Low Birth Weight, Preschool Education, and School Remediation

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Abstract

Studies have documented a strong relationship between low birth weight status and adverse child outcomes such as poor school performance and need for special education services. Following a cohort of over 1,300 low-income and predominately African American children in the Chicago Longitudinal Study we investigated whether birth weight and family socio-economic risk measured at the time of the child's birth predicts placement into special education classes or grade retention in elementary school. Contrary to previous research, we found that low birth weight (< 5 ½ pounds) does not predict special education placement. Rather, these children (especially boys) were more likely to be retained in grade as an alternative approach to addressing poor school performance. Family socio-economic risk at birth was a significant predictor of the need for remedial services. We also assessed whether a high-quality preschool program offered at ages 3 and 4 can reduce the negative effects of low family SES and birth weight on the need for special education and grade retention. Preschool participation in the Child-Parent Centers was found to reduce the likelihood of school remediation. The effects of preschool were greater for children from families with higher levels of socio-economic disadvantage. The beneficial effects of preschool on special education placement were also larger for boys than girls.

Introduction

Many studies have documented a strong relationship between low birth weight status and adverse child outcomes, including poor school performance, behavioral problems, and need for special education services (e.g., Reichman, 2005; Roth, Figlio, Chen, Ariet, Carter, Resnick et al., 2004; Pinto-Martin, Whitaker, Feldman, Cnaan, Zhao, Rosen-Bloch et al., 2004; Avchen, Scott & Mason, 2001; Andrews, Goldberg, Wellen, Pittman & Struening, 1995; and Chaikind & Cormon, 1991). Low birth weight generally is defined as below 2,500 grams, which is approximately 5 and a half pounds. Because of medical advances, children increasingly are surviving at very low (below 1,500 grams or 3.25 pounds) or even extremely low (1,000 grams) birth weights. To the extent that low birth weight is preventable or its negative consequences reduced, improvements in health care during pregnancy and interventions during the early years of life can be expected to enhance the well-being of children while reducing the costs to taxpayers of school remediation services. Recent studies by economists have found that the effects of low birth weight on health and earnings persist into adulthood (Currie and Hyson, 1999; Behrman and Rosenzweig, 2004).

Although the later risks to child development associated with low birth weight are well-known, relatively few prospective studies have been conducted to assess its unique contributions into adolescence. Within the population of urban minority children, low birth weight status is only one of many risk factors associated with lower odds of educational success. The contribution of low birth weight relative to or in addition to other risks is not well documented. For example, low parent education, single-parent family status, and poverty also are risk factors associated with lower school performance and general well-being.

In this research, we combine the strands of the research literature on the effects of low birth-weight and other risk factors on school success with the current policy focus on early educational intervention offered through high-quality preschool. Recent research documents a strong positive relationship between participation in preschool education and school performance for children from low-income families (e.g., Heckman and Masterov, 2007; Kilburn and Karoly, 2008; Temple & Reynolds, 2007). We examine the role of enriched preschool programs offered to low-income families in mediating the negative consequences of low birth weight and other risk factors. Using a longitudinal sample of over 1,500 children from Chicago's poorest

neighborhoods, we investigate the effects of an enriched preschool program on the reduced need for school remediation services for children at risk of school failure due to both family poverty and low birth weight.

Interventions for low birth weight children

Preschool programs have been shown to be effective in reducing the need for school remediation (Barnett & Boocock, 1998; Karoly, Kilburn, Bigelow, Caulkins, & Cannon, 2001). By promoting school readiness skills such as language and social adjustment, good quality preschool programs can help students avoid the need for remediation services and can lead to greater educational success, including higher educational attainment. Although low birth weight has been linked to later adjustment problems, the extent to which the effects of low birth weight can be moderated by early childhood intervention is an open question. Previous studies have shown that the prenatal nutrition program WIC (e.g., Bitler & Currie, 2005; Ludwig & Miller, 2005) and the Nurse Family Partnership program (Olds, Robinson, Pettitt, Luckey, Holmberg, Ng et al., 2004) can reduce the rate of low birth weight births. A series of papers on the Infant Health and Development Program (including McCormick, Brooks-Gunn, Buka, Goldman, Yu, Salganik et al. 2006; McCarton, Brooks-Gunn, Wallace, Bauer, Bennett, Bernbaum et al. 1997; McCarton, Wallace & Bennett, 1996; Brooks-Gunn, Gross, Kraemer, Spiker & Shapiro, 1992) demonstrate that an intervention spanning the years between birth and age 3 can enhance outcomes for low birth weight children. While these studies have focused on prenatal and relatively early childhood interventions, the possibility that participation in high quality preschool education at age 3 or 4 can reduce the risk of academic difficulties has not been investigated specifically for low birth weight children.

School remediation services or practices

Interventions to reduce the risk of academic problems for low birth weight children may provide private benefits to the children in terms of their higher lifetime earnings arising from greater educational success. Importantly, society benefits from reductions in school remediation costs through higher tax revenues and through the lower crime costs resulting from enhanced educational success. The current paper focuses on the relationship between low birth weight and school remediation for learning difficulties in K-12 education. The school remediation programs or practices considered here include special education placement and

grade retention.

In the U.S. in 2007, roughly 6.7 million children received federally-funded special education services, representing 13.7% of all children aged 3-21 (U.S. Department of Education, 2009). Although these numbers have fallen somewhat since their peak in 2005, since the introduction of the Individuals with Disabilities Act (IDEA) in 1975 they had increased steadily for three decades. Researchers have estimated that the ratio of expenditures per child in special education relative to expenditures on students who are not in special education has averaged approximately 2 to 1 over the time period of 1968-2000 (Parrish, Harr, Wolman, Anthony, Merickel & Esra, 2004). A recent report estimates that the cost of educating the typical student who is not in special education was $6,556 per year in 2002 while the total expenditures on the typical student receiving special education was $12,525 (Chambers, Shkolnik, & Perez, 2003). More recent figures reported by the National Education Association suggest that the average cost for special education versus regular education is even greater than 2 to 1 (NEA, 2009). The four largest categories for special education services in terms of enrollment are specific learning disability, speech or language impairments, mental retardation, and emotional disturbance, with the specific learning disability category growing the fastest.

Concern about the disproportional placement of African-Americans in special education (especially boys) has been the subject of numerous studies for several decades at least. Disagreement exists among researchers about the role of poverty as a key predictor of special education placement. The importance of poverty and other related risk factors predicting low school performance and subsequent special education enrollment for minorities was emphasized in the National Research Council Report edited by Donovan and Cross (2002). Other discussions of the overpresentation of minorities in special education suggest that inequitable schooling resources and a lack of understanding about educational differences by educators and administrators are responsible for the disproportionality. Some relevant discussions within this sizeable literature can be found in O'Connor and Fernandez (2006), Losen and Orfield (2002) and Russo and Talbert-Johnson (1997).

Grade retention is an education practice in which children repeat a grade for not meeting minimum promotion requirements. In 2007, information from parent surveys suggested that 9.8 % of children in kindergarten through eighth grade had been retained (U.S. Department of Education, 2009) Hauser, Pager & Simmons (2004) examined grade retention data from other

national sources and concluded that at least 15% of students aged 15-17 had been retained Hauser, Frederick & Andrews (2007) and Frederick and Hauser (2008) report increasing rates of grade retention over time. Although retention may add one year to children's schooling, its largest cost may arise from the relationship between grade retention and later school dropout (Walberg, Reynolds, &Wang, 2004). Like special education placement, the likelihood of grade retention also depends on family economic status and race. Statistics from the U.S. Department of Education (2009) indicate that while nationally almost 14% of students are in special education and 10% have been retained, rates of special education and retention are nearly double for minority and/or low-income students.

Research questions addressed in current research

One of the few studies of a large-scale program that has assessed the long-term outcomes of preschool education is the Chicago Longitudinal Study (CLS), which investigates the effects of the Child-Parent Center (CPC) Program for over 1,500 children born in 1979 or 1980. Beginning in preschool, the program provides comprehensive services and has been administered through the public school system since 1967. The CLS uses a matched experimental study design in which students in 20 kindergarten sites associated with the CPC preschool program are compared to a control group of children in similar kindergarten sites that did not offer the CPC program. The CLS is considered to have a strong experimental design by many educational researchers including Levin, Belfield, Muennig and Rouse (2007). Details of the equivalence of preschool and control groups can be found in Temple and Reynolds (2007). Previous reports in the CLS indicate that preschool participation is associated with lower rates of special education placement and grade retention and with fewer years in special education (Reynolds, Temple, Robertson & Mann, 2001; Conyers, Reynolds & Ou, 2003; Reynolds and Wolfe, 1999) Ongoing research projects using the Chicago Longitudinal Study examine how preschool is associated with the reduced need for remediation in elementary school and how preschool contributes to lasting effects in adulthood on rates of school completion and reductions in crime.

In this report, we assessed links between low birth weight status and later remedial education as well as the contribution of participation in the preschool program offered through the Chicago Child-Parent Centers to these links. Two questions are addressed:

(1) Is low birth weight status associated with school remedial education services through the elementary years of schooling (through 8th grade)?

(2) Does preschool participation in the Child-Parent Centers moderate the effects of low birth weight and related risks on the need for school remediation?

Methods

Sample

The Chicago Longitudinal Study (CLS) follows a single-aged cohort of students who graduated from public kindergartens in 1985-86 in low-income neighborhoods. All children participated in a federally-funded Title 1 educational intervention provided through the Chicago Public School for schools characterized by high poverty rates. The original CLS sample consists of 1,539 students, of which 989 attended the Child-Parent Preschool Program. A large proportion of the sample has been followed into adulthood. Reynolds, Temple, Ou, Robertson, Mersky, Topitzes et al. (2007) report educational attainment or employment status by age 24 for 90% of the original sample. Data exist on the special education placement histories for 1,377 students from administrative records of the Chicago Public School system. Students whose special education histories are not known are those who left the school district to attend another public school system or to attend private schools. Differences in the characteristics between those who stayed in Chicago public schools and those who left have been investigated in previous studies (e.g., Reynolds et al. 2001) and the findings fail to identify any notable differences.

Our data from birth records were obtained in 2002 from the Illinois Department of Public Health for students who could be matched on name and birth date for the birth years of 1979 and 1980. These records contained parental background information (e.g., parental education, marital status), birth weight and prior births, and the hospital of birth. Data on 1,456 students were found. The final study sample consists of 1,315 students whose birth weight is known and who have valid data on special education or grade retention by the end of elementary school. Our sample differs from those used in other studies that frequently rely on birth cohorts using

data collected at a specific hospital or city during a certain time period. Our sample was created by obtaining data on entire kindergarten classrooms located in over two-dozen high-poverty sites in Chicago. Low birth weight students who do not enroll in regular public school kindergartens are not included in our sample.

The Chicago Longitudinal Study data set has a number of features that strengthen the validity of estimates of the impact of low birth weight on school remediation. First, as a prospective longitudinal study of the impact of early childhood experiences on later development, the CLS has measured a comprehensive set of experiences since birth from administrative records, child and family surveys, teachers, and school records. The influence of low birth weight is estimated taking account of many other family circumstances. Second, the effects of low birth weight are estimated within a high risk sample that has been experienced many other risk factors such as family poverty and low levels of parent education. The impact of low birth weight on later performance can thus be estimated controlling for other risk factors. A third strength of the CLS is that it has among the most complete information on school remedial services in K-12 education. Both grade retention and special education were measured annually, which provides cumulative prevalence rates as well as the number of years of remedial services. Finally, because the CLS was developed to investigate the effects of preschool education on child outcomes, the extent to which preschool is more beneficial for low birth weight children compared to normal weight children can be assessed. Previous intervention studies have been limited to the effects of birth to 3 services among low birth weight children.

Child Parent Center (CPC) Program

Located in close proximity to elementary schools in the Chicago public school system, the CPC preschool program provides educational and family-support services to children beginning at age 3 or 4. Within a structure of comprehensive services similar to Head Start, the acquisition of basic skills in language arts and math is emphasized through relatively structured but diverse learning experiences that include teacher-directed, whole-class instruction, small-group and individualized activities, and frequent field trips. Literacy experiences involving word analysis, oral communication, and listening skills are highlighted. All teachers in the half-day preschool program have bachelor's degrees and are certified in early childhood education. Classes include 17 children and 2 staff members (teacher and aide). Each center is run by a head

teacher, and a parent resource teacher implements the parent room activities in cooperation with the school-community representative. After a half- or full-day kindergarten, school-age services also are provided up to third grade in the elementary schools. Families in CPC neighborhoods participated at a high rate (over 80%) which helps ensure that findings are representative of eligible children rather than sample selective (Reynolds, Temple, Robertson & Mann, 2002).

O*utcome Measures*

Grade retention. Grade retention was defined as any child who repeated one or more grades from kindergarten to eighth grade. It was measured by school records, which were obtained yearly to determine whether or not children were promoted from one grade to the next. Children found to be in the same grade for two consecutive years were coded as being retained.

Special education placement. Special education placement was defined as any child who received special education services from first grade to eighth grade in any category of disability, including specific learning disability, speech and language impairment, serious emotional disturbance, mild mental retardation, hearing impairments, and other health impairments. Data came from administrative records collected annually. In addition to the measure of any special education placement, we also looked at participation in the specific category of specific learning disability, which accounts for about half of all placements in our sample and in the U.S. Our data first records special education placement beginning in first grade. We do not have information on special education participation in kindergarten. Contrary to recent studies demonstrating large portions of kindergarten students enrolling in special education (e.g., Roth, Figlio, Chen, Ariet, Carter, Resnick et al 2004), special education referrals in Chicago in the mid-1980s tended to be made later than kindergarten as learning or behavioral problems were identified as students progressed through elementary school.

Explanatory Measures

Birth weight. Following convention in the medical literature, we choose a birth weight of 2,500 grams (5 pounds, 8 ounces) as the threshold that defines low birth weight. Given advances in medical technology, much of the recent literature focuses on the eventual educational outcomes of children who were very small (under 750 grams). In our sample of 1315 children who attended public kindergartens in 1985-86, however, only 21 students weighed less than

1,500 grams (3 pounds, 4 ounces) at birth. Only 2 students weighed less than 1,000 grams (2 pounds, 3 ounces).

CPC preschool participation. Participation in the half-day CPC preschool program at age 3 or 4 was assessed relative to the matched comparison group of children who did not attend the program but instead attended Title 1–funded all-day kindergarten programs in 5 randomly selected schools serving children at risk. Fifteen percent of the comparison group attended Head Start preschool. When examining the effects of participation in enriched preschool as measured as an indicator variable, the comparison is being made between the CPC preschool group versus students who participated in a full day kindergarten and small percentage who participated in an alternative preschool program through Head Start. The alternative-intervention design of the study is likely to lead to conservative effects of intervention given that the comparison group in this study received more educational enrichment than those in most other studies.

Covariates. A number of dichotomous sociodemographic measures were included in all analyses as covariates, including gender and the following five variables measured at the time of the child's birth: maternal education, maternal age, welfare receipt, family size, and single parent status. They were obtained from birth records or administrative data (for welfare receipt).

These birth year variables representing family socio-economic risk have been used in other studies either individually or combined into an index to predict subsequent special education placement (Andrews et al. 1995; Pinto-Martin et al, 2004; Roth, et al., 2004). While in some of our analyses these birth year measures are included as individual covariates, we also combine the five variables (assigning a value of one to each variable if this risk factor is present, and representing maternal age with an indicator variable equal to one for mothers age 19 and under) to create a socio-economic risk index. In our sample, this risk index ranges from 1 to 4 (out of a possible range of 0 to 5) and has a mean of 2.5.

Results

In our sample, 12.2% of students were low birth weight. According to the National Center for Health Statistics, the low birth weight rate for the US was 6.8% in 1980, which was almost half of the prevalence of low birth weight in our sample born in 1979 and 1980. Racial differences explain much of the difference between the national rate of low birth weight and the

rate of low birth weight in our sample. The Chicago sample is almost entirely African American, and in 1980 the percent low birth weight for African Americans in the US was 12.7%. Nationally, the prevalence of low birth weight is increasing over time. In 2000, the percent of low birth weight births for the US increased to 7.6% for all races and to 13.0% for African Americans.

We first examine the relationship between low birth weight and school remediation services by constructing 3 charts showing how the probability of placement in special education or grade retention varies by birth weight. Figure 1 shows that 222 children out of 1315 were ever placed in special education. This represents 16.9% of our sample. As shown in the figure, lower birth weight children do not have higher rates of special education placement as compared to children born at normal weights. Surprisingly, the lighter birth-weight children do not have greater likelihood of being placed in special education. Almost 16% (3 out of 19) of children between 1000 and 1500 grams were ever placed in special education, and neither of the 2 children who weighed less than 1000 grams were placed in special education.

In Figure 2, we look specifically at a particular category of special education. The category of Specific Learning Disability accounts for about half of the special education students in our sample and in the U.S. as a whole. Figure 2 shows that 116 children out of 1315 were ever placed special education for specific learning disability. This represents 8.8% of our sample. The histogram shows that specific learning disability services are not more likely to be offered to low birth weight children. Only 5% (1 out of 19) of children between 1000 and 1500 grams of birth weight were ever placed in this category.

Figure 3 shows that 365 children out of 1315 or 27.8% of the sample were ever retained from kindergarten to the eighth grade year. Ranking by birth weight categories, results show a higher percentage of children ever retained in the lower weight categories in comparison with the higher categories. Whereas 43.1% (8 out of 19) of children between 1000 and 1500 grams of birth weight were ever retained from year k to year 8, 10.0% (1 out of 10) of children with more than 4500 grams of birth weight were ever retained from year k to year 8.

Table 1 contains the means of the variables used in the analyses. The school remediation variables were discussed in detail above, and more information about the subgroup means by sex and by birth weight is provided in Appendix Table A. In Table 1, the economically-disadvantaged status of our sample is apparent. Over half of the mothers were

not high school graduates at the time of the child's birth, and 76% were not married. Over a third of the mothers were still in their teens. Sixty-four percent were public aid recipients (typically AFDC), and 17% reported having more than four children at home at the time of the child's birth.

Tables 2 through 5 report the results of regression analyses of the relationships between various socio-economic characteristics measured at birth and the school outcomes of special education placement and grade retention. Despite the dichotomous nature of the dependent variables, we estimate linear probability models both for ease of interpretation and because of the complications arising in the estimation of interactive effects in nonlinear models (Ai and Norton, 2003). In Tables 3 through 5 we include participation in preschool as a covariate and allow it to interact with family socio-economic risk and with low birth weight. Standard errors used to derive the t-statistics account for heteroskedasticity and allow for the clustering of errors within kindergarten sites.

In Table 2, we report regression estimates from the entire sample of 1315. We look at the effects of gender, low birth weight, and the socio-economic risk index on the two special education outcomes and grade retention. We then replace the risk index with a set of 7 indicator variables reflecting the individual components of family risk. We specify maternal age in a more detailed way than is specified in the risk index by allowing the effects of maternal age to vary for younger and older mothers.

The most notable finding from Table 2 is that low birth weight is a predictor of grade retention but not special education placement. Low birth weight students have a 7 percentage point increase in the probability of being retained. While numerous other studies find that low birth weight children are more likely to receive school remediation services in the form of special education, in the Chicago Public Schools during this time period the learning difficulties of low birth weight children were much more likely to be addressed by the school practice of grade retention. Another notable finding is that maternal education at the time of the child's birth has a significant effect on the child's eventual need for school remediation services holding constant the other risk factors, and this effect is largest for grade retention. As found in other studies, girls are less likely to need or receive school remediation either with grade retention or special education placement.

In Table 3, we return to the use of the risk index rather than the individual components

of risk and add an indicator variable for participation in the high-quality preschool offered by the Child-Parent Center program in the Chicago Public Schools. As before, low birth weight predicts grade retention but not special education placement. As previously reported in studies of the effects of the Child-Parent Center preschool program using risk factors measured later in the childhood rather than at birth (Reynolds et al., 2001), preschool is associated with a reduction in the probability of grade retention or a special education placement. Preschool is associated with a reduction in the need for school remediation by 4 to 7 percentage points. We then allow participation in preschool to interact with low birth weight and with the risk index. From this specification, we can investigate whether preschool has a differential effect for children with low birth weight or with the level of socio-economic risk. For both types of special education, participation in preschool is most effective for students with the highest level of socio-economic risk. Preschool appears to be equally effective on average for low and regular birth weight children.

Because boys are significantly more likely than girls to receive special education services and to be made to repeat a grade during elementary school, our analysis of the effects of early intervention examines boys and girls separately. Results for boys are shown in Table 4 and the results for girls are shown in Table 5. These results clarify the relationship between low birth weight and grade retention found in Tables 2 and 3 by revealing that low birth weight is a significant predictor of grade retention for boys but not girls. The probability of receiving special education services is unrelated to low birth weight status. Although not reported here, similar findings were found for low birth weight defined as being less than 2,000 grams or 1,500 grams.

Socio-economic risk is an important predictor of the need for school remediation services (grade retention and special education placement) for boys but is only associated with grade retention for girls. Participation in preschool has a stronger effect for special education placement and grade retention for boys, which is important because boys make up the majority of students who receive these school remediation services. For boys, preschool appears to be most effective for students with higher levels of socio-economic risk. For the girls receiving services for a specific learning disability, there is some suggestion that preschool is more effective at reducing the need for services for normal weight rather than low birth weight students, although this effect is significant at only the 10% level of significance. Overall, it is

more difficult to explain the variation in school remediation services among girls compared to boys using these covariates measured during the child's birth year.

Participation in the CPC preschool is associated with a statistically significant reduction in rates of special education placement and grade retention for boys and grade retention for girls. For all three outcomes, the point estimates when significant are all in the 6 to 9 percentage point ranges for both boys and girls in the simple regressions shown in Tables 4 and 5.

In the second column for each outcome in Tables 4 and 5, we investigate whether the educational intervention offered through the CPC preschool program has a different effect on children with different degrees of risk due to socio-economic disadvantage or to low birth weight. We include interaction terms for preschool participation interacted with low birth weight and preschool participation interacted with the risk index. Importantly, participation in preschool has a greater effect on special education placement for boys who were born into families experiencing higher levels of socio-economic risk. In other words, the preschool program offers greater benefits in terms of reduction in special education placement rates to boys from more disadvantaged families. For girls, the benefits of preschool participation in terms of reduced need for school remediation services appear unrelated to the level socio-economic risk facing the family at the time of the child's birth.

Conclusion

Contrary to results in many published studies, in our sample of urban children from low-income families low birth weight status is not predictive of later receipt of special education services. While not reported here, we also investigated the determinants of the length of special education participation conditional on participation and found that this also was unrelated to low birth weight status.

Our study finds instead that low birth weight is associated with significantly higher rates of grade retention, especially for boys. While the finding on grade retention is not surprising given that retained children most often have learning problems that prevent them from making adequate academic progress, there are three partial explanations for the lack of a relationship found between low birth weight and special education placement in our sample.

First, all children on average may have been under-identified for special education placement due to lack of funding available in the schools. While the proportion of students in our sample who were placed in special education mirrors the national average for African-Americans, our sample is relatively more economically disadvantaged. Given the educational needs of many students in urban schools, funding levels and school resources are often insufficient to serve all children in need of special education. Consequently, only children with the most clearly identifiable learning problems would receive priority for special education services. Many other children with learning difficulties may not have received appropriate services and perhaps such children were more likely to be low birth weight.

A second explanation for the lack of effects of low birth weight on special education placement is that the learning difficulties of low birth weight children were identified but these students purposely were treated by the school practice of grade retention instead. Grade retention is an alternative method of addressing academic problems that does not require any additional immediate school expenditures and thus is much less costly than special education placement. The findings in this study that low birth weight boys in particular are more likely to be made to repeat a grade rather than receive special education services support this explanation.

Finally, it is possible that because participants in the Chicago Longitudinal Study experienced many other risk factors growing up in the inner city, the impact of low birth weight is relatively less important when students face other socio-economic risks. A 2002 National Research Council report describes the high enrollment rates of minority students (other than Asians) in special education as arising from their experience of "multiple biological and environmental correlates of disability and low achievement" (Donovan & Cross, 2002; p. 167.) The typical child in our study experienced 2.5 family risk factors. Compared to low birth weight, both low levels of maternal education and teenage parenthood are much greater predictors of remedial education.

How much concern is appropriate over the findings that low birth weight children in a large urban school district were not more likely to receive special education services but instead were more likely to be made to repeat a grade? The answer depends on the relative effectiveness of these methods of remediation for learning problems.

Numerous studies such as those cited in Hong & Raudenbush (2005) or Temple,

Reynolds, & Ou (2004) find negative effects of grade retention and suggest that the retained students would have learned more if they had not been retained. On the other hand, the consequences of special education seem less clear. Is the receipt of special education services helpful or harmful? In the disproportionality research, a main concern is that students, particularly males, who "are enrolled inappropriately in special education classes face limited educational opportunities and carry a lifelong label" (Russo and Talbert-Johnson, p. 141.). There are few large-scale studies of the effects of special education as an educational treatment because it is difficult to find students who did not receive special education who are similar enough to serve as a credible comparison group. However, a recent study from Texas suggests that special education placement overall enhances subsequent school performance (Hanushek, Kain & Rivkin, 2002). The findings here in an African-American urban sample that low birth weight boys were not more likely to receive special education services is surprising given the National Research Council Report edited by Donovan and Cross (2002) that identifies poverty and other related risk factors associated with low academic performance as the dominant explanations for racial differences in special education placement rates. .

While this study examined decisions to assist low-performing students for a cohort that entered school over two decades ago, two aspects of this research are especially timely and relevant given the recent policy focus on school accountability as demonstrated by No Child Left Behind and the recent policy focus on expanding access to public preschool programs. Observers have speculated that the high-states testing implemented in various states and included in the U.S. federal NCLB legislation might lead to higher rates of both grade retention and special education placement. Hauser et al. (2007) find that grade retention rates, while generally increasing over time, were not highly responsive to the introduction or expansion of state accountability requirements associated with high stakes testing. Any retention effects found, they argue, occur in kindergarten or in key transitions such as ninth grade and were followed by years in which grade retention rates were than lower than expected. Hauser et al. (2007) express concern that these small changes in retention rates may mask more harmful trends that accountability movements may create in special education placement rates. However, Hanushek and Raymond (2005) looked directly at special education placement rates before and after a time of implementation of state accountability standards and found no overall effect on rates of assignment to special education. In Chicago, Jacobs (2005) suggests

that both grade retention and special education placements increased as a result of the accountability policy enacted in the Chicago Public School district in the mid 1990s.

The current study also provides evidence of the effectiveness of participation in a high-quality preschool program for urban minority youth. While good quality preschool has the promise of ameliorating the harmful effects of family socioeconomic risks such as low levels of parental education and teenage parenthood, we failed to find much support in our sample for the possibility that preschool participation may reduce the harmful effects of low birth weight. Although we found no relationship between birth weight and special education placement, we found that family risk measured at the time of the child's birth was a predictor of school remediation services. The statistically significant interaction of preschool participation with risk indicates that the beneficial effects of preschool on special education placement and grade retention were greater for those at higher levels of socio-economic risk.

Our results suggest that early intervention through participation in preschool works best for boys and for those at the highest level of socio-economic risk. These results are important for policymakers because these low-income inner-city male students are most at risk of schooling difficulties and most likely to fail to complete high school. Previous reports in using the Chicago Longitudinal Study (Reynolds, 2000; Reynolds et al., 2001) also found that preschool effects on school achievement and high school completion were greatest for boys and for children growing up in the highest poverty neighborhoods.

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Table 1. Descriptive statistics.

	Mean (std. dev)
Ever enrolled in special education through grade 8	0.17 (0.37)
Ever enrolled in special education for specific learning disability through grade 8	0.09 (0.28)
Ever retained through grade 8	0.28 (0.45)
Low birth weight (< 2,500 grams)	0.12 (0.33)
Female	0.51 (0.50)
Risk index	2.46 (1.18)
Mother not a high school graduate	0.54 (0.50)
More than 4 children in family	0.17 (0.38)
Public aid receipt	0.64 (0.64)
Single parent	0.76 (0.43)
Maternal age 19 or less	0.34 (0.47)

N=1315. Variables other than the first three were measured at the time of the child's birth.

Table 2. Predictors at birth of any placement in special education or any grade retention during elementary school

	Any placement in special education		Any placement in special education for specific learning disability		Ever retained in grade	
Constant	0.210 (7.08)**	0.206 (6.89)**	0.098 (5.77)**	0.104 (5.70)**	0.225 (6.94)**	0.241 (7.02)**
Female	-0.142 (7.49)**	-0.142 (7.62)**	-0.081 (7.11)**	-0.081 (7.30)**	-0.175 (8.75)**	-0.175 (8.44)**
Low birth weight	0.013 (0.50)	0.011 (0.38)	-0.006 (0.29)	-0.007 (0.310)	0.069 (1.94)*	0.072 (1.96)**
Risk index	0.012 (1.29)	--	.013 (2.15)**	--	0.054 (4.02)**	--
Mother not a high school grad	--	0.054 (1.91)*	--	0.051 (2.76)**	--	0.092 (3.12)**
More than 4 children in family	--	-0.021 (0.75)	--	-0.004 (0.17)	--	0.020 (0.53)
Public aid receipt	--	0.019 (0.77)	--	0.018 (1.10)	--	0.056 (1.80)*
Single parent	--	0.007 (0.29)	--	-0.012 (0.67)	--	0.009 (0.29)
Maternal age 13-17	--	-0.074 (2.52)**	--	-0.030 (1.39)	--	0.026 (0.85)
Maternal age 18-19	--	0.016 (0.45)	--	0.013 (0.49)	--	0.089 (2.78)**
Maternal age 36-42	--	-0.025 (0.56)	--	-0.008 (0.23)	--	0.005 (0.08)
Adj. R2	0.04	0.04	0.02	0.03	0.06	0.06

N=1315. Results are from linear regression models with robust standard errors allowing for clustering within kindergarten sites. Absolute value of t-statistics in parentheses. * denotes statistical significance at 10% for 2-tailed test; ** denotes significance at 5%.

Table 3. Preschool participation and school remediation experiences in grade school, for full sample

	Any placement in special education		Any placement in special education for specific learning disability		Ever retained in grade	
Constant	0.250 (7.41)**	0.181 (4.98)**	0.128 (6.38)**	0.081 (3.69)**	0.275 (7.61)**	0.291 (7.71)**
Female	-0.138 (7.47)**	-0.138 (7.58)**	-0.79 (6.88)**	-0.079 (6.84)**	-0.172 (8.49)**	-0.172 (8.49)**
Low birth weight	0.010 (0.35)	--0.017 (0.32)	-0.009 (0.42)	-0.002 (0.03)	0.064 (1.81)*	0.092 (1.63)*
Risk index	0.011 (1.28)	0.040 (4.17)**	0.012 (2.10)*	0.031 (4.05)**	0.053 (3.91)**	0.045 (3.97)**
Participation in CPC preschool	-0.060 (2.42)**	0.040 (0.98)	-0.045 (2.87)**	0.024 (0.82)	-0.075 (2.69)**	-0.096 (2.05)**
Preschool*low birth weight	--	0.039 (0.59)	--	-0.015 (0.28)	--	-0.045 (0.66)
Preschool*Risk index	--	-0.042 (3.37)**	--	-0.027 (2.71)**	--	0.011 (0.60)
Adj. R^2	0.04	0.04	0.03	0.03	0.06	0.06

N=1315. Results are from linear regression models with robust standard errors allowing for clustering within kindergarten sites. Absolute value of t-statistics in parentheses. . * denotes statistical significance at 10% for 2-tailed test; ** denotes significance at 5%.

Table 4. Preschool participation and school remediation experiences in grade school, for boys.

	Any placement in special education		Any placement in special education for specific learning disability		Ever retained in grade	
Constant	0.229 (4.69)**	0.151 (2.39)**	0.102 (3.72)**	0.040 (1.02)	0.235 (4.69)**	0.248 (3.04)**
Low birth weight	0.018 (0.43)	-0.068 (1.15)	-0.006 (0.18)	-0.051 (0.86)	0.099 (1.95)*	0.149 (1.96)**
Risk index	0.026 (2.18)**	0.060 (3.03)**	0.029 (2.90)**	0.056 (3.15)**	0.071 (4.21)**	0.064 (2.28)**
Participation in CPC preschool	-0.086 (2.41)**	0.031 (0.40)	-0.070 (2.73)**	0.025 (0.48)	-0.087 (2.25)**	-0.105 (1.16)
Preschool*low birth weight	--	0.141 (1.38)	--	0.073 (0.97)	--	-0.084 (1.03)
Preschool*Risk index	--	-0.053 (2.16)**	--	-0.041 (2.00)**	--	0.011 (0.34)
Adj. R^2	0.01	0.02	0.02	0.02	0.04	0.04

N=649. Results are from linear regression models with robust standard errors allowing for clustering within kindergarten sites. Absolute value of t-statistics in parentheses. . * denotes statistical significance at 10% for 2-tailed test; ** denotes significance at 5%.

Table 5. Preschool participation and school remediation experiences in grade school, for girls

	Any placement in special education		Any placement in special education for specific learning disability		Ever retained in grade	
Constant	0.129 (4.96)**	0.082 (1.82)*	0.07 (3.23)**	0.055 (1.91)*	0.137 (2.73)**	0.164 (2.12)**
Low birth weight	0.009 (0.21)	0.043 (0.54)	-0.006 (0.21)	0.059 (1.01)	0.043 (0.98)	0.060 (0.83)
Risk Index	-0.004 (0.38)	0.012 (0.68)	-0.004 (0.67)	-0.002 (0.18)	0.037 (2.20)**	0.024 (0.87)
Participation in CPC preschool	-0.031 (1.44)	0.035 (0.67)	-0.019 (0.82)	0.006 (0.18)	-0.061 (1.83)*	-0.098 (1.12)
Preschool*low birth weight	--	-0.060 (-0.75)	--	-0.105 (1.81)*	--	-0.024 (0.25)
Preschool*risk index	--	-0.023 (1.13)	--	-0.003 (0.280)	--	0.017 (0.49)
Adj. R^2	0.02	0.02	0.02	0.02	0.02	0.01

N=666. Results are from linear regression models with robust standard errors allowing for clustering within kindergarten sites. Absolute value of t-statistics in parentheses. . * denotes statistical significance at 10% for 2-tailed test; ** denotes significance at 5%.

FIGURE 1 - Percentage of children ever placed in special education by birth weight

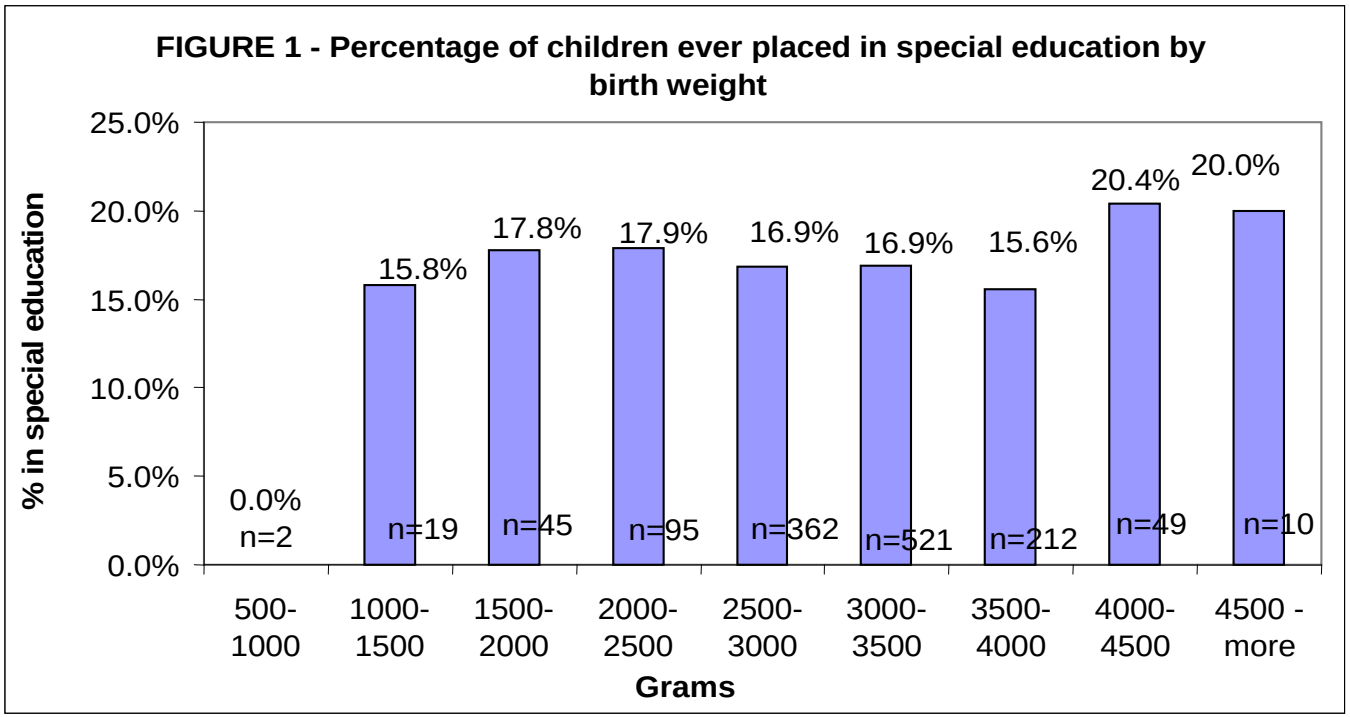


FIGURE 2 - Percentage of children ever placed in special education for specific learning disability by birth weight

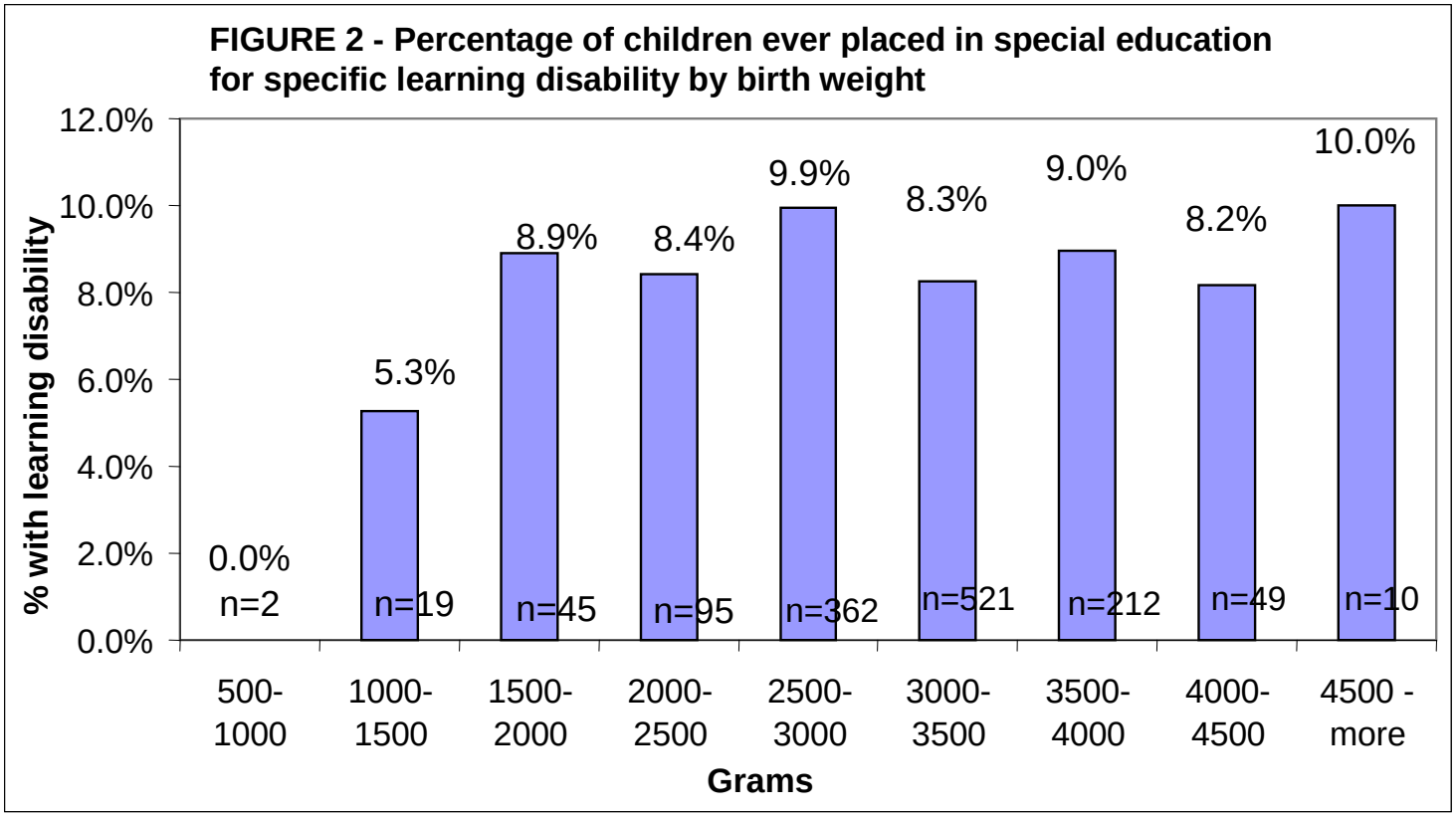
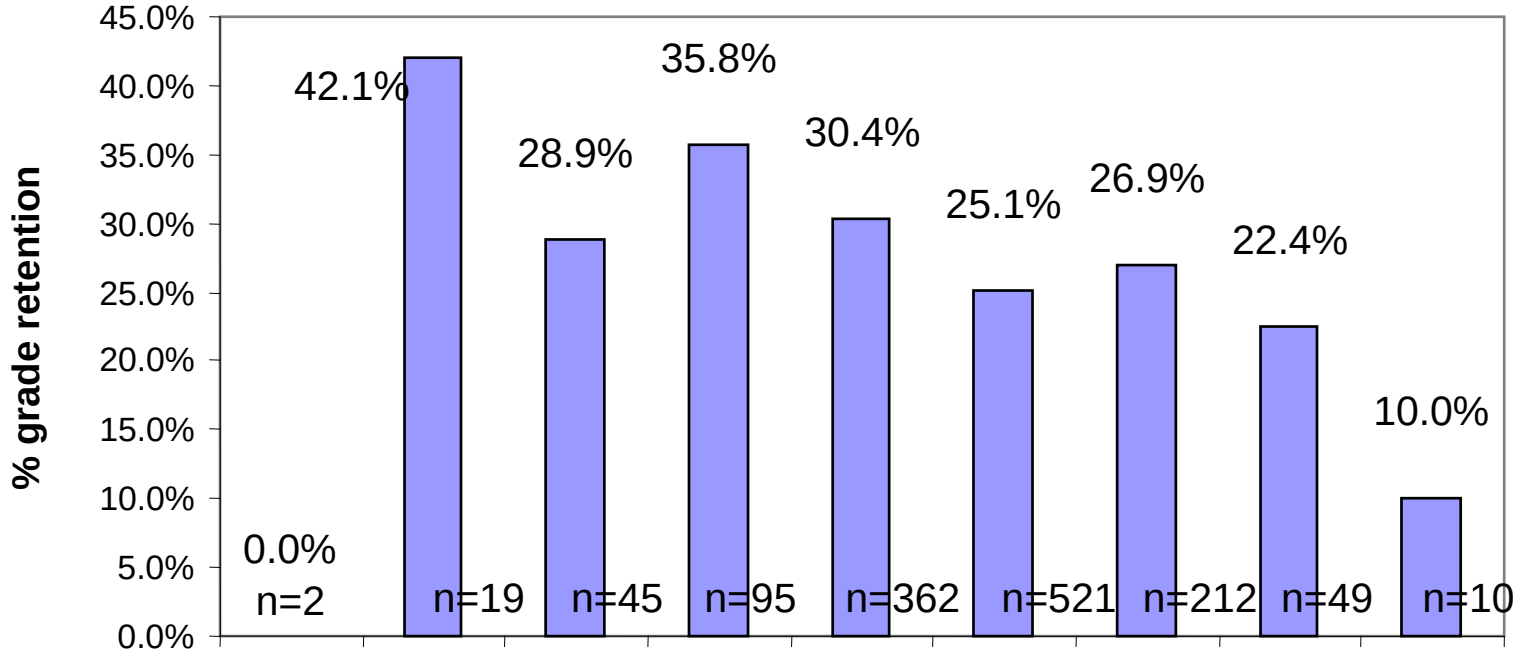


Figure 3 - Percentage of children ever retained from year K to year 8 by birth weight



Appendix Table A. Special education placement rates, mean years of placement, and rates of grade retention by sex and birth weight.

	Percent with any enrollment in special education	Mean years conditional on any participation in special education	Percent with any enrollment in special education for special learning disability	Percent ever retained
Total (n=1315)	16.9	4.2	8.8	27.8
Normal birth weight >= 2,500 g. (n=1154)	16.8	4.2	8.9	26.9 *
Low birth weight < 2,500 g. (n=161)	17.4	4.4	8.1	34.2 *
Boys: (n=649)	24.0	4.2	12.9	36.5
Normal birth weight >= 2,500 g. (n=581)	23.8	4.1	12.9	35.3 *
Low birth weight < 2,500 g. (n=68)	26.5	4.4	13.2	47.1 *
Girls: (n=666)	9.9	4.4	4.8	19.2
Normal birth weight >= 2,500 g. (n=573)	9.8	4.4	4.9	18.3
Low birth weight < 2,500 g. (n=93)	10.7	1.8	4.3	24.7

Differences in mean rates of participation and years conditional on participation between low and normal weight groups are not statistically significant at conventional levels except for grade retention, where * denotes significance at the 6% level for a two-tailed test