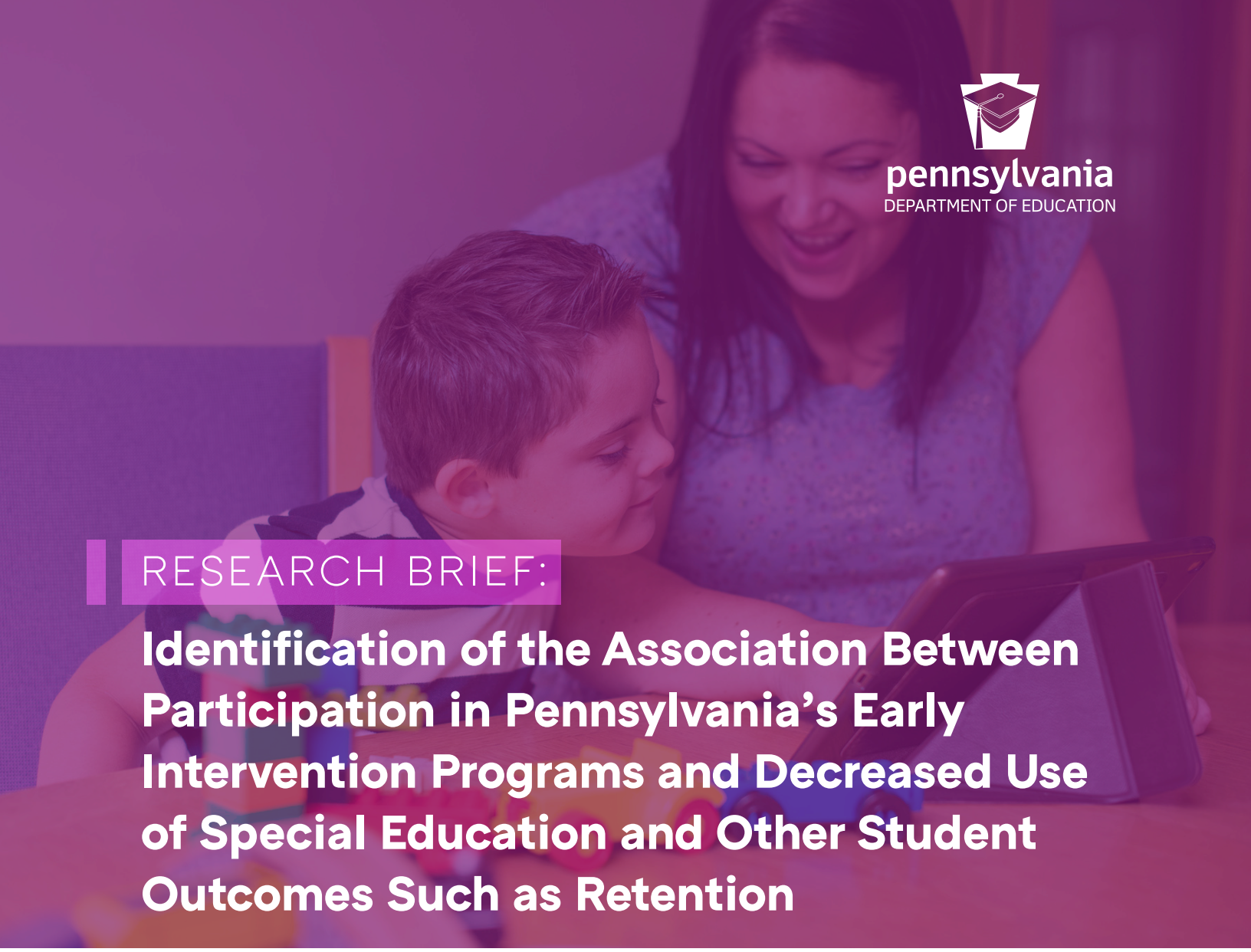

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RESEARCH BRIEF:

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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Research and Evaluation

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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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Research and Evaluation

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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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"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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KEY FINDINGS:

Special Education Use

- Of the Kindergarten Cohort made up of PA students who had previously received Early Intervention services, the majority (79.2%) received special education services by or in Grade 3.
- Of students who received Early Intervention but were not initially receiving special education services at Kindergarten entry, 49.0% began receiving services by or in Grade 3.
- Of students who received Early Intervention and began receiving special education services at Kindergarten entry, 77.1% continued with services through Grade 3.
- Overall, almost half (42.2%) of the cohort received four years of special education services, from Kindergarten through Grade 3.
- 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.
- 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 rates of exiting by or in Grade 3, compared to other students.
- Students who spent two or more years in the Early Intervention program had significantly higher rates of spending four years in special education services.
- 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 versus a regular early childhood classroom or other location.
- There was not a significant effect of participation in an additional early childhood program for decreased rates of retention, and for special education use through Grade 3, the effect was no longer significant when controlling for other significant explanatory variables.
- Dosage remained significant when included in a model with other variables, showing that students with two or more years of dosage had 1.34 to 1.39 times greater odds, or over a 34% increase in odds, of receiving special education services by or in Grade 3.
- 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).
- Additionally, the odds were 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).
- The majority of students identified as having Autism, a hearing and/or visual impairment, or "other disabilities" had higher levels of Early Intervention dosage (two or more years) and the odds of a student going on to receive special education services through Grade 3 were three to four times higher if a student was identified with Autism or a hearing and/or visual impairment.

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KEY FINDINGS:

Retention

- The majority (85.4%) of the PA Kindergarten Cohort were never retained through Grade 3.
- Of those who did repeat a grade level, the majority (74.4%) had repeated Kindergarten.
- Students were more likely to repeat Kindergarten, compared to Grades 1 through 3, regardless of disability type.
- Considering disability type, students with a disability type other than a developmental delay had higher odds (40% increase) of never being retained through Grade 3.
- The majority of students who repeated any grade level by or in Grade 3 had a developmental delay or a speech or language impairment, while only a small percentage had Autism or "other disabilities."
- Logistic regression analysis showed a significant effect of attending Full-Day Kindergarten for the cohort, such that children who received Early Intervention services then attended 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 and other explanatory variables.
- 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).
- The odds of a student never being retained through Grade 3 are 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 received less than two years having 1.2 times greater odds, or 20% increase in odds, of never being retained.

Literature Review

The cognitive, social, and academic skills developed by children in early childhood education programs build a strong foundation for future learning. The positive effects of participation in such programs are found to be 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), increased rates of high school graduation (McCoy et al., 2017), higher educational attainment and rates of employment (Campbell et al., 2002; Schweinhart et al., 2005; The Frank Porter Graham Child Development Institute, 2012), and greater long-term health and wealth outcomes (The National Early Childhood Technical Assistance Center, 2011; Reynolds et al., 2011). Specifically, the benefits of high-quality Early Intervention programs for children with developmental delays and disabilities 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).

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.

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). While there is not one standard measurement of "dosage" (Wasik, Lloyd, & Boller, 2013), 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).

Since the establishment of the Individuals with Disabilities Education Act (IDEA) in 1975, the number of students receiving special education services has rapidly increased (The Condition of Education, 2019) and the demographics of the overall student population have become more diverse over time (Status and Trends in the Education of Racial and Ethnic Groups, 2019). Such drastic changes in the student population have rapidly changed the demographic makeup of special education. Consequently, disproportionate representation within special education is an issue that researchers have monitored, analyzed, and argued for decades. 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 & Lesaux, 2009; Fernandez & Inserra, 2013) differences among student groups.

Consequently, disproportionate representation within special education is an issue that researchers have monitored, analyzed, and argued for decades.

Project Overview and Objectives

The goal of this project was to utilize existing data available on PA'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. Using a range of analytic methods that included descriptive statistics, Chi-Square (Pearson) and Logistic Regression, this research 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 Statewide Longitudinal Data System for future research

These objectives reflect the questions related to Early Childhood Education from the **PDE Research Agenda**. Through discussion with representatives of the Office of Child Development and Early Learning (OCDEL) and The Bureau of Early Intervention Services, it was decided to alter the original set of questions to be specific to Early Intervention programs. Therefore, the questions addressed in this study are:

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?

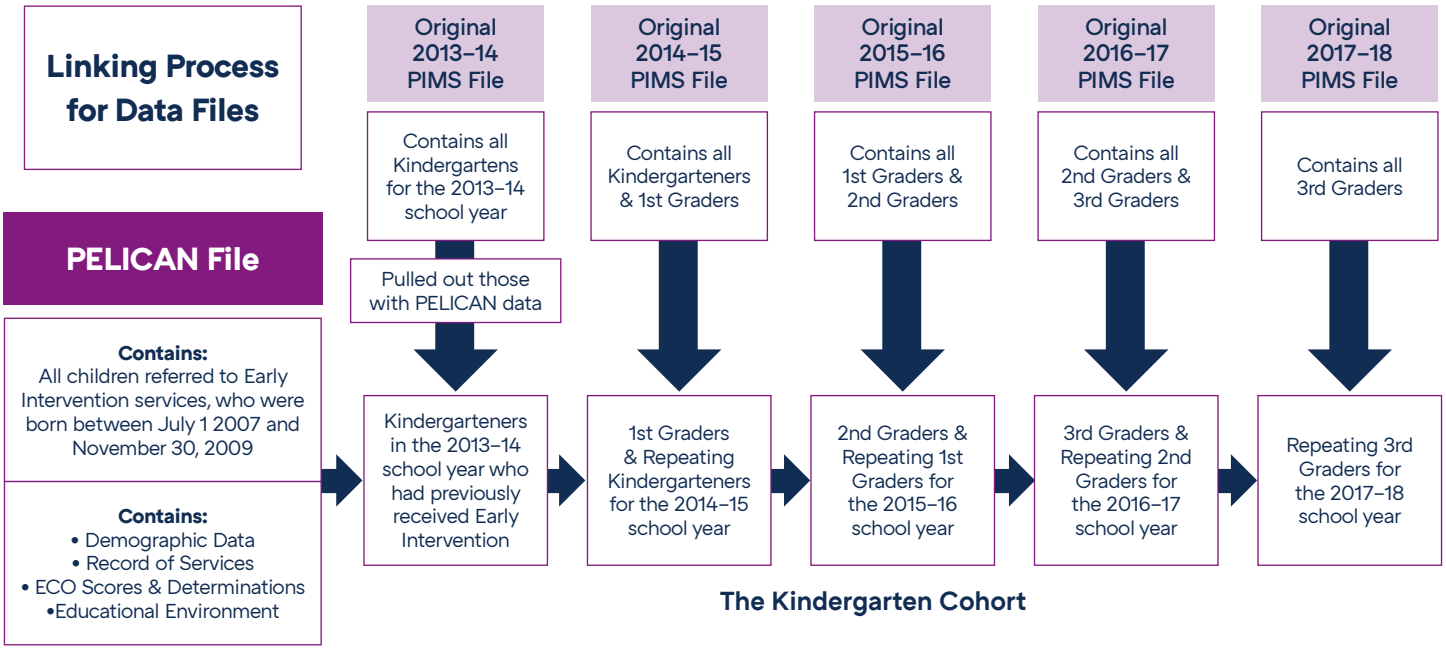
Additional Sub Questions of Interest:

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?

Methodology and Sample

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. PELICAN contains data for all of PA's early learning programs and services. PIMS is a statewide, longitudinal data system that houses student, staff, and school-level data for Kindergarten through Grade 12. Student data from these two data systems were linked by PA Secure ID. Figure 1 illustrates the process of merging student files together to create a multi-year, longitudinal data file for analysis.

FIGURE 1. Linking Process for Data Files



The sample for this study included 13,061 Kindergarten students in PA during the 2013-14 school year who had received Early Intervention services at some point before their entrance into Kindergarten. Table 1 provides the demographic breakdown of the students included in this study. This Kindergarten cohort was tracked backwards to their Early Intervention information, using PELICAN data, then tracked forward from Kindergarten to Grade 3 using PIMS data.

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*

Previous studies have found 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. It should be noted that in this study individual levels of service (i.e. the type, frequency, or intensity of services) were not measured and may vary widely. A list of additional operational definitions can be found in Appendix A.

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.

Discussion of Results

Does Early Intervention Dosage Affect Student Outcomes?

Initial analysis of the effect of dosage included chi-square analysis to investigate whether a relationship exists, followed by logistic regression analysis to examine the effects of dosage in the context of models that included other significant explanatory variables. Initial 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. Figure 2 shows that students at lower levels of dosage (less than six months up to two years) had lower rates of going on to receive special education services, as well as having higher rates of exiting services by Grade 3. Conversely, students who received higher levels of Early Intervention dosage (two to four or more 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.

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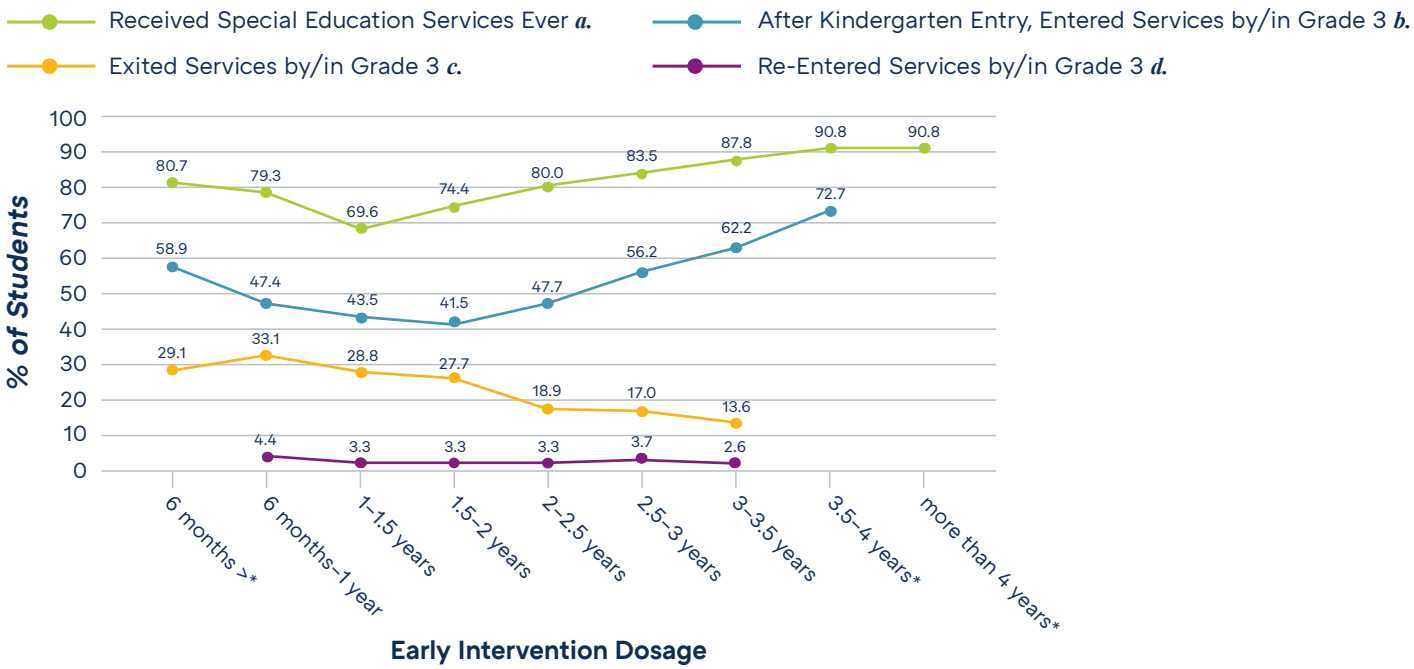
FIGURE 2. Special Education Use Based on Early Intervention Dosage



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

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. In addition to the student and program level characteristics examined, Early Childhood Outcome (ECO) scores were also available and included in the logistic regression analysis. ECO scores measure the gains and improvements made by children with developmental delays and disabilities in Early Intervention. ECO score determinations made at exit from the Early Intervention program were used for this analysis. ECO scores range from "(A) Did Not Improve Functioning," to "(E) Maintained Functioning at a Level Comparable to Same-Aged Peers," with each letter score 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 measure the gains and improvements made by children with developmental delays and disabilities in Early Intervention.

Logistic regression analysis results indicated a statistically significant association between dosage, ECO scores, and both outcomes, special education use through Grade 3 and decreased rates of retention. Analysis showed that when controlling for other explanatory variables, more than two years of dosage is associated with a 34% to 39% increase in odds of special education use through Grade 3. Conversely, less than two years of dosage is associated with a 20% increase in odds of not being retained through Grade 3. Although dosage remained significant when included in a model with other variables, the effect of Early ECO scores was 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." Additionally, the effect is greater for special education use through Grade 3 than it is for retention. These findings indicate that there is a statistically significant effect of dosage and ECO scores for students in this Kindergarten cohort, even after controlling for other significant explanatory variables.

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

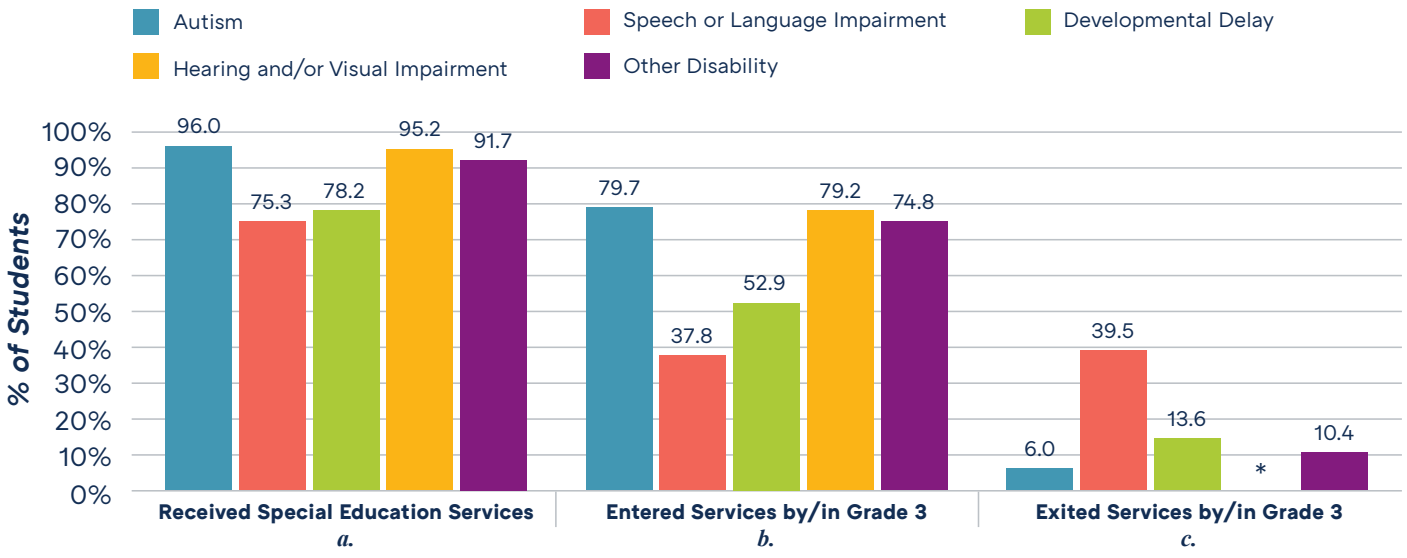
Initially, the finding that receiving higher levels of dosage is associated with a higher likelihood of a student going on to receive special education services may seem counterintuitive and conflicting with the findings of previous studies. However, further

analysis revealed several supplemental findings. First, descriptive analysis showed that students identified with Autism, a hearing and/or visual impairment, or "other disabilities" had high rates of receiving two or more years of Early Intervention dosage. Second, Figure 3 illustrates that students identified with these disability types had significantly higher rates of receiving special education services through Grade 3 compared to students with other disability types. The difference in proportions among each outcome was significant, and for both entering and exiting special education services the effect was moderate (ϕ = .215 and, ϕ = .324).

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.

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.

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

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 educational environment. However, the relationship does vary based on disability type. A significantly higher percentage of students identified with Autism or with a hearing and/or visual impairment received 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.

A significantly higher percentage of students identified with Autism or with a hearing and/or visual impairment received special education services by or in Grade 3, compared to other disability types.

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 in PA, 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

Only a small percentage of the entire cohort (14.6%) repeated any grade level by or in Grade 3. Additional analysis of this subgroup of students who had repeated a grade level found that of the 1,740 students who had repeated, the majority (74.4%) had repeated Kindergarten, 14.3% had repeated Grade 1, 7.7% had repeated Grade 2, and only 3.7% had repeated Grade 3. As Figure 4 shows, the majority of students who repeated a grade level had a developmental delay (59.0%). Logistic regression analysis showed that students with a disability type other than a developmental delay had higher odds (over 40% increase in odds) of never being retained through Grade 3. Interestingly, as Figure 5 shows, students were more likely to repeat Kindergarten, compared to Grades 1 through 3, regardless of disability type.

As Figure 4 shows, the majority of students who repeated a grade level had a developmental delay (59.0%).

FIGURE 4. Percentage of Students Repeating a Grade Level Based on Early Intervention Disability Type

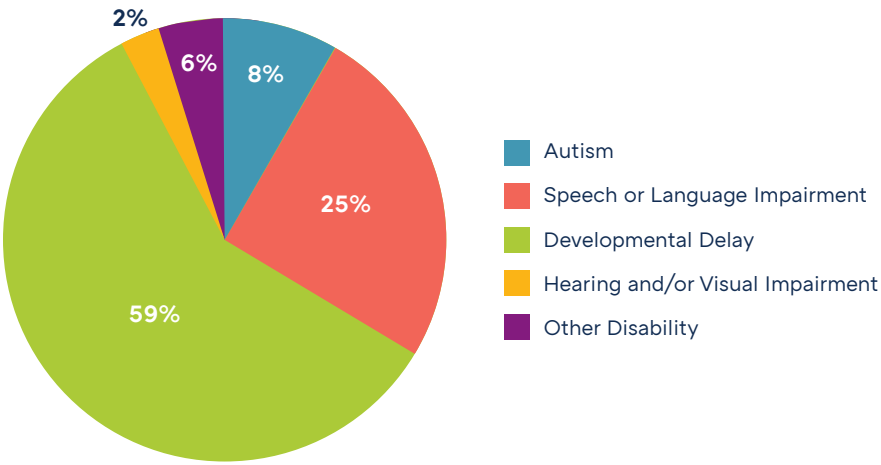
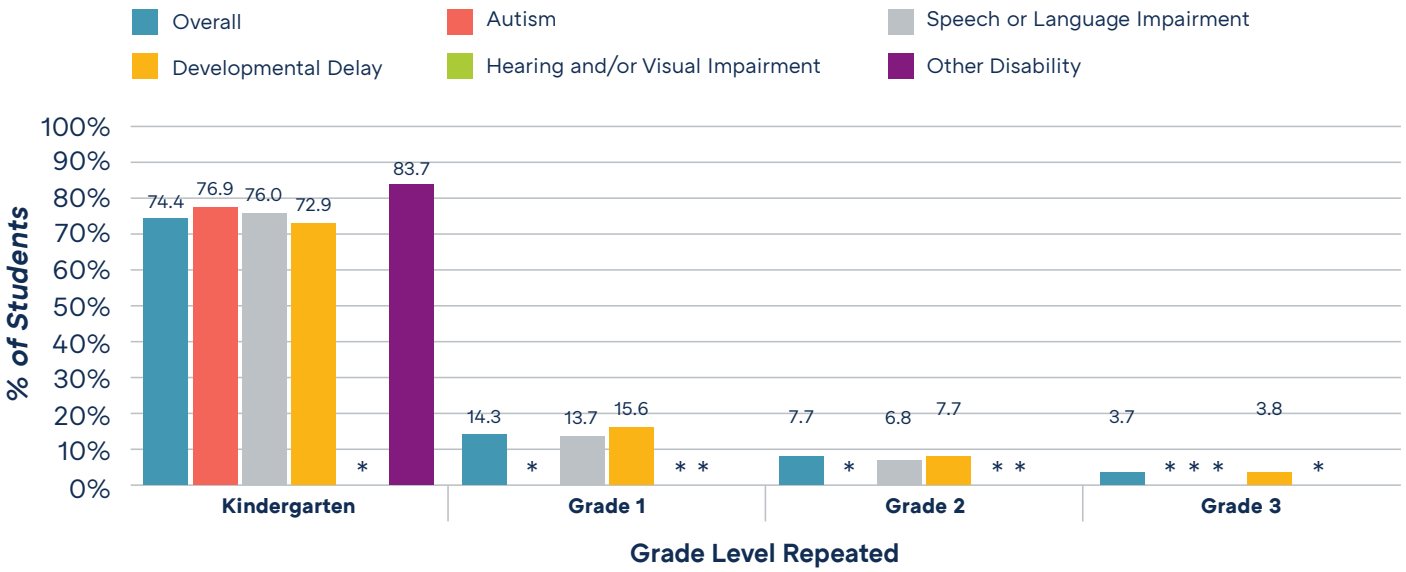


FIGURE 5. Grade Level Repeated Based on Disability Type



**Counts Too Low to Report*

The primary analyses throughout this study also highlighted some interesting between group differences which build slightly on the findings of previous research:

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, (Young et al., 2010; Churchill, 2013).

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.

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.

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.

The initial chi-square analysis showed that students who were never Economic Disadvantaged Status had lower rates of ever receiving services and higher rates of exiting services compared to those who were partial or remained Economic Disadvantaged Status, regardless of dosage. While such findings are comparable to others that found disproportionality in special education placement among low socio-economic status students (Blair and 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.

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 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.

For this cohort, children who received Early Intervention services then attended 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 and other explanatory variables.

Lastly, logistic regression analysis showed a significant effect of attending a Full-Day Kindergarten. For this cohort, children who received Early Intervention services then attended 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 and other explanatory variables. 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 & Offenberg, 2002), however, others argue that long-term benefits beyond that are minimal (Cannon, Jacknowitz, & 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.

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. Initial analyses indicated that a slightly higher percentage of students who participated in an additional program received special education services by or in Grade 3 (79.5% versus 75.3%) or repeated a grade level (14.8% versus 12.4%), compared to students who did not participate. Logistic regression analysis showed that there was not a significant effect of participation in an additional early childhood program for decreased rates of retention and that 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 simultaneously.

Overall, 91.9% of the cohort was enrolled in an early childhood or special education class while in the Early Intervention program.

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.

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, 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 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.

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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.

Appendix A

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 Heath 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"**.

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