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FULL REPORT:

Identification of the Association Between Participation in Pennsylvania's Early Intervention Programs and Decreased Use of Special Education and Other Student Outcomes Such as Retention

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Abstract

Utilizing the statewide longitudinal data system, the present study examined the effects of Pennsylvania's (PA) Early Intervention program, including dosage (time spent in program) on student outcomes (i.e. retention, participation in special education) through Grade 3. Additionally, the study examined if this relationship varied among student groups and if it remained after controlling for other student and program level characteristics, including Early Childhood Outcome (ECO) scores. Following one cohort (N=13,061) from Early Intervention program entrance through Grade 3, chi-square analysis showed that students who spent two or more years in the program received special education services at significantly higher rates, and exited services by Grade 3 at significantly lower rates, compared to students who spent less time in the program. Logistic regression analyses revealed that when controlling for other explanatory variables, two or more years of dosage was associated with a 34% to 39% increase in odds of special education use through Grade 3, and less than two years of dosage was associated with a 20% increase in odds of never being retained. ECO score analyses found that students who did not "maintain or improve functioning to a level comparable to same-aged peers" had up to a 300% increase in odds of receiving services, while students who "improved or maintained functioning to a level comparable to same-aged peers" had a 40% to 72% increase in odds of never being retained. Additionally, the odds of a student receiving special education services through Grade 3 were three or four times higher if a student's disability type was Autism or a hearing and/or visual impairment, respectively. Finally, there was a 70% increase in odds of never being retained if a student who had received Early Intervention services went on to attend Full-Day Kindergarten. These findings suggest that students in PA who receive a higher dosage of Early Intervention services are more likely to participate in special education through Grade 3, while ECO scores reflecting higher student functioning are associated with lower odds of special education use and retention through Grade 3.



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The Pennsylvania Department of Education (PDE) Evaluation and Research project is an effort that was established through a State Longitudinal Data System (SLDS) Grant from the Institute of Education Sciences (IES), National Center for Education Statistics (NCES), awarded in October 2015. The Research and Evaluation project is an initiative to make full use of the P-16+ system data and other data sources to answer priority questions from the PDE research agenda, to form collaborative research partnerships, and to increase PDE's capacity to conduct research. Our mission is to evaluate and analyze data to provide insight that can be used to positively impact policy, inform decision making and lead to improved student outcomes.

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Introduction

Education has been a top priority of Governor Tom Wolf since his election to office in 2015. Governor Wolf has been, and continues to be, an advocate for Pennsylvania's earliest learners and the programs that support them. In 2017, he accepted the Pre-K Champion Award from Pre-K for PA for his continuous support and funding of early childhood education (Commonwealth of Pennsylvania, 2017). Governor Wolf has invested millions of dollars into early childhood education, including a recent \$30 million investment for the state's prekindergarten programs (Commonwealth of Pennsylvania, 2019).

In 2007, Pennsylvania established the Office of Child Development and Early Learning (OCDEL) as a joint office of the Departments of Education and Human Services to focus on providing young children and their families access to high-quality services that ensure school readiness and future academic success. Opportunities provided encompass a range of supports and services for children from birth to age five, including Early Intervention. A child's earliest experiences affect their growth and development, thus access to these services is critical. The Early Intervention program provides children with developmental delays (major or minor delays in reaching developmental milestones) and disabilities supportive services at no cost to families. In PA, there are two distinct Early Intervention programs: Infants and Toddlers (serving children from birth to age three) and Preschool (serving children ages three to the age of beginners). Previous studies have highlighted the positive effects of high-quality early childhood and intervention programs on decreasing the school-readiness gap for children with developmental delays and disabilities.

Utilizing Pennsylvania's longitudinal data system, which includes early childhood and K-Grade 12 data, the present study sought to examine the impact of Pennsylvania's Early Intervention programs on student outcomes through Grade 3. Specifically, the purpose of this study was to analyze the relationship between Early Intervention program dosage and decreased use of special education and rates of retention. This study measured "dosage" as the total duration of time spent in the Early Intervention program, and it should be noted that individual levels of service (i.e. the type, frequency, or intensity of services) were not measured and may vary widely. Additionally, this study sought to determine if the relationship varied based on student demographic groups. This research area has been deemed a high priority by OCDEL and The Bureau of Early Intervention Services.

Previous studies have highlighted the positive effects of high-quality early childhood and intervention programs on decreasing the school-readiness gap for children with developmental delays and disabilities.

Literature Review

The Effects of Early Childhood Education Programs, Early Intervention, & Dosage

The cognitive, social, and academic skills developed in early childhood education programs prepare participants for future academic success by building a strong foundation for future learning. It has become increasingly clear that the benefits of such programs have a lasting impact. Many studies have found that the positive effects of participation in high-quality early childhood education programs are sustained beyond completion of the program, including decreased special education placement and rates of retention through elementary school (Currie, 2001; Hutcheson, 2008; Muschkin, Ladd, & Dodge, 2015), and increased rates of high school graduation (McCoy et al., 2017). The impact of high-quality early childhood education reaches beyond high school graduation, as participants have been found to have higher educational attainment and rates of employment (Campbell et al., 2002; Schweinhart et al., 2005; The Frank Porter Graham Child Development Institute, 2012), as well as greater long-term health and wealth outcomes (Reynolds et al., 2011).

The benefits of high-quality Early Intervention programs for children with developmental delays and disabilities have also been well documented by researchers. The Center on the Developing Child at Harvard University summarized rigorous research on early childhood experiences, describing how high-quality Early Intervention services can change a child's developmental trajectory, leading to better outcomes (The National Early Childhood Technical Assistance Center, 2011). These findings are substantiated by others who have found the benefits of Early Intervention services to include immediate cognitive improvements (Dawson et al., 2012), development comparable to same age peers at Kindergarten entry, and improved functioning and social skills in Kindergarten (Hebbeler et al., 2007).

Additionally, several studies have looked at the association between early childhood education program "dosage" (duration or frequency of services) and specific outcomes, including improved academic skills (McGinty et al., 2011; Domitrovich et al., 2013) and social and emotional competence (Moore et al., 2015). Decisions specific to the "dosage" of Early Intervention services received are not solely based on the severity of the identified disability but are made specific to the needs of each child and the family's desired outcomes (Kuhn & Marvin, 2016). Thus, there is not one standard measurement of Early Intervention "dosage" (Wasik, Lloyd, & Boller, 2013). However, it is clear that the timing of services can affect an intervention's effectiveness. When services are provided earlier in life, they have been found to be more effective and may potentially minimize the need for future special education services (The National Early Childhood Technical Assistance Center, 2011). Practitioners also argue that the intensity, or frequency, and duration of services are both related to an intervention's effectiveness (National Research Council and Institute of Medicine, 2000).

The benefits of high-quality Early Intervention programs for children with developmental delays and disabilities have also been well documented by researchers.

Decisions specific to the "dosage" of Early Intervention services received are not solely based on the severity of the identified disability but are made specific to the needs of each child and the family's desired outcomes.

The Demographics of Special Education

Since the establishment of the Individuals with Disabilities Education Act (IDEA) in 1975, the number of students receiving special education services has rapidly increased. In the 2017-18 school year, the National Center for Education Statistics (NCES) reported that 7 million students ages 3–21, or 14% of total public school enrollment, received special education services (The Condition of Education, 2019). This is a substantial increase from the 4.7 million, or 11% of all public school students who had received special education services in the 1990-91 school year (NCES, 2016). In addition to the growing number of students being served by special education, the demographics of the student population have grown increasingly diverse over time. Overall, the racial/ethnic distribution of students has changed; as the percentage of White and Black or African American students has decreased, the percentage of Hispanic, Asian, and Multi-Racial students has increased (Status and Trends in the Education of Racial and Ethnic Groups, 2019). According to the Migration Policy Institute, the population of English Learners in the U.S. is also rapidly growing (Zong and Batalova, 2015). Such changes within the general student population have also rapidly changed the demographic makeup of special education.

Disproportionate representation within special education is a topic which has been monitored and analyzed for decades. In the 2017-18 school year, a reported 17% of males, compared to only 9% of females ages 6–21, received special education services (The Condition of Education, 2019). The “gender-gap” in special education revealed by these statistics is not new or shocking, as it is a trend that has been discussed and studied over the years (Wehmeyer, & Schwartz, 2001; Hibel, Farkas, & Morgan, 2010; Churchill, 2013). Further, poverty (Blair & Scott, 2002) and the combination of poverty and race (Skiba et al., 2005; Shifrer & Callahan, 2011) have been found to affect rates of disproportionality in special education placement.

The “gender-gap” in special education revealed by these statistics is not new or shocking, as it is a trend that has been discussed and studied over the years.

NCES reported that in the 2017-18 school year, the highest percentages of students receiving special education services were American Indian/Alaskan Native and Black or African American, followed by White, Multi-Racial, Hispanic, Pacific Islander, and Asian students (The Condition of Education, 2019). To this end, many have argued that racial minorities (American Indian/Alaskan Native, Black or African American, and Hispanic) are over-represented in special education (Artiles et al., 2010; Ford, 2012). However, others have argued that racial minorities are under-represented in special education (Hibel, Farkas, & Morgan, 2010; Morgan et al., 2015). Additionally, English Learner (EL) students have been found to be underrepresented in special education until Grade 3, after which, these students are over-represented (Samson and Lesaux, 2009; Hibel and Jasper, 2012). Various explanations for this disproportionality have been posed, including potential biases and misinterpretations of cultural (Artiles et al., 2010; Ford, 2012), behavioral (Young et al., 2010; Churchill, 2013), and linguistic (Samson and Lesaux, 2009; Fernandez and Inserra, 2013) differences among student groups.

Methodology and Sample

The Conceptual Framework for the proposed research and analyses can be seen in Appendix A. They provide the primary constructs of the research questions and the link between questions of interest, variables of interest, and the key outcomes of interest: decreased rates of retention and special education use. This research and analyses had the following implications and major objectives:

- **Identification of the association between participation** in Pennsylvania’s Early Intervention programs and decreased use of special education and other student outcomes such as retention
- **Identification of the variation** in the associations across groups of students
- **Direction for future research** to guide policy decisions in the area of Early Intervention in relation to narrowing the school-readiness gap for students with disabilities and developmental delays
- **Add to existing literature** on the benefits of a child’s participation in Pennsylvania’s Early Intervention programs
- **Demonstration of the benefits** of utilizing Pennsylvania’s comprehensive Early Childhood Data System (PELICAN) and the State Longitudinal Data System for future research

Main Research Questions:

Although the ultimate goal was to utilize already existing data to achieve the major objectives listed above while also answering the priority research questions in the **PDE Research Agenda** under the research area, “Early Childhood Education”, it was determined during a meeting with representatives of OCDEL and The Bureau of Early Intervention Services that the focus of this research should be Early Intervention Services. Therefore, the following research questions were addressed specific to Early Intervention programs:

1. How does dosage affect other outcomes (decreased use of special education, decreased rate of retention)?
2. Does participation in multiple OCDEL programs decrease the likelihood of being placed in special education or not advancing from grade to grade?
3. Does dosage have a different impact for children who are economically disadvantaged?
4. Are there gender differences or racial/ethnic differences?

Additional Sub Questions of Interest:

5. Does this association vary by disability type, or EL Status?
6. Does the location of services affect the association?
7. What is the effect of dosage and participation in additional early childhood programs on special education use and retention through Grade 3 when other explanatory variables, including ECO scores, are included?

Procedures and Data File Preparation

Research questions were addressed through the analysis of linked Pennsylvania's Enterprise to Link Information for Children Across Networks (PELICAN) and Pennsylvania Information Management System (PIMS) data. PIMS is a statewide, longitudinal data system that houses student, staff, and school-level data for Kindergarten through Grade 12. PIMS serves as the primary database for the PDE's required reporting. For this Kindergarten cohort, PIMS templates were obtained for the school years 2013-14 through 2017-18. Working backwards from Kindergarten enrollment (the 2013-14 school year), PELICAN data were obtained for all children referred for Early Intervention services who were born between July 1, 2007 and November 30, 2009. These dates correspond to the earliest and latest birthdates which would allow a child to enter Kindergarten in the 2013-14 or 2014-15 school years. This additional year of data was originally requested for a second Kindergarten cohort, but it was determined that all of the necessary data were not yet available.

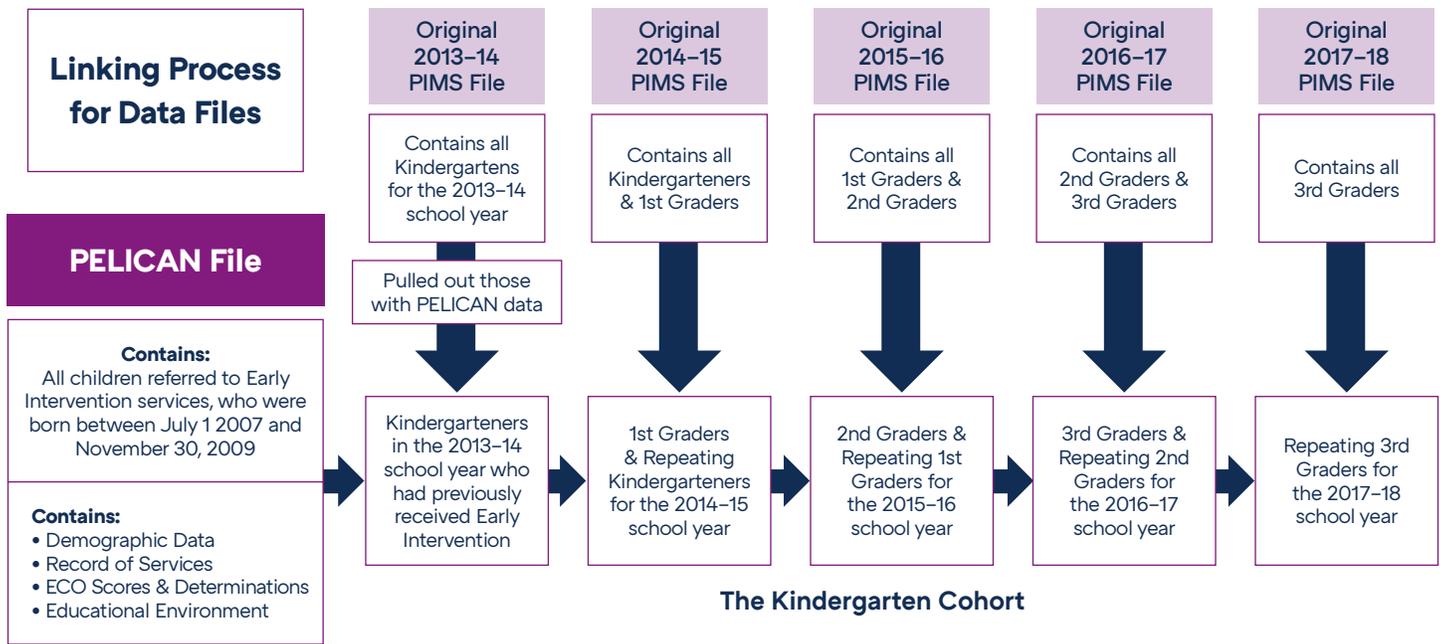
Four PELICAN files were obtained from OCDEL. The Demographic/Eligibility file contained demographic information about children referred to receive Early Intervention services, as well as their determined eligibility, and if applicable, the date they entered the program. Demographic data requested from both PIMS and PELICAN included PA Secure ID, date of birth, and first and last name so that linked data between the two data sources could be matched on multiple measures. The Record Status file contained students' program status (active/inactive) over time, and if the student exited services, it contained a case closure date. The Educational Environment file contained the location/setting where Early Intervention services were received and data regarding participation in additional early childhood or special education programs. Finally, the Early Childhood Outcome (ECO) Score file contained ECO scores at entry and exit into the program, as well as progress determinations.

When combined, these files provided all of the necessary student data needed to calculate dosage as the duration of time spent in the Early Intervention program and, if applicable, the additional participation in other early childhood programs, as well as the child's identified diagnosis, and ECO determinations. These students, who were identified as receiving Early Intervention services at some point prior to Kindergarten entry, were then identified in the 2013-14 PIMS file. This file represented all 132,933 of Pennsylvania's Kindergarteners for that school year. Only Kindergarteners in the 2013-14 PIMS file who had received Early Intervention services prior to entry were included in the analyses.

PIMS Student data were obtained to report student demographic and grade level related data for the 2013-14 through 2017-18 school years. PIMS Special Education data provided information on the special education services received, as well as the students' identified disabilities and the support they received. Finally, student enrollment and attendance data were obtained from the PIMS Student Calendar Fact files to calculate each student's yearly and overall attendance rates. The data sources were linked, connecting all of the requested data by school year, thus creating five data files. These five data files were then linked together by PA Secure ID to create a longitudinal record of students' demographic, grade level, special education, and attendance data from Kindergarten through Grade 3. Figure 1 illustrates the process of linking all files together in order to track the Kindergarten cohort from entrance into the Early Intervention program through Grade 3.

Only Kindergarteners in the 2013-14 PIMS file who had received Early Intervention services prior to entry were included in the analyses.

FIGURE 1. Linking Process for Data Files



Overall, the goal was to analyze the data available on Pennsylvania’s students across time to examine the association between Early Intervention dosage and student outcomes through Grade 3, including decreased special education use and retention rates. Additionally, variation in the association was examined based on student groups. These data were analyzed using varied analytic methods, that included descriptive statistics, Chi-Square (Pearson), and Logistic Regression analysis.

Sample

The sample for this study included 13,061 Kindergarten students in Pennsylvania during the 2013-14 school year who had received Early Intervention services at some point before their entrance into Kindergarten. This Kindergarten cohort was tracked backwards and linked to their data from the Early Intervention program, then tracked forward using PIMS data through Grade 3. Again, Figure 1 shows the process of merging student files together to create a multi-year, longitudinal data file for the Kindergarten cohort. Since the analyses were exploratory in nature and included the total population of students available for the cohort, no sampling technique was used.

Population Demographics

The demographic breakdown of the students included in this study can be found in Table 1. There were 13,061 students in the Kindergarten cohort; 70.0% were male, and 30.0% were female. Sixty-six percent identified as White, 12.8% identified as Black or African American, 10.5% identified as Hispanic, 7.6% identified as Multi-Racial, and 1.9% identified as Asian. The number of students who identified as American Indian/Alaskan Native and Native Hawaiian or Other Pacific Islander combined made up less than 1% of the population.

Of students who had EL Status data available from Kindergarten entry through Grade 3, 95.9% were never identified as being EL Status, 2.7% remained EL Status through Grade 3, and 1.4% were partially EL Status, meaning that over the years their status had changed from EL Status to non-EL status, or vice versa. Further, of students whose Economic Disadvantaged Status data were available from Kindergarten entry through Grade 3, 44.2% remained economically disadvantaged through Grade 3, 31.0% were never economically disadvantaged, and 24.8% were partially economically disadvantaged, meaning that over the years their status had changed from Economic Disadvantaged Status to non-Economic Disadvantaged Status, or vice versa. Based on this measurement criteria, the EL Status of 1,020 (7.8% of the cohort) students and the Economic Disadvantaged Status of 837 (6.4% of the cohort) students could not be determined. For more information on these terms and additional operational definitions refer to Appendix B.

TABLE 1. Sample by Student Groups

Overall	
Total	13061
Gender	
Male	70.0 (9139)
Female	30.0 (3922)
Ethnicity	
American Indian/Alaskan Native	*
Black or African American	12.8 (1678)
Hispanic	10.5 (1377)
White	66.9 (8734)
Multi-Racial	7.6 (999)
Asian	1.9 (249)
Native Hawaiian or Other Pacific Islander	*
EL Status Through Grade 3	
Total	12041
Never EL Status	95.9 (11548)
Partial EL Status	1.4 (169)
Remained EL Status	2.7 (324)
Economic Disadvantaged Status Through Grade 3	
Total	12224
Never Economic Disadvantaged Status	31.0 (3788)
Partial Economic Disadvantaged Status	24.8 (3030)
Remained Economic Disadvantaged Status	44.2 (5406)

*Counts Too Low to Report

The tables provided in Appendix C provide descriptive statistics for all study outcomes overall and based on student groups, which are discussed in this section. While in the Early Intervention program, the majority of students were identified as having a developmental delay (48.9%), followed by a speech or language impairment (38.6%), and Autism (7.6%). The majority of students (63.8%) received their Early Intervention services in a regular early childhood program, while 13.2% received services in a special education class, and 23.0% received their services in some other location. The majority of students (91.9%) were enrolled in an early childhood and/or special education program while also receiving Early Intervention services. A very small percentage of the cohort were in the Early Intervention program for more than four years (0.5%) or six months or less (2.8%), and the highest percentage of students were in the program for 2.5–3 years (21.2%), 2–2.5 years (20.1%), and 1.5–2 years (18.5%).

The majority of students (91.9%) were enrolled in an early childhood and/or special education program while also receiving Early Intervention services.

Of those who went on to receive special education services in Grades K–3, at the time they began the services, the majority (53.7%) were identified with a speech or language impairment as their primary disability, followed by Autism (14.7%) and a specific learning disability (10.2%). During their first year of special education services, almost all (97.4%) received their services inside the classroom. Seventy-six percent of the cohort were enrolled in Full-Day Kindergarten during the 2013-14 school year, while 23.2% were enrolled in Half-Day Kindergarten. Finally, through Grade 3, the overall average percent attendance for the cohort was 94%.

Outcomes Based on Student Group

SPECIAL EDUCATION USE THROUGH GRADE 3

The majority of students in the cohort (79.2%) had received special education services at some point from Kindergarten entry to Grade 3. Eighty percent of males and 76.3% of females in the cohort had received services by Grade 3. White and Multi-Racial students had the highest rates of receiving special education services by Grade 3 (80.6% and 80.3%, respectively), followed by Hispanic students (75.5%), Black or African American students (74.9%), and Asian students (72.4%). Seventy-eight percent of never EL Status students, 77.2% of students who remained EL Status, and 74.7% of partial EL Status students received services at some point. A slightly higher percentage of students who were partially economically disadvantaged (80.7%) and who remained economically disadvantaged (79.0%) received services at some point when compared to students who were never economically disadvantaged (75.8%).

The majority of students in the cohort (79.2%) had received special education services at some point from Kindergarten entry to Grade 3.

GRADE LEVEL SPECIAL EDUCATION SERVICES BEGAN

Of those who received special education services by the end of Grade 3, the majority (80.1%) began in Kindergarten, 11.2% began in Grade 1, 5.1% began in Grade 2, and 3.5% began in Grade 3. Of those who received services, a similar rate of females (80.7%) and males (79.9%) began receiving services in Kindergarten. Asian students had the highest rates of entering

special education in Kindergarten (85.5%) followed by White students (84.0%), Hispanic students (73.7%), Multi-Racial students (73.4%), and Black or African American students (66.7%). Although the majority of partial EL Status (85.5%) and never EL Status students (80.0%) began to receive services in Kindergarten, a much lower percentage of students who remained EL Status (67.2%) began in Kindergarten. Eighty-three percent of never economically disadvantaged students, 81.3% of partially economically disadvantaged students, and 76.7% of students who remained economically disadvantaged began receiving services in Kindergarten. Overall, only 5.5% of students who received special education services by or in Grade 3 began while repeating a grade level.

TOTAL NUMBER OF YEARS IN SPECIAL EDUCATION BY GRADE 3

Overall, almost half (42.2%) of the cohort received four years of special education services, while 21.9% did not ever receive special education services by or in Grade 3. Much lower rates of students received one, two, and three years of special education services, (6.7%, 9.8%, 14.9%, respectively). Only 4.5% of the cohort received five years of special education services, indicating that they received services while repeating a grade level. Further, Table 9 of Appendix C indicates that there are no large differences based on gender, race/ethnicity, EL Status, or Economic Disadvantaged Status with the average number of years spent in special education ranging from a minimum of 2.31 to a maximum of 2.70.

Overall, almost half (42.2%) of the cohort received four years of special education services, while 21.9% did not ever receive special education services by or in Grade 3.

IF NOT RECEIVING SERVICES AT KINDERGARTEN ENTRY, BEGAN BY GRADE 3

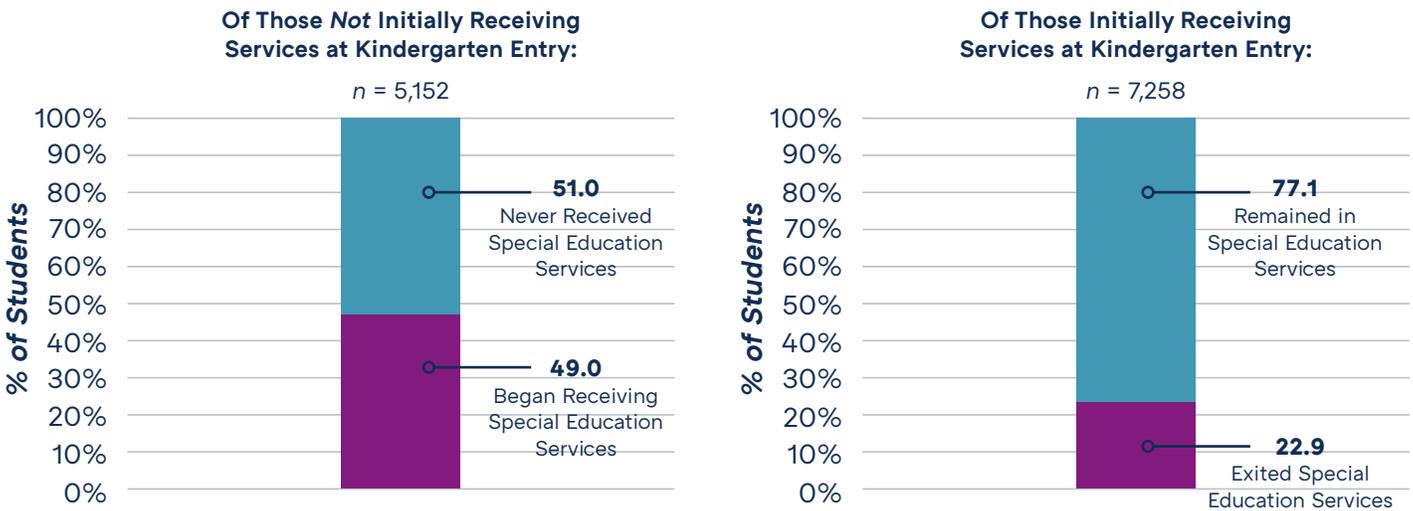
Figure 2 shows that of students who received Early Intervention but were not initially receiving special education services at Kindergarten entry, 49.0% of students began receiving services by or in Grade 3. A higher percentage of male students (51.3%) when compared to female students (43.8%) not receiving services at Kindergarten entry began receiving by or in Grade 3. Compared to the overall average of students who entered after Kindergarten (49.0%), a higher percentage of Multi-racial (56.5%) and Black or African American (53.2%) students began receiving by Grade 3 compared to a significantly lower percentage of Asian students (32.7%). White (47.6%) and Hispanic (47.2%) students began receiving services by Grade 3 at similar rates. Of students not initially receiving services, 52.9% of students who remained EL Status, 47.4% of students who were never EL Status, and only 42.9% of partial EL Status students began receiving services by or in Grade 3. A slightly higher percentage (54.0%) of partially economically disadvantaged students began receiving services by Grade 3 compared to students who remained economically disadvantaged (48.6%) and students who were never economically disadvantaged (41.9%).

IF RECEIVING SERVICES AT KINDERGARTEN ENTRY, EXITED BY GRADE 3

Figure 2 shows that of those who received Early Intervention and began receiving special education services at Kindergarten entry, 22.9% had exited services and did not re-enter by Grade 3, while 77.1% had continued to receive services through Grade 3. A slightly higher percentage of female students (27.4%) when compared to males (21.0%) receiving services at Kindergarten entry exited services by or in Grade 3. Twenty-four percent of White students and Hispanic students exited services by or in Grade 3, while 21.2% of Asian students, 18.3% of Black or African American students, and 17.0% of Multi-Racial

students exited services by or in Grade 3. Of students receiving services at Kindergarten entry, 34.9% of partial EL Status students, 23.2% of never EL Status students, and 19.8% of students who remained EL Status exited services by or in Grade 3. A significantly higher percentage of students who were never economically disadvantaged (28.1%) exited services by or in Grade 3 when compared to students who remained economically disadvantaged (19.8%). The percentage of partially economically disadvantaged students who exited (23.3%) was close to the overall average (22.9%).

FIGURE 2. Special Education Use – Kindergarten Through Grade 3



RETENTION

When looking at rates of retention, only 14.6% of the entire cohort repeated a grade level by or in Grade 3, while 85.4% had not. Similar rates of males and females had repeated a grade level (14.8% and 14.1%, respectively). Black or African American students had the highest rate of repeating a grade level by or in Grade 3 (17.2%) followed by Multi-Racial students (15.2%), White students (14.9%), and Hispanic students (9.6%). Seventeen percent of students identified as partial EL Status and 13.4% of students never identified as EL Status repeated a grade level by or in Grade 3. Twenty percent of students identified as partially economically disadvantaged and similar rates of students who remained economically disadvantaged or were never economically disadvantaged (11.7% and 11.0%, respectively) repeated a grade level by Grade 3.

When looking at rates of retention, only 14.6% of the entire cohort repeated a grade level by or in Grade 3, while 85.4% had not.

KINDERGARTEN RETENTION

For all students, a successful first year of elementary school is crucial. Thus, this study also looked specifically at the percentage of the cohort that repeated Kindergarten. Ten percent of the entire cohort (1,294 students) repeated Kindergarten, while 89.8% did not. A similar rate of male and female students repeated Kindergarten (10.4% and 9.7%, respectively). While 11.3% of White students, 9.3%

of Black or African American students, and 9.2% of Multi-Racial students repeated kindergarten, Hispanic students repeated kindergarten at a lower rate (5.8%). Twelve percent of students identified as partial EL Status and 9.9% of those who were never EL Status repeated Kindergarten. Further, 15.0% of partially economically disadvantaged students, 9.4% of never economically disadvantaged students, and 7.5% of students who remained economically disadvantaged repeated Kindergarten.

Ten percent of the entire cohort (1,294 students) repeated Kindergarten, while 89.8% did not.

GRADE LEVEL REPEATED

As stated above, overall, a small percentage (14.6%) of the cohort repeated any grade level by or in Grade 3. However, to further explore the subgroup of students who had repeated a grade level, additional analysis was conducted. Table 19 of Appendix C shows that of those who had repeated (n = 1,740), the majority (74.4%) had repeated Kindergarten, 14.3% had repeated Grade 1, 7.7% had repeated Grade 2, and 3.7% had repeated Grade 3. Further analysis shown in Table 2 indicates that the majority of students who repeated any grade had a developmental delay or a speech or language impairment, while only a small percentage had Autism or “other disabilities”. However, as Table 3 shows, students were more likely to repeat Kindergarten, compared to Grades 1 through 3, regardless of disability type.

TABLE 2. Early Intervention Disability Type Based on Grade Level Repeated

	Kindergarten	Grade 1	Grade 2	Grade 3	Overall
Disability @ Early Intervention	% (n)	% (n)	% (n)	% (n)	% (n)
Total	100 (1294)	100 (248)	100 (134)	100 (64)	100 (1740)
Autism	8.7 (113)	*	*	*	8.4 (147)
Speech or Language Impairment	25.7 (333)	24.2 (60)	22.4 (30)	*	25.2 (438)
Developmental Delay	57.9 (749)	64.5 (160)	59.0 (79)	60.9 (39)	59.0 (1027)
Hearing and/or Visual Impairment	*	*	*	*	1.7 (30)
Other Disability	6.3 (82)	*	*	*	5.6 (98)

*Counts Too Low to Report

TABLE 3. Grade Level Repeated Based on Early Intervention Disability Type

	Kindergarten	Grade 1	Grade 2	Grade 3
Disability @ Early Intervention	% (n)	% (n)	% (n)	% (n)
Total	74.4 (1294)	14.3 (248)	7.7 (134)	3.7 (64)
Autism	76.9 (113)	*	*	*
Speech or Language Impairment	76.0 (333)	13.7 (60)	6.8 (30)	*
Developmental Delay	72.9 (749)	15.6 (160)	7.7 (79)	3.8 (39)
Hearing and/or Visual Impairment	*	*	*	*
Other Disability	83.7 (82)	*	*	*

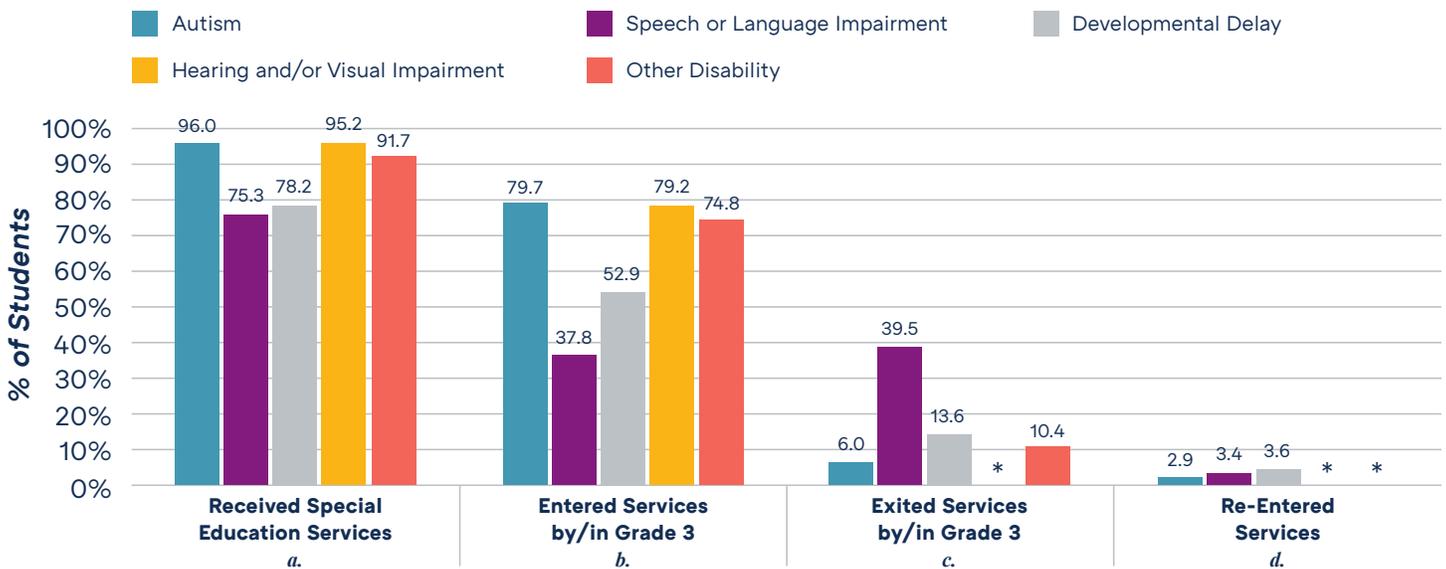
*Counts Too Low to Report

Outcomes Based on Disability Type Determined During Early Intervention

Of the entire cohort, Figure 3 shows that while students identified as having Autism, a hearing and/or visual impairment, and “other disabilities” had the highest rates of receiving special education services by Grade 3 (96.0%, 95.2%, and 91.7%, respectively), students with a developmental delay (78.2%) and those with a speech or language impairment (75.3%) had the lowest rates. Similarly, of those not initially receiving services at Kindergarten entry, the majority of students identified with Autism, a hearing and/or visual impairment, or “other disabilities” (79.7%, 79.2%, and 74.8%, respectively) began receiving services by or in Grade 3, while a significantly lower percentage of students with a developmental delay (52.9%) and a speech or language impairment (37.8%) began receiving services. Of students receiving services at Kindergarten entry, students with a speech or language impairment exited services by Grade 3 at a significantly higher rate (39.5%) when compared to students with a developmental delay (13.6%), with “other disabilities” (10.4%), and with Autism (6.0%). Aside from re-entering services, the difference in proportions among each outcome was significant, and for both entering and exiting special education services the effect was moderate ($\phi = .215$ and $\phi = .324$).

When looking at retention rates of the cohort (see Figure 4), students with “other disabilities” had a significantly higher rate of retention by or in Grade 3 (24.7%) when compared to students with developmental delays (17.6%), Autism, (16.1%), a hearing and/or visual impairment (15.1%), or a speech or language impairment (9.6%). Overall, students with “other disabilities” also had a significantly higher rate of repeating Kindergarten (20.0%) compared to other disability types. For the list of individual disability types that were combined to create the “other disabilities” category used for analysis, see Appendix B.

FIGURE 3. Special Education Outcomes Based on Early Intervention Disability Type



*Counts Too Low to Report

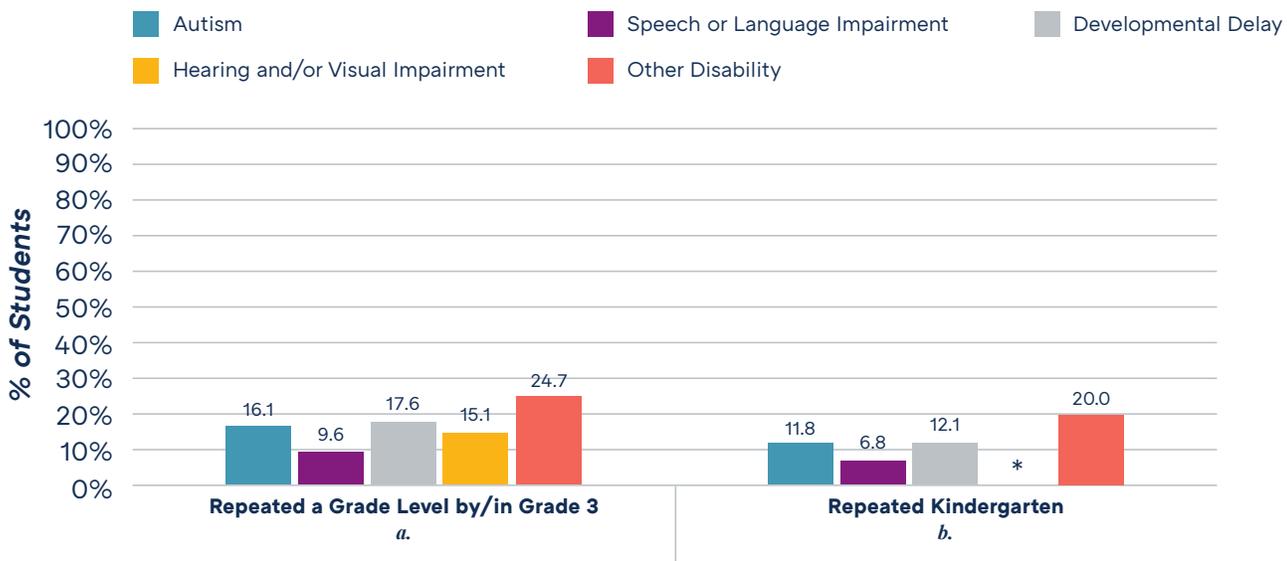
a. $\chi^2(4, N = 12,613) = 287.039, p < .01, \phi = .151$;

b. $\chi^2(4, N = 5,152) = 238.874, p < .01, \phi = .215$;

c. $\chi^2(4, N = 7,258) = 760.492, p < .01, \phi = .324$;

d. $\chi^2(4, N = 8,566) = 3.942, p = .414, \phi = .021$

FIGURE 4. Retention Outcomes Based on Early Intervention Disability Type



*Counts Too Low to Report

a. $\chi^2(4, N = 12,341) = 171.679, p < .01, \phi = .118$;

b. $\chi^2(4, N = 12,686) = 133.175, p < .01, \phi = .102$

Results

How does Early Intervention program dosage affect outcomes – use of special education, and decreased rate of retention through Grade 3?

Initial analyses of the effect of dosage included chi-square analysis to investigate whether a relationship exists. This analysis was followed by logistic regression analyses to examine the effects of dosage in the context of models with the inclusion of other significant explanatory variables.

EARLY INTERVENTION DOSAGE & DECREASED USE OF SPECIAL EDUCATION SERVICES

Figure 5 illustrates that initial chi-square analysis did not reveal a clear relationship between Early Intervention dosage and any measure of special education use. For special education use, those in the Early Intervention program for 1–1.5 years and for 1.5–2 years had the lowest rates of receiving special education services at some point by or in Grade 3 (69.6% and 74.4%, respectively). The rate steadily increased by each category of dosage, with those in the Early Intervention program for 3.5–4 years and for more than four years having the highest rates of receiving special education services (both 90.8%). The difference between groups was significant, $\chi^2(1, N = 12,613) = 91.179, p < .01$, but the effect was small ($V = .129$). Similarly, students in the Early Intervention program for 1–1.5 years and 1.5–2 years also had the lowest rates of beginning to receive services after Kindergarten entry (43.5% and 41.5%, respectively), while

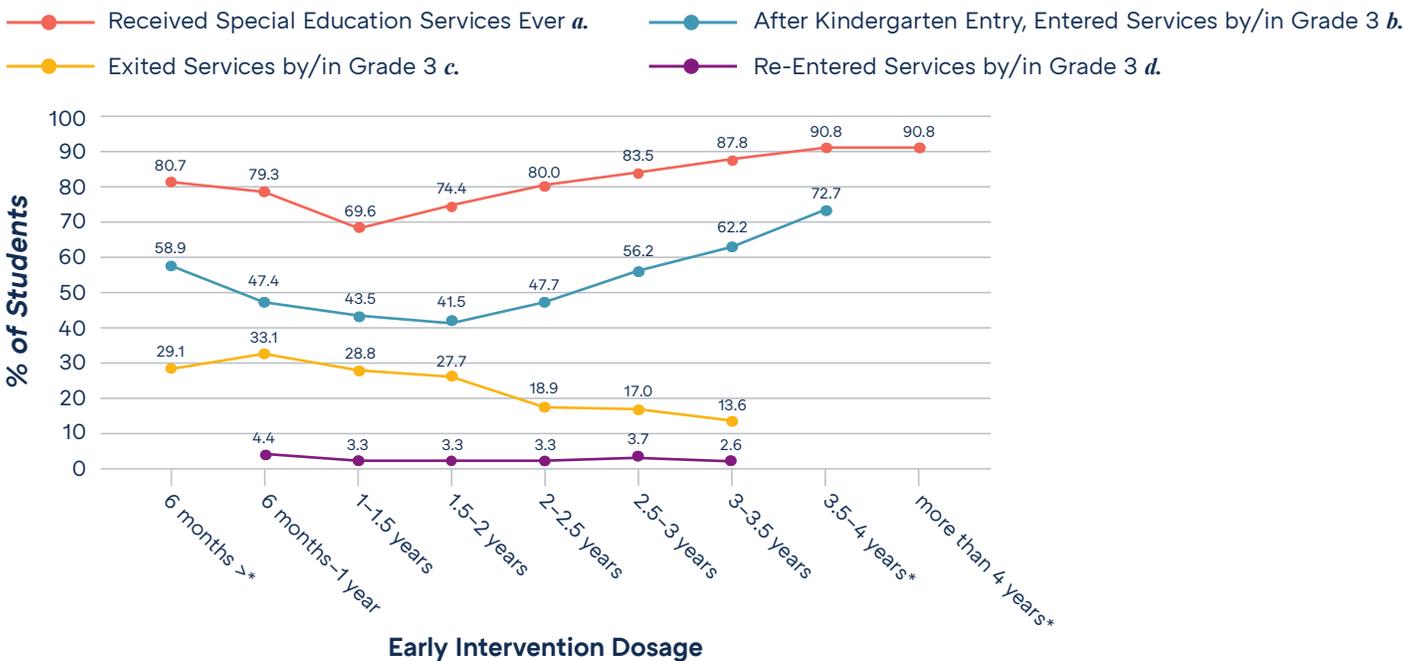
The rate steadily increased by each category of dosage, with those in the Early Intervention program for 3.5–4 years and for more than four years having the highest rates of receiving special education services

those who received 3.5–4 years of Early Intervention had the highest rate (72.7%). The difference between proportions was significant, $\chi^2(1, N = 5,152) = 33.017, p < .01$, but this effect was also small ($V = .137$).

Figure 5 shows that a slight pattern emerges in the percentage of students who exited special education services by or in Grade 3 based on Early Intervention dosage. In general, students in the Early Intervention program for a shorter amount of time had higher rates of exiting services by or in Grade 3. Students who received less than 6 months or 6 months to 1 year of Early Intervention dosage had the highest rates of exiting special education services (29.1% and 33.1%, respectively) with a steady decline in exit rates if a student received Early Intervention for 1.5 up to 3.5 years (from 28.8% to 13.6%). The difference in proportions was significant, $\chi^2(1, N = 7,258) = 163.607, p < .01$, but the association was small ($V = .163$). Overall, the rates of exiting then re-entering special education services by or in Grade 3 were low and comparable across categories of dosage, ranging from 2% to 4%.

Overall, the higher level dosage categories had significantly higher percentages of students that received special education services by or in Grade 3 and lower rates of students who exited services. Conversely, lower level dosage categories generally had lower percentages of students that received special education services by Grade 3 and higher rates of exit by or in Grade 3 for students who did receive services. Specifically, these results show that students who received Early Intervention for more than two years had significantly higher rates of receiving special education services by or in Grade 3 and significantly lower exit rates compared to other students, but the effect is small. Further analysis, shown in Table 4, indicates the majority of children identified as having Autism, a hearing and/or visual impairment, or “other disabilities” received two or more years of Early Intervention dosage. As discussed in the previous section, students in these disability categories also had higher rates of receiving special education services.

FIGURE 5. Special Education Use Based on Early Intervention Dosage



*Some Counts Too Low to Report

a. $\chi^2(1, N = 12613) = 91.179, p < .01, V = .129$;

b. $\chi^2(1, N = 5152) = 33.017, p < .01, V = .137$;

c. $\chi^2(1, N = 7258) = 163.607, p < .01, V = .163$;

d. $\chi^2(1, N = 8566) = 3.127, p = .077, V = .032$

TABLE 4. Early Intervention Dosage Based on Early Intervention Disability Type

	Autism	Speech or Language Impairment	Developmental Delay	Hearing and/or Visual Impairment	Other Disability
Dosage	% (n)	% (n)	% (n)	% (n)	% (n)
Total	100 (991)	100 (5093)	100 (6393)	100 (214)	100 (424)
6 months or less	*	3.1 (158)	2.7 (174)	*	*
6 months–1 year (6–12 months)	4.9 (49)	20.5 (1031)	13.5 (864)	*	8.7 (37)
1–1.5 years (13–18 months)	6.0 (59)	14.9 (750)	12.1 (771)	*	5.7 (24)
1.5–2 years (19–24 months)	11.8 (117)	20.8 (1047)	19.0 (1212)	*	8.5 (36)
2–2.5 years (25–30 months)	23.5 (233)	18.0 (909)	20.9 (1339)	22.0 (47)	24.1 (102)
2.5–3 years (31–36 months)	32.7 (324)	16.5 (833)	22.2 (1421)	36.0 (77)	26.7 (113)
3–3.5 years (37–42 months)	17.1 (169)	5.5 (278)	8.1 (520)	17.3 (37)	21.7 (92)
3.5–4 years (43–48 months)	*	*	0.8 (54)	*	*
more than 4 years (49+ months)	*	*	0.6 (38)	*	*

*Counts Too Low to Report

Additionally, Table 5 shows that those who spent two or more years in Early Intervention had significantly higher rates of spending four years in special education services. Further, Table 6 indicates that there were minimal differences in rates of receiving special education services at Kindergarten entry among students who received less than two years of dosage. However, of those who received two or more years of Early Intervention dosage, the majority of students were receiving special education services at Kindergarten entry.

TABLE 5. Early Intervention Dosage Based on Years Spent in Special Education

	0 years	1 year	2 years	3 years	4 years	5 years
Dosage	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Total	21.9 (2629)	6.7 (811)	9.8 (1172)	14.9 (1795)	42.2 (5074)	4.5 (538)
6 months or less	20.6 (67)	7.4 (24)	13.2 (43)	19.7 (64)	35.4 (115)	*
6 months–1 year (6–12 months)	21.6 (401)	7.3 (136)	12.9 (240)	17.9 (333)	36.4 (676)	3.8 (70)
1–1.5 years (13–18 months)	32.1 (464)	8.0 (116)	11.1 (161)	15.1 (219)	30.8 (446)	2.8 (40)
1.5–2 years (19–24 months)	26.8 (597)	8.3 (185)	11.4 (255)	14.0 (312)	35.7 (797)	3.8 (84)
2–2.5 years (25–30 months)	21.0 (512)	6.0 (147)	7.5 (183)	14.6 (356)	44.4 (1082)	6.4 (155)
2.5–3 years (31–36 months)	17.3 (443)	5.9 (151)	8.2 (210)	14.4 (369)	48.5 (1242)	5.7 (145)
3–3.5 years (37–42 months)	12.8 (130)	4.7 (48)	6.9 (70)	11.6 (118)	61.2 (621)	2.7 (27)
3.5–4 years (43–48 months)	*	*	*	*	64.5 (60)	*
more than 4 years (49+ months)	*	*	*	*	58.3 (35)	*

*Counts Too Low to Report

TABLE 6. Initially in Special Education at Kindergarten Entry Based on Early Intervention Dosage

Dosage	Yes	No
	% (n)	% (n)
Total	57.1 (7461)	42.9 (5600)
6 months or less	50.7 (184)	49.3 (179)
6 months–1 year (6–12 months)	59.0 (1174)	41.0 (817)
1–1.5 years (13–18 months)	43.7 (707)	56.3 (910)
1.5–2 years (19–24 months)	54.3 (1314)	45.7 (1108)
2–2.5 years (25–30 months)	59.9 (1575)	40.1 (1055)
2.5–3 years (31–36 months)	60.6 (1677)	39.4 (1091)
3–3.5 years (37–42 months)	65.6 (719)	34.4 (377)
3.5–4 years (43–48 months)	60.7 (65)	39.3 (42)
more than 4 years (49+ months)	68.7 (46)	31.3 (21)

*Counts Too Low to Report

Finally, although the majority of the cohort had received special education services by or in Grade 3, 20.8% of students did not. Table 7 shows that the highest rates of students who did not receive special education services had received between 1.5–2.5 years of Early Intervention dosage (22.7% and 19.5%, respectively), while the lowest rates had received either the highest or lowest levels of dosage (4.9% and 2.5%, respectively). Further, descriptive analyses shown in Table 8 of Appendix C indicate that a slightly higher rate of females than males did not receive special education services. Asian students had the highest rate of not receiving special education services (27.6%), while Black or African American students and Hispanic students had similar rates (25.1% and 24.5%, respectively), as did Multi-Racial students and White students (19.7% and 19.4%, respectively). Further, partial EL Status students had a slightly higher rate (25.3%) than students who remained EL status (22.8%) and those who were never identified as EL Status (21.8%). Finally, students who were never economically disadvantaged (24.2%) had a higher rate of not receiving special education services compared to students who remained economically disadvantaged (21.0%) or who were partially economically disadvantaged (19.3%).

TABLE 7. Early Intervention Dosage Based on Special Education Use

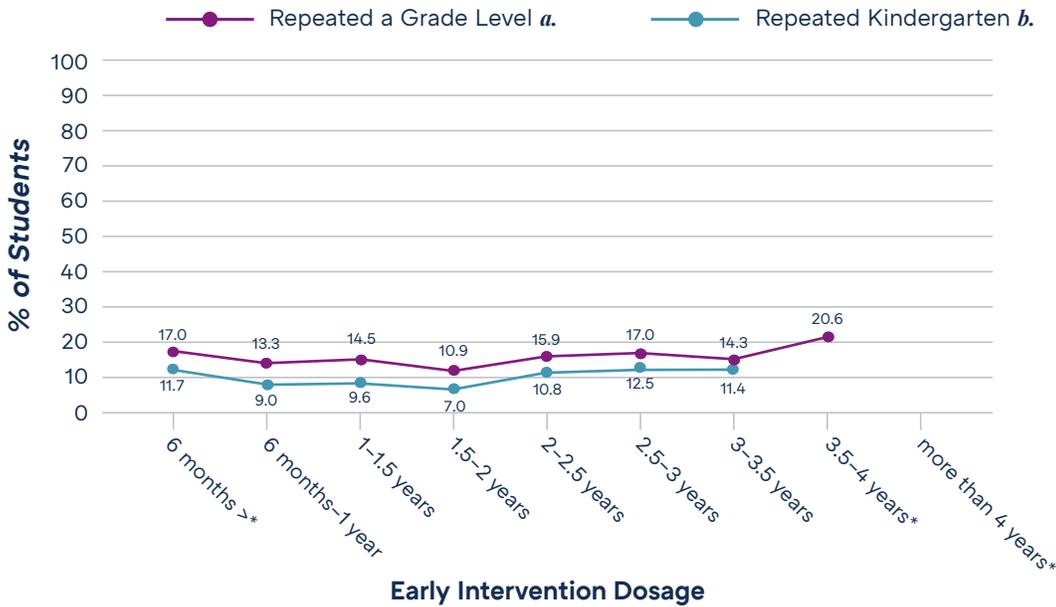
Dosage	Received Special Education Services	Did Not Receive Services
	% (n)	% (n)
Total	100 (9984)	100 (2629)
6 months or less	2.8 (280)	2.5 (67)
6 months–1 year (6–12 months)	15.4 (1535)	15.3 (401)
1–1.5 years (13–18 months)	10.7 (1064)	17.6 (464)
1.5–2 years (19–24 months)	17.4 (1737)	22.7 (597)
2–2.5 years (25–30 months)	20.5 (2042)	19.5 (512)
2.5–3 years (31–36 months)	22.5 (2245)	16.9 (443)
3–3.5 years (37–42 months)	9.3 (933)	4.9 (130)
3.5–4 years (43–48 months)	0.9 (89)	*
more than 4 years (49+ months)	0.6 (59)	*

*Counts Too Low to Report

EARLY INTERVENTION DOSAGE & DECREASED RATES OF RETENTION

As Figure 6 shows, there is no clear relationship between Early Intervention dosage and either measure of retention. Students in the Early Intervention program for 3.5–4 years had the highest rate of retention, (20.6%), while those in the program for 1.5–2 years had the lowest rate (10.9%). Rates of repeating Kindergarten followed the same pattern, with those in the Early Intervention program for less than six months having the highest rate of repeating Kindergarten (11.7%), and students in the program for 1.5–2 years having the lowest rate (7.0%). Although the difference between groups was significant for both measures of retention, the effect was very small ($V = .062$ and $V = .065$).

FIGURE 6. Retention Outcomes Based on Early Intervention Dosage



*Some Counts Too Low to Report

a. $\chi^2(1, N = 12341) = 10.058, p < .01, V = .062$;

b. $\chi^2(1, N = 12686) = 19.843, p < .01, V = .065$

Does Participation in an additional Early Childhood Education Program while in Early Intervention Decrease Special Education Use or Rates of Retention?

PARTICIPATION IN AN ADDITIONAL EARLY CHILDHOOD PROGRAM & SPECIAL EDUCATION PLACEMENT

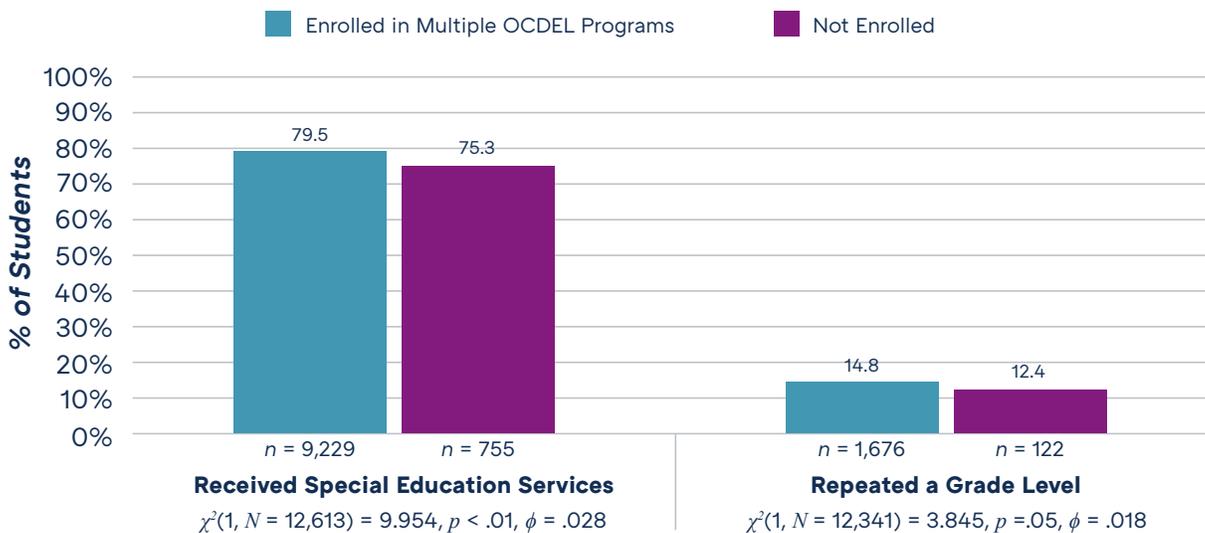
Among the 11,610 children who participated in an early childhood program and/or a special education program while in the Early Intervention program, 79.5% received special education services at some point by or in Grade 3, compared to 75.3% of children who did not participate. Although the small percentage difference (4.2%) between those who participated in an additional OCDEL program and those who did not was significant, $\chi^2(1, N = 12,613) = 9.954, p < .01$, the effect was minimal ($\phi = .028$). Additional analysis, found in Table 1 of Appendix D, showed that regardless of dosage, the majority of students receiving Early Intervention services were participating in additional early childhood programs.

PARTICIPATION IN AN ADDITIONAL EARLY CHILDHOOD PROGRAM & RETENTION

Among the 11,361 children who participated in an early childhood program and/or a special education program while in the Early Intervention program, 1,676 (14.8%) repeated a grade level by or in Grade 3, similar to the rate of retention overall (14.6%). Among the 980 children who did not participate in an early childhood program or a special education program while in the Early Intervention program, 122 (12.4%) repeated a grade level by or in Grade 3. The difference between groups was large enough to be statistically significant, $\chi^2(1, N = 12,341) = 3.845, p = .05$, however the effect was minimal ($\phi = .018$). Overall, a slightly higher percentage of children who enrolled in an additional program received special education services and also repeated a grade level.

Regardless of dosage, the majority of students receiving Early Intervention services were participating in additional early childhood programs.

FIGURE 7. Special Education Use and Retention Based on Additional Program Participation

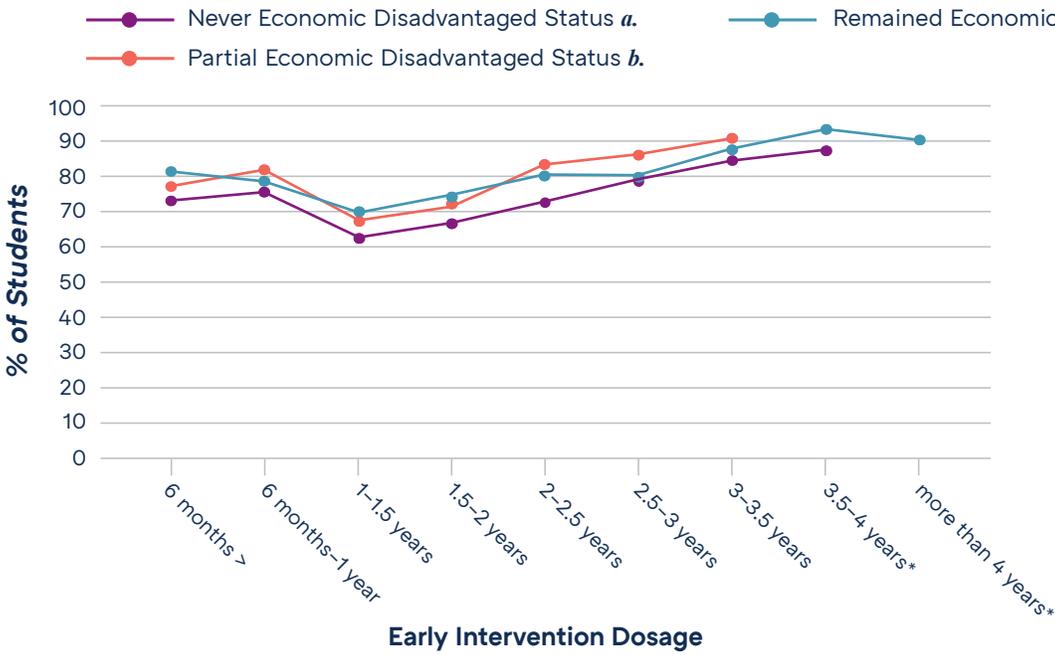


Does dosage have a different impact for children who are economically disadvantaged?

EARLY INTERVENTION DOSAGE & DECREASED USE OF SPECIAL EDUCATION SERVICES BY ECONOMIC DISADVANTAGED STATUS

The association between Early Intervention dosage and special education use is the same, regardless of Economic Disadvantaged Status. However, Figures 8 and 9 show that a slightly lower percentage of students who were never economically disadvantaged received services at any time and a slightly higher percentage exited by or in Grade 3 when compared to students who were partially or remained economically disadvantaged, on average. Overall, however, the difference in proportions for receiving special education services and exiting by Grade 3, at different levels of Early Intervention dosage, is significant regardless of Economic Disadvantaged Status.

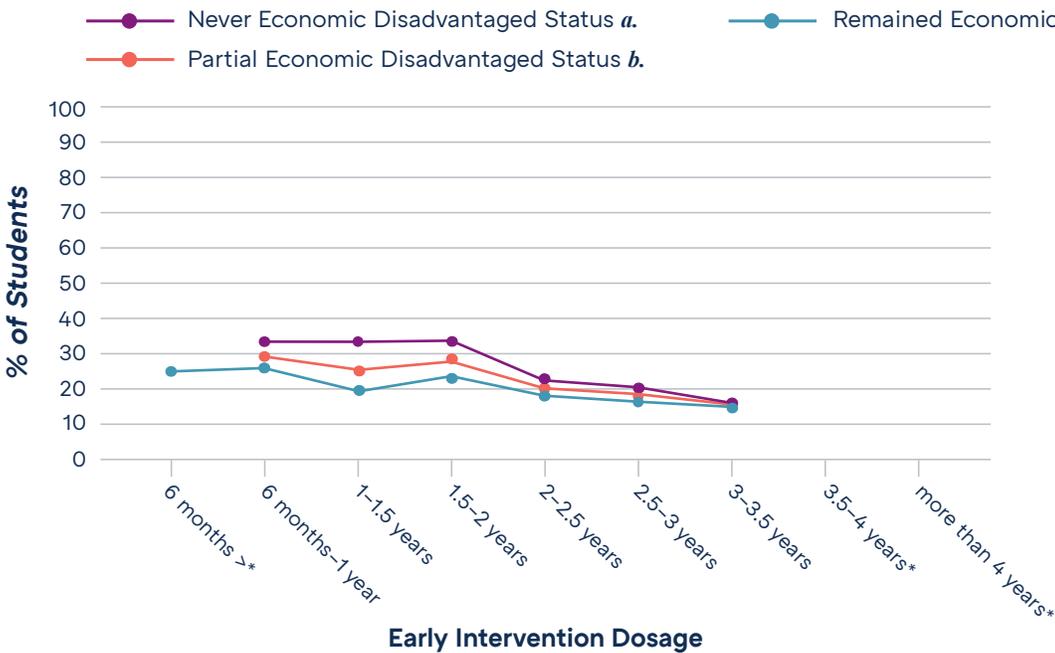
FIGURE 8. Received Special Education Services by Economic Disadvantaged Status Based on Early Intervention Dosage



*Some Counts Too Low to Report

a. $\chi^2(1, N = 3788) = 44.468, p < .01, V = .154$;
b. $\chi^2(1, N = 2985) = 39.227, p < .01, V = .168$;
c. $\chi^2(1, N = 5406) = 21.770, p < .01, V = .105$

FIGURE 9. Exited Services by or in Grade 3 by Economic Disadvantaged Status Based on Early Intervention Dosage



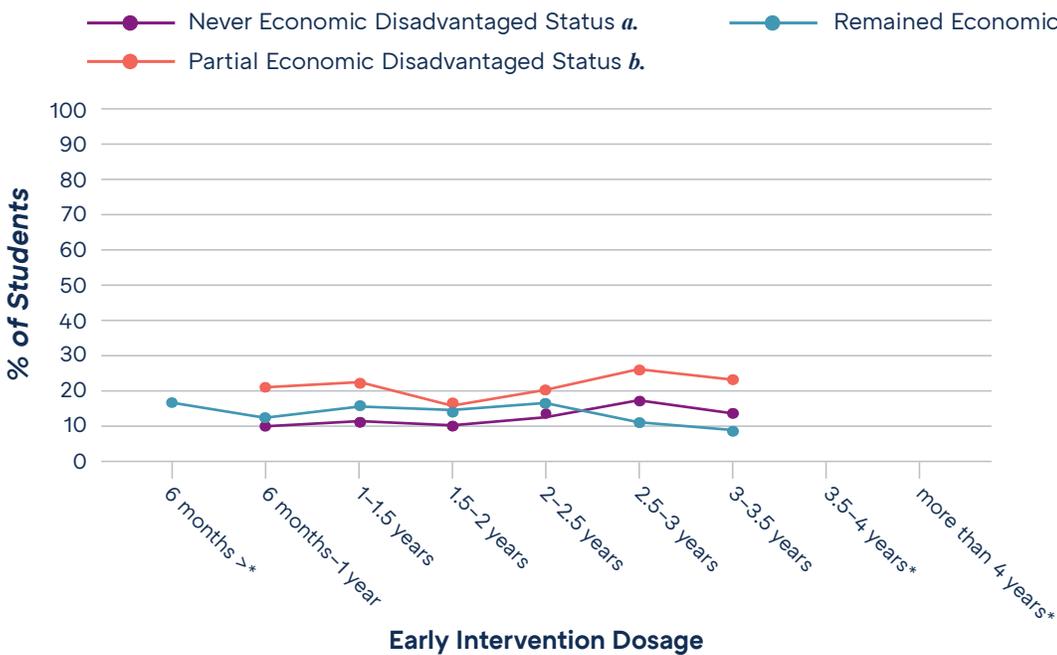
*Some Counts Too Low to Report

a. $\chi^2(1, N = 2211) = 87.255, p < .01, V = .224$;
b. $\chi^2(1, N = 1662) = 34.919, p < .01, V = .171$;
c. $\chi^2(1, N = 3193) = 60.197, p < .01, V = .146$

EARLY INTERVENTION DOSAGE & DECREASED RATES OF RETENTION BY ECONOMIC DISADVANTAGED STATUS

As Figures 10 and 11 illustrate, the association between Early Intervention dosage and rates of retention slightly varies among Economic Disadvantaged Status groups. A higher percentage of partially economically disadvantaged students repeated a grade level by or in Grade 3 and also repeated Kindergarten. Particularly, of those who received 1–1.5 years of Early Intervention dosage, the rate of repeating Kindergarten for partially economically disadvantaged students was 10 percentage points higher than both never economically disadvantaged students and remained economically disadvantaged students. Students who remained economically disadvantaged and those who were never economically disadvantaged had similar rates of repeating any grade level and of repeating Kindergarten up until receiving two or more years of Early Intervention dosage. After the two year mark of Early Intervention dosage, a lower percentage of students who remained economically disadvantaged repeated a grade level by or in Grade 3 and repeated Kindergarten than the other two groups.

FIGURE 10. Retention by or in Grade 3 by Economic Disadvantaged Status Based on Early Intervention Dosage



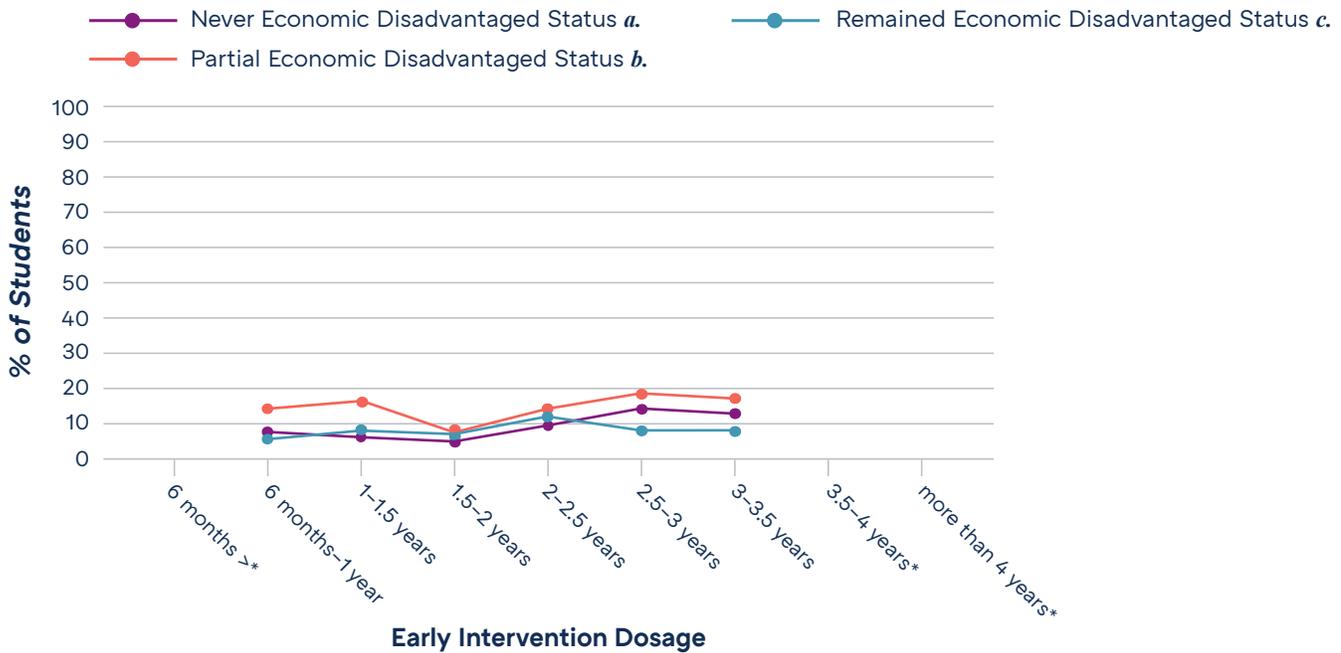
*Some Counts Too Low to Report

a. $\chi^2(1, N = 3788) = 22.774, p < .01, V = .110$;

b. $\chi^2(1, N = 2909) = 4.632, p < .05, V = .107$;

c. $\chi^2(1, N = 5406) = 1.212, p = .271, V = .066$

FIGURE 11. Retention in Kindergarten by Economic Disadvantaged Status Based on Early Intervention Dosage



*Some Counts Too Low to Report

a. $\chi^2(1, N = 3788) = 19.218, p < .01, V = .100$;

b. $\chi^2(1, N = 2965) = 4.269, p < .05, V = .123$;

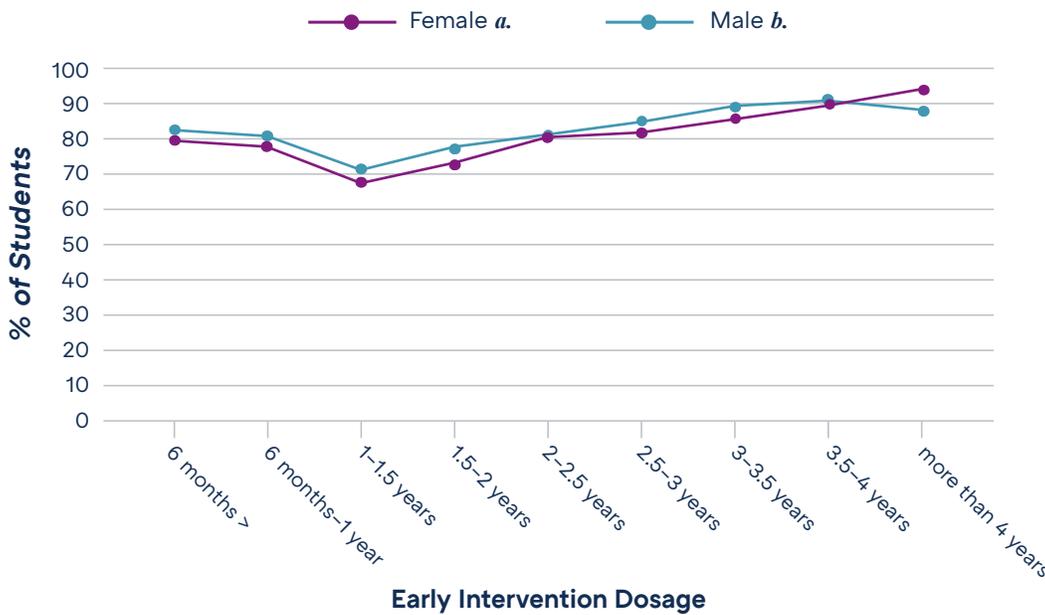
c. $\chi^2(1, N = 5406) = .000, p = .995, V = .063$

Are there gender or racial/ethnic differences?

EARLY INTERVENTION DOSAGE & DECREASED USE OF SPECIAL EDUCATION SERVICES BY GENDER

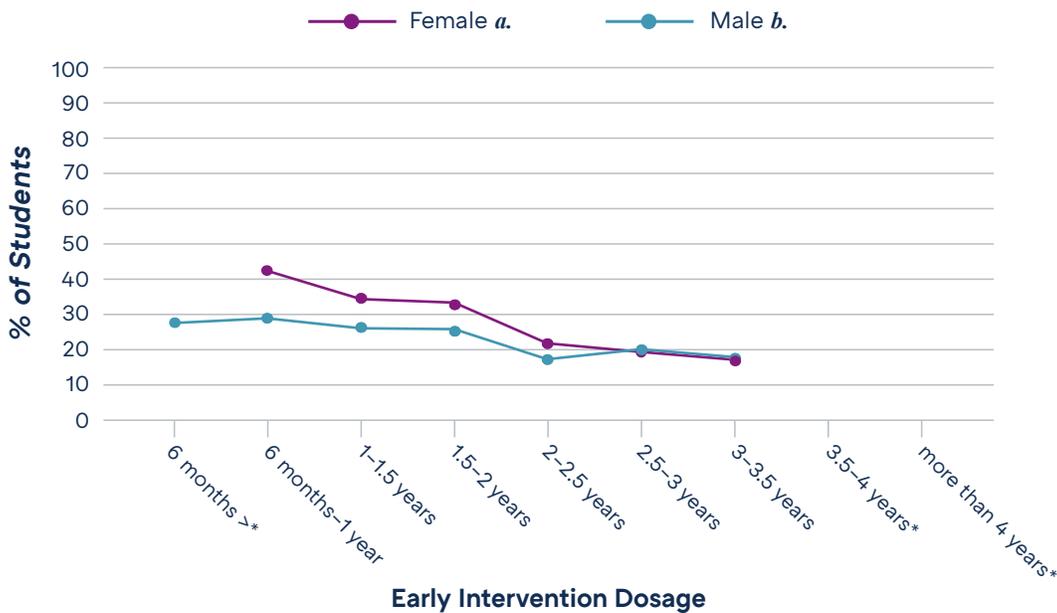
Overall, the relationship between Early Intervention dosage and both receiving special education services and exiting services remains the same, regardless of gender. A slightly higher percentage of males received services by or in Grade 3, until receiving more than four years of Early Intervention, at which point females had a higher rate. Figure 13 shows that a higher percentage of female students who received less than 2.5 years of Early Intervention dosage exited compared to male students. There was a very small difference in exit rates after receiving 2.5 or more years of Early Intervention dosage. However, overall, the difference in proportions for receiving special education services and exiting by Grade 3, at different levels of Early Intervention dosage, is significant regardless of gender.

FIGURE 12. Received Special Education Services by Gender Based on Early Intervention Dosage



a. $\chi^2(1, N = 3775) = 24.624, p < .01, V = .136$;
b. $\chi^2(1, N = 8838) = 63.503, p < .01, V = .126$

FIGURE 13. Exited Services by or in Grade 3 by Gender Based on Early Intervention Dosage



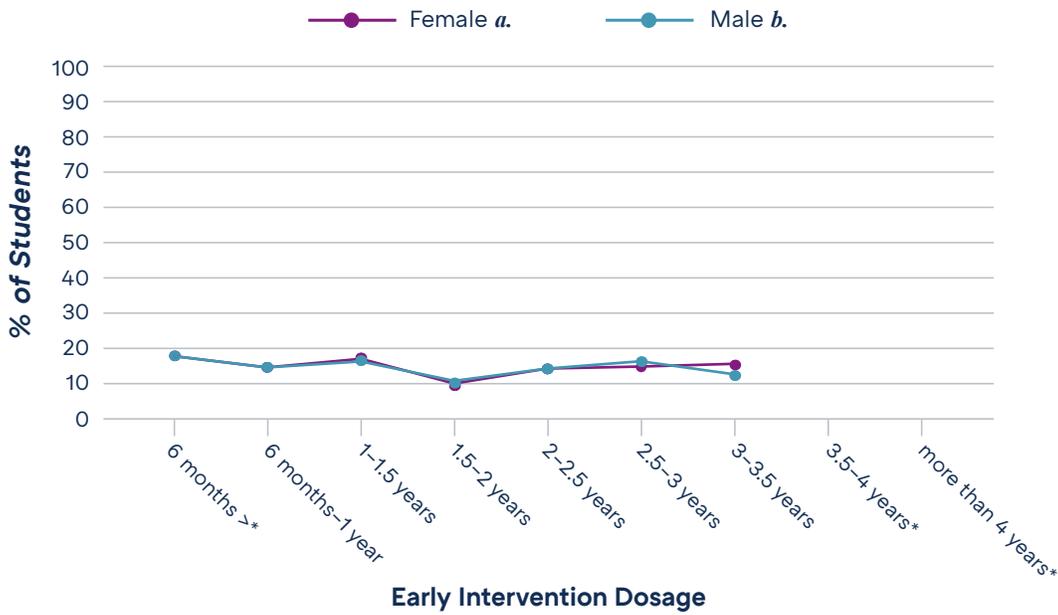
*Some Counts Too Low to Report

a. $\chi^2(1, N = 2123) = 94.558, p < .01, V = .228$;
b. $\chi^2(1, N = 5135) = 73.457, p < .01, V = .131$

EARLY INTERVENTION DOSAGE & DECREASED RATES OF RETENTION BY GENDER

The relationship between Early Intervention dosage and rates of retention is the same regardless of gender. Figures 14 and 15 show that there were no notable differences in rates of retention based on gender with only minimal differences at dosage levels greater than 2.5 years.

FIGURE 14. Retention by or in Grade 3 by Gender Based on Early Intervention Dosage

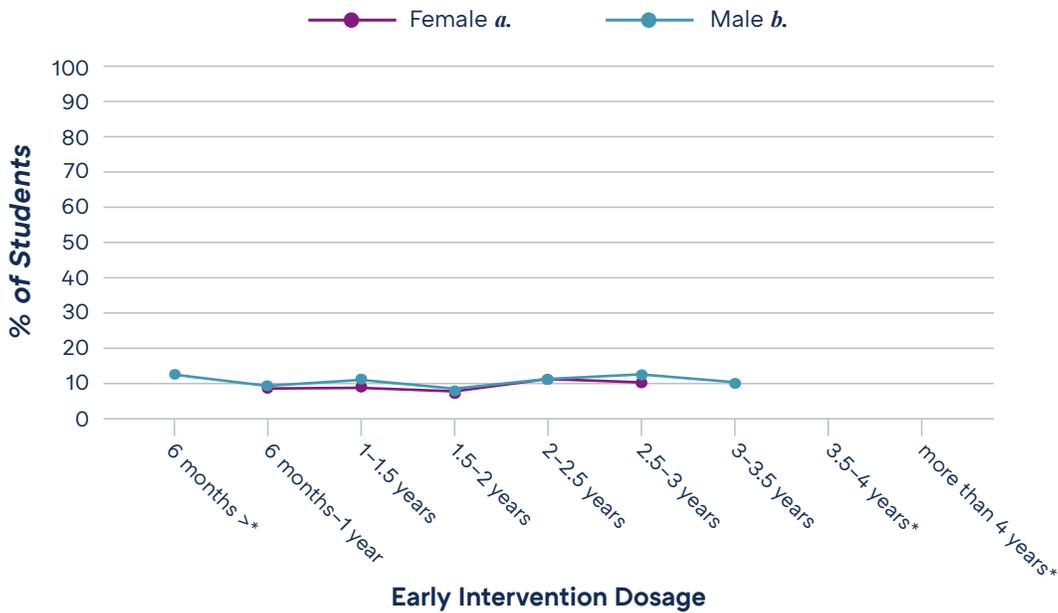


*Some Counts Too Low to Report

a. $\chi^2(1, N = 3694) = 4.897, p < .05, V = .062$

b. $\chi^2(1, N = 8647) = 5.327, p < .05, V = .067$

FIGURE 15. Retention in Kindergarten by Gender Based on Early Intervention Dosage



*Some Counts Too Low to Report

a. $\chi^2(1, N = 3805) = 9.886, p < .01, V = .075;$

b. $\chi^2(1, N = 8881) = 10.444, p < .01, V = .066$

EARLY INTERVENTION DOSAGE & DECREASED USE OF SPECIAL EDUCATION SERVICES BY RACE/ETHNICITY

Table 8 shows special education use based on dosage and race/ethnicity. Overall, the relationship between Early Intervention dosage and receiving special education services by or in Grade 3 remained the same, regardless of racial or ethnic background. However, in other special education outcomes of interest, the number of students broken down by dosage for many race/ethnicity categories were too low to include in this analysis or to report. Table 1 of Appendix E shows the same for retention outcomes.

TABLE 8. Special Education Use by Racial and Ethnic Background Based on Early Intervention Dosage

		Received Special Education Services by/in Grade 3	Entered Services after Initial Kindergarten Entry	Exited Services after Initial Kindergarten Entry	Re-entered Services Ever
Dosage		% (n)	% (n)	% (n)	% (n)
Black or African American	Total	74.9 (1201)	53.2 (459)	18.3 (131)	4.7 (46)
	6 months or less	77.1 (54)	56.8 (21)	*	*
	6 months–1 year (6–12 months)	75.3 (204)	53.1 (76)	27.2 (34)	*
	1–1.5 years (13–18 months)	66.2 (149)	45.7 (64)	*	*
	1.5–2 years (19–24 months)	69.0 (261)	45.1 (96)	22.8 (36)	*
	2–2.5 years (25–30 months)	77.1 (246)	57.3 (98)	*	*
	2.5–3 years (31–36 months)	81.8 (193)	60.9 (67)	*	*
	3–3.5 years (37–42 months)	87.7 (71)	73.0 (27)	*	*
	3.5–4 years (43–48 months)	*	*	*	*
more than 4 years (49+ months)	*	*	*	*	
Hispanic	Total	75.5 (1003)	47.2 (292)	23.8 (164)	4.9 (41)
	6 months or less	81.0 (34)	*	*	*
	6 months–1 year (6–12 months)	73.0 (154)	46.2 (49)	33.7 (35)	*
	1–1.5 years (13–18 months)	76.4 (107)	52.9 (37)	29.4 (20)	*
	1.5–2 years (19–24 months)	70.6 (178)	41.3 (52)	30.6 (37)	*
	2–2.5 years (25–30 months)	81.6 (204)	53.5 (53)	19.9 (29)	*
	2.5–3 years (31–36 months)	75.2 (233)	43.8 (60)	19.9 (33)	*
	3–3.5 years (37–42 months)	73.1 (76)	41.7 (20)	*	*
	3.5–4 years (43–48 months)	*	*	*	*
more than 4 years (49+ months)	*	*	*	*	
White	Total	80.6 (6828)	47.6 (1490)	24.0 (1249)	3.0 (180)
	6 months or less	82.4 (173)	57.0 (49)	28.1 (34)	*
	6 months–1 year (6–12 months)	81.5 (1063)	45.1 (198)	35.0 (295)	3.8 (36)
	1–1.5 years (13–18 months)	69.1 (699)	41.1 (218)	31.7 (147)	*
	1.5–2 years (19–24 months)	77.1 (1140)	39.8 (224)	28.7 (256)	3.5 (34)
	2–2.5 years (25–30 months)	80.2 (1358)	44.1 (264)	19.9 (214)	2.7 (33)
	2.5–3 years (31–36 months)	84.4 (1596)	57.3 (382)	17.2 (204)	3.2 (45)
	3–3.5 years (37–42 months)	89.5 (707)	63.3 (143)	15.1 (83)	*
	3.5–4 years (43–48 months)	91.5 (54)	*	*	*
more than 4 years (49+ months)	92.7 (38)	*	*	*	

	Total	80.3 (763)	56.5 (243)	17.0 (86)	4.7 (30)
	6 months or less	*	*	*	*
	6 months–1 year (6–12 months)	76.7 (83)	51.9 (27)	*	*
	1–1.5 years (13–18 months)	77.6 (90)	55.9 (33)	*	*
	1.5–2 years (19–24 months)	71.4 (135)	46.0 (46)	*	*
	2–2.5 years (25–30 months)	82.4 (192)	53.9 (48)	14.5 (20)	*
	2.5–3 years (31–36 months)	86.0 (172)	64.6 (51)	*	*
	3–3.5 years (37–42 months)	88.7 (63)	71.4 (20)	*	*
	3.5–4 years (43–48 months)	*	*	*	*
	more than 4 years (49+ months)	*	*	*	*
	Total	72.4 (173)	32.7 (32)	21.2 (28)	*
	6 months or less	*	*	*	*
	6 months–1 year (6–12 months)	73.7 (28)	*	*	*
	1–1.5 years (13–18 months)	*	*	*	*
	1.5–2 years (19–24 months)	64.5 (20)	*	*	*
	2–2.5 years (25–30 months)	73.2 (41)	*	*	*
	2.5–3 years (31–36 months)	83.0 (44)	*	*	*
	3–3.5 years (37–42 months)	*	*	*	*
	3.5–4 years (43–48 months)	*	*	*	*
	more than 4 years (49+ months)	*	*	*	*

*Counts Too Low to Report

Does this association vary by disability type or EL status?

EARLY INTERVENTION DOSAGE & DECREASED USE OF SPECIAL EDUCATION SERVICES BY DISABILITY TYPE

Table 9 shows that the relationship between Early Intervention dosage and receiving special education services by or in Grade 3 does change, as the highest percentages of students identified with Autism who received services were in the Early Intervention program for 6 months–1 year, 1–1.5 years, and 3–3.5 years (98.0%, 98.2%, and 98.8%, respectively). Regardless of the amount of dosage received, high percentages of students identified with Autism or identified with a hearing and/or visual impairment received special education services by or in Grade 3. The highest percentage of students identified with a speech or language impairment who received services were in the Early Intervention program for 6 months or less (83.7%), while those who received 1–1.5 and 1.5–2 years of dosage had the lowest rates of receiving special education services by or in Grade 3 (66.1% and 70.9%).

Among students identified with a developmental delay, those who received four or more years of Early Intervention had the highest rates of receiving special education services by or in Grade 3. The rate of students who received special education services steadily decreases with the decrease in each dosage category, until receiving 6 months–1 year of services. The rates

Regardless of the amount of dosage received, high percentages of students identified with Autism or identified with a hearing and/or visual impairment received special education services by or in Grade 3.

of receiving special education services for those in the Early Intervention program for 6 months–1 year (74.3%) and less than 6 months (75.0%) are higher than those who received 1–1.5 years of dosage, the lowest rate (70.6%). For those identified with “other disabilities,” students who received 1.5–2 years of Early Intervention had the lowest rates of receiving special education services by or in Grade 3, while those who received 2.5–3 years and 3–3.5 years of Early Intervention dosage had the highest rates. In the other outcomes of interest, many counts of each disability category were too low to report, thus changes in outcomes cannot be compared across student groups. Table 2 of Appendix E also shows that the number of students broken down by dosage for many disability categories were too low to include in this analysis or to report.

TABLE 9. Special Education Use by Early Intervention Disability Type Based on Early Intervention Dosage

		Received Special Education Services by/in Grade 3	Entered Services after Initial Kindergarten Entry	Exited Services after Initial Kindergarten Entry	Re-entered Services Ever
Dosage		% (n)	% (n)	% (n)	% (n)
Autism	Total	96.0 (923)	79.7 (149)	6.0 (45)	2.9 (24)
	6 months or less	*	*	*	*
	6 months–1 year (6–12 months)	98.0 (48)	*	*	*
	1–1.5 years (13–18 months)	98.2 (56)	*	*	*
	1.5–2 years (19–24 months)	96.4 (108)	*	*	*
	2–2.5 years (25–30 months)	95.1 (214)	68.6 (24)	*	*
	2.5–3 years (31–36 months)	94.6 (295)	75.0 (51)	*	*
	3–3.5 years (37–42 months)	98.8 (164)	92.9 (26)	*	*
	3.5–4 years (43–48 months)	*	*	*	*
more than 4 years (49+ months)	*	*	*	*	
Speech or Language Impairment	Total	75.3 (3676)	37.8 (734)	39.5 (1131)	3.4 (109)
	6 months or less	83.7 (128)	54.5 (30)	44.1 (41)	*
	6 months–1 year (6–12 months)	82.0 (830)	36.8 (106)	43.9 (310)	4.8 (36)
	1–1.5 years (13–18 months)	66.1 (471)	32.6 (117)	42.4 (145)	*
	1.5–2 years (19–24 months)	70.9 (717)	32.6 (142)	42.6 (240)	3.5 (22)
	2–2.5 years (25–30 months)	73.9 (653)	38.9 (147)	33.9 (167)	*
	2.5–3 years (31–36 months)	77.5 (630)	44.9 (149)	36.7 (172)	*
	3–3.5 years (37–42 months)	82.0 (219)	44.2 (38)	27.8 (49)	*
	3.5–4 years (43–48 months)	*	*	*	*
more than 4 years (49+ months)	*	*	*	*	

Developmental Delay	Total	78.2 (4807)	52.9 (1501)	13.6 (438)	3.6 (143)
	6 months or less	75.0 (123)	59.4 (60)	*	*
	6 months–1 year (6–12 months)	74.3 (617)	52.2 (233)	17.2 (65)	4.2 (21)
	1–1.5 years (13–18 months)	70.6 (510)	51.5 (225)	16.5 (45)	*
	1.5–2 years (19–24 months)	75.0 (874)	46.8 (257)	16.0 (95)	3.3 (23)
	2–2.5 years (25–30 months)	80.1 (1041)	51.6 (275)	12.9 (97)	3.3 (30)
	2.5–3 years (31–36 months)	82.8 (1140)	57.8 (324)	10.5 (83)	4.3 (42)
	3–3.5 years (37–42 months)	85.0 (426)	59.0 (108)	11.3 (35)	*
	3.5–4 years (43–48 months)	86.0 (43)	*	*	*
more than 4 years (49+ months)	91.7 (33)	*	*	*	
Hearing and/or Visual Impairment	Total	95.2 (200)	79.2 (38)	*	*
	6 months or less	*	*	*	*
	6 months–1 year (6–12 months)	*	*	*	*
	1–1.5 years (13–18 months)	*	*	*	*
	1.5–2 years (19–24 months)	*	*	*	*
	2–2.5 years (25–30 months)	95.7 (45)	*	*	*
	2.5–3 years (31–36 months)	97.4 (74)	*	*	*
	3–3.5 years (37–42 months)	97.3 (36)	*	*	*
	3.5–4 years (43–48 months)	*	*	*	*
more than 4 years (49+ months)	*	*	*	*	
Other Disability	Total	91.7 (378)	74.8 (101)	10.4 (28)	*
	6 months or less	*	*	*	*
	6 months–1 year (6–12 months)	88.6 (31)	*	*	*
	1–1.5 years (13–18 months)	*	*	*	*
	1.5–2 years (19–24 months)	82.9 (29)	*	*	*
	2–2.5 years (25–30 months)	89.9 (89)	*	*	*
	2.5–3 years (31–36 months)	96.4 (106)	87.9 (29)	*	*
	3–3.5 years (37–42 months)	95.7 (88)	89.2 (33)	*	*
	3.5–4 years (43–48 months)	*	*	*	*
more than 4 years (49+ months)	*	*	*	*	

*Counts Too Low to Report

EARLY INTERVENTION DOSAGE & DECREASED USE OF SPECIAL EDUCATION SERVICES BY EL STATUS

Table 10 shows the relationship between Early Intervention dosage and receiving special education services by or in Grade 3 among never EL Status students. However, differences based on EL Status could not be reported because the number of students broken down by dosage for partial EL Status and remained EL Status were too low to include in this analysis or to report.

TABLE 10. Special Education Use for Never EL Students based on Early Intervention Dosage

		Received Special Education Services by/in Grade 3	Entered Services after Initial Kindergarten Entry	Exited Services after Initial Kindergarten Entry	Re-entered Services Ever
Dosage		% (n)	% (n)	% (n)	% (n)
Never EL Status	Total	78.2 (9033)	47.4 (2269)	23.2 (1570)	3.4 (283)
	6 months or less	79.2 (240)	56.3 (81)	29.6 (47)	*
	6 months–1 year (6–12 months)	78.9 (1390)	46.6 (325)	33.5 (357)	4.6 (58)
	1–1.5 years (13–18 months)	67.6 (938)	41.1 (313)	30.2 (189)	3.2 (26)
	1.5–2 years (19–24 months)	73.1 (1568)	39.6 (379)	28.3 (336)	3.3 (46)
	2–2.5 years (25–30 months)	78.8 (1846)	46.1 (425)	19.1 (271)	3.4 (58)
	2.5–3 years (31–36 months)	83.0 (2055)	55.1 (517)	17.0 (262)	3.3 (63)
	3–3.5 years (37–42 months)	87.6 (865)	62.0 (199)	13.8 (92)	2.7 (22)
	3.5–4 years (43–48 months)	89.8 (79)	70.0 (21)	*	*
	more than 4 years (49+ months)	89.7 (52)	*	*	*

*Counts Too Low to Report

EARLY INTERVENTION DOSAGE & DECREASED RATES OF RETENTION BY EL STATUS

Again, Table 11 shows the relationship between Early Intervention dosage and retention rates among never EL Status students. However, differences based on EL Status could not be reported because the number of students broken down by dosage for partial EL Status and remained EL Status were too low to include in this analysis or to report.

TABLE 11. Retention for Never EL Students based on Early Intervention Dosage

		Repeated a Grade Level	Repeated Kindergarten
Dosage		% (n)	% (n)
Never EL Status	Total	13.4 (1547)	9.9 (1145)
	6 months or less	14.9 (45)	10.6 (32)
	6 months–1 year (6–12 months)	12.3 (217)	8.9 (156)
	1–1.5 years (13–18 months)	13.2 (183)	9.3 (129)
	1.5–2 years (19–24 months)	10.0 (215)	6.9 (149)
	2–2.5 years (25–30 months)	14.8 (347)	10.8 (253)
	2.5–3 years (31–36 months)	15.6 (386)	12.0 (298)
	3–3.5 years (37–42 months)	13.0 (128)	10.8 (107)
	3.5–4 years (43–48 months)	*	*
	more than 4 years (49+ months)	*	*

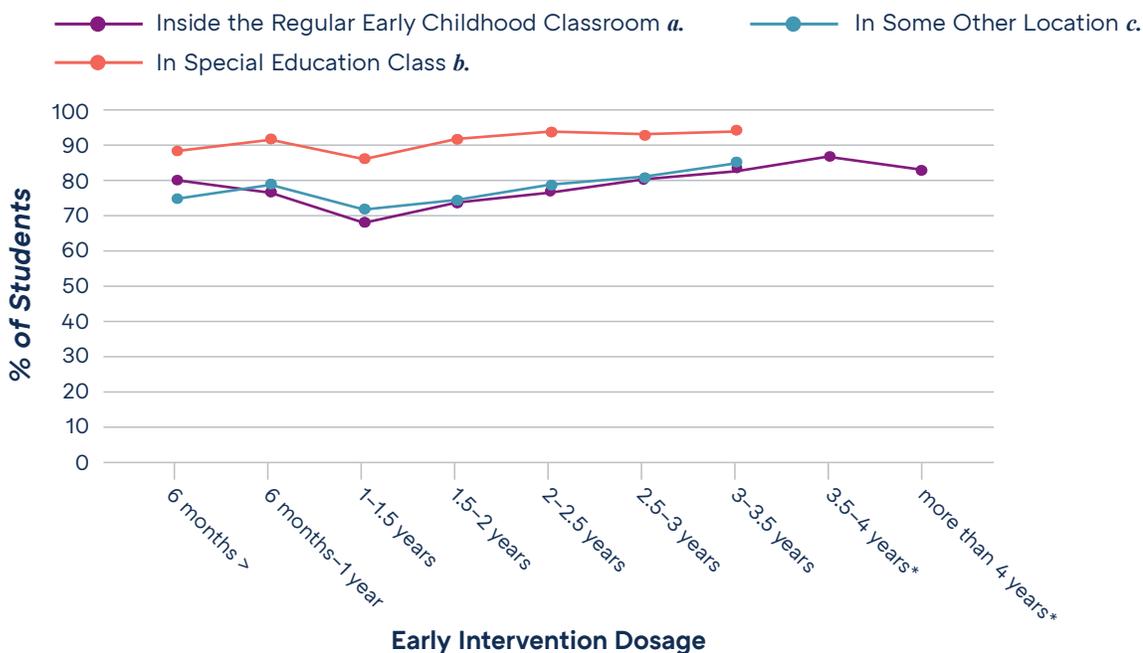
*Counts Too Low to Report

Does the type of educational environment affect the association?

EARLY INTERVENTION DOSAGE & DECREASED USE OF SPECIAL EDUCATION SERVICES BY EDUCATIONAL ENVIRONMENT

Figure 16 shows that the overall relationship between Early Intervention dosage and receiving special education services remains the same regardless of educational environment. However, this analysis revealed that across all categories of dosage, higher rates of students who received Early Intervention in a special education class received special education services by or in Grade 3. Further analysis in Table 12 shows that higher rates (94.1%) of students who received Early Intervention in a special education class went on to receive special education services by Grade 3, compared to other educational environments. The difference in proportions was significant, $\chi^2(2, N = 12,612) = 269.710, p < .01$, but the association was small ($\phi = .146$). This relationship is further explored using logistic regression and is discussed later in this report. Interestingly, additional analysis in Table 2 of Appendix D found that the majority of students with a developmental delay (67%) or a speech or language impairment (66.1%) received services in a regular early childhood classroom while the rates among students identified with Autism were split almost equally among regular early childhood programs (43.0%) and special education classes (39.5%).

FIGURE 16. Received Special Education Services by or in Grade 3 by Early Intervention Educational Environment Based on Early Intervention Dosage



*Some Counts Too Low to Report

a. $\chi^2(1, N = 8048) = 29.684, p < .01, V = .119$;

b. $\chi^2(1, N = 1677) = 8.417, p < .01, V = .117$;

c. $\chi^2(1, N = 2887) = 18.385, p < .01, V = .126$

TABLE 12. Special Education Use Based on Early Intervention Educational Environment

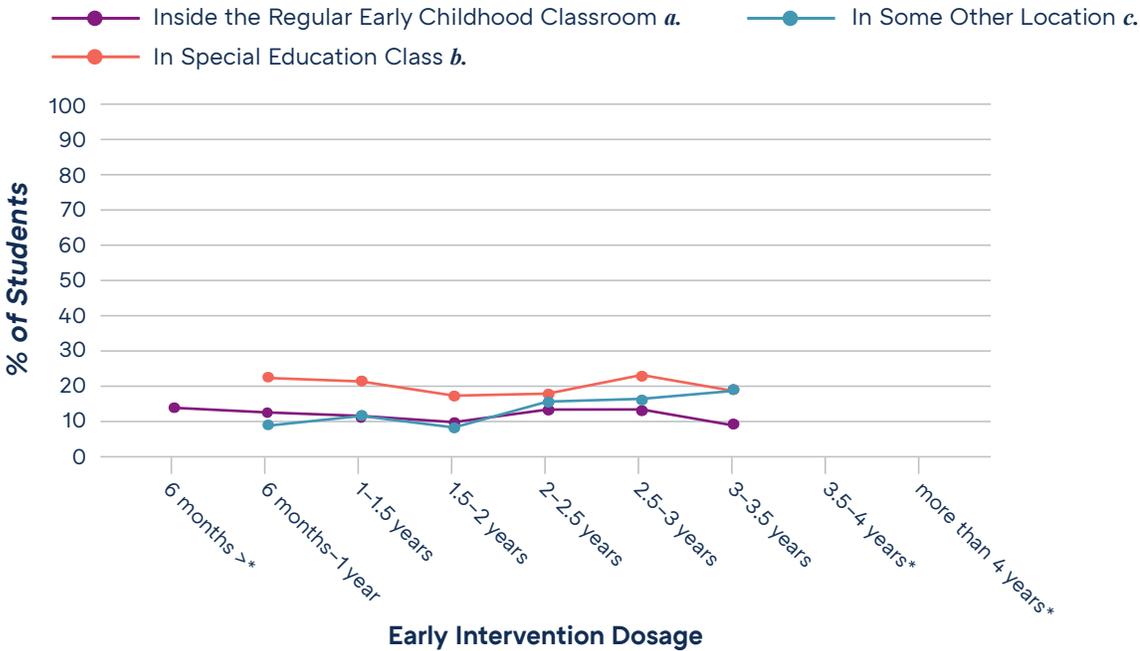
	Yes, received services at some point	Never received services
Educational Environment	% (n)	% (n)
Total	79.2 (9983)	20.8 (2629)
In the Regular Early Childhood Program	76.2 (6133)	23.8 (1915)
In Special Education Class	94.1 (1578)	5.9 (99)
In Some Other Location	78.7 (2272)	21.3 (615)

*Counts Too Low to Report

EARLY INTERVENTION DOSAGE & DECREASED RATES OF RETENTION BY EDUCATIONAL ENVIRONMENT

As Figures 17 and 18 show, similar to receiving special education services, those who received Early Intervention services in a special education class typically had higher rates of repeating any grade level by or in Grade 3 and of repeating Kindergarten, regardless of category of dosage. For students who received services in the regular early childhood classroom, rates of repeating a grade level and of repeating Kindergarten were comparable across dosage categories with the exception of receiving 1–1.5 and 3–3.5 years, at which point rates dropped. However, for students who received services in some other location, the rates increased at 1.5 years of dosage and above. The category of "some other location" includes in the home, in a residential facility, in a separate school, or in a service provider location. At 3–3.5 years of Early Intervention services, rates of retention among students who received services in some other location were similar to students who received services in a special education class. Overall, dosage was not found to have a significant effect on rates of retention for students who received services in a regular or early childhood classroom. However, there is a significant but minimal effect for students who received services in some other location with higher rates for students at dosage levels greater than two years.

FIGURE 17. Repeating a Grade Level by or in Grade 3 by Early Intervention Educational Environment Based on Early Intervention Dosage



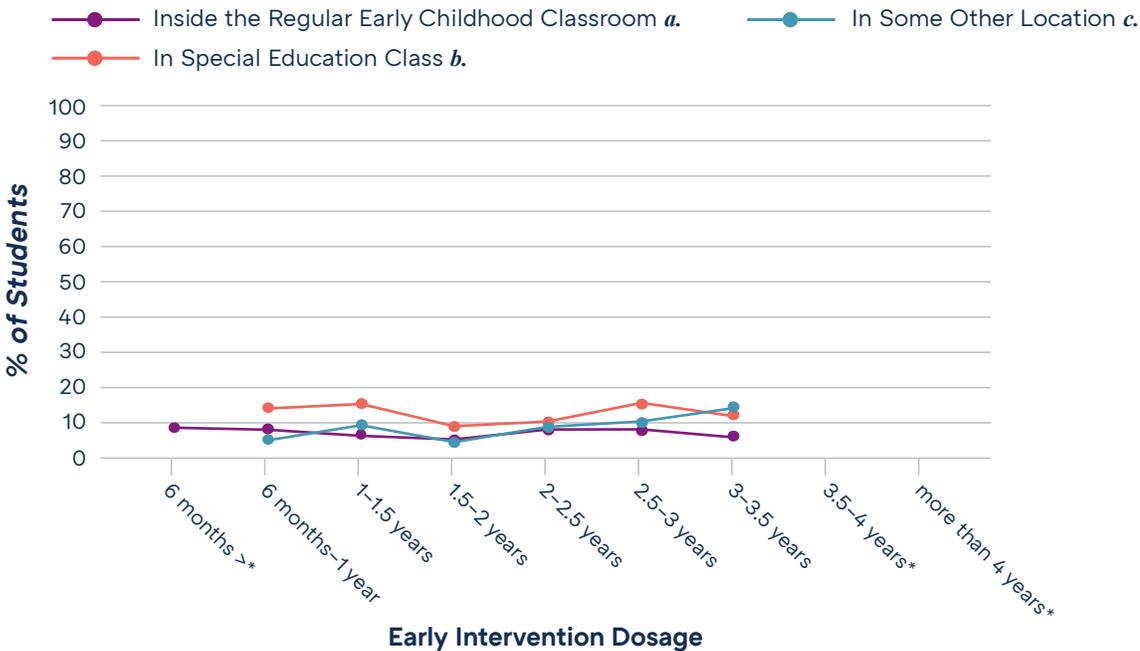
*Some Cases Too Low to Report

a. $\chi^2(1, N = 7878) = .029, p = .865, V = .055;$

b. $\chi^2(1, N = 1625) = .048, p = .827, V = .091;$

c. $\chi^2(1, N = 2837) = 22.711, p < .01, V = .123$

FIGURE 18. Repeating Kindergarten by Early Intervention Educational Environment Based on Early Intervention Dosage



*Some Cases Too Low to Report

a. $\chi^2(1, N = 8094) = 1.442, p = .230, V = .051;$

b. $\chi^2(1, N = 1679) = .047, p = .829, V = .078;$

c. $\chi^2(1, N = 2912) = 24.963, p < .01, V = .132$

What is the effect of dosage and participation in additional early childhood programs on special education use and retention through Grade 3 when other explanatory variables, including ECO scores are included?

The results of analysis examining the association between individual independent variables and outcomes of interest were discussed previously. Logistic regression analysis was also conducted to further examine the effects of dosage and participation in other early childhood programs. Logistic regression was used because all outcomes were binary. In this phase of analysis, we examined the differences in effects of the significant independent variables in isolation and in the context of additional explanatory variables. The analyses were exploratory in nature, which allowed for the examination of all individual independent variables and their association with special education use through Grade 3 and decreased rates of retention.

In addition to the independent variables examined and discussed previously, Early Childhood Outcome (ECO) scores were also available and included in this phase of analysis. ECO scores measure the gains and improvements made by children with developmental delays and disabilities in Early Intervention. The three categories within ECO represent the fundamental knowledge and skills that children should have when entering Kindergarten. According to the Early Childhood Technical Assistance Center, the first category, “Positive Social/Emotional Skills” measures how children interact with and relate to others. The second “Acquisition and Use of Knowledge and Skills” measures children’s abilities to think, problem solve, reason, and communicate. Finally, “Use of Appropriate Behaviors to Meet Their Needs” measures the ability to become more independent, by improving motor skills and taking care of basic needs.

ECO scores measure the gains and improvements made by children with developmental delays and disabilities in Early Intervention.

While multiple ECO score determinations can be made throughout a child’s time in Early Intervention, this study only included ECO score determinations made at exit from the program. For each category, the lowest ECO score is “(A) Did Not Improve Functioning,” with each letter score (B–E) getting incrementally closer to functioning at a level comparable to same age peers. There were very few cases where a student received a score of “(A) Did Not Improve Functioning”. Therefore, for purposes of this analysis, a dichotomous indicator was created to compare students with ECO scores of “(B) Improved Functioning, but not Sufficient to Move Nearer to Same-Aged Peers” and “(C) Improved Functioning to a Level Nearer to Same-Aged Peers but Did Not Reach it” to students with scores of “(D) Improved Functioning to Reach a Level Comparable to Same-Aged Peers” and “(E) Maintained Functioning at a Level Comparable to Same-Aged Peers.” ECO scores were included as independent variables to measure the effect between scores individually with child outcomes, and the effect of dosage and participation in multiple early childhood programs when included in a regression model with ECO scores.

LOGISTIC REGRESSION RESULTS

Table 2 in Appendix A shows the independent variables and covariates that were tested individually for significance. Tables 1 through 3 in Appendix F show the statistically significant variables when tested individually and the final models. For both outcomes, the three ECO rating indicators (Acquisition and Use of Knowledge and Skills, Positive Social/Emotional Skills, and Use of Appropriate Behaviors to Meet

Their Needs) were found to be statistically significant independent variables. Given that and given that the indicators are highly correlated and should not be included in a model together, a final model is provided for each ECO rating indicator. Additionally, given that previous chi-square analysis had shown differences at levels of Early Intervention dosage greater than two years, for the logistic regression analysis, an additional dichotomous indicator of dosage (less than two years versus two or more years) was examined, along with a continuous measure. Only the dichotomous dosage indicator showed significant effects; therefore, that is what is reported and included in all final models.

Logistic regression analysis results indicate that there is a statistically significant association between dosage, ECO scores, and both outcomes (special education use through Grade 3 and decreased rates of retention). As the final models show, the effect of dosage and ECO ratings remains significant even after holding all other explanatory variables constant. A comparison of the odds ratio ($\text{Exp}(\beta)$) for the effect of dosage and ECO ratings on outcomes individually, versus after holding all other significant explanatory variables constant, shows a significant increase in odds regardless. However, the effect is greater for special education use through Grade 3 than it is for retention. In terms of participation in an additional early childhood education program, a significant effect was not found for retention. Although there was a significant effect of participation in an additional program individually for special education use through Grade 3, the effect was no longer significant when controlling for other significant explanatory variables.

Dosage, ECO scores, disability type, gender, Early Intervention location of services, and Race/Ethnicity were all found to be significantly associated with special education use through Grade 3. Most notably, after controlling for other explanatory variables, the odds of a student receiving special education services through Grade 3 are four times higher, a 300% increase in odds, if the student received an “Acquisition and Use of Knowledge and Skills” ECO score of B or C rather than D or E. The odds are more than 2.7 times higher, a greater than 170% increase in odds, if they received a “Positive Social/Emotional Skills” or “Use of Appropriate Behaviors to Meet Their Needs” ECO score of B or C rather than D or E. Further, the odds were three to four times higher if the disability type was Autism or a hearing and/or visual impairment, and three times higher if they received Early Intervention services in a special education classroom rather than a regular early childhood classroom or some other location. It is interesting to note that although dosage remains significant when included in a model with other variables showing students with dosage levels of two or more years having 1.34 to 1.39 times greater odds or over 34% increase in odds, the effect of ECO scores is much larger.

Dosage, ECO ratings, disability type, Full or Half-Day Kindergarten, economically disadvantaged status, Race/Ethnicity, and EL Status were all found to be significantly associated with decreased rates of retention. As a comparison of the odds ratios in the final model tables show (see Table 3), the effect of these variables remains significant even after holding all other explanatory variables constant. Most notably, the odds of a student never being retained through Grade 3 are approximately 1.4 to 1.72 times higher (40% to 72% increase in odds) if their ECO scores were D or E versus B or C, 1.7 times higher (70% increase in odds) if a student

For both outcomes, the three ECO rating indicators were found to be statistically significant independent variables.

Although there was a significant effect of participation in an additional program individually for special education use through Grade 3, the effect was no longer significant when controlling for other significant explanatory variables.

These findings indicate that there is a statistically significant effect of dosage and ECO scores for students in this cohort, even after controlling for other significant explanatory variables.

attended Full-Day Kindergarten and 2.0 times higher (100% increase in odds) if a student's Race/Ethnicity was Hispanic versus non-Hispanic or they remained EL Status from Kindergarten through Grade 3. Similar to special education use through Grade 3, there was a significant effect of dosage with students who had a dosage level less than two years having 1.2 times greater odds or 20% increase in odds of never being retained, however the effect of ECO scores is slightly larger.

These findings indicate that there is a statistically significant effect of dosage and ECO scores for students in this cohort, even after controlling for other significant explanatory variables. It should be noted, however, that the odds of a student receiving special education services and being retained are significantly lower for students who exited Early Intervention with ECO scores that reflected they either "Improved Functioning to Reach a Level Comparable to Same-Aged Peers" or "Maintained Functioning at a Level Comparable to Same-Aged Peers." Additionally, considering disability type, students with Autism or a hearing and/or visual impairment had significantly higher odds of special education use, and students with a disability type other than a developmental delay had higher odds of never being retained through Grade 3. The prediction accuracy for whether a student will use special education services from Kindergarten through Grade 3 or not be retained was 100% based on the final models, indicating a high level of sensitivity.

Discussion and Conclusion

This study sought to explore the relationship between Early Intervention dosage and student outcomes including decreased use of special education and decreased rates of retention. Previous studies have found that participation in high quality early childhood education and Early Intervention programs is associated with decreased rates of special education use and retention in elementary school (Currie, 2001; Hutechson, 2008; Muschkin, Ladd, & Dodge, 2015). Additionally, previous studies have found a range of other potential lasting benefits of participation in such programs, including preparedness at Kindergarten entry (Hebbeler et al., 2007), increased high school graduation rates (McCoy et al., 2017), and greater educational attainment and employment outcomes (Campbell et al., 2002; Schweinhart et al., 2005; The Frank Porter Graham Child Development Institute, 2012). Further, studies specific to the relationship between increased "dosage"—duration, frequency, or timing—of early childhood education and intervention programs and other student outcomes have found potential benefits, including improved academic and social/emotional skills (Moore et al., 2005; McGinty et al., 2011; Domitrovich et al., 2013) and

the potential to minimize the need for future special education services (The National Early Childhood Technical Assistance Center, 2011).

Overall, the studies mentioned above highlight the finding that access to and participation in high quality early childhood programs can have lasting impacts over the participant’s lifetime. Specifically, for children with developmental delays and disabilities, having access to Early Intervention services earlier, more frequently, and for longer amounts of time is crucial for future academic preparedness. Building on such findings, this study examined the relationship between “dosage,” or the total number of months spent in the Early Intervention program, and student outcomes, including special education use and rates of retention.

Does Early Intervention Dosage Affect Student Outcomes?

The effect of Early Intervention dosage was examined first utilizing chi-square analyses and measured by a categorical variable representing ranges in the number of months spent in Early Intervention. Additional analysis using Logistic regression was also conducted testing both a continuous and a dichotomous indicator of dosage representing whether a student received less than two years versus two or more years of Early Intervention.

Chi-square analysis showed no clear relationship between different levels of Early Intervention dosage and decreased rates of retention and only a small relationship between Early Intervention dosage and special education use by or in Grade 3. Overall, students at lower levels of dosage had lower rates of going on to receive special education services, as well as having higher rates of exiting services by Grade 3. Specifically, those who received between 1–2 years of dosage had the lowest rate of receiving services and the rate steadily increased by each category of dosage. Conversely, students who received Early Intervention for more than two years had significantly higher rates of receiving special education services by or in Grade 3 and had significantly lower exit rates, compared to other students.

Logistic regression analysis showed that when controlling for other explanatory variables, a dichotomous indicator of dosage (less than two years versus two or more years) showed a significant effect such that more than two years of dosage is associated with a 34% to 39% increase in odds of special education use through Grade 3. Additionally, a dosage level of less than two years is associated with a 20% increase in odds of not being retained through Grade 3. It should also be noted that although dosage remained significant when included in a model with other variables, the effect of ECO scores is much larger. The odds of a student receiving special education services and being retained are significantly lower for students who exited Early Intervention with ECO scores that reflected they either “(D) Improved Functioning to Reach a Level Comparable to Same-Aged Peers” or “(E) Maintained Functioning at a Level Comparable to Same-Aged Peers.” However, the effect is greater for special education use through Grade 3 than it is for retention.

Overall, students at lower levels of dosage had lower rates of going on to receive special education services, as well as having higher rates of exiting services by Grade 3.

Initially, the finding that receiving more dosage increases the likelihood of a student going on to receive special education services may seem counterintuitive and conflicting with the findings of previous studies. However, further investigation of these findings indicated that the majority of students identified with Autism, a hearing and/or visual impairment, or “other disabilities” received two or more years of

dosage. Descriptive analyses found that students identified with these disability types had higher rates of receiving special education services and of repeating a grade level compared to students with other disability types. Further, the majority of students who received two or more years of Early Intervention dosage began receiving special education services at Kindergarten entry and had significantly higher rates of receiving special education services through Grade 3. These findings suggest that students in Pennsylvania with potentially life-long disability types, such as Autism and hearing and/or visual impairments, receive more Early Intervention services and will likely require special education services upon Kindergarten entry and continue to receive services through Grade 3.

Does the Relationship Vary Among Student Groups?

Another major goal of this study was to examine if the relationship between Early Intervention dosage and student outcomes varied among student groups. Overall, the relationship remained the same, regardless of Economic Disadvantaged Status, gender, racial/ethnic background, and the educational environment. However, the relationship does vary based on disability type. A significantly higher percentage of students identified with Autism or a hearing and/or visual impairment went on to receive special education services by or in Grade 3 compared to other disability types. In fact, for this cohort, logistic regression analysis showed that after controlling for other explanatory variables the odds of a student receiving special education services through Grade 3 were found to be three to four times higher if a student's disability type was Autism (a 221% to 280% increase in odds) or a hearing and/or visual impairment (a greater than 308% increase in odds) respectively. Additionally, there was a 40% increase in odds of a student not being retained through Grade 3 if a student had a disability type other than a developmental delay.

Additionally, there was a 40% increase in odds of a student not being retained through Grade 3 if a student had a disability type other than a developmental delay.

As already discussed, previous studies have found an association between participation in early childhood education programs and decreased use of special education and retention rates. However, the majority of the studies mentioned were not specific to Early Intervention programs or to children with developmental delays and disabilities. The findings of the current study are comparable to those of Muschkin, Ladd, and Dodge (2015) who found that the effects of participation in early childhood education programs differ among disability types. They argued that systematic intervention for children with developmental delays and disabilities has three potential outcomes. Regardless of the services provided, some disability types will require life-long attention and support, including special education placement. However, for others, the effects of the disability or delay may be alleviated by early detection and support, and for some, the need for future services can be completely eliminated. The findings of the current study further suggest that students with potentially life-long disability types may require special education services beyond Early Intervention, regardless of the amount of dosage received. Further, those with other disability types may require less special education services or may be able to exit services by Grade 3, upon receiving a sufficient amount of Early Intervention services.

Additional Findings

Analyses throughout this study highlighted some interesting between group differences, which build slightly on the findings of previous research. First, descriptive analyses revealed that the Kindergarten

cohort, made up of students who had previously received Early Intervention services, was 70% male. Logistic regression analysis also showed that for this cohort there was a 22% to 31% increase in odds of special education use through Grade 3 for male students compared to female students, after controlling for other explanatory variables. This may further suggest evidence of a “gender-gap” in special education, where boys are referred for services at higher rates than girls, which may be explained by behavioral differences among young boys and girls (Young et al., 2010; Churchill, 2013).

Second, the disproportionality of EL students in special education has been highly debated by researchers. However, many have found EL students to be under-represented in special education services until Grade 3, after which they are over-represented. In the current study, students who remained EL Status through Grade 3 had much lower rates of beginning to receive services in Kindergarten and much higher rates of beginning services in Grade 3, compared to partial or never EL Status students and to the overall average. This finding may support the argument that among EL students, there is the potential to initially misidentify a developmental delay or disability as a language deficit, thus prolonging the referral to special education (Samson & Lesaux, 2009; Hibel & Jasper, 2012). Similarly, logistic regression analysis showed that after controlling for other significant factors, there was a 130% increase in odds of Hispanic students not being retained through Grade 3 versus non-Hispanic students. Overall, these relationships between race, language abilities, and student outcomes should continue to be explored in future research.

Third, the overall relationship between dosage and special education use remained significant regardless of Economic Disadvantaged Status. The initial chi-square analysis did show that students who were never economically disadvantaged had lower rates of ever receiving services and higher rates of exiting services by Grade 3 compared to those who were partially or remained economically disadvantaged, regardless of dosage. While such findings are comparable to others that found disproportionality in special education placement among low socio-economic status students (Blair & Scott, 2002; Skiba et al., 2005), the logistic regression analysis found that the significant effect of Economic Disadvantaged Status on special education use by or in Grade 3 disappeared when controlling for other explanatory variables. Interestingly, for decreased rates of retention, the effect remained showing a 30% increase in odds of not being retained for students who were never economically disadvantaged, after controlling for other significant variables.

Fourth, analyses showed that significantly higher rates of students who received Early Intervention in a special education class went on to receive special education services by Grade 3, compared to other educational environments. Further exploration of this finding using logistic regression analysis showed that even after controlling for other explanatory variables, including disability type, for this cohort, the odds of a student receiving special education services by or in Grade 3 are at least three times higher if a student received Early Intervention services in a special education class

Logistic regression analysis also showed that for this cohort there was a 22% to 31% increase in odds of special education use through Grade 3 for male students compared to female students, after controlling for other explanatory variables.

Similarly, logistic regression analysis showed that after controlling for other significant factors, there was a 130% increase in odds of Hispanic students not being retained through Grade 3 versus non-Hispanic students.

versus a regular early childhood classroom or other location. These findings suggest that the location in which Early Intervention services are received may impact special education outcomes and warrants further investigation.

Lastly, this analysis showed a significant effect of attending Full-Day Kindergarten. For this cohort, children who received Early Intervention services and then went on to attend a Full-Day Kindergarten showed a 70% increase in odds of not being retained through Grade 3 compared to children who attended Half-Day Kindergarten, after controlling for dosage, ECO rating, disability type, Economic Disadvantaged Status, Race/Ethnicity, and EL status. The growing body of research on Full and Half-Day Kindergarten suggests that attending a full day of Kindergarten rather than a half-day may decrease rates of retention in the early years of school (Gullo, 2000; Weiss & Offenber, 2002), however, others argue that long-term benefits beyond that are minimal (Cannon, Jackowitz, & Painter, 2006; Le et al., 2006). The potential benefits of Full-Day Kindergarten, especially in regard to students with disabilities, should continue to be explored.

The potential benefits of Full-Day Kindergarten, especially in regard to students with disabilities, should continue to be explored.

Does Participation in an additional Early Childhood Education Program while in Early Intervention Decrease Special Education Use or Rates of Retention?

Finally, another major goal of this study was to explore the relationship between participation in multiple early childhood programs and the outcomes of interest, decreased special education use and rates of retention. Overall, 91.9% of the cohort was enrolled in an early childhood or special education class while in the Early Intervention program. A slightly higher percentage of students who participated in an additional program while in the Early Intervention program received special education services at some point by or in Grade 3 or repeated a grade level, compared to students who did not. Further analysis showed that across all levels of dosage, the majority of students receiving Early Intervention services were participating in additional early childhood programs. Additionally, logistic regression analysis showed that there was not a significant effect of participation in an additional early childhood program for decreased rates of retention. Although there was a significant effect of participation in an additional program individually for special education use through Grade 3, the effect was no longer significant when controlling for other significant explanatory variables. Although previous research has highlighted the benefits of participation in early childhood programs, the findings of the current study suggest that for this cohort such benefits are not multiplied by participating in multiple programs or have less of an effect when considered in the context of other variables.

Although there was a significant effect of participation in an additional program individually for special education use through Grade 3, the effect was no longer significant when controlling for other significant explanatory variables.

Limitations

The present study had several methodological limitations. First, based on discussion with OCDEL and the data available, “dosage” was measured as the duration of time spent in the Early Intervention program. However, there are many instances in which a child’s exit or re-entry data for the program would not be collected. Thus, there are potentially instances in which children were temporarily not receiving services that could not be accounted for in the data. Second, this study did not include a measure of the “quality” of the early childhood program, a variable several previous studies had included in their analysis. Third, the design of this study allowed for only one Kindergarten cohort of 13,061 students to be followed, thus some findings in key areas of interests, such as outcomes regarding EL students, could not be reported because the final counts were too low. Finally, other researchers have argued the importance of examining the effects of student and family contextual factors. Beyond Economic Disadvantaged Status, such data could not be obtained for this study.

Future research could consider the effects of additional measurements of “dosage” which take the frequency and intensity of services into account.

Suggestions for Future Research

One major objective of this study was to explore the association between participation in the Early Intervention program and future outcomes including decreased use of special education and rates of retention. Although the current study did examine this relationship, future research could consider the effects of additional measurements of “dosage” which take the frequency and intensity of services into account. Additionally, as the needs and expectations of a child’s family are considered when making decisions regarding Early Intervention services, future research could consider utilizing additional family-level data. Finally, the original cohort design of this study included a second Kindergarten cohort to be followed through Grade 3. However, this cohort included data from the 2018-19 school year which was not available at the time the data for this study was obtained. This data may be obtained at a later date for secondary analyses.

Conclusion

The support provided through Early Intervention and special education services is invaluable to Pennsylvania’s students and their families. Previous studies have found that general early childhood education programs may reduce the need for future special education services. With a focus specific to Early Intervention programs and children with developmental delays and disabilities, this study found that the effect varies based on both child and program level characteristics. Of this cohort, made up of children in PA identified with different developmental delays or disabilities, the majority of students went on to receive special education services by Grade 3. Even among students who did not initially require special education services at Kindergarten entry, roughly half began receiving services by Grade 3. Additionally, considering disability type, students in this cohort with Autism or a hearing and/or

With a focus specific to Early Intervention programs, this study found that the effect varies based on both child and program level characteristics.

visual impairment had significantly higher odds of special education use, while students with a disability type other than a developmental delay had higher odds of never being retained through Grade 3.

This report also found a statistically significant association between dosage, ECO scores, and both outcomes of interest. Interestingly, the effect was greater for special education use through Grade 3 than it was for retention, and the effect of ECO scores was found to be greater than the effect of dosage. Overall, the odds of a student receiving special education services and being retained are significantly lower for students who exited Early Intervention with ECO scores that reflected they either “Improved Functioning to Reach a Level Comparable to Same-Aged Peers” or “Maintained Functioning at a Level Comparable to Same-Aged Peers.” Given these cohort findings, the continued funding and support of Early Intervention and special education services should remain a priority for Pennsylvania. Research should continue to explore the relationship between early childhood education and intervention programs and special education use, with additional consideration of issues of disproportionality.

Given these cohort findings, the continued funding and support of Early Intervention and special education services should remain a priority for Pennsylvania.

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References

- The Abecedarian Project: High-Quality Early Child Care Has Long-Lasting Effects. (2012). The Frank Porter Graham Child Development Institute. Retrieved from: https://fpg.unc.edu/sites/fpg.unc.edu/files/resources/snapshots/FPG_Snapshot66_2012.pdf
- Artiles, A. J., Kozleski, E. B., Trent, S. C., Osher, D., & Ortiz, A. (2010). Justifying and explaining disproportionality, 1968–2008: A critique of underlying views of culture. *Exceptional Children*, 76(3), 279–299.
- Blair, C., & Scott, K. G. (2002). Proportion of LD placements associated with low socioeconomic status: Evidence for gradient. *Journal of Special Education*, 36, 14–22.
- Campbell, F., Ramey, T., Pungello, E., Sparling, J., & Miller-Johnson, S. (2002). Early Childhood Education: Young Adult Outcomes From the Abecedarian Project. *Applied Developmental Science*, 6(1), 42–57.
- Cannon, J., Jackowitz, A. & Painter, G. (2006). Is Full Better than Half? Examining the Longitudinal Effects of Full-day Kindergarten Attendance. *Journal of Policy Analysis and Management*, 25(2), 299–321.
- Carta, J. J., Greenwood, C. R., Atwater, J., McConnell, S. R., Goldstein, H., & Kaminski, R. A. (2015). Identifying preschool children for higher tiers of language and early literacy instruction within a response to intervention framework. *Journal of Early Intervention*, 36(4), 281–291.
- Churchill, A. (2013). No Longer a Boy's World: Boys and Special Education. Retrieved from: <https://fordhaminstitute.org/ohio/commentary/no-longer-boys-world-boys-and-special-education>
- Commonwealth of Pennsylvania. (2017). Governor Wolf Receives Award for Commitment to Education. Retrieved from <https://www.governor.pa.gov/newsroom/governor-wolf-receives-award-for-commitment-to-early-childhood-education/>
- Commonwealth of Pennsylvania. (2019). Pennsylvania to Invest \$10 Million to Support Early Childhood Educators in Career Development. Retrieved from <https://www.governor.pa.gov/newsroom/pennsylvania-to-invest-10-million-to-support-early-childhood-educators-in-career-development/>
- Commonwealth of Pennsylvania. (2019). Pennsylvania Reaches Early Education Milestone Under Gov. Wolf's Leadership. Retrieved from <https://www.media.pa.gov/Pages/Education-Details.aspx?newsid=668>
- Cooc, N., & Kiru, E. W. (2018). Disproportionality in special education: A synthesis of international research and trends. *The Journal of Special Education*, 52(3), 163-173.
- Currie, Janet. (2001). Early Childhood Education Programs. *Journal of Economic Perspectives*, 15(2), 213–238
- Dawson, G., Jones, E., Merkle, K., Venema, K., Lowy, R., Faja, S., Kamara, D., Murias, M., Greenson, J., Winter, J. Smith, M. (2012). Early Behavioral Intervention Is Associated With Normalized Brain Activity in Young Children With Autism. *Journal of the American Academy of Child & Adolescent Psychiatry*, 51(11), 1150–1159.
- Domitrovich, C., Morgan, N., Moore, J., Moore, J. E., Cooper, B. R., Shah, H. K., Jacobson, L., & Greenberg,

- M. T. (2013). One Versus Two Years: Does Length of Exposure to an Enhanced Preschool Program Impact the Academic Functioning of Disadvantaged Children in Kindergarten? *Early Childhood Research Quarterly*, 28(4), 704–713. <https://doi.org/10.1016/j.ecresq.2013.04.004>
- Donovan, M. S., & Cross, C. T. (Eds.) (2002). *Minority students in special and gifted education*. Washington, D.C.: National Academy Press, National Research Council Committee on Minority Representation in Special Education.
- Early Childhood Technical Assistance Center. Child Outcomes. (n.d.). Retrieved from: <https://ectacenter.org/eco/pages/childoutcomes.asp>
- Fernandez, N., & Inserra, A. (2013). Disproportionate Classification of ESL Students in US Special Education. *TESL-EJ*, 17(2), n2.
- Ford, D. Y. (2012). Culturally different students in special education: Looking backward to move forward. *Exceptional Children*, 78(4), 391–405.
- Gullo, D. (2000) The long term educational effects of half-day vs. full-day kindergarten. *Early Child Development and Care*, 160, 17–24.
- Hibel, J., Farkas, G., & Morgan, P. L. (2010). Who is placed into special education? *Sociology of Education*, 83(4), 312–332.
- Hibel, J., & Jasper, A. D. (2012). Delayed special education placement for learning disabilities among children of immigrants. *Social Forces*, 91(2), 503–530.
- Hebbeler, K., Spiker, D., Bailey, D., et al. (2007). Final Report of the National Early Intervention Longitudinal Study. Retrieved from: https://www.sri.com/sites/default/files/publications/neils_finalreport_200702.pdf
- Hutcheson, M. (2008). *Rural Schools Have Pre-Kindergarten Too: Effectiveness of Rural Pre-Kindergarten Programs at Reducing Retention, Reducing Special Education Placement, and Improving Student Performance*. Capella University Doctoral Dissertation. Retrieved from: <https://search-proquest-com.proxy-ship.klnpa.org/docview/304816456/AB5F5F76A437408EPQ/1?accountid=28640>
- Illinois State Board of Education. (2018). Family Fact Sheet For Early Childhood Outcomes. Retrieved from: <https://www.isbe.net/Documents/Family-Fact-Sheet.pdf>
- The Importance of Early Intervention for Infants and Toddlers with Disabilities and Their Families. (2011). The National Early Childhood Technical Assistance Center, Office of Special Education, U.S. Department of Education, Washington, D.C.
- Jenkins, J. R., Dale, P. S., and Mills, P. E., Cole, K. N., Pious, C., & Ronk, J. (2006). How Special Education Preschool Graduates Finish: Status at 19 Years of Age. *American Educational Research Journal*, 43(4), 737–781.
- Kuhn, M., & Marvin, C. A. (2016). “Dosage” Decisions for Early Intervention Services. *Young Exceptional Children*, 19(4), 20–34. <https://doi.org/10.1177/1096250615576807>

- Le, V. N., Kirby, S. N., Barney, H., Setodji, C. M., & Gershwin, D. (2006). School readiness, full-day kindergarten, and student achievement: An empirical investigation. Santa Monica, California: RAND Corporation.
- McCoy, D. C., Yoshikawa, H., Ziol-Guest, K. M., Duncan, G. J., Schindler, H. S., Magnuson, K., Yang, R., Koepp, A., & Shonkoff, J.P. (2017). Impacts of Early Childhood Education on Medium- and Long-Term Educational Outcomes. *Educational Researcher*, 46(8), 474–487. <https://doi.org/10.3102/0013189X17737739>
- McGinty A., Breit-Smith, A., Fan, X., Fan, X., Justice, L. M., & Kaderavek, J. N. (2011). Does Intensity Matter? Preschoolers' Print Knowledge Development Within a Classroom-based Intervention. *Early Childhood Research Quarterly*, 26(3), 255–267. <http://dx.doi.org/10.1016/j.ecresq.2011.02.002>
- Moore, J., Rhoads Cooper, B., Domitrovich, C., Morgan, N.R., Cleveland, M.J., Shah, H., Jacobson, L. and Greenberg, M.T. (2015). The Effects of Exposure to an Enhanced Preschool Program on the Social-Emotional Functioning of At-risk Children. *Early Childhood Research Quarterly*, 32(3), 127–138. <https://doi.org/10.1016/j.ecresq.2015.03.004>
- Morgan, P. L., Farkas, G., Hillemeier, M. M., Mattison, R., Maczuga, S., Li, H., & Cook, M. (2015). Minorities are disproportionately underrepresented in special education: Longitudinal evidence across five disability conditions. *Educational Researcher*, 44(5), 278–292.
- Muschkin, C. G., Ladd, H. F., & Dodge, K. A. (2015). Impact of North Carolina's Early Childhood Initiatives on Special Education Placements in Third Grade. Working Paper 121. National Center for Analysis of Longitudinal Data in Education Research (CALDER).
- National Center for Education Statistics. (2016). The Condition of Education: Children and Youth with Disabilities. Retrieved from https://nces.ed.gov/programs/coe/pdf/Indicator_CGG/coe_cgg_2016_05.pdf
- National Center for Education Statistics. (2019). The Condition of Education: Children and Youth with Disabilities. Retrieved from https://nces.ed.gov/programs/coe/indicator_cgg.asp
- National Center for Education Statistics. (2019). Status and Trends in the Education of Racial and Ethnic Groups: Indicator 1. Population Distribution. Retrieved from https://nces.ed.gov/programs/raceindicators/indicator_RAA.asp
- National Research Council and Institute of Medicine (2000). Early Childhood Intervention: Views from the Field: Report of a Workshop. Washington, DC: The National Academies Press. <https://doi.org/10.17226/9858>
- Reynolds, A., Temple, J., Ou, S., Arteaga, I. A., & White, B. A. (2011). School-Based Early Childhood Education and Age-28 Well-Being: Effects by Timing, Dosage, and Subgroups. *Science*, 333(6040), 360–364. DOI: 10.1126/science.1203618
- Samson, J. F., & Lesaux, N. K. (2009). Language-minority learners in special education: Rates and predictors of identification for services. *Journal of Learning Disabilities*, 42(2), 148–162.
- Schweinhart, L., Montie, J., Xiang, Z., Barnett, W.S., Belfield, C.R., Nores, M. (2005). The High/Scope Perry Preschool Study Through Age 40 Summary, Conclusions, and Frequently Asked Questions. Retrieved from: http://nieer.org/wp-content/uploads/2014/09/specialsummary_rev2011_02_2.pdf

- Shifrer, D., Muller, C., & Callahan, R. (2011). Disproportionality and learning disabilities: Parsing apart race, socioeconomic status, and language. *Journal of Learning Disabilities, 44*(3), 246–257.
- Skiba, R. J., Poloni-Staudinger, L., Simmons, A. B., Renae Feggins-Azziz, L., & Chung, C. G. (2005). Unproven links: Can poverty explain ethnic disproportionality in special education? *The Journal of Special Education, 39*(3), 130–144.
- Wasik, B. A., Mattera, S. K., Lloyd, C. M., & Boller, K. (2013). Intervention Dosage in Early Childhood Care and Education: It's Complicated. *Mathematica Policy Research*
- Wehmeyer, M., & Schwartz, M. (2001). Disproportionate Representation of Males in Special Education Services: Biology, Behavior, or Bias? *Education and Treatment of Children, 24*(1), 28–45.
- Weiss, A. & Offenber, R. M. (2002). Enhancing Urban Children's Early Success in School: The Power of Full-Day Kindergarten. Philadelphia, PA: Philadelphia Public Schools Office of Research and Evaluation.
- Young, E. L., Sabbah, H. Y., Young, B. J., Reiser, M. L., & Richardson, M. J. (2010). Gender differences and similarities in a screening process for emotional and behavioral risks in secondary schools. *Journal of Emotional and Behavioral Disorders, 18*(4), 225–235. <https://doi.org/10.1177/1063426609338858>
- Zong, J., & Batalova, J. (2015). The Limited English Proficient Population in the United States. Retrieved from <https://www.migrationpolicy.org/article/limited-english-proficient-population-united-states>

Appendix A

TABLE 1. Conceptual Framework

Major Objectives	PDE Research Agenda Questions	Analytic sample (Population)*	Analytic Steps	Additional Sub-questions
<ul style="list-style-type: none"> • Identification of the association between participation in Pennsylvania’s Early Intervention Programs and decreased use of special education and other student outcomes such as retention. • Identification of the variation in the associations across subgroups of students. • Direction for future research to guide policy decisions in the area of Early Intervention in relation to narrowing the school-readiness gap for students with disabilities and developmental delays. • Pending results, add to existing literature on the benefits of a child’s participation in Pennsylvania’s Early Intervention Programs. • Demonstration of the benefits of utilizing Pennsylvania’s comprehensive Early Childhood Data System (PELICAN) and the newlylinked State Longitudinal Data System for future research. 	<p>How does dosage affect other outcomes (decreased use of special education, decreased rate of retention)?</p> <p>Does participation in multiple OCDEL programs decrease the likelihood of being placed in special education or not advancing from grade to grade?</p> <p>Does dosage have a different impact for children who are economically disadvantaged?</p> <p>Are there gender differences or racial/ethnic differences?</p>	<p>One Kindergarten Cohort for the 2013/2014 school year, tracked backwards to birth to obtain Early Intervention dosage, and forward to Grade 3 for outcome measures.</p>	<ol style="list-style-type: none"> 1. Descriptive analyses to examine variable distributions, frequencies, means, and standard deviations. 2. Description of students on key variables of interest. 3. Comparison of students across key variables of interest using varied inferential statistical analysis techniques that included the following: Logistic Regression and Chi-Square Analysis. 	<ul style="list-style-type: none"> • Does this association vary by disability, or EL Status? • Does the location of services affect the association? • What is the effect of dosage and participation in additional early childhood programs on special education use and retention through Grade 3 when other explanatory variables, including ECO scores are included?

TABLE 2. Variables for Analytic Models

Independent Variables	Description	Data Source
<i>Early Intervention Dosage</i>	Determined by the date a child is declared eligible for Early Intervention Services and the date he/she no longer receives any Early Intervention Services.	PELICAN
<i>Early Childhood Outcome Score at Exit</i>	For each category, "Acquisition and Use of Knowledge and Skills", "Positive social and Emotional skills", and "Use of Appropriate Behaviors to Meet Their Needs", students are scored if they improved, maintained, or did not improve functioning.	PELICAN
<i>Combination with Other Early Childhood Program</i>	Indicates if a child attended a "Regular Early Childhood Program" and/or a "Special Education Program" at the time of Early Intervention services.	PELICAN
Outcome Variables		
<i>Decreased Special Education Use</i>		
<i>Years in Special Education</i>	The total number of school years spent in Special Education until Grade 3.	PIMS Special Education
<i>Special Education Ever</i>	Indicates that a student received special education services for at least one school year.	PIMS Special Education
<i>Entered Service by or in Grade 3</i>	Of students who did not receive special education services during their initial year of Kindergarten (2013-14), this indicates that they received services by or in Grade 3.	PIMS Student & Special Education
<i>First Year of Special Education</i>	Indicates the grade level of the student's first year of special education services.	PIMS Student & Special Education
<i>Entered Special Education in a Repeated Grade Level</i>	Indicates if a student entered special education services in a repeated grade level.	PIMS Student & Special Education
<i>Exited Services by or in Grade 3</i>	Of students who did receive special education services during their initial year of Kindergarten (2013-14), this indicates if they exited services and never returned by or in Grade 3 (Yes, exited) or remained in services until Grade 3 (No, remained).	PIMS Special Education
<i>Final Year of Special Education</i>	Of students who exited special education services after their first year of Kindergarten, this indicates their grade level during their final year of special education services.	PIMS Student & Special Education
<i>First Year without Special Education</i>	Of students who exited special education services after their first year of Kindergarten, this indicates their first year without special education services.	PIMS Student & Special Education
<i>Re- entered Special Education Services Ever</i>	Of students who began special education services by Grade 1 this indicates if a student exited and re-entered special education services by or in Grade 3.	PIMS Student & Special Education
Retention		
<i>Repeated Ever</i>	Indicates if a student ever repeated a grade level.	PIMS Student
<i>The Grade Level Repeated</i>	Indicates the grade level that was repeated.	PIMS Student
<i>Repeated Kindergarten</i>	For all students, indicates if Kindergarten was repeated.	PIMS Student

Covariates		
Gender	Student gender.	PIMS Student
Race/Ethnicity	Categorical variable that includes the following: American Indian/Alaskan Native, Black or African American, Hispanic, White, Multi-Racial, Asian, Native Hawaiian or Other Pacific Islander.	PIMS Student
Educational Environment in Early Intervention	The location where the child received Early Intervention services including home, community, home and community, sperate school, or in other early childhood and special education programs	PELICAN
Disability Identified at Early Intervention	The disability type identified during Early Intervention: Autism, Speech or Language Impairment, Developmental Delay, Hearing and/or Visual Impairment, or Other Disability	PELICAN
Economic Disadvantaged Status Over Time	Indicates Economic Disadvantaged Status from Kindergarten through Grade 3: Never Economic Disadvantaged Status, Partial Economic Disadvantaged Status, or Remained Economic Disadvantaged Status	PIMS Student
EL Status Over Time	Indicates EL Status from Kindergarten through Grade 3: Never EL Status, Partial EL Status, or Remained EL Status	PIMS Student
Special Education Environment at Entry into Services	The type of environment where the student is receiving their education, including approved residential and non-residential private school, public residential separate facility, other private residential separate facility, hospital/home bound, non-residential public at separate facility, out of state facility, correctional facility, inside the regular classroom 80% or more of the day, inside regular class no more than 79% of the day and no less than 40%, and inside regular class less than 40% of the day.	PIMS Special Education
Full or Half-Day of Kindergarten	Indicates if during first year of Kindergarten (2013-14), the student received a full or half day of Kindergarten.	PIMS Student
Average Overall Attendance	Indicates the mean attendance for all students, (if a student was missing a year of data, the average was calculated using the years of data reported).	PIMS Student Calendar Fact

Appendix B

List of Operational Definitions

- 1. Early Intervention “dosage”** refers to the duration of time spent in the Early Intervention program.
- 2. “Partial” EL Status** refers to any student who’s EL Status had changed over time by Grade 3- meaning at different points in time they had been identified as both EL Status and Non-EL Status.
- 3. “Partial” Economic Disadvantaged Status** refers to any student whose Economic Disadvantaged Status had changed over time by Grade 3- meaning at different points in time they had been identified as both Economic Disadvantaged Status and Non-Economic Disadvantaged Status.
- 4. Receiving Early Intervention services in “Some Other Location”** includes in the home, in a residential facility, in a separate school, or in a service provider location.
- 5. Receiving special education services in “Some Other Location”** includes a residential or non-residential private school, a public or private residential facility, in a hospital or home, an out-of-state facility, or a correctional facility.
- 6. For purposes of analysis, the disabilities categories of Intellectual Disability, Multiple Disabilities, Orthopedic Impairment, Emotional Disturbance, Specific Learning Disability, Traumatic Brain Injury, and Other Health Impairment were combined into “Other Disability”.**
- 7. For purposes of analysis, the disabilities categories of Deaf-blindness, Hearing Impairment, and Visual Impairment were combined into “Hearing and/or Visual Impairment”.**

Appendix C

Descriptive Analyses

TABLE 1. Kindergarten Length of Day Based on Student Groups

		Half-Day Kindergarten	Full-Day Kindergarten
		% (n)	% (n)
Overall			
	Total	23.2 (3033)	76.8 (10028)
Gender			
	Male	23.5 (2144)	76.5 (6995)
	Female	22.7 (889)	77.3 (3033)
Ethnicity			
	American Indian/Alaskan Native	*	*
	Black or African American	9.1 (153)	90.9 (1525)
	Hispanic	18.4 (253)	81.6 (1124)
	White	26.8 (2346)	73.2 (6391)
	Multi-Racial	16.7 (167)	83.3 (832)
	Asian	43.8 (109)	56.2 (140)
	Native Hawaiian or Other Pacific Islander	*	*
EL Status Through Grade 3			
	Total	23.0 (2772)	77.0 (9269)
	Never EL Status	23.3 (2691)	76.7 (8857)
	Partial EL Status	23.7 (40)	76.3 (129)
	Remained EL Status	12.7 (41)	87.3 (283)
Economic Disadvantaged Status Through Grade 3			
	Total	23.0 (2816)	77.0 (9408)
	Never Economic Disadvantaged Status	41.1 (1556)	58.9 (2232)
	Partial Economic Disadvantaged Status	24.6 (746)	75.4 (2284)
	Remained Economic Disadvantaged Status	9.5 (514)	90.5 (4892)

*Counts Too Low to Report

TABLE 2. Educational Environment for Early Intervention Services Based on Student Groups

		In the Regular Early Childhood Program	Special Education Class	In Some Other Location: Home, Residential Facility, Separate School, or Service Provider Location
		% (n)	% (n)	% (n)
Overall				
Total		63.8 (8329)	13.2 (1723)	23.0 (3008)
Gender				
Male		63.3 (5784)	14.0 (1279)	22.7 (2075)
Female		64.9 (2545)	11.3 (444)	23.8 (933)
Ethnicity				
American Indian/Alaskan Native		*	*	*
Black or African American		70.5 (1182)	12.7 (213)	16.8 (282)
Hispanic		64.6 (890)	17.9 (247)	17.4 (240)
White		62.8 (5484)	11.9 (1038)	25.3 (2212)
Multi-Racial		59.7 (596)	18.7 (187)	21.6 (216)
Asian		64.7 (161)	13.7 (34)	21.7 (54)
Native Hawaiian or Other Pacific Islander		*	*	*
EL Status Through Grade 3				
Total		63.8 (7686)	13.2 (1588)	23.0 (2766)
Never EL Status		63.8 (7363)	13.1 (1512)	23.1 (2672)
Partial EL Status		65.7 (111)	17.8 (30)	16.6 (28)
Remained EL Status		65.4 (212)	14.2 (46)	20.4 (66)
Economic Disadvantaged Status Through Grade 3				
Total		63.9 (7806)	13.3 (1622)	22.9 (2795)
Never Economic Disadvantaged Status		61.4 (2326)	7.7 (291)	30.9 (1170)
Partial Economic Disadvantaged Status		61.9 (1875)	17.1 (517)	21.1 (638)
Remained Economic Disadvantaged Status		66.7 (3605)	15.1 (814)	18.3 (987)

*Counts Too Low to Report

TABLE 3. Educational Environment for Special Education Services in Grades K–3 Based on Student Groups

	Inside the Classroom	In Some Other Location: Residential or Non-Residential Private School, Public or Private Residential Facility, Hospital or Home, Out-of-State Facility, or a Correctional Facility
	% (n)	% (n)
Overall		
Total	97.4 (9695)	2.6 (255)
Gender		
Male	97.4 (6895)	2.6 (183)
Female	97.5 (2800)	2.5 (72)
Ethnicity		
American Indian/Alaskan Native	*	*
Black or African American	95.6 (1141)	4.4 (53)
Hispanic	98.6 (985)	*
White	97.7 (6654)	2.3 (158)
Multi-Racial	97.1 (734)	2.9 (22)
Asian	96.0 (166)	*
Native Hawaiian or Other Pacific Islander	*	*
EL Status Through Grade 3		
Total	97.5 (9165)	2.5 (235)
Never EL Status	97.5 (8806)	2.5 (227)
Partial EL Status	*	*
Remained EL Status	*	*
Economic Disadvantaged Status Through Grade 3		
Total	97.5 (9302)	2.5 (243)
Never Economic Disadvantaged Status	98.1 (2817)	1.9 (54)
Partial Economic Disadvantaged Status	95.8 (2305)	4.2 (100)
Remained Economic Disadvantaged Status	97.9 (4180)	2.1 (89)

*Counts Too Low to Report

TABLE 4. ECO Rating at Exit from Early Intervention Services Based on Student Groups Acquisition and Use of Knowledge and Skills

	A. Did not improve functioning	B. Improved functioning, but not sufficient to move nearer to functioning comparable to same-aged peers	C. Improved functioning to a level nearer to same-aged peers but did not reach it	D. Improved functioning to reach a level comparable to same-aged peers	E. Maintained functioning at a level comparable to same-aged peers	F. Invalid
	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Overall						
Total	0.6 (55)	6.8 (673)	27.2 (2671)	47.8 (4698)	16.9 (1665)	0.7 (67)
Gender						
Male	*	6.7 (459)	28.3 (1941)	47.3 (3246)	16.5 (1130)	*
Female	*	7.2 (214)	24.6 (730)	48.9 (1452)	18.0 (535)	*
Ethnicity						
American Indian/ Alaskan Native	*	*	*	*	*	*
Black or African American	*	9.1 (111)	32.9 (400)	45.3 (550)	10.8 (131)	*
Hispanic	*	6.5 (62)	34.4 (330)	48.1 (461)	9.9 (95)	*
White	0.5 (33)	6.3 (423)	24.0 (1612)	48.8 (3279)	19.8 (1330)	0.6 (40)
Multi-Racial	*	8.9 (67)	35.2 (266)	42.3 (320)	11.6 (88)	*
Asian	*	*	34.6 (56)	47.5 (77)	*	*
Native Hawaiian or Other Pacific Islander	*	*	*	*	*	*
EL Status Through Grade 3						
Total	0.5 (48)	6.8 (611)	27.2 (2465)	48.0 (4344)	16.8 (1523)	0.6 (58)
Never EL Status	0.5 (43)	6.7 (581)	26.7 (2333)	48.2 (4203)	17.3 (1506)	0.6 (56)
Partial EL Status	*	*	35.3 (42)	48.7 (58)	*	*
Remained EL Status	*	10.6 (22)	43.3 (90)	39.9 (83)	*	*
Economic Disadvantaged Status Through Grade 3						
Total	0.5 (48)	6.8 (623)	27.3 (2510)	48.0 (4407)	16.7 (1534)	0.7 (62)
Never Economic Disadvantaged Status	*	5.3 (147)	17.3 (480)	51.7 (1434)	25.2 (700)	*
Partial Economic Disadvantaged Status	*	6.8 (161)	30.8 (723)	46.3 (1088)	14.7 (346)	*
Remained Economic Disadvantaged Status	0.7 (27)	7.8 (315)	32.2 (1307)	46.4 (1885)	12.0 (488)	0.9 (38)

*Counts Too Low to Report

TABLE 5. ECO Rating at Exit from Early Intervention Services Based on Student Groups Positive Social / Emotional Skills

	A. Did not improve functioning	B. Improved functioning, but not sufficient to move nearer to functioning comparable to same-aged peers	C. Improved functioning to a level nearer to same-aged peers but did not reach it	D. Improved functioning to reach a level comparable to same-aged peers	E. Maintained functioning at a level comparable to same-aged peers	F. Invalid
	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Overall						
Total	0.7 (66)	6.5 (638)	25.5 (2502)	39.4 (3875)	27.2 (2674)	0.8 (74)
Gender						
Male	*	6.7 (460)	27.0 (1850)	39.6 (2720)	25.2 (1731)	0.8 (53)
Female	*	6.0 (178)	22.0 (652)	38.9 (1155)	31.8 (943)	0.7 (21)
Ethnicity						
American Indian/ Alaskan Native	*	*	*	*	*	*
Black or African American	*	10.0 (121)	30.5 (371)	39.3 (478)	18.4 (223)	*
Hispanic	*	6.8 (65)	31.0 (297)	43.5 (417)	17.2 (165)	*
White	0.6 (37)	5.5 (368)	22.9 (1536)	38.8 (2608)	31.6 (2122)	0.7 (46)
Multi-Racial	*	9.8 (74)	31.7 (240)	38.5 (291)	17.3 (131)	*
Asian	*	*	34.0 (55)	40.7 (66)	19.1 (31)	*
Native Hawaiian or Other Pacific Islander	*	*	*	*	*	*
EL Status Through Grade 3						
Total	0.7 (60)	6.3 (570)	25.5 (2308)	39.4 (3565)	27.4 (2481)	0.7 (65)
Never EL Status	0.6 (55)	6.2 (538)	25.3 (2209)	39.3 (3430)	27.8 (2429)	0.7 (61)
Partial EL Status	*	*	26.9 (32)	44.5 (53)	*	*
Remained EL Status	*	*	32.2 (67)	39.4 (82)	16.8 (35)	*
Economic Disadvantaged Status Through Grade 3						
Total	0.7 (61)	6.3 (583)	25.6 (2348)	39.4 (3622)	27.2 (2502)	0.8 (69)
Never Economic Disadvantaged Status	*	4.8 (133)	18.2 (505)	38.0 (1055)	38.1 (1058)	*
Partial Economic Disadvantaged Status	1.0 (24)	6.9 (162)	28.4 (667)	38.7 (909)	24.4 (573)	*
Remained Economic Disadvantaged Status	0.7 (27)	7.1 (288)	29.0 (1176)	40.8 (1658)	21.5 (871)	1.0 (40)

*Counts Too Low to Report

TABLE 6. ECO Rating at Exit from Early Intervention Services Based on Student Groups Use of Appropriate Behaviors to Meet Their Needs

	A. Did not improve functioning	B. Improved functioning, but not sufficient to move nearer to functioning comparable to same-aged peers	C. Improved functioning to a level nearer to same-aged peers but did not reach it	D. Improved functioning to reach a level comparable to same-aged peers	E. Maintained functioning at a level comparable to same-aged peers	F. Invalid
	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Overall						
Total	0.7 (64)	6.5 (638)	23.2 (2276)	41.1 (4038)	27.8 (2729)	0.8 (82)
Gender						
Male	*	6.9 (475)	24.6 (1689)	41.5 (2850)	25.3 (1736)	0.9 (62)
Female	*	5.5 (163)	19.8 (587)	40.0 (1188)	33.5 (993)	0.7 (20)
Ethnicity						
American Indian/ Alaskan Native	*	*	*	*	*	*
Black or African American	*	10.6 (129)	27.7 (336)	40.4 (491)	19.3 (235)	*
Hispanic	*	7.0 (67)	26.9 (258)	46.5 (446)	18.0 (173)	*
White	0.5 (36)	5.3 (357)	20.9 (1407)	40.4 (2713)	32.0 (2150)	0.8 (53)
Multi-Racial	*	9.7 (73)	29.4 (222)	40.8 (308)	17.7 (134)	*
Asian	*	*	30.2 (49)	42.0 (68)	21.0 (34)	*
Native Hawaiian or Other Pacific Islander	*	*	*	*	*	*
EL Status Through Grade 3						
Total	0.6 (56)	6.3 (573)	23.2 (2095)	41.2 (3724)	27.9 (2525)	0.8 (74)
Never EL Status	0.6 (54)	6.2 (539)	23.0 (2009)	41.1 (3582)	28.3 (2466)	0.8 (70)
Partial EL Status	*	*	26.9 (32)	45.4 (54)	*	*
Remained EL Status	*	10.1 (21)	26.0 (54)	42.3 (88)	19.2 (40)	*
Economic Disadvantaged Status Through Grade 3						
Total	0.6 (58)	6.4 (585)	23.2 (2129)	41.2 (3783)	27.8 (2551)	0.8 (77)
Never Economic Disadvantaged Status	*	4.1 (114)	17.0 (471)	40.1 (1112)	38.0 (1053)	*
Partial Economic Disadvantaged Status	1.0 (23)	6.9 (161)	25.3 (595)	41.0 (964)	25.2 (592)	*
Remained Economic Disadvantaged Status	0.7 (29)	7.6 (310)	26.2 (1063)	42.1 (1707)	22.3 (906)	1.1 (44)

*Counts Too Low to Report

TABLE 7. Additional Program Participation During Early Intervention Services Based on Student Groups

		Yes	No
		% (n)	% (n)
Overall			
	Total	91.9 (12007)	8.1 (1054)
Gender			
	Male	92.0 (8411)	8.0 (728)
	Female	91.7 (3596)	8.3 (326)
Ethnicity			
	American Indian/Alaskan Native	*	*
	Black or African American	92.7 (1556)	7.3 (122)
	Hispanic	91.9 (1266)	8.1 (111)
	White	91.9 (8023)	8.1 (711)
	Multi-Racial	90.3 (902)	9.7 (97)
	Asian	*	*
	Native Hawaiian or Other Pacific Islander	*	*
EL Status Through Grade 3			
	Total	92.1 (11084)	7.9 (957)
	Never EL Status	92.1 (10638)	7.9 (910)
	Partial EL Status	*	*
	Remained EL Status	88.9 (288)	11.1 (36)
Economic Disadvantaged Status Through Grade 3			
	Total	92.0 (11250)	8.0 (974)
	Never Economic Disadvantaged Status	93.4 (3539)	6.6 (249)
	Partial Economic Disadvantaged Status	90.6 (2746)	9.4 (284)
	Remained Economic Disadvantaged Status	91.8 (4965)	8.2 (441)

*Counts Too Low to Report

TABLE 8. Received Special Education Services by or in Grade 3 Based on Student Groups

		Yes, received services at some point	Never received services
		% (n)	% (n)
Overall			
Total		79.2 (9984)	20.8 (2629)
Gender			
Male		80.4 (7104)	19.6 (1734)
Female		76.3 (2880)	23.7 (895)
Ethnicity			
American Indian/Alaskan Native		*	*
Black or African American		74.9 (1201)	25.1 (403)
Hispanic		75.5 (1003)	24.5 (326)
White		80.6 (6828)	19.4 (1641)
Multi-Racial		80.3 (763)	19.7 (187)
Asian		72.4 (173)	27.6 (66)
Native Hawaiian or Other Pacific Islander		*	*
EL Status Through Grade 3			
Total		78.1 (9401)	21.9 (2629)
Never EL Status		78.2 (9033)	21.8 (2515)
Partial EL Status		74.7 (118)	25.3 (40)
Remained EL Status		77.2 (250)	22.8 (74)
Economic Disadvantaged Status Through Grade 3			
Total		78.4 (9550)	21.6 (2629)
Never Economic Disadvantaged Status		75.8 (2871)	24.2 (917)
Partial Economic Disadvantaged Status		80.7 (2410)	19.3 (575)
Remained Economic Disadvantaged Status		79.0 (4269)	21.0 (1137)

*Counts Too Low to Report

TABLE 9. Number of Years in Special Education Services through Grade 3 Based on Student Groups

	0	1	2	3	4	5	N	Mean	SD	Range
	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)				
Overall										
Total	21.9 (2629)	6.7 (811)	9.8 (1172)	14.9 (1795)	42.2 (5074)	4.5 (538)	12019	2.62	1.67	0.00 – 5.00
Gender										
Male	20.6 (1734)	6.6 (553)	9.7 (815)	14.7 (1236)	43.9 (3697)	4.5 (382)	8417	2.68	1.65	0.00 – 5.00
Female	24.8 (895)	7.2 (258)	9.9 (357)	15.5 (559)	38.2 (1377)	4.3 (156)	3602	2.48	1.71	0.00 – 5.00
Ethnicity										
American Indian/ Alaskan Native	*	*	*	*	*	*	*	*	*	*
Black or African American	26.5 (403)	6.9 (105)	9.6 (146)	19.1 (291)	33.6 (511)	4.3 (66)	1522	2.39	1.70	0.00 – 5.00
Hispanic	26.0 (326)	8.5 (106)	9.1 (114)	17.1 (215)	37.5 (470)	1.8 (23)	1254	2.37	1.68	0.00 – 5.00
White	20.2 (1641)	6.7 (546)	10.1 (821)	13.4 (1085)	44.3 (3597)	5.2 (421)	8111	2.70	1.66	0.00 – 5.00
Multi-Racial	21.0 (187)	4.4 (39)	8.5 (76)	19.5 (174)	43.9 (391)	2.7 (24)	891	2.69	1.61	0.00 – 5.00
Asian	29.7 (66)	*	*	13.5 (30)	43.7 (97)	*	222	2.40	1.76	0.00 – 5.00
Native Hawaiian or Other Pacific Islander	*	*	*	*	*	*	*	*	*	*
EL Status Through Grade 3										
Total	21.9 (2629)	6.7 (811)	9.8 (1172)	14.9 (1795)	42.2 (5070)	4.5 (538)				
Never EL Status	21.8 (2515)	6.7 (768)	9.8 (1135)	14.8 (1706)	42.4 (4899)	4.5 (525)	11548	2.63	1.67	0.00 – 5.00
Partial EL Status	28.0 (40)	*	*	14.7 (21)	37.8 (54)	*	143	2.31	1.75	0.00 – 5.00
Remained EL Status	22.8 (74)	8.3 (27)	9.0 (29)	21.0 (68)	36.1 (117)	*	324	2.48	1.64	0.00 – 5.00
Economic Disadvantaged Status Through Grade 3										
Total	21.9 (2629)	6.7 (811)	9.8 (1172)	14.9 (1795)	42.2 (5074)	4.5 (538)				
Never Economic Disadvantaged Status	24.2 (917)	7.7 (291)	10.9 (413)	12.3 (466)	41.8 (1584)	3.1 (117)	3788	2.49	1.70	0.00 – 5.00
Partial Economic Disadvantaged Status	20.4 (575)	6.9 (196)	9.0 (254)	15.3 (432)	43.2 (1220)	5.2 (148)	2825	2.70	1.66	0.00 – 5.00
Remained Economic Disadvantaged Status	21.0 (1137)	6.0 (324)	9.3 (505)	16.6 (897)	42.0 (2270)	5.0 (273)	5406	2.68	1.66	0.00 – 5.00

*Counts Too Low to Report

TABLE 10. If Not Initially Receiving Special Education Services, Began Receiving by or in Grade 3 Based on Student Groups

		Yes, began receiving services	Never received services
		% (n)	% (n)
Overall			
Total		49.0 (2523)	51.0 (2629)
Gender			
Male		51.3 (1825)	48.7 (1734)
Female		43.8 (698)	56.2 (895)
Ethnicity			
American Indian/Alaskan Native		*	*
Black or African American		53.2 (459)	46.8 (403)
Hispanic		47.2 (292)	52.8 (326)
White		47.6 (1490)	52.4 (1641)
Multi-Racial		56.5 (243)	43.5 (187)
Asian		32.7 (32)	67.3 (66)
Native Hawaiian or Other Pacific Islander		*	*
EL Status Through Grade 3			
Total		47.5 (2382)	52.5 (2629)
Never EL Status		47.4 (2269)	52.6 (2515)
Partial EL Status		42.9 (30)	57.1 (40)
Remained EL Status		52.9 (83)	47.1 (74)
Economic Disadvantaged Status Through Grade 3			
Total		47.8 (2412)	52.2 (2629)
Never Economic Disadvantaged Status		41.9 (660)	58.1 (917)
Partial Economic Disadvantaged Status		54.0 (676)	46.0 (575)
Remained Economic Disadvantaged Status		48.6 (1076)	51.4 (1137)

*Counts Too Low to Report

TABLE 11. First Year of Special Education Services Based on Student Groups

	Of Those Who Received Special Education				Of the Entire Cohort				
	Kindergarten	Grade 1	Grade 2	Grade 3	Kindergarten	Grade 1	Grade 2	Grade 3	Never Received
	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Overall									
Total	80.1 (7976)	11.2 (1117)	5.1 (511)	3.5 (349)	63.4 (7976)	8.9 (1117)	4.1 (511)	2.8 (349)	20.9 (2629)
Gender									
Male	79.9 (5657)	11.2 (796)	5.3 (375)	3.6 (253)	64.2 (5657)	9.0 (796)	4.3 (375)	2.9 (253)	19.7 (1734)
Female	80.7 (2319)	11.2 (321)	4.7 (136)	3.3 (96)	61.6 (2319)	8.5 (321)	3.6 (136)	2.5 (96)	23.8 (895)
Ethnicity									
American Indian/ Alaskan Native	*	*	*	*	*	*	*	*	*
Black or African American	66.7 (797)	21.1 (252)	7.2 (86)	5.0 (60)	49.7 (797)	15.8 (252)	5.4 (86)	3.8 (60)	25.2 (403)
Hispanic	73.7 (736)	16.6 (166)	5.2 (52)	4.5 (45)	55.5 (736)	12.5 (166)	3.9 (52)	3.4 (45)	24.6 (326)
White	84.0 (5725)	8.1 (550)	4.8 (324)	3.1 (213)	67.7 (5725)	6.5 (550)	3.8 (324)	2.5 (213)	19.4 (1641)
Multi-Racial	73.4 (556)	17.4 (132)	5.8 (44)	3.4 (26)	58.8 (556)	14.0 (132)	4.7 (44)	2.8 (26)	19.8 (187)
Asian	85.5 (148)	*	*	*	61.9 (148)	*	*	*	27.6 (66)
Native Hawaiian or Other Pacific Islander	*	*	*	*	*	*	*	*	*
EL Status Through Grade 3									
Total	79.7 (7492)	11.2 (1053)	5.4 (506)	3.7 (349)	62.3 (7492)	8.8 (1053)	4.2 (506)	2.9 (349)	21.9 (2629)
Never EL Status	80.0 (7224)	10.9 (989)	5.5 (493)	3.6 (327)	62.6 (7224)	8.6 (989)	4.3 (493)	2.8 (327)	21.8 (2515)
Partial EL Status	85.5 (100)	*	*	*	63.7 (100)	*	*	*	25.5 (40)
Remained EL Status	67.2 (168)	21.6 (54)	*	*	51.9 (168)	16.7 (54)	*	*	22.8 (74)
Economic Disadvantaged Status Through Grade 3									
Total	79.9 (7624)	11.1 (1064)	5.3 (508)	3.7 (349)	62.6 (7624)	8.7 (1064)	4.2 (508)	2.9 (349)	21.6 (2629)
Never Economic Disadvantaged Status	83.4 (2393)	7.6 (218)	5.3 (152)	3.8 (108)	63.2 (2393)	5.8 (218)	4.0 (152)	2.9 (108)	24.2 (917)
Partial Economic Disadvantaged Status	81.3 (1956)	11.0 (265)	4.2 (102)	3.4 (82)	65.6 (1956)	8.9 (265)	3.4 (102)	2.8 (82)	19.3 (575)
Remained Economic Disadvantaged Status	76.7 (3275)	13.6 (581)	5.9 (254)	3.7 (159)	60.6 (3275)	10.7 (581)	4.7 (254)	2.9 (159)	21.0 (1137)

*Counts Too Low to Report

TABLE 12. Of Those Who Have Received Special Education Services, First Year of Services Was a Repeated Grade Level Based on Student Groups

		Yes	No
		% (n)	% (n)
Overall			
	Total	5.5 (552)	94.5 (9421)
Gender			
	Male	5.8 (409)	94.2 (6688)
	Female	5.0 (143)	95.0 (2733)
Ethnicity			
	American Indian/Alaskan Native	*	*
	Black or African American	5.6 (67)	94.4 (1131)
	Hispanic	3.0 (30)	97.0 (973)
	White	5.9 (403)	94.1 (6418)
	Multi-Racial	5.2 (40)	94.8 (722)
	Asian	*	*
	Native Hawaiian or Other Pacific Islander	*	*
EL Status Through Grade 3			
	Total	5.4 (507)	94.6 (8894)
	Never EL Status	5.5 (493)	94.5 (8540)
	Partial EL Status	*	89.8 (106)
	Remained EL Status	*	99.2 (248)
Economic Disadvantaged Status Through Grade 3			
	Total	5.4 (520)	94.6 (9030)
	Never Economic Disadvantaged Status	6.4 (185)	93.6 (2686)
	Partial Economic Disadvantaged Status	9.5 (230)	90.5 (2180)
	Remained Economic Disadvantaged Status	2.5 (105)	97.5 (4164)

*Counts Too Low to Report

TABLE 13. If Initially Receiving Special Education Services in Kindergarten, Exited Special Education by or in Grade 3 Based on Student Groups

		Yes, exited services by Grade 3	No, continued to receive services
		% (n)	% (n)
Overall			
	Total	22.9 (1660)	77.1 (5598)
Gender			
	Male	21.0 (1078)	79.0 (4057)
	Female	27.4 (582)	72.6 (1541)
Ethnicity			
	American Indian/Alaskan Native	*	*
	Black or African American	18.3 (131)	81.7 (583)
	Hispanic	23.8 (164)	76.2 (525)
	White	24.0 (1249)	76.0 (3959)
	Multi-Racial	17.0 (86)	83.0 (421)
	Asian	21.2 (28)	78.8 (104)
	Native Hawaiian or Other Pacific Islander	*	*
EL Status Through Grade 3			
	Total	23.3 (1632)	76.7 (5382)
	Never EL Status	23.2 (1570)	76.8 (5194)
	Partial EL Status	34.9 (29)	65.1 (54)
	Remained EL Status	19.8 (33)	80.2 (134)
Economic Disadvantaged Status Through Grade 3			
	Total	23.2 (1640)	76.8 (5426)
	Never Economic Disadvantaged Status	28.1 (621)	71.9 (1590)
	Partial Economic Disadvantaged Status	23.3 (388)	76.7 (1274)
	Remained Economic Disadvantaged Status	19.8 (631)	80.2 (2562)

*Counts Too Low to Report

TABLE 14. Final Year of Special Education Based on Student Groups

		Kindergarten	Grade 1	Grade 2	Grade 3
		% (n)	% (n)	% (n)	% (n)
Overall					
	Total	22.8 (372)	32.0 (522)	44.9 (733)	*
Gender					
	Male	22.6 (238)	32.0 (337)	45.0 (474)	*
	Female	23.1 (134)	32.0 (185)	44.7 (259)	*
Ethnicity					
	American Indian/ Alaskan Native	*	*	*	*
	Black or African American	22.8 (29)	28.3 (36)	48.8 (62)	*
	Hispanic	31.2 (49)	24.2 (38)	43.3 (68)	*
	White	22.6 (279)	33.6 (416)	43.5 (538)	*
	Multi-Racial	*	29.3 (24)	62.2 (51)	*
	Asian	*	*	*	*
	Native Hawaiian or Other Pacific Islander	*	*	*	*
EL Status Through Grade 3					
	Total	22.8 (372)	32.0 (521)	44.8 (731)	*
	Never EL Status	22.6 (355)	32.6 (512)	44.5 (698)	*
	Partial EL Status	*	*	*	*
	Remained EL Status	*	*	63.6 (21)	*
Economic Disadvantaged Status Through Grade 3					
	Total	22.8 (372)	32.0 (522)	44.9 (372)	*
	Never Economic Disadvantaged Status	24.2 (150)	33.8 (210)	41.9 (260)	*
	Partial Economic Disadvantaged Status	23.2 (88)	31.3 (118)	44.7 (170)	*
	Remained Economic Disadvantaged Status	21.2 (134)	30.7 (194)	47.9 (302)	*

*Counts Too Low to Report

TABLE 15. First Year Without Special Education Based on Student Groups

		Kindergarten	Grade 1	Grade 2	Grade 3
		% (n)	% (n)	% (n)	% (n)
Overall					
	Total	*	22.7 (371)	31.8 (520)	45.0 (735)
Gender					
	Male	*	22.9 (241)	31.9 (336)	45.1 (475)
	Female	*	22.5 (130)	31.8 (184)	44.9 (260)
Ethnicity					
	American Indian/ Alaskan Native	*	*	*	*
	Black or African American	*	22.0 (28)	29.1 (37)	48.0 (61)
	Hispanic	*	30.8 (48)	24.2 (38)	44.6 (70)
	White	*	22.7 (281)	33.3 (412)	43.7 (540)
	Multi-Racial	*	*	30.5 (25)	61.0 (50)
	Asian	*	*	*	*
	Native Hawaiian or Other Pacific Islander	*	*	*	*
EL Status Through Grade 3					
	Total	*	22.8 (371)	31.8 (519)	45.0 (733)
	Never EL Status	*	22.5 (354)	32.5 (510)	44.5 (699)
	Partial EL Status	*	*	*	*
	Remained EL Status	*	*	*	*
Economic Disadvantaged Status Through Grade 3					
	Total	*	22.7 (371)	31.9 (520)	45.0 (734)
	Never Economic Disadvantaged Status	*	24.0 (149)	33.7 (209)	42.0 (261)
	Partial Economic Disadvantaged Status	*	22.6 (86)	31.3 (119)	45.3 (172)
	Remained Economic Disadvantaged Status	*	21.6 (136)	30.4 (192)	47.7 (301)

*Counts Too Low to Report

TABLE 16. Exited, but Re-Entered Special Education Services by or in Grade 3 Based on Student Groups

		Yes	No
		% (n)	% (n)
Overall			
Total		3.5 (300)	96.5 (8266)
Gender			
Male		3.5 (215)	96.5 (5858)
Female		3.4 (85)	96.6 (2408)
Ethnicity			
American Indian/Alaskan Native		*	*
Black or African American		4.7 (46)	95.3 (933)
Hispanic		4.9 (41)	95.1 (794)
White		3.0 (180)	97.0 (5773)
Multi-Racial		4.7 (30)	95.3 (610)
Asian		*	98.0 (145)
Native Hawaiian or Other Pacific Islander		*	*
EL Status Through Grade 3			
Total		3.5 (299)	96.5 (8232)
Never EL Status		3.4 (283)	96.6 (7930)
Partial EL Status		*	95.8 (92)
Remained EL Status		*	94.6 (210)
Economic Disadvantaged Status Through Grade 3			
Total		3.5 (299)	96.5 (8245)
Never Economic Disadvantaged Status		2.4 (63)	97.6 (2548)
Partial Economic Disadvantaged Status		3.9 (81)	96.1 (1996)
Remained Economic Disadvantaged Status		4.0 (155)	96.0 (3701)

*Counts Too Low to Report

TABLE 17. Repeated a Grade Level By Grade 3 Based on Student Groups

		Yes	No
		% (n)	% (n)
Overall			
	Total	14.6 (1798)	85.4 (10543)
Gender			
	Male	14.8 (1276)	85.2 (7371)
	Female	14.1 (522)	85.9 (3172)
Ethnicity			
	American Indian/Alaskan Native	*	*
	Black or African American	17.2 (270)	82.8 (1296)
	Hispanic	9.6 (126)	90.4 (1185)
	White	14.9 (1238)	85.1 (7048)
	Multi-Racial	15.2 (141)	84.8 (789)
	Asian	*	92.9 (210)
	Native Hawaiian or Other Pacific Islander	*	*
EL Status Through Grade 3			
	Total	13.2 (1593)	86.8 (10432)
	Never EL Status	13.4 (1547)	86.6 (10001)
	Partial EL Status	17.6 (27)	82.4 (126)
	Remained EL Status	*	*
Economic Disadvantaged Status Through Grade 3			
	Total	13.5 (1636)	86.5 (10467)
	Never Economic Disadvantaged Status	11.0 (418)	89.0 (3370)
	Partial Economic Disadvantaged Status	20.1 (584)	79.9 (2325)
	Remained Economic Disadvantaged Status	11.7 (634)	88.3 (4772)

*Counts Too Low to Report

TABLE 18. Repeated Kindergarten Based on Student Groups

		Yes	No
		% (n)	% (n)
Overall			
	Total	10.2 (1294)	89.8 (11392)
Gender			
	Male	10.4 (924)	89.6 (7957)
	Female	9.7 (370)	90.3 (3435)
Ethnicity			
	American Indian/Alaskan Native	*	*
	Black or African American	9.3 (151)	90.7 (1473)
	Hispanic	5.8 (78)	94.2 (1269)
	White	11.3 (957)	88.7 (7528)
	Multi-Racial	9.2 (89)	90.8 (883)
	Asian	*	94.5 (223)
	Native Hawaiian or Other Pacific Islander	*	*
EL Status Through Grade 3			
	Total	9.8 (117)	90.2 (10854)
	Never EL Status	9.9 (1145)	90.1 (10403)
	Partial EL Status	12.6 (20)	87.4 (139)
	Remained EL Status	*	*
Economic Disadvantaged Status Through Grade 3			
	Total	9.9 (1205)	90.1 (10954)
	Never Economic Disadvantaged Status	9.4 (357)	90.6 (3431)
	Partial Economic Disadvantaged Status	15.0 (444)	85.0 (2521)
	Remained Economic Disadvantaged Status	7.5 (404)	92.5 (5002)

*Counts Too Low to Report

TABLE 19. Grade Level Repeated Based on Student Groups

	Kindergarten	Grade 1	Grade 2	Grade 3
	% (n)	% (n)	% (n)	% (n)
Overall				
Total	74.4 (1294)	14.3 (248)	7.7 (134)	3.7 (64)
Gender				
Male	74.9 (924)	13.4 (165)	7.6 (94)	*
Female	73.1 (370)	16.4 (83)	7.9 (40)	*
Ethnicity				
American Indian/Alaskan Native	*	*	*	*
Black or African American	57.4 (151)	22.4 (59)	13.7 (36)	*
Hispanic	67.8 (78)	20.0 (23)	*	*
White	79.5 (957)	11.5 (139)	5.8 (70)	3.2 (38)
Multi-Racial	65.9 (89)	18.5 (25)	*	*
Asian	*	*	*	*
Native Hawaiian or Other Pacific Islander	*	*	*	*
EL Status Through Grade 3				
Total	74.0 (1177)	14.4 (229)	7.6 (121)	4.0 (64)
Never EL Status	74.0 (1145)	14.3 (221)	7.7 (119)	4.0 (62)
Partial EL Status	80.0 (20)	*	*	*
Remained EL Status	*	*	*	*
Economic Disadvantaged Status Through Grade 3				
Total	74.2 (1205)	14.3 (232)	7.6 (124)	3.9 (64)
Never Economic Disadvantaged Status	85.4 (357)	9.1 (38)	*	*
Partial Economic Disadvantaged Status	77.5 (444)	9.9 (57)	7.9 (45)	*
Remained Economic Disadvantaged Status	63.7 (404)	21.6 (137)	10.3 (65)	*

*Counts Too Low to Report

TABLE 20. Early Intervention Dosage Category Based on Student Groups

	6 Months or Less	6 months-1 year (6-12 months)	1-1.5 years (13-18 months)	1.5-2 years (19-24 months)	2-2.5 years (25-30 months)	2.5-3 years (31-36 months)	3-3.5 years (37-42 months)	3.5-4 years (43-48 months)	More than 4 years (49+ months)
	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Overall									
Total	2.8 (363)	15.2 (1991)	12.4 (1617)	18.5 (2422)	20.1 (2630)	21.2 (2768)	8.4 (1096)	0.8 (107)	0.5 (67)
Gender									
Male	2.8 (254)	14.6 (1338)	12.1 (1109)	18.1 (1651)	20.7 (1888)	21.8 (1989)	8.7 (792)	0.8 (75)	0.5 (43)
Female	2.8 (109)	16.6 (653)	13.0 (508)	19.7 (771)	18.9 (742)	19.9 (779)	7.8 (304)	0.8 (32)	0.6 (24)
Ethnicity									
American Indian/Alaskan Native	*	*	*	*	*	*	*	*	*
Black or African American	4.2 (71)	16.7 (280)	14.7 (246)	23.9 (401)	19.4 (325)	14.7 (247)	4.9 (83)	*	*
Hispanic	3.2 (44)	15.8 (218)	11.0 (152)	19.0 (261)	18.7 (258)	23.2 (319)	7.6 (104)	*	*
White	2.5 (220)	15.3 (1334)	12.1 (1058)	17.5 (1527)	19.9 (1742)	22.1 (1926)	9.4 (818)	0.8 (67)	0.5 (42)
Multi-Racial	2.0 (20)	11.4 (114)	12.4 (124)	19.7 (197)	24.3 (243)	21.3 (213)	7.3 (73)	*	*
Asian	*	16.5 (41)	14.1 (35)	12.4 (31)	23.7 (59)	21.7 (54)	*	*	*
Native Hawaiian or Other Pacific Islander	*	*	*	*	*	*	*	*	*
EL Status Through Grade 3									
Total	2.7 (326)	15.5 (1865)	12.0 (1448)	18.5 (2232)	20.3 (2440)	21.3 (2563)	8.4 (1014)	0.8 (93)	0.5 (60)
Never EL Status	2.6 (303)	15.3 (1762)	12.0 (1387)	18.6 (2145)	20.3 (2342)	21.4 (2476)	8.5 (987)	0.8 (88)	0.5 (58)
Partial EL Status	*	20.7 (35)	*	17.8 (30)	23.2 (39)	20.7 (35)	*	*	*
Remained EL Status	*	21.0 (68)	16.01 (52)	17.6 (57)	18.2 (59)	16.0 (52)	*	*	*
Economic Disadvantaged Status Through Grade 3									
Total	2.7 (330)	15.4 (1886)	12.1 (1478)	18.6 (2269)	20.2 (2467)	21.3 (2604)	8.5 (1033)	0.8 (94)	0.5 (63)
Never Economic Disadvantaged Status	2.4 (90)	12.6 (479)	13.4 (509)	15.6 (592)	20.3 (770)	23.4 (885)	10.6 (401)	1.2 (45)	*
Partial Economic Disadvantaged Status	3.0 (90)	14.8 (448)	12.4 (376)	17.4 (528)	21.7 (658)	21.0 (636)	8.6 (262)	*	*
Remained Economic Disadvantaged Status	2.8 (150)	17.7 (959)	11.0 (593)	21.3 (1149)	19.2 (1039)	20.0 (1083)	6.8 (370)	0.6 (34)	0.5 (29)

*Counts Too Low to Report

TABLE 21. Early Intervention Dosage in Months Based on Student Groups

	N	Mean	SD	Range
Overall				
Total	13061	24.68	10.13	0.13 - 74.27
Gender				
Male	9139	24.92	10.09	0.13 - 74.27
Female	3922	24.11	10.20	2.43 - 66.53
Ethnicity				
American Indian/Alaskan Native	*	*	*	*
Black or African American	1678	22.75	9.86	1.03 - 68.17
Hispanic	1377	24.60	10.18	3.43 - 71.00
White	8734	25.00	10.20	0.13 - 74.27
Multi-Racial	999	25.30	9.52	0.60 - 63.20
Asian	249	24.25	10.20	4.57 - 44.23
Native Hawaiian or Other Pacific Islander	*	*	*	*
EL Status Through Grade 3				
Never EL Status	11548	24.79	10.10	0.13 - 74.27
Partial EL Status	169	23.81	10.87	2.10 - 71.00
Remained EL Status	324	21.82	10.23	3.77 - 62.23
Economic Disadvantaged Status Through Grade 3				
Never Economic Disadvantaged Status	3788	25.74	10.15	0.93 - 70.30
Partial Economic Disadvantaged Status	3030	24.79	10.11	0.60 - 71.00
Remained Economic Disadvantaged Status	5406	23.94	10.07	0.13 - 74.27

*Counts Too Low to Report

TABLE 22. Average Overall Attendance (%) Based on Student Groups

	N	Mean	SD	Range
Overall				
Total	12995	0.940	0.062	0.000 - 1.000
Gender				
Male	9094	0.941	0.062	0.000 - 1.000
Female	3901	0.938	0.061	0.004 - 1.000
Ethnicity				
American Indian/Alaskan Native	*	*	*	*
Black or African American	1673	0.921	0.073	0.000 - 1.000
Hispanic	1371	0.934	0.060	0.364 - 1.000
White	8682	0.946	0.057	0.004 - 1.000
Multi-Racial	997	0.925	0.067	0.385 - 1.000
Asian	248	0.949	0.073	0.083 - 1.000
Native Hawaiian or Other Pacific Islander	*	*	*	*
EL Status Through Grade 3				
Never EL Status	11535	0.943	0.047	0.471 - 1.000
Partial EL Status	168	0.939	0.062	0.395 - 1.000
Remained EL Status	324	0.945	0.048	0.740 - 0.999
Economic Disadvantaged Status Through Grade 3				
Never Economic Disadvantaged Status	3779	0.960	0.034	0.488 - 1.000
Partial Economic Disadvantaged Status	3018	0.939	0.054	0.083 - 1.000
Remained Economic Disadvantaged Status	5406	0.933	0.051	0.471 - 1.000

*Counts Too Low to Report

TABLE 23. Primary Disability at Early Intervention Based on Student Groups

	Autism	Speech or Language Impairment	Developmental Delay	Hearing and/or Visual Impairment	Other Disability
	% (n)	% (n)	% (n)	% (n)	% (n)
Overall					
Total	7.6 (991)	38.6 (5039)	48.9 (6393)	1.6 (214)	3.2 (424)
Gender					
Male	9.0 (823)	36.6 (3342)	50.1 (4579)	1.3 (123)	3.0 (272)
Female	4.3 (168)	43.3 (1697)	46.3 (1814)	2.3 (91)	3.9 (152)
Ethnicity					
American Indian/Alaskan Native	*	*	*	*	*
Black or African American	5.7 (95)	26.3 (442)	62.9 (1055)	1.3 (22)	3.8 (64)
Hispanic	7.0 (97)	29.5 (406)	60.0 (826)	*	2.6 (36)
White	7.5 (658)	44.0 (3846)	43.4 (3791)	1.8 (161)	3.2 (278)
Multi-Racial	10.6 (106)	26.6 (266)	57.4 (573)	*	4.0 (40)
Asian	13.3 (33)	27.7 (69)	55.4 (138)	*	*
Native Hawaiian or Other Pacific Islander	*	*	*	*	*
EL Status Through Grade 3					
Total	7.4 (891)	39.1 (4703)	48.8 (5872)	1.6 (193)	3.2 (382)
Never EL Status	7.4 (859)	39.6 (4570)	48.1 (5556)	1.7 (191)	3.2 (372)
Partial EL Status	*	27.2 (46)	60.4 (102)	*	*
Remained EL Status	*	26.9 (87)	66.0 (214)	*	*
Economic Disadvantaged Status Through Grade 3					
Total	7.4 (908)	39.0 (4763)	48.8 (5964)	1.6 (196)	3.2 (393)
Never Economic Disadvantaged Status	8.5 (323)	50.6 (1917)	36.1 (1366)	1.9 (72)	2.9 (110)
Partial Economic Disadvantaged Status	8.4 (256)	35.8 (1086)	49.0 (1485)	1.8 (56)	4.9 (147)
Remained Economic Disadvantaged Status	6.1 (329)	32.6 (1760)	57.6 (3113)	1.3 (68)	2.5 (136)

*Counts Too Low to Report

Appendix D

Additional Chi-Square Analyses

TABLE 1. Enrolled in an Additional Early Childhood Program Based on Early Intervention Dosage

		Yes	No
		% (n)	% (n)
Dosage			
	Total	91.9 (12007)	8.1 (1054)
	6 months or less	81.5 (296)	18.5 (67)
	6 months–1 year (6–12 months)	90.9 (1810)	9.1 (181)
	1–1.5 years (13–18 months)	88.4 (1430)	11.6 (187)
	1.5–2 years (19–24 months)	92.3 (2235)	7.7 (187)
	2–2.5 years (25–30 months)	92.9 (2444)	7.1 (186)
	2.5–3 years (31–36 months)	93.7 (2593)	6.3 (175)
	3–3.5 years (37–42 months)	94.4 (1035)	5.6 (61)
	3.5–4 years (43–48 months)	95.3 (102)	*
	more than 4 years (49+ months)	92.5 (62)	*

*Counts Too Low to Report

TABLE 2. Early Intervention Educational Environment Based on Disability Type

		In the Regular Early Childhood Program	In Special Education Class	In Some Other Location
		% (n)	% (n)	% (n)
Overall				
	Total	63.8 (8329)	13.2 (1723)	23.0 (3008)
Disability @ Early Intervention				
	Autism	43.0 (426)	39.5 (391)	17.5% (173)
	Speech or Language	66.1 (3333)	1.6 (81)	32.2 (1625)
	Developmental Delay	67.0 (4282)	17.1 (1093)	15.9 (1018)
	Hearing and/or Visual Impairment	51.4 (110)	14.5 (31)	34.1 (73)
	Other Disability	42.0 (178)	30.0 (127)	28.1 (119)

Appendix E *Chi-Square Analysis Results*

TABLE 1. Retention by or in Grade 3 by Racial and Ethnic Background Based on Early Intervention Dosage

	<i>Dosage</i>	Repeated a Grade Level	Repeated Kindergarten
		% (n)	% (n)
Black or African American	Total	17.2 (270)	9.3 (151)
	6 months or less	*	*
	6 months–1 year (6–12 months)	16.6 (44)	8.0 (22)
	1–1.5 years (13–18 months)	18.6 (41)	*
	1.5–2 years (19–24 months)	12.5 (46)	5.2 (20)
	2–2.5 years (25–30 months)	17.5 (54)	9.2 (29)
	2.5–3 years (31–36 months)	21.1 (49)	15.1 (36)
	3–3.5 years (37–42 months)	26.3 (21)	*
	3.5–4 years (43–48 months)	*	*
	more than 4 years (49+ months)	*	*
Hispanic	Total	9.6 (126)	5.8 (78)
	6 months or less	*	*
	6 months–1 year (6–12 months)	9.5 (20)	*
	1–1.5 years (13–18 months)	*	*
	1.5–2 years (19–24 months)	*	*
	2–2.5 years (25–30 months)	8.6 (21)	*
	2.5–3 years (31–36 months)	10.9 (33)	7.7 (24)
	3–3.5 years (37–42 months)	*	*
	3.5–4 years (43–48 months)	*	*
	more than 4 years (49+ months)	*	*
White	Total	14.9 (1238)	11.3 (957)
	6 months or less	19.5 (40)	15.0 (32)
	6 months–1 year (6–12 months)	13.1 (167)	9.9 (130)
	1–1.5 years (13–18 months)	14.2 (140)	10.9 (111)
	1.5–2 years (19–24 months)	11.3 (164)	8.3 (122)
	2–2.5 years (25–30 months)	17.5 (290)	12.7 (216)
	2.5–3 years (31–36 months)	17.4 (320)	13.3 (249)
	3–3.5 years (37–42 months)	13.2 (102)	10.7 (84)
	3.5–4 years (43–48 months)	*	*
	more than 4 years (49+ months)	*	*
Multi-Racial	Total	15.2 (141)	9.2 (89)
	6 months or less	*	*
	6 months–1 year (6–12 months)	*	*
	1–1.5 years (13–18 months)	*	*
	1.5–2 years (19–24 months)	11.5 (21)	*
	2–2.5 years (25–30 months)	13.0 (29)	*
	2.5–3 years (31–36 months)	18.3 (37)	10.5 (22)
	3–3.5 years (37–42 months)	*	*
	3.5–4 years (43–48 months)	*	*
	more than 4 years (49+ months)	*	*
Asian	Total	*	*
	6 months or less	*	*
	6 months–1 year (6–12 months)	*	*
	1–1.5 years (13–18 months)	*	*
	1.5–2 years (19–24 months)	*	*
	2–2.5 years (25–30 months)	*	*
	2.5–3 years (31–36 months)	*	*
	3–3.5 years (37–42 months)	*	*
	3.5–4 years (43–48 months)	*	*
	more than 4 years (49+ months)	*	*

TABLE 2. Retention by Early Intervention Disability Type Based on Early Intervention Dosage

		Repeated a Grade Level	Repeated Kindergarten
	<i>Dosage</i>	<i>% (n)</i>	<i>% (n)</i>
Autism	Total	16.1 (149)	11.8 (113)
	6 months or less	*	*
	6 months–1 year (6–12 months)	*	*
	1–1.5 years (13–18 months)	*	*
	1.5–2 years (19–24 months)	*	*
	2–2.5 years (25–30 months)	15.1 (33)	10.2 (23)
	2.5–3 years (31–36 months)	19.1 (58)	14.7 (46)
	3–3.5 years (37–42 months)	15.5 (25)	12.8 (21)
	3.5–4 years (43–48 months)	*	*
	more than 4 years (49+ months)	*	*
Speech or Language Impairment	Total	9.6 (461)	6.8 (333)
	6 months or less	*	*
	6 months–1 year (6–12 months)	8.9 (88)	6.6 (67)
	1–1.5 years (13–18 months)	12.1 (84)	7.9 (57)
	1.5–2 years (19–24 months)	7.3 (73)	4.6 (47)
	2–2.5 years (25–30 months)	11.0 (96)	8.1 (72)
	2.5–3 years (31–36 months)	9.9 (79)	7.4 (60)
	3–3.5 years (37–42 months)	*	*
	3.5–4 years (43–48 months)	*	*
	more than 4 years (49+ months)	*	*
Developmental Delay	Total	17.6 (1060)	12.1 (749)
	6 months or less	22.2 (36)	13.8 (23)
	6 months–1 year (6–12 months)	18.4 (151)	11.6 (98)
	1–1.5 years (13–18 months)	16.8 (120)	11.5 (85)
	1.5–2 years (19–24 months)	14.1 (160)	9.1 (107)
	2–2.5 years (25–30 months)	18.8 (239)	12.5 (163)
	2.5–3 years (31–36 months)	19.9 (269)	14.6 (202)
	3–3.5 years (37–42 months)	14.1 (69)	11.4 (57)
	3.5–4 years (43–48 months)	*	*
	more than 4 years (49+ months)	*	*
Hearing and/or Visual Impairment	Total	15.1 (30)	*
	6 months or less	*	*
	6 months–1 year (6–12 months)	*	*
	1–1.5 years (13–18 months)	*	*
	1.5–2 years (19–24 months)	*	*
	2–2.5 years (25–30 months)	*	*
	2.5–3 years (31–36 months)	*	*
	3–3.5 years (37–42 months)	*	*
	3.5–4 years (43–48 months)	*	*
	more than 4 years (49+ months)	*	*
Other Disability	Total	24.7 (98)	20.0 (82)
	6 months or less	*	*
	6 months–1 year (6–12 months)	*	*
	1–1.5 years (13–18 months)	*	*
	1.5–2 years (19–24 months)	*	*
	2–2.5 years (25–30 months)	*	*
	2.5–3 years (31–36 months)	29.2 (31)	22.0 (24)
	3–3.5 years (37–42 months)	29.7 (27)	27.5 (25)
	3.5–4 years (43–48 months)	*	*
	more than 4 years (49+ months)	*	*

*Counts Too Low to Report

Appendix F

Logistic Regression Analysis Result Tables – Special Education Use

For coefficient and direction of effects interpretation, the coding of variables used in logistic regression models is as follows:

- Special Education Services by or in Grade 3 (No=0; Yes=1)
- Dosage (Less than 2 years=0; 2 or more years=1)
- Additional Early Childhood Education Program (No=0; Yes=1)
- Early Intervention in Early Childhood Program (No=0; Yes=1)
- Early Intervention in Special Education Class (No=0; Yes=1)
- Gender (Female=0; Male=1)
- Acquisition of Knowledge ECO Score (B or C=0; D or E=1)
- Social and Emotional Skills ECO Score (B or C=0; D or E=1)
- Use of Appropriate Behaviors ECO Score (B or C=0; D or E=1)
- Autism (No=0; Yes=1)
- Speech or Language Impairment (No=0; Yes=1)
- Developmental Delay (No=0; Yes=1)
- Hearing and/or Visual Impairment (No=0; Yes=1)
- Never Economically Disadvantaged (No=0; Yes=1)
- Partially Economically Disadvantaged (No=0; Yes=1)
- White (No=0; Yes=1)
- Hispanic (No=0; Yes=1)
- Black or African American (No=0; Yes=1)

¹First is reference in logistic regression model

²Last is reference in logistic regression model

*Final Models include all independent variables that were significant when tested individually and remained significant.

TABLE 1. Logistic Regression Analysis of Special Education Use

Individual Independent Variables	β	Se β	Wald's X^2	df	p	Exp(β) Odds Ratio	Model X^2 (p)	n
Dosage ¹	.480	0.44	117.3	1	.0001	1.616	118.740 (.0001)	12613
Additional Early Childhood Education Program ¹	.242	.077	9.9	1	.002	1.273	9.577 (.002)	12613
Early Intervention in Early Childhood Program ²	5.21	.048	115.7	1	.0001	1.684	121.209 (.0001)	12612
Early Intervention in Special Education Class ¹	1.568	.106	218.6	1	.0001	4.798	329.842 (.0001)	12612
Student Gender ¹ (female as reference)	.242	.047	26.7	1	.0001	1.273	26.333 (.0001)	12613
Acquisition of Knowledge ECO Score ²	1.473	0.74	399.2	1	.0001	4.360	514.814 (.0001)	9386
Social and Emotional Skills ECO Score ²	1.179	0.70	281.8	1	.0001	3.251	340.094 (.0001)	9365
Use of Appropriate Behaviors ECO Score ²	1.190	.073	265.4	1	.0001	3.287	325.085 (.0001)	9358
Disability Type – Autism ¹	1.938	.167	134.7	1	.0001	6.946	244.169 (.0001)	12613
Disability Type – Speech/Language Impairment ¹	.379	.044	73.3	1	.0001	1.461	72.716 (.0001)	12613
Disability Type – Developmental Delay ²	.110	.044	6.3	1	.012	1.116	6.283 (.012)	12613
Disability Type – Hearing/Visual Impairment ¹	1.678	.325	26.7	1	.0001	5.354	45.009 (.0001)	12613
Never Economically Disadvantaged Status ²	.220	.047	22.3	1	.0001	1.246	21.997 (.0001)	12179
Partially Economically Disadvantaged Status ¹	.187	.053	12.6	1	.0001	1.206	12.848 (.0001)	12179
Race/Ethnicity – White ¹	.264	.046	33.5	1	.0001	1.303	33.083 (.0001)	12613
Race/Ethnicity – Hispanic ²	.237	.068	12.2	1	.0001	1.267	11.807 (.001)	12613
Race/Ethnicity – Black or African American ²	.281	.062	20.3	1	.0001	1.324	19.625 (.0001)	12613
Final Model 1a*							832.976 (.0001)	9385
Constant	.344	.067	26.3	1	.0001	1.410		
Acquisition of Knowledge ECO Score ²	1.362	.076	324.4	1	.0001	3.904		
Dosage ¹	0.308	.056	30.7	1	.0001	1.360		
Disability Type – Autism ¹	1.343	.199	45.6	1	.0001	3.830		
Early Intervention in Special Education Class ¹	1.089	.130	70.4	1	.0001	2.972		
Student Gender ¹ (female as reference)	0.230	.058	15.8	1	.0001	1.259		
Race/Ethnicity – White ¹	.469	.059	64.3	1	.0001	1.599		
Final Model 1b*							789.178 (.0001)	9385
Constant	.337	.067	25.5	1	.0001	1.401		
Acquisition of Knowledge ECO Score ²	1.394	.075	340.7	1	.0001	4.029		
Dosage ¹	.328	.055	35.1	1	.0001	1.389		
Disability Type – Autism ¹	1.407	.368	14.6	1	.0001	4.083		
Early Intervention in Special Education Class ¹	1.188	.129	84.6	1	.0001	3.279		
Student Gender ¹ (female as reference)	.266	.058	21.1	1	.0001	1.305		
Race/Ethnicity – White ¹	0.463	.058	62.7	1	.0001	1.588		

TABLE 2. Logistic Regression Analysis of Special Education Use Continued

Individual Independent Variables	β	Se β	Wald's X^2	df	p	Exp(β) Odds Ratio	Model X^2 (p)	n
Final Model 2a*							632.548 (.0001)	9364
Constant	.487	.066	54.6	1	.0001	1.627		
Acquisition of Knowledge ECO Score ²	.985	.073	183.6	1	.0001	2.679		
Dosage ¹	.299	.055	29.3	1	.0001	1.348		
Disability Type – Autism ¹	1.166	.196	35.4	1	.0001	3.209		
Early Intervention in Special Education Class ¹	1.139	.129	77.6	1	.0001	3.124		
Student Gender ¹ (female as reference)	.211	.057	13.5	1	.0001	1.235		
Race/Ethnicity – White ¹	.428	.058	54.7	1	.0001	1.535		
Final Model 2b*							607.150 (.0001)	9364
Constant	.473	.066	51.6	1	.0001	1.604		
Acquisition of Knowledge ECO Score ²	1.049	.072	210.2	1	.0001	2.856		
Dosage ¹	.314	.055	32.4	1	.0001	1.368		
Disability Type – Autism ¹	1.500	.391	14.7	1	.0001	4.481		
Early Intervention in Special Education Class ¹	1.217	.129	89.3	1	.0001	3.378		
Student Gender ¹ (female as reference)	.240	.057	17.5	1	.0001	1.272		
Race/Ethnicity – White ¹	.424	.058	53.8	1	.0001	1.528		
Final Model 3a*							621.398 (.0001)	9357
Constant	.514	.065	61.7	1	.0001	1.672		
Acquisition of Knowledge ECO Score ²	.985	.076	170.2	1	.0001	2.679		
Dosage ¹	.290	.055	27.7	1	.0001	1.336		
Disability Type – Autism ¹	1.253	.199	39.8	1	.0001	3.501		
Early Intervention in Special Education Class ¹	1.129	.128	77.2	1	.0001	3.092		
Student Gender ¹ (female as reference)	.206	.057	12.9	1	.0001	1.228		
Race/Ethnicity – White ¹	.422	.058	53.4	1	.0001	1.525		
Final Model 3b*							588.158 (.0001)	9357
Constant	.505	.065	59.8	1	.0001	1.657		
Acquisition of Knowledge ECO Score ²	1.047	.075	193.6	1	.0001	2.849		
Dosage ¹	.306	.055	30.9	1	.0001	1.358		
Disability Type – Autism ¹	1.490	.391	14.5	1	.0001	4.436		
Early Intervention in Special Education Class ¹	1.217	.128	90.4	1	.0001	3.376		
Student Gender ¹ (female as reference)	.234	.057	16.7	1	.0001	1.264		
Race/Ethnicity – White ¹	.416	.058	52.7	1	.0001	1.516		

Logistic Regression Analysis Result Tables – Retention

For coefficient and direction of effects interpretation, the coding of variables in logistic regression models is as follows:

- Retention (Retained=0; Not Retained=1)
- Dosage (Less than 2 years=0; 2 or more years=1)
- Acquisition of Knowledge ECO Score (B or C=0; D or E=1)
- Social and Emotional Skills ECO Score (B or C=0; D or E=1)
- Use of Appropriate Behaviors ECO Score (B or C=0; D or E=1)
- Developmental Delay (No=0; Yes=1)
- Early Intervention in Early Childhood Program (No=0; Yes=1)
- Early Intervention in Special Education Class (No=0; Yes=1)
- Full or Half-Day of Kindergarten (Half=0; Full=1)
- Never Economically Disadvantaged (No=0; Yes=1)
- Partially Economically Disadvantaged (No=0; Yes=1)
- Remained Economically Disadvantaged (No=0; Yes=1)
- Black or African American (No=0; Yes=1)
- Hispanic (No=0; Yes=1)
- Never EL Status (No=0; Yes=1)
- Remained EL Status (No=0; Yes=1)

¹First is reference in logistic regression model

²Last is reference in logistic regression model

*Final Models include all independent variables that were significant when tested individually and remained significant.

TABLE 3. Logistic Regression Analysis of Retention through Grade 3 – Outcome is Not Retained by or in Grade 3

Individual Independent Variables	β	Se β	Wald's X^2	df	p	Exp(β) Odds Ratio	Model X^2 (p)	n
Dosage ²	.264	.051	26.4	1	.0001	1.302	26.548 (.0001)	12341
Acquisition of Knowledge ECO Score ¹	.572	.059	95.6	1	.002	1.772	94.001 (.0001)	9168
Social and Emotional Skills ECO Score ¹	.462	.059	60.7	1	.0001	1.587	59.391 (.0001)	9150
Use of Appropriate Behaviors ECO Score ¹	.424	.060	49.3	1	.0001	1.528	48.070 (.0001)	9143
Disability Type – Developmental Delay ²	.476	.052	84.5	1	.0001	1.609	85.811 (.0001)	12341
Early Intervention in Early Childhood Program ¹	.243	.052	21.7	1	.0001	1.275	21.460 (.0001)	12340
Early Intervention in Special Education Class ²	.482	.068	50.9	1	.0001	1.620	47.607 (.0001)	12340
Full or Half Day of Kindergarten ¹	.231	.058	15.8	1	.0001	1.260	15.377 (.0001)	12341
Never Economically Disadvantaged ¹	.325	.060	28.9	1	.0001	1.384	30.002 (.0001)	12103
Remained Economically Disadvantaged ¹	.281	.054	26.7	1	.0001	1.324	27.017 (.0001)	12103
Race/Ethnicity – Black or African American ²	.232	.072	10.3	1	.0001	1.261	9.882 (.002)	12341
Race/Ethnicity- Hispanic ¹	.519	.097	28.4	1	.0001	1.680	31.919 (.0001)	12341
Never EL Status ²	.371	.157	5.6	1	.018	1.449	6.096 (.014)	12025
Remained EL Status ¹	.910	.238	14.6	1	.000	2.483	19.045 (.0001)	11872
Final Model 1*							243.857 (.0001)	8826
Constant	.639	.085	56.0	1	.0001	1.894		
Acquisition of Knowledge ECO Score ¹	.544	.065	71.2	1	.0001	1.724		
Dosage ²	.203	.063	10.4	1	.001	1.225		
Disability Type- Developmental Delay ²	.368	.064	33.0	1	.0001	1.445		
Full or Half Day of Kindergarten ¹	.568	.073	61.1	1	.0001	1.764		
Never Economically Disadvantaged ¹	.265	.074	12.8		.0001	1.304		
Race/Ethnicity – Hispanic ¹	.852	.145	34.5	1	.0001	2.344		
Remained EL Status ¹	.687	.311	4.9	1	.027	1.987		
Final Model 2*							205.947 (.0001)	8807
Constant	.747	.085	77.0	1	.0001	2.110		
Acquisition of Knowledge ECO Score ¹	.365	.066	30.4	1	.0001	1.440		
Dosage ²	.216	.063	11.7	1	.001	1.241		
Disability Type – Developmental Delay ²	.357	.065	30.1	1	.0001	1.428		
Full or Half Day of Kindergarten ¹	.544	.072	56.6	1	.0001	1.724		
Never Economically Disadvantaged ¹	.294	.074	16.0	1	.0001	1.342		
Race/Ethnicity – Hispanic ¹	.866	.146	35.0	1	.0001	2.378		
Remained EL Status ¹	.681	.322	4.5	1	.034	1.976		
Final Model 3*							197.644 (.0001)	8799
Constant	.753	.087	75.4	1	.0001	2.124		
Acquisition of Knowledge ECO Score ¹	.336	.067	24.9	1	.0001	1.400		
Dosage ²	.210	.063	11.0	1	.001	1.234		
Disability Type – Developmental Delay ²	.368	.065	32.1	1	.0001	1.444		
Full or Half Day of Kindergarten ¹	.550	.073	57.4	1	.0001	1.733		
Never Economically Disadvantaged ¹	.301	.074	16.6	1	.0001	1.351		
Race/Ethnicity – Hispanic ¹	.832	.145	32.7	1	.0001	2.297		
Remained EL Status ¹	.695	.322	4.7	1	.031	2.004		

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