED, or Bachelor's degree or higher. Maternal employment was included with a measure of the average number of hours per week mothers' worked, scaled in 10 hour increments. Household structure were represented with a variable capturing the number of children in the home and a marital status indicator reflecting whether the child's mother reported being married (or stably married across waves in trajectory analyses). An indicator for whether the child ever lived in a household where the primary language was not English also was included. Lastly, dummy variables were included to indicate whether the household is located in South, West, Northeast (reference), or Midwest according to U.S. Census region definitions (or where the household was located for a majority of waves in trajectory analyses). Time varying covariates were taken from wave 1 in analyses examining kindergarten outcomes, and, unless otherwise indicated above, they were averaged across the kindergarten through fifth grade waves in trajectory analyses.

2.3 DATA ANALYSIS

Hypothesis 1: In addressing whether economic disparities in children's academic and behavioral skill at kindergarten entry vary by urbanicity, differences in the functional form and magnitude of associations between income and child functioning across urbanicity were tested. To do so, non-parametric equations using General Additive Modeling (GAM; Hastie & Tibshirani, 1990) were estimated. GAM identifies thresholds in functional form by estimating the relationship between a predictor and outcome without making assumptions about whether the nature of that relationship is linear, quadratic, logarithmic, etc. Instead, functional form is determined empirically by the data. For each urbanicity separately, the relation between income and children's skills were modeled using GAM with Equation 1, where *f* represents an unknown, nonlinear function that is estimated non-parametrically.

(1) $\text{Child outcome}_{1i} = \mu_i + \beta_1 \text{Child}_{1i} + \beta_2 \text{Household}_{1i} + f(\text{Income}_{1i}) + \varepsilon_i.$

In this equation, *f* (Income) is the GAM-estimated, nonlinear association between income and the child outcome after controlling for covariates. The output provides a plot of *f* (Income) on Income. GAM plots provide accurate and reliable visual guidance as to regions where thresholds exist (Setodji et al., 2012).

As GAM is non-parametric, it does not provide estimates of the magnitude and statistical significance of associations between income and child outcomes at observed thresholds. Nor does it test whether income's association with the outcome is significantly different below and above the threshold. Thus, because GAM requires researchers to make judgments about the existence and location of thresholds, it is important to examine the validity of thresholds with other statistical methods. In this study, user-identified thresholds were tested via spline regressions, with each

potential threshold constituting a spline knot. The parameterized models allow users to examine the magnitude and significance of income's association with child outcomes and the validity of visually-chosen thresholds.

Next, urbanicity-related differences in the magnitude of income gaps in child outcomes at kindergarten-entry were estimated by fitting a model on the full sample that included thresholds (Equation 2).

(2) $\text{Child outcomes}_{1i} = B_0 + D_{(\text{Large Urban})}(B_1\text{Income}_{1i} + B_2(\text{Income}_{1i} \times D_{(\text{Income}\geq \text{LU T1})}) + \ldots B_p(\text{Income}_{1i} \times D_{(\text{Income}\geq \text{LU T}p)})) + D_{(\text{Small Urban})}(B_3\text{Income}_{1i} + B_4(\text{Income}_{1i} \times D_{(\text{Income}\geq \text{SU T1})}) + \ldots B_p(\text{Income}_{1i} \times D_{(\text{Income}\geq \text{SU T}p)})) + D_{(\text{Suburban})}(B_5\text{Income}_{1i} + B_6(\text{Income}_{1i} \times D_{(\text{Income}\geq \text{sub T1})}) + \ldots B_p(\text{Income}_{1i} \times D_{(\text{Income}\geq \text{sub T}p)})) + D_{(\text{Rural Town})}(B_7\text{Income}_{1i} + B_8(\text{Income}_{1i} \times D_{(\text{Income}\geq \text{RT T1})}) + \ldots B_p(\text{Income}_{1i} \times D_{(\text{Income}\geq \text{RT T}p)})) + D_{(\text{Rural})}(B_9\text{Income}_{1i} + B_{10}(\text{Income}_{1i} \times D_{(\text{Income}\geq \text{R T1})}) + \ldots B_p(\text{Income}_{1i} \times D_{(\text{Income}\geq \text{R T}p)})) + B_{11}\text{Urbanicity}_{1i} + B_{12}\text{Child}_{1i} + B_{13}\text{Household}_{1i} + \varepsilon_t.$

In Equation 2, a dummy variable for each urbanicity was multiplied with the appropriate functional form for that urbanicity. This combined model allows the form and magnitude of the income-child outcome relation to vary by urbanicity. Post hoc tests were conducted within the combined model to determine whether income estimates differed across urbanicity. The nesting of children within schools was addressed by making a cluster adjustment to provide robust standard errors.

Hypothesis 2: The second set of hypotheses regard urbanicity moderation of income's relations to change in achievement and behavior from kindergarten through fifth grade. In examining change in children's development over time, there are several different analytic strategies. With respect to achievement, all children's academic skills generally grow as they age in a linear or quadratic fashion, though the rate of growth varies across individuals (e.g. El Nokali, Bachman, & Votruba-Drzal, 2010). Children's behavior problems, on the other hand, do not uniformly increase or decrease over time across. Rather, children tend to follow one of several unique trajectories of internalizing and externalizing problems. For example, studies have

identified children following either chronically high, high-desisting, moderate-desisting, or low externalizing problem trajectories (Campbell, Spieker, Burchinal, Poe, & the NICHD ECCRN, 2006; Nagin & Tremblay, 1999; Shaw, Gilliom, Ingoldsby, & Nagin, 2003). With respect to internalizing, studies have generally found three trajectory groups, low-stable, decreasing then increasing, and high-stable, or low, moderate, and high (Cote et al., 2009; Fanti & Henrich, 2010; Sterba, Prinstein, & Cox, 2007). As achievement and behavior follow different patterns of change, researchers should use different analytical techniques for modeling trajectories of achievement versus trajectories of behavior problems.

To examine whether urbanicity moderates income's relations to achievement growth over the elementary school years, three-level hierarchical linear modeling was utilized (Raudenbush & Bryk, 2002). First, children's academic trajectories were estimated using growth models in the form of Equation 3.

(3) $Y_{tij} = \pi_{0ij} + \pi_{1ij}\text{Time} + \varepsilon_{tij}$.

Time tracked growth from kindergarten entry through the spring of fifth grade. Time was measured as the number of months that had passed since the day the child started kindergarten. Academic skills at time "t" for child "i" in school "j" are modeled as a function of the skills of child "i" in school "j" at the fall of kindergarten (π_{0ij}), and the per month growth of skills from the spring of the kindergarten year to the spring of fifth grade (π_{1ij} and π_{2ij}). Random effects for both the slope and intercept were included.

At level 2, variability in the level 1 parameters (intercept and slope) were modeled with Equations 4-5.

(4) $\pi_{0ij} = \beta_{00j} + \beta_{01j}\text{Income}_{ij} + \beta_{02j}\text{Urbanicity}_{ij} + \beta_{03j}\text{IncomexUrbanicity} + \beta_{04j}\text{Child}_{ij} + \beta_{05j}\text{Household}_{ij} + r_{0ij}$

(5) $\pi_{1ij} = \beta_{10j} + \beta_{11j}\text{Income}_{ij} + \beta_{12j}\text{Urbanicity} + \beta_{13j}\text{IncomexUrbanicity} + \beta_{14j}\text{Child}_{ij} + \beta_{15j}\text{Household}_{ij} + r_{1ij}$

Here, the initial level (intercept) of skills was predicted by income, urbanicity, the interaction between income and urbanicity (modeled using the urbanicity-specific functional form identified by the results of the prior analyses), and child and household characteristics taken from the fall of kindergarten. The slope parameters were estimated as a function of income, urbanicity, child, and household variables measured over time. In addition, an interaction between income and urbanicity was included to answer the primary question of interest, namely whether associations between income and growth in children's skills vary across urbanicity. GAM models were fit to model relations between income and slope estimates in order to determine whether links between income and *growth* in academic skills also varied in functional form across urbanicity. All covariates except urbanicity dummy variables were grand-mean centered so intercepts at level-2 represent adjusted means for the average child in large urban cities. Lastly, to account for the nesting of children within schools, a level-3 school specific random effect was included.

Based on prior research showing that children follow distinct behavior problem trajectories, group-based trajectory modeling (GBTM; Jones & Nagin, 2013; Nagin; 2005) was utilized to identify groups of children following similar developmental trajectories of internalizing and externalizing behavior problems from kindergarten through fifth grade. Using finite mixtures of suitably defined probability distributions, GBTM identifies distinctive clusters of individual trajectories within the population. Thus, unlike the hierarchical growth curve methodology which models population variability in growth with multivariate continuous distribution functions, GBTM utilizes a multinomial modeling strategy that can identify different groups of children with similar trajectories of behavioral functioning over time. The distribution of outcome trajectories

is denoted by $P(Y_i \mid Time_i)$, where Y_i represents individual I's longitudinal sequence of behavioral outcomes and $Time_i$ represents the time elapsed since individual I entered kindergarten. GBTM assumes that the population distribution of trajectories arises from a finite mixture of unknown order J. The group-specific trajectory can be modeled with up to a fifth order polynomial. Importantly to this study, GBTM is also able to analyze the effect of covariates on the probability of membership in a trajectory group.

In this analysis, a Censored Normal model was fitted to the data because the response variable is a psychometric scale with censored values at its minimum and maximum. A key issue in the application of a group-based model is making a determination of how many groups define the best fitting model. Final, optimal models were selected using Bayesian Information Criterion (BIC) and prior research on internalizing and externalizing trajectories in children (D'Unger, Land, McCall, & Nagin, 1998; Kass & Reftery, 1995). Quadratic functions were initially applied to all trajectories, but models were simplified if the quadratic term was non-significant. Similarly, intercept only models were estimated if linear growth terms were non-significant. Analyses were weighted with ECLS-K population weights, but models were unable to adjust for the clustering of children within schools.

2.4 RESULTS

Tables 1 and 2 show descriptive statistics for the kindergarten and longitudinal samples. Statistics are presented for the full samples and for each urbanicity group separately. Several patterns emerge. With respect to child outcomes, unadjusted differences show that, on average, suburban

children have slightly higher and rural children have slightly lower kindergarten achievement scores (though not different from children in large urban areas in math) than children in other areas. There were very slight, but significant, mean differences in children's behavior problems at kindergarten entry, whereby suburban kindergartners have fewer internalizing problems than children in large cities and rural areas and fewer externalizing problems that children in all other areas. There were also marked differences in demographic characteristics across urbanicity. Specifically, suburban children tend to be the most advantaged in terms of socioeconomic factors, with the highest family incomes, parental education levels, and marriage rates. Families in large urban cities, small urban cities, and rural areas look similar on many demographic characteristics, but differ on a few factors. Rural children are far more likely to be white, Southern, and living in two-parent married homes where English is the primary language. In contrast, in large urban cities, children tend to be racial/ethnic minority children living in single parent homes. Additionally, a disproportionate share of children in non-English speaking homes reside in large central cities. These demographic patterns are largely repeated in the longitudinal sample. Interestingly, looking at child outcomes longitudinally, unadjusted differences show that suburban children tend to maintain their academic advantage through fifth grade, while rural children gain academic ground as they progress through elementary school. Lastly, behavior problems appear to worsen longitudinally in small urban communities compared to patterns in other urbanicities.

2.4.1 Aim 1: Differences in Income's Relations to Achievement and Behavior at Kindergarten Entry Related to Urbanicity

GAM diagnostics revealed some differences in the functional form of associations between income and achievement and behavior at kindergarten entry. With respect to achievement, the point at which family income's relation to reading and math achievement weakened was at $90,000 in all urbanicities except rural areas. In rural area, the link between income and reading skills did not plateau until $140,000, and the link between income and math skills was linear. For both internalizing and externalizing, a threshold where income's association with behavior problems diminished was observed around $60,000 across all urbanicities. The results of the parameterized model specifications showed these thresholds were significant.

Estimates of urbanicity-related differences in income gaps in achievement and behavior at the start of kindergarten are presented in Tables 3 and 4, respectively. Models control for all demographic covariates, though those results are not presented for the sake of parsimony. Main effects of urbanicity are presented first, followed by estimates of income-child outcome associations within each urbanicity group. For ease of interpretation, models were estimated so that the coefficients represent the absolute slope of each line segment within each urbanicity and, thus, statistical significance for the coefficients indicates that the income-achievement relation in that group is different from zero. Post hoc tests were conducted within the combined model determined whether income estimates (within the same income group) differed across urbanicity.

Kindergarten achievement. For achievement, we see some main effects of urbanicity, whereby, holding all else constant, rural kindergarteners perform as much as ¼ SD worse on tests of reading achievement and about 1/5 SD worse on tests of math achievement than kindergartners

in other areas. Children in small urban areas also lag behind large urban and suburban children at the start of kindergarten in terms of reading and math achievement, though effect sizes are small (approximately .10 SD for reading and .07 SD for math).

Income-achievement associations also differ across urbanicity. For families living in large urban cities making less than $90,000, every $10,000 increase in income was linked to .05-.06 SD increases in children's reading and math skills, respectively. Similarly, in small urban cities the income-achievement relation for families making less than $90,000 was .05 SD for both reading and math. In suburbs, income increases below $90,000 related to increases of .05 SD in math and .04 SD in reading. Across large urban cities, small urban cities, and suburbs, income was generally not related to achievement for more affluent families (i.e. those making at least $90,000). The sizes of income-achievement links were smaller in rural areas. Income had very small positive relations to reading achievement until families earned $140,000 or greater (.03 SD per $10,000 in income). Income was not related to reading achievement for rural children in families making at least $140,000. Income predicted improved math skills throughout the income distribution in rural areas, but again, with an extremely small effect size of .02 SD. Post-hoc comparisons revealed some differences in income's relations to achievement across urbanicity. Income gaps in reading were smaller in rural areas than in large or small urban cities, and smaller in suburbs than in large cities. Income gaps in math skills were smallest in rural areas compared to all other urbanicities.

Kindergarten behavior. Results for models predicting behavior problems with income and urbanicity are contained in Table 4. There are no main effects of urbanicity on either internalizing or externalizing, but the interactions between income and urbanicity produced several significant findings. Starting with internalizing results, for children in more advantaged families (i.e. those with incomes of $60,000 or greater), there were no associations between income and children's

internalizing behaviors at kindergarten entry in any urbanicity context (except a single finding that income had a miniscule negative relation to internalizing in rural areas (.01 SD)). Moving on to lower-income children (i.e. those with incomes of less than $60,000), income did not relate to internalizing for more disadvantaged children living in large urban cities. On the other hand, in small urban cities, suburbs, and rural areas, increased income was related to fewer internalizing problems for children with lower family incomes (less than $60,000). Effect sizes for internalizing were similar across small cities, suburbs, and rural areas: per every $10,000 increase in family income, internalizing problems decreased by .04 SD in small urban cities and suburbs and by .03 SD in rural areas. Post hoc analyses showed no significant differences in income-internalizing associations across urbanicity.

With respect to externalizing, income had no links to children's externalizing problems for more advantaged children living in small cities, suburbs, or rural areas. In large urban cities, however, increases in income predicted slightly *more* externalizing problems for higher-income (.004 SD). Moving on to children in lower income homes, there were no associations between income and kindergarten externalizing behaviors in large urban cities. In all other urbanicities, increased income was related to fewer externalizing problems for children with family incomes of less than $60,000. Specifically, externalizing behaviors decreased .06 SD per $10,000 in small urban cities and rural areas and by .02 SD in suburbs. Post hoc tests revealed significant moderation of income's relations to externalizing problems at kindergarten entry. Negative links between income and externalizing problems for lower income children were larger in small urban cities and rural areas than in large cities and suburbs.

2.4.2 Aim 2: Differences in Relations Between Income and Trajectories of Achievement and Behavior Related to Urbanicity

Achievement trajectories. Before addressing research aim 2, unconditional growth models of children's math and reading achievement were estimated to test whether there was significant variability in trajectories of academic achievement over the course of elementary school. Chi-square tests revealed significant variability in initial levels and slopes of math and reading achievement. There also were positive and significant coefficients on the slope terms, indicating that children's achievement trajectories increased over time. Specifically, on average, both reading and math skills increased by .04 SD per month of schooling (effect sizes are calculated using the standard deviations of reading and math scores across the stacked data panel).

Next, to address whether there were urbanicity-related differences in income's associations with reading and math trajectories, conditional growth models from the fall of kindergarten through the spring of fifth grade were estimated, predicting achievement intercepts and slopes with interactions between income and urbanicity and a host of demographic covariates. Prior to running these models, GAM was used to determine the functional form of links between income and growth in reading and math skills. GAM diagnostics revealed that there were similar income thresholds across achievement outcomes and urbanicity. Income's relation to academic skills growth plateaued at around $50,000 in all urbanicities. Accordingly, growth models were estimated using spline income terms to predict the slope, with a term representing the association between income and achievement growth for children in families earning below $50,000 and a term representing the size of the link for children in families earning $50,000 or more.

Results from the achievement trajectory models are presented in Table 5. First, we see that urbanicity generally does not have main effects on the growth of reading and math skills across elementary school. Income, on the other hand, is related to achievement trajectories, though the size of the income-achievement growth relation differs across urbanicity. In all areas, for families making less than $50,000, reading and math skills growth is faster as children's family incomes increase. However, income gaps in reading skills growth were significantly larger in rural areas compared to large urban cities and suburbs. A $10,000 income increase in lower income families was linked to reading growth of .06 point per month in rural areas, while a similar income increase predicted reading growth of .04 point and .03 point in large urban cities and suburbs, respectively. For lower income children, income gaps in reading growth in small urban cities were also significantly larger than gaps in suburbs. In terms of math achievement, income gaps in math growth were also larger in rural areas compared to large urban cities and suburbs. For children with family incomes of less than $50,000 living in rural areas, math growth improved by .05 point every month per every $10,000 increase in family income. The same income increase predicted math growth of .03 point per month in large urban cities and suburbs. Once families made at least $50,000 per year, links become income and children's academic skills growth were very small, though still statistically significant in some areas. Specifically, for children living in families earning $50,000 or more, increased income continued to predict more rapid growth in reading and math achievement in large urban cities and suburbs, whereas it was not related to achievement trajectories in small cities or rural areas. Notably, however, there were no significant differences across urbanicity in associations between income and academic growth once family income reached $50,000.

Behavior trajectories. Moving on to trajectories of behavior problems, the first goal was to model developmental trajectories of internalizing and externalizing from kindergarten to fifth grade. Using BIC statistics, prior literature, and pragmatism to identify the optimal number of groups, a four-group model was selected as the best fitting model for internalizing and a five-group model was selected for externalizing. Figures 2 and 3 depict the observed trajectories for internalizing and externalizing, respectively. For internalizing, the majority of children showed relatively stable levels of internalizing problems over time, with 49.92% of children falling into the low-stable group and 39.08% falling into the mid-stable group. The low-stable group began kindergarten with internalizing behaviors over ½ SD below mean levels and, despite slight but significant growth in internalizing problems, still exhibited lower than average internalizing at fifth grade (roughly .20 SD). The mid-stable group entered kindergarten exhibiting almost ½ SD more internalizing problems than the average, and, while internalizing decreased, these children's internalizing behaviors remained elevated compared to average at fifth grade (.19 SD). Next, the mid-increasing group (7.21% of the sample), which started with similar levels of internalizing as the mid-stable group at kindergarten, experienced rapid growth in internalizing problems throughout elementary school, ending fifth grade with internalizing scores that were two SDs above mean levels. Lastly, the high-declining group, which consisted of only 3.78% of children, were rated by teachers as having 2.4 SDs more internalizing problems at kindergarten entry than the average child. Children in the high-declining group, despite a marked decline in internalizing problems, still exhibited behavior problems that were .70 SD greater than the mean.

Turning to externalizing problems, three of the five trajectory groups showed relatively stable levels of externalizing problems over time. The largest group of children (36.12%) exhibited stably low levels of externalizing from kindergarten through fifth grade, ranking roughly

.60 SD below the mean on externalizing behaviors throughout the elementary school years. An almost equal proportion of children (33.46%) fell into the mid-stable group. These children displayed mean levels of externalizing problems from kindergarten entry through fifth grade. Lastly, a small percentage of children (7.18%) exhibited consistently higher than average levels of externalizing (1.8-2 SDs). The final two externalizing trajectory groups showed change over time, though in opposite directions. Nine percent of the sample began kindergarten with slightly higher than average levels of externalizing (about .23 SD), but problematic behavior increased over time. By fifth grade, children in this mid-increasing group were exhibiting externalizing problems that were almost 1.5 SDs greater than average. Lastly, 14.12% of children were in a high-declining externalizing trajectory group. These children began kindergarten exhibiting high levels of externalizing problems (roughly 1.25 SDs above the mean), but by fifth grade their externalizing behaviors were beginning to near average levels, though high-declining children were still 1/3 SD above the average peer.

Next, this study asked whether income's relations to behavioral trajectories differed across large cities, small cities, suburbs, and rural areas. Tables 6 and 7 presents results from multinomial logistic regression models predicting membership in the internalizing and externalizing trajectory groups with urbanicity, income, and—to answer the above research question—the interaction between urbanicity and income, controlling for demographic characteristics. Relative risk ratios (RRR) are presented, indicating whether the predictor puts children at significantly higher/lower risk of belonging to a group compared to the omitted group. A significant RRR < 1 represents a decrease in the likelihood of being in the specified trajectory group versus the omitted group. A significant RRR > 1 represents an increased likelihood of membership in that group versus the omitted group. Importantly, unlike prior models, estimates on the income interactions are additive.

Spline terms were used again to model the relations between income and behavioral trajectory groups, with the threshold at $60,000 as per findings detailed above (GAM procedures are not applicable to group-based trajectory modeling).

Internalizing. Table 6, panel 1 shows risk factors for group membership in the mid-increasing, mid-stable, and high-declining group compared to the lowest risk internalizing group—the low-stable group. First, there are some main effects of urbanicity on internalizing group membership. To summarize, living in a large urban city generally places children at decreased risk of being in any group other than the lowest risk group. Specifically, compared to peers in large cities, living in a rural area greatly increases a child risk of being in the mid-increasing, mid-stable, and high-declining group (RRR=3.7, 2.3, & 4.4, respectively). Living in a suburban area as opposed to a large urban city increases the likelihood of children being in the mid-stable (RRR=1.9) or high-declining (RRR=4.9) group compared to the low-stable group. Lastly, children living in a small city instead of a large city are about four-times as likely to belong to the mid-increasing and high-declining groups rather than the low-stable group.

Moving on to differences in income's effects across urbanicity, we see that links between income and internalizing trajectories varied vastly across urbanicity. First, in large urban inner-cities, there is little evidence of associations between income and internalizing trajectories (which are the estimates on the first income terms). In contrast, for lower-income families (those with family incomes of less than $60,000), increased income was related to decreased likelihood of membership higher internalizing problems in small urban cities and rural areas, and suburbs to a lesser extent. Specifically, for small city and rural children in more economically disadvantaged homes, every $10,000 increase in income was related to a 30% decrease in the risk of belonging to the most risky internalizing group (i.e. the mid-increasing) as opposed to the low-stable group

(the income-internalizing association was similarly larger in rural areas compared to suburban areas). Similarly, in all urbanicities other than large urban cities, increased family income decreased the probability that a child with family income of less than $60,000 would be in the high-declining group as opposed to the stably-low group by roughly 25% per $10,000. The patterns for children in families making at least $60,000 also varied across urbanicity. While income decreased the risk of being in the mid-increasing group instead of the low-stable group for more advantaged children in large urban cities, it did not have an ameliorative effect in small urban, suburban, and rural areas, and income was even linked to a slight 6% increase in the likelihood of mid-increasing group membership in small urban cities compared to peers in large urban cities.

Panel 2 of Table 6 shows some differences in income's associations with internalizing when considering the highest risk group—the mid-increasing group—as the reference group. Again, we see a familiar pattern where income for lower income children is more predictive of membership in groups with fewer internalizing problems in small urban cities and rural areas. Specifically, increased income is linked to marginally greater chances of being in the mid-stable group as opposed to the mid-increasing group for children with family incomes of less than $60,000 living in small urban and rural areas compared to large urban cities or suburbs. When considering children in families earning at least $60,000, compared to children in all other urbanicities, increased income is linked to a roughly 50% greater likelihood of children in large cities being in either the mid-stable or high-declining group compared to the mid-increasing group. Similar to prior findings, increased income for more economically advantaged children actually *increased* the risk of membership in mid-increasing group rather than the mid-stable group for children in small cities and rural areas compared to peers in large cities and suburbs. Lastly, panel

3 of Table 6 shows again that for children in families earning less than $60,000, income was more predictive of reduced risk of high-declining group membership as opposed to mid-stable group in small cities, suburbs, and rural areas (RRR=.64-.72).

Externalizing. The results examining risk factors for externalizing trajectories are in Table 7. There are some main effects of urbanicity. First, in panel 1, which shows risk factors linked to externalizing group membership compared to the low-stable reference group, we see that rural residence confers a two-three times greater risk of being in a higher risk externalizing trajectory group compared to living in a large urban city. Moving onto panel 2, living in a small urban city, as compared to a large urban city, doubles the risk of belonging to a higher risk group than the mid-stable. Lastly, children living in rural areas face a higher likelihood of being high-declining group versus the mid-increasing group compared to suburban children (RRR=2.32; Table 7, panel 3).

Next, income is related to externalizing mostly similarly across urbanicity (i.e. there are few significant interactions). However, when differences existed, they followed the same general pattern as observed with internalizing problems; for children in lower-income families, income was more predictive of decreased externalizing problems in small urban and rural areas. Specifically, while increased income is related to decreased risk of bring in either the mid-stable, mid-increasing, high-declining, or high-stable groups compared to the low-stable group for all children living in lower income families (Table 7, panel 1), the link is twice as strong in rural areas with respect to the comparison between the high-declining and low-stable group, with every $10,000 increase in family income related to 40% reduction in the risk of membership in the high-declining group. Panel 2 of Table 7 presents results when considering mid-stable as the reference group. Primarily, for more disadvantaged children in small urban cities, income predicts

significantly lower risk of membership in the high-declining group instead of the mid-stable group compared to peers in large urban cities or suburbs (RRR=.80-.81). Lastly, in a finding that did not follow pattern, for children with family income of less than $60,000, increased income is more predictive (roughly 30% greater) of being in the less problematic high-declining group versus the mid-increasing group in suburbs compared to small cities and rural areas (Table 7, panel 3).

Finally, with respect to children living in more advantaged homes (family incomes of at least $60,000), there were almost no links between income and externalizing problems and few significant interactions between income and urbanicity. To summarize, income tended to continue to have stronger links to decreased risk of being in a more problematic externalizing trajectory group for more advantaged children in rural areas compared to those in small urban cities or suburbs (Table 7, panels 1 and 2).

2.5 DISCUSSION

Following a nationally representative sample of children from kindergarten through fifth grade, this study sought to both replicate prior findings of differences in income's associations with kindergarten achievement across urbanicity and expand the literature on income and urbanicity to behavior problems and developmental trajectories. In doing so, this study bolsters existing evidence suggesting that economic disadvantage may have differing relations to child development across the urban-rural continuum. Furthermore, it provides interesting new evidence of urbanicity moderation of income's associations with behavior problems and trajectories of achievement and behavior.

Urbanicity Differences in Income Gaps in Achievement at Kindergarten Entry

The first goal of this dissertation was to replicate the findings of Miller and colleagues (2013) using kindergarten data from the ECLS-K. The same general pattern of results was obtained, but there were some differences that must be acknowledged. First, similar to Miller et al. (2013), we found some differing links between income and reading and math achievement across urbanicity. In large urban cities, small urban cities, and suburbs, the threshold at which income's association with achievement begins to weaken occurs sooner in the income distribution than in rural areas. However, this plateau came at a much higher level of family income, $90,000, than prior studies on income and urbanicity or income generally had identified (e.g., Duncan, Yeung, Brooks-Gunn, & Smith, 1998; Miller et al., 2013). The thresholds in rural areas were $140,000 for reading and linear for math, consistent with prior studies (Miller et al., 2013; Miller & Votruba-Drzal, 2014b). Second, prior findings that income gaps in kindergarten achievement are exacerbated in large urban inner-cities and, comparatively, small in rural areas were replicated. Specifically, in large urban cities, a $10,000 increase in family income (for all children in families earning less than $90,000) relates to improvements in children's achievement of .05-.06 SD. In rural areas, effects sizes are halved (.02-.03 SD). However, compared to prior work, effect sizes were much smaller within all contexts and the differences in economic disparities between urbanicity were also smaller. For instance, associations between income and achievement obtained by Miller and colleagues' (2013) ranged from a high of .15-.16 SD in large urban cities to a low of .05 SD in rural areas. Thus, effect sizes in the ECLS-K are roughly three-times smaller than those in the ECLS-B. Similarly, differences in the size of income gaps in achievement between large urban cities and rural areas shrunk in this study. The economic disparities were triple the size in large cities than in rural areas in the ECLS-B, but the difference was only double in the ECLS-K.

What explains the differences obtained in this study? First, as the ECLS-K begins following children at kindergarten, our income measure for models predicting kindergarten outcomes included family income measured at only one time point. Studies have shown that cumulative family income, as opposed to income at any one point in time, is more predictive of children's development (Blau, 1999). Accordingly, effect sizes may have been diluted by the fact that the history of children's family incomes over the course of their lifetime was unavailable. A second possible explanation for the smaller income gaps obtained in this study involves the temporality of the two studies. In the ECLS-K, children entered kindergarten in 1998. In the ECLS-B, children's kindergarten assessments were collected in 2006-2007, almost ten years later. Economic disparities in achievement have grown over the past several decades (Reardon, 2011). This may explain why income effects on academic skills in the ECLS-B are larger than those obtained using the ECLS-K data.

Urbanicity Differences in Income Gaps in Behavioral Functioning at Kindergarten Entry

The second goal of this dissertation was to examine urbanicity moderation of economic disparities in children's behavioral functioning at kindergarten entry. It was anticipated, based on prior research looking at differences in income gaps in achievement across urbanicity, that the negative association between income and behavior problems would be strongest in urban areas, and relatively weak in suburban and rural areas. This hypothesis was only partially supported. Income, which had non-linear links to behavior problems, had the strongest negative relations to externalizing problems in small cities and rural areas compared to large cities and suburbs. Specifically, for lower income families (those earning less than $60,000) living in small urban cities or rural areas, for every $10,000 increase in income, children's externalizing problems were reduced by .06 SD. On the other hand, in large cities, income increases were unrelated to

reductions in externalizing problems for children in families earning less than $60,000. The same increase related to .02 SD reduction in externalizing problems for similar suburban peers. There were no significant differences in income's relation to internalizing related to urbanicity, perhaps due to the relatively lower levels of internalizing problems present in kindergarteners in this sample.

These results raise questions regarding why patterns of urbanicity moderation of income gaps in kindergarten achievement differ from gaps in behavior. This may indicate that the mechanisms underlying economic disparities in achievement and behavior differ, and these mechanisms vary within community context. For instance, seminal work by Yeung and colleagues (2002) established that the processes underlying income's relation to achievement differed from the processes driving income gaps in behavior. Links between income and achievement were primarily mediated through families' investments in stimulating learning environments, while links between income and behavior problems were mostly explained by levels of parental stress and parenting (Yeung et al., 2002). Exacerbation of economic disparities in achievement in large urban areas and attenuation in rural areas may indeed be mediated by resources and investments. In urban areas, where enriching resources are abundant and diverse, there can be more differentiation linked to income in the frequency and quality of important investments towards children's learning, which may in part explain why income has a stronger association with achievement in more urban areas. Economic gaps in rural communities may be attenuated because, even as parental income increases, resources and experiences remain relatively limited (Gordon & Chase-Lansdale, 2001; Miller et al., 2013; Vernon-Feagans et al., 2010). If increased family income does not translate into increases in educational enrichment, we would expect economic

disparities in achievement to be smaller in rural areas, and this would be driven by differences across urbanicity in children at the upper-end of the income distribution's achievement.

As urbanicity's moderation of income's links to behavior problems followed a different pattern, with income gaps being exacerbated in small cities and rural areas compared to large cities and suburbs, it is unlikely that child investments are driving findings. Prior literature suggests that differences in associations between across urbanicity may be explained by variation in income gaps in parental distress and parenting (e.g. Yeung et al., 2002). There is some evidence that low-income families living in rural areas and small cities may be especially at risk for heightened economic and mental distress compared to more urban counterparts. In these places, there is a relative lack of social services catering to low-income populations, like food banks, job training and employment agencies, and health clinics (Allard, 2008), decreased access to public transportation (Brown, 2008; Tomer, Kneebone, Puentes, & Berube, 2011), and low-income people in rural/small town areas feel greater stigma associated with being poor than do poor people living in large cities (Rank & Hirschl, 1988). These factors may widen income gaps in parental distress and parenting in small cities and rural areas compared to the other contexts, which in turn would exacerbate economic disparities in externalizing problems in small urban cities and rural areas (Conger et al., 2002; McLoyd, 1990). This would be especially true if the stressors experienced in large urban cities (e.g. air and noise pollution) were experienced more broadly across the income distribution, which is plausible.

One interesting finding from models examining urbanicity moderation of income-behavior association is the relation between increased income and elevated externalizing problems in large urban cities. Prior work by Luthar and colleagues suggests that affluence can place children at risk for worse psychosocial development (Luthar & Becker, 2002; Luthar & Latendresse, 2005),

though these studies sampled adolescents. This study provides some evidence that higher family income can relate to elevated behavior problems in much younger children, kindergarteners in this case. This notion deserves more research attention in the future.

Urbanicity, Income, and Trajectories of Academic Growth and Behavior Problems

This study also provides new evidence regarding the role of urbanicity in predicting children's developmental trajectories. The overarching pattern we see across achievement and behavioral trajectories is that income generally has much stronger links to developmental change in rural areas and, to a lesser extent, small urban areas, and is less predictive of developmental trajectories in suburbs and large urban cities. More specifically, with respect to achievement, the role of income in predicting reading and math skill growth from kindergarten through fifth grade is almost twice the size in rural areas as compared to large inner-cities and suburban places. Income gaps in reading growth are also larger in small cities compared to suburbs. When combining these results with results from the first research aim, it suggests an interesting situation where low-income children living in large urban inner-cities may enter kindergarten academically further behind their more advantaged peers than do similarly situated rural children, but they learn relatively more over the elementary school years than do lower-income children in rural areas.

These results raise many questions regarding why economic disparities in academic growth through fifth grade appear attenuated in suburbs and large cities and exacerbated in rural places. This pattern is different than the pattern at kindergarten entry, which may imply that schools are the factor driving trajectory results. One might assume that differences in schooling quality across the urban-rural continuum explain these patterns, but it is important to note that there are not main effects of urbanicity on academic growth, suggesting that it is not the overall academic quality of schools that explain findings. Instead, it appears that it is the lower income students in large cities

and suburbs are being particularly aided by their formal schooling experiences. Perhaps the level of resources available to assist struggling students or at-risk students differs across urban, suburban, and rural communities, and this contributes to the attenuation of income gaps in academic growth in large city and suburban communities and the exacerbation of gaps in rural areas. Indeed, rural schools generally have less available per-pupil funding than do more urban school districts, and rural teachers tend to have comparatively lower levels of educational attainment and less experience, which may limit teachers' abilities to effectively foster academic growth in at-risk students (Hadderman, 1999; Monk, 2007; Reeves, 2003). Clearly, additional research is warranted to uncover the processes that explain these findings, as it could help future practitioners and researchers develop programs and policies that reduce income inequality in children's academic trajectories.

This study produced several interesting findings regarding urbanicity, income, and behavioral trajectories, adding new information to the literature on risk factors for maladaptive behavioral trajectories. First, and quite notably, this study replicated prior findings of distinct trajectories of children's internalizing and externalizing behavior problems in a nationally representative cohort of U.S. children, which to the author's knowledge is a novelty. This study found four distinct internalizing trajectories and five externalizing trajectories. The trajectory groups were similar, but not identical, to those identified in several prior studies using different samples (e.g. Campbell et al., 2006; Feng et al., 2008; Nagin & Tremblay, 1999; Serba et al., 2007; Shaw et al., 2003). Interestingly, when trajectory groups differed from prior studies, the ECLS-K included an additional trajectory group—a mid-increasing group. This could be due to various different factors, including the large size (almost 11,000 children) or nationally representative

nature of the sample, the particular behavioral constructs measured, and the way they were measured.

Next, urbanicity, which has not been studied as a predictor of behavior trajectories, has some direct links to behavior and moderates income's associations with behavior from kindergarten through fifth grade. Living in a large urban city, holding all else constant, is related to better trajectories of internalizing problems across the elementary school years. Large urban city residence decreases the risks of being in a higher risk internalizing trajectory group (as opposed to the low-stable group) by as much as five-fold. This protective main effect of large urban residence is significantly greater than that in every other urbanicity, with few exceptions. Living in a rural area had negative relations to behavioral functioning. In addition to its links with membership in more risky internalizing groups explained above, rural residence also predicted a two- to three-fold increased likelihood of falling into a higher risk externalizing group compared to living in a large urban city or suburb. Urbanicity also moderated the relation between income and behavioral trajectories. To summarize, with some exceptions, income gaps in trajectories of behavior tended to be largest in rural areas and small urban areas and smallest in large urban cities and suburbs. Stated differently, income was more predictive of decreased risk of membership in a more maladaptive trajectory group for lower income children (those with family incomes of less than $60,000) living in rural areas or small cities.

This general pattern is the same pattern observed for both economic disparities in kindergarten behavior and economic disparities in academic growth. While much more research is necessary to understand the processes that drive the moderation of income effects on behavior trajectories by urbanicity, perhaps some implications may be made by comparing the findings of this study. While links between urbanicity, family income, and academic skills changed once

children entered elementary school, the same pattern of income attenuation in large cities and suburbs repeated when examining moderation of links between income and behavior problems in kindergarten and between income trajectories of behavior problems through fifth grade. Thus, while formal schooling plays an important role in fostering academic growth and remediating any academic skills gaps that children may bring to kindergarten, children's family and home context may continue to be the driving factor in shaping their behavioral functioning. Indeed, it may not be surprising that schools would play a much larger role in shaping growth in children's academic skills as opposed to their behavioral trajectories. Alternatively, perhaps the mechanism explaining the attenuation of trajectories of achievement and behavior in large cities and suburbs and exacerbation in small cities and rural areas is the same, but these processes differ in early childhood and middle childhood—producing different patterns of urbanicity moderation at kindergarten and across elementary school. Additional studies should attempt to identify these mechanisms and use that information to develop programs and policies aimed at reducing income inequality in children's development across the United States.

3.0 URBANICITY AND LOW-INCOME CHILDREN'S DEVELOPMENT: DO COMMUNITY CHARACTERITICS EXPLAIN DIFFERENCES?

3.1 RESEARCH AIMS AND HYPOTHESES

As detailed in the introduction, unique characteristics of urban, suburban, and rural communities may moderate links between economic disadvantage and early academic and behavioral functioning. And while some research on differences in within-urbanicity income gaps across urban, suburban, and rural areas exist, little is known regarding how low-income urban, suburban, and rural children fare in comparison to each other. Even less clear are the processes by which urbanicity moderates links between economic disadvantage and development. Using a sample of low-income families with toddlers living in urban, suburban, and rural areas, study 2 aims to examine differences in low-income children's early academic and behavioral functioning across urbanicity and the aspects of their community contexts that explain those differences.

3.1.1 Aim 1

The first research aim is to determine whether there are differences in low-income children's age-5 academic skills and behavior problems across large urban cities, small urban cities, suburbs and rural areas. Based on the relatively high levels of environmental stress and concentrated poverty and socioeconomic segregation in inner-cities, it is hypothesized that low-income children living

in large and small urban cities will possess less well-developed academic skills and higher levels of problem behavior at age 5 compared to suburban and rural peers.

3.1.2 Aim 2

Secondly, it examines whether contextual characteristics, specifically community resources (educational activities, public transportation, and social service providers), family (financial strain and social support) and environmental stress (neighborhood danger and pollution), and community culture (community-level disadvantage and socioeconomic integration), differ across the urban, suburban and rural communities in which low-income families reside. It is hypothesized that resources will be most available in large and small urban cities, and decrease as urbanicity decreases. Financial stress is anticipated to be greater in rural areas and suburbs and lower in urban areas since suburbs and rural areas offer decreased access to social services. Social support is expected to be lower in suburbs than in urban or rural areas based on research showing that low-income suburban families often feel isolated from their support networks. On the other hand, environmental stress, both neighborhood violence and air pollution, is expected to be greatest in urban areas as well, and relatively lower in suburbs and rural areas. Lastly, concentrated disadvantage is hypothesized to be worse in large and small urban cities compared to suburbs and rural areas, and worse in rural areas than suburbs. Socioeconomic integration is expected to be greatest in suburbs, followed by rural areas and then urban cities.

3.1.3 Aim 3

Lastly, this study explores whether variation in resources, family and environmental stress, and neighborhood disadvantage and socioeconomic integration across the urban-rural continuum explain urbanicity-related differences in early functioning. It is expected that community resources, family and environmental stress, and community disadvantage and socioeconomic integration will mediate urbanicity-related differences in age 5 functioning both directly and through their relations with parental distress and parenting (see Figure 4).

3.2 METHOD

3.2.1 Participants

Data for this study were drawn from the Early Steps Multisite Study (ESMS), a large multisite study designed to examine the effectiveness of an intervention for children at risk for conduct problems (Dishion et al., 2008). Participants included over 700 primary caregiver-child dyads recruited in 2002-2003 from Women, Infants, and Children (WIC) Nutritional Supplement Centers in the metropolitan areas of Pittsburgh, Pennsylvania, Eugene, Oregon, and Charlottesville, Virginia. Families were contacted at WIC sites and invited to participate if they had a son or daughter between age 2 years 0 month and 2 years 11 months, following a screen to ensure that they met the study risk criteria (Dishion et al., 2008). Risk criteria for recruitment were defined as ranking 1 SD above normative averages in three domains: (a) child behavior problems (conduct

problems and high-conflict relationships with adults); (b) family problems (maternal depression, daily parenting challenges, substance-use problems, and teen parent status); and (c) socioeconomic risk (low parental education and low family income). Two or more of the three risk domains were required for inclusion in the sample. Children who met the family problems and socioeconomic risk criterion (but not the child conduct problems criterion) only qualified for inclusion in the study if they had at least above-average behavior problem scores (Dishion et al., 2008).

Of the 879 families who had 2 year-old children that met the eligibility requirements, 731 agreed to participate. The children in the sample had a mean age of 29.9 months at the time of the age 2 assessment. Of the 731 families (49 % female), 37% were recruited in Pittsburgh, 37% in Eugene, and 26% in Charlottesville. The sample is racially/ethnically diverse, with primary caregivers self-identifying as belonging to the following racial/ethnic groups: 28% African American, 50% European American, 13 % multiracial, and 9% other groups (e.g., American Indian, Native Hawaiian). Thirteen percent of the sample reported being Hispanic. Participants also varied in terms of urbanicity, with 22% residing in large urban city cores, 33% in small urban city cores, 22% in suburbs, and 23% in rural areas when children were 2. At recruitment, nearly 90% of families had annual incomes of less than $35,000, and the average annual income was about $20,000. Only 3% of the sample reported earning over $50,000 annually across the waves of data collection. Accordingly, the ESMS is a high-risk, predominately low-income sample. Of the 731 families who initially participated, 659 (90 %) were available at the age-3 follow-up, 619 (85 %) participated at the age-4 follow-up, and 621 (85 %) participated at the age-5 follow-up. Selective attrition analyses comparing participants retained versus those who dropped out of the sample on the key variables included in analyses revealed few significant differences between groups.

3.2.2 Procedure

The ESMS is currently ongoing; this uses data collected from the first four waves of data collection when the target child was 2, 3, 4, and 5 years old. Observational and parent report data were collected during home visits at each wave. Parent data were collected from primary caregivers and, if available, alternative caregivers. The overwhelming majority of primary caregivers were mothers, and the term "mothers" and "parents" will be used interchangeably with primary caregivers. Additionally, all parent-report measures used in this study are those reported by primary caregivers only.

Home visits involved structured and unstructured play activities for the target child with mothers and, if applicable, alternative caregivers. Assessments began by introducing children to several age-appropriate toys and having them play for 15 min while mothers completed questionnaires. After the free play, mother and child participated in a cleanup task (5 min), followed by a delay of gratification task (5 min), four teaching tasks (3 min each), a second free play (4 min), a second cleanup task (4 min), the presentation of two inhibition inducing toys (2 min each), and a meal preparation and lunch task (20 min). Home visit protocols were comparable in terms of content, structure, and length at ages 2, 3, 4, and 5.

3.2.3 Measures

Child Outcomes (Age 5)

Academic skills. Children's early academic skills were directly assessed using the Academic Skills Cluster of the Woodcock-Johnson Tests of Achievement III (WJ-III), which consists of an

aggregate, age-standardized composite of the Letter-Word Identification (76 items), Calculation (45 items), and Spelling (59 items) subtests (McGrew & Woodcock, 2001). WJ-III administration rules require the discontinuation of testing after 6 consecutive missed question. The Letter-Word and Spelling tests evaluated letter and written word identification abilities, writing abilities, and spelling skills. Questions on the Calculation test required children to write numbers and perform relatively simple mathematical procedures like addition and subtraction. It uses a standard score scale based on a mean of 100 and standard deviation of 15 and has a median reliability of .95.

Behavioral problems. The ESMS assessed behavior problems with two instruments, the Child Behavior Checklist and the Eyberg Child Behavior Inventory. Mothers completed the Child Behavior Checklist for Ages 6-18 (CBCL; Achenbach & Rescorla, 2001) during the age-5 home visit. The CBCL is a 112-item questionnaire that assesses behavioral functioning in children. Each item is answered on a three-point scale: *not true*, *sometimes/somewhat true, very/often true*. The CBCL includes questions assessing children's internalizing behaviors, like being anxious, withdrawn, and sad. It also taps externalizing problems, such as rule-breaking and aggressive behaviors as well as attentional abilities. Second, child conduct problems were assessed using the Eyberg Child Behavior Inventory (ECBI; Robinson, Eyberg, & Ross, 1980). The ECBI is a parent-report 36-item inventory of child conduct problem behaviors. It assesses caregivers' perceptions of the intensity of specific problem behaviors (e.g., "refuses to obey until threatened," "gets angry when doesn't get his/her own way") using a seven-point scale ("1" = *never*, "7" = *always*). The current study analyzes two measures of behavior problems: a measure of internalizing using the internalizing scale of the CBCL (32 items; $\alpha = .80$) and a measure of externalizing created by compositing items from the CBCL and ECBI (55 items; $\alpha = .95$).

Urbanicity

The ESMS collected children's addresses at each wave of data collection. Urbanicity was coded at each wave by applying RUCA codes and central city boundaries to children's census tract of residence, as described in Chapter 2. Children were assigned an urbanicity based on the urbanicity in which they resided the majority of age 2, 3, 4, and 5 waves. Of the 731 families originally participating in the ESMS, only 5% did not reside in a single urbanicity for the majority of waves. These children were classified as living in the urbanicity in which they resided most recently.

Community Resources

A measure of community resources was created using geocoded data. Data from the U.S. Economic Census, which provides yearly counts of several types of businesses and establishments in every U.S. zip code, and the Public Library Geographic Database, which contains addresses of public libraries nationally, were used to calculate the availability of three important community resources: educational resources (e.g. museums, zoos, libraries) code; public transportation; and social service providers (e.g. food banks, low-income housing services, community and youth centers, parenting support programs). Next, Geographic Information Systems (GIS) software was utilized to aggregate the availability of resources across children's communities. Specifically, at each wave of data collection the number of resources within specific radii of children's home zip code were summed.

As little prior research has empirically tested the appropriate geographic area for measuring resource availability, measures were created at several different radii (beginning with 20-miles based on Miller and colleagues (2014) prior work). Then, measures of community characteristics were correlated with corroborative measures from outside data sources (U.S. Census data and

ECLS data) to determine the geographic area that best encapsulated that community characteristic. For instance, with respect to resources, measures of the number of libraries within various radii of children's home zip codes were correlated with parental reports of frequency of family trips to the library. Starting with the 20-mile mile radius, additional measures with smaller and larger radii were created and tested until the geographic area with the highest correlation to reports of resource use was identified. This process was used for all community measures created with GIS. Also, measures of resource availability adjusting for population concentration in that area were also correlated with resource use to determine whether population-normed availability measures were better predictors of certain resources. These analyses revealed that, with respect to educational resources and social services, the number of establishments within a 15-mile radius of children's homes was most predictive of families' use of these resources. For public transportation, the number of public transit employees divided by the number of residents within a 20-mile radius of a zip code was most predictive of residents' public transit use. Accordingly, after taking the natural log of these measures to adjust for non-normality, measures of educational resources within a 15-miles radius of children's home zip code, social services within a 15-miles radius of children's home zip code, and public transportation availability within 20-miles of children's home zip codes were averaged across the age-2 through age-4 waves. Measures of the availability of educational resources, social services, and transportation were highly intercorrelated ($r = .80$-$.97$). Due to collinearity problems, a composite measure that averaged standardized values of the three resources ($\alpha = .73$) was used in analyses.

Stress

Family and environmental stressors were assessed with data from the ESMS and secondary data from the U.S. Environmental Protection Agency (EPA). To assess family stress, two ESMS

measures were utilized. First, at each wave mothers were given the Financial Stress Questionnaire (Conduct Problems Prevention Research Group, 1994), a self-report measure designed to assess household spending and adequacy of funds. Items were rated on a five point scale, and a composite measure of financial stress was created by averaging all items (9 items; α = .59-.63). Second, mothers reported on perceived social support at each wave with the General Life Satisfaction instrument (GLS; Crnic, Greenberg, Rogozin, Robinson, & Basham, 1983). The GLS is a self-report measure assessing availability of and satisfaction with support resources in three domains: intimate relationships, friendships, and community support. A composite measure of social support was created by summing scores on five items asking about respondents' satisfaction with support from various sources.

Stress from the physical environment was assessed with two variables. First, the ESMS contains a parent-report measure of neighborhood danger obtained using the Me and My Neighborhood Questionnaire (MMNQ; Pitt Mother and Child Project, 2001). The MMNQ assesses, among other things, perceptions of neighborhood violence and disorder (e.g. "family member was robbed or mugged [in my neighborhood]," "people in my neighborhood complain of being hassled by the police"). Fifteen items (rated on a 4-point scale) were summed to create a neighborhood dangerousness composite measure, which showed high internal reliability across waves (α = .86-.88). Second, environmental pollution was measured with geocoded data from the Toxic Release Inventory (TRI) created by the EPA. The TRI program tracks the management of certain toxic chemicals that may pose a threat to human health and the environment. U.S. facilities in different industry sectors must report annually how much of each chemical is released to the environment and/or managed through recycling, energy recovery, and treatment. TRI contains the information on the quantities, types, and release pathways (air, water, off-site, etc.) of toxic

chemicals released by reporting facilities, as well as the addresses of those facilities. The number of pounds of developmentally hazardous chemicals (identified using a list of chemicals generated by the EPA) released on-site via air, ground, or water were summed within zip code. Pollution was aggregated using the GIS procedure discussed above, but smaller geographic areas were used based on the public health literature, which finds that more proximal measures of pollution are most predictive of human health and development (e.g. Wilhelm et al., 2008). Environmental pollution within a 5-mile radius best predicted child outcomes. All four measures of stress (financial strain, social support, neighborhood danger, and pollution) were averaged across the age-2 through age-4 waves and analyzed separately because they were not highly intercorrelated (r = -.30-.15).

Culture

Cultural theories of poverty hypothesize that structural/economic factors like neighborhood disadvantage and isolation of the poor negatively influence community norms and behavior (e.g. Wilson, 1984; Massey, 1990). Thus, measures of community-level disadvantage and socioeconomic integration were created using data from the U.S. Decennial Census and American Community Survey. A composite measure of community-level disadvantage incorporating community poverty rate, percentage of residents receiving public assistance, adult unemployment rate, percentage of residents without a high school degree, and percentage of female-headed households was created using GIS as described above (Sampson, Raudenbush, & Earls, 1997). Likewise, a measure of socioeconomic advantage at the community-level, which may reflect positive role models and socialization processes, was generated by aggregating measures of the percentage of residents with college degrees, percentage of residents with professional/managerial jobs, the median income, and percentage of upper-income residents

(incomes greater than $100,000 in 2000 dollars). A 2-mile radius was determined to be most appropriate level of aggregation for the community culture characteristics. These measures showed high internal reliability (α = .92 for neighborhood disadvantage and α = .95 for neighborhood advantage). As with the other community measures, culture variables were averaged over the age-2 through age-4 waves.

Parental Distress

Maternal depression was measured at each wave in the ESMS with the Center for Epidemiological Studies-Depression Scale (CES-D; Radloff, 1977), a well-established and widely used assessment of depressive symptomatology. Mothers reported how frequently they experienced a list of depressive symptoms in the past week on a scale ranging from 0 (less than a day) to 3 (5–7 days). Items were summed to create an overall depressive symptoms score (20 items; α = .74-.77). Also at each home visit, parenting stress was assessed using a self-report instrument (Crnic & Greenberg, 1990) asking mothers to report the frequency with which she experienced various parenting hassles (e.g. nagging, difficult kids) and to what extent these events were stressful. This study uses the "extent of hassle" items, which were rated on a 5-point scale (*no hassle* to *big hassle*; 20 items; α = .86-.89). Lastly, at the age-3 and age-4 home visit, the ESMS assessed mothers' feelings of being discriminated against on the basis of race or SES with an 18-item self-report instrument. Mothers rated whether they had experienced feelings like stereotyping or marginalization on a 5-point scale (race: 9 items, α = .87-.88; income: 9 items, α = .88-.89). Scores on the race and income discrimination scales were averaged to create a composite measure of perceived discrimination. Parenting distress measures were averaged across available waves and examined separately in models.

Parenting

Direct measures of parenting include several items from the Infant/Toddler Home Observation for Measurement of the Environment at ages 2 and 3 and the Early Childhood Home Observation for Measurement of the Environment at age 4 (IT-HOME and EC-HOME, respectively; Caldwell & Bradley, 2003) and ratings of family interactions created using the Relationship Process Code (RPC; Jabson, Dishion, Gardner, & Burton, 2004), a derivative of the Family Process Code (Dishion, Gardner, Patterson, Reid, & Thibodeaux, 1983). Maternal nurturance, responsivity, harshness, and stimulation were assessed with observer-report items from the IT-HOME (21 items; α = .46-.54) and EC-HOME (21 items; α = .60). Parenting quality was also assessed during the observational protocol described in the procedure section using the RPC (κ = .86). After coding each interaction, coders completed an impressions inventory regarding several aspects of the interaction, including instances of coercive, harsh, or detached parenting. These direct measures of parenting were factor analyzed to create a composite observational measure of negative parenting (13 items; α = .66-.71).

Parental discipline was assessed using the O'Leary Parenting scale, a 30-item self-report measure assessing dysfunctional discipline techniques (Arnold, O'Leary, Wolff, & Acker, 1993). Items ask mothers to rate the parenting response typical of their style of parenting (e.g. "when there's a problem with my child. . ." "things build up and I do things I don't mean to" or "things don't get out of hand") on a 1 to 7 scale, with 7 being the most dysfunctional response. From these items, three factors of dysfunctional discipline have been identified: laxness; over-reactivity, and verbosity (Arnold et al., 1993). For this study, the over-reactivity factor was utilized to capture parents' tendencies to reactive and harsh discipline (6 items; α = .65-.68).

Demographic Covariates

During each home visit, mothers completed demographic questionnaires. As in Study 1, a limited set of demographic variables were used as covariates to reduce selection bias. These controls include child age, gender, and minority status, annual family income, maternal education, number of children in home, and an indicator for whether the mother was stably married across the age-2 through age-4 waves. Minority status was represented with a dummy variable indicating whether the child is any non-White race (including children of Hispanic ethnicity regardless of reported race). Annual income was assessed categorically but transformed into a continuous variable by taking the midpoint value of each range. Values were adjusted for inflation using the CPI such that all values represent 2010 dollars. Maternal education was measured continuously. Family income, highest level of maternal education, and number of children in the home were averaged across ages 2 through 4. Also, an indicator for whether child was in the treatment group was included as a covariate.

3.3 DATA ANALYSIS

To test the hypothesis of urbanicity-related differences in the academic and behavioral skills of low-income children at age 5, we predicted child outcomes with urbanicity, controlling for demographic covariates, using structural equation modeling (SEM). SEM models were run in Mplus Version 6 software (Múthen & Múthen, 2008) using maximum likelihood estimation, which handles missing data in an optimal fashion, minimizing bias and increasing statistical power (Allison, 2003). Academic and behavioral functioning were estimated in two separate models

because the achievement measure was not significantly correlated with the behavioral outcomes. The models predicting behavior problems analyzed internalizing and externalizing separately but in the same model, and the covariance between internalizing and externalizing was freely estimated. Next, we tested urbanicity-related differences in community characteristics is a similar manner. A multilevel SEM model was used to predict the hypothesized community mediating characteristics with urbanicity, controlling for demographic covariates. All community mediators were estimated in a single model, and the covariance among community characteristics was freely estimated. To account for nesting of children within communities, cluster adjustments were made at the zip code level for analyses examining differences in child outcomes and community characteristics (Curran, 2004; Muthén, 1994).

To examine whether observed urbanicity-related differences in academic and behavioral functioning at age 5 are explained by variation in resources, stress, and culture across the urban-rural continuum, we utilized multilevel SEM techniques (Curran, 2004; Muthén, 1994). In a single model, children's academic skills were modeled as a function of urbanicity, which operates through the mediating variables that differed across urbanicity in the prior analyses. These mediators, in turn, predict parental distress and parenting measures, which predict achievement. The impact of urbanicity on children's internalizing and externalizing was modeled similarly in another model. Also, correlations between the proposed mediators, parental distress measures, and behavioral measures were freely estimated, but, if not significant, relations were constrained to zero in final models. Cluster adjustments were again made at the zip code level to address the nesting of children within communities.

While the conceptual models hypothesized full multi-path mediation (i.e. effects of urbanicity on achievement and behavior were not direct, but filtered through resources, stress, and

culture, which had direct effects on achievement and behavior and/or operated through parenting distress and parenting), initial model specification freely estimated all paths from urbanicity to community variables, parental distress, parenting, and child outcomes. Similarly, paths from community variables to parental distress, parenting, and child outcomes were estimated, as were direct paths from parental distress to child outcomes. The overall model fit of each model was assessed using standard goodness of fit indexes. Specifically, chi-square values were examined, with non-significant values signifying good fit. In addition, the Root Mean Square Error of Approximation (RMSEA), which is a measure of relative fit better suited for the current analyses with a sample size of more than several hundred, Comparative Fit Index (CFI), and the Tucker-Lewis Index (TLI) were also used to judge model fit. RMSEA values below .06 and CFI and TLI values above .95 support good model fit (Hu & Bentler, 1999). Then, non-significant paths were eliminated from the models (with the exception of urbanicity dummy variables, in which case if one or more dummy was significant, all dummies were included), provided that they did not significantly worsen model fit. Once the most parsimonious model was established, product of coefficients calculations were used to test whether community characteristics acted as mediators of links between urbanicity and child development (MacKinnon et al., 1998; Sobel, 1982). Control variables were included in these mediation SEM path models, but removed if non-significant.

3.4 RESULTS

Table 8 presents descriptive statistics on analysis variables for the full sample and for each urbanicity separately. There are several mean differences across urbanicities. With respect to

child outcomes, children living in large urban cores have fewer academic skills than suburban and rural children. They also exhibited more internalizing and externalizing problems than peers in all other contexts. Parenting also differs, with parents in large urban areas exhibiting the harshest discipline techniques and the most negative parenting. There were few notable differences in parental distress. Parents in large urban cores, however, did report experiencing more daily hassles than parents in small cities and rural areas. There were also mean differences in sociodemographic characteristics. Chiefly, children in large urban cores were, on average, the most disadvantaged in terms of family income and maternal marriage rates, but had higher than average parental education levels.

3.4.1 Aim 1: Differences in Low-Income Children's Achievement and Behavior Across Urbanicity

The first aim of this paper was to estimate differences in economically disadvantaged children's achievement and behavior across the urban-rural continuum (Table 9). Controlling for a host of child and family characteristics, there remained some differences in children's functioning related to urbanicity. Children living in rural areas had .27 SD higher levels of achievement than children in large urban (trend) and small urban cities. Disadvantaged children living in large urban city cores had elevated behavior problems. Specifically, children in large urban cities exhibited more internalizing behaviors when compared to children in all other urbanicities and more externalizing behaviors than peers in rural and small urban areas. Moreover, these disparities were sizable. Children in large urban cities showed elevations in internalizing behaviors of 1/3 SD compared to peers in all other urbanicities. With respect to externalizing problems, children in large urban

cities exhibited more problems than children in small cities and rural places (.35 SD and .36 SD, respectively).

3.4.2 Aim 2: Differences in Community Characteristics Across Urbanicity

The second goal was to explore differences in community characteristics related to urbanicity. Results, presented in Table 10, show important differences in these hypothesized mediators across urbanicity. As predicted, large urban communities had much greater availability of resources compared to all other places, with differences ranging from a high of 2.07 SD compared to rural areas to a low of 1.12 compared to suburbs. There were also differences among small cities, suburbs, and rural areas. Resource availability in suburbs was greater than in small cities (.68 SD) and rural areas (.95 SD). Next, indicators of environmental and family stress differed by urbanicity, though not always in consistent ways. Danger was much higher in large urban inner-cities compared to all other contexts (.67-1.14 SD), but financial stress was .26-.28 SD lower. With respect to community pollution, large cities fell in the middle. They had less pollution than small cities (.85 SD) and suburbs (.42 SD; trend) but .24 SD more than rural areas. In terms of the stress mediators examined in this study, aside from financial stress, rural areas appeared to be the least stressful to live in; on average they were rated less dangerous (.25-.47 SD) and were less polluted (.66-1.09 SD) than large cities, small cities and suburbs. Only one community characteristic, social support, did not vary across urbanicity.

3.4.3 Aim 3: Mediation of Urbanicity-Related Differences in Achievement and Behavior Through Community Characteristics

Next, hypotheses regarding mediation of differences in the early development of disadvantaged children residing across the urban-rural continuum were tested in two separate SEM path models (one for achievement and one for behavior). These models are discussed in the two sections below, organized by child outcome. For parsimony, only those paths through which significant urbanicity mediation occurs are presented.

Achievement. Figure 5 presents the final model testing urbanicity-mediation of differences in academic skills, with arrows representing significant paths. As stated in the data analysis section, paths were included from urbanicity to all resource, parental distress, parenting, and achievement variables. Paths were included from resources to all parental distress, parenting, and achievement variables. Lastly, paths from the parenting distress variables to parenting and achievement and paths from parenting to achievement were estimated. Non-significant paths were eliminated from the model. This model trimming did not negatively affect fit. The final model demonstrated very good model fit, with a non-significant chi-square value ($\chi 2(53) = 57.50$), RMSEA = .01, CFI = .99, and TLI = .99.

Standardized path coefficients for all paths in the final achievement model are presented in Table 11. Only one parenting measure, negative parenting, predicted achievement. Increased negative parenting was related to decreases in achievement of .12 SD. In addition, there were direct negative effects of neighborhood pollution on children's academic development (.12 SD). Several community characteristics were linked to achievement through negative parenting. More dangerous neighborhoods were related to worse parenting (.11 SD). Pollution predicted negative

parenting, but in a peculiar direction—increased pollution was related to .13 SD less negative parenting. Community resources and family financial stress were linked to negative parenting, and hence achievement, via parents' perceptions of their daily hassles. Greater financial strain was related to a .27 SD increase in perceived daily hassles, while greater resource availability curiously predicted more hassles as well (.17 SD). Hassles, in turn, increased parents' negative parenting (.14 SD). Lastly, there were direct links between urbanicity and negative parenting, with rural, suburban, and small urban parents all exhibiting lower levels of negative parenting than parents in large inner-cities (rural=.34 SD; suburb=.26 SD; small urban=.25 SD, trend).

There was significant mediation of differences in early achievement across urbanicity. About .10 SD, or 37%, of the academic advantage that disadvantaged children living in rural area have compared to peers in large urban cities was mediated. The largest portion of the difference was explained by relatively less pollution in rural areas and less negative parenting exhibited by rural parents. Similarly, .14 SD or 56% of rural children's academic advantage over children in small cities could be explained by our mediation model, and the mediation was almost entirely driven by decreased pollution in rural communities compared to small cities.

Behavior problems. Figure 6 depicts the final model testing urbanicity-mediation of differences in internalizing and externalizing problems. As with achievement, the final model fit the data very well ($\chi 2(136) = 141.20$, RMSEA = .01, CFI = 1.00, TLI = 1.00). Standardized path coefficients for the final behavior model are presented in Table 12. Both parenting and parental distress was related to behavior problems. With respect to internalizing, the use of over-reactive discipline techniques by parents predicted increased internalizing problems (.14 SD). Similarly, parents' depressive symptoms and feelings of being discriminated against were linked to higher levels of internalizing (.26 SD for depression and .15 for discrimination). Looking at externalizing,

increases in both over-reactive discipline (.14 SD) and negative parenting (.13 SD) were related to higher levels of externalizing problems in children. All three parental distress variables were positively related to children's externalizing, with parents' daily hassles having the largest association (.33 SD), followed by depression (.15 SD) and perceived discrimination (.11 SD). Community characteristics were, as hypothesized, related to parental distress and parenting. Increased neighborhood danger and family financial stress predicted higher levels of parental depression and perceived discrimination (danger=.21-.26 SD and financial strain=.30-.31 SD). In addition, all community characteristics except pollution were linked to parents' hassles, though not always in hypothesized direction. Increased neighborhood danger and financial stress were associated with more reported hassles (.14 SD and .25 SD, respectively), but resource availability also predicted more hassles (.16 SD). Community-level socioeconomic advantage and, unexpectedly, disadvantage were related to decreases in parents' daily hassles (.11 SD and .16 SD, respectively). Community characteristics were also related to parenting, both directly, with danger and pollution predicting less negative parenting, and indirectly through hassles. Lastly, as in the achievement model, direct links between urbanicity and parenting were identified. Rural, suburban, and small urban parents displayed less negative parenting than parents in large inner-cities, and parents in small urban cities used less over-reactive discipline than parents in all other settings.

Urbanicity-related differences in behavior problems were partly explained by community factors. In terms of internalizing problems, roughly 50% of the observed gap between children in large urban cities compared to peers in rural areas and small urban cities was mediated. This mediation was predominately driven by the fact that disadvantaged rural and small urban children lived in communities that were less dangerous than large urban cities. Interestingly, mediation

was partially offset by the increased financial stress felt in rural and small urban homes compared to large urban homes, which was linked to greater levels of internalizing. Lower levels of externalizing displayed by disadvantaged suburban children relative to children in large urban cities was also explained by the same processes as above, though it explained less of the gap (.09 SD). Turning to externalizing problems, .22 SD or 61% of the lower levels of externalizing behaviors exhibited by rural children in comparison to children in large cities was mediated. This mediation was driven by decreased neighborhood danger and less negative parenting, but also by less resource availability, in rural areas. An even larger portion of the difference between children in small cities and large cities was explained by our model (.26 SD or 74% of the gap), whereby children in small cities had fewer externalizing problems. In addition to living in safer neighborhoods and experiencing less negative parenting, lower levels of over-reactive discipline faced by children in small cities also helped to explain their decreased externalizing problems compared to peers in large cities.

3.5 DISCUSSION

Looking within a sample of over 700 disadvantaged children and families living in urban, suburban, and rural communities, results show that low-income children residing in large urban inner-cities may be at increased risk for internalizing and externalizing compared to similar situated children living in small cities, suburbs, and rural areas. These disparities were moderate in size, with inner-city children exhibiting 1/3 SD elevations in both internalizing and externalizing behaviors compared to peers other locations. There was also a pattern of increased academic

achievement among disadvantaged rural children. To the author's knowledge, this is one of the only studies that has found differences in low-income children's development related to urbanicity. Moreover, the achievement findings replicate patterns observed in a recent investigation using nationally representative data on recent cohort of low-income kindergarteners (Votruba-Drzal & Miller, 2014).

The communities in which low-income families live systematically differ across the urban-rural continuum

A second goal of this study was to identify whether important characteristics of large urban, small urban, suburban, and rural communities varied. Several differences in community characteristics related to urbanicity were identified. Resource availability was highest in large urban cities, followed by suburbs and small cities, with rural areas have the least access to important resources. This is consistent with suggestions from prior research (e.g. Vernon-Feagans, Gallagher, & Kainz, 2008), but notably this is one of the few studies to empirically demonstrate this pattern. With respect to stress, results are mixed. Large urban inner-cities, for instance, are the most dangerous on average, but they tend to have fewer toxic releases and families feel less financial strain than most other urbanicities. Financial stress was lower in large cities compared to all other places. Prior research has documented that, compared to large cities, social services aimed at alleviating economic hardship are much less available in suburbs, small towns, and rural areas (Allard, 2004; 2008; Murphy & Wallace, 2010). The relative lack of social services may explain why small urban, suburban, and rural families experienced more financial stress than families in large cities. Compared to all other areas, the rural areas in which ESMS families resided were generally experienced decreased stressors, with low levels of danger and pollution. Interestingly, despite literature indicating that urban cities and rural areas are at the greatest risk for exposure to

environmental pollutants (e.g. Evans, 2004), this study found that toxic releases were greatest in the suburban and small urban communities in which ESMS families lived. Importantly, this measure only captures on-site toxic releases by industries. It does not include things like chemical releases off-site, pollution arising as a result of most farming operations, and automobile emissions, which could artificially reduce large urban and rural pollution in this study's measure of pollution. Lastly, this study's findings of high levels of concentrated disadvantage and isolation of the poor in inner-city urban areas echo the work of urban sociologists (Massey, 1996; Wilson, 1987). As hypothesized, low-income families residing in suburbs were not as geographically concentrated and were less isolated from more advantaged neighbors than their counterparts in large urban cities. Remarkably, rural areas, whose struggles with concentrated poverty have been well-studied by rural sociologists (e.g. Lichter & Johnson, 2007), had *lower* levels of neighborhood disadvantage than did both large and small urban areas. Moreover, disadvantaged rural families were not more proximal to socioeconomic advantage than low-income families in more urban areas despite contrary hypotheses (e.g. Evans & Kutcher, 2011), and in fact, their neighborhoods had lower levels of advantage compared to every other area except large urban cities. This highlights the importance of conducting comparative research looking at the context of poverty across different geographic areas. It is critical to note that, as discussed in limitations, these finding of decreased disadvantage and advantage in rural areas may be driven by the particular sample utilized in this study.

Differences in community characteristics help explain variation in child outcomes related to urbanicity

The final goal of this study was to determine whether variation in community characteristics mediated links between urbanicity and child development. Indeed, a significant portion of the

observed gaps in achievement and behavior problems were explained by community factors. Rural children had higher achievement than peers in large and small cities, and this was due in part to low levels of danger and less pollution in rural neighborhoods. Compared to achievement, community factors were stronger mediators of urbanicity-related gaps in behavior (roughly 50%-75%). Disadvantage children living in large urban cities generally had the highest levels of behavior problems partly because they lived in the most dangerous neighborhoods, with the highest levels of resource availability (which operated contrary to what was hypothesized), and parents in large cities tended to display harsher parenting. Results also uncovered evidence of suppression; children in large urban cities often looked worse than peers in other contexts in terms of achievement and behavior *despite* living in homes with less financial stress than small urban, suburban, and rural homes.

Several of the community characteristics tested as mediators in this study did not operate to predict child and family functioning in the hypothesized fashion. For instance, greater resource availability was linked to worse parental distress, while increased disadvantage and pollution predicted less distress and less negative parenting, respectively. The failure of these measures to predict as expected may be due to limited variability in the communities that comprised the urbanicity groups. ESMS included three sites. Accordingly, there were few communities in each urbanicity category. For instance, the large urban city group included only children living in the city of Pittsburgh. As such, the reason that, as an example, increased resource availability predicts higher rated of parental distress may be solely because parents in Pittsburgh, the place with the highest resource availability in this study, are more distressed for reasons unrelated to resources. It should also be mentioned that ESMS is a sample of especially high-risk families (i.e. families with some combination of risk factors, including low-socioeconomic status, parental mental health

problems, or child behavior problems). Compared to a broader sample of low-income families, there may be less variability among ESMS participants in factors like parental distress and parenting practices related to the cluster of risk factors faced by these families. Alternatively, resource availability, the measure used in this study, may not be the way to operationalize resources. Instead, perhaps looking at measures of resource quality or resource accessibility that included parental reports of barriers to accessing available resources would have better predicted child outcomes.

A final lesson garnered from this study is that the study of how "place" affects families and children is extremely complex. There are several community factors that relate to both children's and parents' well-being. These community characteristics are often related, like for instance pollution and neighborhood socioeconomic advantage or danger and concentrated disadvantage. Thus, studies examining one of these community factors without looking at related others may obtain biased estimates of the associations between the community factor and outcomes. Secondly, because many of the community factors operate in opposite fashion, it is important to examine numerous aspects of neighborhood or community before making assumptions regarding whether place matters. For example, researchers looking at differences in outcomes across different neighborhoods or communities may deduce that there are associations when looking at mean differences. Instead, there may be several aspects of place that are affecting outcomes in opposite ways. It is critical to understand these individual factors to understand the constellation of community factors that are most beneficial or most detrimental to human development.

Limitations

There are several limitations to the current study. First, these are observational data. Thus, results are correlational and must be interpreted with caution. Families self-select neighborhoods, and

factors driving their selections may be related to other parental characteristics, including parental mental health and stress, which also shape the proximal contexts in which their children develop. Accordingly, while covariates were included in all models in an attempt to reduce omitted variable bias, it is possible that the observed associations between urbanicity, community characteristics, parental distress, parenting, and early achievement and behavior are caused by some unmeasured characteristics of the parents or children in the sample.

Given its variability in urbanicity and strong measurement of both child outcomes and parental factors, ESMS was a strong study to use for the present research. There are, however, some notable drawbacks as well. The ESMS is not a nationally representative sample of disadvantaged families. Accordingly, relations between urbanicity and community or parental characteristics may not be driven by urbanicity per se, but by the particular areas sampled in ESMS. To provide one example, perhaps findings of decreased financial strain in large urban cities compared to small cities, suburbs, and small towns is a finding unique to Pittsburgh (the large urban area sampled in ESMS), which is a large urban city with relatively low cost of living, and does not generalize to other large cities. Replication of this study's findings across different cities, suburbs, and rural areas is necessary to provide validity to its results. Second, ESMS is a high-risk sample. Thus, the community and family processes observed within the sample may not be representative of those operating in other low-income families who are not struggling with similar risk factors. Future research is needed to test whether these results generalize across all low-income children and families living in the U.S.

Lastly, we were not able to measure all community-level mediators with administrative data. Neighborhood danger, social support, and economic strain were parent-reported (as were measures of behavior problems). Accordingly, measures of these stressors may be biased by

parents' own feelings of distress. For instance, perhaps a mother who is severely depressed perceives her neighborhood as more dangerous and offering less social support than third-party data reveals. Indeed, the parent-reported community-level characteristics were the strongest predictors of parental distress, which may indicate some reporter bias in these associations. Future research should attempt to measure these potential mediators with outside data. For instance, social network analysis may be a useful method to create more objective measures of support networks within communities. Also, though difficult and time-consuming, efforts should be made to construct a measure of neighborhood danger using police data obtained from local police departments or the Federal Bureau of Investigation.

Despite its limitations, this study provides important information regarding differences in the lives of disadvantaged children and families across urbanicity. Disadvantage manifests differently in large urban cities, small urban cities, suburbs, and rural areas. Low-income families living across the urban-rural continuum face many distinct challenges and have varying strengths. Comparative work like this study is necessary to understand these different risks and assets in order to develop policies and programs aimed at alleviating the harmful effects of poverty that are properly tailored to the children and families they serve. Clearly, additional work is necessary to further expand our knowledgebase regarding how place intersects with income to shape the lives of children.

4.0 CONCLUSIONS

As the geography of poverty in the U.S. continues to shift, it is increasingly important to understand how income differentially relates to child development across urban, suburban, and rural landscapes. Yet, with the exception of some of my preliminary studies, extant research has not addressed whether and why economic disadvantage is differentially predictive of children's early school success across the urban-rural continuum. The goals of this dissertation were to improve upon the current limited literature addressing income, urbanicity, and child development by replicating findings, extending research to examine early behavior problems and trajectories of achievement and behavior, and probing mechanisms driving associations. After finishing these investigations, it is important to consider the global conclusions that can be drawn from results across the studies. Then, I will reflect upon some important questions and issues that still need to be addressed.

4.1 OVERARCHING CONCLUSIONS

A primary research interest of mine is to explore whether economic disadvantage has differing links to child development across the urban-rural continuum. When addressing this question, it is important to consider to whether urbanicity-related differences in low-income children's functioning exist *compared to whom*. My prior work and study 1 ask whether gaps in achievement and behavior between lower-income children compared to more advantaged peers in similar

communities are larger or smaller across urbanicity. These studies, of course, do not answer the question of whether low-income children perform better or worse on measures of achievement and behavioral functioning than other low-income children living in other urbanicities. This too is an important question if we want to consider not just how economically disadvantaged children are doing compared to more advantaged peers in their schools and communities, but how we expect them to fare nationally compared to economically similar peers. The two studies contained in this dissertation aimed to address both of these important inquiries. Findings suggest that when they enter kindergarten, (1) the disparity between the academic skills of low-income rural children and more advantaged peers in their schools/communities is smaller than in more urban areas, and (2) low-income rural kindergarteners have higher achievement than low-income peers in urban areas. The story with respect to behavior problems is different. At kindergarten entry, (1) low-income children living in large cities and suburbs have levels of externalizing problems that are more similar to their upper-income peers in the same schools/communities than the gaps in small cities or rural areas, but (2) low-income children in large urban cities tend to exhibit more behavior problems than low-income children living in less urban places. When thinking about how place intersects with economic disadvantage to shape development, we must take both of these comparisons into account.

Together, these studies also give us some insight into mechanisms that contribute to academic and behavioral functioning as children age. For instance, the factors that contribute to variation in economic disparities in achievement and behavior at kindergarten entry across urbanicity do not appear to drive differences during the elementary school years. We know from study 2 that urbanicity-related differences in kindergarten income gaps are linked, in part, to variation in neighborhood violence, pollution, and parenting. With respect to parenting, an

expansive body of research has shown that negative parenting, is detrimental to young children's academic and behavioral functioning (e.g. Jackson, Brooks-Gunn, Huang, & Glassman, 2003; Webster-Stratton, 1998). While studies have documented the negative links between harsh parenting and development in older children (e.g. Campbell, Pierce, Moore, Marakovitz, & Newby, 1996; Conger et al., 1994), other scholars have argued that parenting has little influence on children as they progress through formal schooling and have increased interaction with peers (e.g. Harris, 1995). Since this dissertation suggests different mechanisms are driving urbanicity-related variation in links between economic disadvantage and development at kindergarten and through elementary school, one may find support for notions that parenting, which partly drives income gap differences at kindergarten, is not as influential in shaping academic and behavioral development as children age through middle childhood. However, contemporary theories of parenting and development maintain that parenting remains an important part of youth and adolescent development, but its effects must be understood in light of the simultaneous influence of the youth's social world, like peers and schools (Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000). Accordingly, it is important to understand how the intersection between home environment and peer and school environments potentially alters the relations between parenting and development across urbanicity as children age.

Results also indicate that neighborhood violence is linked to young children's functioning via its negative effect on parental functioning, while pollution has a direct effect, and these factors may not play a large role in explaining differential change in achievement and behavior linked to urbanicity and income as children progress through elementary school. Some support for this conclusion can be found in prior research. Exposure to environmental toxins has its most detrimental impacts on development in utero and in early childhood (birth to age 5), when brains

are rapidly forming and growing (Evans, 2006; Shonkoff, 2010). Thus, it is not surprising that increased toxic releases in low-income children's communities is tied to deficits in academic performance at kindergarten entry, but urbanicity differences in pollution do not appear responsible for variation in income's relation to achievement growth at older ages (Evans, 2006). Second, results of the current investigation show that neighborhood violence impacts children through their parents (via parents' mental health and parenting quality). Similarly, Linares and colleagues (2001), studying a sample of children aged 3 to 5 living in high-crime neighborhoods, found that the link between community violence and children's behavior problems was mediated by maternal distress. Perhaps, in addition to having a less direct effect on very young children, children in elementary school are less affected by community violence because they are still young enough to have limited unrestricted access to neighborhoods and because they are buffered from the negative effects of violence on their parents by increased time spent away from home at school. This would help to explain why income gaps in academic and behavioral growth during elementary school are attenuated in large inner-cities and exacerbated in rural areas despite the finding that neighborhood violence rates are highest in urban areas and lowest in rural ones. It would be interesting to examine urbanicity-related differences in economic gaps in functioning during adolescence and young adulthood, when youth have the most direct, unsupervised interactions with neighborhoods. Perhaps patterns of exacerbation in income gaps in achievement/attainment and behavior in large urban inner-cities would manifest again during the adolescent and young adult years.

Lastly, considering the three theoretical pathways explaining income-child development gaps, this dissertation appears to suggest that, in terms of early academic and behavioral development (prior to the start of schooling), the family and environmental stress pathway is the

dominant mechanism explaining why urbanicity moderates links between economic disadvantage and development. This is especially true with respect to achievement, where low-income rural kindergarteners were found to have a relative advantage compared to peers in other urbanicities across both the ECLS-K and ESMS samples. Interestingly, researchers often cite the resource and investment pathway as being the primary explanation for economic disparities in children's achievement and stress as being responsible for income gaps in behavior (e.g. Gershoff et al., 2007; Yeung et al., 2002). Recent evidence, however, has suggested that stress may play a larger role than previously thought in explaining income-achievement gaps (Evans et al., 2011). This dissertation provides additional evidence that stress theories of poverty's effects on children are very important in explaining income gaps in achievement as well as behavior. The same stressors identified in this dissertation as pathways via which urbanicity moderates links between economic disadvantage and academic and behavioral functioning may suggest a similar moderation of economic disparities in children's health outcomes (Evans & Katrowitz, 2002),—a proposition not tested in this dissertation, but one that necessitates future study. Even though resource availability did not play a role in explaining urbanicity-related kindergarten achievement gaps as expected, looking at the results of trajectory analyses in study 1, I believe that the community resources, specifically schools, may be vitally important in explaining urbanicity-related differences in links between income and child development during middle childhood.

4.2 DIRECTIONS FOR FUTURE RESEARCH

After concluding the studies in this dissertation, some areas for future research on the intersection between urbanicity and economic disadvantage became clear. First, there remains a pressing need for studies testing *how* urbanicity moderates relations between income and academic and behavioral development. With some success, study 2 attempted to identify mediating mechanisms to explain urbanicity's links with low-income children's development. But several of the community characteristics did not operate in an expected manner. I posited that this may be primarily due to the limited number of communities in the urbanicity groups, but perhaps certain community factors, like resource availability, that scholars often assume play large roles in the well-being of families and children are, in fact, unrelated to their functioning. These types of analyses linking community characteristics to proximal processes and development continue to be exceedingly rare, but they are vital to the study of how "place" intersects with economic disadvantage to shape child development (e.g. Bronfenbrenner & Morris, 1998).

Second, schools are an important aspect of the community that necessitate more research attention as pathways through which economic gaps in child functioning are attenuated or exacerbated differentially across urbanicity. One striking finding in study 1 was that the role of urbanicity and income in academic and behavioral development shifts as children enter and progress through elementary school. Clearly, this could be due to differences in children's school experiences related to urbanicity and income. Currently, there is basic research on differences in structural characteristics of schools, such as expenditures and teacher experience and pay, in urban, suburban, and rural communities (e.g. Hadderman, 1999; Lippman, Burns, & McArthur, 1996; Monk, 2007; Reeves, 2003). But very little of this research looks at urbanicity-related differences

in the learning and socialization processes within schools. To truly understand how poor and non-poor children's school experiences and interactions shape their development in urban, suburban, and rural areas, rich, comparative work examining differences in the proximal processes within schools across the urban-rural continuum must be conducted.

There are several methodological challenges that should be addressed in conducting future research on urbanicity, economic disadvantage, and child development. First, more multi-level data on children living in communities that span the urban-rural continuum is needed, including geocoded data on children's residences to accurately measure community-level constructs. Few existing studies sample across the urban-rural continuum, thus precluding comparisons of urban, suburban, and rural children and families. Exceptions are nationally representative datasets like the Early Childhood Longitudinal Studies (ECLS-B and ECLS-K), NLSY, and PSID, but these studies often lack the detailed measurement of family processes necessary to analyze *how* urbanicity impacts development. The ESMS, used in study 2, contains detailed measurement of family processes and contains children from communities across the urban-rural continuum, yet the limited number of sites and communities sampled may have impacted results. Thus, those wishing to study links between urbanicity, income, and development are confronted with the sizable challenges of finding or collecting data that samples widely across urban, suburban, and rural areas, contains children's addresses, and has enough richness in its measurement of family-level and child-level constructs to explore how distal community characteristics relate to the proximal processes that drive development.

Another methodological issue to address is how to best conceptualize and define urbanicity. Specific definitions vary across research, but on a conceptual level urban, suburban, and rural areas differ on three key dimensions: population density; proximity to an urban core; and

commuting patterns. Of course urban cities, suburbs, and rural areas are not homogenous. Yet, traditional urbanicity definitions ignore heterogeneity within contexts. We may expect the effect of urbanicity on relations between poverty and educational outcomes to vary depending on important characteristics of the community (e.g., region, local economy, history). For example, studies of low-income rural populations living in various regions of the U.S. reveal large differences in the level of socioeconomic integration encountered by families (Duncan, 1999; Kutcher, Evans, Whitlock, & Swisher, 2011; Vernon-Feagans & Cox, 2011). Based on her fieldwork in Appalachia and the Mississippi Delta, Duncan (1999) illustrates how more advantaged members of these communities wield power over jobs and opportunities, thereby maintaining their privilege and socially isolating the poor. This social isolation deprives the poor of the "cultural tool kit" needed to participate in the local economy and society. In contrast, Duncan found no evidence of the same class hierarchy in a small rural town in Maine. Rather, its unique economic and social history engendered feelings of inclusiveness and trust, widespread community participation, and high social capital among all members of the community. Thus, region, economy, and history may be important moderators of urbanicity's effects. Indeed, in study 2, the rural areas sampled in the ESMS neighbored small urban "college towns." Perhaps the resources, physical environment, social capital, and community norms and practices of these surrounding rural areas are unique and are driving our findings of improved functioning among economically disadvantaged rural children. Similarly, the small urban cities contained in the ESMS, Eugene, OR and Charlottesville, VA, differ undoubtedly on the aforementioned community characteristics from a declining manufacturing small urban city, like Akron, OH or Flint, MI. The variability with urban, suburban, and rural contexts underscores the importance of undertaking replication studies using varied samples of children and families. It also draws

attention to a bigger issue with current conceptualizations of urbanicity. Urbanicity may be better viewed as a proxy for several different community characteristics that are salient for children and families. If researchers spend more time examining the specific aspects of communities that determine how income relates to development, the field can move beyond categorical definitions of urbanicity and create stronger measures of community context that incorporate several characteristics important for moderating the effects of income on family and child functioning.

Lastly, researchers must continue to create and test measures of community-level variables using data from multiple sources and Geographic Information Systems (GIS) software or spatial lag techniques (e.g. Miller, Votruba-Drzal, & Coley, 2012; Sampson, Morenoff, & Earls, 1999). This dissertation utilized administrative data from sources such as the Decennial and Economic Censuses and the EPA as well as survey-based data on community characteristics reported by parents. It also extended the current literature by using GIS to create measures of community characteristics at varying geographic distances and then empirically testing which measure appeared to best capture the relevant area for that construct. This work is a necessary first step at deciphering what constitutes relevant local community boundaries for the purposes of accessing resources, experiencing risks and benefits of the physical environment, and interacting with neighbors. More work, however, is necessary to establish community boundaries for use in urbanicity research. Importantly, relevant community boundaries may vary across urban, suburban, and rural areas—a theory that this dissertation did not test. In densely populated, resource rich urban communities, people may conceive the local community as consisting of the city block or neighborhood in which they reside. In this case, aggregating community-level data at the Census block group or tract level may be most appropriate. In remote, sparsely populated rural areas, however, residents likely traverse much larger distances routinely to get to schools,

work, stores, and other places. Accordingly, rural residents may perceive their local community as covering a much larger area, perhaps the entire county. Finally, while this dissertation used GIS in creating many of its community-level measures, there are more sophisticated and nuanced ways to utilize GIS to capture aspects of communities. For example, GIS can directly map distances between children and resources/risks (e.g. distance between a child's home and the nearest library or facility handling toxic waste). This may be a better method of measuring community resources and risks compared to aggregating across geographical units, but this is a question only future empirical research can answer. Accordingly, there is great potential for studies linking community-level factors with child development to advance the literature. To make the most impact, they should use data from various sources and rigorous techniques to identify relevant community boundaries and create strong measures of community aspects that promote or inhibit positive development.

4.3 FINAL NOTE

When crafting programs and policies aimed at reducing inequality in the academic and behavioral functioning of economically disadvantaged children and their more advantaged peers, is it imperative to understand the moderators, pathways, and processes. This dissertation strengthened our knowledge base regarding urbanicity moderation of trajectories of achievement and behavioral functioning and elucidated how some processes that drive that development, may differ for economically disadvantaged children living in large cities, small cities, suburbs, and rural areas. Future research has the potential to further our knowledge of the role of urbanicity in child

development by continuing to test mechanisms using advanced techniques and rigorous methods to link community-level characteristics of urban, suburban, and rural areas to family processes and early childhood development. This research will improve the level of efficacy these policies and programs are able to achieve.

APPENDIX A

TABLES

Table 1. Weighted Descriptive Statistics at Kindergarten Entry for Full Sample and by Urbanicity

	Full Sample ($N \approx 16{,}750$) *M* or % (*SD*)	Lg. Urban City ($N \approx 2{,}400$) *M* or % (*SD*)	Sm. Urban City ($N \approx 2{,}450$) *M* or % (*SD*)	Suburb ($N \approx 6{,}800$) *M* or % (*SD*)	Rural ($N \approx 5{,}150$) *M* or % (*SD*)
Child Outcomes					
Academic Skills					
Reading skills	22.46	22.14	21.68	23.97	20.99
	(8.43)	(8.39)	(8.02)	(9.01)	(7.50)
Math skills	19.94	19.03	19.20	21.28	18.90
	(7.28)	(6.90)	(6.99)	(7.66)	(6.74)
Behavior Problems					
Internalizing	1.54	1.56	1.54	1.53	1.55
	(0.53)	(0.55)	(0.53)	(0.52)	(0.54)
Externalizing	1.79	1.81	1.85	1.75	1.82
	(0.57)	(0.56)	(0.57)	(0.56)	(0.58)
Family Income	$54,227.13	$46,141.33	$43,943.75	$66,970.62	$45,423.18
	(52,905.49)	(46,733.82)	(40,217.07)	(62,296.60)	(43,541.72)
Demographic Covariates					
Child race: White	63.39%	33.53%	51.53%	67.78%	73.98%
Hispanic	13.69%	22.71%	24.08%	13.69%	8.40%
Black	15.62%	35.50%	18.18%	11.68%	9.62%
Other	7.30%	8.25%	6.21%	6.86%	7.99%
Child gender: Male	51.40%	50.38%	51.92%	51.49%	51.44%
Age at kindergarten entry (mos.)	65.61	64.74	65.91	65.42	66.04
	(4.39)	(4.78)	(4.33)	(4.21)	(4.37)
Parental education: No degree	6.82%	11.07%	7.33%	4.95%	7.43%

Table 1 (continued)

	H.S. degree	60.92%	62.10%	66.47%	52.55%	68.68%
	Bach. degree	32.26%	26.83%	26.20%	42.50%	23.89%
Maternal employment (hrs./week)		25.62	26.91	26.27	24.48	26.30
		(20.09)	(20.16)	(20.53)	(19.79)	(20.21)
Mother married		69.78%	55.58%	63.19%	75.24%	70.93%
Number of children in household		2.44	2.47	2.50	2.38	2.49
		(1.17)	(1.29)	(1.31)	(1.07)	(1.17)
Non-English speaking household		5.78%	12.56%	5.41%	6.94%	1.98%
Region:	Northeast	19.14%	24.47%	7.85%	28.97%	9.67%
	Midwest	25.02%	23.64%	21.98%	19.74%	33.66%
	South	36.41%	20.62%	47.71%	32.26%	42.41%
	West	19.43%	31.26%	22.47%	19.02%	14.26%

Table 2. Weighted Longitudinal Descriptive Statistics for Full Sample and by Urbanicity

	Full Sample ($N \approx 10{,}600$) *M* or % (*SD*)	Lg. Urban City ($N \approx 1{,}350$) *M* or % (*SD*)	Sm. Urban City ($N \approx 1{,}500$) *M* or % (*SD*)	Suburb ($N \approx 4{,}300$) *M* or % (*SD*)	Rural ($N \approx 3{,}450$) *M* or % (*SD*)
Child Outcomes					
Academic Skills					
Reading skills – Fall K	23.14	22.77	22.19	24.40	21.28
	(8.43)	(8.81)	(7.96)	(9.14)	(7.57)
Reading skills – Spring K	33.23	32.55	32.02	34.31	31.39
	(10.26)	(10.69)	(10.42)	(10.44)	(9.61)
Reading skills – Spring 1st grade	57.46	54.74	55.54	58.51	54.83
	(13.74)	(14.21)	(13.72)	(13.45)	(13.47)
Reading skills – Spring 3rd grade	110.56	104.12	106.29	112.08	106.63
	(20.27)	(20.29)	(20.89)	(19.21)	(20.46)
Reading skills – Spring 5th grade	142.21	134.53	137.49	144.47	137.47
	(23.22)	(23.99)	(23.74)	(21.39)	(23.95)
Math skills – Fall K	20.95	19.60	19.59	21.85	19.31
	(7.28)	(7.25)	(6.97)	(7.82)	(6.87)
Math skills – Spring K	29.25	27.30	27.42	30.06	27.65
	(8.81)	(9.00)	(8.91)	(8.85)	(8.47)
Math skills – Spring 1st grade	44.83	42.16	43.51	45.51	43.18
	(9.19)	(9.08)	(9.23)	(8.83)	(9.28)
Math skills – Spring 3rd grade	87.21	81.69	84.11	89.15	83.60
	(17.94)	(18.31)	(18.01)	(17.03)	(17.96)
Math skills – Spring 5th grade	116.25	110.05	112.55	118.73	111.75
	(21.47)	(21.94)	(21.06)	(19.81)	(22.39)
Behavior Problems					
Internalizing – Fall K	1.54	1.52	1.51	1.49	1.52

Table 2 (continued)

	(0.53)	(0.52)	(0.52)	(0.51)	(0.53)
Internalizing – Spring K	1.51	1.52	1.52	1.53	1.54
	(0.53)	(0.52)	(0.52)	(0.51)	(0.50)
Internalizing – Spring 1st grade	1.53	1.58	1.55	1.54	1.59
	(0.52)	(0.54)	(0.51)	(0.52)	(0.52)
Internalizing – Spring 3rd grade	1.56	1.55	1.59	1.58	1.64
	(0.52)	(0.55)	(0.51)	(0.53)	(0.55)
Internalizing – Spring 5th grade	1.60	1.60	1.68	1.58	1.64
	(0.54)	(0.55)	(0.55)	(0.53)	(0.54)
Externalizing – Fall K	1.72	1.75	1.75	1.67	1.76
	(0.57)	(0.52)	(0.55)	(0.54)	(0.57)
Externalizing – Spring K	1.69	1.71	1.70	1.64	1.73
	(0.58)	(0.55)	(0.58)	(0.54)	(0.58)
Externalizing – Spring 1st grade	1.72	1.72	1.72	1.64	1.78
	(0.58)	(0.57)	(0.58)	(0.56)	(0.57)
Externalizing – Spring 3rd grade	1.75	1.74	1.79	1.68	1.81
	(0.56)	(0.56)	(0.57)	(0.54)	(0.56)
Externalizing – Spring 5th grade	1.72	1.72	1.80	1.65	1.76
	(0.54)	(0.57)	(0.57)	(0.50)	(0.54)
Family Income (K-5th grade)	$67,426.31	$65,210.75	$58,858.92	$85,329.05	$54,322.53
	(49,087.21)	(45,743.39)	(48,614.96)	(53,990.32)	(39,077.42)
Covariates (K-5th grade)					
Child race: White	68.74%	37.94%	54.79%	73.99%	76.08%
Hispanic	14.89%	30.09%	21.32%	13.87%	8.72%
Black	9.75%	22.45%	18.13%	5.82%	8.56%
Other	6.63%	9.51%	5.76%	6.32%	6.64%
Child gender: Male	50.04%	47.18%	47.26%	51.19%	50.29%
Age at kindergarten entry (mos.)	65.81	65.05	65.94	65.52	66.22
	(4.39)	(4.83)	(4.29)	(4.15)	(4.34)

Table 2 (continued)

Parental education:	No degree	4.94%	9.04%	6.34%	3.22%	4.49%
	H.S. degree	54.66%	50.64%	58.30%	42.51%	66.44%
	Bach. degree	40.40%	40.32%	35.36%	54.27%	29.07%
Maternal employment (hrs./week)		26.72	28.60	28.35	24.38	28.26
		(16.10)	(16.05)	(16.02)	(16.21)	(15.98)
Mother stably married		68.41%	60.21%	61.24%	75.53%	65.89%
Number of children in household		2.45	2.51	2.44	2.41	2.47
		(1.07)	(1.12)	(1.13)	(0.98)	(1.08)
Non-English speaking household		8.50%	21.26%	9.56%	8.68%	2.96%
Region:	Northeast	19.31%	20.61%	6.54%	32.59%	10.67%
	Midwest	27.56%	23.11%	19.83%	22.27%	36.51%
	South	34.54%	17.92%	50.49%	26.24%	40.68%
	West	18.59%	38.36%	23.14%	18.90%	12.14%

Table 3. OLS Regression Predicting Achievement at Kindergarten Entry with Urbanicity and Income

	Reading	**Math**
	$N \approx 15{,}300$	$N \approx 16{,}100$
	Coeff.	Coeff.
	(*SE*)	(*SE*)
Urbanicity main effects:		
Small urban	-1.08** [ab]	-0.47† [ab]
	(0.35)	(0.26)
Suburban	-0.41 [bc]	0.15 [bc]
	(0.27)	(0.21)
Rural	-2.21*** [ac]	-1.52*** [ac]
	(0.31)	(0.24)
Urbanicity x income:		
Large urban: Inc. < $90,000	0.51*** [de]	0.34*** [d]
	(0.07)	(0.05)
Large urban: Inc. >= $90,000	-0.02	0.12*
	(0.06)	(0.05)
Small urban: Inc. < $90,000	0.45*** [f]	0.37*** [e]
	(0.08)	(0.06)
Small urban: Inc. >= $90,000	0.04	0.05 [g]
	(0.12)	(0.04)
Suburb: Inc. < $90,000	0.31*** [d]	0.34*** [f]
	(0.05)	(0.04)
Suburb: Inc. >= $90,000	0.03	0.02 [h]
	(0.02)	(0.02)
Rural: Inc. < $140,000	0.29*** [ef]	

Table 3 (continued)

	(0.04)	
Rural: Inc. >= $140,000	0.02	
	(0.04)	
Rural: Linear inc.		0.18*** defgh
		(0.03)
Intercept	23.49***	20.23***
	(0.23)	(0.19)

*** p < .001 ** p < .01. * p < .05. † < .10. Coefficients represent the slope of the income-skills association for each group. "*" symbols denote the significance of the slopes. Post-hoc analyses tested the significance of differences between slopes from each group to every other group. Within each column, coefficients with shared superscript letters are different from each other at the p <.05 level.

Controls included in models are race, gender, age at kindergarten entry, highest level of parental education, number of children in the house, maternal employment, maternal marital status, region of residence, and indicators for whether child lived in a non-English speaking home.

Table 4. OLS Regression Predicting Behavior at Kindergarten Entry with Urbanicity and Income

	Internalizing	**Externalizing**
	$N \approx 16{,}000$	$N \approx 15{,}600$
	Coeff.	Coeff.
	(*SE*)	(*SE*)
Urbanicity main effects:		
Small urban	-0.038	0.113
	(0.03)	(0.03)
Suburban	-0.015	0.007
	(0.02)	(0.02)
Rural	-0.007	0.030
	(0.02)	(0.04)
Urbanicity x income:		
Large urban: Inc. < $60,000	-0.014†	-0.011 [ab]
	(0.01)	(0.01)
Large urban: Inc. >= $60,000	0.001	0.006* [e]
	(0.00)	(0.00)
Small urban: Inc. < $60,000	-0.023**	-0.032*** [ac]
	(0.01)	(0.01)
Small urban: Inc. >= $60,000	-0.001	0.003
	(0.00)	(0.00)
Suburb: Inc. < $60,000	-0.021***	-0.012* [cd]
	(0.01)	(0.01)
Suburb: Inc. >= $60,000	-0.001	0.001
	(0.00)	(0.00)
Rural: Inc. < $60,000	-0.018**	-0.034*** [bd]
	(0.01)	(0.01)
Rural: Inc. >= $60,000	-0.003*	-0.002 [e]
	(0.00)	(0.00)
Intercept	1.527***	1.749***
	(0.02)	(0.02)

*** p < .001 ** p < .01. * p < .05. † < .10. Coefficients represent the slope of the income-skills association for each group. "*" symbols denote the significance of the slopes. Post-hoc analyses tested the significance of differences between slopes from each group to every other group. Within each column, coefficients with shared superscript letters are different from each other at the p <.05 level.

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Table 4 (continued)

Controls included in models are race, gender, age at kindergarten entry, highest level of parental education, number of children in the house, maternal employment, maternal marital status, region of residence, and indicators for whether child lived in a non-English speaking home

Table 5. Multi-level Models Predicting Achievement Trajectories with Urbanicity and Income

	Reading		**Math**	
	$N \approx 10{,}600$		$N \approx 10{,}600$	
	Coeff.	(*SE*)	Coeff.	(*SE*)
Intercept[1]				
Intercept	17.57***	(0.73)	15.77***	(0.45)
Slope				
Intercept	1.96***	(0.03)	1.56***	(0.02)
Urbanicity:				
Small Urban	0.062† [a]	(0.03)	0.037	(0.03)
Suburban	0.011 [a]	(0.03)	0.011	(0.03)
Rural	0.032	(0.03)	0.028	(0.03)
Income x Urbanicity:				
Large urban < $50,000	0.038*** [b]	(0.01)	0.032*** [a]	(0.01)
Large urban ≥ $50,000	0.005*	(0.00)	0.006**	(0.00)
Small urban < $50,000	0.053*** [c]	(0.01)	0.041***	(0.01)
Small urban ≥ $50,000	0.001	(0.00)	0.001	(0.00)
Suburban < $50,000	0.034*** [cd]	(0.01)	0.030*** [b]	(0.00)
Suburban ≥ $50,000	0.004**	(0.00)	0.004***	(0.00)
Rural < $50,000	0.056*** [bd]	(0.01)	0.054*** [ab]	(0.00)
Rural ≥ $50,000	0.002	(0.00)	0.002†	(0.00)
Demographic Covariates				
Race:				
Hispanic	-0.065***	(0.01)	-0.152***	(0.01)
Black	-0.135***	(0.01)	-0.049***	(0.01)
Other	-0.076***	(0.01)	-0.024*	(0.01)
Male	-0.037***	(0.01)	0.068***	(0.01)
Age at kindergarten entry	0.001	(0.00)	-0.002*	(0.00)
Parental Ed.:				
High school degree	0.086***	(0.02)	0.055***	(0.01)
Bachelor's degree	0.167***	(0.02)	0.125***	(0.01)
Maternal employment	-0.005*	(0.00)	-0.003†	(0.00)
Mother stably married	-0.001	(0.01)	-0.008	(0.01)
Number of children	-0.024***	(0.00)	-0.009***	(0.00)
Non-English speaking household	-0.029*	(0.01)	0.042***	(0.01)
Region:				
Midwest	0.010	(0.01)	0.000	(0.01)
South	0.005	(0.01)	0.018†	(0.01)
West	-0.005	(0.01)	0.000	(0.01)

Table 5 (continued)

[1] Coefficients for the predictors of the intercept are not presented in this table for parsimony's sake. They are available from the author upon request.

*** p < .001 ** p < .01. * p < .05. † < .10. "Income x Urbanicity" coefficients represent the slope of the income-skills association for each group. "*" symbols denote the significance of the slopes. Post-hoc analyses tested the significance of differences between slopes, within income group, from each urbanicity group to every other group. Within each column, coefficients with shared superscript letters are different from each other at the p <.05 level.

Table 6. Multinomial Logistic Regression Predicting Internalizing Trajectory Group

Panel 1. Low-Stable Reference Group	Mid-Increasing	Mid-Stable	High-Declining
	RRR	RRR	(RRR)
	(SE)	(SE)	(SE)
Income:			
< $60,000	1.12	0.93	1.07
	(0.13)	(0.08)	(0.14)
>= $60,000	0.65**	0.99	0.94
	(0.15)	(0.03)	(0.06)
Urbanicity:			
Small Urban	4.20**	1.55	3.86*
	(0.53)	(0.37)	(0.56)
Suburban	1.87	1.92*	4.90**
	(0.55)	(0.31)	(0.52)
Rural	3.67**	2.26*	4.35**
	(0.50)	(0.32)	(0.55)
Inc. x Urb:			
Small Urban x < $60,000	0.64**	0.96	0.69*
	(0.13)	(0.09)	(0.15)
Small Urban x >= $60,000	1.63** [b]	0.98	0.86
	(0.15)	(0.04)	(0.25)
Suburban x < $60,000	0.80† [a]	0.91	0.67**
	(0.13)	(0.07)	(0.13)
Suburban x >= $60,000	1.43* [bc]	1.01	1.03
	(0.16)	(0.03)	(0.08)
Rural x < $60,000	0.63*** [a]	0.90	0.64***
	(0.12)	(0.08)	(0.13)
Rural x >= $60,000	1.62** [c]	0.98	1.07
	(0.16)	(0.05)	(0.08)
Demographic Covariates			
Child race:			
Black	0.46**	0.80	0.58*
	(0.24)	(0.15)	(0.25)
Hispanic	0.54**	1.08	0.68
	(0.22)	(0.13)	(0.25)
Other	0.51*	1.22	0.81
	(0.28)	(0.13)	(0.26)
Child gender: Male	1.61***	1.14†	1.59***
	(0.12)	(0.07)	(0.14)
Parental education:			
High school degree	0.63*	0.91	0.76
	(0.23)	(0.17)	(0.24)
Bachelor's degree	0.55*	0.82	0.65
	(0.28)	(0.18)	(0.31)
Maternal employment	1.03	1.00	0.93
	(0.04)	(0.02)	(0.05)
Mother stably married	0.45***	0.70***	0.44***

Table 6 (continued)

	(0.15)	(0.10)	(0.19)
Number of children in household	1.17**	1.03	1.00
	(0.06)	(0.04)	(0.07)
Non-English speaking household	0.45**	0.76†	0.37**
	(0.28)	(0.15)	(0.30)
Region:			
Midwest	1.13	0.96	0.81
	(0.20)	(0.11)	(0.21)
South	0.75	0.91	0.75
	(0.20)	(0.11)	(0.21)
West	1.08	0.89	1.05
	(0.22)	(0.12)	(0.22)

Panel 2. Mid-Increasing Reference Group	Mid-Stable	High-Declining
	RRR (SE)	(RRR) (SE)
Income:		
< $60,000	0.83	0.93
	(0.15)	(0.19)
>= $60,000	1.51**	1.45*
	(0.15)	(0.16)
Urbanicity:		
Small Urban	0.38	0.74
	(0.62)	(0.76)
Suburban	1.02	2.45
	(0.63)	(0.73)
Rural	0.62	1.11
	(0.57)	(0.72)
Inc. x Urb:		
Small Urban x < $60,000	1.45* [a]	1.20 [a]
	(0.16)	(0.20)
Small Urban x >= $60,000	0.60** [c]	0.13*
	(0.16)	(0.92)
Suburban x < $60,000	1.13 [ab]	0.85 [a]
	(0.15)	(0.18)
Suburban x >= $60,000	0.71* [cd]	0.71†
	(0.17)	(0.18)
Rural x < $60,000	1.44** [b]	1.04
	(0.14)	(0.18)
Rural x >= $60,000	0.60** [d]	0.65*
	(0.16)	(0.17)
Demographic Covariates		
Child race:		

Table 6 (continued)

Black	1.75*	1.25
	(0.27)	(0.34)
Hispanic	1.99**	1.24
	(0.25)	(0.33)
Other	2.36**	1.56
	(0.29)	(0.37)
Child gender: Male	0.71*	0.99
	(0.14)	(0.18)
Parental education:		
High school degree	1.45	1.21
	(0.24)	(0.31)
Bachelor's degree	1.46	1.14
	(0.30)	(0.40)
Maternal employment	0.96	0.91
	(0.04)	(0.06)
Mother stably married	1.57**	1.00
	(0.17)	(0.25)
Number of children in household	0.88†	0.86†
	(0.07)	(0.09)
Non-English speaking household	1.67†	0.83
	(0.30)	(0.41)
Region:		
Midwest	0.86	0.73
	(0.22)	(0.28)
South	1.21	1.00
	(0.22)	(0.29)
West	0.83	1.00
	(0.24)	(0.31)

Panel 3. Mid-Stable Reference Group	High-Declining
	(RRR)
	(SE)
Income:	
< $60,000	1.20
	(0.16)
>= $60,000	0.94
	(0.07)
Urbanicity:	
Small Urban	3.25†
	(0.64)
Suburban	2.70†
	(0.58)
Rural	2.09
	(0.61)
Inc. x Urb:	
Small Urban x < $60,000	0.64**

Table 6 (continued)

	(0.15)
Small Urban x >= $60,000	1.16† [a]
	(0.08)
Suburban x < $60,000	0.72*
	(0.14)
Suburban x >= $60,000	1.03 [a]
	(0.09)
Rural x < $60,000	0.69*
	(0.15)
Rural x >= $60,000	1.11
	(0.09)
Demographic Covariates	
Child race:	
Black	0.74
	(0.28)
Hispanic	0.67
	(0.26)
Other	0.68
	(0.27)
Child gender: Male	1.39*
	(0.15)
Parental education:	
High school degree	0.86
	(0.18)
Bachelor's degree	0.84
	(0.26)
Maternal employment	0.94
	(0.05)
Mother stably married	0.63*
	(0.20)
Number of children in household	0.97
	(0.07)
Non-English speaking household	0.50*
	(0.31)
Region:	
Midwest	0.85
	(0.22)
South	0.81
	(0.22)
West	1.20
	(0.24)

N ≈ 10,850. *** p < .001; ** p < .01; * p < .05; † p < .10. "Income x Urbanicity" coefficients represent the slope of the income-skills association for each group. The coefficient on "Income" is the slope of the income-skills association for the large urban group. Within sets of urbanicity variables and income group, identical superscripts denote differences at p < .05.

Table 7. Multinomial Logistic Regression Predicting Externalizing Trajectory Group

Panel 1. Low-Stable Reference Group	Mid-Stable	Mid-Increasing	High-Declining	High-Stable
	RRR (SE)	RRR (SE)	(RRR) (SE)	(RRR) (SE)
Income:				
< $60,000	0.80**	0.72**	0.79*	0.69**
	(0.09)	(0.11)	(0.09)	(0.12)
>= $60,000	1.00	1.02	1.01	0.96
	(0.03)	(0.05)	(0.03)	(0.07)
Urbanicity:				
Small Urban	0.93	1.96	1.96 [a]	1.97
	(0.39)	(0.45)	(0.41)	(0.49)
Suburban	0.60 [a]	1.08 [a]	0.55 [ab]	0.99 [a]
	(0.35)	(0.42)	(0.38)	(0.46)
Rural	1.89† [a]	2.56* [a]	3.03** [b]	3.54** [a]
	(0.37)	(0.43)	(0.38)	(0.45)
Inc. x Urb:				
Small Urban x < $60,000	1.03	0.92	0.83† [c]	0.90
	(0.09)	(0.10)	(0.10)	(0.12)
Small Urban x >= $60,000	1.04	1.03 [b]	1.07 [ef]	1.05
	(0.04)	(0.06)	(0.04)	(0.09)
Suburban x < $60,000	1.11 [b]	0.96	1.12 [cd]	1.02 [b]
	(0.07)	(0.10)	(0.08)	(0.11)
Suburban x >= $60,000	1.00	1.02 [c]	0.99 [e]	1.03
	(0.03)	(0.05)	(0.04)	(0.08)
Rural x < $60,000	0.93 [b]	0.92	0.81** [d]	0.82† [b]
	(0.08)	(0.10)	(0.09)	(0.11)
Rural x >= $60,000	0.98	0.85† [bc]	0.98 [f]	0.98
	(0.04)	(0.09)	(0.05)	(0.09)
Demographic Covariates				
Child race:				
Black	1.79***	4.22***	2.44***	3.60***
	(0.17)	(0.19)	(0.17)	(0.20)
Hispanic	1.36*	1.10	1.00	0.99
	(0.13)	(0.20)	(0.16)	(0.21)
Other	0.91	0.41**	0.84	1.05
	(0.14)	(0.28)	(0.16)	(0.21)
Child gender: Male	2.89***	7.92***	5.00***	10.30***
	(0.08)	(0.13)	(0.10)	(0.14)
Parental education:				
High school degree	1.00	0.76	0.95	0.83
	(0.21)	(0.23)	(0.21)	(0.25)
Bachelor's degree	0.71	0.39***	0.69	0.45**
	(0.22)	(0.26)	(0.23)	(0.29)
Maternal employment	1.15***	1.21***	1.20***	1.21***
	(0.03)	(0.04)	(0.03)	(0.04)

Table 7 (continued)

Mother stably married	0.83†	0.75*	0.64***	0.53***
	(0.10)	(0.12)	(0.11)	(0.15)
Number of children in household	0.97	0.89*	0.90*	0.87*
	(0.04)	(0.05)	(0.05)	(0.06)
Non-English speaking household	0.88	0.75	0.84	0.39***
	(0.15)	(0.25)	(0.19)	(0.27)
Region:				
Midwest	0.98	1.18	1.15	1.44*
	(0.11)	(0.16)	(0.14)	(0.18)
South	0.97	0.86	1.34*	1.11
	(0.11)	(0.16)	(0.14)	(0.18)
West	1.18	1.40†	1.85***	1.53*
	(0.12)	(0.19)	(0.15)	(0.20)

Panel 2. Mid-Stable Reference Group	Mid-Increasing	High-Declining	High-Stable
	RRR (SE)	RRR (SE)	(RRR) (SE)
Income:			
< $60,000	0.90	0.99	0.87
	(0.10)	(0.09)	(0.11)
>= $60,000	1.03	1.01	0.96
	(0.05)	(0.04)	(0.07)
Urbanicity:			
Small Urban	2.11†	2.11* [a]	2.12†
	(0.41)	(0.38)	(0.43)
Suburban	1.82	0.93 [a]	1.65
	(0.40)	(0.36)	(0.41)
Rural	1.35	1.60	1.87
	(0.40)	(0.35)	(0.39)
Inc. x Urb:			
Small Urban x < $60,000	0.90	0.81* [a]	0.88
	(0.10)	(0.10)	(0.11)
Small Urban x >= $60,000	0.99	1.02	1.01
	(0.06)	(0.05)	(0.09)
Suburban x < $60,000	0.87	1.01 [a]	0.92
	(0.10)	(0.08)	(0.10)
Suburban x >= $60,000	1.02 [a]	0.98	1.03
	(0.06)	(0.05)	(0.08)
Rural x < $60,000	0.98	0.87	0.88
	(0.09)	(0.08)	(0.10)
Rural x >= $60,000	0.86 [a]	1.00	1.00
	(0.09)	(0.06)	(0.09)
Demographic Covariates			
Child race:			

Table 7 (continued)

Black	2.36***	1.36†	2.01***
	(0.19)	(0.17)	(0.18)
Hispanic	0.79	0.74†	0.72†
	(0.20)	(0.16)	(0.20)
Other	0.45**	0.93	1.15
	(0.28)	(0.18)	(0.20)
Child gender: Male	2.75***	1.74***	3.56***
	(0.13)	(0.10)	(0.13)
Parental education:			
High school degree	0.76	0.94	0.83
	(0.21)	(0.19)	(0.22)
Bachelor's degree	0.55*	0.98	0.63†
	(0.25)	(0.22)	(0.27)
Maternal employment	1.06	1.04	1.06
	(0.04)	(0.03)	(0.04)
Mother stably married	0.81	0.77*	0.63**
	(0.13)	(0.12)	(0.15)
Number of children in household	0.92	0.93	0.90†
	(0.05)	(0.05)	(0.06)
Non-English speaking household	0.83	0.95	0.44**
	(0.25)	(0.19)	(0.26)
Region:			
Midwest	1.21	1.18	1.48*
	(0.17)	(0.15)	(0.17)
South	0.89	1.39*	1.15
	(0.17)	(0.14)	(0.18)
West	1.19	1.57**	1.30
	(0.19)	(0.15)	(0.20)

Panel 3. Mid-Increasing Reference Group	High-Declining	High-Stable
	RRR (SE)	(RRR) (SE)
Income:		
< $60,000	1.08	0.93
	(0.12)	(0.13)
>= $60,000	0.97	0.93
	(0.06)	(0.09)
Urbanicity:		
Small Urban	1.01	0.97
	(0.47)	(0.49)
Suburban	0.50 [a]	0.86
	(0.47)	(0.49)
Rural	1.18 [a]	1.33
	(0.44)	(0.46)
Inc. x Urb:		

Table 7 (continued)

Small Urban x < $60,000	0.90 [b]	0.98
	(0.12)	(0.13)
Small Urban x >= $60,000	1.04	1.02
	(0.07)	(0.11)
Suburban x < $60,000	1.17 [bc]	1.06
	(0.11)	(0.12)
Suburban x >= $60,000	0.96 [d]	1.01
	(0.07)	(0.09)
Rural x < $60,000	0.89 [c]	0.90
	(0.11)	(0.12)
Rural x >= $60,000	1.16 [d]	1.16
	(0.10)	(0.12)
Demographic Covariates		
Child race:		
Black	0.58**	0.85
	(0.21)	(0.20)
Hispanic	0.97	0.96
	(0.24)	(0.26)
Other	2.11*	2.60**
	(0.32)	(0.31)
Child gender: Male	0.63**	1.30
	(0.15)	(0.17)
Parental education:		
High school degree	1.45	1.42
	(0.24)	(0.24)
Bachelor's degree	2.38**	1.70†
	(0.30)	(0.32)
Maternal employment	0.99	1.00
	(0.05)	(0.05)
Mother stably married	0.96	0.78
	(0.16)	(0.17)
Number of children in household	1.02	0.98
	(0.07)	(0.07)
Non-English speaking household	1.17	0.55†
	(0.30)	(0.33)
Region:		
Midwest	0.97	1.21
	(0.21)	(0.21)
South	1.54*	1.29
	(0.20)	(0.22)
West	1.32	1.09
	(0.23)	(0.25)

Panel 4. High-Declining Reference Group	High-Stable
	(RRR)

Table 7 (continued)

	(SE)
Income:	
< $60,000	0.87
	(0.13)
>= $60,000	0.96
	(0.08)
Urbanicity:	
Small Urban	1.01
	(0.51)
Suburban	1.78
	(0.48)
Rural	1.17
	(0.45)
Inc. x Urb:	
Small Urban x < $60,000	1.08
	(0.14)
Small Urban x >= $60,000	0.99
	(0.10)
Suburban x < $60,000	0.91
	(0.12)
Suburban x >= $60,000	1.05
	(0.09)
Rural x < $60,000	1.01
	(0.12)
Rural x >= $60,000	1.01
	(0.10)
Demographic Covariates	
Child race:	
Black	1.48†
	(0.21)
Hispanic	0.98
	(0.24)
Other	1.24
	(0.24)
Child gender: Male	2.05***
	(0.15)
Parental education:	
High school degree	0.88
	(0.26)
Bachelor's degree	0.65
	(0.31)
Maternal employment	1.01
	(0.05)
Mother stably married	0.82
	(0.17)
Number of children in household	0.96
	(0.07)

Table 7 (continued)

Non-English speaking household	0.46**
	(0.30)
Region:	
Midwest	1.25
	(0.21)
South	0.83
	(0.21)
West	0.83
	(0.24)

$N \approx 10{,}300$. *** p < .001; ** p < .01; * p < .05; † p < .10. "Income x Urbanicity" coefficients represent the slope of the income-skills association for each group. The coefficient on "Income" is the slope of the income-skills association for the large urban group. Within sets of urbanicity variables and income group, identical superscripts denote differences at p < .05.

Table 8. Descriptive Statistics for ESMS Sample

	Full Sample (N = 731) M or % (SD)	Lg. Urban City (N = 160) M or % (SD)	Sm. Urban City (N = 130) M or % (SD)	Suburb (N = 260) M or % (SD)	Rural (N = 180) M or % (SD)
Child Outcomes					
Academic skills	97.95	95.32 [ab]	96.02	99.22 [a]	99.66 [b]
	(14.93)	(14.14)	(16.35)	(14.33)	(15.31)
Internalizing behaviors	51.11	53.64 [abc]	50.06 [a]	50.42 [b]	50.58 [c]
	(9.58)	(8.78)	(9.25)	(9.75)	(9.95)
Externalizing behaviors	0.00	0.13 [abc]	-0.08 [a]	0.01 [b]	-0.08 [c]
	(0.52)	(0.54)	(0.47)	(0.52)	(0.51)
Parenting					
Over-reactive discipline	3.06	3.27 [abc]	2.88 [ad]	3.08 [bd]	2.97 [c]
	(0.81)	(0.84)	(0.81)	(0.76)	(0.83)
Negative parenting	-0.01	0.12 [abc]	-0.04 [a]	-0.03 [b]	-0.06 [c]
	(0.36)	(0.39)	(0.36)	(0.35)	(0.31)
Parental Distress					
Perceived discrimination	1.50	1.55 [a]	1.50	1.51	1.42 [a]
	(0.55)	(0.60)	(0.54)	(0.57)	(0.45)
Daily Hassles	46.64	48.12 [ab]	44.79 [ac]	47.69 [cd]	45.20 [bd]
	(11.11)	(11.42)	(10.22)	(11.68)	(10.38)
Depression	15.76	16.64	15.08	16.23	14.84
	(8.69)	(9.27)	(8.38)	(8.52)	(8.61)
Community Characs.					
Resources					
Resource availability	-0.80	-0.29 [abc]	-1.04 [ade]	-0.76 [bdf]	-1.16 [cef]
	(0.42)	(0.08)	(0.12)	(0.40)	(0.23)
Stress					
Pollution	35.08	16.89 [ab]	64.51 [ace]	46.49 [bde]	12.05 [cd]
	(53.21)	(17.20)	(58.02)	(61.89)	(39.39)
Neighborhood danger	7.76	12.74 [abc]	6.56 [ad]	7.54 [be]	4.71 [cde]
	(6.48)	(7.68)	(5.50)	(5.64)	(4.45)
Economic stress	3.18	3.05 [ab]	3.23 [a]	3.20	3.22 [b]
	(0.70)	(0.66)	(0.73)	(0.71)	(0.69)
Social support	0.00	0.02	0.01	-0.01	0.00
	(0.44)	(0.42)	(0.40)	(0.46)	(0.41)
Culture					
Neighborhood advantage	-0.20	-0.34 [ab]	-0.04 [ac]	-0.12 [bd]	-0.33 [cd]

Table 8 (continued)

	(0.49)	(0.38)	(0.38)	(0.57)	(0.44)
Neighborhood disadvantage	0.04	0.54 [abc]	0.06 [ade]	-0.11 [bdf]	-0.23 [cef]
	(0.49)	(0.50)	(0.30)	(0.44)	(0.33)
Covariates					
Child Characs.					
Race White	46.34%	26.87% [abc]	42.19% [ade]	53.31% [bd]	56.42% [ce]
Racial/ethnic min.	53.66%	73.13% [abc]	57.81% [ade]	46.69% [bd]	43.58% [ce]
Boy	50.48%	50.63%	52.31%	50.38%	49.44%
Age at assessment	65.60	66.34 [abc]	65.20 [a]	65.59 [b]	65.21 [c]
	(3.42)	(3.74)	(3.52)	(3.24)	(3.21)
Treatment group	50.21%	50.63%	58.46% [a]	46.54% [a]	49.44%
Household Characs.					
Avg. yearly income	$22,136	$19,053 [abc]	$22,384 [a]	$23,746 [b]	$22,228 [c]
	($12,523)	($11,459)	($12,117)	($13,620)	($11,670)
Par. ed. Less than H.S.	18.80%	14.58% [a]	25.62% [ab]	15.10% [bc]	22.94% [c]
H.S./GED	78.85%	82.64% [ab]	71.90% [ac]	83.67% [cd]	73.53% [bd]
College degree	2.35%	2.78%	2.48%	1.22%	3.53%
Mother stably married	31.28%	11.11% [abc]	31.40% [a]	36.73% [b]	40.59% [c]
Avg. children in house	2.55	2.55	2.51	2.54	2.57
	(1.15)	(1.27)	(1.24)	(1.11)	(1.17)

Table 9. Differences in Children's Functioning Across Urbanicity

	Achievement	**Internalizing**	**Externalizing**
	β	B	β
	(*SE*)	(*SE*)	(*SE*)
Small Urban	0.01 [a]	-0.33**	-0.35**
	(0.17)	(0.10)	(0.05)
Suburban	0.16	-0.32**	-0.20
	(0.15)	(0.10)	(0.06)
Rural	0.27† [a]	-0.34**	-0.36**
	(0.15)	(0.11)	(0.06)
Covariates:			
Racial/ethnic minority	0.07	-0.19*	-0.12
	(0.09)	(0.08)	(0.09)
Boy	-0.29**	-0.01	0.13†
	(0.09)	(0.06)	(0.07)
Age at assessment	-0.08	-0.01	-0.04
	(0.06)	(0.04)	(0.03)
Treatment group	-0.08	-0.08	-0.10
	(0.08)	(0.08)	(0.08)
Average income	0.00	-0.04	-0.04
	(0.05)	(0.05)	(0.04)
Average parental ed.	0.23***	-0.06	-0.01
	(0.05)	(0.05)	(0.04)
Mother stably married	0.08	-0.07	-0.14†
	(0.08)	(0.10)	(0.08)
Avg. children in house	-0.11*	-0.07†	-0.09*
	(0.05)	(0.04)	(0.04)

Note. *** p < .001 ** p < .01. * p < .05. † p < .10. Urbanicity dummy variables are compared to the reference group of large urban city. Within columns, shared superscripts indicate significant differences between urbanicity groups at p < .05 or p < .10 if followed by +.

Table 10. Differences in Community Characteristics Across Urbanicity

	Community Resources	Environmental and Family Stress				Community Culture	
	Resources	**Social Support**	**Danger**	**Financial Strain**	**Pollution**	**Advantage**	**Disadvantage**
	B (*SE*)	B (*SE*)	B (*SE*)	B (*SE*)	B (*SE*)	B (*SE*)	β (*SE*)
Small Urban	-1.80*** ^{ab}	0.01	-0.89*** $^{a+b+}$	0.28**	0.85** ^{a}	0.65* ^{a}	-0.91*** ^{a}
	(0.11)	(0.16)	(0.16)	(0.10)	(0.31)	(0.26)	(0.20)
Suburban	-1.12*** ^{ac}	-0.08	-0.67*** $^{a+c}$	0.26**	0.42† ^{b}	0.57* ^{b}	-1.21***
	(0.22)	(0.11)	(0.13)	(0.10)	(0.23)	(0.25)	(0.21)
Rural	-2.07*** ^{bc}	-0.10	-1.14*** $^{b+c}$	0.27**	-0.24* ^{ab}	0.15 ^{ab}	-1.44*** ^{a}
	(0.11)	(0.11)	(0.12)	(0.10)	(0.11)	(0.19)	(0.17)

Note. *** p < .001 ** p < .01. * p < .05. † p < .10. Urbanicity dummy variables are compared to the reference group of large urban. Within column, shared superscripts indicate significant differences between urbanicity groups at p < .05 or p < .10 if followed by +.

Estimates are adjusted for all demographic covariates: child age at assessment, gender, average family income, average parental education, average number of children in the household, indicators for whether the child was a racial/ethnic minority, in the treatment group, and had parents that were stable married across waves of data collection.

Table 11. Standardized Coefficients for Significant Paths in Urbanicity–Achievement Mediation Model

Path	β	(*SE*)
Small urban → Resources	-1.81 [ab]	(0.04)
Suburban → Resources	-1.11 [ac]	(0.04)
Rural → Resources	-2.09 [bc]	(0.05)
Small urban → Danger	-0.88 [d]	(0.16)
Suburban → Danger	-0.68 [e]	(0.12)
Rural → Danger	-1.15 [de]	(0.11)
Small urban → Financial strain	0.29	(0.11)
Suburban → Financial strain	0.25	(0.08)
Rural → Financial strain	0.28	(0.09)
Small urban → Pollution	0.84 [f]	(0.32)
Suburban → Pollution	0.41 [g]	(0.20)
Rural → Pollution	-0.27 [fg]	(0.08)
Resources → Hassles	0.17	(0.04)
Financial strain → Hassles	0.27	(0.04)
Small urban → Negative parenting	-0.25†	(0.14)
Suburban → Negative parenting	-0.26	(0.13)
Rural → Negative parenting	-0.34	(0.13)
Danger → Negative parenting	0.11	(0.04)
Pollution → Negative parenting	-0.13	(0.03)
Hassles → Negative parenting	0.14	(0.03)
Pollution → Achievement	-0.12	(0.04)
Negative parenting → Achievement	-0.12	(0.04)

Note: Only significant paths ($p < .05$) are listed above except for paths between urbanicity and outcomes, in which case all urbanicity dummy variables are listed and non-significant relations are indicated with NS after the coefficient or † if significant at $p < .10$.

Urbanicity dummy variables are compared to the reference group, large urban. Within urbanicity categories, shared superscripts denote significant differences between urbanicities at $p < .05$ or $p < .10$ if followed by +.

Table 12. Standardized Coefficients for Significant Paths in Urbanicity–Behavior Mediation Model

Path	B	(SE)
Small urban → Resources	-1.81 [ab]	(0.10)
Suburban → Resources	-1.11 [ac]	(0.21)
Rural → Resources	-2.09 [bc]	(0.11)
Small urban → Danger	-0.88 [d]	(0.16)
Suburban → Danger	-0.68 [e]	(0.12)
Rural → Danger	-1.15 [de]	(0.11)
Small urban → Financial strain	0.29	(0.11)
Suburban → Financial strain	0.25	(0.08)
Rural → Financial strain	0.28	(0.09)
Small urban → Pollution	0.84 [f]	(0.32)
Suburban → Pollution	0.41 [g]	(0.20)
Rural → Pollution	-0.27 [fg]	(0.08)
Small urban → Neighborhood advantage	0.64 [h]	(0.22)
Suburban → Neighborhood advantage	0.53 [i]	(0.23)
Rural → Neighborhood advantage	0.09 NS [hi]	(0.17)
Small urban → Neighborhood disadvantage	-0.91 [j+k]	(0.18)
Suburban → Neighborhood disadvantage	-1.14 [j+]	(0.19)
Rural → Neighborhood disadvantage	-1.42 [k]	(0.15)
Danger → Perceived discrimination	0.26	(0.04)
Financial strain → Perceived discrimination	0.31	(0.04)
Resources → Hassles	0.16	(0.04)
Danger → Hassles	0.14	(0.06)
Financial strain → Hassles	0.25	(0.04)
Neighborhood advantage → Hassles	-0.11	(0.04)
Neighborhood disadvantage → Hassles	-0.16	(0.05)
Danger → Depression	0.21	(0.04)
Financial strain → Depression	0.30	(0.04)
Small urban → Over-reactive discipline	-0.40 [lm+]	(0.12)
Suburban → Over-reactive discipline	-0.19 NS [l]	(0.12)
Rural → Over-reactive discipline	-0.20 NS [m+]	(0.13)
Hassles → Over-reactive discipline	0.36	(0.04)
Small urban → Negative parenting	-0.47	(0.13)
Suburban → Negative parenting	-0.38	(0.12)
Rural → Negative parenting	-0.45	(0.11)
Danger → Negative parenting	0.10	(0.04
Pollution → Negative parenting	-0.13	(0.03)
Hassles → Negative parenting	0.15	(0.03)
Discrimination → Internalizing	0.15	(0.04)

Table 12 (continued)

Depression ⟶ Internalizing	0.26	(0.04)
Over-reactive discipline ⟶ Internalizing	0.14	(0.04)
Discrimination ⟶ Externalizing	0.11	(0.05)
Hassles ⟶ Externalizing	0.33	(0.04)
Depression ⟶ Externalizing	0.15	(0.05)
Over-reactive discipline ⟶ Externalizing	0.14	(0.04)
Negative parenting ⟶ Externalizing	0.13	(0.03)

Note: Only significant paths ($p < .05$) are listed above except for paths between urbanicity and outcomes, in which case all urbanicity dummy variables are listed and non-significant relations are indicated with NS after the coefficient or † if significant at $p < .10$.

Urbanicity dummy variables are compared to the reference group, large urban. Within urbanicity categories, shared superscripts denote significant differences between urbanicities at $p < .05$ or $p < .10$ if followed by +.

APPENDIX B

FIGURES

INCOME ➡ CHILD DEVLOPMENT PATHWAYS

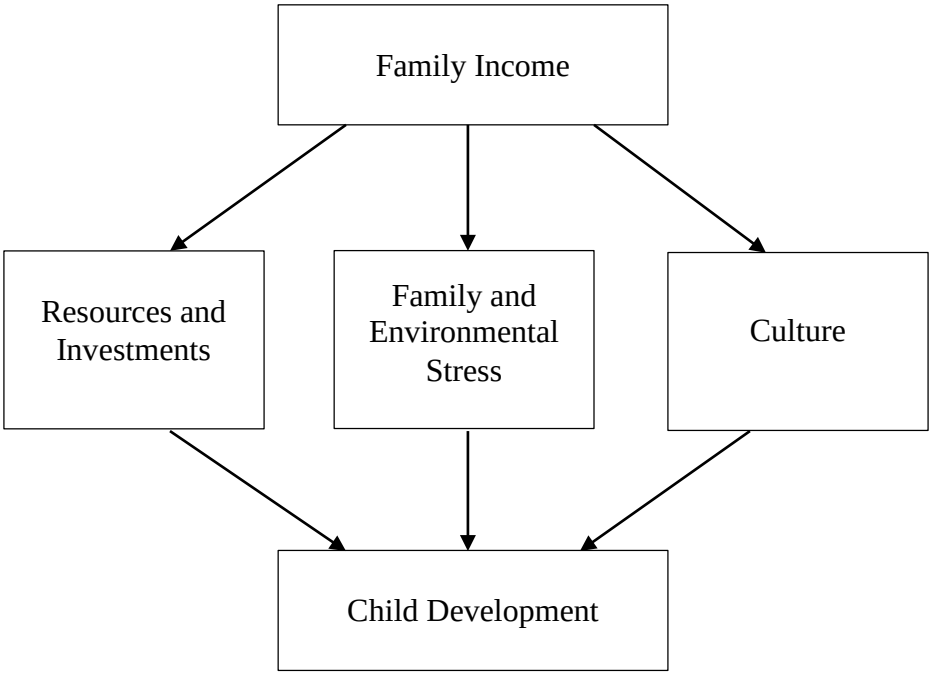
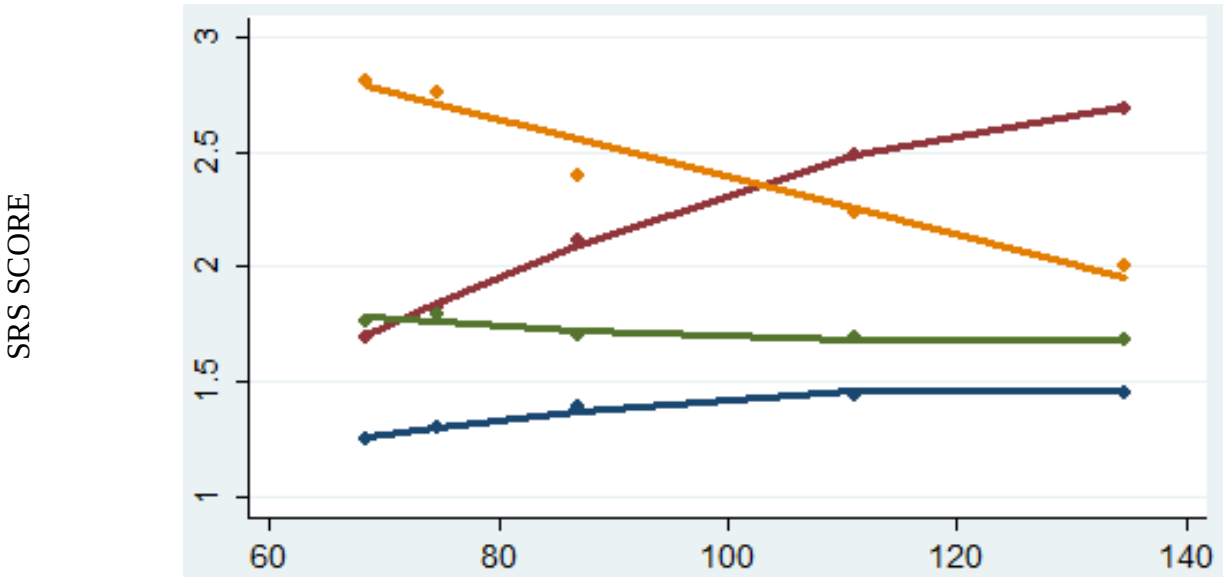


Figure 1. Theoretical Pathways of Income's Effects on Child Development



Group Percentages

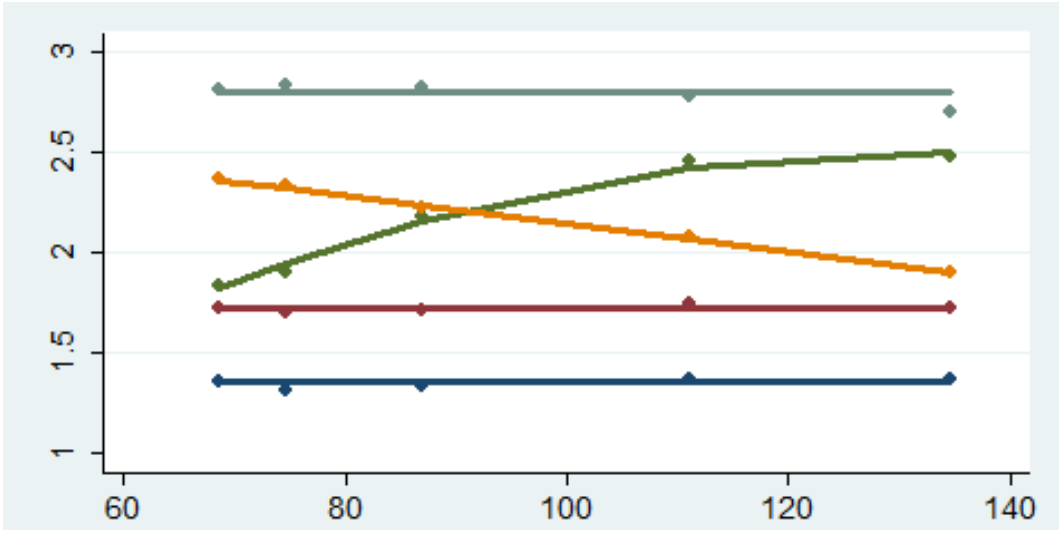
Group 1: Low-Stable – 49.92%

Group 2: Mid-Increasing – 7.21%

Group 3: Mid-Stable – 39.08%

Group 4: High-Declining – 3.78%

Figure 2. Internalizing Trajectory Groups



Group Percentages

Group 1: Low-stable – 36.12%

Group 2: Mid-stable – 33.46%

Group 3: Mid-increasing – 9.12%

Group 4: High-declining – 14.12%

Group 5: High-stable – 7.18%

Figure 3. Externalizing Trajectory Groups

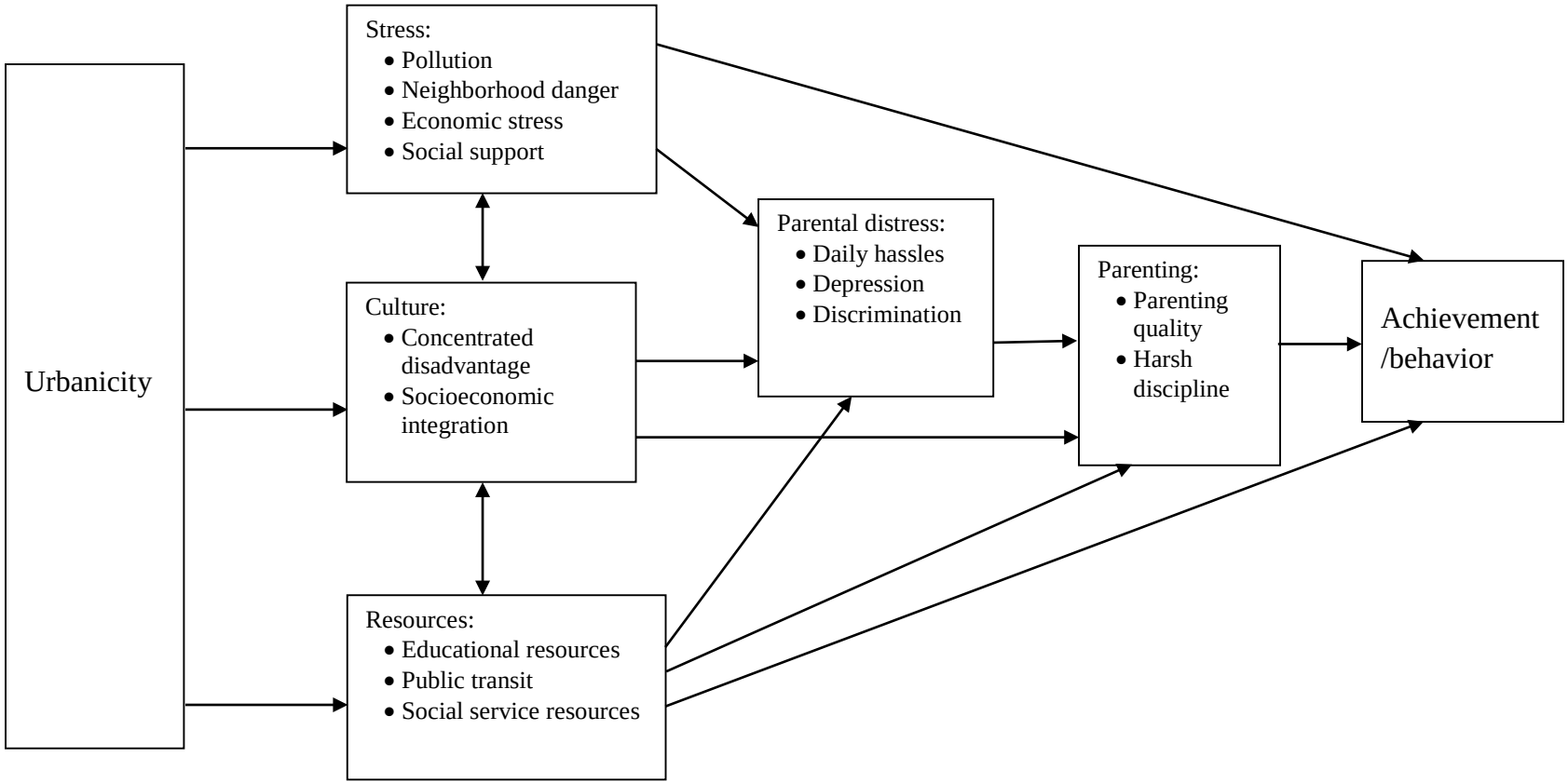
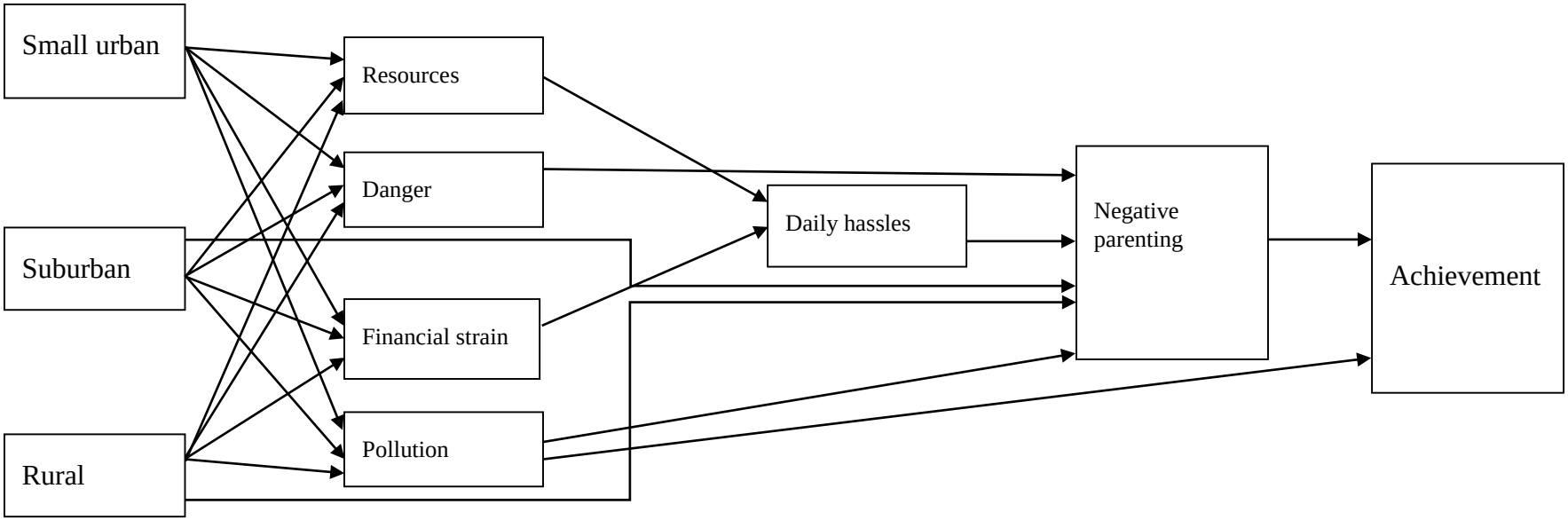
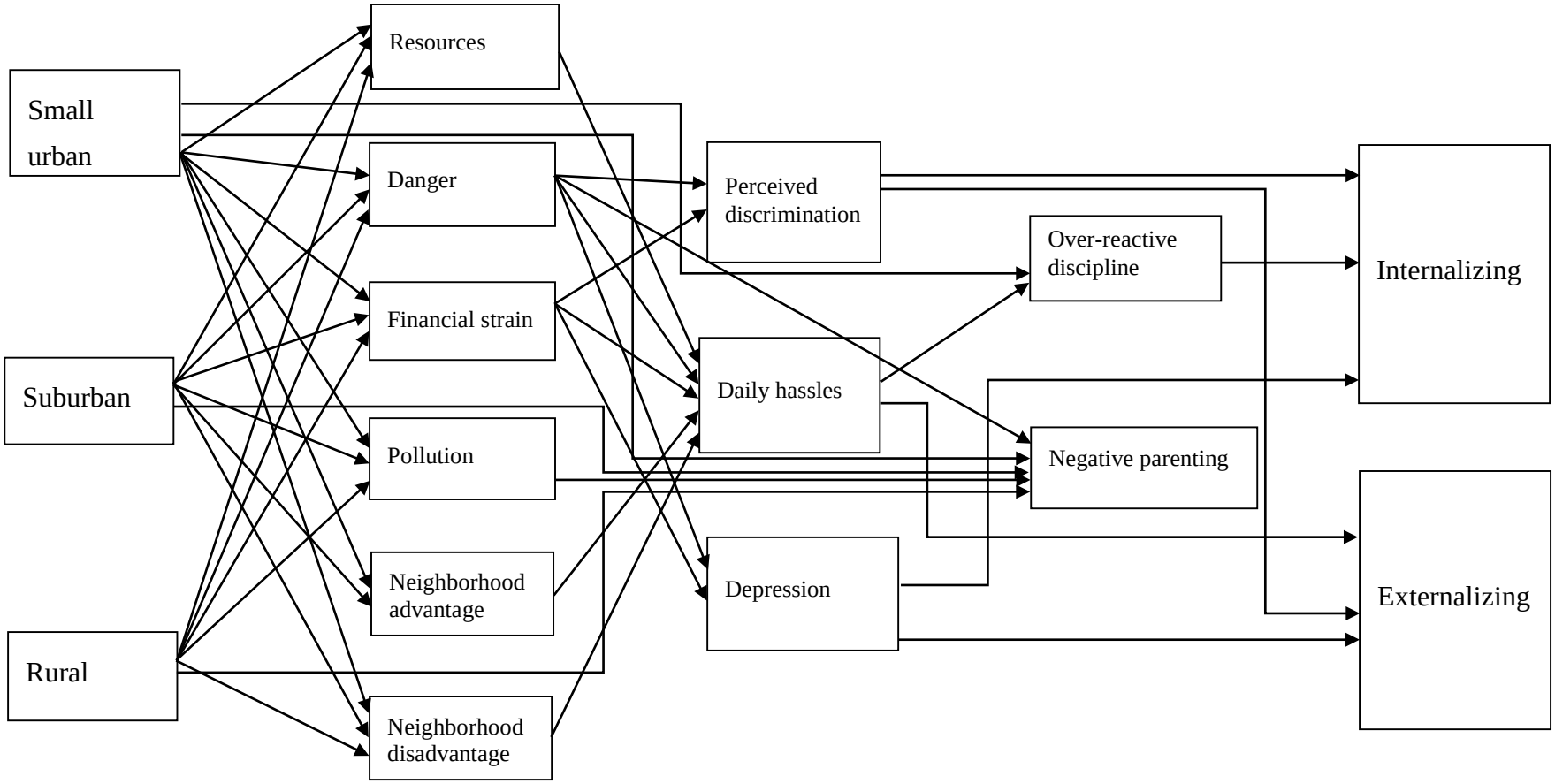


Figure 4. Conceptual Model of Urbanicity's Effects on Economically Disadvantaged Children's Functioning



Note. Arrows illustrate significant paths in final model. Standardized path coefficients are presented in Table 11. $\chi 2(53) = 57.50$, RMSEA = .01, CFI = .99, TLI = .99.

Figure 5. Mediation of Urbanicity's Relation to Achievement



Note. Arrows illustrate significant paths in final model. Standardized path coefficients are presented in Table 12. $\chi 2(136) = 141.20$, RMSEA = .01, CFI = 1.00, TLI = 1.00.

Figure 6. Mediation of Urbanicity's Relation to Behavior

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