ECOLOGICAL PREDICTORS OF SCHOOL SERVICE USAGE AND EARLY ACADEMIC SKILLS IN KINDERGARTEN CHILDREN WITH DEVELOPMENTAL DISABILITIES AND DELAYS

by

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DISSERTATION ABSTRACT

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Title: Ecological Predictors of School Service Usage and Early Academic Skills in Kindergarten Children with Developmental Disabilities and Delays

Young children with developmental disabilities and delays often require extra supports in the school environment, yet lag behind their typically developing peers on measures of academic success. However, little is known about factors that influence both the school service use and early academic skills of kindergarten-age children with developmental delays and disabilities. A better understanding of the predictors of school service use and early academic skills for this population of children could inform the development of effective early intervention efforts to increase positive school outcomes. This study examined factors that predict the special service use in school and early academic skill of children identified with a developmental disability or delay prior to school entry.

Results from this study found that children identified with a developmental disability or delay prior to school entry utilized a range of school-based services in kindergarten. In addition, over half of the children in this study demonstrated below average achievement at the end of kindergarten. A significant association between family background and child school readiness was found, such that increased risk factors in the home environment predicted poor school readiness skills. Direct effects were also

found between child school readiness and school-based service use and early academic skills, indicating that readiness to transition to formal education can influence school-based service use and academic achievement in kindergarten. Finally, an indirect effect on early academic skills by child school readiness as mediated by school-based services was found. This finding demonstrates that the additional supports young children with development disabilities and delays receive at school can positively impact their achievement in kindergarten.

This study demonstrates that young children with developmental delays and disabilities and their families could benefit from early intervention services that stress the development of school readiness skills. Such services may decrease the risk of poor school outcomes for this population of children who tend to be at risk of academic failure. Additionally, findings have implications for intervening at the school level, as results found that school-based services are an important part of bolstering the early academic success of young children with developmental delays and disabilities.

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CHAPTER I

INTRODUCTION

Developmental disabilities are cognitive, physical, psychological, speech, language, or self-care deficits that typically originate in childhood and tend to be chronic in nature (Yeargin-Allsopp, Murphy, Oakley, & Sikes, 1992). Such disabilities affect a considerable number of children in the United States. According to Boyle and colleagues (2011), approximately 10 million children aged 3 to 17 display some type of developmental disability. This represents a 17% increase in the prevalence of developmental disabilities over the last 12 years. Among preschool-age children, common disabilities include speech problems and developmental delays (Blanchard, Gurka, & Blackman, 2006). The most common forms of disability seen in school-age children include learning disabilities, attention-deficit/hyperactivity disorder, and behavior problems.

The research examining outcomes for young children identified with developmental disabilities is limited, but suggests they tend to experience an array of problems throughout childhood and into adulthood. For instance, behavioral disorders are common and persistent among young children with developmental delays and disabilities (Emerson, 2003; Green, O'Reilly, Itchon, & Sigafoos, 2005). Baker and colleagues (2003) determined that approximately three times as many young children with developmental delays demonstrate clinical level behavior problems when compared to their typically developing peers. In addition, many children diagnosed with developmental delays prior to school entry require special education services through the age of 16 (Dale, Jenkins, Mills, & Cole, 2005; Mills, Dale, Cole, & Jenkins, 1995). As

these children reach adulthood, Keogh and colleagues (2004) found they generally do not outgrow developmental disabilities, but continue to struggle. Thus, research demonstrates that developmental disabilities identified in young children tend to be associated with subsequent delays in adult functioning (Beadle-Brown et al., 2000; Bernheimer, Keogh, & Guthrie, 2006; Dale, Mills, Cole, & Jenkins, 2003). Given the high prevalence rates and negative outcomes associated with developmental delays and disabilities in children, it is important to gain a better understanding of how best to intervene with this population to prevent later problems. One way to learn how to intervene and improve outcomes may be to better understand the impact that family factors have on the school readiness of young children with development delays and disabilities, as well as how school readiness and teacher factors influence school outcomes for these children. Given the increasing importance of school success on positive long-term outcomes, it is crucial to gain a more thorough understanding of the early school achievement of young children with developmental disabilities and delays. Therefore, this study will examine ecological factors that influence the school-based service usage and early academic skills of children identified with a developmental disability or delay prior to school entry.

Developmental Disability and School-Based Services

As mandated by the Individuals with Disabilities Act (IDEA), all young children diagnosed with a developmental disability are eligible to receive early intervention services and supports. These services often consist of family training, technology services, counseling, home visits, medical services, nutrition services, occupational therapy, social work, psychological support, special education, speech and language

services, audiology, and vision services (Ramey, Ramey, & Lanzi, 2007). In general, results regarding the effectiveness of early intervention are quite variable. Lazar and colleagues (1982) found that intellectual gains made by children receiving early intervention services dissipated after three years in school and academic gains did not endure beyond six years. In contrast, Campbell and Ramey (1994) demonstrated that early intervention had positive effects on children's cognitive development and academic achievement through the age of 12. Even to date, no formal reporting mechanisms or systems of review exist to evaluate the outcomes for children engaging in early intervention programs. As a result, little is known about the long-term outcomes of young children identified with developmental disabilities.

While limited research has examined the school outcomes of young children with a developmental delay or disability, preliminary evidence suggests these children tend to require special services throughout their school careers. For instance, both Delgado (2009) and Mills et al. (1995) found that approximately 66% of children who had received early intervention services for a developmental disability continued to receive special education services at the age of 9. Similarly, Dale and colleagues (2005) found that over 60% of these children received special education services at age 12 and 61% at age 16. In a longitudinal study of preschool-age children identified with a developmental delay, Delgado, Vagi, and Scott (2006) concluded that 74% of these children continued to receive special education services in the third grade. These results are consistent with the notion that poor achievement at a young age often leads to placement in special education during subsequent schooling.

In addition to the effects of special education services at the individual child level, it is important to consider the cost to schools of providing these services. Research has found that special education supports are more costly to deliver than general education and that local school districts often contribute the majority of funding necessary to provide these services (Chambers, Parrish, & Harr, 2002). Although not all kindergarten-age children with disabilities are provided with special education (Hebbeler et al., 2007), young children with developmental disabilities and delays tend to exhibit more behavior problems (Baker et al., 2003; Emerson, 2003) and lower academic skills (Hocutt, 1996) than their typically developing peers. Thus, these children may still be provided with extra school-based supports that are more costly to schools than general education alone. Therefore, research to help clarify the number and type of school-based services used by children with developmental disabilities and delays and the factors that predict service use may be important in developing and utilizing early intervention programs that reduce the costs associated with educating these students.

Developmental Disability and Early Academic Skills

Although legislation and policy require schools to provide students with disabilities access to the most appropriate and least restrictive curriculums and environments (IDEA, 2004; President's Commission on Excellence in Special Education, 2002), few studies have investigated the development of academic skills in this population of children. Instead, much of the existing research has focused on how various instructional and placement strategies influence the academic success of students with disabilities. For example, Carlberg and Kavale (1980) found that children with intellectual disabilities performed equally well in special placement and general

education classrooms, while children with learning or behavioral disorders performed somewhat better in special placements. Madden and Slavin (1983) concluded that children with disabilities performed best academically when instruction in general education classrooms was supplemented by special education programs. More recent research examining the effects of inclusive settings on the academic skills of children with developmental disabilities has produced equivocal results. While Walther-Thomas (1997) found the academic success of students with disabilities in general education classrooms was equivalent to that of students in special placements, Vaughn and colleagues (2001) found unsatisfactory outcomes for these students in inclusive classrooms. Overall, Hocutt (1996) concluded that, regardless of instructional intervention, children with disabilities generally perform below their non-disabled peers on academic measures. This finding was also supported by Kemp and Carter (2006) in their study of the academics of young students with disabilities in general education classrooms.

Overall, the above-mentioned research seems to indicate that children with developmental disabilities and delays tend to lag behind their typically developing peers on measures of academics. However, it says little about which factors, beyond inclusive versus special education, may influence success in this population. A broader understanding of the conditions that affect the acquisition of early academic skills in young children with disabilities is important for several reasons. First, as children transition to kindergarten, requirements placed on them by formal education are often more demanding than home and preschool expectations. For example, kindergarten has explicit goals for literacy, numeracy, and socialization (Haines, Fowler, Schwartz,

Kottwitz, & Rosenhoetter, 1989). As demonstrated by McIntyre, Blacher, and Baker (2006), children with disabilities often experience difficulties adapting to the academic and behavioral expectations placed on them in kindergarten, which may put them at risk for continued school failure. Early school struggles may be particularly detrimental to later success, as research has shown that achievement within the first two years of school is crucial to positive outcomes in elementary school and beyond (Gutman, Sameroff, & Cole, 2003; McClelland, Acock, & Morrison, 2006). In addition, both the pacing of instruction and emphasis on academic performance is heightened during middle and high school (Deshler & Schumaker, 2006; Wagner, Newman, Cameto, Levine, & Marder, 2003). Consequently, young children with disabilities who struggle to master early academic skills, such as the basics of literacy and numeracy, may not only continue to experience challenges in elementary education, but may fall even farther behind their typically developing peers. Therefore, it is important to gain a more complete understanding of the factors that influence the development of early academic skills in young children with development disabilities, as this could inform effective early intervention strategies to prevent academic hardship in this population.

Ecological Framework for Understanding School Success

Sameroff and Seifer (1990) argued the study of children's adjustment should be embedded within the ecological factors to which children are often exposed. From this perspective, children's success in school occurs within and is influenced by multiple ecological systems (Bronfenbrenner & Morris, 1998; Pianta & Walsh, 1996). For instance, Pianta and Harbers (1996) found that mother-child interactions strongly predict academic achievement for children at grades 2, 3, and 4. For older children, the work of

Stormshak and colleagues (2011) demonstrates that family-centered approaches to intervention in schools significantly reduce children's antisocial behavior and drug use throughout adolescence. While the above research contributes to an ecological understanding of typically developing children's school success across developmental periods, little is known about the factors that influence success in school for young children with developmental disabilities and delays. As is noted above, since children identified with developmental delays and disabilities tend to lag behind their non-disabled peers in school (Hocutt, 1996), more knowledge concerning this topic could inform the development of effective intervention efforts to increase positive school outcomes for these children. The following sections highlight a number of ecological factors that may be particularly salient for the school success and/or failure of children with developmental disabilities.

Ecological Factors Contributing to School Success

Family-level factors.

Socioeconomic status. A longstanding tradition of research has examined the relationship between socioeconomic status (SES) and children's school readiness. As demonstrated by Duncan and Magnuson (2005), SES accounts for a significant amount of the difference in children's school readiness outcomes. Children with more risk factors, including economic disadvantage, are more likely to have lower cognitive, literacy, and social skills than their more affluent peers (NICHD Early Child Care Research Network, 2005). In addition, a meta-analysis by Sirin (2005) found that students from lower SES backgrounds showed reduced academic achievement. Given the link between SES and deficits in school readiness, it is not surprising that children from low-income

backgrounds are overrepresented in special education (Duncan & Brooks-Gunn, 1997). Another factor in this overrepresentation may be that teachers are more likely to refer low-income students for special education services (Grossman, 2002). Poverty is also a significant predictor of disability status (Fujiura & Yamaki, 2000); research estimates that 35% of families with young children with disabilities are living in low-income conditions (Bowe, 1995; Guralnick, 1998). Thus, links between SES and school readiness are particularly pertinent for children with developmental disabilities. Overall, past research suggests family SES can significantly impact a child's readiness to successfully transition to the demands of kindergarten and that this association may be particularly important for young children with developmental disabilities and delays.

Education level. Parent education has been shown to be significantly associated with the school readiness and early academic success of children (Rauh, Parker, Garfinkel, Perry, & Andrews, 2003; Rouse & Fantuzzo, 2009). While parent education is strongly related to income level, Davis-Kean (2005) highlights its unique influence on parental beliefs and behaviors tied to children's academic skill. In particular, Ramey and Ramey (1998) found that children whose mothers have low levels of education often demonstrate impairments in cognitive skills critical to school readiness. Children born to parents with low education levels are also at increased risk for both early school difficulties (U.S. Department of Education, 2000) and developmental disabilities and delays (Campbell et al., 2003; Chapman, Scott, & Mason, 2002; Hollomon, Dobbins, & Scott, 1998). Thus, research suggests that parent education levels may significantly impact children's school readiness skills.

Prenatal drug use. A longstanding body of research has documented that children exposed to drugs while in utero often display cognitive and learning difficulties that impair their readiness for school (Aronson & Hagberg, 1998; Mattson, Riley, Gramling, Delis, & Jones, 1998). A number of researchers have found prenatal alcohol exposure to be associated with learning problems, low cognitive abilities, and deficits in academic achievement (Goldschmidt et al., 1996; Streissguth, Barr, & Sampson, 1990). Additional research has also found that prenatal marijuana use predicts poor academic success and teacher evaluations (Goldschmidt, Richardson, Cornelius, & Day, 2004). Prenatal exposure to drugs is often associated with neurodevelopmental abnormalities that are expressed as developmental disabilities, delays, and learning disorders (Stratton, Howe, & Battaglia, 1996). For instance, in their sample of children exposed to prenatal alcohol, Streissguth, Barr, Kogan, and Bookstein (1996) found that 40% had received special education services and 65% had received remedial support in reading and mathematics. Research related to prenatal drug exposure clearly demonstrates the negative impacts of a mother's drug use on a child's development of skills critical to school readiness.

In summary, children exposed to multiple risk factors, such as socioeconomic disadvantage, low parent education, and drug use, may not develop adequate early cognitive and, thus, school readiness skills. This is particularly detrimental for young children with developmental disabilities and delays, as they are more likely than their typically developing peers to struggle with the transition to kindergarten (McIntyre et al., 2006). A better understanding of how family risk factors impact the school readiness of

children with developmental delays and disabilities may provide valuable information regarding how to best help these children enter school ready to learn.

Child-level factors.

Cognitive ability. Past research demonstrates a strong link between cognitive ability and academic achievement. Intelligence tests were originally developed by Alfred Binet specifically to assess children's school success (Neisser et al., 1996). Since this time, research has consistently found cognitive ability to be significantly correlated with academic achievement (Deary, Strand, Smith, & Fernandes, 2007; Jensen, 1998; Kuncel, Hezlett, & Ones, 2004). In particular, Rohde and Thompson (2007) found the correlation between general cognitive ability and academic achievement to be approximately .50. Thus, while there is a considerable amount of shared variance between intelligence and academics, room remains to investigate other explanatory variables. Given that research suggests children's general cognitive ability may strongly impact their academic success, it seems likely that cognitive ability is also associated with the provision of school-based services.

Early literacy skills. The relationship between early literacy skills and later achievement has been well documented by research (Catts, Fey, Zhang, & Tomblin, 2001; Duncan et al., 2207; Scanlon & Vellutino, 1996; Snow, Tabors, Nicholson, & Kurland, 1995). Duncan and colleagues (2007) found early literacy skills to be predictive of long-term reading and math achievement. Unfortunately, children who struggle to acquire early reading and language skills are often at risk of continued academic failure throughout school (Chatterji, 2006). This may be particularly important for children with developmental disabilities and delays, as they are more likely than their typically

developing peers to have language impairments that impede the acquisition of early literacy abilities (Wise, Sevcik, Lovett, Morris, & Wolf, 2007). For example, as Thatcher and colleagues (2008) posit, children with communication disorders often struggle to master the academic demands of school. These children are likely to exhibit subsequent deficits in important academic abilities (Nation, Clark, Marshall, & Durand, 2004). Thus, the acquisition of literacy skills prior to kindergarten entry may influence the academic success and special education placements of young children with developmental disabilities and delays.

School adjustment. Adjustment to the social and behavioral demands of school has been linked to academic skill in kindergarten and beyond, even when controlling for cognitive ability (DiPerna, Lei, & Reid, 2007; Howse, Calkins, Anastopoulos, Keane, & Shelton, 2003; McClelland et al., 2006). As such, children with poor school adjustment tend to struggle in the classroom environment. Little is known about the school adjustment behaviors of young children with developmental disabilities and delays. In a small study of elementary school students, Kemp and Carter (2006) found that on-task behavior in the classroom was problematic for children with disabilities during whole group instruction. This finding was also replicated with middle and high school students (Carter, Sisco, Brown, Brickham, & Al-Khabbaz, 2008). McIntyre et al. (2006) found that young children with intellectual disabilities struggled to adapt to kindergarten expectations. Overall, these studies suggest that children with developmental disabilities may struggle to adjust to the school environment, which may lead to them receiving more services and having poor academic outcomes.

Teacher-level factors.

Teaching experience. Research often associates expertise in a skill or subject with years of practice (e.g., Simon & Chase, 1973; Sternberg, 1998). Not surprisingly, years of experience in the classroom has been shown to be associated with the academic success of students. For example, Hawkins, Stancavage, and Dorsey (1998) found that students who were taught by teachers with more than five years of experience outperformed students of less experienced teachers. Similarly, Fetler (1999) demonstrated that number of years spent teaching was positively related to academic achievement. More experienced teachers also tend to endorse greater levels of teaching self-efficacy related to competence in instructional and classroom management skills (Wolters & Daugherty, 2007). Given this body of research, one might expect teaching experience to be related to the classroom success of children with developmental disabilities and delays.

Teacher beliefs. Teachers' beliefs are important components in maintaining effective classroom environments and promoting student achievement. For instance, Archambault and colleagues (2012) found the more teachers endorsed high and efficacious expectations, the better students achieved academically. Burts et al. (1993) also found that kindergarten students from classrooms where teachers enacted developmentally appropriate beliefs demonstrated higher reading achievement in first grade than students from less appropriate classrooms. The link between teacher beliefs and school success may be particularly important for students with developmental disabilities, as teachers do not always hold positive attitudes about the inclusion of disabled students in general education classrooms. Specifically, teachers tend to be more

inclusive toward students with physical and sensory disabilities, but less inclusive of children with learning difficulties (Lindsay, 2007; Ward, Center, & Bochner, 1994). Thus, teachers' beliefs about developmentally appropriate practices may be an important determinant of the academic skills of children with developmental disabilities.

Classroom literacy activities. Research has highlighted the importance of teachers' use of developmentally appropriate practices in literacy instruction to support the early reading and language skills of children. The National Association for the Education of Young Children found kindergarten reading instruction to be most successful when it promoted phonological awareness, alphabetic principle, vocabulary, and contextualized reading activities (NAEYC, 1998). Unfortunately, research seems to suggest a lack of focus on developmentally appropriate literacy activities when teaching children with developmental disabilities and delays (Katims, 2000; Kliewer, 1998; Kliewer, Biklen, & Kasa-Hendrickson, 2006). Studies examining the quality of literacy instruction have also found consistently low to intermediate quality use of instructional techniques that effectively promote literacy and language development (Justice, Mashburn, Hamre, & Pianta, 2008; La Paro, Pianta, & Stuhlman, 2004). This may be detrimental to children, as the acquisition of early literacy skills has been linked to long-term school success (Chatterji, 2006). Overall, past research suggests that developmentally appropriate literacy instruction may have significant impacts on the academic achievement and service placement of young children with developmental delays and disabilities.

Service Use as a Mediator of Academic Achievement

Given that past research demonstrates strong links between family background and child school readiness, as well as associations between child and teacher factors and special services and early academic success, service usage might be expected to mediate the relationship between child and teacher factors and academic outcomes. Research supports the notion that school-based services impact the academic success of students with disabilities. For example, Hanushek, Kain, and Rivkin (1998; 2002) have repeatedly demonstrated that special education programs significantly boost the academic achievement of students with disabilities. Fuchs and Fuchs (1995) have shown special school-based services often provide unique instructional possibilities, such as individualized instruction and access to highly trained teachers, not available in most general education classrooms. Recent work examining the effectiveness of school-based interventions in increasing the academics of children with disabilities has also found associations between early entry into special services and increased academic success for this population (Cavanaugh, Kim, Wanzek, & Vaughn, 2004; Ehrhardt, Huntington, Molino, & Barbaresi, 2013).

Although positive associations have been found between school-based services and academics for students with disabilities, these results are not conclusive. In one of the first comprehensive studies examining academic outcomes for students with disabilities, Carlberg and Kavale (1980) found that special education services were only somewhat effective for students with mild disabilities and were not effective for students with severe difficulties. More recent investigation has concluded that special education placement subsequent to preschool predicts decreased long-term academic success (Dale

et al., 2005; Jenkins et al., 2006). These results are consistent with the hypothesis that early school failure leads to subsequent special education placement and continued poor academic achievement, as well as the hypothesis that extended time in special education limits academic growth (Dale et al., 2005). In sum, while associations have been found between placement in school-based services and academic success, the strength and direction of these associations remains equivocal. As stated by Dale et al. (2005), placement in school-based services is potentially both an outcome measure and casual factor in academic skill, making associations between these two variables difficult to interpret.

Given the elusive nature of the relationship between school-based services and academic success, this is an important area for further investigation. It is also important to determine if early ecological factors influence academic outcomes, though their influence on service usage. If so, intervening on these factors earlier might both decrease service usage, saving schools resources, and increase academic success. Additionally, results could clarify early service use as an effective method for increasing the academic success of students with disabilities. Alternatively, results may demonstrate that, at a young age, ecological factors (e.g., teacher experience, socioeconomic status) are more influential than school services in altering the early academic skill of students with developmental disabilities and delays. In the latter case, school services are likely still a critical and valuable component of school success; however, it may be that interventions targeting children's context are an equally important factor in the early development of academic skills for young children with developmental disabilities and delays. Either finding is an important step toward identifying effective early interventions for increasing

the academic success of students with disabilities, potentially altering their long-term school success.

Summary

While young children with developmental disabilities and delays are likely to lag behind their non-disabled peers on measures of academic success (Hocutt, 1996), little is known about the factors that influence both school service usage and early academic skills in this population of children. Research has shown that multiple individual, family, and teacher contexts significantly impact child development (Bronfenbrenner & Morris, 1998; Pianta & Walsh, 1996). Therefore, gaining a better understanding of the ecological predictors of service usage and early academic skills for young children with developmental delays and disabilities could inform the development of effective early intervention efforts to increase positive school outcomes for these children.

Study Purpose

This study examined factors that predict special service usage in school and early academic skills of children identified with a developmental disability or delay prior to school entry. This study was guided by the following research questions:

1. What types and how many school-based services are children with developmental disabilities and delays using at the end of kindergarten? It was hypothesized that these children would utilize a range of school-based services, with most children utilizing at least one service.
2. How well are children with a developmental disability or delay achieving on early measures of academic skill at the end of kindergarten? Overall, it was

hypothesized that most children in this study would perform below standards on early measures of academics. Two possibilities were further clarified. Children with developmental disabilities and delays receiving the most school-based services may perform better on early academic measures when compared to children with developmental disabilities and delays receiving fewer services, as additional school support may bolster these academic skills. In contrast, those children with developmental disabilities and delays demonstrating the most trouble with early academic skills may require the most school-based services. As such, more school support may be related to lower skill in early academics.

3. What ecological factors predict the number of school-based services used by children with developmental disabilities and delays at the end of kindergarten? Because of the associations between pre-existing family factors and child skills, it was hypothesized that family factors would predict child skills, but would not directly predict school-based service usage. In turn, it was hypothesized that lower cognitive ability, lower early literacy skills, and lower school adjustment would predict increased service use in school. It was also hypothesized that lower levels of teacher experience, lower endorsement of developmentally appropriate teaching beliefs, and lower endorsement of developmentally appropriate literacy activities would predict increased service use in school.
4. Does school-based service usage mediate the relationship between child and teacher factors and academic skill at the end of kindergarten for children with developmental disabilities and delays? Given the equivocal nature of past research findings regarding the association between school services and academic

skills, two alternative outcomes were possible. First, school-based service usage may mediate the relationship between child and teacher factors and academic skill, with a significant indirect path from these factors to academic skill through service utilization. Alternatively, school services may not mediate the relationship between child and teacher factors and academic skill; therefore, no indirect path between these factors and early academics would be found. In this circumstance, it was hypothesized that contextual variables operating in the lives of young children with developmental disabilities and delays would be the primary contributors to the early academic skill of these children.

CHAPTER II

METHODS

Participants

This study utilized existing data from a longitudinal, multi-wave randomized efficacy trial conducted at the Oregon Social Learning Center (Kids in Transition to School – Early Childhood Education Program [KARES]). The research project was funded by a grant from the National Center on Special Education, Institute of Education Sciences, Department of Education (R324A080026) awarded to the Principal Investigator Dr. Katherine Pears. The KARES intervention was designed to enhance the psychosocial and school readiness of children with developmental disabilities and delays and co-occurring behavior problems as they entered kindergarten. Participants in this study were 101 children (24 females) in Early Childhood Special Education (ECSE) who were randomly assigned to the control condition (services as usual) of the KARES intervention. A total of 68.3% of the participants were European American, 13.9% were Hispanic or Latino, 12.9% were mixed ethnicity, 2.0% were African American, 2.0% were Native American, and 1.0% were Asian American. The mean age of the children in this study was 5.28 years (SD = 0.28). Of the participants, 57.4% were identified with a developmental delay, 32.7% with a communication delay, and 9.9% with autism. Eligibility requirements for this study included: child was a monolingual or bilingual English speaker, child was receiving ECSE services, and child was beginning kindergarten in the fall. Children recruited for this study were also identified by their ECSE service coordinators as experiencing behavioral or social difficulties likely to interfere with a successful kindergarten transition.

Participants in this study were enrolled in a total of 19 public school districts, 4 alternative schools, 4 private schools, and 1 home school throughout the data collection period (summer 2008 through spring 2012). For all public school districts, the average percentage of students eligible for free and reduced lunch (FRL) throughout the data collection period was 51.29%. The average FRL rate for all districts during the 2008-2009 school year was 45.27%. For the 2009-2010 school year the average FRL rate was 50.72%, for the 2010-2011 school year the average FRL rate was 53.28%, and for the 2011-2012 school year the average FRL rate was 55.88%. From 2008 through 2012, FRL rates for all school districts ranged from a low of 8% to a high of 72%. Overall, 41.18% of study participants were enrolled in school districts with average FRL rates below 50% and 58.82% of participants were enrolled in school districts with average FRL rates above 50%.

The average total student body for all school districts throughout the data collection period was 7794. The average number of students enrolled in all districts during the 2008-2009 school year was 11,160. For the 2009-2010 school year the average enrollment was 11,090, for the 2010-2011 school year average enrollment was 11,411, and for the 2011-2012 school year average enrollment was 11,852. From 2008 through 2012, the number of students enrolled in all school districts ranged from a low of 75 to a high of 83,852. In summary, 64.71% of study participants were enrolled in school districts with average enrollment below 5,000 students and 35.29% of participants were enrolled in school districts with average enrollment above 5,000 students.

Procedure

All study procedures were approved by the institutional review board of the research center at which the study was conducted. Each child's caregiver was contacted, via a home visit, to explain the study and request consent for the child to participate. The summer before kindergarten entry, trained assessors evaluated the children's cognitive abilities and early literacy skills. Also during this time, caregivers provided information regarding their family's income level, education level, and prenatal drug use. During the fall of the children's kindergarten year, classroom teachers reported on their teaching experience, beliefs about instruction, and classroom literacy activities. Teachers also reported on children's school adjustment behaviors. At the end of the kindergarten year, classroom teachers provided information about the number and types of school services received by each child in the study. Also at this time, trained assessors evaluated the early academic skills of the children in this study.

Measures

This section describes each of the measures used in this study. Copies of measurement tools can be found in the Appendix.

Family measures.

Socioeconomic status. Family socioeconomic status was assessed using the following question answered by primary caregivers: "Which represents your gross annual household income?" Annual income was categorized on a 12-point scale, ranging from less than $4,999 to greater than $100,000.

Education level. The education level of primary caregivers was assessed using the following question answered by primary caregivers: "Which represents the highest

grade you completed in school?" Education level was categorized on a 14-point scale, ranging from less than 6th grade to graduate degree.

Prenatal drug use. Overall level of prenatal drug use was measured by asking primary caregivers whether the child's biological mother used the following drugs during pregnancy: caffeine, tobacco, alcohol, marijuana, and other. Respondents could answer *yes* or *no*. Number of drugs used during pregnancy was summed to create a variable measuring total drug use.

Child measures.

Cognitive ability. The general cognitive ability of children in this study was measured prior to kindergarten entry using raw scores from the Block Design and Vocabulary subscales of the Wechsler Preschool and Primary Scales of Intelligence – Third Edition (WPPSI-III; Wechsler, 2002). The Block Design subscale measures a child's ability to analyze visual information, while the Vocabulary subscale primarily assesses a child's word knowledge. The Block Design subscale (r = .89) and Vocabulary subscale (r = .84) are strongly correlated with the Full Scale IQ (Wechsler, 2002). Both subscales were correlated and averaged to create a mean score of general cognitive ability.

Early literacy skills. Raw scores from the Concepts About Print Test (CAP; Clay, 2000) were used to measure the literacy skills of children in this study prior to school entry. This individually administered test assesses a child's understanding of print concepts such as book orientation, print direction, letters, words, and punctuation. It includes 24 items, scored as either correct or incorrect. CAP has been found to be a

reliable and valid measure for evaluating young children's knowledge regarding print concepts (Clay, 2005).

School adjustment. Scores from the School Adjustment Behavior subscale of the teacher-report Walker-McConnell Scale of Social Competence and School Adjustment (SSCSA; Walker & McConnell, 1995) were used to measure the school adjustment behaviors of children in this study during fall of kindergarten. The School Adjustment Behavior subscale is comprised of 10 items measuring behavioral and social classroom competencies highly preferred by teachers. This scale shows good internal consistency (α = .93). All items are measured on a 5-point scale, ranging from 1 (*student never displays the behavior*) to 5 (*student frequently displays the behavior*).

Teacher measures.

Teaching experience. The experience level of kindergarten teachers in this study was assessed using the following question: "List your years of teaching experience at each of the following levels." Teaching level was categorized as below kindergarten, kindergarten, and above kindergarten. Number of years in each teaching category was summed across categories to create a variable measuring overall level of teaching experience.

Beliefs about instruction. Scores from the Developmentally Inappropriate Beliefs subscale of the Teachers Beliefs and Practices Scale-Kindergarten Version (TBPS-K; Charlesworth et al., 1991) were used to assess the instructional beliefs of teachers in this study during fall of kindergarten. This subscale measures teachers' inappropriate beliefs regarding areas such as curriculum goals, teaching strategies, and cognitive development. This subscale consists of 11 items (e.g., *It is ___ for children to*

color within predefined lines) measured on a 5-point scale, ranging from 1 (*not very important*) to 5 (*extremely important*). This measure is reliable in this sample (α = .75).

Classroom literacy activities. Scores from the Developmentally Inappropriate Literacy Activities subscale of the TBPS-K (Charlesworth et al., 1991) were used to assess the literacy instruction of teachers in this study during fall of kindergarten. This subscale measures teachers' inappropriate instructional activities regarding early literacy skills. This subscale consists of 4 items (e.g., *How often do children in your class copy from the chalkboard*) measured on a 5-point scale, ranging from 1 (*almost never/less than monthly*) to 5 (*very often/daily*). The reliability of this measure in the sample was α = .59.

Mediator and outcome measures.

Service use in school. The number of school services used by children in this study was measured using the following question answered by classroom teachers during spring of kindergarten: "Has the study child in your class used any special school services in the current school year?" School services were categorized as special education (general education and resource room only), special education (full-time aid or self-contained classroom), Chapter 1/Title 1, in-school counseling, after school tutoring, individual tutoring in reading, pull-out small group program in reading, individual tutoring in mathematics, pull-out small group program in mathematics, and other. Number of school services were summed to create a variable measuring the overall use of special services by children in this study.

Early academic skill. The early academic skills of children in this study were measured at the end of kindergarten using scaled scores from the Academic Skills

subscale of the Woodcock-Johnson Tests of Achievement: Third Edition (WJ-III; Woodcock, McGrew, & Mather, 2001). This subscale measures children's letter-word knowledge, calculation skills, and spelling abilities. The WJ-III has been shown to be a reliable and valid measure (Woodcock et al., 2001).

Data Analysis

The current study utilized structural equation modeling to examine the associations between ecological factors, school service use, and early academic skills in kindergarten-aged children with developmental disabilities and delays. Both direct and indirect effects were examined to fully investigate study hypotheses. A confirmatory factor analysis was employed as a preliminary analysis to assess validity of latent variables and to inform model specification.

All analyses were completed using the statistical software Mplus Version 7.0. Mplus 7.0 utilizes maximum likelihood estimation (ML) to determine model estimations and analyze variance-covariance parameters (Muthén & Muthén, 2012). ML estimation was used because it allows for approximation of missing data that is less biased than pairwise or listwise deletion (Schafer & Graham, 2002) and is appropriate even when data are not missing at random or completely at random (Little & Rubin, 2002). Multiple model fit indices were examined to determine model fit, including the chi-square statistics of Comparative Fix Index (CFI; Hu & Bentler, 1999), Tucker Lewis Index (TLI; Tucker & Lewis, 1973), Root Mean Square Error of Approximation (RMSEA; Steiger, 1990), and Standardized Root Mean Square Residual (SRMR; Hu & Bentler, 1999). CFI and TLI values greater than .90 indicated adequate model fit to the data (Hu & Bentler, 1999). RMSEA and SRMR values less than .08 indicated adequate model fit (Browne &

Cudeck, 1993). To evaluate the statistical significance of individual model parameters, such as correlations and factor loadings, the statistical significance level was set at .05.

CHAPTER III

RESULTS

Descriptive and Preliminary Statistics

Descriptive statistics for all study variables were examined, including means, standard deviations, skew, and kurtosis (see Table 1). To examine the first study hypothesis, the number and types of school-based services used by children in this study was investigated. Children utilized between zero and six school-based services, with 16.8% utilizing no services, 25.7% utilizing one service, 24.8% utilizing two services, 15.8% utilizing three services, 9.9% utilizing four services, 4.0% utilizing five services, and 3.0% utilizing six services. Of the children receiving school-based services, 30.3% were receiving special education services in a general education classroom, with 27.7% of these children receiving a second special education service of speech therapy. In addition, 11.1% of children were receiving special education services in a self-contained classroom, 42.4% were receiving Chapter1 or Title 1 services, 11.1% were receiving in school counseling, 4.0% were receiving after school tutoring, 9.1% were receiving individual tutoring in reading, 36.4% were receiving small group reading instruction, 6.1% were receiving individual tutoring in math, and 12.1% were receiving small group math instruction. An additional 11.1% of children were receiving services specified as other, with 3.2% of these children receiving an additional unspecified school-based service. While a direct measure of special education eligibility via the investigation of children's Individualized Service Plans (IEP) was not utilized for this study, results from teacher reported services indicated that approximately 41% of children were receiving at least one special education service as would be mandated on an IEP.

Table 1

Means, Standard Deviations, and Normality of Study Variables

Variables	*M*	*SD*	Skew	Kurtosis
Socioeconomic status	6.04	3.36	.22	-1.03
Parent education levels	8.81	2.97	.10	-1.21
Prenatal drug use	1.36	1.45	1.42	1.64
Cognitive ability	18.34	4.78	-.02	.92
Early literacy skills	5.26	3.61	1.03	.99
School adjustment	34.11	8.41	-.04	-.40
Teaching experience	16.54	9.87	.66	-.07
Inappropriate teaching beliefs	32.95	5.16	-.32	.22
Inappropriate literacy activities	14.69	3.23	-.67	.16
School services	2.00	1.53	.67	-.06
Early academic skills	89.10	18.00	.03	.37

To address the second study hypothesis, standard scores on the Academic Skills subscale of the WJ-III were examined to determine how well children in this study were achieving academically at the end of kindergarten. It was found that 12.4% of children performed in the extremely low range, 18.5% performed in the borderline range, 22.7% performed in the low average range, 35.1% performed in the average range, 7.2% performed in the high average range, 1.0% performed in the superior range, and 3.1% performed in the very superior range. Overall, 53.6% of children demonstrated below average academic skills at the end of kindergarten, 35.1% demonstrated average skills, and 11.3% demonstrated above average skills.

Children's early academic skill was significantly correlated with number of school-based services utilized (r = -.464, p = .000), indicating that children with lower academic skills received more services in school. An independent-samples t-test was run to determine if there were differences in academic achievement between children utilizing no services and children utilizing one or more services. There was homogeneity of variances, as assessed by Levene's test for equality of variances (p = .793). Children not receiving any school-based services scored higher on measures of academic skill (M = 100.25, SD = 17.38) than children receiving one or more school-based services (M = 86.90, SD = 17.39). This was a statistically significant difference, M = 13.35, 95% CI [3.91, 22.79], $t(95) = 2.81$, p = .006.

Model Assumptions

A bivariate correlation matrix was used to examine correlations between the independent variables. Correlations were found to be small to moderate, indicating that multicollinearity was not a problem (see Table 2). Extreme skew and kurtosis values

Table 2

Correlations among Study Variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Socioeconomic status	_										
2. Parent education level	.29**	_									
3. Prenatal drug use	-.24*	-.25*	_								
4. Cognitive ability	.15	.23*	-.14	_							
5. Early literacy skills	.23*	.26**	-.16	.52**	_						
6. School adjustment	-.06	.12	.03	.08	.35**	_					
7. Teaching experience	.19	.32**	-.10	.15	.18	.06	_				
8. Inappropriate teaching beliefs	.00	-.05	.17	-.10	-.15	-.14	-.23*	_			
9. Inappropriate literacy activities	-.05	-.04	-.02	-.13	-.14	-.24*	-.37**	.62**	_		
10. School services	-.13	-.16	.19	-.15	-.34**	-.32**	-.17	.14	.15	_	
11. Early academic skills	.10	.20*	-.09	.38**	.58**	.43**	.14	-.08	-.20	-.46**	–

Note. *$p < .05$. ** $p < .01$.

were also examined. All study variables were within the recommended limits of -2.0 and +2.0 for skew values and -10.0 to +10.0 for kurtosis values (Kline, 2010). Tolerance values were found to be over the recommended limit of .20 (Schumacker & Lomax, 1996). Overall, multivariate normality was determined to be tenable based on examination of both univariate and bivariate normality (Kline, 2010).

Confirmatory Factor Analysis

A confirmatory factor analysis was conducted to test the construct validity of the latent predictor variables prior to testing the full structural equation (see Figure 1). Study variables were transformed using linear transformation prior to analysis. Variables with large means were divided by 10 and positively stated items were multiplied by -1, so that all predictor variables represented increased risk or problems. The 3-factor model fit the data well, χ^2 (24) = 33.174, p = .101, *CFI* = .932, *TLI* = .898, *RMSEA* = .062, *SRMR* = .071. Each of the indicator variables (cognitive ability, early literacy skills, and school adjustment) loaded significantly onto the child school readiness latent variable. Each of the indicator variables (parent education, parent SES, and prenatal drug use) loaded significantly onto the family background latent variable and each of the indicator variables (teaching experience, developmentally inappropriate teaching beliefs, and developmentally inappropriate literacy activities) loaded significantly onto the teacher background and beliefs latent variable. See Table 3 for estimates and variances associated with this model.

Full Structural Equation Model

To examine the third study hypothesis, a structural equation model was tested in which family background predicted child school readiness and child school readiness and

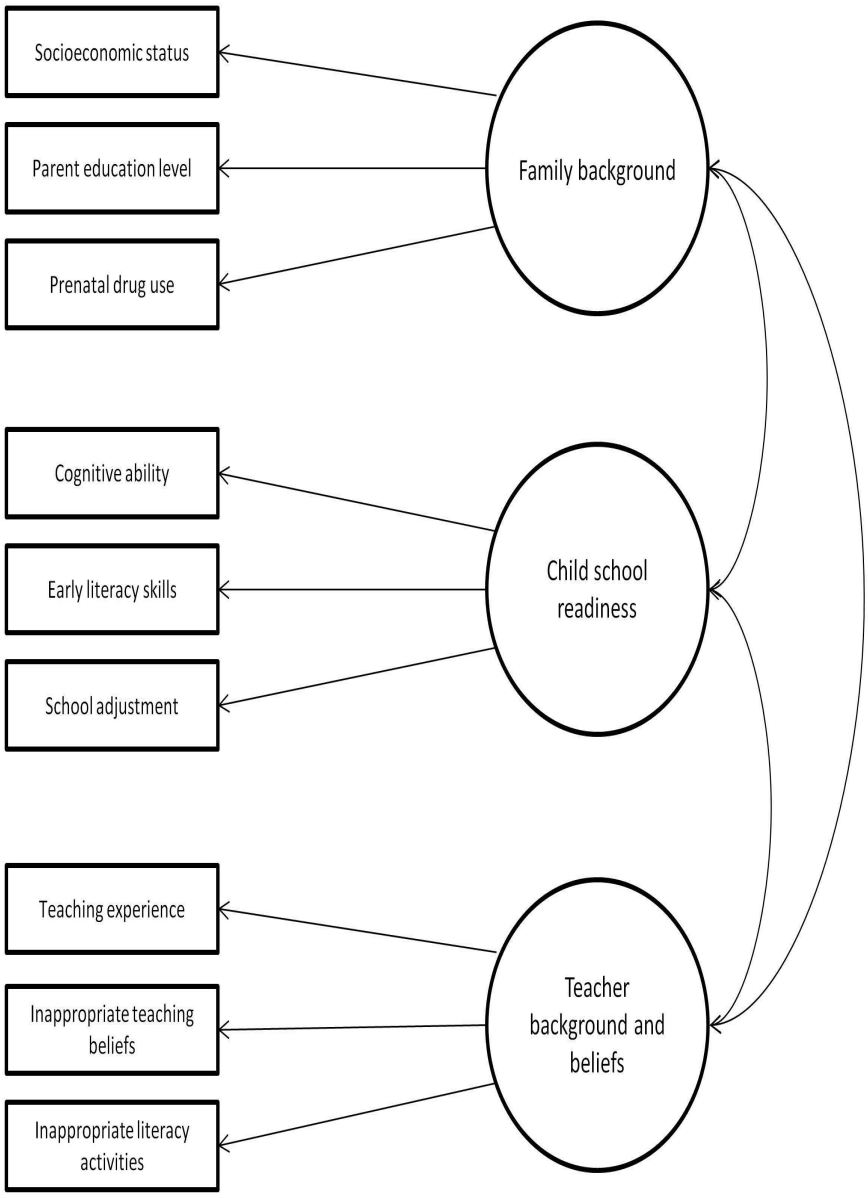

Figure 1. The 3-factor model of ecological context as indicated by family background, child school readiness, and teacher background and beliefs. Latent constructs are shown in ellipses, and observed variables are shown in rectangles.

Table 3

Standardized Loadings for the 3-Factor Confirmatory Model of Ecological Context

	β	*S.E.*
Family background		
Socioeconomic status	.54*	.11
Parent education level	.98*	.16
Prenatal drug use	.36*	.10
Child school readiness		
Cognitive ability	.58*	.13
Early literacy skills	.53*	.13
School adjustment	.43*	.12
Teacher background and beliefs		
Teaching experience	.40*	.10
Inappropriate teaching beliefs	.66*	.10
Inappropriate literacy activities	.93*	.13

Note. * All loadings were significant at less than .001

teacher background and beliefs predicted school-based service use (see Figure 2). This model showed acceptable fit, χ^2 (32) = 42.70, p = .098, *CFI* = .928, *TLI* = .899, *RMSEA* = .058, *SRMR* = .077. In addition, examination of model parameters found significant direct effects (see Table 4). Family background statistically significantly predicted child school readiness (β = .485, p = .001), such that increased family risk was associated with less child school readiness. Child school readiness statistically significantly predicted school service usage (β = .344, p = .001), such that increases in child school readiness problems was associated with more service use. Thus, children demonstrating more problems with school readiness at kindergarten entry were receiving more school-based services at the end of kindergarten. The path from teacher background and beliefs to school service use was not statistically significant.

Mediation Model

Structural equation modeling was utilized to examine the mediating role of school service use in the relationship between the latent variables child school readiness and teacher background and the outcome variable early academic skills (see Figure 3). Indirect effects were examined in order to test the hypothesis that school services might mediate the association between child and teacher factors and academic skills. This model demonstrated acceptable fit χ^2 (39) = 49.81, p = .116, *CFI* = .946, *TLI* = .924, *RMSEA* = .052, *SRMR* = .076. Examination of model parameters found significant direct and indirect effects (see Table 5). Family background had a significant direct effect on child school readiness (β = .502, p = .000), such that increased family risk was associated with more problems in child school readiness. Child school readiness had a significant direct effect on school-based service use (β = .377, p = .000), such that increases in

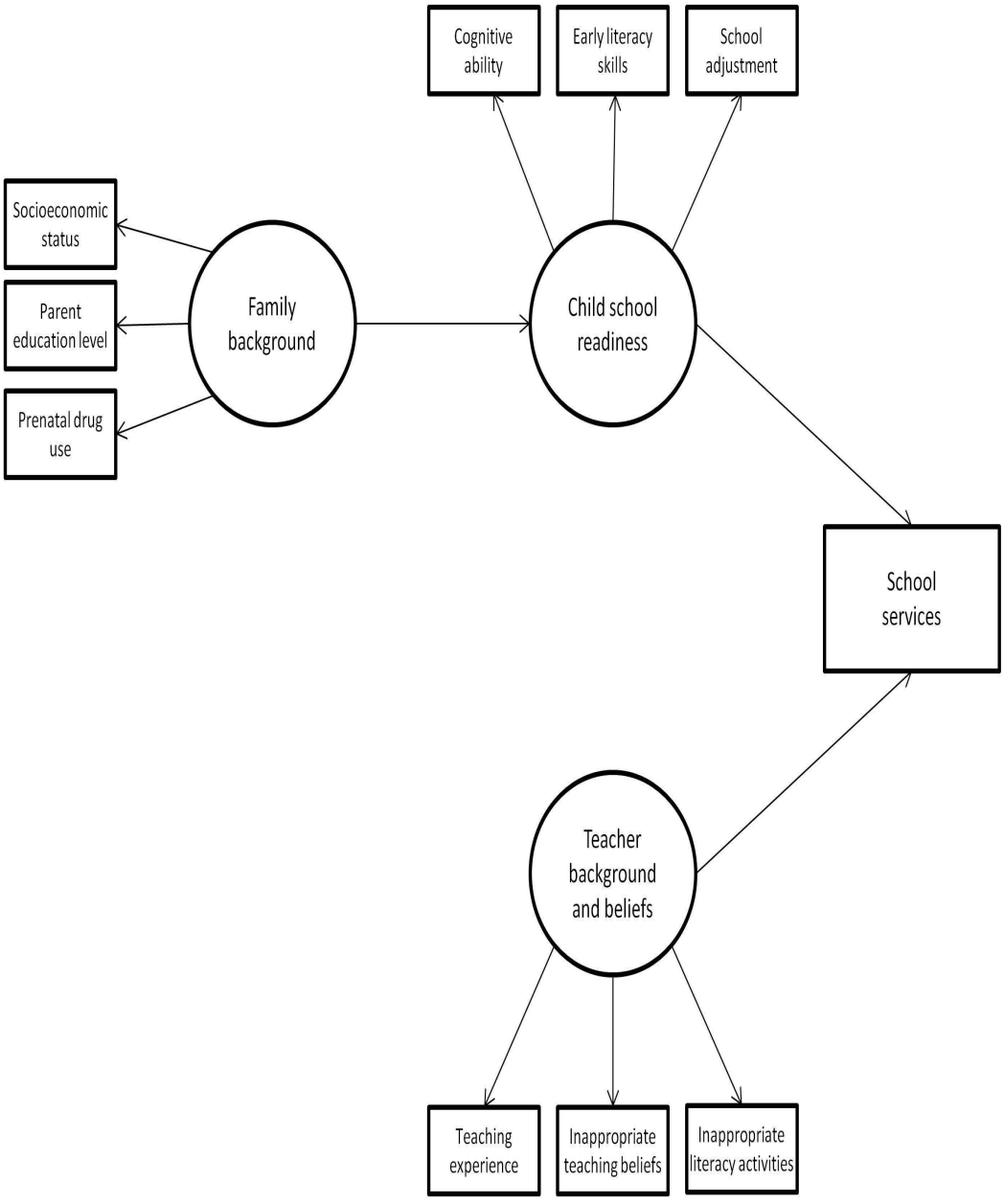

Figure 2. Conceptual structural equation model indicating the influence of family background on child school readiness and the influence of child school readiness and teacher background and beliefs on school service use. Latent constructs are shown in ellipses, and observed variables are shown in rectangles.

Table 4

Standardized, Standard Error, and Significance Levels for Full Structural Equation Model

Parameter	*β*	*S.E.*	*p*
Family Background → Child School Readiness	.49	.15	.00
Child School Readiness → School Services	.34	.11	.00
Teacher Background and Beliefs → School Services	.13	.11	.25
Covariance Family Background and Teacher Background and Beliefs	.18	.16	.27

Note. $X^2(32) = 42.70$, $p = .10$; CFI = .93; TLI = .90; RMSEA = .06; SRMR = .08

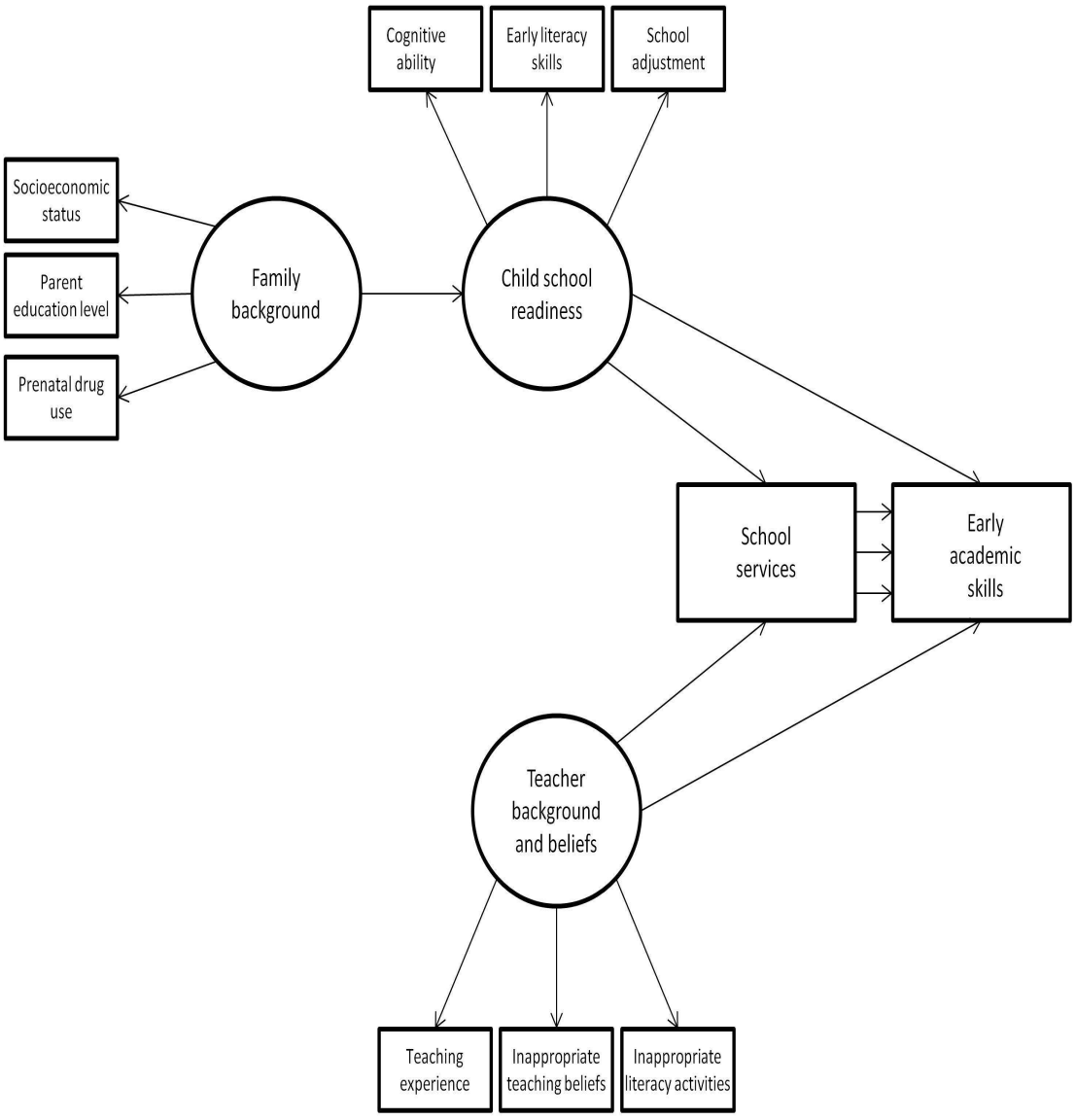

Figure 3. Conceptual mediation model indicating the influence of school service use on the association between ecological variables and early academic skills. Latent constructs are shown in ellipses, and observed variables are shown in rectangles.

Table 5

Standardized, Standard Error, and Significance Levels for Mediation Model

Parameter	*β*	*S.E.*	*p*
Direct Effects			
Family Background → Child School Readiness	.50	.14	.00
Child School Readiness → School Services	.38	.10	.00
Child School Readiness → Early Academic Skills	-.57	.10	.00
Teacher Background and Beliefs → School Services	.11	.11	.32
Teacher Background and Beliefs → Early Academic Skills	-.08	.10	.42
School Services → Early Academic Skills	-.23	.09	.02
Covariance Family Background and Teacher Background and Beliefs	.15	.17	.37
Indirect Effects			
Child School Readiness → School Services → Early Academic Skills	-.09	.04	.02
Teacher Background and Beliefs → School Services → Early Academic Skills	-.02	.03	.37

Note. $X^2(39) = 49.81$, $p = .12$; CFI = .95; TLI = .92; RMSEA = .05; SRMR = .08

school readiness problems was associated with more service use. Child school readiness also had a significant direct effect on early academic skills (β = -.566, p = .000), such that more school readiness problems were associated with decreased academic achievement. No other significant direct effects were found. However, a significant indirect effect was identified. The indirect path from child school readiness to early academic skills through school service usage was significant (β = -.085, p = .020). Thus, the total effect of child school readiness on early academic skills was mediated by school-based service use. However, the direct effect from child school readiness to early academic skills remained significant, suggesting partial mediation. No other indirect effects were found.

In summary, direct effects between family background and child school readiness were found, demonstrating that family risk factors significantly impact the school readiness of young children with a developmental disability or delay. This finding was in the expected direction with more family risk predicting less school readiness for children. Direct effects were also found between child school readiness and school-based service use and early academic skills. These findings were also in the expected direction with less school readiness leading to more service use at school and poorer academic achievement at the end of kindergarten. Thus, a child's readiness to enter formal education can influence the additional supports he or she needs once in school and his or her academic achievement throughout kindergarten. Finally, the indirect effect on early academic skills by child school readiness as mediated by school-based services demonstrates that the additional supports young children with disabilities and delays receive at school can positively impact their academic achievement in kindergarten.

Post Hoc Analyses

To better understand the insignificant path from teacher background and beliefs to service use, independent-samples t-tests were run to determine if there were differences in teaching experience, teachers' endorsement of developmentally inappropriate teaching beliefs, or teachers' use of developmentally inappropriate literacy activities between children utilizing no services and children utilizing one or more services. There were no statistically significant differences between the services and no services groups for teaching experience (M = 5.99, 95% CI [-1.17, 13.16], $t(17.78) = 1.76$, $p = .096$), teachers' beliefs (M = -1.13, 95% CI [-3.93, 1.67], $t(97) = -.80$, $p = .426$), or teachers' literacy activities (M = -1.04, 95% CI [-2.79, 0.71], $t(97) = -1.18$, $p = .240$). Overall, these findings suggest teaching experience, teachers' developmentally inappropriate teaching beliefs, and teachers' developmentally inappropriate literacy activities do not significantly impact the service use of kindergarten age children with developmental disabilities and delays.

CHAPTER IV

DISCUSSION

Past research has demonstrated that children with developmental disabilities and delays are more likely than their typically developing peers to utilize special education services in school (Dale et al., 2005; Delgado et al., 2006; Delgado, 2009; Mills et al., 1995) and to struggle on measures of academic success (Hocutt, 1996). In addition, research has shown the individual, family, and school contexts of children significantly influence their immediate and long-term school outcomes (Bronfenbrenner & Morris, 1998; Pianta & Walsh, 1996). However, little is known about the factors that predict the school service usage and early academic skills of children with developmental delays and disabilities. A better understanding of these associations could inform the development of effective early intervention programs to increase positive school outcomes for these children. Results from this study suggest that family risk factors significantly influence the school readiness skills of children with developmental disabilities and delays. Additional results suggest school-based services are important in increasing the early academic skills of this population of children.

To increase this understanding, this study examined patterns and ecological predictors of the school service use and early academic skills of kindergarten-aged children identified with a developmental delay or disability prior to school entry. First, the number and types of school-based services used by these children in kindergarten was examined. Next, the early academic skill of children with developmental disabilities and delays was investigated. A better understanding of this information is important, as it adds to the limited knowledge regarding early school outcomes for children identified

with a disability or delay prior to school entry. Third, the role of ecological predictors in school service usage was examined. Family factors were hypothesized to predict child factors which, along with teacher factors, were believed to influence school service usage. Finally, the influence of school-based service use in the relationship between ecological predictors and early academic achievement was investigated. Overall, this study aimed to gain a more complete understanding of the early school experiences of children with developmental disabilities and delays, including the ecological contexts that contribute to their school service use and academic success.

School-Based Services

Results from this study found that children identified with a developmental disability or delay prior to school entry utilized a range of school-based services in kindergarten, thereby confirming the first hypothesis. Children in this study received between zero and six services, with approximately 83% receiving one or more services. In addition, approximately 26% of the children were receiving at least one service. This finding is congruent with past research demonstrating that young children with development disabilities and delays tend to require special services in school (Delgado et al., 2006; Delgado, 2009; Mills et al., 1995). This finding also demonstrates that children receiving early intervention services tend to continue receiving extra supports once they transition to formal education. It should be noted that, of the children who received school-based services, approximately 30% were receiving special education supports in a general education setting and approximately 11% were receiving special education supports in a self-contained classroom. Thus, only 41% of the children receiving services were receiving special education supports. The majority of children were receiving less

intensive interventions, such as Chapter1/Title 1, small group instruction, and in-school counseling. These findings may indicate that, for many children with developmental disabilities and delays, early intervention services provide the scaffolding necessary to transition to kindergarten fairly successfully. However, findings from this study also suggest young children with developmental delays and disabilities are more likely to require extra supports in the school environment when compared to their typically developing peers. As such, young children with developmental disabilities and delays may be at greater risk for academic difficulties as they progress through formal education and academic demands continue to increase. These children may also cost school districts more to educate, as they likely require extra school supports that are more costly than general education alone.

Early Academic Skills

Results from this study found that approximately 54% of children identified with a developmental delay or disability prior to school entry demonstrated below average academic achievement at the end of kindergarten, thereby confirming the second hypothesis. Approximately 35% demonstrated average academic skills and approximately 11% demonstrated above average academic skills. Overall, these findings suggest young children with development disabilities and delays tend to perform below their more typically developing peers on measures of early academic achievement. This is consistent with past research demonstrating that children with disabilities are typically not as successful in developing early academic skills (Hocutt, 1996). Results also showed a significant difference between the early academic achievement of children who received services in kindergarten and children who did not receive services. In particular,

children who did not receive any additional supports demonstrated significantly higher academic skills at the end of kindergarten than children who received one or more additional services. Results appear to suggest that children with developmental disabilities and delays demonstrating the most trouble with early academic skills also require the most school-based services. As such, more school support was related to lower skills in early reading and math achievement.

These findings have important early intervention implications. Given that research has shown achievement within the first two years of school to be critical to long-term school success (Gutman et al., 2003; McClelland et al., 2006), the below average academic achievement of children with delays and disabilities in kindergarten is certainly of concern. Young children who do not master kindergarten-level academics may not only experience immediate academic difficulty, but may continue to fall even farther behind their peers as literacy and numeracy demands increase. As such, the development and dissemination of early intervention programs that focus on helping young children with developmental delays and disabilities develop the academic skills necessary to be successful in kindergarten may prevent long-term academic failure in this population. Overall, such interventions may support young children with disabilities and delays in developing a successful academic trajectory.

Ecological Predictors of School-Based Services

Results from this study partially supported the third hypothesis that child school readiness and teacher background would significantly predict the number of school-based services used by children with developmental delays and disabilities in kindergarten. The model demonstrated adequate fit to the data. Results showed a significant association

between family background and child school readiness, such that increased risk factors in the home environment predicted poor school readiness skills. This is consistent with past research linking family conditions, such as socioeconomic status, parent education, and prenatal drug use, to children's cognitive ability (Hart, Petrill, Deckard, & Thompson, 2007; McLoyd, 1998), early literacy skills (Kainz & Vernon-Feagans, 2007; Mattson, Crocker, & Nguyen, 2011), and school readiness behaviors (Gullo & Burton, 1993). A significant association was also found between child school readiness and school service use. In particular, poor school readiness skills predicted an increase in the number of services used in school. Teacher background was not significantly associated with school service usage. In sum, child school readiness, including cognitive ability, early literacy, and school adjustment, appears to be an important contributor to the number of services children with developmental disabilities and delays receive in kindergarten.

While it was originally hypothesized that teacher background would be a predictor of school-based service usage, the lack of a significant relationship may also be an important outcome. For instance, this finding may demonstrate that kindergarten teachers are not referring children for additional services based on their own teaching experience or beliefs regarding classroom instruction. This idea is supported by results demonstrating teaching experience, teachers' developmentally inappropriate beliefs, and teachers' developmentally inappropriate literacy activities did not significantly influence service use throughout kindergarten. Therefore, teachers may be referring students based solely on lack of academic skills. Thus, children entering kindergarten with the fewest academic skills are the most likely to be referred for school-based services that provide essential academic boosts.

To better understand how kindergarten teachers make decisions regarding referral of students with disabilities for additional supports, future investigation is needed. For example, this study relied on self-report measures only to define the latent variable teacher background and beliefs. As highlighted by Dickinson and Tabors (2001), teachers tend to report what they want to accomplish in the classroom rather than what they actually do. Studies have also shown that practices in the classroom are not as high quality as many proponents of developmentally appropriate childhood education would like (Maxwell, McWilliam, Hemmeter, Ault, & Schuster, 2001). As such, future research may consider investigating additional teacher characteristics, including those measured through direct classroom observation, to gain a more comprehensive understanding of how teacher behaviors and practices may impact the decision process regarding student referral for extra school-based supports. This may be especially important given that past research has found that teachers' referral decisions may be influenced by variables unrelated to a student's specific academic difficulties (Podell & Soodak, 1993).

Mediation Model

Study results partially supported the fourth hypothesis that school-based service usage would mediate the relationship between child and teacher predictors and the academic achievement of children with developmental disabilities and delays at the end of kindergarten. Findings from the mediation model showed significant direct and indirect effects. In particular, a significant direct effect was found between child school readiness and school service use, with poor school readiness predicting increased service use. A significant direct effect was also found between child school readiness and early academic achievement, such that poor school readiness predicted lower academic skills.

Overall, these findings demonstrate that the readiness of young children with developmental disabilities and delays to transition to the demands of formal education is an important piece of their early academic success. This is consistent with past research showing young children with developmental disabilities and delays often struggle to meet the academic and behavioral demands of kindergarten (McIntyre et al., 2006).

A significant direct effect was also found between family background and child school readiness, such that increased risk in the home environment predicted poor child school readiness. Findings from this study suggest that, consistent with past research, family background factors have a strong influence on the readiness of children to meet the demands of formal education. Children's school readiness in turn impacts both their immediate and long-term academic success. Results from this study support the need for early intervention with parents of young children with developmental delays and disabilities to provide support and instruction regarding how best to prepare children for the demands of kindergarten. Given this study found parent education, SES, and prenatal drug use to be significantly associated with child school readiness, early intervention that specifically targets families with these risk factors may be an effective way to improve school readiness skills. More specifically, if low SES and education and high drug use families with children with developmental disabilities and delays receive early intervention targeting school readiness, this may reduce the need for intensive school-based services and support a more positive academic trajectory. It should be noted that while environmental factors influence child development, these factors also co-occur with genetic influences to determine child outcomes (Plomin, 1994). For example, a young child diagnosed with Autism Spectrum Disorder is born with particular genetic

mechanisms that likely interact with environmental conditions to impact behavior, well-being, and academic achievement. While this study did not address genetic influences, more studies are needed to better identify how genetic mechanisms interact with a child's environmental contexts, such as home and school, to determine academic outcomes. Overall, a multitude of factors likely impact the service use and early academic skills of young children with developmental disabilities and delays, including familial, social, teacher, and genetic vulnerabilities.

In this study, teacher background was not significantly associated with school service use or the early academic skills of children with developmental delays and disabilities. As stated previously, this finding was contrary to study hypotheses, but may have interesting implications. In particular, in accordance with the purpose of special services, kindergarten teachers may be referring children for additional school services based solely on academic deficits. Thus, they did not appear to be basing decisions on personal beliefs regarding instruction and teaching experience. In addition, results from this study suggest that in kindergarten, child school readiness and the influence of family background on readiness are stronger predictors of early academic achievement than teacher background. However, additional longitudinal investigations are needed to better determine how these relationships change over time. For example, teacher experience may be more predictive of school service use as children transition to middle and high school. In higher grades teachers begin focusing on specific academic subjects (e.g., math, language arts, science) rather than the more generalized curriculum taught in elementary school. As such, the experience level of teachers may more strongly influence their ability to effectively teach specific academic skills to students with

developmental disabilities and delays, thereby increasing the likelihood that past teaching experience might predict referral to school-based services for students with developmental disabilities.

Finally, a significant indirect path was found from child school readiness to early academic skills that was mediated by school service use. However, the direct association between child school readiness and early academic skills remained, suggesting partial mediation. This finding supports the study hypothesis that service usage would mediate the relationship between child and teacher factors and early academic skills for children with developmental disabilities and delays. Service use was not a significant mediator for teacher predictors. However, the finding that school-based service use partially mediated the relationship between child school readiness and early academic skills has meaningful implications. This outcome suggests the additional supports kindergarten-aged children with developmental disabilities and delays receive in school are important contributors to their development of early academic achievement. This finding adds to past research demonstrating that special education services can significantly boost the academic performance of students with disabilities and delays (Cavanaugh et al., 2004; Ehrhardt et al., 2013; Fuchs & Fuchs, 1995; Hanushek et al., 1998; 2002). While the results of this study found that children with developmental delays and disabilities tend to perform below average on measures of early academic achievement, without the provision of additional school-based services, these children might have shown even more marked academic difficulties. Therefore, school-based service usage may ameliorate some of the differences between children with developmental disabilities and their non-disabled peers in terms of early academic success. In summary, results from

this study suggest school-based services are an important contributor to the early academic achievement of kindergarten-aged children with developmental disabilities and delays and may partially improve deficits in school readiness as these children enter formal education.

Utilization and Continuity of Services

The study of special education services and their influence on the academic achievement of children with developmental disabilities and delays has a long and complicated history. One of the most cited articles regarding the effectiveness of special education concluded that placement in these services had a negative effect on students' academic performance (Carlberg & Kavale, 1980). In addition, Ysseldyke and colleagues (1998) found the gap between general and special education students to grow larger over time. More recent research by Forness (2001) demonstrated special education services are not wholly ineffective, but rather specific interventions within special education are more efficacious at boosting achievement than others. Finally, by tracking the progress of children who transition in and out of services, Hanushek et al. (1998, 2002) found that students with disabilities benefitted from special education. In summary, research regarding the effectiveness of special education remains inconclusive and wrought with methodological complications. Gaining a better understanding of both effective and ineffective components of special education, as well as child, family, and teacher characteristics that influence the provision and efficacy of services is crucial as it has enormous implications for the school success of children with developmental delays and disabilities.

Children receiving services at school are highly diverse in terms of disability type, skill set, and response to intervention. For example, students may be receiving services for a variety of conditions, such as behavioral disturbances, mood disorders, chronic health conditions, speech problems, and learning delays. Given this diversity of needs, the question of overall effectiveness of services seems difficult, if not impossible, to answer. A more realistic question may be: "what kinds of services are most efficacious for which students"? This approach to studying the effectiveness of service use is supported by Leinhardt and Pallay (1982), who highlighted the importance of understanding what happens for students as part of service use. Additionally, a better understanding of the timeframe of service provision may highlight variables associated with students who temporarily access services versus students who require individualized supports throughout their education. This is important because research seems to suggest there are distinct groups of students with differing levels of need and responsiveness. For instance, Hanushek and colleagues (1998, 2002) found special education to increase the academic achievement of students who transition in and out of services. In contrast, extended time in special education has been shown to limit academic growth (Dale et al., 2005). As such, a better understanding of the variables associated with short-term versus long-term service use may provide valuable information about which services are most effective for which students and how services may be improved for students who require extended support.

Children receiving services at school are also living in a multitude of family environments, some of which provide rich and supportive learning conditions and some of which put children at-risk for academic, behavioral, and emotional concerns. Past

research has found strong associations between parental beliefs and expectations regarding education and academic outcomes for children (Davis-Kean, 2005). Additional research has shown parent education and SES to influence the reduction and amplification of symptoms associated with developmental disabilities and delays (Sonnander & Claesson, 1999). As a result, the efficacy of school-based services may be significantly impacted by the quality of a child's home environment. To date, very little research has addressed the overlap of family factors with the efficacy of school services. The results of this study suggest that variables, such as SES, parent education, and prenatal drug use, influence the readiness of children with developmental disabilities and delays to transition to kindergarten. Future research is needed to investigate how family factors impact the service use and achievement of children over time, including the factors associated with short-term versus long-term service use.

Finally, not only are children and families that receive school-based services a highly diverse group, but schools also vary in the types of services they offer, the quality of services, and the effectiveness of teachers and administrators. For example, schools in affluent neighborhoods may have the resources to provide high dosages of individualized and effective instruction, as well as the ability to hire and retain highly qualified teachers when compared to schools in low-income and rural settings (Dupere, Leventhal, Crosnoe, & Dion, 2010). Few studies have systematically investigated the role that teacher and school factors play in the provision, effectiveness, and continuity of school-based services. Yet variables, such as teacher quality, have been shown to influence the academic achievement of both general and special education students (Stanovich & Jordan, 2000, 2002). Thus, continued research is needed to better understand how

teacher and school contexts impact the service use and achievement of children with developmental disabilities and delays.

Overall, a multitude of overlapping, complex, and ever-changing factors likely influence the timing, type, and quality of services that students with developmental disabilities and delays receive and the likelihood of benefitting from these services. Given the number of children diagnosed with developmental delays and disabilities and the importance of school success to long-term positive outcomes, disentangling the complex ecological variables associated with service use and academic achievement should be a research priority.

Limitations and Future Research

It is important to consider several limiting factors of this study. First, the sample size was small, making it difficult to draw strong conclusions regarding the utility and generalizability of findings. The small sample size reduced statistical power, thereby increasing the chance of committing a Type II error and failing to identify significance when it existed (Kazdin, 2002). Given the small sample size, this study was also limited in its ability to investigate a larger number of predictor variables. Future research should consider investigating additional ecological and contextual factors that may influence school-based service use and academic success for children with developmental delays and disabilities. In addition, the study sample consisted of primarily Euro-American children. While this is representative of the population of young children with developmental disabilities and delays in the Pacific Northwest, it may not be representative of all children with disabilities. Future studies should investigate whether similar results emerge for children from diverse ethnic backgrounds. While this study

was longitudinal in that it investigated change over one academic year, it was not able to examine the long-term effects of ecological predictors on the service use and academic skills of children with developmental disabilities and delays. It is possible that results will change as these children spend more time in school and are more strongly influenced by teachers and peers. Future research should examine ecological predictors of the long-term school service usage and academic achievement for this population of children. Finally, this study was not able to address which types of school-based services were most effective in bolstering the early academic skills of children in this sample. As a result, no conclusions were drawn regarding the most efficacious school services for young children with developmental disabilities and delays. This may be an important topic for future investigation.

Strengths

While this study had several limiting factors, it also possessed a number of strengths. For example, this study examined young children with developmental disabilities and delays as a heterogenous group. This is important because it accurately reflects the population of children receiving early intervention and early childhood special education services (Scarborough et al., 2004). These children transition to kindergarten as a diverse group of students with varying levels of need. The majority of research on children with developmental disabilities and delays has focused on narrow segments of this population, such as children with an intellectual disability only. As a result, research to date can make only limited conclusions regarding the school outcomes of children with a variety of disabilities and delays. Another strength of this study is the fact that it included predictor variables across a variety of ecological levels, including

child, family, and teacher. Past research has highlighted the importance of a child's context on his or her development (Bronfenbrenner & Morris, 1998), yet the difficulty of such comprehensive data collection often precludes ecologically-based research. This study was able to fill a gap in the literature by examining ecological predictors of school service usage and early academic skills of the whole population of young children with developmental disabilities and delays.

Conclusion

In conclusion, this study provided information regarding ecological factors that contribute to the school-based service use and early academic skills of children with developmental disabilities and delays. Results demonstrated the importance of family background, including SES, parent education, and prenatal drug use, on the development of school readiness skills in this population. Results also found school readiness to be a significant predictor of the school service use and early academic achievement of young children with developmental delays and disabilities. Additionally, it was found that school services partially mediated the relationship between child school readiness and early academic skills, suggesting that school-based services are an important component in bolstering the early academic success of these children.

Overall, results demonstrated that young children with developmental disabilities and delays and their families could benefit from early intervention services that stress the development of school readiness skills, such as early literacy and school adjustment behaviors. Such early intervention services may decrease the risk of poor school outcomes for this population of children who tend to be at risk of academic failure. Given the increasing importance of school success to positive life outcomes, it is critical

that young children with developmental delays and disabilities receive effective interventions that support their successful transition to the demands of formal education.

APPENDIX

MEASURES

Family Measures

Socioeconomic status

Which letter represents your gross annual household income?

a – less than $4,999	g - $30-39,999
b - $5-9,999	h - $40-49,999
c - $10-14,999	i - $50-59,999
d - $15-19,999	j - $60-79,999
e - $20-24,999	k - $80-99,999
f - $25-29,999	l - $100,000 +

Education level

Which letter represents the highest grade you completed in school?

a. Below 6^{th} grade

b. Partial junior high (6^{th} or 7^{th})

c. Junior high school (8^{th})

d. Partial high school (9^{th}-11^{th})

e. G.E.D

f. High school (private, parochial, prep, trade or public)

g. Some community college or vocational/specialized training courses

h. Partial 4-year college (less than one year)

i. Partial 4-year college (at least 1 year)

j. Specialized/vocational training completed

k. Community college degree or certification

l. Standard 4-year college or university graduation

m. Some graduate courses

n. Graduate degree

Prenatal drug use

Did you use caffeine while pregnant with TC?	1 – yes	2 – no
Did you use tobacco while pregnant with TC?	1 – yes	2 – no
Did you use alcohol while pregnant with TC?	1 – yes	2 – no
Did you use marijuana while pregnant with TC?	1 – yes	2 – no
Did you use other drugs while pregnant with TC?	1 – yes	2 – no

Child measures

Cognitive ability (Block Design and Vocabulary subscales from the WPPSI-III; Wechsler, 2002) - Measure not displayed due to confidentiality

Early literacy skills (CAP; Clay, 2000)

1. Pass the book to the child, holding it vertically by outside edge, spine towards the child. Say: *"Show me the front of this book."*	**___/1**
2. With the book open to pages 2 and 3, say: *"I'll read this story. You help me. Show me where to start reading. Where do I begin to read?"*	**___/1**
3. With the book open to pages 4 and 5, say: *"Show me where to start."* *"Which way do I go?"* *"Where do I go after that?"* *"Point to it while I read."*	**___/4**
4. With the book open to pages 6 and 7, say: *"Show me the first part of the story. Show me the last part."* *"Show me the bottom of the picture."*	**___/2**
5. With book open to pages 8 and 9, say: *"Where do I begin? Which way do I go? Where do I go after that?"*	**___/1**
6. With book open to pages 10 and 11, say: *"What's wrong with this?"*	**___/1**
7. With book open to pages 12 and 13, say: *"Where do I start reading?"* *"What's wrong on this page?"* *"What's wrong on this page?"*	**___/3**
8. With book open to pages 14 and 15, say: *"What's wrong with the writing on this page?"* *"What's this for?"*	**___/2**
9. With book open to pages 16 and 17, say: *"What is this for?"* *"What is this for?"* *"What is this for?"* *"Find a little letter like this."*	**___/4**
10. With book open to pages 18 and 19, say: *"Show me was. Show me no"*	**___/1**
11. With book open to page 20, say: *"I want you to push the cards across the story like this until all you can see is just one letter. Now show me two letters."* *"Show me just one word. Now show me two words."* *"Show me the first letter of a word. Show me the last letter of a word."* *"Show me a capital letter."*	**___/4**
	Total **___/24**

School adjustment (School Adjustment Behavior subscale from the teacher-report SSCSA; Walker & McConnell, 1995).

		Never		Sometimes		Frequently
1.	Uses free time appropriately	1	2	3	4	5
2.	Has good work habits (e.g., is organized, makes efficient use of class time, etc)	1	2	3	4	5
3.	Listens carefully to teacher instructions and directions for assignments	1	2	3	4	5
4.	Answers or attempts to answer a question when called on by the teacher	1	2	3	4	5
5.	Displays independent study skills (e.g., can work adequately with minimum teacher support)	1	2	3	4	5
6.	Responds to conventional behavior management techniques (e.g., praise, reprimands, timeout)	1	2	3	4	5
7.	Responds to requests promptly	1	2	3	4	5
8.	Attends to assigned tasks	1	2	3	4	5
9.	Does seatwork assignments as directed	1	2	3	4	5
10	Produces work of acceptable quality given her/his skill level	1	2	3	4	5

Teacher measures

Teaching experience

List your years of teaching experience at each of the following levels

____ _____ 1. Below kindergarten level (e.g., preschool)

____ _____ 2. Kindergarten (includes K-1 and K-2)

____ _____ 3. Above kindergarten (first grade and above, not K-1 or K-2)

Developmentally inappropriate teaching beliefs (TBPS-K; Charlesworth et al., 1991)

Recognizing that some things in your program are required of you by external sources, what are YOUR OWN PERSONAL <u>BELIEFS</u> about kindergarten programs? Please circle the number that most nearly represents YOUR BELIEFS about each item's importance for kindergarten. (1 = not at all important, 5 = extremely important)

		Not at all Important	Not Very Important	Fairly Important	Very Important	Extremely Important
1.	As an evaluation technique in the kindergarten program, standardized group tests are __.	1	2	3	4	5
2.	As an evaluation technique in the kindergarten program, performance on worksheets and workbooks is __.	1	2	3	4	5
3.	Workbooks and/or ditto sheets are __ to the kindergarten program.	1	2	3	4	5
4.	Flashcard (numbers, letters, and/or words) are __ to the kindergarten program for instructional purposes.	1	2	3	4	5
5.	In terms of effectiveness, it is __ for the teacher to lecture to the class and to make sure everyone participates in the same activity.	1	2	3	4	5

6.	It is __ for teachers to use their authority through punishments and/or reprimands to encourage appropriate behavior.	1	2	3	4	5
7.	It is __ for children to be involved in establishing rules for the classroom.	1	2	3	4	5
8.	It is __ for children to be instructed in recognizing the single letters of the alphabet, isolated from words.	1	2	3	4	5
9.	It is __ for children to color within predefined lines.	1	2	3	4	5
10.	It is __ for children in kindergarten to form letters correctly on a printed line.	1	2	3	4	5
11.	It is __ for kindergarteners to learn to read.	1	2	3	4	5

Developmentally inappropriate literacy activities (TBPS-K; Charlesworth et al., 1991)

Please respond to the following items by circling the number that most nearly represents how often your children participate in the following activities on the average.

		Almost Never (less than monthly)	**Rarely (monthly)**	**Sometimes (weekly)**	**Regularly (2-4 times a week)**	**Very Often (daily)**
1.	Read in ability level groups	1	2	3	4	5
2.	Use flashcards with sight words and/or math facts	1	2	3	4	5
3.	Practice handwriting on lines	1	2	3	4	5
4.	Copy from the chalkboard	1	2	3	4	5

Outcome measures

Service use in school

Has the KITS study child in your class used any special school services in the current school year? If YES, indicate the type of services the student is receiving. Circle all responses that apply.

Type of service	How many months in service?	Hrs/week in service?	Currently in service?	
1. Special Ed: general ed and resource room only	___ ___	___ ___	1. Yes	2. No
2. Special Ed: full-time aid, self-contained classroom	___ ___	___ ___	1. Yes	2. No
3. Chapter I/Title 1	___ ___	___ ___	1. Yes	2. No
4. In school counseling	___ ___	___ ___	1. Yes	2. No
5. After school counseling	___ ___	___ ___	1. Yes	2. No
6. Individual tutoring program in reading	___ ___	___ ___	1. Yes	2. No
7. Pull-out small group program in reading	___ ___	___ ___	1. Yes	2. No
8. Individual tutoring program in mathematics	___ ___	___ ___	1. Yes	2. No
9. Pull-out small group program in mathematics	___ ___	___ ___	1. Yes	2. No
10. Other	___ ___	___ ___	1. Yes	2. No

Academic achievement (Letter-Word Identification, Calculation, and Spelling subscales from the WJ-III; Woodcock et al., 2001) - Measure not displayed due to confidentiality

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