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Effect of retention in elementary grades on dropping out of school early

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ABSTRACT

This study investigated the effect of grade retention in elementary school on dropping out of school by age 16. Participants were 538 (54% males) ethnically diverse, academically at-risk students recruited from Texas schools into a longitudinal study when they were in first grade (mean age = 6.58). Propensity score weighting successfully equated the 171 retained students and the 367 continuously promoted students on 65 covariates assessed in grade 1. Fifty-one students dropped out of school by age 16 and 487 persisted. Retention (vs. promotion) led to an increased early dropout rate (odds ratio = 1.68), even after controlling for 65 covariates associated with school achievement, retention, or both. Implications of findings for dropout prevention and grade retention policies are discussed.

1. Introduction

The substantial percentage of students who leave school without a high school diploma is a major concern for educators, policymakers, and society at large. In 2013, 7% of 16- to 24-year-olds in the United States were not enrolled in school and had not received a high school diploma or a general education development (GED) certificate (NCES, 2015). Failure to attain a high school degree or GED predicts life-long economic, occupational, social, and health disparities (Pleis, Ward, & Lucas, 2010). In Texas, the location of the current study, students enrolled in grade 9 in 2012 who fail to obtain a high school diploma are predicted to earn, on average, $263,440 less over their lifetime compared to members of their cohort who obtain a high school diploma. The cumulative impact on the nation's economy is staggering (Alliance for Excellent Education, 2015).

The current study is part of an on-going longitudinal study of the effects of being retained in the elementary grades on subsequent academic success and psycho-social adjustment. Results of previously published studies with this same sample (summarized below) have found that retention in the elementary grades does not impede students' academic achievement or educational motivation in elementary school, middle school, or the first year of high school. Despite these findings, we expected that students who were retained in the elementary grades would be more likely than their promoted peers to leave school at age 16, even after adjusting for pre-retention differences between retained and promoted students. At age 16, previously retained students are, on average, one year further away from graduation than are their promoted peers. Similar to their promoted peers, they have options to pursue employment, assume family responsibilities, or hang out with friends. Thus, leaving school at age 16 may be a more attractive “exit” strategy for them than it is for their same-age promoted peers who are closer to graduation (Alexander, Entwisle, & Dauber, 2003; Cham, West, Hughes, & Im, 2015).

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1.1. Grade retention and school completion

1.1.1. Methodological challenges in estimating a causal effect

Given the serious negative consequences of dropping out of school for the individual and for society, researchers have sought to identify factors that predict dropping out in hopes of developing interventions that could ameliorate risk processes. Retention in grade is the most consistent predictor of dropping out of school (Alexander, Entwisle, & Kabbani, 2001; Bowers & Sprott, 2012). However, the association between repeating a grade and subsequent failure to obtain a high school diploma or GED may be a result of a host of interrelated confounds. For example, low academic achievement and poverty at the beginning of first grade are strongly correlated with both retention in the elementary grades and dropping out of school during high school (Alexander et al., 2001; Willson & Hughes, 2009).

The ideal approach to estimating the average causal effect of grade retention on school completion would be to conduct a randomized experimental design. Given the impracticality of such an approach, prior longitudinal studies have attempted to estimate the effect of grade retention on school completion by statistically adjusting for a few potential confounds, such as family demographic variables and children's academic skills, measured prior to grade retention (Alexander et al., 2001; Reynolds & Ou, 2004). Although these studies are an improvement over studies that fail to control for known confounds, it is unlikely that a limited number of covariates adequately captures the important preexisting differences between the retained and promoted groups (Cook, Steiner, & Pohl, 2009; Steiner, Cook, Shadish, & Clark, 2010). Furthermore, these statistical adjustments make assumptions that are rarely tested and which, if not met, lead to biased estimates of the effect of grade retention (Shadish, Cook, & Campbell, 2002).

The current study applies propensity score analyses, a method of equating groups on a large number of potential confounders measured prior to the administration of some “treatment” such as grade retention, to isolate the effect of grade retention in the elementary grades on dropping out of school. In this approach, students are measured on a wide variety of baseline measures believed on the basis of prior substantive theory and empirical research to be related to selection into the “treatment” (retention in grade) and the outcome (school completion) (West et al., 2014). Based on these measures, a statistical model is used to estimate a single propensity score for each participant, defined as the predicted probability that the participant will be in the treatment condition. If the treatment groups can be equated on the propensity scores, then, according to statistical theory (Rosenbaum & Rubin, 1983), they will be equated on all covariates used in the construction of the propensity score. If the covariates include all potential confounds, an unbiased estimate of the treatment effect can be obtained (Rosenbaum & Rubin, 1983). If not, bias in the estimate of the treatment effect will be reduced, often substantially.

The authors know of only one study utilizing propensity score analyses to test an effect of grade retention on high school completion. Analyzing archival data from two studies of youth attending high school prior to the early 1990s, Andrew (2014) employed propensity score matching to estimate an effect of retention in the elementary grades. He found that retention had a negative effect on high school completion. However, study results must be interpreted cautiously due to the retrospective nature of the study, changes in school populations and school retention policy over a 25 year period, reliance on youth-report of both the independent and dependent variables, and the examination of only a very limited number of potential confounding variables.

1.2. Cohort and context considerations

The history of grade retention in the United States has been characterized by large fluctuations over time in the incidence of this educational intervention (Bali, Anagnostopoulos, & Roberts, 2005). These fluctuations have been associated with, and presumably reflect, shifts in educators' and policymakers' beliefs about the effectiveness of grade retention and the conditions under which it should be applied. The “No Child Left Behind” federal legislation passed in 2001 extended to a national level the movement begun in the mid-1990s to end social promotion (i.e., the practice of advancing children who had not mastered the competencies at one grade level to the next). This act required that assessments, aligned with state standards, measure the achievement of all children at each grade level (U.S. Department of Education, 2002). The implementation of these educational policies corresponded with a substantial increase in the percentage of students retained in grade from the 1995 to 2004 For example, from 1995 to 2004, the retention rate in Texas for grade 1 increased from 5.8% to 6.4%, and the rate in grade 3 increased from 1.3% to 2.6% (Texas Education Agency, 2005).

Few published, prospective studies have investigated the effect of grade repetition on school completion. The majority of these studies were conducted with cohorts of students who entered urban, minority-serving public schools prior to 1990 (Alexander et al., 2003; Jacob & Lefgren, 2009; Ou & Reynolds, 2010). Given the significant changes in the educational policy context and the limited ethnic and income diversity in the samples used in these earlier studies, the results may not generalize to more diverse samples that characterize the current educational context. Additionally, these early studies dropped from the analysis those students who left the district in which the study was conducted (Alexander et al., 2003; Jacob & Lefgren, 2009). Mobility is common in US schools. Based on the US Census, between the years 2005 and 2010, 44.7% of youth ages 5–9 years of age and 34.6% of youth ages 10–17 years of age moved households at least once (Ihrke & Faber, 2012). Furthermore, mobility rates are higher for lower income students and for students who leave school without a high school diploma or GED (Engec, 2006; South, Haynie, & Bose, 2007). Hence, dropping students from the analysis who leave the district may lead to biased estimates of an effect of grade retention.

1.3. Gender and ethnic differences in grade retention and school completion

The risks of both grade retention and dropping out of school are higher for boys than girls (Alexander et al., 2001; Andrew, 2014), and for African American and Hispanic students than for White students (Stark & Noel, 2015). For example, in Texas in the

2003–2004 academic year, 6% of Black and Hispanic students in grades 1–12 were retained in grade, compared to 2.9% of White students; the rate of grade retention that year for females was 3.7%, compared to 5.6% for males (Texas Education Agency, 2005). For students entering 9th grade in the fall of 2009, the percentage of students classified as drop outs 5 years later was 11.1% for Black, 9.1% for Hispanic, and 3.4% for White students. The percentage of females classified as drop outs was 5.9%, compared to 8.2% for males (Texas Education Agency, 2014).

Despite consistent findings of ethnic and gender differences in both grade retention and dropping out, a dearth of studies have examined whether gender or ethnicity moderates the association between retention and dropping out. It is important to know if retention in grade has a similar impact on the likelihood of completing high school for boys and girls and for White students compared to Black and Hispanic students.

1.4. Background of current study

As described in the Methods section below, participants in the current study were drawn from three school districts in Texas with student populations whose demographics were generally representative of the school population of the entire state. Participants who left one of the three participating school districts were retained in the sample. Participants were recruited from the cohorts of students entering first grade in the fall of 2001 or 2002. Since 1995, Texas statutes have stipulated that students can only be promoted if the student has demonstrated proficiency in the subject matter of the grade (Texas Education Agency, 2002). In 1999 Texas implemented policies requiring that schools assess the literacy of students from kindergarten through third grade and provide remedial instruction to students who fail to demonstrate grade-level literacy competencies. In 2003 Texas began requiring students in specified grades, beginning in grade 3, to demonstrate mastery of grade-level competencies in order to advance to the next grade. Students had up to three chances to pass the tests of grade level proficiency and were provided remedial instruction if they failed the test. Participants in the present study entered first grade early in the state's implementation of these stricter accountability practices. During the later time period when the current study participants were in high school, Texas required students to either pass an exit exam to graduate or pass end-of-course exams to obtain credit for courses required for graduation.

1.5. Results of prior studies with current longitudinal sample

The initial purpose of this longitudinal study was to determine the effects of retention in the elementary grades on children's subsequent academic achievement and psychosocial adjustment. To increase the likelihood that all participants would have a non-zero probability of grade retention (Cole & Hernán, 2008), the original sample was restricted to children scoring below the median for the student's school district on a measure of early literacy (see Participants section below for details). Prior to any student being retained in grade, extensive data on variables shown in prior research to predict grade retention or academic achievement were collected on each student by means of direct child assessment, parent and teacher questionnaires, peer sociometric assessment, and school records. These data included measures of students' reading and math achievement, IQ, language and literacy skills, peer relationships, teacher-student relationships, behavioral dispositions, executive control, personality, and liking for school as well as measures of the home-school relationship, parents' educational aspirations for their child, the parent-child relationship, home literacy practices, and the family's socioeconomic status. Measures of classroom and school level variables (e.g., percentage of ethnic minority youth) were also collected.

Prior published studies with the current sample have employed propensity-score analyses (either matching or weighing) to equate retained and promoted students on all observed and unobserved potential confounds. These studies have used one of two types of comparisons: same-grade versus same-age comparisons (Wu, West, & Hughes, 2008a; Steiner, Park, & Kim, 2016; West, 2016). In same age comparisons, retained and promoted students are compared on the outcome measure during the same academic year (i.e., same age), but when the retained student is at a lower grade. In same-grade comparisons, the performance of retained and promoted students is compared when they are in the same grade. For example, if the retention decision was made in 1st grade, the performance of promoted students the following year, when they were in 2nd grade for the first time would be compared to the performance of retained students two years later, when they were in 2nd grade for the first time. Educators have suggested that same grade comparisons are more reasonable than same age comparisons in studies of the effect of retention on achievement, because same age comparisons test retained students over content that they have not yet encountered (Wu, West, & Hughes, 2008b; Lorence & Dworkin, 2006).

These prior studies with the current sample support the conclusion that retention in grade 1 bestowed short-term benefits in reading and math achievement, relative to matched promoted students who were in the same grade the year before (Wu et al., 2008a; Wu et al., 2008b; Hughes, Chen, Thoemmes, & Kwok, 2010). However, these benefits disappeared within a few years. When students were in grade 5, students previously retained in grade 1 and their matched peers who were continuously promoted did not differ in reading or math skills, even though retained students had been in school one year longer by grade 5 than their matched, promoted peers (Moser, West, & Hughes, 2012). Furthermore, retention in first grade did not appear to harm students' psychosocial adjustment at grade 4 and bestowed benefits in terms of engagement in the classroom, sense of school belonging, and perceived academic self-efficacy (Wu, West, & Hughes, 2010). At the transition to middle school, students retained in the elementary grades (grades 1–5) did not differ from matched, continuously promoted children on level of academic achievement or sense of school belonging, nor did they differ in rate of change on these variables across the middle school grades (Im, Hughes, Kwok, Puckett, & Cerda, 2013). Finally, at the transition to high school, students retained in grades 1–5 and matched, continuously promoted students did not differ in their self-reported motivation to complete high school or to enroll in post-secondary education (Cham et al., 2015).

1.6. Retention and early dropping out

Despite the finding that previously retained students in our longitudinal sample were achieving as well as their matched, continuously promoted peers in middle school and at the beginning of high school, they may still be more likely to drop out of school than their continuously promoted peers who were at equivalent risk of dropping out of school at entry to first grade. Indeed, Alexander et al. (2003) found that students in Baltimore City schools who were retained in the elementary grades, relative to similarly low achieving, promoted students, were more likely to drop out of school in adolescence, despite performing better in their coursework than promoted children. These authors concluded that "Retention, so far as we can determine, does not impede…children academically or assault their self-esteem in the early years, yet something about the experience apparently weakened repeaters' attachment to school" (p. ix).

Consistent with Alexander et al. (2003), we expected that students retained in the elementary grades would be more likely than equated promoted peers to leave school without a diploma or a GED by age 16. This hypothesis is based on the reasoning that, when previously retained students are 16 years of age, they are further away from graduation than are their continuously promoted, same-age peers. Thus, dropping out of school may be a more attractive "exit" strategy for low achieving retained students than for their equated promoted peers. For 16- or 17-year old retained students, their personal cost-benefit analyses of continuing an extra year in school versus pursuing work, parenthood, or other options may not be as positive as that of comparable, continuously promoted students who do not face this extra year (Alexander et al., 2003; Roderick, 1994). According to this reasoning, retention may impair students' graduation rates, even if does not harm their psychosocial adjustment, motivation, or achievement (Cham et al., 2015). Results of a study of students attending an urban school in Massachusetts are consistent with this reasoning (Roderick, 1994). Specifically, results showed that the largest difference between retained and promoted students in dropping out of school occurred at age 16, which was the minimum age for legally leaving school in Massachusetts at the time of the study. Over 40% of the students who repeated one previous grade and over half of students who repeated more than one grade left school during the year in which they turned 16, compared to only 15% of non-retained youths.

Defining school dropout is a challenge because students do not report that they have officially dropped out of school. In Texas, with few exceptions, students are legally required to be enrolled in school until age 18 unless enrolled in a program to pass the GED exam. However, conditions exist that serve as loopholes that permit a student to functionally withdraw from additional education without being in violation of the state compulsory enrollment law. If a parent informs the school that the student is withdrawing from school with the intent to enroll in home schooling or private schooling, including unaccredited online private schooling, that student is considered enrolled in school for purposes of the State's compulsory attendance law. There is no requirement that the student present a curriculum for review (Texas Education Agency, 2013, 2014) nor is there any monitoring of the student's educational progress. Furthermore, at age 16, youth may be employed full time in nonhazardous jobs (Texas Work Force Commission, 2015). Thus, at age 16, students who exit school with the stated intent to enroll in a private school or home schooling would legally be able to work full time, including during normal school hours. We provide further consideration of the definition of school drop out in the discussion.

1.7. Research questions

1. Are students who are retained in grades 1 to 5 more likely to drop out of school prior to the start of the school year at which the student is 17 years old? Based on the empirical literature summarized above (Alexander et al., 2003; Roderick, 1994), we expected that students who are retained in grades 1 to 5 will have an elevated risk of dropping out of school prior to the start of the school year at which the student was 17 years old on September 1.
2. Are there gender or ethnic differences in the likelihood of being retained in the elementary grades or in the likelihood of dropping out of school early? Based on prior empirical findings (Alexander et al., 2003; Roderick, 1994), we expected that boys would be over-represented among retained students and early drop outs, relative to girls. Based on data on ethnic/racial differences in high school graduation rates at the state and national levels (National Center for Education Statistics, 2015; Texas Education Agency, 2014), we expected Black and Hispanic youth would be over-represented among early drop outs, relative to White youth.
3. Does gender or ethnicity moderate the effect of retention on early drop out status? Based on a lack of prior research addressing gender and ethnic moderation, analyses of potential moderators of the grade retention effect are exploratory.

The present study commenced in the 2001–02 school year. Thus, results have more generalizability to the current public school context than research conducted with students who entered public schools prior to the era of accountability and high stakes tests. By using propensity score weighting to equate retained and promoted students on a comprehensive set of covariates assessed in first grade, the present results are likely to provide a more accurate estimate of the causal effect of grade retention on dropping out of school prior to age 17 than has previously been available. A finding that retention has an effect on dropping out of school early would have implications for targeting school drop-out prevention and recovery interventions at this developmental level for students with a history of prior grade retention.

2. Methods

2.1. Participants

Participants were 538 youth who were recruited into this longitudinal study when in first grade. Participants were drawn from a larger sample of academically at-risk students from three Texas school districts (one major urban and two small city districts, according to Texas Education Agency classification), when the students entered grade 1 in the fall of 2001 or 2002. The first small city school district (district enrollment = 13,558) had a student body that was 39% White, 36% Hispanic, 25% African American, and 1% Other, with 59% economically disadvantaged, and 10% limited in English proficiency. The second small city school district (district enrollment = 7, 424) had a student body that was 68% White, 11% Hispanic, 12% African American, and 9% Other, with 25% economically disadvantaged, and 5% limited in English proficiency. The composition of the urban school district (district enrollment = 24,429) was 38% White, 27% Hispanic, 29% African American, and 6% Other, with 40% economically disadvantaged, and 11% limited in English proficiency. Taken together, the districts' student enrollment was generally representative of the total population of students enrolled in Texas schools for the 2001–2002 year in terms of ethnicity (41% White, 42% Hispanic, 14% African American, and 3% Other), economic adversity (51%) and limited English proficiency (15%) (Texas Education Agency, 2003).

A total of 1374 grade 1 students in the three school districts met the following criteria for participation: scored below the median score on a state approved district-administered measure of literacy at end of kindergarten or beginning of grade 1, spoke either English or Spanish, were not receiving special education services other than speech and language services in grade 1, and were not previously retained in grade 1. The decision to recruit a sample of students who were below their school district's median score on a measure of literacy was based on findings that low reading achievement is the strongest predictor of being retained in the early elementary grades (Alexander, Entwisle, & Dauber, 1994; Willson & Hughes, 2009). This decision captured most of the students who would subsequently be retained and reduced the number of students who needed to be tracked and tested on an annual basis. Incentives (small gifts and a random chance to win to a larger prize) were instrumental to collecting 1200 returned consent forms; 784 (65.33%) parents provided consent. No differences were indicated between the eligible students with and without parental consent across a broad array of archival variables, including performance on the district-administered test of literacy (standardized within district, due to differences in test used), age, gender, ethnicity, eligibility for free or reduced price lunch, bilingual class placement, cohort, and school context variables (i.e., % ethnic/racial minority; % economically disadvantaged). At the end of the 5th year of participation in the study, parents of 569 (72.58%) children provided the required written consent for continued participation. Of the 215 children without consent, only 18 actively declined, whereas 157 did not return the consent form, 9 had moved to Mexico, 1 was deceased, 25 had previously withdrawn from the study, and 5 were not able to be located.

The analysis sample for the current study consisted of 538 students (54.1% male), for whom students' school enrollment status was known for the year the student turned 16 and the following two years (see Measures section below). At entrance into the study in first grade, the students' average age (in years) was 6.58 (SD = 0.38), with 57.3% of the sample being eligible for free or reduced price lunch and 33.6% of the sample being White, 25.7% African American, 37.0% Hispanic (38.73% of whom had limited English proficiency), and 3.8% other. At grade 1, the mean full scale IQ based on the Universal Nonverbal Intelligence Test (Bracken & McCallum, 1998) was 93.03 (SD = 14.41), and the mean reading and math achievement Woodcock Johnson III age-standard scores (Woodcock, McGrew, & Mather, 2001) or the comparable Spanish language test of achievement (Woodcock & Muñoz-Sandoval, 1996) were 95.98 (SD = 17.64) and 101.26 (SD = 13.95), respectively.

The 538 continuing participants and the 246 attrited participants were similar on the 65 measured covariates (potential confounders) in the propensity score analysis (see Measures section below). For the 43 continuous covariates, the absolute value of the standardized mean difference (Cohen, 1988) between the students with and without renewed parent consent ranged from 0.01 to 0.29, with a median of 0.06. For the 22 binary and ordered covariates the magnitude of the Pearson correlations between the covariate and students' renewed consent status ranged from − 0.16 to 0.11, with a median of 0.01. Cohen termed effect sizes of this magnitude “small.”

Of these 538 students, 166 (30.9%) were retained once, 5 (0.9%) were retained twice, and 367 (68.2%) students were continuously promoted during grades 1 to 5. Of the166 students retained once in the elementary grades, 111 (66.9%) were retained in grade 1, 25 (15.1%) in grade 2, 15 (9.0%) in grade 3, 9 (5.4%) in grade 4, and 6 (3.6%) in grade 5.

2.2. Procedures for tracking students' school enrollment status

Tracking and maintaining the participation of an at-risk sample of first grade students in a longitudinal study across 12 or more years is a challenge. Differences between participants who remain in the study and those who attrite can affect both the internal and external validity of results (Jurs & Glass, 1971). To minimize such threats, the current study followed the recommendations of Ribisl et al. (1996) and implemented a number of steps to minimize attrition and maximize participation. This section describes study procedures for tracking students' school enrollment status from first grade through exiting high school by graduating, passing the GED, or dropping out of school.

Each student attending a Texas public school has a unique identification number. Using these numbers, beginning in September of each year, each of the three participating school districts provided the study's project director with school enrollment data for all study participants who were enrolled that year. This list included information on students' school campus, grade, and parent address and phone number. This information was entered into the study's student tracking database for the given year. Non-participating school districts to which study participants had transferred were contacted with a request to verify whether the student was enrolled

for that year.

When a public school enrolls a new student, Texas law requires the new school to send a request for the student's school records from the student's most recent school within 10 days of enrollment. Thus, for students who were in a given school district at the end of the prior year and were not included on the district's list provided to study staff, study staff contacted the school the student last attended via phone or fax. Given Texas law, we asked the school to complete a form providing information on the student's whereabouts, including the student's new school (or reason for withdrawal from school, such as enrolling in a private school or home schooling, moving out of the country, obtaining a GED, graduating, or being incarcerated) as well as the student's and/or parents' most recent home address. Upon obtaining the name of the new school, study staff faxed a copy of the parent consent form which authorizes schools to release educational records to the study, with a request for information on the student's grade, home address, and the name of the student's teacher (classroom teacher in elementary grades and language arts teacher in secondary grades).

If students were not located using these procedures, attempts were made to obtain school enrollment information from the parent or student via phone, email, or US postal service. Several well-supported strategies for tracking participants' addresses and phone numbers were employed (Ribisl et al., 1996). Students were also sent birthday cards each year with instructions to the postal service not to forward, to ensure that our system included the most current address information. Parents and students were also contacted each year via email or US mail to complete annual questionnaires, which included information on the student's school enrollment status as well as current contact information for the student and the parent as well as the names of individuals whom the study may contact to obtain information about the student's whereabouts. Parents and students were paid $25.00 for completing the annual questionnaire. Mail, including birthday and holiday cards, was sent at least twice each year, with instructions to the postal service not to forward it. Establishing good communication with a contact person at each school (including small gifts of cookies or treats for the office) also helped us maintain contact with students. Additionally, attempts were made to contact individuals listed on the most recently returned parent questionnaire to locate the student's or parents' current contact information.

When a student's school enrollment status could not be determined for a given year, one of the three participating school districts attempted to locate the student, using the student's unique identification number, on a state-wide database. This database included all students enrolled in any Texas public school. Finally, GED status was obtained from student report on questionnaires and from the Texas Education Agency's searchable website of individuals issued a GED (https://bass.tea.state.tx.us/Tea.GEDi.Web/Forms/CertificateSearch.aspx). This website permits searching by the student's identification number assigned by the Texas Education Agency and student date of birth. Additionally, lists of graduating students were provided by each participating school district.

Once a student was located for a given year, study staff continued to monitor the student's school enrollment status via annual questionnaires sent to parents, student, and students' teachers. When a student's enrollment status changed during the year, the most recent status was recorded for the given year.

2.3. Measures

2.3.1. Retention status

Students were considered retained in a given grade if they were in the same grade for two consecutive years. Schools provided information on students' grade placements every year.

2.3.2. Early drop out status

Students who drop out of school rarely announce that they are leaving school. Thus a specific date for leaving school is usually not available. The present study collected data on students' school enrollment status at the beginning of each school year and defined early drop out when three criteria were met: a) The student was not enrolled in an accredited school the year following the school year during which the student was 16 on September 1; b) the student was not enrolled in an accredited school the next year; and c) the student did not graduate or earn a GED during this two-year period. Thus, early drop outs left school *prior* to the school year in which they were 17 years old on September 1, and did not return to school or obtain a GED the following year.

For the purposes of the study, students who left public school to be “home schooled” or to attend an unaccredited private school *after Year 8* were considered not enrolled in an accredited school. As noted earlier, a loophole in Texas law permits students who transfer to home schooling or unaccredited private schooling to be considered as enrolled in school. Texas does not provide oversight of home schooling, which the courts have ruled are a form of private schooling. To determine whether private schools to which students transferred were accredited, study staff used several strategies to determine whether the private school was accredited by any recognized accrediting body (e.g., Advanced, Southern Association of Colleges and Schools Council on Accreditation and School Improvement, Texas Private School Accreditation Commission). These strategies included contacting the school directly, going to the school's website, and looking up the school on websites of bodies that accredit high schools. Notably, all of the unaccredited private schools to which students in the current study transferred after grade 8 were on-line, for profit schools, in which students were enrolled for no more than two semesters and withdrew without a diploma. Furthermore, none of the students who left public school under the home school or private school exemption had attended home schooling or private school prior to Year 8.

Students who were in school in Year 8 but were missing school enrollment status in the following two years were also considered drop outs. This decision is justified based on the study's previously described procedures for tracking students' school enrollment and GED status each year for 12 years. All other eligible students were defined as continuing in school (i.e., persisters). Of the 51 early drop outs, 5 left under the home-school exemption, 7 left to attend a non-accredited, on-line school, and 39 left school with no indication of subsequent school enrollment for the following two years. Of the 51 early drop outs, 31 left school prior to the academic year in which the student was 16 years old as of September 1, and 20 students left school prior to the academic year the student was

17 years old as of September 1 (i.e., during the academic year the student began at age 16). Thus, all early drop outs left school prior to age 17. Of the 487 persisters, 476 were still in school the year they turned 16 and the following year, 5 had graduated during that time, and 6 had earned a GED.

2.3.3. Selection of covariates for the propensity score analysis

The covariates were 65 variables assessed in year 1, prior to any participant being retained in the elementary grades. Following the recommendation by Rubin (2001) and research by Steiner et al. (2010), we attempted to identify covariates that provided comprehensive coverage of variables that have been shown in prior research to be associated with retention and dropping out of school (Alexander, Entwisle, & Horsey, 1997; Alexander et al., 2001; Willson & Hughes, 2006; Willson & Hughes, 2009; Benner, Graham, & Mistry, 2008; Hamre & Pianta, 2001; McCoy & Reynolds, 1999). Consistent with bio-ecological models of risk and protection (Bronfenbrenner & Morris, 2000), the variables included factors at the levels of the individual child, the family, the school, and the home-school relationship. The Appendix A includes a list of these 65 covariates, along with the measurement domain or construct and measurement source for each covariate.

Variables at the individual child level included child demographic variables, cognitive and academic functioning, social-behavioral adjustment, participation in remedial services, self-regulatory skills, motivation, and personality. Variables at the family level include family demographic variables. School-level risk variables included school level average achievement and the percentage of students who are mobile, on free or reduced lunch status, and White. Home-school relationship variables included parent involvement in school, the quality of the home-school relationship, and parents' perceptions of their role and that of the teacher. As shown in the Appendix A, these variables were assessed with direct child testing and interviews, teacher and parent questionnaires, peer sociometric assessment, and school records.

Each of the 65 variables was correlated in the expected direction with the treatment (i.e., retained in grades 1, 2, 3, 4, or 5 versus continuously promoted in grades 1–5) and with the outcome (i.e., status as early drop out or persister). The average magnitude (ignoring sign) of the correlation with retention status was 0.13 (range = 0.001, 0.35). The average magnitude of the correlation with early drop out status was 0.07 (range = 0.00, 0.18).

2.4. Assessment of covariates

Student assessments were conducted in individual sessions at school. Trained graduate and undergraduate students who had demonstrated proficiency in administration conducted all assessments. Children who spoke any Spanish or whose parents spoke Spanish (based on teacher report) were administered the Woodcock–Muñoz Language Survey (WMLS; Woodcock & Muñoz-Sandoval, 1993) to determine if they were more proficient in Spanish than English. Children more proficient in Spanish were administered all tests in Spanish by bilingual examiners.

Student assessments of language proficiency, academic achievement (i.e., Woodcock Johnson III Tests of Achievement; Woodcock et al., 2001) and cognitive ability Universal Nonverbal Intelligence Test; Bracken & McCallum, 1998) were administered in the Fall of the year. In the Spring semester tests of inhibitory control (i.e., Kochanska, Murray, & Coy, 1997; Liew, Chen, & Hughes, 2010), learning motivation (Burhans & Dweck, 1995; Luo, Hughes, Kwok, & Liew, 2009) and student perceived academic self-efficacy (Harter & Pike, 1984) were administered. Trainees received a minimum of 18 h of classroom instruction each semester and passed a practice examination on each measure prior to administering measures in the school, and their protocols were checked and corrected, as needed, on a weekly basis.

Data from teachers were obtained via questionnaires administered between November and May, and teachers were paid $25 for completing each questionnaire. The teacher questionnaires included questions on remedial services the student had received, measures of social/behavioral adjustment (i.e., Strengths and Difficulties Questionnaire, Goodman, 2001), home-school alliance and parent involvement (Teacher Report of Parent Involvement Scale; Wong & Hughes, 2006), student behavioral engagement in the classroom (Hughes, Luo, Kwok, & Loyd, 2008), the teacher-student relationship (Teacher Network of Relationship Questionnaire, Hughes et al., 2008), student ego-control (Block & Block, 1980), and student personality (John & Srivastava, 1999; Wong & Hughes, 2006).

Data from parents were obtained from parent questionnaires and included the Strengths and Difficulties Questionnaires (Goodman, 2001), the home-school alliance and parent involvement (Parent Report of Parent Involvement Scale, Wong & Hughes, 2006).

Classroom sociometric assessment was used to obtain classmates' perceptions of students' social-behavioral adjustment (Masten, Morison, & Pellegrini, 1985; Gleason, Kwok, & Hughes, 2007). All classmates with parental permission to participate in the sociometric procedure were individually interviewed at school to obtain their perceptions of their classmates' behavioral adjustment (e.g., conduct problems or prosocial behaviors) and their liking for the student. Both nominations and ratings were used to obtain measures of peer liking and disliking (Asher & Dodge, 1986; Gleason et al., 2007). Scores were standardized within classrooms.

2.5. Data analysis overview

Each step of the data analysis plan is described in detail in the Results section. First, we used chi square tests to test gender and ethnic effects on grade retention status and on drop out status. Second, we conducted propensity score analysis to estimate each student's propensity score, the conditional probability of being retained in elementary school, given the each student's set of scores on the both 65 covariates and the missing data indicators. This step includes testing the success of the propensity score weighting

Table 1
Frequency of early drop out and retention status by gender and ethnicity.

	Early drop out (N = 51)		Persisters (N = 487)		
	Retention	Promoted	Retention	Promoted	Total
Panel A: Gender					
Female	11	10	54	172	247
Male	17	13	89	172	291
Total	28	23	143	344	538
Panel B: Ethnicity					
Black	13	5	51	69	138
Hispanic	8	10	48	133	199
White non-Hispanic	7	8	41	125	181
Other	0	0	3	17	20
Total	28	23	143	344	538

Note. Early drop outs left school prior to the school year in which they were 17 years old on September 1 and did not return to school or obtain a GED the following year. Persisters were still in school the year they turned 16 and the following year, or had graduated or earned a GED during that time.

procedure in balancing the distribution of the 65 covariates and the missing data indicators between retained and promoted students. Third, we use weighted logistic regression analysis to test the effect of retention on early drop out. Fourth, we use multiple group structural equation models to test the potential moderating effects of gender and ethnicity on the relation between retention status and early drop out.

3. Results

3.1. Descriptive data

Of the sample of 538 students, 51 (9.5%) were early drop outs and 487 (90.5%) persisted in school; 171 (31.8%) were retained in the elementary grades and 367 (68.2%) were continually promoted. Of the 171 retained students, 28 (16.3%) were early drop outs; of the 367 continuously promoted students in elementary grades, 23 (6.3%) were early drop outs.

Panel A in Table 1 presents the 2 × 2 × 2 cross tabulation of drop out status by gender and retention status. With respect to gender and grade retention status, 65 (26.3%) females were retained in the elementary grades compared to 106 (36%) males. The gender main effect on grade retention status was statistically significant, $\chi^2(1) = 6.30$, $p = 0.01$ (odds ratio = 1.60).

As depicted, 21(10.9%) females were early drop outs compared to 30 (10.3%) males. The gender main effect ($\chi^2(1) = 0.51$, $p = 0.48$) on early drop out was not statistically significant.

Panel B in Table 1 presents the 4 × 2 × 2 cross tabulation of drop out status by ethnic/racial group and retention status. There was a significant effect of ethnicity/race on the frequency of retention ($\chi^2(2) = 16.81$, $p < 0.01$): 64 (46.4%) of African American students, 53 (38.1%) of Hispanic students, and 48 (26.5%) of White students were retained in grade. Follow up pairwise tests showed African American students were retained more often than White students, $\chi^2(1) = 13.55$, $p < 0.01$ (odds ratio = 2.40). Hispanic and White students did not differ in their retention rates, $\chi^2(1) = 0.13$, $p = 0.72$.

As depicted, the frequencies (and percentages) of early drop outs among African American, Hispanic, and White students were 18 (13%), 18 (9%), and 15 (8%), respectively. The ethnicity main effect on early drop out was not statistically significant, $\chi^2(2) = 2.23$, $p = 0.33$.

3.2. Missing data

The median proportion of missing data across the 65 covariates was 11.4%. The mean proportion of missing data across the 65 covariates was 17.6% (SD = 0.13). To minimize any effects of missing data in the estimation of propensity scores, we used a procedure termed imputation with constant plus missingness indicators proposed by D'Agostino and Rubin (2000; see also Rosenbaum, 2010) that attempts to produce balance in both the completely observed values and on the set of missing data indicator variables. A missing data indicator variable is created for each covariate on which there are any missing data. The student receives a value of 1 on the indicator variable for the covariate if the value was observed, 0 if not observed. Thus, a child having observed values on variables 1 and 3 and missing values on variables 2 and 4 would be represented by the following pattern: 1 0 1 0. If there are no missing values for a variable (e.g., gender), then no missing data indicator is needed. If two variables have missing values for exactly the same set of children, then one of the indicator variables is deleted (i.e., the two indicator variables representing missingness are correlated 1.0) to avoid collinearity. This procedure resulted in 44 unique missing data indicators.

3.3. Propensity score analysis: Overview of steps

The first step in the propensity score analysis is to estimate each student's propensity score, the conditional probability of being retained in elementary school, given the each student's set of scores on the 65 covariates and the 44 missing data indicators. The

second step is to equate the estimated propensity score distributions between retained and promoted students. The third step is to check the balance of the distribution of the 65 covariates and 44 missing data indicators between retained and promoted students.

3.4. Propensity score estimation

The propensity scores were estimated by the Random Forests method (Breiman, 2001) using the cforest command in R software package party (Version 1.0–15; Strobl, Boulesteix, Kneib, Augustin, & Zeileis, 2008). The Random Forests method is a machine learning approach that seeks to maximize the prediction of the outcome (retention status) from the set of covariates and missing data indicators. This method automatically identifies complex and nonlinear relationships of the covariates with retention. It includes resampling procedures designed to maximize the robustness of the solution. The Random Forests method has performed well in simulation studies (see Cham & West, 2016 for a review).

3.5. Propensity score equating

A variety of methods including forms of matching, stratification, and weighting can be used to equate groups (West et al., 2014). We used weighting to equate the retained and promoted groups. Weighting methods have long been used in survey research to adjust for unequal selection probabilities (Horvitz & Thompson, 1952; Lohr, 2010). In the context of propensity score analysis inverse propensity score weighting (weighting by the odds, Schafer & Kang, 2008) is a popular method that has been shown to have good properties. Specifically, retained students were given a weight of 1, and promoted students were given a weight of $\frac{\hat{\pi}}{1-\hat{\pi}}$ ($\hat{\pi}$ is the estimated propensity score for promoted students). The inverse of the weights for the retained students = 1 and for promoted students = $\left(\frac{\hat{\pi}}{(1-\hat{\pi}}\right)^{-1}$ is used in a weighted regression equation (Cohen, Cohen, West, & Aiken, 2003). In regions of the distribution of the propensity scores with a low probability of being retained, retained participants receive an inverse weight above 1. For example, if $\hat{\pi} = 0.2$,then the inverse weight $\left(\frac{\hat{\pi}}{(1-\hat{\pi}}\right)^{-1}$ will be $\left(\frac{0,2}{1-0.2}\right)^{-1} = 4$.In contrast, in regions of the distribution with a high probability of being retained, retained participants receive an inverse weight below 1. For example, if $\hat{\pi} = 0.8$,then the inverse weight $\left(\frac{\hat{\pi}}{(1-\hat{\pi}}\right)^{-1}$ will be $\left(\frac{0,8}{1-0.8}\right)^{-1} = 0.25$.This weighting procedure serves to equate selection into the retained and non-retained groups without loss of participants.

The success of the weighting procedure is illustrated in Fig. 1. Prior to equating, despite enrolling only students who were below the median in reading skills in first grade, the left panel shows that the distributions of the two groups had only modest overlap, with the retained students having a substantially higher median probability of being retained than the promoted students. In contrast, in

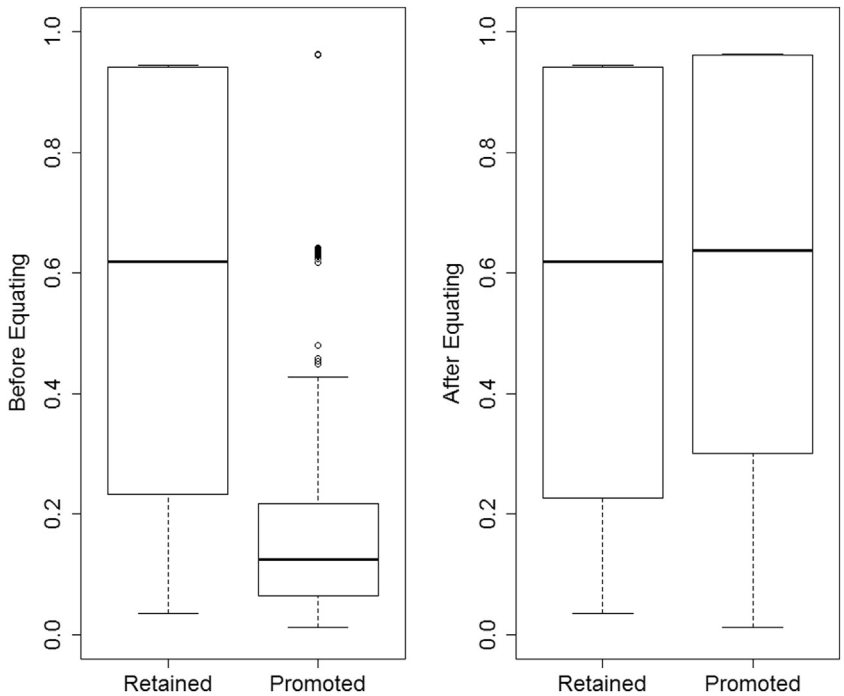

Fig. 1. Boxplots of propensity scores in the retained and promoted groups. The left panel displays the differences in the distributions of the propensity scores in the retained and promoted groups without equating. The dark horizontal line indicates the substantially higher median in the retained than promoted group. The right panel shows that the distributions of the propensity scores in the two are much more similar after equating using the weighting by odds method. After equating, the medians are approximately equal.

Table 2
Absolute standardized mean difference (SMD) and variance ratio (VR) of selected covariates.

Covariates	SMD		VR	
	Before	After	Before	After
District literacy average score	0.619	0.228	2.859	2.065
TQ highest expected level of child's education	0.815	0.174	1.326	1.223
Student's Woodcock-Johnson III Broad Reading standard score	0.747	0.155	1.194	1.694
TQ student's achievement	0.593	0.395	1.409	1.076
TQ student's school engagement (teacher-report)	0.606	0.175	1.035	1.197
Student's Woodcock-Johnson III Broad Math standard score	0.564	0.028	1.072	1.144
TQ student's conscientiousness personality	0.560	0.152	1.106	1.243
Student's IQ score	0.491	0.114	1.132	1.601
Student's ethnicity (African-American vs. Caucasian groups)	0.430	0.152	1.071	1.129
Student's ADHD behaviors (peer-report)	0.398	0.202	1.885	1.093
Student's social preference by peers (peer-report)	0.466	0.231	1.009	1.055
TQ student's status receiving 1–1 tutoring by a peer	0.390	0.085	1.619	1.000
TQ home-school relationship (alliance)	0.391	0.050	1.342	1.554
PQ family social economic status	0.460	0.341	1.351	1.248
PQ student's ADHD behaviors	0.378	0.064	1.262	1.101

Note. TQ is teacher questionnaire. PQ is parent questionnaire. Before is before propensity score equating. After is after propensity score equating using the weighting by the odds method. ADHD is attention deficit hyperactivity disorder. The depicted covariates were selected based on their high correlations with retention status.

the right panel after equating using inverse propensity score weighting (weighting by the odds), the distributions of the estimated propensity scores were close to balanced and had very similar medians.

3.6. Balance of covariates

To evaluate the effectiveness of the propensity score equating on reducing differences between retained and promoted groups, we assessed the balance of the completely observed values on the 65 covariates and the 44 missing data indicators between the retained and promoted students (Cham & West, 2016; Rosenbaum & Rubin, 1984). We calculated the absolute standardized mean difference ($SMD = \frac{\overline{X}_{retained} - \overline{X}_{retained}}{SD}$) and variance ratio ($VR = \frac{Variance_{retained}}{Variance_{promoted}}$) of each of the 65 observed covariates and the missing data indicators. A *SMD* of 0 and a *VR* of 1 indicate perfect balance (Ho, Imai, King, & Stuart, 2007; Rubin, 2001). Rubin (2001) suggested that if each covariate has a *SMD* with a magnitude (absolute value) between 0.00 and 0.25 and a Variance Ratio between 0.50 and 2.00, the propensity score equating procedure has led to adequate balance.

Table 2 shows the *SMD*s and *VR*s before and after propensity score weighting for the 15 selected covariates that are were most highly correlated with retention status. The results show that overall the covariates had substantially lower *SMD*s and *VR*s after propensity score weighting. After propensity score weighting, retained and promoted groups differed by > 0.25 *SMD* on only 2 of the 65 covariates (i.e., teacher perception of child achievement and family social economic status). A high proportion of the missing data indicators had good balance (i.e., 95% of the missing data indicators had a *SMD* below 0.25, and 90% of the missing data indicators had a *VR* below 2) before equating. After propensity score equating, a slightly lower proportion of the missing data indicators had *SMD*s and *VR*s that were close to perfect balance. Note that the relatively low rate of missing data (11.4%) and the large number of missing data indicators led to sparse data and a corresponding lack of precision in the estimates of the *SMD*s and *VR*s for the missing data indicators.

Based on these balance checks, we concluded that the propensity score weighting procedure adequately equated the retained and promoted groups on the most important covariates, with the exception of two covariates (i.e., teacher perception of child achievement; family social economic status). To reduce the potential confounding effect of these two covariates, we included them as predictors of early drop out in our main analyses.

3.7. Retention effect on early drop out

We analyzed our data using M*plus* version 7.4 (Muthén & Muthén, 1998) with the WEIGHT function to take into account the inverse propensity score weighting, along with the TYPE = COMPLEX function to take into account the potential clustering in our data (i.e., students nested within schools). Because the outcome variable was binary, we also specified ESTIMATOR = WLMSV, which invokes a robust weighted least squares estimator using a diagonal weight matrix appropriate for binary outcome data.

In the weighted logistic regression analysis, there were three predictors: (a) teacher perception of child achievement, (b) family socio-economic status, and (c) retention status (1 = retained; 0 = promoted). The binary outcome variable was drop out status. Recall that our earlier check on the success of the propensity score equating procedure showed that covariates (a) and (b) were not well balanced by the propensity equating procedure, hence, we included them in the weighted logistic regression model to control for their potential effects on the outcome. Of importance, the results showed that the effect of retention status on early drop out was positive and statistically significant (unstandardized $\widehat{\beta} = 0.52$, $SE = 0.226$, z = 2.302, $p = 0.021$, odds ratio = 1.68). The odds that

the retained students would drop out were > 50% higher than the odds for the promoted students. In the weighted regression equation, the two covariates that were not adequately equated between the promotion and retention groups through the inverse propensity score weighting procedure did not show a statistically significant relation to early drop out: child achievement, unstandardized $\widehat{\beta} = 0.17$, $SE = 0.048$, $z = 0.348$, *ns*; family socio-economic status, unstandardized $\widehat{\beta} = -0.099$, $SE = 0.163$, $z = -0.603$, *ns*.

Of particular interest is the difference in the last grade completed of those early drop outs who were retained in the elementary grades versus early drop outs who were continuously promoted in the elementary grades. Of the 51 early drop outs, 6 (12%) dropped out prior to beginning grade 9, 28 (55%) dropped out prior to grade 10, 12 (24%) dropped out prior to grade 11, and the last grade completed was not known for 5 students. Of those 46 early drop outs for whom the last grade was known, 25 had been retained in the elementary grades, of whom 23 (93%) left school prior to grade 10. Of the 21 early drop outs who had been continuously promoted in the elementary grades, 11 (52%) left school prior to grade 10. Thus, considering only the early drop out group, previously retained students were > 10 times (odds ratio = 10.45) likely to drop out prior to grade 10 than were promoted students.

3.8. Gender and ethnicity moderation effect

3.8.1. Gender

Using multiple group structural equation modeling (i.e., DIFFTEST in Mplus), we tested the potential moderating effect of gender in the relation between retention status and early drop out. No difference in the magnitude of the effect of retention on drop out status was found for gender ($\Delta\chi^2 = 1.54(1)$, $p = 0.22$).

3.8.2. Ethnicity

We also used multiple group structural equation modeling to test the potential moderating effect of ethnicity on the relation between retention status and early drop out. No moderating effect of ethnicity was found, $\Delta\chi^2(2) = 0.28$, ns.

4. Discussion

Using the propensity score weighting by the odds method, we successfully equated the retained and promoted students on a comprehensive set of 65 covariates (and 44 corresponding missing data indicators) measured in first grade prior to any retention. After equating these two groups, we examined the effect of grade retention on early drop out status. As expected, the results supported the conclusion that retention in the elementary grades leads to an increase in the proportion of students who leave school prior to age 17 without a diploma or a GED. Furthermore, the effect of grade retention effect was similar for males and females and for Caucasian, Hispanic, and African American students.

The finding of an effect of repeating a grade in elementary school on dropping out of school early is important for two primary reasons. First, the results of prior research on effects of retention in the elementary grades on school completion have been inconclusive because of inadequate controls for pre-retention differences between those students who were subsequently retained and those who were continuously promoted. Even though students in the current study were selected on the basis of scoring below the median for their school district on a test of literacy at the start of first grade, students who were subsequently retained compared to students who were continuously promoted differed on a large number of covariates known to predict children's subsequent academic performance. Our pre-retention assessment was comprehensive and included direct assessment of children's IQ, reading and math achievement, inhibitory control, learned helplessness, academic competence beliefs, and liking for school as well as parent and teacher reports of the home-school relationship and the child's academic, social, and behavioral functioning, and peer assessments of the child's prosocial and antisocial behaviors and likeability. Although we cannot definitively rule out the possibility that the effect of retention on early drop out is due to an unmeasured confounder (omitted variable) that is associated with retention status and which exerts an influence on drop out status *over and above measured covariates*, the comprehensive nature of the pre-retention assessment makes this an unlikely possibility (Rosenbaum, 2010; West et al., 2014).

Second, this study identifies a specific developmental period (i.e., prior to 17 years of age) as a time of increased risk for leaving school–especially among students who are off-age for grade. At age 16, students previously retained were, on average, one year further away from graduating from high school than were their same age, promoted peers. Students continuously promoted through elementary and middle schools were 16 at the beginning of grade 11. Students retained once during grades 1 to 8 were 16 at the beginning of grade 10. Like their promoted peers, at age 16 retained students were able to legally work outside the home. If they met certain conditions, including enrolling in a GED course, they were legally able to leave school. Recalling that study students were at risk for academic failure from the beginning of their school careers, it is likely that they continued to struggle in school. Thus, the retained students' mental calculus of the benefits and costs of continuing in school an extra year is likely different than it is for their same age, continuously promoted peers. Consistent with this reasoning and with the drop out pattern reported by Roderick (1994), among the early drop out group, retained students were > 10 times as likely to drop out prior to grade 10 than were promoted students.

The current study defined the retention and promoted groups based on retention histories in the elementary grades and did not consider the effect of retentions subsequent to grade 5.

Retention during the middle school years (i.e., grades 6–8) is uncommon. During the 2003–04 academic year, 2.3% and 1.9% of students were retained in grade 7 and 8, respectively (Texas Education Agency, 2005), compared to 6.4% in grade 1. Of the 51 early

drop outs, only one student in the retention group and two students in the promoted group were retained in middle school. However, 7 students in the promoted group repeated grade 9, whereas no student in the retention group repeated grade 9. This increase in retention in grade 9 among continuously promoted students may reflect differences in how grade retention is defined in high school versus the middle school grades. In the middle school grades, students who fail a single course typically retake that course, but are classified as being promoted to the next grade. In contrast, in grade 9 and above, a student who fails a required course will be classified at the same grade level for two years. In 2003–04, 16.5% of grade 9 students were retained. (Texas Education Agency, 2005). Although our data do not address why no previously retained students repeated grade 9, it is plausible that previously retained students who fail a course in grade 9 are more likely to leave school than to repeat grade 9, when they are 16 years old.

4.1. Study limitations and future directions

As expected in a study of over 12 years' duration, attrition was an issue. The major source of attrition was the inability to renew consent for the participation of their children from parents who failed to respond, even with repeated reminders. High rates of attrition in a study pose threats to the generalizability of study findings, especially when participants who leave the study differ from those remaining. Due to the many efforts made to retain students in the study, attrition was kept to 31%. This rate compares favorably with that of two large-scale studies of comparable length, the NICHD SECCYD (Vandell et al., 2010) and the NCES ECLS-K studies (National Center for Education Statistics, 2009), especially considering the at-risk nature of our sample relative to these two samples. The SECCYD study excluded high risk mothers and their infants. In the ECLS-K study, attrition for the eligible sample at year 8 was 43%, even though 50% of non-English- speaking participants who moved during the elementary grades (an indicator of risk) were declared ineligible.

Of importance, the current study did not exclude students who moved out of one of the participating districts, even if the student moved out of state. Of the students recruited into the current study, 27% moved out of one of the three participating school districts to a non-participating district in the first 5 years of the study, and many children moved multiple times across the 12 years of the study. This level of mobility is comparable to that for the entire school population for the three participating school districts, which averaged 32% mobility during the same period of time according to district records. The extensive efforts to maintain the original study sample resulted in an analysis sample that was substantially similar to the full recruited sample on all demographic and other baseline variables, thereby reducing potential validity threats associated with selective attrition. Another noteworthy aspect of the present study is the meticulous tracking of students who left public school to determine if they were attending or graduated from an accredited private school or had obtained a GED. In the case a student enrolled in another Texas public school or transferred to home schooling or a private school, it is highly likely that our methods would have located them. Only in the case in which (a) a student enrolled in an out-of-state school and neither the parent or the school requested records or notified the former school of the transfer, and (b) the study staff was unsuccessful in efforts to contact the student or parent, would the student be incorrectly classified as a drop out.

Unfortunately, the present sample size limited the ability to test for effects of the grade(s) at which students are retained. Additionally, because students who scored above the median on the school district test of early literacy administered at the beginning of first grade were excluded from the study, our results cannot be expected to generalize to higher-achieving students. Based on prior research documenting a strong association between reading competencies and grade retention (Alexander et al., 2001; McCoy & Reynolds, 1999), we expected that a relatively low proportion of the students who were above the median in literacy would be at a substantial risk of being retained. The propensity score analysis includes the requirement that no student have an estimated probability of being retained of 0.0 or 1.0.

The sample is geographically limited; students were recruited from schools in only one state. Because policies governing both grade retention and high school graduation differ across states, the results may not generalize to states with a different policy context. For example, home schooling comes under the private school exemption of the compulsory attendance law in Texas, and students who leave public school to enroll in private school (including home schooling) are officially considered school transfers rather than school drop outs (Texas Education Agency, 2011, 2014) Importantly, Texas does not require that the parent or school provide evidence of the quality or nature of the private schooling provided to the student, nor does the state monitor the student's attendance or progress in private schools (TEA, 2014). In contrast, in some states (e.g., California), private and home schooling exemptions to the compulsory education law require evidence that the educational program provided to the student meets specific educational requirements (California Department of Education, 2016).

Finally, data on the reasons for which a student leaves school are not available. We hypothesize that the finding that previously retained students leave school at higher rate, and at earlier grades, is due to availability of “exit” strategies such as employment. However, we do not have sufficient data on students' stated reasons for leaving school or employment status at this age to test this hypothesis.

4.2. Implications

4.2.1. Accelerated paths to graduation

Study findings have implications for interventions aimed at increasing school completion rates. When students reach 16 years of age and have at least three additional years of school prior to graduation, leaving school appears to become a more attractive option to previously retained students than to their same-age, promoted peers. If this supposition is accurate, interventions that focus on placing previously retained students on an accelerated schedule to graduate “on time” may improve school completion rates. Given

that previously retained students begin leaving school at the transition to high school (i.e., after grade 8 or 9), credit recovery programs in middle school or high school may occur too late to prevent students leaving school. According to the What Works Clearing House (U.S. Department of Education, Institute of Education Sciences, 2008), accelerated middle school programs have been found to improve students' staying in school and their rate of school progress. Accelerated middle school programs typically are self-contained programs in which courses are thematically linked, instruction is more experiential, classes are smaller, and additional academic and social supports are available. A recent research synthesis study of high school completion programs found strong evidence that programs that include these intervention components can improve high school or GED completion rates, especially among high-risk students (Community Preventive Services Task Force, 2015).

4.2.2. Narrowing the private school and home schooling exemptions

Changing state education policies that enable students to leave school without being in violation of the compulsory education law by claiming the private or home schooling exemption might increase school completion rates. Of the 51 students classified as early drop outs, 12 left school under one of these exemptions and did not return to an accredited school or obtain a GED in the following two years. Students who enrolled in on-line, for-profit unaccredited schools typically discontinued enrollment after one or two semesters. According to Texas Education Agency policies, students who leave school under the private schooling exemption are not considered as having dropped out of school. Each of the three participating school districts, like most districts in Texas, offered a variety of alternatives for students to “catch up” on their credits, receive support for staying in school during and after pregnancy, or attend special campuses that offer a more individualized, smaller context. However, pressures on public schools in Texas to report low dropout rates may serve as a disincentive for schools to encourage low performing students to select these programs over home or private schooling. Students choosing home or private school do not count as “failures” in the state evaluation of the schools.

4.3. Alternatives to grade retention

As stated previously, previous studies with the current sample and other samples have found that grade retention does not impair students' academic achievement, compared to performance of their same age, promoted peers, when they were in the same grade. However, upon reaching grade 9, being one year older than one's same-age continuously promoted peers who were at equivalent initial risk of retention, increases the risk of leaving school early. Given the harm to students and costs to society associated with failure to obtain a high school diploma or GED, alternatives to grade retention are needed for students who struggle to meet minimum grade level competencies in the elementary grades. Multi-tiered models of intervention, often referred to as Response to Intervention, involve a graduated series of evidence-based instruction and intervention to students whose academic progress begins to fall below grade-level expectations (Shinn & Walker, 2010). Elements of Response to Intervention models include a) universal screening for academic, behavioral, and social-emotional difficulties; (b) the provision of early and intensive evidence-based interventions for students with academic or social-emotional difficulties; and (c) frequent progress monitoring and evaluation of interventions. Empirical studies support the efficacy of Response to Intervention models in preventing and remediating the academic difficulties that result in grade retention (Al Otaiba et al., 2014; Clarke et al., 2014).

African American and Hispanic students are more likely to be retained in elementary grades than are White students. During the years study participants were in Grade 1 the mean rates of first grade retention in Texas for White, African American, and Hispanic students were 4.2%, 7.6%, and 7.9%, respectively. Despite ethnic differences in frequency of retention, the estimated causal effect of retention on dropping out of school prior to age 17 did not differ by student ethnicity. Thus, African American and Hispanic students are more likely to be retained in the elementary grades than White students, yet the risk of retention on dropping out of school is similar across ethnic groups These findings suggest that policies that reduce the frequency of grade retention in the elementary grades would be expected to reduce ethnic/racial disparities in dropping out of school.

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Appendix A
List of covariates for propensity score analysis.

	Covariates	Domain/Construct	Source
1	Student Woodcock-Johnson III broad reading standard score	Achievement	Performance
2	Student Woodcock-Johnson III broad math standard score	Achievement	Performance
3	Teacher expected highest level of child's education	Achievement	Teacher
4	Student achievement (teacher-report)	Achievement	Teacher
5	Student universal nonverbal intelligence test score	Cognitive	Performance
6	Student ethnicity (Hispanic vs. White)	Demographic	Archival
7	Student ethnicity (Black vs. White)	Demographic	Archival
8	Student age at eligibility	Demographic	Archival

9	Student gender	Demographic	Archival
10	Student limited English proficiency status	Demographic	Archival
11	Student bilingual class status	Demographic	Archival
12	Student English as second language status	Demographic	Archival
13	Household employment status	Demographic	Parent
14	Household highest level of education	Demographic	Parent
15	Number of children (under age 18) living in household	Demographic	Parent
16	Family adversity	Demographic	Parent
17	Family free/reduced lunch	Demographic	Parent
18	Student language of testing	Demographic	Teacher
19	Parent positive perceptions about school	Home-School	Parent
20	Parent satisfaction with home-school communication	Home-School	Parent
21	Parent perceived parent-teacher shared responsibilities	Home-School	Parent
22	Parent perceived school-based involvement	Home-School	Parent
23	Parent sense of responsibility for child's education	Home-School	Parent
24	Parent perceived teacher responsibility for child's education	Home-School	Parent
25	Parent self-efficacy for helping child in school	Home-School	Parent
26	Home-school alliance	Home-School	Teacher
27	Parent involvement in school	Home-School	Teacher
28	Student academic self-efficacy	Motivation	Child
29	Student Dweck puzzles task choice	Motivation	Performance
30	Student agreeableness (teacher-report)	Personality	Teacher
31	Student's conscientiousness (teacher-report)	Personality	Teacher
32	Teacher-student conflict (teacher-report)	Relation with teacher	Teacher
33	Teacher-student support (teacher-report)	Relation with teacher	Teacher
34	Child attended a Pre-K school program	Remedial Services	Parent
35	Student receives teacher instruction in reduced class size	Remedial Services	Teacher
36	Student receives tutoring by an adult	Remedial Services	Teacher
37	Student receives tutoring by a peer	Remedial Services	Teacher
38	Student receives remedial instruction outside classroom	Remedial Services	Teacher
39	Student receives instruction with an aide	Remedial Services	Teacher
40	Student receives remedial instruction before/after school	Remedial Services	Teacher
41	Student receives 1–1 tutoring by an adult before/after school	Remedial Services	Teacher
42	Student receives individual counseling	Remedial Services	Teacher
43	Student receives speech therapy	Remedial Services	Teacher
44	Student's receives small group tutoring	Remedial Services	Teacher
45	School % mobility	School Risk	Archival
46	School level % free or reduced lunch	School Risk	Archival
47	School level % White school	School Risk	Archival
48	District average literacy score	School Risk	Archival
49	Student inhibitory control	Self-regulation	Performance
50	Student ego control (teacher-report)	Self-regulation	Teacher
51	Student trouble	Social/Behavioral	Sociometrics
52	Student aggression	Social/Behavioral	Sociometrics
53	Student prosocial behaviors	Social/Behavioral	Sociometrics
54	Student ADHD behaviors	Social/Behavioral	Sociometrics
55	Student sad/withdrawn	Social/Behavioral	Sociometrics
56	Student liking by peers	Social/Behavioral	Sociometrics
57	Student social preference by peers (peer-report)	Social/Behavioral	Sociometrics
58	Student ADHD behaviors	Social/Behavioral	Parent
59	Student's prosocial behaviors	Social/Behavioral	Parent
60	Student conduct problems	Social/Behavioral	Parent
61	Student internalizing behaviors	Social/Behavioral	Parent
62	Student school engagement (teacher-report)	Social/Behavioral	Teacher
63	StudentADHD behaviors (teacher-report)	Social/Behavioral	Teacher
64	Student prosocial behaviors (teacher-report)	Social/Behavioral	Teacher
65	Student conduct problems (teacher-report)	Social/Behavioral	Teacher

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