ABSTRACT

Title of Document: EXAMINING THE EFFECTS OF STATE HIGH SCHOOL EXIT EXAM POLICIES ON SELECTED OUTCOMES OF STUDENTS WITH DISABILITIES

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This study had several purposes. The first purpose of the study was to examine the relationship between selected student, family and school characteristics, and state exit exam policies and the impact on graduation from high school among a sample of students with disabilities. A second purpose of the study was to explore the relationship between attending high school in a state that has an exit exam policy and the academic rigor of the coursework, as measured by the highest math course completed, among a sample of students with disabilities. The last purpose of study was to investigate the contribution of attending high school in a state that has an exit exam policy and academic rigor in coursetaking on enrollment in postsecondary education among a sample of students with disabilities. Using binary and multinomial logistic regression, I analyzed data for roughly 1,000 students with disabilities in the Education Longitudinal Study of 2002 (ELS:02).

The findings regarding the effects of state exit exam policies on the selected post-school outcomes of students with disabilities vary. I found that presence of a state exit exam requirement did not significantly predict receipt of a standard high school diploma for a student with a disability in the class of 2004, nor does the requirement predict enrollment in postsecondary education for a student meeting the same criteria. I also found that presence of a state exit exam requirement for the class of 2004 did predict completion of advanced math coursework for a student with a disability, though the same factor did not predict completion of middle academic math coursework for a student meeting the same criteria. Finally, I discuss the implications of these findings on policy and practice for students with disabilities, as well as for future research.

EXAMINING THE EFFECTS OF STATE HIGH SCHOOL EXIT EXAM POLICIES ON SELECTED OUTCOMES OF STUDENTS WITH DISABILITIES

By

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Chapter I

Introduction to the Study

During the 2009-10 academic year, the graduation hopes of millions of students rested on their ability to pass a series of exams. Almost three-quarters of the nation's students were enrolled in schools in states that administered exit exams during the 2009-10 school year, making more students than ever subject to high stakes in education (Center on Education Policy, 2010). High-stakes tests are generally defined as any test in which a student's ability to graduate, be promoted to the next grade level, or be admitted to a particular program is contingent upon the student's test performance (American Educational Research Association, American Psychological Association, & National Council on Measurement in Education, 1999). High-stakes tests have been implemented at all levels of K-12 education, but performance on state-administered tests known as exit exams or graduation exams can determine whether a student receives a diploma. Gaumer Erickson, Kleinhammer-Tramill, and Thurlow (2007) define exit exams as "assessments that require a minimum level of proficiency for graduation and the receipt of a standard or traditional diploma" (p. 117).

Exit exams have become an important and often-debated issue in part because a student's scores have the potential to affect his or her ability to obtain a high school diploma, and subsequently, the student's future education and employment options. Thurlow and Johnson (2000) discussed how the use of high-stakes examinations to determine high school diploma decisions could have lifelong consequences and directly affect a person's future economic independence and well-being, further raising questions about how these assessments can affect students years after they have left school.

Several studies have found that students who do not graduate with a high school diploma experience difficulty in accessing higher education and less economic success, and students with disabilities can be particularly affected by the lack of a standard diploma (Gaumer Erickson & Morningstar, 2009; Gaumer Erickson et al., 2007; Johnson & Thurlow, 2003; O'Neill, 2001; Thurlow & Johnson, 2000).

High-Stakes Testing in the United States

After A Nation at Risk, which was released in 1983 by the National Commission on Excellence in Education (NCEE) (National Commission on Excellence in Education, 1983), caught the attention of the entire country, a number of politicians took an interest in raising academic standards for all levels of education. Goals for Education: Challenge 2000 in 1988 and the national goals from the President's Education Summit in 1989 informed the development of future legislation, including Goals 2000: The Educate America Act (PL 103-227) and the Improving America's Schools Act of 1994 (PL 103-382) (McDonnell, McLaughlin, & Morison, 1997; PL 103-227, 1994; "What is Goals 2000," 1994). Goals 2000 (PL 103-227) was the first federal law to encourage or require large-scale testing of students, and the Improving America's Schools Act of 1994 (PL 103-382) continued to emphasize standards-based reform by requiring states to develop and implement assessments aligned with academic standards (Heubert & Hauser, 1999). With the No Child Left Behind Act of 2001 (NCLB) came greater changes in accountability requirements for states. High school students must now be tested in reading, math, and science at least once between grades 10 and 12, though the law does not require states to use these assessments to inform decisions about graduation (Goertz

& Duffy, 2003; Johnson, Thurlow, Stout, & Mavis, 2007; Katsiyannis, Zhang, Ryan, & Jones, 2007).

State mandated assessments can have low or high stakes depending on the consequences associated with how students perform on the assessments (Goertz & Duffy, 2003). Under Title 1 of the ESEA, each state is required to have developed and approved grade-level content and achievement standards in, at least, reading/language arts, mathematics and science. States may create similar standards in other subject matter areas. In addition, each state must have assessments that are aligned with the standards and which are administered at grades 3-8 and at least once during high school (Goertz & Duffy, 2003). The results of these assessments are used to hold schools and school systems accountable and may also be used in making decisions about promotion, student placement, and even graduation from high school (Goertz & Duffy, 2003; Heubert & Hauser, 1999). According to Goertz and Duffy (2003), these are high stakes tests, The American Educational Research Association, American Psychological Association, and National Council on Measurement in Education (1999) state the following about high-stakes tests:

> When significant educational paths or choices of an individual are directly affected by test performance, such as whether a student is promoted or retained at grade level, graduated, or admitted or placed into a desired program, the test is said to have high stakes (p. 139).

A test that is said to have low-stakes will have "no significant, tangible, or direct consequences attached to the results, with information alone assumed to be a sufficient incentive for people to act" (Heubert & Hauser, 1999, p. 35).

The above definition of high stakes applies primarily to the consequences for individual students, but state assessments can also have high stakes for school systems. The notion of high stakes for schools refers to the use of student test scores or lack of student progress to determine consequences for schools (Goertz & Duffy, 2003). In this case, the system, administration, and teachers are held accountable for their students' inability to meet the performance standards measured by a state assessment (Baker & Linn, 2004). Consequences may include intervention by the state education agency, additional assistance from outside groups, changes in funding levels, replacement of school administration or staff, or even closure (Baker & Linn, 2004; Goertz & Duffy, 2003; Heubert & Hauser, 1999). Therefore, while there is a difference between high stakes for students and high stakes for schools, individual students and the school system are both held accountable for student progress in a true high-stakes environment.

High stakes exit exams. The use of high stakes exit exams began in the 1970s when several states, including Florida, New York, and North Carolina, instituted what were commonly referred to as minimum competency tests (MCTs) to measure whether students had mastered certain basic literacy and numeracy skills before graduating from high school (Bond, Roeber, & Braskamp, 1997; Center on Education Policy, 2009; Heubert & Hauser, 1999; Pipho, 1978). Failing an MCT, which resulted in the inability to earn a high school diploma, was viewed as a sign that a student lacked basic skills necessary to succeed in typical life situations (Benjes, Heubert, & O'Brien, 1980). The MCT movement grew to more than 30 states by the early 1980s (Lerner, 1991; Office of Technology Assessment, 1992; Pipho, 1978).

The use of MCTs as high school exit exams began to decline in the 1990s after A Nation at Risk highlighted the low academic standards in many states and states subsequently implemented more difficult standards-based exams (Holme, Richards, Jimerson, & Cohen, 2010). Thanks to an increased focus on high standards in the last 20 years, most assessments, particularly exams that students must pass before receiving a diploma, have transitioned from testing basic competency skills to testing more complex skills to assess state standards and college and career preparedness (Heubert & Hauser, 1999; Warren, Jenkins, & Kulick, 2006). Over the years, many terms have been used to identify the exams that students must pass before graduating from high school, including high stakes tests or assessments, exit exams, and graduation exams. Therefore, I have used the terms "exit exam" and "graduation exam" throughout the study to refer to high-stakes exams at the high school level.

Overview of Research on High Stakes Graduation Exams

A large body of research has examined factors thought to impact a student's ability to graduate from high school. Research has indicated relationships between high school graduation and specific student and family, school, and graduation exam policy factors. Among the student-level factors found to impact graduation from high school are gender (Ensminger & Slusarick, 1992; Finn, Gerber, & Boyd-Zaharias, 2005), socioeconomic status (SES) or family household income (Borg, Plumlee, Stranahan, 2007; Ensminger & Slusarick, 1992; Finn et al., 2005; Rylance, 1997; Stewart, 2008), and race and ethnicity (Borg et al., 2007; Hickman, Bartholomew, Mathwig, & Heinrich, 2008; Stewart, 2008). Certain academic or social characteristics, including grade point average (GPA), grade retention, number of absences, and aggressive behavior toward

peers, have also been shown to affect a student's ability to graduate (Barrington & Hendricks, 1989; Borg et al., 2007; Ensminger & Slusarick, 1992; Finn et al., 2005; Hickman et al., 2008; Rylance, 1997; Stewart, 2008). Additionally, researchers have found relationships between high school graduation and some family characteristics, including family structure and parental involvement (Astone & McLanahan, 1991; Barrington & Hendricks, 1989; Ensminger & Slusarick, 1992; Stewart, 2008).

School-level factors with a connection to graduation include urbanicity of a school, school enrollment (Finn et al., 2005), and teacher education and experience (Borg et al., 2007). Finally, some research has documented the impact of exit or graduation exams on graduation rates (Jacob, 2001; Marchant & Paulson, 2005; Reardon, Arshan, Atteberry, & Kurlaender, 2010; Warren & Jenkins, 2005; Warren, Jenkins, & Kulick, 2006).

Some recent studies on the effects of exit exams conducted in individual states have also identified differential impacts of these exams on specific student subgroups. For example, Reardon, Attebury, Arshan, and Kurlaender (2009) found that the effects of the California High School Exit Exam (CAHSEE) were more negative on low-performing students, minority students, and females. Papay, Murnane, and Willett (2010) found that low-income urban students who did not pass the mathematics section of the Massachusetts Comprehensive Assessment System (MCAS), which is a requirement for graduation in the state, were more likely to drop out of high school than their peers. Ou (2009) found that New Jersey students of color who barely missed a passing score on the state's High School Proficiency Assessment (HSPA) were more likely than other students to drop out of high school after failing the exam. While all of these studies focus on

particular subgroups of students, none of them address the effects of high-stakes tests on students with disabilities. Thus, while recent research has investigated the influence of exit exam policies on the larger population of high school students as well as certain subgroups of students, we do not know to what extent the same factors may influence high school graduation of students with disabilities.

Importance of a High School Diploma

Recent research has shown that earning a high school diploma has a significant impact on an individual's ability to participate in almost all segments of our present-day society, including the economy, workforce, and citizenry in general (Johnson et al., 2007; O'Neill, 2001). Recent data from the Bureau of Labor Statistics (2010) reveals that the unemployment rate for individuals without a high school diploma was 14.6% in 2009, almost 5 percentage points higher than those with a high school diploma but no college (9.7%). The 2009) median weekly earnings of full-time workers without a high school diploma were also significantly lower than the median weekly earnings of those with at least a high school diploma ($454 per week and $626 per week, respectively) (Bureau of Labor Statistics, 2010).

The effects of having a high school diploma on post-school outcomes are also evident for the population of students with disabilities. Data from the National Longitudinal Transition Study 2 (NLTS2) show that 51% of students with disabilities in the study who completed high school enrolled in some type of postsecondary school while only 18% of students with disabilities in NLTS2 who did not complete high school reported participation in postsecondary education (Newman, Wagner, Cameto, Knokey, & Shaver, 2010). Data from a 2001 survey of high school students in Alabama show that

postsecondary education participation rate of students with disabilities still lags behind the participation rate of students without disabilities, but researchers note that students with disabilities who participate in academically rigorous high school programs that lead to a high school diploma are more likely to enroll in postsecondary training (Chambers, Rabren, & Dunn, 2009). More data on the effects of earning a high school diploma on post-school outcomes of students with and without disabilities is included in Chapter II.

Importance of Rigorous Coursework

Previous research has discussed rigorous curriculum and how it can influence the post-high school options of students with disabilities. Wilson, Hoffman, and McLaughlin (2009) found a relationship between higher levels of math coursetaking and plans to attend a two- or four-year college or university in a group of high school students with disabilities. However, their findings and other national data indicate that students with disabilities do not complete advanced math courses at the same rate as students without disabilities. This suggests that students with disabilities may experience limited access to more rigorous courses, whether it is due to low academic expectations or some other factor (Wilson et al., 2009). The inability to access academic coursework necessary for college and career preparation could lead to decreased post-school opportunities for students with disabilities. Since Wilson et al. (2009) were only able to examine the connections between math coursetaking and plans to enroll in postsecondary education, more research is necessary to determine whether there is a connection between rigorous coursework and the actual rates of postsecondary education enrollment for students with disabilities. More research is also needed to provide insight about whether policies and

practices associated with increased educational accountability have influenced the coursetaking choices and curriculum access for students with disabilities.

Purpose of Study and Research Questions

During the 2009-10 school year, mandatory exit exam policies were in place in more than half of the states in the country, and roughly three-quarters of public school students in the United States attended schools in states that administer high-stakes assessments (Center on Education Policy, 2010). As many states continue to use scores from large-scale assessments to make decisions about graduation and several others decide whether to implement similar policies, it is imperative that they have accurate information and data to guide their decision-making. Therefore, this study had multiple purposes.

The first purpose of the study was to examine the relationship between selected student, family and school characteristics, and state exit exam policies and the impact on graduation from high school among a sample of students with disabilities. The second purpose of the study was to explore the relationship between attending high school in a state that has an exit exam policy and the academic rigor of the coursework, as measured by the highest math course completed, among a sample of students with disabilities. The final purpose of the study was to investigate the contribution of attending high school in a state that has an exit exam policy and academic rigor in coursetaking on enrollment in postsecondary education among a sample of students with disabilities.

Research questions. The following questions guided the study:

Research Question 1: Does attending a high school in a state that reported having an exit exam in 2004 predict high school graduation for a student with a disability, controlling for selected student, family, and school characteristics?

Research Question 2: Does attending a high school in a state that reported having an exit exam in 2004 predict math coursetaking for a student with a disability, controlling for selected student, family, and school characteristics?

Research Question 3: Does attending a high school in a state that reported having an exit exam in 2004 predict enrollment in postsecondary education for a student with a disability, controlling for selected student, family, and school characteristics? What is the contribution of math coursetaking to the relationship between attending high school in a state with an exit exam in 2004 and enrollment in postsecondary education for a student with a disability?

Methodology

To answer these research questions, this study used the Educational Longitudinal Study of 2002 (ELS:2002) dataset. The ELS:2002 is an ongoing, longitudinal study conducted by the National Center for Educational Statistics (NCES) to gain information about the "educational and developmental experiences" (Bozick & Lauff, 2007, p. 1) of secondary school students. The sample is a nationally representative sample of students who were sophomores in high school in 2002 and will be followed longitudinally until 2012. Follow-up data were collected in 2004 and 2006 on high school completion, post-secondary educational experiences, labor force participation, family life, and civic engagement of the students in the study.

In this study, I used a subsample of the ELS:02 data, which included only students with disabilities who were selected from the larger sample of participants. For this subsample of youth, I examined whether the presence of a high school exit exam policy in 2004 predicted high school graduation and enrollment in postsecondary education. In addition, I examined whether other student-level and school-level factors, along with the presence of an exit exam policy in 2004, contributed to attainment of a regular high school diploma in students with disabilities. To gain more information about the characteristics of the students in the study, I first completed an exploratory data analysis. Next, I used binary logistic regression to determine whether high school exit exams predicted receipt of a regular high school diploma and multinomial logistic regression to determine whether high school exit exams predicted math coursetaking. Finally, I used logistic regression to determine whether high school exit exams predicted enrollment in postsecondary education and how math coursetaking contributed to this relationship. A more detailed description of the methodology is included in Chapter III.

Significance of the Study

This study contributes to existing knowledge regarding students with disabilities and high school exit exam policies in several ways. First, the study adds to the current base of research on high school exit exams by analyzing data collected within the last 10 years. Warren, Jenkins, and Kulick (2006) note in their study that most past research on high school exit exams utilized data collected in the 1990s or earlier. Both Jacob (2001) and Warren and Jenkins (2005) used the National Education Longitudinal Study of 1988 (NELS), which collected data on students expected to graduate from high school in 1992. While the results from these studies are informative, they only tell us about the effects of

exit exams on students who graduated in 1992. Most high school exit exams have changed considerably in the last 20 years. In the early 1990s, most exit exams were likely to assess minimum competency of high school students, while exit exams introduced in the last 10 years typically assess rigorous state standards. Additionally, more states have implemented exit exam requirements since the 1990s. Because the studies using NELS data found no effects of exit exams on graduation (Jacob, 2001; Warren & Jenkins, 2005), it was worth investigating whether the subsequent changes in exit exams and state policies have led to changes in the effects of exit exams on high school graduation. This study, which used data collected within the last 10 years, adds to the current base of literature because it investigated the effects of high school exit exams on high school graduation in a more recent population of high school students.

Next, this study also adds to the current base of research on students with disabilities by specifically focusing on this subsample within ELS:02. As noted earlier in this chapter, recent research has been published regarding the effects of high school exit exams on graduation in other subgroups of students. However, no existing research addressed the effects of high school exit exams on graduation in students with disabilities. In fact, some past studies excluded students with disabilities entirely. Additionally, no existing research explored the potential connection between high school exit exams and enrollment in postsecondary education of students with disabilities. Addressing the connection between exit exams and these outcomes in students with disabilities in the study provides insight into the ways a state policy could impact the lives of students with disabilities beyond the high school years. Finally, the exploratory data analyses in the study offer a look at the characteristics of students with disabilities in

ELS:02, including the characteristics of students who live in states with and without a high school exit exam policy. Overall, this study provides insight into students with disabilities in ELS:02 and increases understanding of the implications of a state exit exam policy on certain student outcomes in students with disabilities.

Definition of Key Terms

Accountability: With regards to education, the practice of holding school systems, schools, administrators, teachers, and students responsible for the academic performance of students.

Alternate diploma: A credential issued by a high school to a student who does not or is unable to complete all academic requirements for graduation. Includes certificates of completion, certificates of attendance, special education or IEP diplomas, occupational diplomas, vocational diplomas, and modified diplomas. Also referred to as a "non-standard" diploma.

Common Core State Standards: A state-led initiative to develop and adopt a set of rigorous K-12 standards in English Language Arts and Mathematics that is coordinated by the National Governors Association (NGA) and the Council of Chief State School Officers (CCSSO).

Education Longitudinal Study of 2002 (ELS:02): A longitudinal study that monitors the transition of a nationally representative sample of youth as they progress from 10th grade through high school and on to postsecondary education and/or employment.

Elementary and Secondary Education Act (ESEA): Federal legislation that funds elementary and secondary education in the United States and emphasizes equal access to education for all children.

End-of-course exam: A standards-based exam that is aligned with the content of a specific high school level course. This exam is taken after a student completes the course being assessed.

Exit exam: An exam or assessment that requires a student to achieve a certain score or level of proficiency to graduate from high school and earn a standard or traditional diploma. Also referred to as "high school exit exam" or "graduation exam".

High school diploma: A credential awarded by a high school after successful completion of academic requirements. This credential can be used to gain entry to postsecondary education or as a qualification for employment. Also referred to as a "standard" or "regular" diploma.

High school graduation: The process by which an individual successfully meets all requirements for completion of high school and is granted a diploma.

High-states test: An assessment in which results can affect a student's ability to graduate, be promoted to the next grade, or attain admission to a program. These tests can also have high stakes for schools and school systems in that teachers and administrators can be held accountable for the performance of their students and can lead to sanctions for the school or district.

Individuals with Disabilities Education Act (IDEA): Federal legislation that outlines the requirements for providing special education to students with disabilities.

Minimum competency test/exam (MCT/MCE): A test designed to assess the minimum competency of high school students that typically assesses knowledge and skills below the high school level.

The No Child Left Behind Act of 2001 (NCLB): The 2001 reauthorization of ESEA that emphasizes high standards and accountability in public schools.

Post-school outcomes: Goals and achievements expected after graduation from or completion of high school, including postsecondary education, employment, independent living, and community involvement.

Postsecondary education: Education pursued after graduating from or completion of high school. This can include education in the following settings: colleges, universities, technical schools or colleges, trade schools, and vocational programs.

Standards-based exam: An assessment that is aligned with state standards and typically assesses high school-level knowledge and skills.

Standards-based reform: An education reform movement that calls for student performance to be measured against a set of rigorous academic performance standards.

Student with a disability: A student who receives special education services and has a disability as defined in IDEA, including: autism, deaf-blindness, deafness, hearing impairment, intellectual disability, multiple disabilities, orthopedic impairment, other health impairment, emotional disturbance, specific learning disability, speech or language impairment, traumatic brain injury, visual impairment, or developmental delay.

Chapter II

Review of the Literature

High school graduation is a transformative event in an adolescent's life. Once a person attains this level of education, he or she is able to pursue further education or obtain a more lucrative job. Failing to earn a diploma can also have long-term economic effects on a person's life. Data collected by the Bureau of Labor Statistics (BLS) show that people who did not graduate high school made up only 8% of the working population in 2009 (Bureau of Labor Statistics, 2010). Additionally, BLS data showed that people without high school diplomas were more likely to be unemployed than people with high school diplomas, and earn less money per month on average than high school graduates (Bureau of Labor Statistics, 2010).

A number of hurdles must be crossed to obtain a high school diploma. Certain coursework requirements must be fulfilled, attendance requirements must be satisfied, and increasingly in some states, high school examinations must be passed. Twenty-five states required students to pass an exit exam before earning a high school diploma during the 2009-2010 school year, and three more states plan to implement this requirement before 2012 (Center on Education Policy, 2010).

Graduation rates and drop out rates. The National Center for Education Statistics (NCES) reports that 74.7% of public school students who began their freshman year of high school in 2004 graduated with a regular diploma within four years (NCES, 2010). Some students, however, will not be successful in their pursuit of a high school diploma. The national high school dropout rate has declined over the last 30 years from 14% in 1980 to 8% in 2009, but students from low-income families and Hispanic

students are more likely to drop out of high school than their peers (NCES, 2010). Additionally, graduation rates for students with disabilities have been substantially lower than the graduation rates of their peers in the general student population. Recent national data analyzed by NCES shows that 59% of students served under IDEA who exited school during the 2007-08 school year graduated with a regular diploma, 24.6% are believed to have dropped out, and 16% received a non-standard diploma or reached maximum age without graduating (NCES, 2010). With so many students still failing to obtain a diploma, we must review relevant literature to learn more about which factors may contribute to successful completion of high school. Relevant literature on post-school outcomes will also show the long-term consequences of leaving high school without a diploma, including the inability to access higher education and an increased risk of poor economic outcomes.

This chapter draws upon existing literature and policy to examine the effects of exit exam policies for all high school students, including those with disabilities, and predictors of high school graduation. The chapter is divided into the following main sections: a) search procedures; b) overview of policy and legal considerations of exit exams; c) high-stakes graduation assessments; d) history and legality of high school exams and standards-based accountability; e) how national policies and initiatives are influencing and informing the current state of exit exams; f) measuring high school graduation; g) high school diplomas and post-secondary outcomes for all students as well as students with disabilities; and h) critical review of quantitative research studies.

Search Procedures

Two bodies of literature were examined: policy and reports and empirical studies. The articles, reports, federal policy, and other literature on high-stakes testing and graduation that are included in this chapter were identified in a variety of ways. First, electronic searches for literature on high-stakes testing were conducted using EBSCO, ERIC, and PsychINFO, using the descriptors "high stakes testing" (searching all article text) and "students with disabilities" (searching all subject terms). I did not use "graduation" or "high school diploma" as descriptors during this search because I was looking specifically for documents that would give me more information about high-stakes testing and students with disabilities. Because this particular search yielded almost 200 articles, it was necessary to sort them by relevance and identify articles that were the most pertinent to my topic. I did this by reading abstracts and looking at subject terms and keywords in the article listing. Articles on the use of accommodations on high-stakes assessments, test subject matter, test-taking skills, and study skills were not included in this review because examination of these topics were not included in the study. A total of 12 articles were identified through this search and included empirical research, literature reviews, and position papers. Approximately 20 additional relevant articles, reports, books, and other documents were identified through ancestral searches of these articles. I also conducted a separate electronic search for literature regarding minimum competency testing in the 1970s and 1980s and students with disabilities. For this particular search, I searched EBSCO using the descriptors "minimum competency testing" (searching all article text) and "special education" (searching all subject terms). This search yielded 10 articles that discussed minimum competency testing of students with disabilities during

the specified time period. Finally, a search of relevant websites was conducted, including: the U.S. Department of Education (more than five reports, memos, and press releases), the National Center on Educational Outcomes (NCEO) (more than five reports), Wrightslaw (information about legal decisions), the Library of Congress (THOMAS), the National Longitudinal Transition Study-2 (NLTS2) (three reports), the Center on Education Policy (CEP) (four reports), and the Manhattan Institute for Policy Research (MI) (one report). The reports and publications that were identified through this search are reviewed in the following sections: overview of policy and legal considerations of exit exams; high-stakes graduation assessments; history and legality of high school exams and standards-based accountability; how national policies and initiatives are influencing and informing the current state of exit exams; measuring high school graduation; and high school diplomas and post-secondary outcomes.

I also conducted an additional search specifically to identify any empirical research that identified predictors of high school graduation. The purpose of this was to explore the factors that potentially affect a student's ability to earn a high school diploma, and more specifically, to find out if any past research had identified exit exams as a factor. I used several methods to find the 13 empirical articles that I reviewed in the final section of this chapter. I began by conducting electronic searches in EBSCO and ERIC, using various combinations of the following descriptors: "high school graduation", "high school academic achievement", and "predictors". These searches yielded fewer than 30 unique articles, only one of which was within the scope of this review. The remainder of the articles that were identified through these searches were not appropriate for the critical review because they did not include high school graduation as a dependent

variable. A subsequent search of "high school diploma" and "predictors" yielded no studies. My next step was to conduct an electronic search through Google, using the descriptor "predictors of high school graduation", in an attempt to find other existing empirical reports, and subsequently identify references used in those reports that might be relevant to my methodological review. I identified reports from the California Dropout Research Project that focused on predictors of high school graduation. I was able to identify three empirical articles that were relevant to the topic of this paper through this method. I then conducted ancestral searches of those three articles in EBSCO. Many of the articles yielded through this search were not empirical studies and did not include high school graduation as a dependent variable, and thus were eliminated. I selected the six remaining articles for review after reading abstracts of the articles identified through ancestral searches. These articles likely did not show up in the initial EBSCO searches due to differences in search terms and keywords. Finally, three additional articles were identified through manual searches of *Educational Evaluation and Policy Analysis*, a journal whose articles were excluded from the results of my initial EBSCO searches.

I aimed to include only articles that listed high school graduation as a dependent variable. My original intention was to exclude articles about predictors of dropping out of high school, as this is not the topic of this review, but as I conducted my literature search, I found several excellent articles that discussed predictors of high school graduation compared with predictors of dropping out of high school. I chose to include these studies, as they did have high school graduation as a dependent variable, but will focus primarily on the results that relate to high school graduation and completion. Studies that focused solely on predictors of dropping out of high school are not included

in this review. While I did not specifically limit by search to those that included students with disabilities, I was of course most interested in those studies and their findings. The study by Rylance (1997) includes only students identified with severe emotional disturbance, and two other studies (Barrington & Hendricks, 1989; Marchant & Paulson, 2005) include special education referral or IEP status as an independent or control variable.

Overview of Policy and Legal Considerations of Exit Exams

In order to better understand students with disabilities and high-stakes exit exams, it is important to review the policies and laws that established educational accountability for all students in the United States, as well as those policies that established inclusion in accountability systems for students with disabilities. Many states began to hold their students to higher educational standards before federal legislation was passed in 1994. Goals 2000: The Educate America Act first mentioned the use of large-scale assessment as a way of measuring progress toward educational goals, and it started a movement that was continued by future legislation. With regards to students with disabilities, the 1997 amendments to the Individuals with Disabilities Education Act (IDEA) first made it a requirement for states to include students with disabilities in state and local assessments, but the 2004 reauthorization of IDEA further raised expectations for these students by alignment with the No Child Left Behind Act (NCLB) and requiring states to include them in state accountability systems (Zhang, Katsiyannis, & Kortering, 2007).

Goals 2000: Educate America Act of 1994. Congress enacted the Goals 2000: Educate America Act in 1994 (PL 103-227) as a response to the six national education goals developed at the President's Education Summit in 1989 (McDonnell, McLaughlin,

& Morison, 1997; PL 103-227, 1994; "What is Goals 2000," 1994). The legislation allowed the federal government to award grants to states that established plans for implementing performance standards and developing statewide assessments that accommodated all students (Gronna, Jenkins, & Chin-Chance, 1998; PL 103-227, 1994; "What is Goals 2000"). Goals 2000 also specified eight National Education Goals that were to be met by the year 2000. Six of these goals were based on the ones developed in Charlottesville, and included goals to increase the national high school graduation rate to 90% and for students in 12th grade to have been deemed competent in a variety of subjects like English, math, and science (PL 103-227, 1994; "What is Goals 2000", 1994).

Goals 2000 was the first federal law to encourage or require large-scale testing of students (Heubert & Hauser, 1999). One important part of the law to note is its emphasis on providing access to standards and curriculum to all students, including students with disabilities (PL 103-227, 1994). The law did state that, with regards to large-scale assessments, states should "provide for the participation in such assessments of all students with diverse learning needs; and the adaptations and accommodations necessary to permit such participation" (PL 103-227, sec 301 [9cBIIIaa-bb], 1994), but Goals 2000 did not go so far as to provide any specific directives on how states and schools should go about including students with disabilities in assessments (McDonnell et al., 1997).

1994 ESEA reauthorization: The Improving America's Schools Act. The Improving America's Schools Act (ESEA, PL 103-382) built upon Goals 2000 and the education reform efforts of the previous years and instituted new accountability requirements (Heubert & Hauser, 1999). This reauthorization to the Elementary and

Secondary Education Act in 1994 called for states to develop their own assessments aligned with state standards for content and performance specifically for Title I students. States were required to develop and set these standards by the 1997-98 school year, and begin using their assessments by the 2000-01 school year. The law stated that the purpose of this change was "to enable schools to provide opportunities for children served to acquire the knowledge and skills contained in the challenging content standards and to meet challenging state performance for all children" (Improving America's Schools Act, 20 U.S.C. section 6301(d), 1994). Like Goals 2000, states were required to ensure that assessments allowed the use of "reasonable adaptations for students with diverse learning needs" (National Research Council, 1996, p. 1-2), but there were still questions about how students with disabilities would be included in the new tests (Heubert & Hauser, 1999; Thurlow, 2004).

Students with disabilities: Pre-1997 IDEA Amendments. Prior to the passage of the 1997 Amendments to IDEA, widespread exclusion of students with disabilities from statewide accountability systems was the norm (Hehir, 2005). However, a few states took the initiative before the federal requirement took effect, and began implementing policies that included students with disabilities in their state assessments (Hehir, 2005; Koretz & Barton, 2003). In 1993, four years before the federal requirement was enacted, Massachusetts adopted inclusive policies for assessing students in this subgroup (Hehir, 2005). The Education Reform Act of 1993 required participation of all students, including students with disabilities, in the Massachusetts Comprehensive Assessment System (MCAS) (Massachusetts General Laws, 1993).

A few other states were taking steps to include students with disabilities in their state assessments, through both the regular administration of their tests and alternate assessments, before the 1997 amendments were passed (Koretz & Barton, 2003; McDonnell et al., 1997). For example, Kentucky reported that they administered alternate portfolio assessments to only 1% of students in the state and included all others, including students with disabilities, in state assessments, while schools in North Carolina faced consequences if they excluded more than 5% of students from state assessments (McDonnell et al., 1997). Additionally, Kentucky, Indiana, and Maryland reported that at least 75% of students with disabilities in their states participated in statewide assessments in 1992 (Shriner & Thurlow, 1994).

1997 IDEA Amendments. On June 4, 1997, President Bill Clinton signed the IDEA Amendments of 1997 into law. President Clinton heralded the near unanimous support of the bill and acknowledged the parties involved in its creation, including Congress, the Department of Education, parents, educators, advocacy organizations, and other stakeholders in the disability community (Woolley & Peters, n.d.). This legislation, which included new provisions related to the accountability of students with disabilities, was a long time coming for many who believed that this group of students did not receive equal access to education.

Special education stakeholders and researchers described the IDEA Amendments of 1997 as the most significant amendments added to the law since its inception in 1975 (Yell & Shriner, 1997). As previously mentioned, these amendments first required states to include students with disabilities in state and district-wide assessments (Zhang et al., 2007). Section (612)(a)(17), paragraph (1)(A) of the amendments state, "children with

disabilities are included in general State and district-wide assessment programs, with appropriate accommodations, where necessary." The amendments included a number of new accountability provisions, requiring states to create performance goals and indicators for students with disabilities, and mandating that states and local districts report the progress toward meeting these goals as well as the performance of students with disabilities on these assessments to the public and federal government in a transparent manner (IDEA 1997, Section 612(a)(17)(B); McLaughlin & Thurlow, 2003).

Researchers and government officials explained the inclusion of these new amendments as being important in defending the rights of children with disabilities and keeping expectations high for this group of students (Thurlow & Johnson, 2000; U.S. Department of Education, 2000). For example, an August 24, 2000 memorandum from the Office of Special Education Programs (OSEP) in the U.S. Department of Education suggested that because certain benefits result from participation in assessments, excluding students with disabilities may actually violate Section 504 of the Rehabilitation Act of 1973 (Section 504) and Title II of the Americans with Disabilities Act of 1990 (ADA). The memo also stated that students with disabilities should not participate in state and district-wide assessments "just for the sake of participation", but to ensure continued access to the general curriculum and create "high education expectations for all children and accountability for the educational results of all students" (pp. 2-3). These new requirements were viewed by many to be a step forward for students with disabilities because they would now be held to the same standards as students without disabilities and would be able to benefit from increased access to the general curriculum and

improved instruction as teachers would now be responsible for teaching them the material covered on these exams (McDonnell et al., 1997; Thurlow & Johnson, 2000).

2001 ESEA reauthorization: The No Child Left Behind Act. The 2001 reauthorization of the Elementary and Secondary Education Act, or NCLB, greatly changed the accountability requirements for schools across the United States (McLaughlin & Thurlow, 2003). NCLB initially required states to test high school students in reading and math at least once between grades 10 and 12, and added science testing requirements for high school students during the 2007-08 school year (Goertz & Duffy, 2003; Johnson, Thurlow, Stout, & Mavis, 2007). It should be noted that while NCLB does require states to test students and assess the rigorous performance standards they must establish under the same law, states are not mandated to use these assessments to make decisions about graduation, which would classify them as having high stakes for students (Johnson et al., 2007; Katsiyannis, Zhang, Ryan, & Jones, 2007). The law does, however, impose high stakes on systems, as states and districts are also required under the law to include graduation rate in adequate yearly progress (AYP) calculations, and the graduation rates of all subgroups, including students with disabilities, must also be included (Johnson et al., 2007). Schools that fail to make AYP face consequences that include allowing students to transfer to other schools, offering supplemental educational services provided by an outside organization, replacing staff and other corrective actions, and ultimately, restructuring the school (Goertz & Duffy, 2003).

The 2001 reauthorization of ESEA greatly increased the emphasis on accountability for all students, including those with disabilities (Thurlow, 2004). Including students with disabilities in assessments and accountability systems has a

number of benefits, including increased educational expectations for these students (McDonnell et al., 1997). However, soon after NCLB's accountability provisions were implemented, a large number of schools failed to make AYP solely because of the performance of students with disabilities (Center on Education Policy, 2009a). Because of this, the U.S. Department of Education made the decision to change policies and allow exceptions for certain groups of students with disabilities in 2003 and 2005. The 2003 exception, often referred to as the 1% rule, allowed schools to test students with the most significant cognitive disabilities using alternate assessments tied to alternate standards, and school districts were allowed to count no more than 1% of the passing scores from these assessments toward their AYP calculations.

A second exception was introduced in 2005, often referred to as the 2% rule, in which schools were allowed to administer alternate assessments tied to alternate standards to students other than those with significant cognitive disabilities. As with the previous exception, school districts were allowed to count no more than two percent of the passing scores on these assessments toward their AYP calculations. In 2007, new regulations related to the two percent rule were introduced and states were given the ability to create and implement an alternate assessment based on modified standards. States were not required by NCLB to offer this new type of assessment, and as of 2009, it had not proved to be a popular option as only eight states offered the alternate assessment based on modified standards (Albus, Lazarus, Thurlow, & Cormier, 2009). In March 2011, U.S. Secretary of Education Arne Duncan announced that the Department of Education would no longer support the two percent rule, explaining that the policy masks student performance and weakens accountability (U.S. Department of Education, 2011).

Duncan also stated that no replacement policy would be issued, and that this would raise educational expectations for students with disabilities (U.S. Department of Education, 2011).

2004 IDEA reauthorization. The 2004 reauthorization of IDEA continued to include amendments requiring states to include students with disabilities in state and district-wide assessments (Katsiyannis et al., 2007). This reauthorization differed from the 1997 amendments in that provisions were included in 2004 to align IDEA with NCLB. These provisions included several new requirements for states, like establishing goals for the performance of students with disabilities that match with the state's definition of AYP and monitoring graduation and dropout rates. This alignment also included requirements for alternate assessments to be aligned with state academic achievement standards or alternate standards if a state has developed them under NCLB regulations.

High-Stakes Graduation Assessments

As noted earlier, the federal legislation and much of the state reform activities have focused on K-12 assessments which are used most commonly for school and system accountability and do not require that states institute graduation assessments. Some recent data suggest that students with disabilities are achieving higher scores on these state assessments (Center on Education Policy, 2009b). It is important to distinguish between those high-stakes assessments that are used for school and system accountability and those used to determine whether a student graduates from high school. It is also important to understand how high school exit exams differ from other forms of high-stakes assessment as well as their characteristics. Finally, it is important to have

information about how the exams are being implemented to better understand how they might be affecting all high school students as well as smaller subgroups such as students with disabilities.

Types of high-stakes exit exams. States use several types of tests as high school exit exams. One type of exam, the minimum competency test (MCT), has been used since the 1970s and is designed to be a single test that measures whether students have "mastered the basic skills that should be required of a high school graduate" (Heubert & Hauser, 1999, p. 163), and often focuses on skills taught before high school (Center on Education Policy, 2008). Because of a shift to standards-focused accountability in recent years, most states have since transitioned to different forms of assessment, and only one state, New Mexico, utilized MCTs as a mandatory exit exam during the 2010-11 school year (Center on Education Policy, 2008; Center on Education Policy, 2010; Heubert & Hauser, 1999).

Other states with mandatory exit exams utilize comprehensive or end-of-course (EOC) exams (Center on Education Policy, 2010). A comprehensive assessment typically assesses the state standards of several academic subjects in a single test, and is administered to all students at a specific grade level, regardless of their course enrollment (Center on Education Policy, 2008; Center on Education Policy, 2010). As a result, some students may be tested on material that has not been taught in their current courses and their performance may not be an accurate portrayal of their knowledge (Center on Education Policy, 2010). Comprehensive exams may also be described as standards-based exams, or SBEs, due to their alignment with a state's academic standards (Center on Education Policy, 2004). In contrast, EOC exams are administered upon completion

of courses like Algebra, Biology, and American history, and assess mastery of material taught only in those courses. New York was one of the first states to use rigorous EOC exams to make decisions about graduation and other states, including Virginia, soon followed (Heubert & Hauser, 1999). A 2008 report by the Center on Education Policy found that five states had already implemented EOC exams or planned to move from comprehensive exams to EOC exams in the coming years. In 2010, the Center on Education Policy confirmed that this movement to EOC exams is continuing. Seven states required students to pass these exams to receive a diploma in 2010, and the organization identified 10 other states that intend to implement EOC exams as a graduation requirement in future school years (Center on Education Policy, 2010).

The importance of high-stakes exit exams. One of the reasons why high-stakes tests are such an important and often controversial issue is because a student's scores have the potential to affect his or her life after high school. Thurlow and Johnson (2000) noted, "the use of exit exams to determine whether a student earns a high school diploma…has lifelong consequences and directly affects an individual's economic self-sufficiency and well-being as an adult" (p. 307). Earning a high school diploma is essential for students who want to attend college, and is typically required before an individual can enter the military or begin a career. When a student does not pass a state's exit exam or pass a modified or alternate exam, states will often award the student a non-standard diploma, such as a certificate of completion or a special education diploma, instead of a standard high school diploma. Benjes, Heubert, and O'Brien (1980) explained that employers and university admissions officers viewed MCT failure and the resulting denial of a high school diploma as an implication "that the student in question

lacks the basic skills necessary in everyday life situations or has not been able to master his course materials" (p. 558). A sort of social stigma against non-standard diplomas continues, according to Gaumer Erickson and Morningstar (2009), who found that postsecondary options were significantly limited for those students who received alternate exit documents. Other research has shown that there is a large gap between the hourly earnings of those with high school diplomas and those who lack a diploma (O'Neill, 2001). Further research and data on post-graduation outcomes will be presented later in this chapter.

History of High School Exams

Some states began using exams to make decisions about graduation in the late 1960s and early 1970s (Thurlow & Johnson, 2000). North Carolina, New York, and Florida were among the first states to administer MCTs during these years (Center on Education Policy, 2009). Initially, many states were startled by the idea of testing for competency before awarding a diploma, and only a few additional states, including California and Oregon, had instituted MCT requirements by 1976 (Pipho, 1978). However, the use of MCTs quickly gained momentum between 1976 and 1985 and primarily tested literacy and numeracy skills (Bond, Roeber, & Braskamp, 1997; Heubert & Hauser, 1999; Pipho, 1978). In fact, Pipho (1978) says that every state had either mandated MCTs or was considering instituting testing by March 1978. In many cases, legislation mandating MCTs was adopted quickly and with little consideration about how the tests would be developed and implemented (Pipho, 1978). By the early 1980s, more than 30 states required students to participate in MCTs (Lerner, 1991; Office of Technology Assessment, 1992; Pipho, 1978).

The United States entered a new era of education reform in 1983 when the National Commission on Excellence in Education (NCEE) released its highly visible report, A Nation at Risk. The report alleged that low academic standards in American education were causing students to graduate from high school without the basic skills necessary to compete with students from other countries (National Commission on Excellence in Education, 1983). A Nation at Risk triggered the standards-based reform movement by recommending higher, more rigorous academic standards in all levels of education (McLaughlin & Thurlow, 2003; McLaughlin, 2010). This report, as well as others expressing concern about the state of education in the United States, led to an increased interest in educational reform, especially among several governors of southern states, including Bill Clinton of Arkansas, Lamar Alexander of Tennessee, and Richard Riley of South Carolina (Vinovskis, 1999). In October 1988, these governors, along with other legislators and education stakeholders who were members of a long-standing regional organization called the Southern Regional Education Board (SREB) released Goals for Education: Challenge 2000. These 12 goals aimed at meeting or exceeding national standards for education by the year 2000, and aspired to ensure that schools took steps to decrease dropout rates and increase the percentage of adults with a high school diploma to 90%, among other goals.

This action, along with a focus on education reform in the 1988 presidential election, led to the President's Education Summit, which was held in Charlottesville, VA in September 1989. The historic meeting, which was attended by then President George H.W. Bush and the governors of all 50 states, inspired the creation of six national education goals, including increasing the nation's high school graduation rate to 90

percent or better, assessing student performance in critical subjects at regular intervals and moving American students to the top achievers on international math and science assessments by the year 2000 (Bush, 1990).

During the 1995-96 school year, 17 states used high school exit exams to determine eligibility for graduation (Bond et al., 1997). Most of these states were in the southern and eastern regions of the United States. The national picture of education reform began to shift again in the mid-1990s when standards-focused legislation like Goals 2000: The Educate America Act and the Improving America's Schools Act of 1994 were passed. The format of state assessments changed accordingly, with many states moving from MCTs to exams aligned with rigorous academic standards (Fuhrman, Goertz, & Duffy, 2004; Heubert & Hauser, 1999). The number of states requiring passage of an exam to receive a high school diploma increased steadily between 1996 and 1998, and by the year 2000, 22 states had implemented or planned to implement tests that had high stakes for students (Johnson et al., 2007; Thurlow, 2000).

Exit exams and students with disabilities. As the MCT movement grew in the 1970s-80s, so did the questions about including students with disabilities in the exams (Johnson et al., 2007). While legislation such as Goals 2000 and the Improving America's Schools Act required that all students should be included in state assessments, states were left to decide whether this group of students would be required to fulfill the test requirement prior to 1994. Before this legislative action occurred, many states excluded students with disabilities from these tests altogether, and even after the federal government emphasized providing access for all, students with disabilities were still excluded from assessments because there was no specific federal policy regarding the

inclusion of students with disabilities. Other states decided to establish different standards for the assessment of these students, modify the testing procedures, use a student's IEP as the standard for graduation, or allow no modifications at all (Wildemuth, 1983).

A study by Smith and Jenkins (1980) collected information from 25 states about policies regarding inclusion of students with disabilities in MCTs in the early years of competency testing requirements. They found that policies, as reported in June/July 1978, were not consistent from state-to-state, with some states developing separate diplomas for students with disabilities who did not pass MCTs (Arizona, Delaware, Florida, Maine, and Tennessee), others allowing local school districts to determine the involvement of students with disabilities (California, Colorado, Oregon, Utah, and Wyoming), and one state developing a modified MCT for students with disabilities (Kansas). Ten states had not yet established policies regarding the inclusion of students with disabilities when surveyed, but none of the 25 states in the study allowed schools to waive MCT requirements for students with disabilities (Smith & Jenkins, 1980). It is important to note that the researchers sent surveys to eight other states that had instituted MCTs as a graduation requirement, but they did not respond, so it is possible that some students with disabilities were excluded from MCTs.

Several researchers discussed issues related to the inclusion of students with disabilities in MCTs in a November 1980 issue of *Exceptional Children* dedicated to the topic. Olsen (1980) and McCarthy (1980) both discussed the role of a student's IEP goals in the MCT era, and whether these goals should still be used to determine graduation eligibility for students with disabilities when tests are used to determine

competence for all other students. Ross and Weintraub (1980) expressed the need for flexible, realistic, and equitable graduation requirements for all students, especially those with disabilities.

A few years later, McKinney (1983) detailed the performance of students with disabilities on North Carolina's fall 1978 MCT, which was administered to 11th grade students and included reading and math tests. The state excluded any student who was diagnosed with a "severe" intellectual disability, allowed modified test administration for other students enrolled in special education programs, and gave parents of students with disabilities the ability to request exemptions for their children. Students with disabilities who were granted an MCT exemption were not eligible for a standard high school diploma, and received a certificate instead (McKinney, 1983).

Passage rates for the 3,043 students with disabilities who participated in the exam were broken down into disability categories. Students described as being "educable mentally handicapped" had the lowest passage rate, with only 12% of students in this group passing the reading test, 7% passing the math test, and 5% passing both exams (McKinney, 1983). Students with visual impairments had the highest passage rate, with 92% of students in this group passing the reading test and 88% passing the math test. McKinney (1983) found that students described as being "educable mentally handicapped" were more likely to pass MCTs if they received test modifications. The author also found a relationship between race and frequency of passing, stating that African-American students with disabilities were less likely to pass MCTs than Caucasian students with disabilities (McKinney, 1983).

Relevant litigation and exit exams. Over the years, a number of court cases have challenged the practice of using statewide exams in making decisions about graduation. One of the first and most prominent court cases to challenge mandatory statewide competency testing was *Debra P. v. Turlington* (1981). A group of African-American students challenged the use of Florida's State Student Assessment Test as a requirement for a high school diploma, citing lack of adequate notice of graduation requirements and past segregation of schools as affecting the students' ability to pass the exam. In this case, the students and their parents prevailed. The court ruled that sufficient notice, determined by the judge to be at least four to six years, was not provided in this situation, and that students were not allowed a reasonable amount of time in which to prepare for the test. The court also ruled that diplomas could not be withheld from any students until Florida was able to demonstrate that the test was actually assessing what was taught by the school's curriculum, and that any "racially discriminatory impact" was not the result of past segregation in the school system (*Debra P. v. Turlington*, 1981; Heubert & Hauser, 1999; Katsiyannis et al., 2007).

A second court case on the legality of using exit exams to make graduation decisions also drew attention as states began to institute certain diploma requirements. *Board of Education of the Northport-East Northport Union Free School District v. Ambach*, Case No. 83-1183 (1981) questioned the legality of requiring students with disabilities to pass state exit exams before graduating. The New York Board of Regents announced in 1976 that, beginning with the class of 1979, all students would be required to pass the state's Basic Competency Test or Regents exam in both English and mathematics to obtain a high school diploma (T.M., 1984). Abby, a 20-year-old student

with a neurological impairment, and Richard, a 21-year-old student with an intellectual disability, were recommended for graduation by Northport-East Northport after both students successfully completed their IEPs, despite the fact that neither student passed both required exams. The New York commissioner of education, Gordon Ambach, subsequently revoked the students' diplomas after learning that neither had fulfilled the state's requirements. The school district appealed the decision, stating that the denial of diplomas constituted a denial of FAPE, violated Section 504 of the Rehabilitation Act of 1973, and deprived the students of future opportunities such as gainful employment. The New York Supreme Court ruled in favor of the state, stating that students do not have a right to a diploma, and that the state of New York "has a legitimate interest in attempting to insure the value of its diplomas and to improve upon the quality of education provided" (*Northport-East Northport v. Ambach*, 1981, para. 17). Additionally, the Court did not agree that the denial of diplomas was a violation of Section 504, stating that the law "does not guarantee that [a student with a disability] will successfully achieve the academic level necessary for the award of a diploma" (*Northport-East Northport v. Ambach*, 1981, para. 19). The school district later requested that the United States Supreme Court review the ruling, and the Justices of the nation's highest court declined to hear the case in March 1984 (T.M., 1984).

Shortly thereafter, *Brookhart v. Illinois State Board of Education* (1983) also addressed the involvement of students with disabilities in high-stakes exit exams. Of specific interest was whether denial of diplomas to 14 students with disabilities who did not pass the state's exit exam violated the students' right to a free appropriate public education (FAPE) and other rights under IDEA and Section 504. The parents of the

students who were denied diplomas believed that the right to FAPE was greater than any other state or local standard set for all students, including graduation requirements, and that the students were entitled to diplomas for completing the goals listed in their IEPs. The court ruled in favor of the school district, saying that states have the right to establish their own standards, such as graduation standards, and that, therefore, denying diplomas was not a violation of IDEA or FAPE. However, while the court did decide that students with disabilities should be held to the same standards as students without disabilities, it did recognize the importance of providing adequate notice and opportunities for the students in question to prepare for the test (*Brookhart v. Illinois State Board of Education*, 1983; Katsiyannis et al., 2007).

Almost twenty years later, another group of students with disabilities challenged the use of high-stakes tests. In this case, *Rene v. Reed* (2001), a group of Indiana students with disabilities, including a nineteen-year-old honor student named Megan Rene, argued that they had not been given sufficient notice of the State's new Graduation Qualifying Examination (GQE), and subsequently, had not been able to adequately prepare for the test. They felt they should be exempt from taking the GQE, as it violated their rights under IDEA and the Fourteenth Amendment. The court upheld past decisions and ruled in favor of the State, stating that the more than three years notice the students had been given constituted adequate notice, and that the students had been given multiple opportunities "to learn and master the proficiencies" included in the GQE. Additionally, the court noted that accommodations for cognitive disabilities listed in a student's IEP and used during regular classroom instruction and activities do not necessarily have to be

observed during statewide accommodations, especially if they would substantially affect a student's results (Katsiyannis et al., 2007; *Rene v. Reed,* 2001).

There have been more court cases involving high-stakes testing and students with disabilities in California and Alaska in recent years. In February 2002, a federal court ruled that the California Board of Education could not administer the California High School Exit Exam (CAHSEE) until 45,000 students with learning disabilities were allowed to use accommodations, including calculators, on the test. Several students with learning disabilities filed *Chapman v. California Department of Education* (2002) and alleged discrimination because the exam "provides no alternate assessment, no procedure for requesting accommodations, and no process for appeals" (Gonzales, 2001). Judge Charles R. Breyer stated that an upcoming administration of the exam would likely violate the rights that had been guaranteed to students with learning disabilities by IDEA. While this case marked the first time a state has been ordered to change a standardized exam for students with disabilities, mandatory participation by all students, including students with disabilities, was upheld (*Chapman v. California Department of Education*, 2002). Legal challenges over the CAHSEE have since continued, with California's board of education recommending in 2007 that alternate assessments not be developed, and making certificates of attendance or achievement available to students who do not pass the exam (Johnson et al., 2007; McLaughlin & Thurlow, 2003).

Noon v. Alaska (2004) was filed on behalf of 500 students with disabilities who otherwise met graduation requirements, but were denied a high school diploma because they did not pass Alaska's High School Graduation Qualifying Exam (HSGQE). Several students and their parents alleged that the exam violated student rights under IDEA to

have reasonable accommodations, alternative methods of assessment, and not be tested on concepts and material that has not taught or that they are not required to learn. The lawsuit was eventually settled and the State of Alaska allowed all students with disabilities scheduled to graduate in 2004 to receive a diploma regardless of whether they passed the HSGQE (*Noon v. Alaska*, 2004; Wrightslaw, 2004).

The Current State of Exit Exams

As of late 2011, 25 states required students to pass exit exams to earn a high school diploma, according to data collected by the Center on Education Policy (2011). Three more states, Oklahoma, Oregon, and Rhode Island, have phased in exit exam requirements during the current school year, meaning that students in the graduating class of 2012 will be the first students in these states to have diplomas withheld if they do not pass an exit exam. The Center on Education Policy (2010) also reported that two more states are considering implementing high-stakes graduation exams. Under proposed regulations, Pennsylvania and Connecticut would require their graduating classes of 2015 and 2018, respectively, to pass exit exams before receiving a high school diploma. The same 2010 report by the Center on Education Policy revealed that 74% of students in the United States lived in states with high-stakes testing policies during the 2009-10 school year. Included in this group of students are 82.9% of the nation's students of color, 84.4% of students who are classified as English Language Learners (ELL), and 77.6% of students who receive free/reduced price lunch. The report did not offer data on the number or percentage of students with disabilities who were affected by exit exam policies during the 2009-10 school year.

As states continue to introduce new policies that mandate exit exams, a few states have decided to eliminate this requirement. The Center on Education Policy (2010) reports that North Carolina's graduating class of 2011 will be the last to be subject to this particular graduation policy, and Tennessee will stop withholding diplomas based on exit exam performance after the 2011-12 school year. While the state-level graduation requirement has been eliminated in North Carolina, the State Board of Education will allow individual school districts to require their students to pass EOC exams before graduating. Students in both states will still participate in state standardized assessments as required for accountability purposes under NCLB. Ohio and Alaska have also considered changing their state exit exam requirements, but as of December 2010, neither state has eliminated its policy (Center on Education Policy, 2010).

National policies influencing exit exams. Recent reforms suggest that exit exams will continue to have a presence in our educational system. Several national policy initiatives introduced in recent years are focused on accountability for students and schools, and reforming graduation assessments and other policies appear to be central to the plans for preparing students for higher education and careers. One current initiative is the movement toward a set of common state standards and potentially a common assessment. The Common Core State Standards were developed not by the federal government, but rather by two organizations, the Council of Chief State School Officers (CCSSO) and the National Governors Association Center for Best Practices (NGA Center) for the purpose of establishing a rigorous, consistent set of standards that can be implemented across the country (Common Core State Standards Initiative, 2010b). These standards build upon a previous set of college- and career-readiness standards,

which were also developed by CCSSO and the NGA Center, and consist of expectations for students in grades Kindergarten through 12 in the subject areas of English language arts and mathematics. The organizations have stated that the Common Core State Standards will offer "an historic opportunity to improve access to rigorous academic content" (Common Core State Standards Initiative, 2010a, para. 2) for students with disabilities by further maximizing access to the general curriculum. As of late 2010, 23 states with high-stakes testing policies have committed to adopting the Common Core State Standards, and the remaining three states, Alaska, Texas, and Virginia, have stated that they do not intend to adopt either the English language arts or mathematics standards (Center on Education Policy, 2010).

Another recent initiative is the Race to the Top state grant and assessment consortium competitions. The new program, introduced in 2009 and funded by the American Recovery and Reinvestment Act of 2009 (ARRA), awards federal grants to states for the purpose of encouraging educational reform and developing new ways of increasing student achievement (Race to the Top Fund, 2010). Additionally, the program encourages states to adopt the Common Core State Standards and collaborate with the majority of states in the country in developing common assessments by awarding higher numbers of points to states that show evidence of participation in an assessment consortium (34 C.F.R. Subtitle B, Chapter II, 2009). Two assessment consortia have been formed, the Partnership for Assessment of Readiness for College and Careers (PARCC) and the SMARTER Balanced Assessment Consortium, and in a separate Race to the Top Assessment competition in late 2010, the consortia were awarded a combined $330 million to develop new state assessments (U.S. Department of Education, 2010).

As of late 2010, 26 states have joined PARCC and 31 states have joined SMARTER Balanced, with 12 states electing to join both consortia (Center on Education Policy, 2010). The new assessments should be implemented during the 2014-15 school year, and both consortia plan to develop assessments that will be appropriate for all students, including students with disabilities.

Measuring High School Graduation

The ultimate goal for any student who enters high school is to graduate and earn a diploma that allows access to higher education and jobs. Recent data from the Education Longitudinal Study of 2002 (ELS:2002) show that a large percentage of high school-aged students are achieving this goal. As of 2006, almost 88 percent of the students in the study had graduated with a high school diploma (Bozick & Lauff, 2007). However, some have argued that increased accountability and the growing presence of high-stakes graduation exams could reduce graduation rates and cause dropout rates to soar (Amrein & Berliner, 2002; Steinback, 2003). It is challenging to research these claims as state-reported graduation rates are often unreliable and difficult to compare due to differences in the way these rates are calculated. Concerns about these often misleading graduation rates as well as the inability of many states to collect and utilize reliable graduation data led to a movement to standardize the calculation of graduation rates.

As previously mentioned, one indicator in each state's AYP rating under NCLB is high school graduation rates, not only for the entire population of students, but also for certain subgroups. The legislation describes a state's graduation rate as "the percentage of students who graduate from a secondary school with a regular diploma in the standard number of years" [NCLB 2001, section 1111 (b)(2)(C)(vi)]. Regulations state that any

definition that is approved by the U.S. Department of Education may be used to calculate graduation rates, and that alternate diplomas like GEDs and certificates of completion may not be counted (34 CFR Part 200 Title I). Because of this, the manner in which graduation rates were calculated varied widely between states.

The first attempt to adopt a standardized graduation occurred in 2005 when the National Governors Association (NGA) published a report by their Task Force on State High School Data. This report contained several recommendations that focused on their goal of creating "better systems and methods of collecting, analyzing, and reporting graduation and dropout data" in all states (NGA, 2005, p. 7). Their first recommendation was for states to adopt and implement an adjusted cohort method of calculating graduation rates. The report stated that graduation rates should be determined using the following formula:

> Graduation rate = [on-time graduates in year *x*] ÷ [(first-time entering ninth graders in year *x* – 4) + (transfers in) – (transfers out)] (NGA, 2005, p. 7)

The task force specified that only students receiving regular diplomas should be counted, and that those who earned other diplomas, including GEDs, certificates of completion, and special education diplomas, could not be classified as graduates under the adjusted cohort method. In 2008, U.S. Secretary of Education Margaret Spellings announced that NCLB had been amended to require states to use the adjusted cohort rate in calculating and reporting graduation rates to measure progress toward AYP goals (U.S. Department of Education, 2008). Despite this federal requirement, only 22 states used the adjusted cohort rate in 2010, and three more states will transition to this method in 2011 (Center on Education Policy, 2010).

The other popular method for calculating graduation rates is the leaver rate, which was developed by NCES. This formula takes students who drop out, or "leavers", into consideration when calculating a state's graduation rate. The leaver rate is determined using the following formula:

> Graduation rate = [current year graduates] ÷ [(current year graduates) + (current year 12^{th} grade dropouts) + (prior year's 11^{th} grade dropouts) + (two years' prior 10^{th} grade dropouts) + (three years' prior 9^{th} grade dropouts)] (Center on Education Policy, 2010, p. 40)

The leaver rate also excludes those students who receive a certificate of completion, GED, or other non-standard diploma. This rate also does not account for students who take longer than four years to earn a diploma. There has also been some difficulty with this rate because it can be very difficult to determine which students have actually dropped out of school and which ones have transferred to another school (Marchant & Paulson, 2005). A report by the Center on Education Policy (2010) revealed that 17 states used the leaver rate in 2010. The report also indicated that seven states used neither the adjusted cohort rate nor the leaver rate in 2010, while the method of graduation rate calculation was unknown for four states (Center on Education Policy, 2010).

As new graduation-related initiatives emerge at both the federal and state levels, questions remain about the effects of certain factors on a student's ability to graduate from high school with a diploma. One question is whether the graduation rates in states that require exit exams improve in the years following implementation of the exam. Greene and Winters (2004) analyzed the effects of lagging the implementation of an

exam on student graduation rates. Using regression, they found no positive or negative effect from year to year after implementation (Greene & Winters, 2004). The authors of the study only conducted an analysis on the larger population of students, so the effects of lagging the implementation of an exit exam on subgroups of students, such as students with disabilities, are not known.

Graduation rates for students with disabilities. It can be difficult to obtain accurate data about the academic progress of students with disabilities. The Center on Education Policy (2009b) cites several reasons for this so-called "fuzzy" data, including frequently changing numbers in the population and subgroups, lack of consistency in assessment types and graduation definitions from state to state, and changes in federal and state policies over time. Graduation data and rates for students with disabilities do, indeed, vary widely. National data collected by the U.S. Department of Education and analyzed by NCES show that 59% of students served under IDEA who exited school during the 2007-08 school year graduated with a regular diploma. Of the remaining students who exited school that year, 24.6% are believed to have dropped out and 16% received a non-standard diploma or reached maximum age without graduating (NCES, 2010). Performance during the 2007-08 school year improved from the prior school year (2006-07) when 56% of students who exited school graduated with a regular diploma, 25.5% are believed to have dropped out, and 17.9% received a non-standard diploma or reached maximum age without graduating (NCES, 2010). One issue with this analysis is that it does not take into account that some students may continue school, receive a diploma later or move to a different school and graduate there, or they may return to general education classes. With over 200,000 students who fit into these categories for

both school years, it is possible that the graduation rate for students with disabilities could increase if a different method of calculation is used.

The National Longitudinal Transition Study-2 (NLTS2), which began in 2001 with funding by the U.S. Department of Education, has also collected data on the high school completion of students with disabilities. The NLTS2 is a 10-year longitudinal study that is following a nationally representative sample of 11,270 13-16 year old students who were receiving special education services under IDEA as of December 2000 (Newman, Wagner, Cameto, & Knokey, 2009). A 2005 brief by NLTS2 staff reported that, when surveyed in 2003, 72% of students in their sample completed high school and received either a regular diploma or a non-standard diploma such as a certificate of completion or attendance (NLTS2, 2005). At the time these data were collected, however, many students in the sample were between the ages of 15 and 17, ages at which the students in the study would likely still be enrolled in high school. The graduation rate for 18 year olds was 71%, and the rate for 19 year olds in the study was 80%. Since this brief was published in 2005, three more data collection waves have occurred, the most recent in 2009. The data collected in 2009 show that 84.8% of the students in the study graduated from high school (NLTS2, 2010). It is important to note that "graduation" is defined as receiving either a regular diploma or a non-standard type of diploma in both cases. It is also important to mention that while NLTS2 has a nationally representative sample, the students in the sample opted in to the study. This differs from the data analyzed by NCES in that the IDEA data are reported by states to the federal government. As a result of the differences between graduation definitions and samples, the graduation rates reported by NCES cannot be compared with the ones reported by NLTS2. This

does, however, provide an example of the difficulties associated with obtaining an accurate picture of academic progress in students with disabilities.

Diploma options. Another consideration in determining graduation rates of students with disabilities is diploma options. Guy, Shin, Lee, and Thurlow (1999) identified five types of diploma options, including the standard diploma, honors diploma, IEP diploma, certificate of attendance, and other types of certificates. It is important to recognize, however, that completing high school with a diploma that is not considered to be standard can have certain implications for students, especially those with disabilities.

Some researchers described the potential effects of differentiated diplomas for students with disabilities when states began to adopt MCTs in the 1970s. Safer (1980) expressed concern that students with disabilities who received certificates or diplomas that are different from the ones received by their peers without disabilities could be discriminated against when trying to enter the job market. Ewing and Smith (1981) worried that "postsecondary education, training, and employment opportunities [could] be adversely affected" and that "denial of a standard diploma based on failure of the competency test could result in accelerated economic and academic deprivations" for persons with disabilities (p. 524). In recent years, research on non-standard diplomas has confirmed past researchers' fears. Gaumer Erickson et al. (2007) found a relationship between nonstandard diplomas and high school exit exams, and they discovered that this relationship is particularly strong for students with disabilities. Their research revealed that states with high-stakes testing policies awarded non-standard diplomas to students with disabilities more often than states without high-stakes policies. Research has also shown that receiving a non-standard diploma can have an impact on a student's future

options, including access to postsecondary education (Gaumer Erickson & Morningstar, 2009).

Thurlow, Vang, and Cormier (2010) surveyed 26 states that have implemented or plan to implement high stakes assessments about diploma options. Their findings reflect the diverse nature of graduation policies across the United States. Four states (Arkansas, Idaho, New Jersey, and Washington) offer only a standard high school diploma. All other states offer at least one non-standard diploma option. A few states have more non-standard diploma options available than standard diploma options, including Florida, where one standard option and five non-standard options are offered. Consistent with Guy et al. (1999), these non-standard diplomas have names like "occupational diploma", "modified diploma", "certificate of coursework completion", and "special education diploma" (Thurlow et al., 2010, pp. 47-48).

States often allow students who do not pass the exit exam to pursue alternative methods of earning a standard high school diploma. In 2010, 19 of the 26 states that have implemented or plan to implement high stakes tests offered alternative routes to a diploma (Thurlow et al., 2010). Of these 19 states with alternative routes, 13 states had alternative routes for all students, including those with disabilities, 16 had alternative routes designed solely for students with disabilities, and 10 offered separate options for both groups of students. The formats of and requirements associated with these alternate pathways vary widely from state to state, but alternative assessments, portfolio assessments, and waivers are popular options (Center on Education Policy, 2009a).

High School Diplomas and Post-Secondary Outcomes

According to Johnson et al. (2007), "a high school diploma is the minimum requirement for participation in the economy, the workforce, and the citizenry" (p. 54). As I mentioned earlier in this chapter, one of the reasons why high-stakes exit exams are controversial is because graduation decisions can be contingent on a student's exam results, which can, in turn, affect post-graduation outcomes for students. A student who does not obtain a high school diploma will have difficulty in finding a job, and will experience significant barriers to post-secondary education and training. During the height of the MCT movement, Safer (1980) expressed concern about the possible effects of requiring students to pass tests to earn a diploma, saying that students who did not meet minimum standards would be at a severe disadvantage in the job market compared to their peers who received diplomas. Since then, research has shown that the lack of a high school diploma also has considerable effects on an individual's ability to participate in the economy, according to O'Neill (2001), who found a large gap between the hourly earnings of those with high school diplomas and those who lack a diploma.

Considerable attention has been paid to the post-school outcomes of students with disabilities since the 1980s, when a number of reports and studies highlighted dismal post-school outcomes for this group of students (Wilson, Hoffman, & McLaughlin, 2009). Transition policies were strengthened in future legislation, including the 1997 IDEA Amendments, and research on post-school outcomes for students with disabilities continued (Benz, Lindstrom, & Yovanoff, 2000). With regards to students with disabilities, McDonnell et al. (1997) define post-school outcomes as "goals and achievements expected after high school graduation…[including] employment,

education, independent living, and community participation" (p. 252). In this section, data on post-school outcomes for students with and without disabilities will be presented. Additionally, data on income levels and employment status will be presented to show the relationship between acquiring a high school diploma and future economic outcomes and workforce participation.

High school graduation and post-secondary outcomes. A number of studies and organizations, including federal agencies, have collected data on enrollment in postsecondary institutions, employment after high school, and wage earnings. One of these studies is the High School and Beyond (HS&B) study. HS&B is a nationally representative longitudinal study that included two cohorts: students who were seniors in high school in 1980, and students who were sophomores in high school in 1980 (NCES, n.d.). Follow-up data were collected on both groups of students every two years until 1986. Data from the surveys showed that 64% of students who earned a high school diploma enrolled in at least one postsecondary education course, with 10.6% taking vocational courses, 20% taking courses at 2-year or community colleges, and 33.7% enrolling in courses at 4-year colleges (Jones, Sebring, & Campbell, 1986; Jones, Sebring, Crawford, Spencer, & Butz, 1986a). In contrast, data from the surveys revealed that of all students who exited high school, 56% enrolled in at least one postsecondary course, with 10% taking vocational courses, 10% enrolling in courses at 2-year or community colleges, and 27.5% taking courses at 4-year colleges (Jones, Sebring, & Campbell, 1986; Jones, Sebring, Crawford, Spencer, & Butz, 1986b). These findings show a relationship between obtaining a high school diploma and access to post-secondary education in the years immediately following high school graduation.

The BLS within the U.S. Department of Labor analyzes data on employment and income in the United States. Employment data collected by the agency show that 122 million people were employed in 2009 (Bureau of Labor Statistics, 2010). Of those 122 million employed people, only 10 million people, or 8% of the employed population, did not have a high school diploma. The remaining 92% of workers graduated from high school. In comparison, BLS data on employment from 1992 illustrate that 12% of the employed population did not have a high school diploma. This decrease shows us that graduating from high school has become increasingly more important to ensuring employment. Additionally, the unemployment rate for those without a high school diploma was 14.6% in 2009, while the unemployment rate for those with a high school diploma ranged from 4.6% (people with at least a bachelor's degree) to 9.7% (people with a high school diploma but no college) (Bureau of Labor Statistics, 2010). Finally, earnings for workers in the United States can vary greatly by level of educational attainment. In 2009, median typical earnings for full-time workers without a high school diploma were $454 per week. Weekly earnings increased considerably with the attainment of a high school diploma: median weekly earnings for high school graduates with no college were $626 (Bureau of Labor Statistics, 2010). College experience further increased income levels, as those with some college or an associate degree made $726 per week, and those with at least a bachelor's degree made $1137 per week. These statistics on income levels further prove that attainment of high school graduation can have major effects on a student's life years after high school.

High school graduation and post-secondary outcomes of students with disabilities. As previously mentioned, considerable attention has been paid to the post-

school outcomes of students with disabilities in the last three decades as a result of various studies, reports, and legislation (Benz et al., 2000; Curtis, Rabren, & Reilly, 2009; Newman et al., 2009; Newman, Wagner, Cameto, Knokey, & Shaver, 2010; Wilson et al., 2009). Entire studies, such as the National Longitudinal Transition Study (NLTS), have focused on examining the transition of students with disabilities in the years following high school and beyond. The NLTS sample included more than 8000 students with disabilities who were between the ages of 13 and 21 in 1985 and were receiving special education services (Blackorby & Wagner, 1996). Data from a subsample of students in NLTS indicated that employment rates for students with disabilities lagged significantly behind employment rates of the general student population. However, students with disabilities who graduated from high school were more likely to be competitively employed less than two years after high school (53%) and three to five years after high school (65%) than their peers who dropped out of high school or aged out of the public education system (Blackorby & Wagner, 1996).

NLTS also collected data on postsecondary school enrollment for students with disabilities. Blackorby and Wagner (1996) reported that 14% of students with disabilities had attended a post-secondary school in the two years following high school. Similar to the data on employment, students who graduated from high school were more likely (19%) to access postsecondary education than those who dropped out (6%) or aged out (11%) in the two years following high school as well as three to five years after high school (37% for graduates; 11% for dropouts; 18% for ageouts). These findings were consistent with a 2001 study of high school students in Alabama, which found that 20 percent of students with disabilities in the study had received postsecondary education or

training, including technical school, two-year colleges, or four-year colleges in the year following high school graduation (Chambers, Rabren, & Dunn, 2009). This particular study showed that while students with disabilities are less likely than their peers without disabilities to enroll in postsecondary training, participation in postsecondary education for students with disabilities can be increased through enrollment in high school programs that are academically rigorous and lead to a high school diploma.

The NLTS2, which is described in the previous section on graduation as a 10-year, nationally representative longitudinal study that began in 2001, has also collected data on the post-secondary educational and employment outcomes of the 11,270 study participants (Newman et al., 2009). Data collected from study participants in 2005 indicated that certain post-school outcomes for students with disabilities have improved since the original NLTS. A report comparing the outcomes of NLTS2 participants with the outcomes of NLTS participants defines a high school completer as any student who received a high school diploma, certificate, or earned a General Educational Development (GED) credential by 2005 (Newman et al., 2010). This report reveals that 62% of students with disabilities in NLTS2 enrolled in postsecondary education within four years of leaving high school, a significant improvement over the postsecondary matriculation rate of the participants in the initial NLTS (Newman et al., 2010). Of the students in NLTS2 who completed high school, 51% enrolled in some type of postsecondary school, with 37% enrolling in a two-year college, 17% enrolling in a four-year college, and 24% enrolling in a vocational, business, or technical school (Newman et al., 2010). Only 18% of NLTS2 participants who did not complete high school enrolled in some type of postsecondary school, with 4% enrolling in a two-year college, 0.4%

enrolling in a four-year college, and 15% enrolling in a vocational, business, or technical school (Newman et al., 2010).

While postsecondary enrollment rates have improved drastically in the years between NLTS and NLTS2, employment rates for students with disabilities have not improved significantly since the original NLTS. When interviewed in 2005, which was between one and four years after most study participants left high school, 56% of NLTS2 subjects indicated that they were currently employed (Newman et al., 2010). Of the NLTS2 participants who completed high school, 59% reported employment at the time of the study interview, while 40% of non-completers in the study were employed when interviewed (Newman et al., 2010). Students in the study who did not complete high school actually reported a higher average hourly wage than those who did complete high school, with non-completers earning $13.80 per hour and completers earning $8.40 per hour in the four years since leaving high school (Newman et al., 2010). This differs from the hourly wages reported in 1990 by participants in the initial NLTS, when high school completers received an average hourly wage of $9.30 and non-completers received an average hourly wage of $8.50 (Newman et al., 2010).

Critical Review of Research Studies

Over the last several decades, researchers have produced a body of literature on factors related to high school graduation. The vast majority of the studies have identified certain student, family and school-level factors that are related to receiving a high school diploma. Five of the studies addressed impacts of graduation requirements. In the following section, I review 13 empirical, peer-reviewed articles on the effects of a broad range of factors on high school graduation and academic achievement. These articles are

examined to address the following question: what student-level, school-level, and other factors predict high school graduation? The purpose of this review is to identify the strengths and weaknesses of the existing literature on predictors of high school graduation, and to identify gaps in the current research base.

Findings. For the purpose of gaining a better understanding of the factors that predict high school graduation, I divided the findings from the 13 empirical articles into three groups: student-level factors, school-level factors, and other factors. Because of the large number of factors mentioned in this body of literature, I decided to divide student-level and school-level factors into three subcategories. Student-level factors include demographic factors, family factors, and academic/social factors. School-level factors include school-level demographic factors, staffing and resources, and social/school climate. There was only one factor that did not fit into the student-level and school-level categories, graduation exam required by state, and this factor was included under the "other factors" category. Table 1 details the student- and school-level predictors described by the 13 empirical studies.

TABLE 1 HERE

Student-level factors. The student-level category had a larger number of predictors than the other two categories of factors. I chose to divide the category into three subcategories to provide the most thorough synthesis of the literature. The first category, demographic factors, includes gender, race/ethnicity, age, and socioeconomic status (SES). The family factors category includes variables related to parents, parenting, and families, such as family structure, parents' educational attainment, and parental

involvement in the child's education. The academic and social factors category includes student grade point average (GPA), achievement test scores, student behavior and effort, and peer relationships.

Demographic. Of the 13 empirical studies, seven included demographic factors as either independent or control variables. Two of the studies (Ensminger & Slusarick, 1992; Finn, Gerber, & Boyd-Zaharias, 2005) found that a student's gender had a significant effect on whether the student graduated from high school. Several other studies, however, did not find a significant connection between a student's gender and the odds of earning a high school diploma. Five studies found a connection between SES or household income and high school graduation (Borg, Plumlee, Stranahan, 2007; Ensminger & Slusarick, 1992; Finn et al., 2005; Rylance, 1997; Stewart, 2008). Like the gender variable, only 3 studies found race or ethnicity to be a significant predictor of high school graduation (Borg et al., 2007; Hickman, Bartholomew, Mathwig, & Heinrich, 2008; Stewart, 2008), while other studies did not see the same effects. Only one study (Rylance, 1997) found significant relationships between a student's age as a predictor of high school graduation, with older students in the sample being more likely to have earned high school diplomas than younger students in the sample.

Family. Family factors include variables related to parents, parenting, and families. Table 1 lists 10 family characteristics where high school graduates differed significantly from students who did not complete high school. These factors were identified in four of the 13 studies reviewed (Astone & McLanahan, 1991; Barrington & Hendricks, 1989; Ensminger & Slusarick, 1992; Stewart, 2008). Astone and McLanahan (1991) focused specifically on finding links between family structure and parenting and

earning a high school diploma, while the other three studies looked at a wide range of variables. The most frequently identified characteristic was family structure, which is a phrase used by several of the articles to describe a family with only one parent, a step-parent, or grandparents or other relatives acting as parents. Astone and McLanahan (1991) and Stewart (2008) both found that the family structure of students who graduated from high school differed significantly from the family structure of students who did not graduate.

Academic and social. The final student-level subcategory includes all academic and social factors that affect high school graduation. Table 1 lists 20 academic and school characteristics where high school graduates differed significantly from their peers who did not complete high school. These factors were identified in seven of the 13 studies reviewed (Barrington & Hendricks, 1989; Borg et al., 2007; Ensminger & Slusarick, 1992; Finn et al., 2005; Hickman et al., 2008; Rylance, 1997; Stewart, 2008). Grade point average (GPA) and achievement test scores were the most frequently used variables across the 13 studies.

School-Level Factors. The school-level category is also divided into three subcategories: demographic factors, staffing and resource factors, and social and school climate factors. Demographic factors include the degree of urbanicity of a school, school enrollment, and school SES. The staffing and resources category includes variables related to the staff and resources made available to the school, like teacher quality, number of staff, and various resources allotted to a school by the district or state. Social and school climate includes various aspects of a school's culture, encompassing

interactions between students, teachers, and staff, as well as general attitudes and behavior of a school's population.

Demographic. Table 1 lists two demographic factors of schools, urbanicity and school enrollment, that were found to affect high school graduation rates or academic achievement. Both of these factors were found in Finn et al.'s (2005) longitudinal study on small classes in the early grades and how they might relate to future academic success. After analyzing their data using hierarchical linear modeling (HLM), they found that students who attended high schools in suburban and rural settings were more likely to earn a high school diploma than their counterparts in inner-city schools. They also found that graduation rates were positively related to school size. With only two demographic factors identified across the 13 studies, more research is necessary to learn more about the effects of school demographic factors on high school diploma attainment.

Staffing and resources. Table 1 lists two factors related to staffing and resources of schools that were found to affect high school graduation rates: percentage of teachers with advanced degrees and percentage of teachers who are new hires. Both of these factors were found in Borg et al.'s (2007) descriptive study on the effects of high-stakes tests in one Florida county. They used probit modeling to find connections between student success and teacher quality. Their analysis revealed that students who attend high schools in which a higher percentage of teachers hold advanced degrees are more likely to pass the Florida Comprehensive Assessment Test (FCAT) and eventually graduate from high school. They also found a negative, significant relationship between the percentage of newly hired teachers variable and student FCAT scores. This suggests that students in schools with a higher percentage of new teachers are less likely to graduate

from high school. Again, more research is needed in the area of staffing and resources of schools to establish a link between these school-level factors and high school graduation.

Social and school climate. Table 1 lists only one factor related to school climate: school cohesion. Stewart (2008) defines this factor as "a global measure that assesses the extent to which there is trust, shared expectations, and positive interactions among students, teachers, and administrators" (p. 190). This descriptive study conducted HLM analyses of second-wave data from the National Educational Longitudinal Study (NELS) with a sample of 11,999 students from 715 high schools nationwide. The study explored the effects of six school-level variables, including school poverty, proportion of non-White students, school location, school size, and another school climate variable called "school social problems", but school cohesion was the only school-level variable that reached significance. Stewart (2008) found that schools that had more positive interactions between students and teachers tended to have higher student academic achievement. As with the other two school subcategories, more research is needed in this area to establish connections between school climate and student achievement and graduation.

Graduation policies. While reviewing the literature, I found a factor that did not fit into the other categories, as it is neither a function of the individual student nor of a school. This factor is the requirement of a graduation exam by a state. Because it was a state policy I chose to review these studies separately. Five studies (Jacob, 2001; Marchant & Paulson, 2005; Reardon, Arshan, Atteberry, & Kurlaender, 2010; Warren & Edwards, 2005; Warren, Jenkins, & Kulick, 2006) examined the effects of high school graduation exams on graduation rates. Jacob (2001) conducted an OLS regression

analysis of data from the National Educational Longitudinal Study (NELS), which is a large, nationally representative data set of students who were in 8th grade in 1988, and who were subsequently surveyed and interviewed into their postsecondary years. To measure the variable of graduation exam requirements, Jacob (2001) first collected data about which states had graduation exam requirements in 1992 when the NELS cohort was expected to graduate. The author then created a "state" sample with the dataset based on the information collected. Jacob (2001) found that graduation exam requirements decrease the probability of high school graduation among lower ability students, though this requirement appears to have no impact on the graduation rates of most students.

Marchant and Paulson's (2005) analysis of data from the College Board's 2001 SAT test-takers paired with state aggregated data from NCES on graduation rates for students expected to graduate in 2002 found significant differences in high school graduation rates in states that require a graduation exam versus those that have not implemented this requirement. To measure the variable of graduation exam requirements in this study, the authors used an article by Amrein and Berliner (2002) to identify states that required students to pass a standardized test to graduate in 2002, then computed a graduation rate for the group of states that required a graduation exam, and a graduation rate for the group of states that did not require a graduation exam in 2002. The graduation rates were computed using state aggregated data from NCES. Their regression analyses showed that states that require a graduation exam had lower graduation rates. Because the number of states requiring passage of a graduation exam has increased since both of these studies were published, more research is necessary to learn more about the

connections between graduation exams and high school graduation, especially among certain subgroups of students. Additionally, the analyses presented in the study do not necessarily prove that high school exit exams are independently associated with high school graduation. It should also be noted that a study published a year later states that inaccurate information about states' exit exam policies was used in Marchant and Paulson's (2005) analysis, which raises questions about the accuracy of their findings (Warren et al., 2006).

Reardon et al. (2010) analyzed longitudinal data from four of California's largest public school districts and found no significant effect of failing the exit exam on high school graduation. California required a passing score on the California High School Exit Exam (CAHSEE) as a requirement for graduation beginning with the graduating class of 2006. The study by Reardon et al. (2010) used data from five cohorts of students, beginning with students in the first class to graduate under the new requirements through the class of 2010. Since students in the state take the CAHSEE in the second semester of 10^{th} grade, the students in the sample took the exam from 2004 through 2008. It is important to note that Reardon et al. (2010) excluded students with disabilities from the study because they were "not subject to the CAHSEE requirement in most of the years" (p. 504). Graduation status in this study was indicated through a district-provided binary indicator of graduation status. The authors state that this may cause the graduation rate in the study to be inaccurate, as some students may have transferred and graduated from school districts that were not included in the study. Using a regression discontinuity design, Reardon et al. (2010) found that the estimated effect of failing at least one section of the CAHSEE on high school graduation was statistically significant. However, they

explain that this effect is unreliable because the estimate is unstable, and therefore, any effects are likely to be the result of other factors.

Like Jacob (2001), Warren and Edwards (2005) used data from NELS to analyze the effects of high school exit exams on students' chances of obtaining a high school diploma. Warren and Edwards (2005) note that their research differs from that of Jacob (2001) and other research in that they used external information to determine which states had implemented high school exit exams before NELS data collection, and that they distinguished between a high school diploma and a GED. The authors noted that of the 13,632 students in their sample, who were expected to graduate from high school in 1992, there were 5.347 students who lived in states that required passage of a state exit exam to earn a high school diploma. This amounted to 39% of the sample. The authors did not indicate whether students with disabilities were included in their study.

Warren and Edwards (2005) used several methods of analysis in their study, including binary logistic regression and two- and three-level hierarchical linear modeling, and determined that high school exit examination requirements in the early 1990s were not associated with lower rates of obtaining a high school diploma. However, the authors note that the high school exit examinations administered during this time period were different than exit exams that have since been implemented in that the exams and the standards and knowledge that they test have become more complex. They recommended that more recent student populations be studied to determine whether there are stronger connections between more recent exit exam policies and rates of diploma acquisition.

Warren, Jenkins, and Kulick (2006) chose to investigate the connection between high school exit exam policies and high school completion in a different way. They used

data on high school completion rates for graduating classes of 1975 through 2002 in states that had high school exit exams, taken from the October Current Population Surveys (CPS) and Common Core Data (CCD), rather than longitudinal data sets. This resulted in a sample of 1428 "state-years", or graduating classes. They also classified states as having either minimum competency or more difficult exams. Any state that included information on the exam that was taught during ninth grade or later was labeled as a state with a more difficult exam, and states whose exams only tested material presented through eighth grade was classified as minimum competency.

Warren et al. (2006) used fixed effects modeling to analyze the data in their study. They found that state high school exit exams are associated with lower high school graduation rates, particularly when the exams fit the study's criteria of being more difficult. They also found that states with greater racial and ethnic diversity and higher rates of poverty show stronger connections between the presence of an exit exam policy and high school completion rates.

One other study, Borg et al. (2007), stated that one of the purposes of the study was to "ascertain the effect of FCAT graduation requirements on a student's probability of earning a high school diploma" (p. 702). However, this study differs from the other studies discussed in this section in that it does not include presence of a graduation exam policy as an independent variable. Because of this, the study findings indicate that certain student- and school-level factors affect one's ability to pass the FCAT and, therefore, graduate from high school, but the authors truly do not analyze the potential relationship between the actual graduation exam requirement and a student's ability to earn a diploma.

Critique of studies reviewed. The existing literature identifies a wide variety of factors that affect high school graduation and academic achievement. Collectively, the studies have much strength, including large, well-described samples with strong external validity, but all of the studies have certain weaknesses, including the absence of reported effect sizes in many studies, that cannot be overlooked. In this section, I will discuss the designs, participants, procedures, and validity of the 13 studies I reviewed (see Appendix A for details and additional comparisons of the purposes, samples, variables and analysis methods, and findings of the 13 studies).

Designs. All of the studies included in this review were descriptive. A descriptive study involves "collecting numerical data to test hypotheses or answer questions about the current subject of study" (Gay, Mills, & Airasian, 2009, p. 601). Additionally, five of the studies (Astone & McLanahan, 1991; Ensminger & Slusarick, 1992; Finn et al., 2005; Hickman et al., 2008; Reardon et al., 2010) utilized longitudinal survey methods, meaning that the data were collected multiple times over a period of years to measure changes over time (Gay et al.). This type of research design can be useful in determining which variables in a study are worth testing more extensively, but one major disadvantage is that it is difficult to make reliable causal inferences from a descriptive study (Shadish, Cook, & Campbell, 2002). While these 13 studies do give us a good starting point in determining directions for future quantitative research, none of them can tell us that the factors they studied have a causal relationship with high school graduation and academic achievement.

Participants and data sets. Many of the studies in this review were secondary analyses of data sets that are available to researchers. Jacob (2001), Stewart (2008), and

Warren and Edwards (2005) used the National Educational Longitudinal Study (NELS), a nationally representative sample of more than 12,000 young adults. Astone and McLanahan (1991) used data from the High School and Beyond (HS&B) study, a nationally representative longitudinal study that surveyed more than 10,000 students at over 1,000 high schools in the 1980s. Marchant and Paulson (2005) created a large data set with a sample of 694,400 high school students when they analyzed state graduation exam data from all 50 states and the District of Columbia. The data in Rylance's (1997) research came from the National Longitudinal Transition Study (NLTS), a study of the post-school outcomes of students with disabilities nationwide. Data in the other five studies were collected within two states, Tennessee (Finn et al., 2005) and California (Reardon et al., 2010), and individual school districts (Barrington & Hendricks, 1989; Borg et al., 2007; Ensminger & Slusarick, 1992; Hickman et al., 2008). The analytic samples were well described in all studies, which allows for replication of procedures.

Because many of these studies utilized large sets of data collected from students across the United States, we see stronger external validity in these cases than we would typically see in smaller studies that might have stronger internal validity. However, it is difficult to compare the results of studies like Barrington and Hendricks (1989), which looked only at graduation rates of students in a small Wisconsin town, and Ensminger and Slusarick (1992), which followed a cohort of African-American students from a single neighborhood in Chicago, to the studies with large, nationally representative samples. The studies are also difficult to compare because they look at the effects of different independent variables on high school graduation. For example, Barrington and Hendricks (1989) included more academic variables like achievement test scores, high

school GPA, and the number of courses failed by a student. In contrast, the aim of Ensminger and Slusarick (1992) was to examine the effects of early school performance and family characteristics and involvement on high school graduation. Thus, differences in the purposes, samples, and variables greatly influence the extent to which results can be compared across studies.

Variables. There were a large number of independent or predictor variables used in the various studies. Independent variables that were used in more than one study included race, SES, and GPA and tended to be defined consistently. For example, eligibility for free or reduced lunch programs was used to define SES in some studies (Marchant & Paulson, 2005; Finn et al., 2005).

One problem was the lack of a consistent definition across the studies of the dependent variable, high school graduation. Two studies (Barrington & Hendricks, 1989; Marchant & Paulson, 2005) used a "cohort" definition of graduation, where only students who graduated within four years were deemed graduates. Astone and McLanahan (1991) defined a high school graduate as any student who received a high school diploma or a GED. Five studies (Borg et al., 2007; Ensminger & Slusarick, 1992; Finn et al., 2005; Hickman et al., 2008; Rylance, 1997) counted any student whose records stated that he or she was a graduate. Reardon et al. (2010) used graduation status data provided by school districts to determine which students had graduated. Jacob (2001) only provides information on how a student was determined to be a dropout and does not include a definition of a high school graduate. The data set used in this study, NELS, determined graduation status through study participant questionnaires, parent questionnaires, and analysis of participant high school transcripts. However, the author does not identify

which graduation variables in the data set were used to ultimately determine whether a participant had graduated.

Procedures and data analysis. While description of procedures, such as data collection procedures in the studies that did not use extant datasets, sequence of events in the studies, and data analysis procedures, left much to be desired in most of the studies, all of the researchers clearly identified the statistical methods used to analyze their data. Many used statistical regression models to analyze their data, including OLS and hierarchical linear modeling (Finn et al., 2005; Rylance, 1997; Stewart, 2008; Warren and Edwards, 2005) and path analysis (Ensminger & Slusarick, 1992). Only two studies (Finn et al., 2005; Reardon et al., 2010) reported effect sizes. Effect size measures the "magnitude of the impact of the independent variable on the dependent variable" (Kline, 2009, p. 153) and should always be included so that research can be interpreted effectively and so findings can be compared across studies (Kline, 2009). None of the studies reported confidence intervals.

Summary of critical research review. The research reviewed above offers some insight about factors that may affect a student's ability graduate from high school. These studies indicated connections between graduation and certain student and family, school, and other factors. Among the student-level factors are gender (Ensminger & Slusarick, 1992; Finn et al., 2005), SES and household income (Borg et al., 2007; Ensminger & Slusarick, 1992; Finn et al., 2005; Rylance, 1997; Stewart, 2008), and race and ethnicity (Borg et al., 2007; Hickman et al., 2008; Stewart, 2008). Certain academic or social characteristics, including GPA, grade retention, number of absences, and aggressive behavior toward peers, have been shown to affect a student's ability to graduate

(Barrington & Hendricks, 1989; Borg et al., 2007; Ensminger & Slusarick, 1992; Finn et al., 2005; Hickman et al., 2008; Rylance, 1997; Stewart, 2008). Additionally, researchers have found relationships between high school graduation and some family characteristics, including family structure and parental involvement (Astone & McLanahan, 1991; Barrington & Hendricks, 1989; Ensminger & Slusarick, 1992; Stewart, 2008).

School-level factors with a connection to graduation included urbanicity of a school and school enrollment (Finn et al., 2005) and teacher education and experience (Borg et al., 2007). Finally, some research has documented the impact of exit or graduation exams on graduation rates (Jacob, 2001; Marchant & Paulson, 2005; Reardon et al., 2010; Warren & Edwards, 2005; Warren et al., 2006).

As noted in the results section, there are several areas where more research is necessary to accurately identify predictors of high school graduation and academic achievement. Of particular concern in these studies is the absence of effect sizes and confidence intervals, which affects the reliability and validity of the research. In addition to the methodological issues, much of the literature I reviewed examined large diverse samples and, with the exception of Rylance (1997), did not examine students with disabilities. Additionally, five studies (Jacob, 2001; Marchant & Paulson, 2005; Reardon et al., 2010; Warren & Edwards, 2005; Warren et al., 2006) look at graduation exams as a predictor of graduation in high school students, but none examined this as a predictor within subgroups of student populations. In fact, at least one of the studies excluded students with disabilities from the sample (Reardon et al., 2010). Therefore, further research is necessary to gain more information about the connection between the existence of a high stakes testing policy and graduation rates of students with disabilities.

Warren et al. (2006) concluded in their study that associations between high school exit examination policies and high school graduation rates did not begin to occur until recently. As more states add high school graduation exam requirements, it will be important to conduct research on how these new requirements are affecting student outcomes. It will be equally as important for future researchers to ensure that clear definitions of high school graduation, well-described procedures, and effect size calculations are included in their studies to enhance the reliability and validity of their results.

Chapter Summary

In the last 20 years, the United States has seen a distinct shift toward stronger accountability in education. Goals 2000 was the first federal law to encourage or require large-scale testing of students, while the 1997 Amendments to IDEA first required states to include students with disabilities in large-scale assessment programs. The 2001 reauthorization of ESEA, known as NCLB, greatly increased the emphasis on accountability for students and schools. Despite the movement toward greater accountability for students, little is known about the effects of exit exam policies on the high school completion and post-school outcomes of certain groups of students, including students with disabilities. First, there is not much research on the effects of exit exams on high school graduation and outcomes. Many of the studies that are available study the effects of policies that were in place before the implementation of stronger accountability requirements. Second, not many empirical, peer-reviewed studies have looked specifically at students with disabilities, and in some cases, this group of students has been excluded entirely.

Chapter III

Methodology

This study had several purposes. The first purpose of the study was to examine the relationship between selected student, family and school characteristics, and state exit exam policies and the impact on graduation from high school among a sample of students with disabilities. The second purpose of the study was to explore the relationship between attending high school in a state that has an exit exam policy and the academic rigor of the coursework, as measured by the highest math course completed, among a sample of students with disabilities. The final purpose of the study was to investigate the contribution of attending high school in a state that has an exit exam policy and academic rigor in coursetaking on enrollment in postsecondary education among a sample of students with disabilities.

In order to conduct this research, specific variables were selected from the first, second, and third waves of data as well as the transcript study data of the Education Longitudinal Study of 2002 (ELS:02) database. The variables used included: high school graduation status, type of high school credential, math course pipeline, post-graduation college enrollment, and specific student and school characteristics of students with disabilities. These variables were entered into a logistic regression equation to examine their effects on receipt of a high school diploma, coursetaking, and enrollment in postsecondary education.

This chapter includes a description of the ELS:02 database, including an overview of ELS:02, its purpose, design, sampling procedures, instrumentation, response rates, the methods used to identify students with disabilities in the sample, and the methods used to

determine which students in the sample attended high school in a state that required an exit exam in 2004. The second section of this chapter describes the variables that were used in the study and provides a rationale for variable selection. Finally, the last section of the chapter discusses the methodology used to analyze the data, including an explanation of the statistical analysis methods that were used and software programs that were used to conduct the analyses.

ELS:02 Dataset

Overview and purpose. The ELS:02 is funded by the U.S. Department of Education's National Center for Educational Statistics (NCES). ELS:02 is a longitudinal study that is designed to monitor the transition of students who were in 10th grade during the 2001-2002 school year through high school and on to post-high school activities like postsecondary education and/or employment (Ingels, Pratt, Rogers, Siegel, & Stutts, 2004). The study began in 2002, when base year data were collected, and follow-up data were collected in 2004 and 2006. An additional data collection will begin in the summer of 2012, when the cohort of students in the study will have been out of high school for eight years. By collecting data at this time, ELS:02 intends to offer a look at the later postsecondary outcomes of the students in the study (Ingels et al., 2004).

ELS:02 is the fourth study in NCES's high school longitudinal study program. Other studies in this program include the National Longitudinal Study of the High School Class of 1972 (NLS-72), High School and Beyond (HS&B), and the National Education Longitudinal Study of 1988 (NELS:88) (Ingels et al., 2004). NCES intends for these four studies to "describe the educational experiences of students from four decades – the

1970s, 1980s, 1990s, and 2000s – and also provide bases for further understanding of the correlates of educational success in the United States" (Ingels et al., 2004, p. 2).

ELS:02 has two notable features: first, it is a longitudinal study; second, it is an integrated multilevel study with multiple respondent populations (Ingels et al., 2004). Four levels of analysis can be conducted with ELS:02 data: cross-sectional, longitudinal, cross-cohort, and international comparison. In early 2002, ELS:02 staff invited 17,591 students from 752 high schools across the United States to complete the base year student questionnaire, and 15,362 students completed the survey (Ingels et al., 2004).

One very important difference between ELS:02 and other longitudinal studies is that students with disabilities were considered ineligible to participate in past NCES high school longitudinal studies. In NELS:88 specifically, students with physical, mental, and emotional disabilities who had IEPs were excluded if their "degree of disability was deemed by school officials to make it impractical or inadvisable to assess them" (Ingels et al., 2004, p. 52). In addition, NELS:88 and prior studies did not allow students to use accommodations on tests in the study. In contrast, ELS:02 did not exclude all students with IEPs, but rather, decided whether each individual student had the ability to participate in each study activity and allowed the use of accommodations if necessary for participation (Ingels et al., 2004). Because of this approach, there are some students with disabilities who did not participate in all study activities, but are still considered part of the sample. For example, many students with disabilities were able to complete the base year student questionnaire, thus meeting the study's definition of participation, but some students were deemed by their schools to be unable to participate in the base year assessments. The approach used by ELS:02 also allowed these students to participate in

future follow-up activities and assessments if a change in eligibility status occurred (Ingels et al., 2004). Study staff did not make determinations regarding students' ability to complete ELS:02 activities; rather, these decisions were made by schools and individual students' IEP teams. Of all students invited to participate in ELS:02, 163 prospective participants were not able to participate in the base year questionnaire and tests, and 119 of those 163 were excluded due to mental or physical disabilities (Ingels et al, 2004). ELS:02 includes base year sampling data for all excluded students, but these data are only available in the restricted dataset. More information regarding future eligibility of these students, as well as information regarding the use of accommodations by students with disabilities in the study, will be discussed later in this chapter.

ELS:02 sampling strategy. In selecting the sample for ELS:02, study staff used a two-stage selection process. Before selection occurred, the 1999-2000 Common Core of Data (CCD) and the 1999-2000 Private School Survey (PSS) were consulted to find high schools that met the criteria for inclusion in the study. The target population for schools in the study consisted of regular public schools, public schools classified as State Education Agency schools and charter schools, and Catholic and other private schools (Ingels et al., 2004). Schools were eligible for the study only if they had a 10^{th} grade class and were located in one of the 50 states within the United States or the District of Columbia. The following types of secondary schools were not eligible for inclusion in ELS:02: schools with no 10^{th} grade; schools with no enrollment; ungraded schools; Bureau of Indian Affairs schools; special education schools, which includes schools that were not classified in the CCD or PSS as special education schools but had the words "blind", "unsighted", "deaf", or "impaired" in the school name (manually verified); area

vocational schools not enrolling students directly; schools in detention centers or correctional facilities, which includes schools with the words "detention", "correctional", or "jail" in the school name (manually verified); Department of Defense schools outside of the United States; and closed public schools (Ingels et al., 2004).

After consulting the CCD and PSS, and excluding ineligible schools, the first stage of the selection process began by identifying eligible high schools for a stratified probability proportional to size (PPS) sample (Ingels et al., 2004). After first stratifying the sample based on region of the United States, schools were further stratified by metropolitan status to select schools that would provide a nationally representative sample of students. Out of roughly 27,000 schools with 10th grade students in the United States, 1,221 were deemed to be eligible for inclusion in ELS:02 and were invited to participate; 752 agreed to participate in the study. Of these, 580 were identified as public schools (Ingels et al., 2004).

After schools agreed to participate in the study, school administration was asked to submit a roster of 10th grade students to NCES. These rosters were then stratified by race/ethnicity and ELS:02 staff randomly selected approximately 26 10th grade students from each school for participation in the study (Ingels et al., 2004). Certain subgroups of students, specifically Asian and Hispanic students, were oversampled in the study. ELS:02 staff facilitated this oversampling by "increas[ing] the sample size to include additional public school students in the sample" (Ingels et al., 2004, p. 45). It should be noted that students with disabilities were not oversampled in ELS:02. ELS:02 staff expected a total sample size of approximately 20,000 students at the end of the sample selection process. Ultimately, the established sample size for the base year data

collection in ELS:02 was approximately 17,600 high school sophomores (Ingels et al., 2004).

Instrumentation

To satisfy the study's goal of monitoring the transition from high school to post-school education and employment, ELS:02 data were collected from many sources across a period of several years. Data were collected from the students in the study, parents, teachers, high school administrators, and librarians or media center directors (Ingels et al., 2004; Ingels, Pratt, Wilson, Burns, Currivan, Rogers, & Hubbard-Bednasz, 2007). Additional data on schools and students were obtained through a high school facility checklist in the base year of the study and high school transcripts during a follow-up collection (Ingels et al., 2007).

The following instruments were used in the first three data collections of ELS:02: student questionnaires (base year, first follow-up, and second follow-up); parent questionnaire; English and math teacher questionnaires; school administrator questionnaire (base year and first follow-up); library or media center questionnaire; school facilities checklist; reading assessment (base year only); mathematics assessment (base year and first follow-up); and high school transcript (Ingels et al., 2007). In this study, only the following instruments were used: student base year and second follow-up questionnaires; first follow-up math assessment; parent questionnaire; and high school transcript. Table 2 provides a timeline of the ELS:02 data collection efforts.

TABLE 2 HERE

Math direct assessment. As shown in Table 2, mathematics direct assessments were administered during the base year and first follow-up data collections. Both assessments contained items from various levels of math courses, including arithmetic, algebra, geometry, data/probability, and advanced topics (Ingels et al., 2004; Ingels et al., 2007). The base year assessment began with what ELS:02 staff refer to as a "routing test", which was scored immediately upon completion, and scores were subsequently used to assign participants to a second test that was either low, medium, or high difficulty (Ingels et al., 2004). In terms of structure, the base year assessment was comprised mostly of multiple-choice questions with a few open-ended questions (Ingels et al., 2004). The follow-up math assessment did not include a routing test; rather, scores from the 10th grade assessment were used to assign participants to a low, medium, or high difficulty test (Ingels et al., 2007). Finally, the follow-up assessment did not contain any open-ended questions and consisted solely of multiple-choice items (Ingels et al., 2007).

Student questionnaires. As shown in Table 2, student questionnaires were administered during the base year collection and both follow-up data collections. The base year student questionnaire was administered to all students in the sample during their sophomore year of high school in 2001-02 (Ingels et al., 2004). Most students in the study participated in a 45-minute group administration of this questionnaire at their schools. This paper and pencil version of the questionnaire was only available in English. Remaining students in the study completed a shortened version of the questionnaire through a computer assisted telephone interview (CATI), which was available in English and Spanish. The base year student questionnaire was administered at the same time as the reading and math assessments, and was divided into seven

sections: (1) locating information, (2) school experiences and activities, (3) plans for the future, (4) non-English language use, (5) money and work, (6) family, and (7) beliefs and opinions about self (Ingels et al., 2004).

A single questionnaire was developed for the second follow-up data collection, which occurred between January and September 2006 (Ingels et al., 2007). A new method of administering the questionnaire was introduced during this data collection, a self-administered web-based survey instrument. Less than one-third of the students in the sample completed the online questionnaire and the rest of the subjects completed the questionnaire either through CATI or computer-assisted personal interviewing (CAPI) (Ingels et al., 2007). Regardless of the method of survey administration, the same web-based instrument was used for all sample members, which eliminated the potential for problematic effects. The second follow-up survey consisted of five sections: (1) high school, (2) postsecondary education, (3) employment, (4) community, and (5) locating information (Ingels et al., 2007).

Parent questionnaire. As shown in Table 2, a parent survey was administered during the base year data collection in 2002 (Ingels et al., 2004). Parent surveys have not been administered in either of the follow-up data collections and there are no plans to include a parent survey in the third and final follow-up in 2012 (Ingels et al., 2007). Instructions specified that the survey should be completed by the parent or guardian most familiar with the student's school situation and experiences, which makes this survey self-selected. Hardcopy and electronic versions for CATI were produced in both English and Spanish, and were designed to collect data on five different topics: (1) family

background, (2) child's school life, (3) child's family life, (4) their opinions about the child's school, and (5) aspirations and plans for the child's future (Ingels et al., 2004).

High school transcripts. As shown in Table 2, high school transcripts of students in the study were collected after the first follow-up data collection. The transcripts were collected between December 2004 and early 2005, at least six months after the anticipated Spring 2004 graduation of the cohort (Ingels et al., 2007). ELS:02 coordinators requested that schools include a variety of information on the transcripts, including coursetaking histories, school-level information, and student-level information, including the type of diploma or credential awarded and the date that a diploma or credential was awarded. Transcripts were collected for any student who completed at least one of the first two student questionnaires, including students who dropped out of school, transferred to a new school, or graduated before Spring 2004 (Ingels et al., 2007). If a student reported transferring to a new school during the first follow-up questionnaire, transcripts were collected from the student's base year school as well as the last school the student attended. If a student was added to the study via the freshening sample during his or her senior year, a transcript was only collected from the last school attended. ELS:02 also requested transcripts for students who could not participate in the first two questionnaires due to severe disabilities or language barriers (Ingels et al., 2007). Incomplete transcripts were collected for certain groups of students, including students with disabilities who would remain enrolled in high school beyond Spring 2004 to receive special education services. ELS:02 was able to collect transcript data for over 14,900 youth in the study, which is 91% of the cohort (Ingels et al., 2007).

Identifying Students with Disabilities in ELS:02

As previously mentioned, ELS:02 is unique in that it not only includes students with IEPs to the maximum extent possible, but it also allowed accommodations to be used during the assessment portions of the study to increase participation of students with disabilities (Ingels et al., 2004). In some cases, however, students selected for participation were not able to participate in certain study activities. Eligibility for study activities was re-evaluated before the first follow-up occurred in 2004 to maximize participation of students with disabilities. Eligibility was not re-evaluated before the second follow-up data collection in 2006. Table 3 shows the total number of students who were excluded from base year and first follow-up data collections, including the number of students who were excluded as a result of a disability. Less than 1% of ELS:02 participants were excluded for this reason. Table 4 shows the questionnaire eligibility status changes for ELS:02 participants between the base year and first follow-up data collections.

TABLE 3 HERE

TABLE 4 HERE

It should be noted that none of the ELS:02 participants were excluded from the 2004 transcript study. Study staff attempted to obtain transcripts from all students, including those with disabilities, regardless of their ability to participate in questionnaires or assessments (Ingels et al., 2007). As a result, data on special education courses taken by ELS:02 participants are available through the transcript study. A list of Special

Education and Special Education – Resource Curriculum courses is available in Appendix B.

As noted above, ELS:02 is the first in the NCES series of high school longitudinal studies to allow the use of accommodations on study assessments and questionnaires. These accommodations, which were offered "to the extent possible, given practical and monetary constraints" (Ingels et al., 2004, p. 53), included four categories of assessment accommodations: alternative test presentation, alternative means of test responses, alternative test setting, and timing or length of testing administration. The study's use of two-stage, adaptive testing was suitable for use by students with a variety of disabilities and who required accommodations for participation (Ingels et al., 2004). Use of accommodations on study assessments was recorded in the ELS:02 data file under the variables BYTXACC (for use of accommodations on the base year assessments) and F1TXACC (for use of accommodations on the first follow-up assessments). The type or nature of accommodations used is also noted in the data file. Additionally, ELS:02 allowed the use of accommodations in questionnaire administration, including administration of the questionnaire by survey staff if a student was not able to complete the survey on his or her own due to a disability (Ingels et al., 2004). Less than 1% of ELS:02 participants used accommodations during the administration of study instruments. Table 5 shows the number of students who used accommodations during the administration of ELS:02 instruments.

TABLE 5 HERE

To most accurately identify students with disabilities in ELS:02, it is necessary to employ multiple methods of identification. The student, parent, and teacher questionnaires included questions regarding student disability status. Students were asked if they had ever received special education services, while parents were asked whether they thought their child had a disability. Responses to these questions do not provide a clear, accurate picture of which students in the sample had disabilities or received special education services; therefore, more reliable methods of identification will be used in this study.

One method of identifying students with disabilities in ELS:02 is to use the base year Individualized Education Program (IEP) status variable, BYIEPFLG. The data for this variable come from the sampling roster and are provided by personnel at each student's school. The IEP status variable is a categorical variable that only allows a yes or no response. This variable, however, cannot be used on its own to identify students with disabilities as there is a substantial amount of missing data associated with it, which would likely exclude many students with disabilities from the study. Because of this, additional variables were used to identify students with disabilities who were missing data on the IEP status variable.

The alternate method of identifying students who received special education services is to use course-taking data from student transcripts. Data were collected on three types of special education courses, two of which are of particular interest in this study. The first variable is F1R54_C, the total Carnegie units in special education. Any student who has taken more than zero credits in special education is counted under this category, even if the student took less than one full credit, because a student must have an

IEP to participate in special education. The second variable, F1R56_C, is the total Carnegie units in special education/resource curriculum. As with the first special education course variable, only students with an IEP can receive credit for these courses, so students with more than zero credits are eligible to be added to the sample. The courses included in F1R54_C and F1R56_C are listed in Appendix B. It should be noted that some students with disabilities do not receive credit for special education and resource curriculum courses, and some students with IEPs do not take special education or resource courses at all, so there may still be students with disabilities in ELS:02 who were not included in the sample because they were not identified under any of the variables listed in this section.

It is necessary to know some basic information about the students with disabilities in ELS:02 and how this group of students compares to the larger population of students with disabilities. One way to do this is to compare the disability categories of students in ELS:02 to the disability categories of students in the National Longitudinal Transition Study 2 (NLTS2), which had a nationally representative sample of adolescents with disabilities. Due to the ways in which states report data on students in special education to the federal government, NLTS2 data is the only option for a national comparison group of adolescents with disabilities. The comparison between students with disabilities in ELS:02 and participants in NLTS2 is presented in Table 6. Additionally, the samples for NLTS2 and ELS:02 were constructed in different ways, with NLTS2 directly selecting students from school rosters as opposed to the ELS:02 sample selection process described earlier in this chapter. The differences between the two groups, including the higher proportions of students with learning disabilities in ELS:02 and higher proportions

of students with intellectual disabilities in NLTS2, suggest that the ELS:02 participants are a potentially unique population of students with disabilities. These differences in the ELS:02 sample were considered when generalizing the results of this study.

TABLE 6 HERE

Only students with disabilities who met the following criteria were included in the present study: (a) participated in base year and second follow-up questionnaires, (b) provided information regarding postsecondary education enrollment in the second follow-up questionnaire, (c) provided information regarding their 12th grade enrollment status during the first follow-up data collection in 2004, and (d) had transcript data available. Figure 1 provides a visual of how the analytic sample was identified. Beginning with the full ELS:02 sample, cases that did not fulfill the criteria listed above were filtered out, then participants for the study were selected based on the student's IEP status and Carnegie units earned in special education or special education/resource curriculum.

FIGURE 1 HERE

Variables

This section provides a review of the variables that were analyzed in this study. Variable selection was informed by the research questions as well as by findings from the literature reviewed in Chapter II. Descriptions of dependent and independent variables are included in this section. The independent variables include policy-based, student-level, and school-level variables.

It should be noted that imputation was used with certain variables "to address the issue of item nonresponse by providing a procedure that uses available information and some assumptions to derive substitute values for the missing values in a data file" (Ingels et al., 2007, p. 135). This strategy will be noted when used in the descriptions of the variables below, and if used, the imputation procedures used by ELS:02 staff will be described. More information on imputation is available in the methodology section of this chapter.

Dependent variables. There are three dependent variables in this study. The transcript indicated outcome (F1RTROUT) variable was used in research question one. Data for this variable were obtained from participants' high school transcripts. This is a categorical variable, and responses were coded in 16 different ways: Fall 2003-Summer 2004 graduate, post-Summer 2004 graduate, pre-Fall 2003 graduate, graduation date unknown, diploma with special education adjustments, certificate of attendance, still enrolled in high school, dropped out, transferred, left for health-related reason, received GED certificate, withdrew, dismissed, incarcerated, other, and status cannot be determined. This variable was recoded to make it a dichotomous variable with students who graduated with a diploma coded as 1, which includes the three categories of graduates and the students whose graduation date is unknown, and the rest of the students, with the exception of those whose status cannot be determined and the students who transferred and do not have status data available, in the sample recoded as 0. There are two reasons for recoding the data into two categories. First, the small sample of students with disabilities in the study would make analyses of so many different categories very difficult or impossible. Second, one of the main purposes of the study

was to examine the effects of certain factors on graduation and the receipt of a regular diploma rather than the time it took to achieve this milestone. Finally, it should be noted that students were excluded from the study if their graduation status could not be determined or if they were coded as having transferred to a new school and did not have graduation status data available.

The dependent variable in research question two is a composite math coursetaking variable. This variable, which is referred to as the math pipeline variable (F1RMAPIP) in ELS:02, indicates the highest math course for which a student received non-zero credit. The math coursetaking variable in ELS:02 is based on Burkam and Lee's (2003) categorization of math courses taken by NELS:88 participants. Burkam and Lee (2003) divided 47 high school math courses into eight categories using the NCES Classification of Secondary School Courses (CSSC) codes and course content descriptions. The data for the ELS:02 math coursetaking pipeline variable come from student transcripts and are placed into one of the following eight categories: no math; non-academic; low academic; middle academic; middle academic II; advanced I; advanced II/Pre-Calculus; advanced III/Calculus. Table 7 shows the courses that comprise each of these categories.

TABLE 7 HERE

There are at least two considerations that must be noted regarding this variable. First, the math coursetaking pipeline variable constructed by Burkam and Lee (2003) only counts the highest-level math course completed by a student rather than the highest-level math course attempted. Burkam and Lee note that there were a "small (but noticeable) number" (2003, p. 9) of NELS:88 participants who were affected by this

distinction, and it is possible, though not certain, that the same is true for ELS:02 participants. Next, the math coursetaking pipeline variable does not recognize or classify math courses that fall under the Carnegie classification for special education courses, including Functional Math Skills, Functional Vocational Math, and Functional Consumer Math. Burkam and Lee do not address this in their working paper, but since these courses are not listed in their course grouping or in the list of recognized courses in the ELS:02 F1RMAPIP variable (as shown in Appendix B), it is possible that these courses were considered to be non-credit courses. This would mean that students whose highest-level completed math course is one of the three special education courses listed above could fall into the "no math" category.

Since a smaller sample was used in the study and some of the eight categories in this variable had small numbers of students with disabilities, it was necessary to recode and collapse the categories to facilitate analysis. The first category, which was coded as 0, included the no math, non-academic, and low academic groups. The second category, which was coded as 1, included the middle academic and middle academic II groups. The third category, which was coded as 2, included the advanced I, advanced II/Pre-Calculus, and advanced III/Calculus groups.

The third dependent variable, postsecondary enrollment (F2B07), was used in research question three. In the second follow-up questionnaire, participants were asked if they had ever attended a postsecondary school, which includes any college, university, vocational or technical school, or other trade school regardless of whether course(s) were completed. This is a categorical variable, and participants were only given two possible

responses for answering the question: yes or no. Imputation was not used on this item. This variable was coded 1 = yes; 0 = no.

Independent variables. A variety of independent variables were used in the study. Each of the ten variables is categorized with similar variables (if any). The policy-based category consists of one variable, presence of a state exam policy. The student-level demographic characteristics category consists of three variables: gender, race/ethnicity, and socioeconomic status (SES). The student-level academic characteristics category consists of three variables: GPA, number of absences, and vocational course participation. The family characteristics category consists of one variable, mother's highest level of education. Finally, the school-level characteristics category consists of two variables: school urbanicity and school enrollment.

Presence of state exit exam policy. The ELS:02 restricted data includes a variable that indicates the state code for the location of each school (BYSTATE). The source of the data from this variable is the school files within the base year sampling data. Federal Information Processing Standard (FIPS) state codes, which are two-digit numeric codes developed by the federal government that represent all 50 states and the District of Columbia, are used to identify the state of each student's high school in the dataset. Because this information comes from the base year sampling data, which were used to select the schools in the study, this variable has no missing data.

In order to investigate the research questions in this study, which focus on the differences between states with and without state exit exam policies in 2004, it was necessary to recode the state variable. This required further information regarding the state policies that were in place in 2004. According to the Center on Education Policy

(2004), 20 states required students graduating in 2004 to pass an exit exam to earn a high school diploma, amounting to 52% of the public school students in the United States. Table 8 lists the states that withheld diplomas for the class of 2004 if the exit exam requirement was not fulfilled. Additionally, there is a list of names and types of state exit exams in Appendix C. The states listed below were recoded in the dataset as 1 and the remaining states without required exit exams, including the District of Columbia, were recoded as 0. This variable was used in all three of the research questions.

TABLE 8 HERE

Gender. Studies by Ensminger and Slusarick (1992) and Finn, Gerber, and Boyd-Zaharias (2005) found connections between student gender and high school graduation. Data for the gender variable in ELS:02, BYSEX, were collected from the base year student questionnaire. If data were missing for this variable, ELS:02 staff first looked for gender information from the student roster, then used logical imputation based on the student's first name, and employed statistical imputation for any remaining missing cases. The BYSEX variable is a categorical dichotomous variable with only two possible responses: male or female. Male students were coded 1 and female students were coded 0.

Race/ethnicity. Several studies reviewed in Chapter II found students' race/ethnicity to be a significant factor affecting high school graduation (Borg, Plumlee, & Stranahan, 2007; Hickman, Bartholomew, Mathwig, & Heinrich, 2008; Stewart, 2008). The ELS:02 restricted dataset includes many variables regarding the race and ethnicity of students in the study. One variable, BYRACE_R, is a composite, categorical

race/ethnicity variable created using data from multiple ELS:02 variables. Race/ethnicity data was first obtained from the base year student questionnaire, and then missing cases were imputed using a variety of sources. First, data from the sampling roster was consulted to find information on race/ethnicity. Next, if the student's biological parent completed the base year parent questionnaire and race/ethnicity information was available for the parent, the parent's response was imputed for the student. Finally, logical imputation based on other questionnaire items such as student's surname and native language was used for remaining missing cases. ELS:02 reported data from eight categories of race/ethnicity: American Indian/Alaska Native; Asian; Black or African American; Hispanic/no race specified; Hispanic/race specified; Multiracial; Native Hawaiian/Pacific Islander; and White. Since the sample in this study only included students with disabilities and several of these categories included very small numbers of students with disabilities, it was necessary to recode and collapse the data into four categories: White; Hispanic; Black or African American; and Other (includes American Indian/Alaska Native, Asian, Multiracial, and Native Hawaiian/Pacific Islander).

Socioeconomic status. Several studies found a connection between SES or household income and high school graduation (Borg et al., 2007; Finn et al., 2005; Rylance, 1997; Stewart, 2008). ELS:02 contains several continuous and categorical variables on student SES, and I elected to use two SES variables, one continuous and one categorical, in the study. The reason for this is because one variable was better for describing the characteristics of the participants while the other was preferable for more advanced statistical analysis of the ELS:02 data. First, I used BYSES2QU, which is a categorical composite variable in the exploratory data analysis to investigate the

characteristics of the sample. The original version of this variable, BYSES2, is a continuous composite variable that was developed using five other variables in ELS:02: father's/guardian's education; mother's/guardian's education; family income; father's/guardian's occupation; and mother's/guardian's occupation. The BYSES2 variable was then divided into quartiles and recoded to create the BYSES2QU categorical variable. The variable uses occupational prestige scores from the 1989 General Social Study (GSS). Since the scores were divided into quartiles, there were four possible codes in this SES variable: lowest quartile, second quartile, third quartile, and highest quartile. Data for this variable were collected from the base year parent and student questionnaires, and missing cases were imputed. Second, the continuous variable described above, BYSES2, was used in all other data analyses in the study. The data for this variable, which are comprised of occupational prestige scores from the 1989 GSS, range from -2.11 to 1.98. This continuous variable was mean centered prior to being used in the analyses for the three research questions.

GPA. As described in Chapter II, studies by Barrington and Hendricks (1989) and Hickman, Bartholomew, Mathwig, and Heinrich (2008) found a relationship between high school GPA and high school graduation. There are several GPA variables in the ELS:02 restricted dataset, but I used F1RGPP, the GPA for all courses taken in the 9th through 12th grades, in the study. This variable is taken directly from the high school transcript and is described as the cumulative GPA for all courses taken in high school, excluding eighth grade, based on a four-point scale. I elected to use this variable rather than another variable that calculates GPA based on academic courses only because the latter could potentially exclude some special education courses in the calculation. This is

a categorical variable that grouped subjects' GPAs into eight categories: 0.00-0.50, 0.51-1.00, 1.01-1.50, 1.51-2.00, 2.01-2.50, 2.51-3.00, 3.01-3.50, and 3.51-4.00. Due to small sample sizes in some categories, this variable was collapsed and recoded into two categories: GPA of at least 2.01 coded as 1 and GPA is 2.00 or lower coded as 0. The reason for dividing students in this manner is because the mean cumulative GPAs for high school graduates in the studies cited above were within the 2.51-3.00 range, while the mean GPAs for nongraduates or dropouts were far below the same range.

Absences. Studies by Barrington and Hendricks (1989) and Hickman et al. (2008) found that students with higher rates of absenteeism were less likely to earn a high school diploma. The ELS:02 base year student questionnaire asks students how many times they were absent from school during the first semester or term of their 10^{th} grade year. This categorical variable, BYS24C, had five response options: never, 1-2 times, 3-6 times, 7-9 times, and 10 or more times. Barrington and Hendricks (1989) found that the mean number of absences in 10^{th} grade for high school graduates was eight, while the mean number of absences in 10^{th} grade for dropouts or nongraduates was greater than 10. Based on this finding, this variable was recoded as a dichotomous variable, with those students with 6 absences or fewer in the first semester of 10^{th} grade recoded as 1 and at least 7 absences recoded as 0.

Participation in vocational education. Research by Rylance (1997) showed that participation in vocational education was significantly associated with high school graduation in students with disabilities. The variable for total Carnegie units in special education – vocational or career preparation and exploration in ELS:02, F1R55_C, was taken from the high school transcript. It is a continuous variable with values that range

from 0.07 to 12 Carnegie units, with one Carnegie unit being equivalent to a one-year academic course taken one period a day for five days a week. This variable was recoded as a dichotomous variable, with those who have taken any credit in special education vocational education recoded as 1 and those who have not recoded as 0.

Mother's education level. Ensminger and Slusarick (1992) found that students whose mothers had at least a high school diploma were more likely to graduate from high school. This justifies using the ELS:02 variable for mother's education level rather than the dataset's composite variable for parents' highest level of education, which only includes data for the parent with the highest level of education. Data for the ELS:02 composite variable for mother's highest level of education, BYMOTHED, were collected from the base year parent questionnaire. This categorical variable had eight possible responses: did not finish high school; graduated from high school or GED; attended 2-year school, no degree; graduated from 2-year school; attended college, no 4-year degree; graduated from college; completed master's degree or equivalent; and completed PhD, MD, or other advanced degree. If data on mother's education level were missing from the base year parent questionnaire, the base year student questionnaire, which also includes a question regarding mother's level of education, was consulted. In the case that cases were still missing after consulting both questionnaires, ELS:02 staff used a weighted sequential hot deck imputation. The sample for the study contains only students with disabilities and some categories within this variable had sample sizes that are too small to be analyzed, so it was necessary to collapse and recode this variable. Based on research cited at the beginning of this paragraph, the variable was recoded into

two categories: mother has at least a high school diploma and mother did not finish high school.

School urbanicity. Finn et al. (2005) found that students who attended high schools in suburban or rural areas were more likely to graduate from high school than students from urban high schools. The data in the ELS:02 variable for urbanicity, BYURBAN, were obtained from sampling data, as indicated in the 1999-2000 Common Core of Data. This is a categorical variable with three response options: urban, suburban, or rural. There are no missing data associated with this variable.

School enrollment. Finn et al. (2005) also found a positive relationship between graduation rates and high school enrollment. ELS:02 includes total school enrollment variables for each of the four years that the students in the study would have been in high school. The variable for total school enrollment in 2001-02, CP02STEN, was used for this measure because this was the 10^{th} grade year for the students in the study and would pertain to all students in the original sample, including those who graduated early or dropped out before the expected graduation date in 2004. The data for this continuous variable came from the Common Core of Data 2001-02 and range from 20 to 4643. ELS:02 notes that the data for this variable were taken from the school file and were replicated across each student belonging to that school. Due to occasional issues with using numbers in the thousands in statistical analyses, the data in this variable were prepared for analysis by dividing each value by 100. The results will be reported with this in mind. This continuous variable was also mean centered prior to being used in the analyses for the three research questions.

Data Analyses

Sampling weights. Sampling weights are used in the analysis of data for the purpose of reporting results representative of the population rather than the sample, which is typically over-sampled in nationally representative studies. Ingels et al. (2007) describe the weighting scheme in ELS:02 as being meant "to compensate for unequal probabilities of selection and to adjust for the fact that not all individuals selected into the sample actually participated" (p. 135).

ELS:02 includes both student-level and school-level sampling weights. Since student-level data have been collected at many different points of the longitudinal study, ELS:02 staff created a number of student-level weights. These weights include: (a) cross-sectional weights intended to be representative of all 10th grade students in the United States in 2002; (b) cross-sectional weights intended to be representative of all 12th grade students in the United States in 2004; (c) weights for the expanded sample of questionnaire-capable and questionnaire-incapable participants (only available in the restricted-use dataset); (d) a cross-sectional weight for students who were incapable of completing questionnaires for both the base year and first follow-up data collections, as well as students who were incapable of completing the base year questionnaire but were deemed capable of completing the first follow-up questionnaire; (e) a cross-sectional first follow-up weight for base year sample members who completed some or all of the first follow-up questionnaire; (f) a first follow-up panel weight for the expanded sample as described above (only available in the restricted-use dataset); (g) panel transcript weights for students who completed some or all of the base year and first follow-up questionnaires and participated either fully or partially in the transcript study; (h) a cross-

sectional weight for sample members who completed some or all of the second follow-up questionnaire; (i) a cross-sectional weight for members of the sample who have transcript data available and who participated in the second follow-up questionnaire; (j) a second follow-up panel weight for first and second follow-up respondents; and (k) a second follow-up panel weight for sample members who were non-respondents in at least one data collection (Ingels et al., 2007). Since school-level data were only collected during the base year data collection, there is one school-level weight, which weights data based on Spring 2002 10^{th} grade schools.

For this study, appropriate ELS:02 sampling weights were applied based on the unit of analysis and data collection point. The weight variable used in Research Questions 1 and 2 was F1TRSCWT, which is a cross-sectional high school transcript weight that applies to sample members who had at least one transcript available and who participated in the base year and/or first follow-up data collections. This was the appropriate weight variable because the data for both outcome variables come from student transcripts. Each of the two analyses in Research Question 3 used a different variable. The appropriate weight variable for the first analysis in Research Question 3 is F2QWT, a cross-sectional weight that applies to sample members who participated in the second follow-up questionnaire, because the data for the dependent variable were collected during the second follow-up. The appropriate student-level weight variable for the second analysis in Research Question 3 was F2QTSCWT, which is a cross-sectional weight that allows for analysis of study participants who have transcript data available and who participated in the second follow-up questionnaire (Ingels et al., 2007).

All weights were normalized based on the analytic sample. All analyses were also run both weighted and unweighted due to uncertainty about the credibility of the weights in the dataset and concerns about the reliability of the results when weighted. Information about when weights were used is included in the results of the analyses in Chapter IV.

Missing data. With a longitudinal study involving a large sample and multiple questionnaires, missing data are likely to exist. There may be questions on a survey that a respondent may not want to answer, leading to missing data. Additionally, a questionnaire's design may have certain skip patterns, which could cause questions to be left unanswered. The ELS:02 staff used imputation to the maximum extent possible to reduce instances of missing data. Many of the variables in this study include imputed data, and use of imputation has been noted in the description of these variables. There were several types of imputation that were used to fill in missing data. The most commonly used procedure was weighted sequential hot deck imputation (Ingels et al., 2004). The study also uses sequential hot deck imputation, logical imputation, and multiple imputation (Ingels et al., 2004).

As noted above, there are a number of reasons why a respondent would have missing data. To explain missing data, ELS:02 uses a universal reserve code system for missing items in the data files. The code conventions include: (-1) "Don't know"; (-2) "Refused"; (-3) "Item legitimate skip/NA"; (-4) "Nonrespondent"; (-5) "Out of Range"; (-6) "Multiple Response"; (-7) "Partial interview-breakoff"; (-8) "Survey component legitimate skip/NA"; and (-9) "Missing" (Ingels et al., 2004).

Because of the procedures employed by ELS:02 researchers, cases of missing data in this study are minimal. As noted above, many of the variables in this study have been imputed and others, including presence of a state exam policy and school urbanicity, include data taken from sampling data and have no missing cases. Additionally, in selecting variables for this study, I aimed to select variables with little or no missing data. For example, there were other variables that could have been selected for this study, but some, including percentage of teachers with advanced degrees, could not be used due to large amounts of missing data. In the instances in which small amounts of missing data still existed, listwise deletion was used to eliminate cases with missing data on any variable. This procedure had the potential to reduce the sample size, but as Kline (2009) describes, an advantage of using this method is that "all analyses are based on the same subset of cases" (p. 242).

Finally, it is important to note that there was a possibility that deleting cases from the sample could lead to problems with bias. I ran a non-bias report analysis to test for differences between the analytic sample and the sample of cases that were dropped as a result of missing data. A series of chi-square analyses were conducted for categorical variables, while t-tests were conducted on continuous variables. Key student- and school-level variables from the study were included in the analysis. The results of the non-bias report analysis assisted in evaluating the external validity of the analytic subsample.

Analyses. Several types of analyses were conducted in this study. First, exploratory descriptive analyses were conducted to examine the differences between students with disabilities in states with and without high school exit exams in 2004.

Binary logistic regression was used in question one to examine the extent to which attending high school in a state with exit exams in 2004 predicted attainment of a regular high school diploma for students with disabilities. Multinomial logistic regression was used in question two to investigate the relationship between attending high school in a state with exit exams in 2004 and math coursetaking for students with disabilities. Finally, a series of logistic regression analyses were used in question three to determine whether attending high school in a state with exit exams in 2004 predicted enrollment in postsecondary education, and how math coursetaking contributed to this relationship. A description of these types of analyses is provided in this section.

Exploratory descriptive analyses. Descriptive statistics for all dependent and independent variables were computed before proceeding with the other analyses. The purpose of this was to learn about the characteristics of the full sample of students with disabilities in ELS:02 as well as to compare the characteristics of the two analytic subsamples, students with disabilities who lived in states with exit exam policies in 2004 and students with disabilities who lived in states without exit exam policies in 2004. Additionally, descriptive statistics were computed for the full ELS:02 sample for the purpose of providing context. Specifically, I was interested in finding out how the characteristics of students with disabilities in ELS:02 compared with the characteristics of all ELS:02 participants. The descriptive statistics that were computed in these analyses included frequencies, mean, and standard deviation.

Since logistic regression was used in this study, it is important to note that multicollinearity was assessed prior to a logical regression analysis as it could have led to incorrect results. Therefore, while conducting the exploratory data analyses, I screened

the variables for multicollinearity. Tolerance statistics and variance inflation factor (VIF) scores are not available through the logistic regression command in SPSS, so it was necessary to use the linear regression command for this exploratory analysis. The tolerance statistics and VIF scores were examined to determine whether issues of multicollinearity existed.

Finally, before conducting all other analyses, I conducted bivariate correlational analyses first between each dependent variable and all independent variables, then a bivariate correlational matrix analysis with all independent variables. This allowed me to evaluate correlation among the variables in the study and to drop any variables from the analyses that were highly correlated with another variable. Variables correlated at 0.6 or higher were considered highly correlated and I determined whether they should remain in the study.

Logistic regression analysis. Since the remainder of the analyses in the study involved forms of logistic regression analysis, I will present background information about logistic regression in this section, as well as rationale for using this as a method for analysis in the study. Specific information about the independent and dependent variables in each question and procedures for analysis are discussed in the sections that follow.

The decision to use logistic regression for these questions was related to the purpose of the study and the nature of the questions in the study. Logistic regression is similar to bivariate and multiple regression in that it can be used for the purposes of explanation or prediction (Huck, 2012). However, logistic regression is different from other types of regression in that it can focus "primarily on the dependent variable and

how to predict whether people end up in one or the other of the two categories of that outcome variable" (Huck, 2012, p. 394). In all questions, logistic regression was used for predictive purposes. For example, in the case of Research Question 1, the purpose was to determine whether the non-control independent variable, the presence of a high school exit exam policy in 2004, predicted whether students in the sample graduated with a regular diploma, one of the categories of the outcome variable, or if they did not graduate with a regular diploma, the other category of the outcome variable. Likewise, in Research Question 3, the purpose was to determine whether the non-control independent variable, the presence of a high school exit exam in 2004, predicted whether students in the sample enrolled in postsecondary education, one of the categories of the outcome variable, of if they did not enroll in postsecondary education, the other category of the outcome variable.

Logistic regression is often used to describe the predictive power of an independent variable by using odds, and an odds ratio is reported for each independent variable in the analysis (Huck, 2012). Huck defines the odds ratio as a "more user-friendly concept than the Pearson-based coefficient of determination" that "measures the strength of association between the independent variable and the study's dependent variable" (2012, p. 395). Logistic regression also has fewer assumptions than other types of regression. The assumptions of logistic regression include independent observations and a relationship between the independent variable and the logit of the dependent variable (Leech, Barrett, & Morgan, 2008). Logistic regression also requires certain conditions, including a dichotomous outcome variable that is mutually exclusive and a large sample (Leech et al., 2008).

Research Question 1. Research Question 1: Does attending a high school in a state that reported having an exit exam in 2004 predict receipt of a regular high school diploma for a student with a disability, controlling for selected student, family, and school characteristics?

To answer Research Question 1, I used binary logistic regression to predict a dichotomous outcome from a dichotomous predictor in the full sample of students with disabilities in ELS:02. As noted in Research Question 1, I controlled for selected student, family, and school characteristics, so only one predictor was entered into the equation. In this model, transcript-indicated graduation status was the dependent variable and the presence of an exit exam policy in 2004 was the independent variable. While setting up the commands in SPSS to execute the analysis, I ensured that confidence intervals were computed for the odds ratio of the predictor's contribution to the equation. The reason for reporting this is because the use of confidence intervals is one method for testing the significance of the odds ratio in logistic regression (Huck, 2012). Additionally, the results of the Wald test, also reported in the statistical output, was used to determine whether the odds ratio was statistically significant. Through this analysis, I hoped to determine whether attending high school in a state with an exit exam in 2004 predicted receipt of a regular high school diploma for a student with a disability, and hypothesized that presence of a state exit exam requirement would not predict high school graduation for a student with a disability in ELS:02.

Research Question 2. Research Question 2: Does attending a high school in a state that reported having an exit exam in 2004 predict math coursetaking for a student with a disability, controlling for selected student, family, and school characteristics?

Because Research Question 2 had a dependent variable that is not dichotomous, binary logistic regression was not an appropriate method of analysis. Because math pipeline is a categorical variable that was recoded to three categories, I used multinomial logistic regression to answer Research Question 2. Utilizing a multinomial logistic regression model allowed for the prediction of a categorical outcome from a dichotomous predictor in the full sample of students with disabilities in ELS:02. While the dependent variable is technically ordinal in nature, which would suggest usage of ordinal logistic regression, I felt that multinomial logistic regression was a more appropriate choice for the intended purpose of this particular analysis. Since the intent of Research Question 2 was to predict completion of a math course in one category rather than another, it made more sense to treat math pipeline as a nominal variable.

As noted in Research Question 2, I controlled for selected student, family, and school characteristics, so only one predictor was entered into the equation. In this model, math pipeline was the dependent variable and the presence of an exit exam policy in 2004 was the independent variable. Confidence intervals were computed and reported for the purpose of testing the significance of the predictor's odds ratios, and Wald's x^2 was computed and reported to determine statistical significance. Through this analysis, I hoped to determine whether attending high school in a state with an exit exam in 2004 predicted if the highest math course completed by a student with a disability fell into the non-academic/low, middle, or advanced rigor category, and I hypothesized that presence of an exit exam requirement would predict math coursetaking for a student with a disability in ELS:02.

Research Question 3. Does attending a high school in a state that reported having an exit exam in 2004 predict enrollment in postsecondary education for a student with a disability, controlling for selected student, family, and school characteristics? What is the contribution of math coursetaking to the relationship between attending high school in a state with an exit exam in 2004 and enrollment in postsecondary education for a student with a disability?

To answer Research Question 3, I used a series of two logistic regression analyses. The purpose of the first analysis was to predict a dichotomous outcome from a dichotomous predictor in the full sample of students with disabilities in ELS:02. As noted in Research Question 3, I controlled for selected student, family, and school characteristics, so only one predictor was entered into the equation for the first model. In this model, postsecondary enrollment status was the dependent variable and the presence of an exit exam policy in 2004 was the independent variable. Confidence intervals were computed and reported for the purpose of testing the significance of the predictor's odds ratios, and Wald's x^2 was computed and reported to determine statistical significance. Through the first analysis, I hoped to determine whether attending a high school in a state with an exit exam in 2004 predicted enrollment in postsecondary education for a student with a disability, and I hypothesized that presence of a state exit exam requirement would predict enrollment in postsecondary education for a student with a disability in ELS:02.

The purpose of the second analysis was to determine the contribution of a non-dichotomous categorical variable to the relationship between a dichotomous predictor and a dichotomous outcome in the full sample of students with disabilities in ELS:02. This differs from the previous analysis in that two predictors were entered into the equation for

the second model. In this model, postsecondary enrollment status was still the dependent variable, but the presence of an exit exam policy in 2004 was the focal independent variable and math pipeline was a second independent or predictor variable. This created a logistic regression analysis with a two-way interaction. Jaccard (2001) defines an interaction as an effect that exists "when the effect of an independent variable on a dependent variable differs depending on the value of a third variable" (p. 12).

The procedure for a logistic regression analysis with a two-way interaction involves the use of dummy variables, according to Jaccard (2001). As noted earlier in this chapter, data for presence of an exit exam policy in 2004 were recoded as 1 if the state had an exit exam requirement, and 0 if the state did not have an exit exam requirement. Because math pipeline has three levels, it was represented in this analysis using two dummy variables, $MATH_{ADV}$ (Advanced category coded as 1, all other responses coded as 0) and $MATH_{MID}$ (Middle category coded as 1, all other responses coded as 0). The reference group for presence of an exit exam policy in 2004 was no exit exam and the lowest category in the math pipeline (which includes no math, non-academic, and low academic math courses) was the reference group for math pipeline.

Through this analysis, I obtained and reported predicted odds ratios, logistic coefficients, and exponents of coefficients for the predictor variables. Additionally, confidence intervals were computed and reported for the purpose of testing the significance of the predictor's odds ratios. By adding the interaction variable, I hoped to be able to examine whether math coursetaking affected the relationship between attending high school in a state with an exit exam requirement in 2004 and postsecondary

education enrollment of a student with a disability, and I hypothesized that math coursetaking would affect this relationship for a student with a disability in ELS:02.

Proposed Statistical Software for Conducting Analysis

The IBM SPSS 19.0 software program (IBM, 2010) was used throughout all analyses in the study. The purpose of using SPSS is because the software provides the ability to conduct all statistical techniques in the study including exploratory data analyses, application of sampling weights, and logistic regression analyses.

Summary

This chapter provided a detailed description of the methods that were used to answer the research questions. A description of the ELS:02 database, including overview, purpose, research design, sampling strategy, and instrumentation, was provided to give background information on the database that was used in the study. A section on identifying students with disabilities indicated that the sample of students with disabilities were determined using the IEP status variable and the transcript-indicated variable for special education coursetaking. From the ELS:02 database, transcript-indicated graduation status, highest-level math course completed as indicated by transcript, and postsecondary education enrollment were identified as dependent variables. In addition, the following variables were identified as independent variables or covariates: presence of a state exit exam policy (as indicated by the state code for school location), gender, race/ethnicity, SES, mother's highest level of education, GPA, number of absences, vocational course participation, urbanicity, and school enrollment. Finally, SPSS software was used to answer the research questions by conducting exploratory data analyses, binary logistic regression analyses, and multinomial logistic regression analysis.

Chapter IV

Analyses and Findings

This study had several purposes. The first purpose of the study was to examine the relationship between selected student, family and school characteristics, and state exit exam policies and the impact on graduation from high school among a sample of students with disabilities. A second purpose of the study was to explore the relationship between attending high school in a state that has an exit exam policy and the academic rigor of the coursework, as measured by the highest math course completed, among a sample of students with disabilities. The last purpose of study was to investigate the contribution of attending high school in a state that has an exit exam policy and academic rigor in coursetaking on enrollment in postsecondary education among a sample of students with disabilities. To accomplish this, variables were selected from the base year, first follow-up, and second follow-up waves of the Education Longitudinal Study of 2002 (ELS:02) database, including the transcript data.

In this chapter, I present the results of the study. First, I provide the results of the non-bias analyses, which includes analyses of missing data, to evaluate the effects of excluding cases without complete data on all of the selected variables. Next, I provide results of the exploratory data analyses, including the characteristics and comparisons of the samples and subsamples, multicollinearity diagnostics, and intercorrelations for the variables in the study. These analyses are followed by the findings from the logistic regression analyses for the three research questions.

Missing Data Analysis

Though I used filters during the sample determination process to reduce the number of cases in the analytic sample with missing data, a portion of participants still had missing data on certain variables. As noted in Chapter III, cases with missing data were to be dropped from the analytic sample using listwise deletion. After dropping these cases, I conducted analyses on the missing data to determine whether this caused the analytic sample to be biased. These analyses also helped to evaluate the extent to which the findings from the analytic sample can be generalized to the national population of high school students with disabilities. In this section I present the results of the missing data analysis.

Results of the missing data analysis. Cases that were missing data on one or more of the variables were dropped from the analytic sample. After using listwise deletion to exclude cases with missing data on at least one variable, 78% of cases in the sample were retained (N = 991) for analysis in the study. Overall, I excluded 279 cases (22%) from the analytic sample due to missing data. Table 9 shows the comparison of cases that were dropped and for those retained in the sample. The frequencies for categorical variables are presented, as are the means and standard deviations for the continuous variables. I conducted chi-square analyses and t-tests for the purpose of comparing the two groups of participants. As noted earlier in this section, only certain variables still had missing data after the sample was filtered and narrowed to only students with disabilities. The following variables had varying amounts of missing data: graduation status, gender, race/ethnicity, SES (categorical), SES (continuous), number of absences, mother's education level, and school enrollment.

TABLE 9 HERE

As shown in Table 9, there are some differences between the group of cases with missing data and the group of cases with complete data. There were statistically significant differences on two of the dependent variables, math pipeline and enrollment in postsecondary education. There were also statistically significant differences between the groups on several of the covariates, including GPA, number of absences, and SES (continuous). This could be cause for concern, as eliminating cases could threaten the validity of the study and create a bias in the sample of cases to be analyzed. The results in Table 9 suggest that results in the study should be interpreted with caution with regard to the variables that showed statistically significant differences.

To further examine the external validity of the sample to be used in the analyses, I compared the characteristics of the sample to national data for high school students with and without disabilities. Data for the national population of students without disabilities were presented to determine how students with disabilities compare to their peers, particularly on the outcome variables in this study. For my comparisons with high school students with disabilities, I used results from the National Longitudinal Transition Study-2 (NLTS2). This is an appropriate comparison group for several reasons. First, comprehensive national data on high school students with disabilities is not publicly available at this time, but NLTS2 is a large-scale study funded by the U.S. Department of Education with a nationally representative sample of young adults with disabilities. Second, the NLTS2 sample consists of students with disabilities who were 13 to 16 years

of age in 2000, which makes the participants comparable in age to the participants in ELS:02, who were sophomores in high school in 2002. Finally, like ELS:02, NLTS2 included a transcript study and collected data on variables similar to the outcome measures in this study. NLTS2, however, did not collect data on all of the variables in this study, so only results for the dependent variables and some covariates are included. Table 10 compares statistics from the analytic sample with statistics from NLTS2, as well as national data on high school sophomores. National data on the population of high school sophomores came from various sources, which are noted below Table 10.

TABLE 10 HERE

As seen in Table 10, there are several notable differences between the national population data and the two samples. First, the high school graduation rate for the students with disabilities in ELS:02 was higher than the graduation rate for both the national population of students who graduated from high school in 2004 and the graduation rate for students with disabilities in NLTS2. It should be noted that NLTS2 reported a different graduation rate than the one shown in Table 10 because their definition of graduation differed from the one in this study. The NLTS2 counted students who received non-standard diplomas as high school graduates. Because of this, I used receipt of a standard diploma data from NLTS2 to determine a graduation rate that was consistent with the definition of graduation used in my study. NLTS2 reported a graduation rate of 75.5%, with 54.4% of students in the study receiving a standard diploma, 16.4% receiving a special diploma, 2.4% receiving a certificate of completion, 0.9% receiving a vocational, occupational, or career diploma, and 0.1% receiving a GED.

Additionally, students with disabilities in ELS:02 completed advanced math courses at a much higher rate than the participants in NLTS2, and the youth in NLTS2 completed non-academic or low academic math courses at a higher rate than their peers in ELS:02. The postsecondary education enrollment rates for the samples of students with disabilities were similar, but still lower than the national rate of postsecondary enrollment for the entire student population. The percentage of students with disabilities in ELS:02 from states with an exit exam in 2004 is virtually the same as what was seen in the national population of 2004 high school graduates. Male students with disabilities are overrepresented in the analytic sample when compared with the national population of high school sophomores in 2002, but the overrepresentation is less than what is seen in the NLTS2 sample. Hispanic and African-American students with disabilities are overrepresented in the analytic sample with rates comparable to what was seen in the NLTS2 sample. Students with disabilities in ELS:02 from the category of other races were also overrepresented when compared to the national groups. Finally, when compared with the nationally representative population of students with disabilities in NLTS2, fewer students with disabilities in ELS:02 participated in Special Education – Vocational courses.

Summary. Overall, the results of the missing data analyses indicate no significant differences between the full analytic sample of students with disabilities in ELS:02 and the cases with complete data that were used in the logistic regression analyses. However, there were significant differences between the analytic sample, nationally representative data for high school students with disabilities, and data for the

national population of students expected to graduate from high school in 2004. These differences have implications for the external validity of findings in this study.

Exploratory Data Analyses

Prior to addressing the research questions, I computed descriptive statistics for all dependent and independent variables in the study. These descriptive statistics included frequencies and percentages for the dependent variables and categorical independent variables and mean and standard deviation for the continuous independent variables in the study. The main purpose was to describe the characteristics of the analytic sample of students with disabilities in ELS:02. A second purpose was to compare the characteristics of the analytic sample to the full ELS:02 sample. Finally, I computed descriptive statistics for the two analytic subsamples, students with disabilities who lived in states with exit exam policies in 2004 and students with disabilities who lived in states without exit exam policies in 2004, for the purpose of comparing the characteristics of the two groups.

Characteristics of ELS:02 sample and analytic sample. Overall, there were significant differences between the full sample of ELS:02 participants and the analytic sample of students with disabilities on several characteristics. With regard to the dependent variables in the study, the results show some differences between the full ELS:02 sample and the analytic sample. First, students in the analytic sample graduated with a standard high school diploma at a lower rate (85.2%) than students in the full sample (90.2%). Students in the analytic sample were also more likely to be in the lowest category of the math pipeline (24.6%) than students in the full sample (8.5%). Finally,

the rate of enrollment in postsecondary education was considerably lower in the analytic sample (55.8%) than it was in the full sample (75%).

Students with disabilities in ELS:02 differed from the full sample in other ways as well. Male students made up a majority of the participants in the analytic sample (56%). Students of color were overrepresented in the analytic sample, with Hispanic youth (18.8%), Black or African-American youth (17.9%), and youth from the "Other" category (13%) comprising more than half of the students with disabilities in ELS:02. More than a third of the students with disabilities in ELS:02 were from families in the lowest SES quartile (35.2%). Data from the continuous variable also show a difference between the average SES of the two groups, with the mean SES score for the analytic sample being -0.21 (SD = 0.71), lower than the mean SES score for the ELS:02 sample, 0.04 (SD = 0.75). Students with disabilities also differed from the full sample on the academic measures, with more than a quarter of the participants in the analytic sample finishing high school with a GPA at or below 2.0 (27.3%) and 20.1% of youth missing more than 7 days of school in a semester. Finally, 20.2% of students with disabilities in the study had a mother who did not graduate from high school. Table 11 shows the results of the descriptive analyses for the full sample of ELS:02 participants and the results for the analytic sample of students with disabilities.

TABLE 11 HERE

Characteristics of students with disabilities in states with and without exit exams. The descriptive statistics show some differences between the two subsamples of students with disabilities in the study. I computed the descriptive statistics for the two

groups with only the sample of cases with complete data (N = 991). The results for that analysis are as follows. Descriptive statistics for the full analytic sample (N = 1270) are available in Appendix E. The graduation rates of the two groups were similar, with the students from states without exit exams achieving a slightly higher graduation rate (86.1%) than their peers from states with exit exams (84.9%). The differences between the two groups can be observed on the remaining dependent variables. While the percentage of students completing courses in the lowest category of the math pipeline is similar for the two groups, 56.0% of students in states without exit exams completed a course in the middle academic category and 21.3% completed an advanced math course. Fewer of their peers in states with exit exams completed math courses in the middle category (48.7%), but they completed advanced math courses at a much higher rate (30.2%) than the students who did not have to pass an exit exam to graduate (21.3%). Additionally, students with disabilities in states with exit exams enrolled in postsecondary education at a higher rate (63.1%) than students with disabilities in states without exit exams (55.4%).

Like the sample with missing data, there were more male students than female students in each of the groups. One demographic characteristic with larger differences between the groups was race/ethnicity. More than one-fifth of the students in states without exit exams were Hispanic (22.1%) while 15.7% of the students in states with exit exams were Hispanic. Black or African-American students were overrepresented in the group with exit exams (22.4%) compared to the group without exit exams (11.6%). White students made up less than half of the population in the group of students in states with exit exams (49.7%). More than one-third of students in states without exit exams

were from families in the lowest SES quartile (37.1%) and 30.4% of their peers in states with exit exams were classified as being in the lowest SES category. Finally, more students in states with exit exams attended high schools in rural settings (21.7%) than students whose states had no exit exam requirement (18.5%). Table 12 shows the comparison of cases with complete data for both groups of states: the states with exit exam requirements in 2004 and the states without exit exam policies in 2004.

TABLE 12 HERE

Results of chi-square analyses. To learn more about the differences between the two groups of students based on the presence of a state exit exam policy, I conducted chi-square analyses on the three dependent variables. Table 13 shows that the groups were not significantly different on the transcript-indicated graduation variable. However, I did find significant differences between the two groups on both the math pipeline variable and the enrollment in postsecondary education variable. While there were significant differences on those variables, more analyses were conducted to determine whether the effects could be attributed to the presence of a state exit exam policy, and those results are presented later in this chapter.

TABLE 13 HERE

Results of multicollinearity diagnostics. Huck (2012) notes that multicollinearity exists in logistic regression when independent and control variables are highly correlated with each other. To determine whether multicollinearity would be a

concern in this study, I evaluated the independent and control variables for collinearity using tolerance statistics and variance inflation factor values (VIF). The tolerance statistics for the independent variables ranged from .72 to .99 and the VIF values ranged from 1.01 to 1.40. These tolerance statistics and VIF values indicate that all of these variables could be included in the logistic regression analyses without violating the assumption of collinearity. The tolerance statistics and VIF values are presented in Table 14.

TABLE 14 HERE

Results of bivariate correlations. To gain more insight into the relationships between the many independent variables and three dependent variables in this study, I conducted bivariate correlations before conducting the logistic regression analyses for my research questions. Since this study had three dependent variables, the bivariate correlations were conducted three times to evaluate the strength of the relationships between high school graduation, math coursetaking, and postsecondary education enrollment and each of the eight dichotomous or continuous variables. I used Cramer's V statistics (for the dichotomous independent variables) and Pearson's product-moment correlation coefficients (for the continuous independent variables) for these analyses. The purpose of the bivariate correlation analyses was not only to learn more about the factors affecting these student outcomes, but also to determine whether the same factors had different relationships with the differing outcome variables. For example, I was particularly interested in finding out whether the presence of a state exit exam policy, an

independent variable, had a stronger or weaker relationship with high school graduation than it did with math coursetaking and enrollment in postsecondary education.

The results of the bivariate correlation analysis between high school graduation and the independent dichotomous or continuous variables are presented in Table 15. Only two of the independent variables, exit exam required by state (Cramer's $V = .02$) and school enrollment ($r = -.04$), were not significantly correlated with high school graduation. Five other dichotomous variables were significantly correlated ($p < .05$) with high school graduation with Cramer's V ranging from .08 to .38. The remaining continuous variable, SES, was also significantly correlated with high school graduation ($r = .19, p < .01$). Although the majority of the correlations were significant, the coefficients signal only weak to moderate relationships between the dichotomous or continuous independent variables in the study and high school graduation.

TABLE 15 HERE

The results of the bivariate correlation analysis between math coursetaking and the independent dichotomous or continuous variables are presented in Table 16. Only one of the independent variables, gender (Cramer's $V = .06$), was not significantly correlated with high school graduation. The independent variable of interest in this study, exit exam required by state, was significantly correlated with math coursetaking (Cramer's $V = .08, p < .05$). Four other dichotomous variables were also significantly correlated ($p < .01$) with math coursetaking with Cramer's V ranging from .09 to .23. The two continuous variables, SES ($r = .27$) and school enrollment ($r = .06$), were also significantly correlated with math coursetaking ($p < .05$). As with high school

graduation, despite the fact that the majority of the correlations were significant, the coefficients signal only weak to moderate relationships between the dichotomous or continuous independent variables in the study and math coursetaking.

TABLE 16 HERE

The results of the bivariate correlation analysis between postsecondary education enrollment and the independent dichotomous or continuous variables are presented in Table 17. All six of the dichotomous independent variables were significantly correlated ($p < .05$) with enrollment in postsecondary education with Cramer's V ranging from .06 to .29. As with math coursetaking, the independent variable of interest in this study, exit exam required by state, was significantly correlated with enrollment in postsecondary education (Cramer's $V = .06$, $p < .05$). The two continuous variables, SES ($r = .36$) and school enrollment ($r = .09$), were also significantly correlated with postsecondary education enrollment ($p < .01$). Again, even though all of the correlations were significant, the coefficients signal only weak to moderate relationships between the dichotomous or continuous independent variables in the study and enrollment in postsecondary education.

TABLE 17 HERE

Based on the results of the bivariate correlation analyses between the three dependent variables, we can conclude that the relationships between certain independent variables and each of the dependent variables differ based on the outcome being examined. For example, presence of a state exit exam policy was not significantly

correlated with high school graduation, but it had weak significant correlations with math coursetaking and enrollment in postsecondary education. This particular result suggests that this independent variable could have very different relationships with math coursetaking and enrollment in postsecondary education than it does with high school graduation, and that these relationships are worthy of further investigation.

Finally, I conducted bivariate correlations between all of the independent variables and summarized them within a correlation matrix. The purpose of this was to determine the relationship among the independent variables and decide which of the variables, if any, should be dropped from the logistic regression analyses. Table 18 shows the bivariate correlation matrix. The majority of the correlations did not warrant any concerns about using the identified variables in the logistic regression models. However, mother's education level and SES were correlated at .52. In Chapter III, I stated that I would drop any variables correlated at .60 or higher, and while the correlation between mother's education level and SES is not above .60, it is still quite strong and considerably higher than the correlations between other variables. Both mother's education level and SES are serving as control variables in the logistic regression analyses and could have been dropped. However, SES has been a significant predictor of student outcomes in a number of previous studies; therefore, I decided to retain SES and drop mother's education level from the study. All other variables were retained in the analyses related to the three research questions.

TABLE 18 HERE

Research Question 1

Research Question 1: Does attending a high school in a state that reported having an exit exam in 2004 predict high school graduation for a student with a disability, controlling for selected student, family, and school characteristics?

I used logistic regression to analyze the relationship between attending high school in a state with an exit exam requirement for graduates in 2004 and graduating from high school with a standard diploma among students with disabilities while controlling for selected student, family, and school characteristics. As noted in Chapter III, the analysis for Research Question 1 was conducted both with and without the appropriate weight variable. The unweighted results are presented in this chapter and results of the analysis weighted with the normalized version of the cross-sectional high school transcript weight for base year and first follow-up participants (F1TRSCWT) are presented in Appendix D (Table D1).

After using listwise deletion to eliminate cases with missing data on any of the dependent or independent variables in the study, I conducted a logistic regression analysis with the remaining sample (N = 991). When all independent variables and covariates were considered together, they significantly predicted high school graduation (Model $X^2 = 170.58, df = 12, p < .001$). The student, family, and school characteristics alone significantly predicted high school graduation (Block 1 $X^2 = 169.89, df = 11, p < .001$) and correctly predicted 18.9% of the students who did not graduate from high school, 97.6% of those who graduated, and 86.3% of all cases. However, adding the variable for state exit exam requirement in 2004 did not significantly increase the prediction of high school graduation among students with disabilities in ELS:02 above

that of the other characteristics (Block 2 $X^2 = 0.68, df = 1, p > .05$). The presence of a state exit exam policy in 2004 along with the control variables correctly predicted 22.4% of the students who did not graduate from high school, 97.8% of those who graduated, and 86.9% of all cases.

Table 19 presents the results from the logistic regression analysis, including the odds ratios. As suggested by the results presented in the previous paragraph, presence of a state exit exam policy in 2004 was not a significant predictor of high school graduation for students with disabilities in ELS:02 ($p > .05$) when all of the independent variables and covariates were considered. Rather, other variables in the study were more likely to predict high school graduation than an exit exam requirement. The odds of graduating from high school significantly increased for participants with GPAs greater than or equal to 2.01 (OR = 6.93) when compared to participants with GPAs at or below 2.00. The odds of graduating also significantly increased for youth with disabilities who had six absences or fewer during the first semester of their sophomore year (OR = 1.79) when compared with peers who were absent seven times or more. The odds of graduating significantly decreased for students with disabilities who received credit for Special Education – Vocational courses (OR = 0.51) when compared with students with disabilities who did not participate in these courses. Students with disabilities who attended high schools in rural areas were significantly less likely to graduate with a standard diploma (OR = 0.50) when compared with students who attended high schools in urban areas. Finally, the odds of graduating from high school significantly increased as SES levels increased (OR = 2.03).

TABLE 19 HERE

Research Question 2

Research Question 2: Does attending a high school in a state that reported having an exit exam in 2004 predict math coursetaking for a student with a disability, controlling for selected student, family, and school characteristics?

I used multinomial logistic regression to analyze the relationship between attending high school in a state with an exit exam requirement for graduates in 2004 and math coursetaking among students with disabilities while controlling for selected student, family, and school characteristics. As noted in Chapter III, the analysis for Research Question 2 was conducted both with and without the appropriate weight variable. The unweighted results are presented in this chapter and results of the analysis weighted with the normalized version of the cross-sectional high school transcript weight for base year and first follow-up participants (F1TRSCWT) are presented in Appendix D (Table D2).

After using listwise deletion to eliminate cases with missing data on any of the dependent or independent variables in the study, I conducted a multinomial logistic regression analysis with the remaining sample (N = 991). When all independent variables and covariates were considered together, they significantly predicted math coursetaking (Model $X^2 = 231.19$, $df = 24$, $p < .001$). The student, family, and school characteristics alone significantly predicted math coursetaking (Block 1 $X^2 = 222.15$, $df = 22$, $p < .001$). Additionally, introducing the variable for state exit exam requirement in 2004 significantly increased the prediction of math coursetaking among students with

disabilities in ELS:02 above that of the other characteristics (Block 2 $X^2 = 9.04$, $df = 2$, $p < .05$).

Since I conducted a logistic regression analysis with a non-dichotomous categorical outcome variable, Table 20 is divided into two sections and presents the results, including odds ratios, for the following groups: students with disabilities in ELS:02 who completed coursework in the middle academic category of the math pipeline compared with students with disabilities who completed coursework in the lowest category, and students with disabilities in ELS:02 who completed coursework in the advanced category of the math pipeline compared with students with disabilities who completed coursework in the lowest category. The odds of completing math coursework in both the middle academic (OR = 0.25) and the advanced (OR = 0.12) categories significantly decreased for students with disabilities who received credit for Special Education – Vocational courses when compared with students with disabilities who did not participate in these courses. Additionally, the odds of completing math coursework in both the middle academic (OR = 0.49) and the advanced (OR = 0.18) categories significantly decreased for students with disabilities who attended high schools in rural areas when compared with their peers who attended high schools in urban areas. However, the odds of completing math coursework in the middle academic (OR = 1.67) and advanced (OR = 2.85) significantly increased as SES scores of students with disabilities increased.

While the presence of a state exit exam policy in 2004 did not significantly predict completion of math coursework in the middle academic category ($p > .05$), the odds of completing math coursework in the advanced category significantly increased for

students with disabilities who attended high schools in states with an exit exam requirement in 2004 (OR = 1.54) when compared to students with disabilities whose states did not have an exit exam requirement in 2004. Additionally, the odds of completing math coursework in the advanced category significantly increased for participants with GPAs greater than or equal to 2.01 (OR = 4.59) when compared to participants with GPAs at or below 2.00. Students with disabilities who attended high schools in suburban areas were significantly less likely to complete math coursework in the advanced category (OR = 0.53) when compared with students who attended high schools in urban areas. Finally, the odds of completing math coursework in the advanced category rose with every 100-student increase in school enrollment (OR = 1.03).

TABLE 20 HERE

Research Question 3

Research Question 3: Does attending a high school in a state that reported having an exit exam in 2004 predict enrollment in postsecondary education for a student with a disability, controlling for selected student, family, and school characteristics? What is the contribution of math coursetaking to the relationship between attending high school in a state with an exit exam in 2004 and enrollment in postsecondary education for a student with a disability?

This section is divided into two subsections for the purpose of reporting the results for this research question. I present the results of the analysis that examined the presence of a state exit exam policy in 2004 and enrollment in postsecondary education in the first subsection. In the second subsection, I report the results of the analysis that

investigated the contribution of math coursetaking to the relationship between the presence of a state exit exam policy in 2004 and enrollment in postsecondary education. As noted in Chapter III, the analyses for Research Question 3 were conducted both with and without the appropriate weight variables. The unweighted results are presented in this chapter. Results of the first analysis weighted with the normalized version of the cross-sectional weight for second follow-up questionnaire variables (F2QWT) are presented in Appendix D (Table D3), as are results of the second analysis weighted with the cross-sectional weight for use with transcript and second follow-up questionnaire variables (F2QTSCWT) (Table D4).

Results of the first analysis. I used logistic regression to analyze the relationship between attending high school in a state with an exit exam requirement for graduates in 2004 and postsecondary education enrollment among students with disabilities while controlling for selected student, family, and school characteristics. After using listwise deletion to eliminate cases with missing data on any of the dependent or independent variables in the study, I conducted a logistic regression analysis with the remaining sample (N = 991).

When all independent variables and covariates were considered together, they significantly predicted enrollment in postsecondary education (Model $X^2 = 270.49$, $df = 12$, $p < .001$). The student, family, and school characteristics alone significantly predicted enrollment in postsecondary education (Block 1 $X^2 = 267.82$, $df = 11$, $p < .001$) and correctly predicted 59.1% of the students who did not enroll in postsecondary education, 79.3% of those who enrolled, and 71.1% of all cases. Similar to the results in Research Question 1, adding the variable for state exit exam requirement in 2004 did not

significantly increase the prediction of postsecondary education enrollment among students with disabilities in ELS:02 above that of the other characteristics (Block 2 X^2 = 2.67, $df = 1$, $p > .05$). The presence of a state exit exam policy in 2004 along with the control variables correctly predicted 59.9% of the students who did not enroll in postsecondary education, 80% of those who enrolled, and 71.8% of all cases.

Table 21 presents the results from the logistic regression analysis, including the odds ratios. As suggested by the results presented in the previous paragraph, presence of a state exit exam policy in 2004 was not a significant predictor of postsecondary education enrollment for students with disabilities in ELS:02 ($p > .05$) when all of the independent variables and covariates were considered. In this case, other variables in the study were more likely to predict enrollment than an exit exam requirement. The odds of enrollment significantly decreased for male students with disabilities (OR = 0.65) when compared with female students with disabilities. The odds of enrollment in postsecondary education significantly increased for participants with GPAs greater than or equal to 2.01 (OR = 3.62) when compared to participants with GPAs at or below 2.00. The odds of postsecondary education enrollment significantly decreased for students with disabilities who received credit for Special Education – Vocational courses (OR = 0.32) when compared with students with disabilities who did not participate in these courses. Students with disabilities who attended high schools in rural areas were significantly less likely to enroll in postsecondary education (OR = 0.51) when compared with students who attended high schools in urban areas. Finally, the odds of enrolling in postsecondary education significantly increased as SES scores increased (OR = 2.03) and the odds of

enrolling in postsecondary education rose significantly with every 100-student increase in school enrollment (OR = 1.28).

TABLE 21 HERE

Results of the second analysis. I conducted the second analysis in Research Question 3 because I was interested in comparing the impact of state exit exam policies on postsecondary enrollment for each of the three math pipeline levels. I used logistic regression to examine the contribution of math coursetaking to the relationship between attending high school in a state with an exit exam requirement for graduates in 2004 and postsecondary education enrollment among students with disabilities while controlling for selected student, family, and school characteristics. While this analysis retained the same dependent variable (postsecondary enrollment status), focal independent variable (presence of a state exit exam policy in 2004), and control variables as the first analysis, it differed in that the math coursetaking variable was added as a second independent variable, as were two interaction variables between math coursetaking and presence of a state exit exam policy in 2004. After using listwise deletion to eliminate cases with missing data on any of the dependent or independent variables in the study, I conducted a logistic regression analysis with the remaining sample (N = 991).

When all independent variables and covariates were considered together, they significantly predicted enrollment in postsecondary education (Model $X^2 = 344.82$, $df = 16$, $p < .001$). As with the first analysis in Research Question 3, the student, family, and school characteristics alone significantly predicted enrollment in postsecondary education (Block 1 $X^2 = 267.82$, $df = 11$, $p < .001$) and correctly predicted 59.1% of the students

who did not enroll in postsecondary education, 79.3% of those who enrolled, and 71.1% of all cases. Next, the dummy variables for math coursetaking were added to the model, which significantly increased the prediction of enrollment in postsecondary education (Block 2 $X^2 = 73.94$, $df = 2$, $p < .001$) and correctly predicted 65.6% of the students who did not enroll in postsecondary education, 81% of those who enrolled, and 74.8% of all cases. The interaction variables between math coursetaking and presence of a state exit exam policy in 2004, however, did not significantly increase the prediction of postsecondary education enrollment above that of the other variables included in the model (Block 3 $X^2 = 3.03$, $df = 2$, $p > .05$). Adding these interaction variables to the other variables in the model correctly predicted 66.1% of the students who did not enroll in postsecondary education, 81.4% of those who enrolled, and 75.2% of all cases. Finally, adding the variable for state exit exam requirement in 2004 did not significantly increase the prediction of postsecondary education enrollment among students with disabilities in ELS:02 above that of the other variables in the model (Block 4 $X^2 = 0.03$, $df = 1$, $p > .05$). The presence of a state exit exam policy in 2004 along with the other variables in the model correctly predicted 66.1% of the students who did not enroll in postsecondary education, 81.2% of those who enrolled, and 75.1% of all cases.

Table 22 presents the results from the logistic regression analysis, including the odds ratios. As suggested by the results presented in the previous paragraph, presence of a state exit exam policy in 2004 was not a significant predictor of postsecondary education enrollment for students with disabilities in ELS:02 ($p > .05$) when all of the independent variables and covariates were considered. The interaction between math

coursetaking and presence of a state exit exam policy in 2004 also was not a significant predictor of enrollment in postsecondary education ($p > .05$).

As with the first analysis in Research Question 3, other variables in the study were more likely to predict enrollment than an exit exam requirement. The odds of enrollment in postsecondary education significantly increased for students with disabilities who completed advanced coursework in math (OR = 8.67) and students with disabilities who completed middle academic level coursework in math (OR = 2.30) when compared with students with disabilities who completed math coursework in the lowest category of the math pipeline. Additionally, the odds of enrollment significantly decreased for male students with disabilities (OR = 0.66) when compared with female students with disabilities. The odds of enrollment in postsecondary education significantly increased for participants with GPAs greater than or equal to 2.01 (OR = 3.07) when compared to participants with GPAs at or below 2.00. The odds of postsecondary education enrollment significantly decreased for students with disabilities who received credit for Special Education – Vocational courses (OR = 0.47) when compared with students with disabilities who did not participate in these courses. Finally, the odds of enrolling in postsecondary education significantly increased as SES scores increased (OR = 2.96) and the odds of enrolling in postsecondary education rose significantly with every 100-student increase in school enrollment (OR = 1.03).

TABLE 22 HERE

Chapter Summary

Through my analyses, I found a number of factors that predicted selected outcomes for students with disabilities in ELS:02. These factors include certain student demographic and academic characteristics, school characteristics, and state exit exam policies.

When comparing the sample of students with disabilities in ELS:02 to the full sample of ELS:02 participants, the group of students with disabilities had a lower high school graduation rate than the full sample. They also enrolled in postsecondary education at a lower rate, completed advanced math coursework at a lower rate, and completed non-academic or low academic math coursework than the full ELS:02 sample. The students with disabilities were more likely to be male, Hispanic or African-American, and from a family in the lowest SES quartile. They were also more likely to have a GPA at or below 2.00 and a mother who did not graduate from high school.

The students with disabilities in ELS:02 were also divided into two groups based on whether their state required them to pass an exit exam before graduating in 2004, and these groups were subsequently compared. The students with disabilities in states with exit exams completed advanced coursework at a higher rate than their peers in states without exit exams and also had a higher rate of enrollment in postsecondary education. The students in states with exit exams were less likely to be Hispanic but more likely to African-American, and more likely to have a mother with a high school diploma. Finally, the students with disabilities in states with exit exams were more likely to attend schools in rural areas and had a higher mean SES score than the students with disabilities in states without exit exams.

When examining the associations among student characteristics, school characteristics, presence of a state exit exam policy in 2004, and the three outcome variables, a number of characteristics increased or decreased the probability that a student with a disability would achieve each outcome. First, while presence of a state exit exam policy in 2004 did not significantly predict high school graduation, enrollment in postsecondary education, or completion of math coursework in the middle academic category, it did significantly predict completion of math coursework in the advanced category. Specifically, students with disabilities who attended high schools in states with an exit exam requirement in 2004 were more than 1.5 times as likely to take advanced math coursework than the students with disabilities in ELS:02 who were not required to pass an exit exam before graduating from high school. A high school GPA above 2.00, six or fewer absences per semester, and a higher SES score all significantly increased the odds of graduating from high school with a standard diploma, while participating in Special Education – Vocational courses and attending a school in a rural area both decreased the odds of high school graduation for students with disabilities.

Students who participated in Special Education – Vocational courses were significantly less likely to complete middle academic or advanced math coursework, as were students with disabilities who attended high schools in rural areas. However, with every one point increase in SES score, students with disabilities were 1.67 times more likely to complete math coursework in the middle academic category, and 2.85 times more likely to complete advanced math courses. Students with disabilities who had GPAs above 2.00 were more likely to complete advanced math courses, while students

with disabilities who attended schools in suburban areas were significantly less likely to complete advanced math coursework than their peers in urban areas.

Male students with disabilities were significantly less likely to enroll in college than female students, as were students who participated in Special Education – Vocational courses. SES was related to enrollment in postsecondary education, with every one-point increase in SES score causing students with disabilities to be 2.03 times more likely to enroll in additional education after high school. Finally, the odds of enrolling in postsecondary education significantly increased as students with disabilities completed higher levels of math coursework. Students with disabilities who completed middle academic math coursework were 2.3 times more likely to enroll, and those who completed advanced coursework were 8.67 times more likely to gain access to higher education than students with disabilities who only completed non-academic or low academic math coursework.

Chapter V

Discussion

This study utilized data from the base year, first follow-up, and second follow-up waves of the Education Longitudinal Study of 2002 (ELS:02) database, including the transcript data, to explore the relationships between selected factors, like presence of a state exit exam policy in 2004, on post-school outcomes of students with disabilities. Using logistic regression analyses, I examined the following: (a) the effects of selected student, family and school characteristics, and state exit exam policies on graduation from high school for a sample of students with disabilities; (b) the relationship between attending high school in a state that has an exit exam policy and the academic rigor of the coursework, as measured by the highest math course completed, among a sample of students with disabilities; and (c) the contribution of attending high school in a state that has an exit exam policy and academic rigor in math coursetaking on enrollment in postsecondary education among a sample of students with disabilities. The results of this study suggest that the presence of a state exit exam policy is not a significant predictor of high school graduation or postsecondary education enrollment among students with disabilities. However, the results did indicate that students with disabilities who were enrolled in a school in a state with exit exam requirements were more likely to complete advanced math coursework than their peers who did not have to pass an exit exam to graduate from high school. The results also indicated that math coursetaking was a significant predictor of postsecondary education enrollment among students with disabilities in ELS:02, but that the interaction between math coursetaking and presence of a state exit exam requirement was not significant. In this chapter, I discuss the findings

of this study, the implications for policy and practice, and potential directions for future research on this topic.

Discussion of Findings

Empirical, peer-reviewed research of good quality on the topic of high school exit exams and students with disabilities is greatly needed as much of what is communicated to stakeholders and the general public about the effects of exit exams for students with disabilities is anecdotal rather than empirical (Ysseldyke, Nelson, Christenson, Johnson, Dennison, Triezenberg, Sharpe, & Hawes, 2004). In a recent national study of graduation requirements and policies by Johnson, Thurlow, and Schuelka (2012), one state director of special education stated, "we hear anecdotes/media sensations about most of [the possible unintended consequences of exit exam policies on students with disabilities]…however, we have no evidence to support a causal relationship" (pp. 49-50).

Additionally, while empirical research on predictors of high school graduation exists, research of this nature on students with disabilities is non-existent. For this reason, this study was intended to be exploratory and the purpose was to provide an initial look at whether state exit exam policies affect the ability to graduate from high school and enroll in post-secondary education among students with disabilities. As with any study that is exploratory in nature, the results should be interpreted with caution and there were several important limitations to this study that will be discussed later in this chapter. That said, the results of this study provide insight into an under-researched topic.

High school graduation. As noted in the review of literature, findings from previous research regarding the effects of state exit exam policies on high school graduation are inconsistent. Studies from Marchant and Paulson (2005), Reardon, Arshan, Atteberry, and Kurlaender (2010), and Warren, Jenkins, and Kulick (2006) found that state exit exams negatively affected high school graduation rates. Jacob (2001) found that exit exam requirements did affect certain groups of students, but that they do not impact graduation rates in general. Warren and Edwards (2005) did not find an association between high school exit exam requirements and graduation rates. The findings from the current study are most consistent with the previous research by Jacob (2001) and Warren and Edwards (2005), both of which used data from the National Educational Longitudinal Study (NELS), a predecessor of ELS:02.

The findings from the present study indicate that, controlling for selected student and school characteristics, there is no difference in the odds of receiving a standard high school diploma among students with disabilities in the class of 2004 who attended high schools in states with exit exam policies compared to those students whose states did not require them to pass a test to receive a standard diploma. This does not mean, however, that the high school exam policies did not have an impact; rather, it means that other factors such as high school GPA, number of absences, participation in Special Education – Vocational courses, attending high school in a rural area, and SES were more influential in predicting high school graduation for students with disabilities. It should also be noted that when a student-level weight was used in the logistic regression analysis, the state exit exam variable showed a result that was very close to being significant (as seen in Table D1 in Appendix D, $p = 0.078$). This means that while there

was not a significant difference in the odds of receiving a standard diploma based on presence of a state exit exam requirement in this sample, there could potentially be a significant difference on this variable in a nationally representative population of students with disabilities.

Other factors that significantly predicted high school graduation in this study were consistent with findings presented in the review of literature. For example, previous research has found connections between absenteeism and graduation, as well as increased rates of high school graduation for those students who achieve GPAs above 2.00 (Barrington & Hendricks, 1989; Hickman, Bartholomew, Mathwig, & Heinrich, 2008). In addition, several previous studies indicated a relationship between SES and obtaining a high school diploma (Borg, Plumlee, & Stranahan, 2007; Finn, Gerber, & Boyd-Zaharias, 2005; Rylance, 1997; Stewart, 2008).

One result from this study was inconsistent with research reviewed in Chapter II. Rylance (1997) found that students with disabilities who participated in vocational education were more likely to graduate from high school. The findings in the current study indicate that students with disabilities in ELS:02 who participated in special education vocational courses were actually less likely to graduate from high school than their peers who did not receive credit for these classes. However, it is important to note that the study by Rylance (1997) used data from the first NLTS, which included participants with disabilities who exited school before 1990. In the present study, only a small proportion of students in the analytic sample (7.7%) received credit for special education vocational courses, suggesting that the majority of students with disabilities in the sample participated in coursework that was focused on teaching academic skills.

More students with disabilities in NLTS2 (15.7%) received credit for Special Education – Vocational courses. These statistics, along with the comparison of the results from Rylance's (1997) study, could indicate that educational expectations for students with disabilities have increased since NLTS data were collected in the late 1980s.

Finally, as noted in Chapter IV, there were differences in the high school graduation rates of the students in ELS:02 with disabilities compared to the graduation rates of NLTS2 participants. As shown in Table 10, 85.6% of the students with disabilities in ELS:02 graduated from high school with a regular diploma, while only 54.1% of the students in NLTS2 graduated with a standard credential. This difference in graduation rates could be related to several factors. First, the sample in the present study consisted of more students with learning disabilities than the sample of students from NLTS2. The differences in types of disabilities represented in the samples could account for some of the differences between graduation rates. Additionally, as noted in Chapter III, the sampling methods for ELS:02 and NLTS2 were very different. NLTS2 selected students identified as having a disability or an IEP from school rosters, while ELS:02 randomly selected students from the schools in the study, which were the primary sampling units in ELS:02. This means that the students with disabilities in ELS:02 were not deliberately selected for the study because of their disability status. Not all of the participants in the sample for the present study were identified as having an IEP, and as noted by McLaughlin (2010), there have been past instances of differences in access and outcomes between students with and without IEPs. It seems possible that these differences in sampling methods and selection of participants could have contributed to

the differences in graduation rates, but we cannot know for certain whether this is the case.

Math coursetaking. This study found that students with disabilities in states with exit exams were significantly more likely to complete advanced math coursework than their peers in states without exit exam requirements. The results from Research Question 2 are consistent with the findings from past research regarding the effects of graduation requirements and accountability policies on math coursetaking in high school students without disabilities (Clune & White, 1992; Schiller & Muller, 2003). Clune and White (1992) used a sample of high schools enrolling large proportions of low-achieving students in four states in which graduation requirements had become more difficult between the years of 1982 and 1988. They not only found that the average number of math credits taken by students in these schools increased significantly over a six-year period, but also that enrollment in advanced math courses increased and enrollment in basic math courses decreased (Clune & White, 1992). Schiller and Muller (2003) analyzed NELS to determine whether certain accountability policies, including the use of exams to determine consequences for students, were associated with higher levels of math coursetaking. They found that students who attended high schools in states with more graduation requirements completed more advanced math courses than students in states with fewer requirements (Schiller & Muller, 2003).

Like the results from the studies by Clune and White (1992) and Schiller and Muller (2003), the results from the present study suggest a relationship between the presence of an accountability policy and more rigorous math coursework. This finding is important given that completion of advanced math coursework by students with

disabilities lags behind that of the larger population of high school students. As noted in Chapter IV, 45.9% of the full ELS:02 sample participants completed advanced math courses compared to 30.2% of the students with disabilities in states with exit exam requirements in ELS:02 and 21.3% of the student with disabilities in states without exit exam policies in ELS:02. Additionally, Shifrer and Callahan (2010) found that only 22% of students in ELS:02 who were identified as having a learning disability completed Algebra II, which is in the middle academic level of courses, by twelfth grade. In comparison, they found that 69% of students in ELS:02 who were not identified as having a learning disability completed Algebra II (Shifrer & Callahan, 2010). Statistics like these raise questions about whether students with disabilities are receiving the same access to educational opportunities as students without disabilities, which can have implications beyond high school.

In the present study, students with disabilities in states with exit exam requirements were significantly more likely to complete math coursework than the students with disabilities in states without exit exam requirements. This suggests that there could be a connection between exit exams and increased access to general education courses for students with disabilities. Ysseldyke, Dennison, and Nelson (2004) note that one of the most important positive effects of large-scale assessments has been the increase in access to the general curriculum for students with disabilities. Ysseldyke et al. (2004) also report that participation in large-scale assessments has led to higher expectations and academic standards for students with disabilities. Johnson et al. (2012) report that 83.3% of state special education directors in states with exit exams think students with disabilities in their states have more opportunities to participate in the

general education curriculum and "achieve good results" (p. 48). The same study reported that 78.2% of these state special education directors believed that the exit exam requirement was causing a decrease in the "'differences' between general education and special education students" because students with disabilities were being held to the same standards as their peers (Johnson et al., 2012, p. 48). The results from the present study confirm the beliefs of these state special education directors. While students with disabilities still lag behind students without disabilities in the completion of advanced math coursework, the gap between students with and without disabilities is much smaller in the states with exit exams than it is in the states without exit exams. Ultimately, the results from the present study regarding completion of advanced math coursework suggest higher expectations for students with disabilities in states with exit exam requirements, and these higher expectations will allow students with disabilities to have a better opportunity to prepare for life beyond the high school years.

The present study also found several other factors that contributed significantly to math coursetaking. Socioeconomic status was a significant predictor at both the middle academic and advanced levels of math coursetaking for the students with disabilities in ELS:02. This is consistent with past research on math coursetaking in high school, which has found significant connections between SES and completion of more advanced math courses for students without disabilities (Schneider, Swanson, & Reigle-Crumb, 1998; Stevenson, Schiller, & Schneider, 1994). Additionally, a study of 9,460 ELS:02 participants found that roughly 30% of students in the highest SES quartile completed advanced math courses, while only 11% of students in the lowest SES quartile completed a pre-calculus course or higher (Bozick & Ingels, 2008). Regarding the math

coursetaking patterns of students with disabilities, data from NLTS2 show that 12.2% of students with a family income of more than $50,000 per year completed advanced math courses, compared with only 3.5% of participants with a family income between $25,001 and $50,000 per year and 1.5% of participants with an annual family income of $25,000 or less (NLTS2, n.d.). The findings in the present study reinforce that SES is a strong factor in math coursetaking patterns of high school students with and without disabilities.

School location also significantly predicted math coursetaking in students with disabilities. The results indicated that students with disabilities in ELS:02 who attended schools in rural areas significantly less likely to complete both middle academic and advanced math courses than their counterparts who attended schools in urban areas. Additionally, students with disabilities in ELS:02 who attended schools in suburban areas were significantly less likely to complete advanced math courses than their peers who attended schools in urban areas. A recent study by Anderson and Chang (2011) examined the differences between the math coursetaking patterns of high school students in rural and non-rural areas. Using data from the 2005 High School Transcript Study, they found that students in rural areas were more likely to be enrolled in math courses below Algebra I during their first year of high school than students in urban/central city or suburban/urban fringe areas, and were significantly less likely to complete advanced math courses (Anderson & Chang, 2011). They also found that students in rural areas had significantly less access to advanced placement math courses than students in other areas (Anderson & Chang, 2011). While this study looked at the larger population of high school students, students with disabilities in rural areas would have fewer

opportunities to gain higher-level math knowledge if the lack of access to advanced math courses in rural high schools is combined with a lack of access to the general curriculum.

Other significant predictors of advanced math coursetaking were high school GPA, participation in Special Education – Vocational courses, and school enrollment. The odds of completing advanced math courses were 4.6 times better for students with disabilities in ELS:02 who had a GPA above 2.00 than for students with disabilities with GPAs below 2.00. The odds of completing advanced math courses were 0.12 times less for students with disabilities in ELS:02 who received credit for Special Education – Vocational courses than for students with disabilities who did not participate in Special Education – Vocational courses. Finally, with every increase of 100 students in a school's enrollment, the odds of completing advanced math courses were 1.03 times better for students with disabilities in ELS:02. Like rural schools, students in smaller schools may be impacted by a lack of teachers who are qualified to teach advanced math courses (Anderson & Chang, 2011).

Enrollment in postsecondary education. This study found that students with disabilities in states with exit exam requirements were not significantly more likely to enroll in postsecondary education than students with disabilities in states without exit exam requirements. The goal of the first analysis in Research Question 3 was to examine the effects of state exit exam policies on postsecondary outcomes without investigating the effects of other curricular factors. Conversely, the goal of the second analysis was to examine whether these state policies, when combined with math coursetaking, impacted the same postsecondary outcome as the first analysis. The reason for this was to consider

how the relationship between the presence of a state exit exam policy and enrollment in postsecondary education varied as a function of math coursetaking.

Several other student- and school-level factors significantly predicted enrollment in postsecondary education for students with disabilities in ELS:02. These factors included gender, high school GPA, participation in Special Education – Vocational courses, attending high school in a rural area, SES, and school enrollment. Several of these factors are consistent with findings from NLTS2. The present study found that the odds of enrolling in postsecondary education were 0.65 times lower for male students with disabilities in ELS:02 than for female students with disabilities. NLTS2 data indicate that 56.2% of female students had attended a postsecondary institution by 2007, while only 51.2% of male students had done the same (NLTS2, n.d.). The present study also found that the odds of enrolling in postsecondary education increased by 3.4 times with every one-point increase in SES. NLTS2 data indicate that 66.5% of the students in the highest SES category had attended a postsecondary institution by 2007, while only 40.7% of the students in the lowest SES category had enrolled in postsecondary education by 2007 (NLTS2, n.d.).

The results from the second analysis in Research Question 3 indicated that both interactions between state exit exam policies and middle academic math coursetaking and state exit exam policies and advanced math coursetaking were not significant. As noted in Chapter IV, adding the two product terms into the model at Block 3 did not significantly increase the prediction of postsecondary education enrollment. The effect of a state exit exam policy on enrollment in postsecondary education for a student with a disability whose highest math course completed was in the middle academic category is

1.5 times the effect of a state exit exam policy for students in the other categories of the math pipeline. Additionally, the effect of a state exit exam policy on enrollment in postsecondary education for a student with a disability whose highest math course completed was in the advanced category is 0.95 times the effect of a state exit exam policy for students in the other categories of the math pipeline. Again, the results show that neither interaction was significant.

Other factors in the model significantly predicted enrollment in postsecondary education, including math coursetaking. The results for Research Question 3 show that students with disabilities who completed math coursework in the middle academic and advanced categories of the math pipeline were significantly more likely to enroll in postsecondary education than students with disabilities who completed courses in the lowest category. This result is consistent with findings from past studies on the effects of math coursetaking on enrollment in postsecondary education. Long, Conger, and Iatarola (2012) found that students in Florida who took a rigorous math course in high school increased their likelihood of enrolling in a four-year college by 9.4 percentage points. Rose and Betts (2001) found that over 90% of High School and Beyond participants who took Calculus in high school completed at least some postsecondary education. Comparatively, only 33% of participants whose highest math course was vocational math completed at least some postsecondary education (Rose & Betts, 2001).

While several studies have documented the relationship between more advanced math coursetaking and attainment of higher education in the larger population of high school students, little is known about the connection between rigorous math courses and postsecondary outcomes in students with disabilities. In a 2010 article, McLaughlin

stated that we do not "know with certainty whether greater access to rigorous courses and higher expectations would make a difference to…postschool outcomes" (p. 274) for students with disabilities. While we cannot generalize the results in this study to all students with disabilities, they do suggest a relationship between access to more rigorous coursework and at least one post-school outcome, enrollment in postsecondary education, in this particular group of students with disabilities. Accordingly, we still cannot draw definitive conclusions about a potential connection between academic rigor and post-school outcomes for students with disabilities, but based on the findings of this study, additional research is recommended to inform best practices for the education of students with disabilities.

Implications for Policy and Practice

As previously mentioned, there was virtually no research examining the effects of state exit exam policies on the post-school outcomes of students with disabilities. The results do, however, provide some insight into a topic that has been under researched and controversial. In their 2000 article about high-stakes testing and students with disabilities, Thurlow and Johnson discuss several implications of exit exams, as well as other high stakes tests. One of their suggestions was that increased educational accountability "should not result in lower expectations, narrowing of curricular options, or displacement of the student from the general education curriculum" for students with disabilities (Thurlow & Johnson, 2000, p. 310). Thurlow and Johnson (2000) also mention several intended consequences, or potentially positive outcomes, of high-stakes tests for students with disabilities, including increased access to the general curriculum, improved

instructional and intervention strategies, and use of appropriate academic accommodations.

Recommendations for Exit Exam Policies and Practice

As noted earlier in this section, it is inappropriate to make recommendations for policy changes based only on the results of this study. This is particularly true for exit exam policies as they are determined by individual states and vary widely. I feel that only one recommendation can be made regarding exit exam policies, and that is for more research on these requirements and their effects on students with disabilities.

Based on the information presented in the discussion section of this chapter, one recommendation for practice is to ensure that students with disabilities have the opportunity to access higher-level math courses. In order to access these more challenging courses, we need to better prepare students with disabilities to be able to take these courses. This involves earlier course planning and academic preparation for this group of students. In order to access advanced math courses, a student must first complete a sequence of progressively more difficult math courses, and this sequence usually begins in middle school. Students who do not begin the sequence, which typically does not include special education math courses, early in middle school will not be able to take any of the courses in the advanced category of the math pipeline before graduating from high school. Waiting until high school or even middle school to prepare students with disabilities to take advanced math courses is simply too late. If we want more students with disabilities to enroll in higher level math courses, which could lead to improved postsecondary outcomes, schools and families must begin planning and preparing students with disabilities for more rigorous coursework as early as is possible

and reasonable. Schools should also provide teachers with professional development opportunities so they may learn how to prepare students with disabilities for rigorous coursework.

Additionally, school administrators and teachers must ensure that they maintain high expectations for students with disabilities in order for this group of students to have access to more rigorous coursework. As previously noted, the results from this study suggest that exit exam requirements are associated with higher levels of math coursetaking for students with disabilities. The math pipeline variable in ELS:02 only counts courses in which a student received a passing grade, so not only have these students taken advanced math courses, but they were also able to complete them. This shows that when the students with disabilities in the study were given the opportunity to access the courses, they were able to learn the advanced material. However, recent research suggests that some school administrators do not believe that students with high-incidence disabilities in their schools are capable of participating in state assessments (Gagnon, Maccini, & Haydon, 2011). Low expectations like these could prevent students with disabilities from accessing the general curriculum, which could subsequently lead to fewer opportunities for educational and economic success beyond the high school years. As noted by McLaughlin (2010), preconceived opinions about the academic abilities of students with disabilities could possibly be reflected in the educational outcomes of this group of students. To ensure that students with disabilities are able to access more rigorous curriculum, and therefore, better educational outcomes, school administrators and teachers must not allow preconceived notions about students with disabilities to influence their decisions about course placement.

Limitations of the Research

This study utilized data from ELS:02 and the results provide insight into the effects of state exit exam policies on selected outcomes for students with disabilities. There are, however, a few limitations that should be taken into consideration when evaluating the results and determining potential implications of the research.

Missing data. Missing data are not an abnormal phenomenon in large-scale datasets and ELS:02 staff used a number of strategies to reduce the amount of missing data. However, this did not completely eliminate the problem and as a result, many cases in this study had missing data for at least one variable. Overall, I excluded 279 cases from the analytic sample due to missing data, which amounted to 22% of the 1270 cases originally selected for analysis. According to Kline (2009), the exclusion of this many cases can affect the validity of the findings, including the ability to generalize results to a larger population. Additionally, using listwise deletion to eliminate cases with missing data for at least one variable may have led to bias in the sample used for analyses. To examine whether this practice caused the sample to be biased, I conducted a missing data analysis between the cases with complete data and the cases with missing data. This analysis showed significant differences between the two groups on several variables, including math pipeline, enrollment in postsecondary education, GPA, number of absences, school enrollment, and the continuous SES variable. To evaluate the ability to generalize results of the study, I also compared statistics of the cases with complete data with data from NLTS2 and the national population of students who were expected to graduate from high school in 2004. Compared to the national population of students, my sample tended to overrepresent male students, as well as Hispanic students, African-

American students, and those students who made up the "Other" category of the race and ethnicity variable. These differences, as well as the results from the missing data analysis, should be considered when generalizing the findings of this study to larger populations of students. It should be noted, that after excluding cases with missing data, 51.6% of students with complete data attended high school in a state with exit exam requirements for the class of 2004. This rate is consistent with the national rate of students in states with exit exams in 2004, which was 52% (Center on Education Policy, 2004).

Disability identification considerations. Perhaps the biggest issue regarding the identification of students with disabilities in ELS:02 was the fact that it was very difficult to determine which participants had disabilities. The IEP status variable had very large amounts of missing data associated with it, and the sample available from that variable was insufficient for reliable statistical analysis on its own. To maximize the number of cases in the analytic sample, additional variables from the transcript study had to be used. However, it is likely that there were students with disabilities in ELS:02 who were missing data on the IEP status variable but did not complete any special education courses. Any participant for whom this is true would have been excluded from the study. Wilson et al. (2009) also identified this concern, and suggested that more reliable measures of disability status be included in future nationally representative studies. I would also recommend that the companies and agencies conducting these studies take steps to maximize the amount of complete data available on disability status variables so that future researchers can use these nationally representative studies to produce research to inform policies and practices for students with disabilities.

It is important to note that in this study, I was examining the effects of state exit exam policies on the larger population of students with disabilities. Due to the lack of available data on disability type in ELS:02, I was unable to examine the effects of these policies on more specific subpopulations, like those with high-incidence disabilities and low-incidence disabilities. Because of this, it is very important to understand that generalization of the results in this study to other groups of students with disabilities would not be prudent. To say that the range of abilities within the larger population of students with disabilities and even within smaller groups based on disability identification varies widely would be an understatement. Given that the abilities of students with disabilities vary considerably, it is possible that a state exit exam policy could have more of an effect on high school graduation for some subpopulations of students with disabilities than for others.

Additionally, as noted in Chapter III, ELS:02 strived to include students with disabilities to the maximum extent possible. However, IEP teams determined that some students were not able to participate in certain study activities. This could have caused greater instances of missing data for participants with more significant challenges, thus reducing the rate of participation for students with certain disabilities in this study. Coupled with the higher rate of participation in ELS:02 for students with learning disabilities, the results in this study may be more generalizable to students with high-incidence disabilities than to students with low-incidence disabilities. In summary, when considering the implications of the results of this study, it is very important to remember that this is a potentially unique population of students with disabilities that is not nationally representative of the larger population of high school students with disabilities

and that analysis of the impact of state exit exam policies on smaller groups of youth with disabilities was not included in this study.

ELS:02 design constraints. As noted in Chapter III, the ELS:02 base year data collection occurred in Spring 2002, when study participants were in the second semester of their sophomore year of high school. As a result of the study design, ELS:02 excludes any student who dropped out of school prior to the second semester of his or her sophomore year. Recent national data from NCES show that 3.2% of students dropped out of high school during 9th grade and 3.5% of students dropped out during 10th grade (Stillwell, Sable, & Plotts, 2011). Dropout rates in individual states vary widely; for example, in Illinois, the freshman dropout rate for the 2008-09 school year was 11.7% (Stillwell et al., 2011). Even though a small proportion of students are dropping out during the first year and a half of high school, it is all but certain that any graduation rate computed using ELS:02 data will be higher than that of a rate computed using a cohort model. Accordingly, the graduation rates presented in this study may have been different had data been collected beginning in the participants' freshman year of high school. Future research on this topic should consider using datasets that include data for all four years of high school. For example, the most recent study in the NCES-sponsored longitudinal series, the High School Longitudinal Study of 2009 (HSLS:09), began collecting data at the start of the participants' freshman year. Using data from this dataset in future studies about high school graduation could potentially produce results that are more reliable and consistent with what is seen in the national population of high school students.

Availability of data on postsecondary education. The data on enrollment in postsecondary education in this study were collected during the second follow-up student questionnaire. Being that the second follow-up data collection occurred two years after graduation, this may not have been enough time to obtain an accurate picture of the postsecondary educational outcomes of students with disabilities. Therefore, an additional limitation of this study is that some students with disabilities who took an extra year or more to complete high school, or who waited more than two years to pursue postsecondary education, would be excluded from this study. The final ELS:02 data collection will occur in the second half of 2012, and will collect additional data on postsecondary education enrollment and degree attainment. Future research using ELS:02 to investigate post-school outcomes of students with disabilities should utilize this final wave of data to gain the most reliable information about the postsecondary education outcomes of students with disabilities in ELS:02.

Recommendations for Future Research

Given the lack of available empirical research on the topic of state exit exam policies and students with disabilities, there is so much potential for future research in this area. To ensure that exit exam policies, as well as accountability policies in general, continue to be implemented in a way that will allow students with disabilities to reach their potential, I believe that future research should examine a number of topics.

First, future research should examine the effects of changes in educational accountability since 2004. The current national picture regarding exit exams looks very different than it did eight years ago, when the students in ELS:02 graduated from high school. As of December 2011, 31 states either had exit exam requirements in place or

planned to implement them by 2020, and 76% of public school students in the United States lived in states with exit exams (Center on Education Policy, 2011). A few states have even dropped the exit exam requirement in recent years and at least one more will do so by 2015 (Center on Education Policy, 2011). Additionally, many states with existing exam requirements are adopting new exams or test formats (Center on Education Policy, 2011). With so many changes, future research is necessary to determine whether the effects on outcomes for students with disabilities have also changed. This will help us to learn if the changes have produced intended or unintended consequences for students with disabilities.

On the same subject of changes, implementation of the new Common Core State Standards and planned common assessments will undoubtedly raise more questions about students with disabilities and their involvement in this new phase in the standards movement. Future research should focus on the effects of common academic standards on the performance of students with disabilities and whether differences in outcomes occur across states when students with disabilities are expected to be held to the same academic standards as their peers in other areas of the country. Before doing research in this area, it will be necessary to learn more about whether states will be changing their graduation requirements for students with disabilities after adopting the Common Core State Standards and if they plan to use a common assessment to determine whether a student receives a high school diploma.

One way to extend this study would be to evaluate outcomes for students with disabilities based on the rigor or type of exit exam. As noted in earlier chapters, the level of difficulty for exit exams varies from state to state. Additionally, some states assess

student learning in different ways, with minimum competency exams assessing knowledge gained before high school in a number of academic areas and end-of-course exams assessing mastery of material taught in a specific course. Evaluating based on the rigor or type of exit exam could offer new information about whether more rigorous exams lead to improved post-school outcomes for students with disabilities.

Finally, it would be useful to duplicate or extend this research with different samples of students with disabilities. Larger samples could increase the external validity of future research. Also, using state-level data would allow for comparisons of groups of students who took the same test and are subject to the same state policies and graduation requirements.

Chapter Summary

This study had several purposes. The first purpose of the study was to examine the relationship between selected student, family, and school characteristics, and state exit exam policies and the impact on graduation from high school among a sample of students with disabilities. A second purpose of the study was to explore the relationship between attending high school in a state that has an exit exam policy and the academic rigor of the coursework, as measured by the highest math course completed, among a sample of students with disabilities. The last purpose of study was to investigate the contribution of attending high school in a state that has an exit exam policy and academic rigor in coursetaking on enrollment in postsecondary education among a sample of students with disabilities. The findings regarding the effects of state exit exam policies on the selected post-school outcomes of students with disabilities vary. I found that presence of a state exit exam requirement did not significantly predict receipt of a

standard high school diploma for a student with a disability in the class of 2004, nor does the requirement predict enrollment in postsecondary education for a student meeting the same criteria. I also found that presence of a state exit exam requirement for the class of 2004 did predict completion of advanced math coursework for a student with a disability, though the same factor did not predict completion of middle academic math coursework for a student meeting the same criteria. Though the findings from this study are not sufficient to change or influence federal and state policies regarding exit exam requirements, the study establishes a knowledge base for future research involving state exit exam policies and students with disabilities.

Tables

Table 1

Significant Student-Level and School-Level Factors from Literature

Student-level factors		
Demographic	Family	Academic/Social
• Gender • SES/household income • Race/ethnicity • Age	• Occupation of father • Family structure (single parent family or stepparent) • Parental college aspirations/ educational expectations • Mother monitors student progress • Parental supervision • Mother with a HS diploma • Parental involvement in PTA • Student works on homework with family • Strict rules set by family • Parent-child discussion	• Number of absences • Achievement test scores • Number of failed courses • GPA • Negative teacher comments • Number of high schools attended • Special education referrals • Aggressive behavior • Student's educational expectations • Student mobility • Enrollment in a magnet school • Participation in counseling • Participation in vocational education • Number of core courses taken • Grade retention • Placement in juvenile probation • Participation in a small class (13-17 students) • School attachment • School commitment • Association with positive peers
School-level factors		
Demographic	Staffing & Resources	Social/School Climate
• Urbanicity • School enrollment	• Percentage of teachers with advanced degrees • Percentage of teachers who are new hires	• School cohesion

Table 2

Data Collection Timeline by Instrument

	2002	2004	2004-05	2006
	Spring – 10th grade	Spring – 12th grade	Post-12th grade	Spring – Post high school
English Direct Assessment	X			
Math Direct Assessment	X	X		
Student Survey	X	X		X
Parent Survey	X			
English Teacher Survey	X			
Math Teacher Survey	X			
School Administrator Survey	X	X		
Library/Media Survey	X			
School Facility Checklist	X			
High School Transcript			X	

Table 3

Number of Students Excluded by Year

	Base Year – 2002	First Follow-Up - 2004
Total Students Excluded	163	100
Students Excluded Due to Mental or Physical Disability	119	90

Table 4

Changes in Eligibility Status Between Base Year (2002) and First Follow-Up (2004)

	First Follow-Up Questionnaire Eligible	First Follow-Up Questionnaire Ineligible
Base Year Questionnaire Eligible	n/a	16
Base Year Questionnaire Ineligible	105	57

Table 5

Number of Study Participants Accommodated by Year

	Base Year – 2002	First Follow-Up - 2004
Number of students accommodated	114	48

Table 6

Comparison of Disability Categories in ELS:02 and NLTS2

	ELS:02 (n = 1003)	NLTS2 (ages 15-17)[a]
	%	%
Specific learning disability	69	61.4
Emotional disturbance or behavior disorder	7.9	11.9
Speech or language impairment	3.2	3.2
Intellectual disability	9.4	13
Hearing impairment	1.5	1.4
Visual impairment	1.6	0.6
Orthopedic impairment	--	1.2
Other health impairment	4.3	5.3[b]
Multiple disabilities	2.3	2.2[c]

[a] Data from Wagner, Cameto, & Newman (2003)
[b] Includes participants with autism and traumatic brain injury
[c] Includes participants with deaf-blindness

Table 7

Math Courses Grouped into Math Pipeline Categories

Math Pipeline Category	Math Course	
No Math	No Math Courses	
Non-Academic	Mathematics, Other General	Technical Mathematics
	Mathematics 7	Mathematics Review
	Mathematics 7, Accelerate	Mathematics Tutoring
	Mathematics 8	Consumer Mathematics
	Mathematics 8, Accelerated	Actuarial Sciences, Other
	Mathematics 1, General	Applied Mathematics, Other
	Mathematics 2, General	Basic Math 1
	Science Mathematics	Basic Math 2
	Mathematics in the Arts	Basic Math 3
	Mathematics, Vocational	Basic Math 4
Low Academic	Pre-Algebra	Algebra 1, Part 2
	Algebra 1, Part 1	Geometry, Informal
Middle Academic	Pure Mathematics, Other	Unified Math 1, Part 1
	Algebra I	Unified Math 1, Part 2
	Geometry, Plane	Pre-IB Geometry
	Geometry, Solid	IB Math Methods 1
	Geometry	IB Math Studies 1
	Mathematics 1, Unified	Discrete Math
	Mathematics 2, Unified	Finite Math
	Geometry, Part 1	Algebra and Geometry
	Geometry, Part 2	Mathematics, Other
Middle Academic II	Algebra 2	Pre-IB Algebra 2 /Trigonometry
	Mathematics 3, Unified	
Advanced I	Algebra 3	Linear Algebra
	Trigonometry	Mathematics, Independent Study
	Analytic Geometry	Statistics, Other
	Trigonometry and Solid Geometry	Statistics
	Algebra and Trigonometry	Probability
	Algebra and Analytic Geometry	Probability and Statistics
		AP Statistics
Advanced II	Analysis, Introductory	IB Math Studies 2
Advanced III	Calculus and Analytic Geometry	AP Calculus
		IB Math Studies/Calculus
	Calculus	AP Calculus CD

Table 8

States Requiring the Class of 2004 to Pass an Exit Exam Before Graduation

States	
Alabama	Nevada
Alaska	New Jersey
Florida	New Mexico
Georgia	New York
Indiana	North Carolina
Louisiana	Ohio
Maryland	South Carolina
Massachusetts	Tennessee
Minnesota	Texas
Mississippi	Virginia

Table 9

Comparison of Participants Excluded Due to Missing Data and Cases with Complete Data

	Cases with Missing Data (N = 279)		Analytic Sample (N = 991)		X^2	*p*
	n	%	*n*	%		
High school graduation status (n = 1119)						
Graduated	105	82	848	85.6	1.12	0.289
Did not graduate	23	18	143	14.4		
Math pipeline (n = 1270)						
No math/non-academic/low academic	96	34.4	217	21.9	19.32	<.01
Middle academic	130	46.6	519	52.4		
Advanced	53	19	255	25.7		
Enrollment in postsecondary education (n = 1270)						
Yes	119	42.7	590	59.5	25.17	<.01
No	160	57.3	401	40.5		
State exit exam requirement in 2004 (n = 1270)						
Yes	138	49.5	517	52.2	0.64	0.424
No	141	50.5	474	47.8		
Gender (n = 1241)						
Male	138	55.2	557	56.2	0.08	0.775
Female	112	44.8	434	43.8		
Race/ethnicity (n = 1206)						
White, non-Hispanic	95	44.2	499	50.4	7.34	0.062
Hispanic	53	24.7	186	18.8		
Black or African-American	45	20.9	171	17.3		
Other	22	10.2	135	13.6		
SES (categorical) (n = 1206)						
Lowest quartile (0-25%)	91	42.3	334	33.7	6.06	0.109
Second quartile (26-50%)	53	24.7	268	27.0		
Third quartile (51-75%)	37	17.2	213	21.5		
Highest quartile (76-100%)	34	15.8	176	17.8		
GPA (n = 1270)						
≤ 2.00	106	38	241	24.3	20.50	<.01
≥ 2.01	173	62	750	75.7		
Number of absences (n = 1127)						
6 or fewer	92	67.6	809	81.6	14.60	<.01
7 or more	44	32.4	182	18.4		
Participation in Special Education – Vocational courses (n = 1270)						
Yes	25	9	76	7.7	0.50	0.481
No	254	91	915	92.3		

Mother's education level (n = 1230)						
No high school diploma	58	24.3	190	19.2	3.11	0.078
High school diploma/GED or higher	181	75.7	801	80.8		
School urbanicity (n = 1270)						
Urban	88	31.5	290	29.3	0.66	0.717
Suburban	139	49.8	501	50.6		
Rural	52	18.6	200	20.2		
Continuous variables					*t*	*p*
SES (continuous) (n = 1206)	-0.31 (0.70)		-0.19 (0.71)		-2.38	.02
School enrollment (n = 1239)	1425.13 (951.49)		1293.66 (883.93)		1.97	.05

Table 10

Comparison of the National Population of High School Sophomores in 2002, NLTS2 Participants, and the Cases with Complete Data

	National Population	NLTS2 Sample[e] (N = 11270)	Cases with Complete Data (N = 991)
	%	%	%
High school graduation status			
Graduated	75[a]	54.1	85.6
Did not graduate	25[a]	45.9	14.4
Math pipeline			
No math/non-academic/low academic	n/a	41	21.9
Middle academic	n/a	53.3	52.4
Advanced	n/a	5.7	25.7
Enrollment in postsecondary education			
Yes	66.7[a]	53	59.5
No	33.3[a]	47	40.5
State exit exam requirement in 2004			
Yes	52[b]	n/a	52.2
No	48[b]	n/a	47.8
Gender			
Male	51.1[c]	66.6	56.2
Female	48.9[c]	33.4	43.8
Race/ethnicity			
White, non-Hispanic	63.2[d]	60.6	50.4
Hispanic	14.8[d]	18.4	18.8
Black or African-American	15.7[d]	18.5	17.3
Other	5.6[d]	2.5	13.6
Participation in Special Education – Vocational courses			
Yes	n/a	15.7	7.7
No	n/a	84.3	92.3

[a]Source: Digest of Education Statistics, 2005 (Snyder, Tan, & Hoffman, 2006)
[b]Source: Center on Education Policy (2004)
[c]Source: Common Core of Data 2001-02 (2002)
[d]Source: NCES Elementary/Secondary Education System (n.d.)
[e]Source: NLTS2 Data Tables (http://www.nlts2.org/data_tables/index.html)

Table 11

Comparison of Participants in the ELS:02 Sample and Analytic Sample

	ELS:02 Sample (N = 16197)		Analytic Sample (N = 1270)	
	n	%	*n*	%
High school graduation status				
Graduated	12104	90.2	953	85.2
Did not graduate	1320	9.8	166	14.8
Math pipeline				
No math/non-academic/low academic	1259	8.5	313	24.6
Middle academic	6752	45.6	649	51.1
Advanced	6797	45.9	308	24.3
Enrollment in postsecondary education				
Yes	10534	75.0	709	55.8
No	3503	25.0	561	44.2
State exit exam requirement in 2004				
Yes	8727	53.9	655	51.6
No	7470	46.1	615	48.4
Gender				
Male	7653	49.8	695	56.0
Female	7717	50.2	546	44.0
Race/ethnicity				
White, non-Hispanic	8682	57.0	594	49.3
Hispanic	2217	14.5	239	18.8
Black or African-American	2020	13.3	216	17.9
Other	2325	14.4	157	13.0
SES (categorical)				
Lowest quartile (0-25%)	3600	23.6	425	35.2
Second quartile (26-50%)	3590	23.6	321	26.6
Third quartile (51-75%)	3753	24.6	250	20.7
Highest quartile (76-100%)	4301	28.2	210	17.4
GPA				
≤ 2.00	2846	19.2	347	27.3
≥ 2.01	11950	80.8	923	72.7
Number of absences				
6 or fewer	12138	84.5	901	79.9
7 or more	2234	15.5	226	20.1
Participation in Special Education – Vocational courses				
Yes	459	3.1	101	8.0
No	14349	96.9	1169	92.0

Mother's education level				
No high school diploma	1942	12.7	248	20.2
High school diploma/GED or higher	13376	87.3	982	79.8
School urbanicity				
Urban	5486	33.9	378	29.8
Suburban	7764	47.9	640	50.4
Rural	2947	18.2	252	19.8
Continuous variables	Mean (SD)			
SES (continuous)	0.04 (0.75)		-0.21 (0.71)	
School enrollment	1273.89 (839.59)		1319.98 (899.01)	

Table 12

Comparison of Participants in States with and without Exit Exams in 2004 – Cases with Complete Data Only (N = 991)

	State had exit exam (N = 517)		No exit exam (N = 475)	
	n	%	*n*	%
High school graduation status				
Graduated	439	84.9	409	86.1
Did not graduate	78	15.1	66	13.9
Math pipeline				
No math/non-academic/low academic	109	21.1	108	22.7
Middle academic	252	48.7	266	56.0
Advanced	156	30.2	101	21.3
Enrollment in postsecondary education				
Yes	326	63.1	263	55.4
No	191	36.9	212	44.6
Gender				
Male	289	55.9	268	56.4
Female	228	44.1	207	43.6
Race/ethnicity				
White, non-Hispanic	257	49.7	242	50.9
Hispanic	81	15.7	105	22.1
Black or African-American	116	22.4	56	11.6
Other	63	12.2	73	15.4
SES (categorical)				
Lowest quartile (0-25%)	157	30.4	176	37.1
Second quartile (26-50%)	150	29.0	119	25.1
Third quartile (51-75%)	108	20.9	105	22.1
Highest quartile (76-100%)	102	19.7	75	15.8
GPA				
≤ 2.00	130	25.1	112	23.6
≥ 2.01	387	74.9	363	76.4
Number of absences				
6 or fewer	430	83.2	379	79.8
7 or more	87	16.8	96	20.2
Participation in Special Education – Vocational courses				
Yes	38	7.4	38	8.0
No	479	92.6	437	92.0
Mother's education level				
No high school diploma	90	17.4	99	20.8
High school diploma/GED or higher	427	82.6	376	79.2

School urbanicity				
Urban	151	29.2	140	29.5
Suburban	254	49.1	247	52.0
Rural	112	21.7	88	18.5
Continuous variables	Mean (SD)			
SES (continuous)	-0.13 (0.72)		-0.24 (0.69)	
School enrollment	1314.41 (864.29)		1269.57 (905.64)	

Table 13

Chi-square Analysis for the Outcomes of Students with Disabilities Based on Presence of an Exit Exam Policy in 2004

Variable	Exit exam policy in 2004 (n = 517)	No exit exam policy in 2004 (n = 474)	X^2	*p*
High school graduation			0.38	.539
Yes	439	409		
No	78	65		
Math coursetaking			11.34	.003
No math/low academic	109	108		
Middle academic	252	267		
Advanced	156	99		
Enrollment in postsecondary education			5.56	.018
Yes	326	264		
No	191	210		

Table 14

Tolerance Statistics and Variance Inflation Factors for Independent Variables

Measure	Statistic	VIF
1. Exit exam required by state	.99	1.01
2. Gender	.97	1.03
3. GPA	.92	1.09
4. Number of absences	.96	1.04
5. Participation in special education vocational courses	.99	1.02
6. Mother's education level	.74	1.35
7. SES (continuous)	.72	1.40
8. School enrollment	.97	1.03

Note. A tolerance statistic of less than .20 may indicate a problem with collinearity (Menard, 2002). There is no commonly accepted "critical threshold" for VIF values, but most consider a VIF value above 5 or 10 to be an indication of multicollinearity. The tolerance statistics and VIF values are only provided for dichotomous or continuous independent variables. Nominal variables with more than two response categories were not included in this analysis due to the inability to meaningfully interpret the correlations.

Table 15

Bivariate Correlations of High School Graduation and Independent Variables

Measure	Cramer's V
1. Exit exam required by state	.02
2. Gender	.08*
3. GPA	.38**
4. Number of absences	.15**
5. Participation in special education vocational courses	.08**
6. Mother's education level	.13**
Measure	**Pearson's Product-Moment**
7. SES (continuous)	.19**
8. School enrollment	-.04

Note. The bivariate correlations are only provided for dichotomous or continuous independent variables. Nominal variables with more than two response categories were not included in this analysis due to the inability to meaningfully interpret the correlations.

**$p < .01$

*$p < .05$

Table 16

Bivariate Correlations of Math Coursetaking and Independent Variables

Measure	Cramer's V
1. Exit exam required by state	.08*
2. Gender	.06
3. GPA	.23**
4. Number of absences	.09**
5. Participation in special education vocational courses	.21**
6. Mother's education level	.13**
Measure	**Pearson's Product-Moment**
7. SES (continuous)	.27**
8. School enrollment	.06*

Note. The bivariate correlations are only provided for dichotomous or continuous independent variables. Nominal variables with more than two response categories were not included in this analysis due to the inability to meaningfully interpret the correlations.

**$p < .01$

*$p < .05$

Table 17

Bivariate Correlations of Postsecondary Education Enrollment and Independent Variables

Measure	Cramer's V
1. Exit exam required by state	.06*
2. Gender	.09**
3. GPA	.29**
4. Number of absences	.13**
5. Participation in special education vocational courses	.14**
6. Mother's education level	.18*
Measure	**Pearson's Product-Moment**
7. SES (continuous)	.36**
8. School enrollment	.09**

Note. The bivariate correlations are only provided for dichotomous or continuous independent variables. Nominal variables with more than two response categories were not included in this analysis due to the inability to meaningfully interpret the correlations.

**$p < .01$

*$p < .05$

Table 18

Intercorrelation Matrix of Independent Variables

Measure		2	3	4	5	6	7	8	9	10
1. State exit exam policy	---									
2. Gender	-.01	---								
3. Race/ethnicity	.03	.03	---							
4. GPA	-.02	-.15	-.08	---						
5. Absences	.04	.06	.04	.16	---					
6. Special Ed – Vocational	-.01	.02	-.02	-.01	-.06	---				
7. Mother's education level	.05	.03	-.09	.06	.01	-.07	---			
8. School urbanicity	.02	.02	-.19	.05	.02	.03	.10	---		
9. SES	.08	.04	-.17	.14	.07	-.08	.52	.004	---	
10. School enrollment	.03	-.04	.16	-.06	-.01	.03	-.08	-.30	.02	---

Table 19

Summary of Logistic Regression Analysis Predicting High School Graduation

Variable	*B*	*SE*	*OR*	95% CI	Wald statistic	*p*
Constant	0.99	0.35	2.69		8.10	.004
State exit exam requirement in 2004[a]						
Yes	-0.17	0.21	0.84	[0.56, 1.27]	0.68	.409
Gender[b]						
Male	-0.36	0.22	0.70	[0.46, 1.06]	2.80	.095
Race/ethnicity[c]						
Hispanic	-0.53	0.29	0.59	[0.34, 1.04]	3.33	.068
Black or African-American	-0.24	0.29	0.79	[0.45, 1.39]	0.67	.415
Other	-0.59	0.32	0.56	[0.30, 1.03]	3.44	.064
GPA[d]						
≥ 2.01	1.94	0.21	6.93	[4.58, 10.51]	83.44	<.001*
Number of absences[e]						
6 or fewer	0.58	0.23	1.79	[1.13, 2.83]	6.18	.013*
Participation in Special Education – Vocational courses[f]						
Credit	-0.68	0.33	0.51	[0.27, 0.96]	4.35	.037*
School urbanicity[g]						
Suburban	0.12	0.24	1.12	[0.70, 1.81]	0.23	.630
Rural	-0.69	0.30	0.50	[0.28, 0.91]	5.16	.023*
SES (continuous)[h]	0.71	0.17	2.03	[1.44, 2.85]	16.38	<.001*
School enrollment[h]	-0.01	0.01	0.99	[0.97, 1.02]	0.26	.610

Notes. CI = confidence interval for odds ratio (OR). Results are unweighted; weighted results are available in Appendix D.

[a] Comparison group = No

[b] Comparison group = Female

[c] Comparison group = White, non-Hispanic

[d] Comparison group = ≤ 2.00

[e] Comparison group = 7 or more

[f] Comparison group = No credit

[g] Comparison group = Urban

[h] Continuous variable

*p<.05

Table 20

Summary of Multinomial Regression Analysis Predicting Math Coursetaking at Middle Academic and Advanced Levels

Variable	Middle academic math courses						Advanced math courses					
	B	*SE*	*OR*	95% CI	Wald statistic	*p*	*B*	*SE*	*OR*	95% CI	Wald statistic	*p*
Intercept	1.48	0.32			21.91	< .001	-0.37	0.43			0.73	.392
State exit exam requirement in 2004[a]												
Yes	-0.06	0.17	0.94	[0.67, 1.32]	0.14	.711	0.44	0.21	1.54	[1.03, 2.33]	4.31	.038*
Gender[b]												
Male	-0.25	0.18	0.78	[0.56, 1.11]	1.94	.164	-0.31	0.21	0.73	[0.49, 1.11]	2.18	.139
Race/ethnicity[c]												
Hispanic	0.21	0.25	1.23	[0.75, 2.01]	0.67	.413	-0.52	0.32	0.59	[0.31, 1.12]	2.60	.107
Black or African-American	0.05	0.25	1.05	[0.65, 1.70]	0.04	.845	-0.37	0.30	0.69	[0.38, 1.25]	1.47	.225
Other	-0.06	0.27	0.95	[0.56, 1.59]	0.04	.833	-0.32	0.32	0.73	[0.39, 1.35]	1.00	.317
GPA[d]												
≥ 2.01	0.09	0.19	1.10	[0.75, 1.60]	0.22	.636	1.52	0.30	4.59	[2.58, 8.18]	26.69	< .001*
Number of absences[e]												
6 or fewer	0.12	0.21	1.12	[0.74, 1.71]	0.30	.582	0.32	0.28	1.37	[0.79, 2.37]	1.28	.258
Participation in Special Education – Vocational courses[f]												
Credit	-1.40	0.27	0.25	[0.15, 0.42]	26.90	< .001*	-2.11	0.45	0.12	[0.05, 0.29]	21.75	< .001*
School urbanicity[g]												
Suburban	-0.41	0.22	0.67	[0.44, 1.02]	3.51	.061	-0.63	0.25	0.53	[0.33, 0.87]	6.29	.012*
Rural	-0.72	0.26	0.49	[0.29, 0.82]	7.48	.006*	-1.70	0.33	0.18	[0.10, 0.35]	25.91	< .001*
SES (continuous)[h]	0.51	0.14	1.67	[1.26, 2.20]	13.01	< .001*	1.05	0.16	2.85	[2.07, 3.94]	40.64	< .001*
School enrollment[h]	0.02	0.01	1.02	[1.00, 1.04]	3.12	.077	0.03	0.01	1.03	[1.00, 1.06]	4.59	.032*

Notes. CI = confidence interval for odds ratio (OR). Results are unweighted; weighted results are available in Appendix D.
[a] Comparison group = No
[b] Comparison group = Female
[c] Comparison group = White, non-Hispanic
[d] Comparison group = ≤ 2.00
[e] Comparison group = 7 or more
[f] Comparison group = No credit
[g] Comparison group = Urban
[h] Continuous variable
*p<.05

Table 21

Summary of Logistic Regression Analysis Predicting Enrollment in Postsecondary Education

Variable	*B*	*SE*	*OR*	95% CI	Wald statistic	*p*
Constant	-0.32	0.28	0.73		1.25	.263
State exit exam requirement in 2004[a]						
Yes	0.25	0.15	1.28	[0.95, 1.73]	2.66	.103
Gender[b]						
Male	-0.44	0.16	0.65	[0.48, 0.88]	7.94	.005*
Race/ethnicity[c]						
Hispanic	-0.32	0.22	0.73	[0.47, 1.12]	2.14	.144
Black or African-American	0.27	0.22	1.31	[0.84, 2.02]	1.44	.231
Other	0.28	0.24	1.33	[0.83, 2.12]	1.39	.238
GPA[d]						
≥ 2.01	1.29	0.18	3.62	[2.55, 5.13]	52.04	< .001*
Number of absences[e]						
6 or fewer	0.32	0.19	1.38	[0.94, 2.01]	2.70	.100
Participation in Special Education – Vocational courses[f]						
Credit	-1.14	0.29	0.32	[0.18, 0.56]	15.84	< .001*
School urbanicity[g]						
Suburban	-0.14	0.18	0.87	[0.61, 1.23]	0.62	.430
Rural	-0.67	0.23	0.51	[0.33, .81]	8.28	.004*
SES (continuous)[h]	1.22	0.13	3.39	[2.62, 4.37]	87.55	< .001*
School enrollment[h]	0.04	0.01	1.28	[1.02, 1.06]	12.80	< .001*

Notes. CI = confidence interval for odds ratio (OR). Results are unweighted; weighted results are available in Appendix D.

[a] Comparison group = No

[b] Comparison group = Female

[c] Comparison group = White, non-Hispanic

[d] Comparison group = ≤ 2.00

[e] Comparison group = 7 or more

[f] Comparison group = No credit

[g] Comparison group = Urban

[h] Continuous variable

*p<.05

Table 22

Summary of Logistic Regression Analysis Predicting Enrollment in Postsecondary Education with Interaction of Math Pipeline

Variable	*B*	*SE*	*OR*	95% CI	Wald statistic	*p*
Constant	-1.22	0.36	0.30		11.66	.001
State exit exam requirement in 2004[a]						
Yes	-0.05	0.33	0.95	[0.50, 1.81]	0.03	.874
Math pipeline[b]						
Middle Academic	0.83	0.27	2.30	[1.36, 3.89]	9.66	.002*
Advanced	2.16	0.40	8.67	[3.98, 18.86]	29.64	< .001*
Interactions						
$MATH_{MID}$ * STATETEST	0.40	0.39	1.49	[0.70, 3.18]	1.08	.298
$MATH_{ADV}$ * STATETEST	-0.06	0.53	0.95	[0.34, 2.68]	0.01	.918
Gender[c]						
Male	-0.42	0.16	0.66	[0.48, 0.90]	6.86	.009*
Race/ethnicity[d]						
Hispanic	-0.24	0.23	0.78	[0.50, 1.23]	1.12	.289
Black or African-American	0.33	0.23	1.39	[0.89, 2.18]	2.10	.147
Other	0.41	0.25	1.51	[0.92, 2.47]	2.65	.104
GPA[e]						
≥ 2.01	1.12	0.19	3.07	[2.14, 4.42]	36.58	< .001*
Number of absences[f]						
6 or fewer	0.26	0.20	1.30	[0.87, 1.94]	1.68	.195
Participation in Special Education – Vocational courses[g]						
Credit	-0.77	0.31	0.47	[0.26, 0.85]	6.31	.012*
School urbanicity[h]						
Suburban	-0.01	0.19	0.99	[0.68, 1.43]	0.01	.944
Rural	-0.38	0.24	0.69	[0.43, 1.10]	2.41	.121
SES (continuous)[i]	1.08	0.14	2.96	[2.27, 3.85]	64.08	< .001*
School enrollment[i]	-0.03	0.01	1.03	[1.01, 1.05]	9.36	.002*

Notes. CI = confidence interval for odds ratio (OR). Results are unweighted; weighted results are available in Appendix D.

[a]Comparison group = No

[b] Comparison group = No math/non-academic/low academic

[c] Comparison group = Female

[d] Comparison group = White, non-Hispanic

[e] Comparison group = ≤ 2.00

[f] Comparison group = 7 or more

[g] Comparison group = No credit

[h] Comparison group = Urban

[i] Continuous variable

*p<.05

Figures

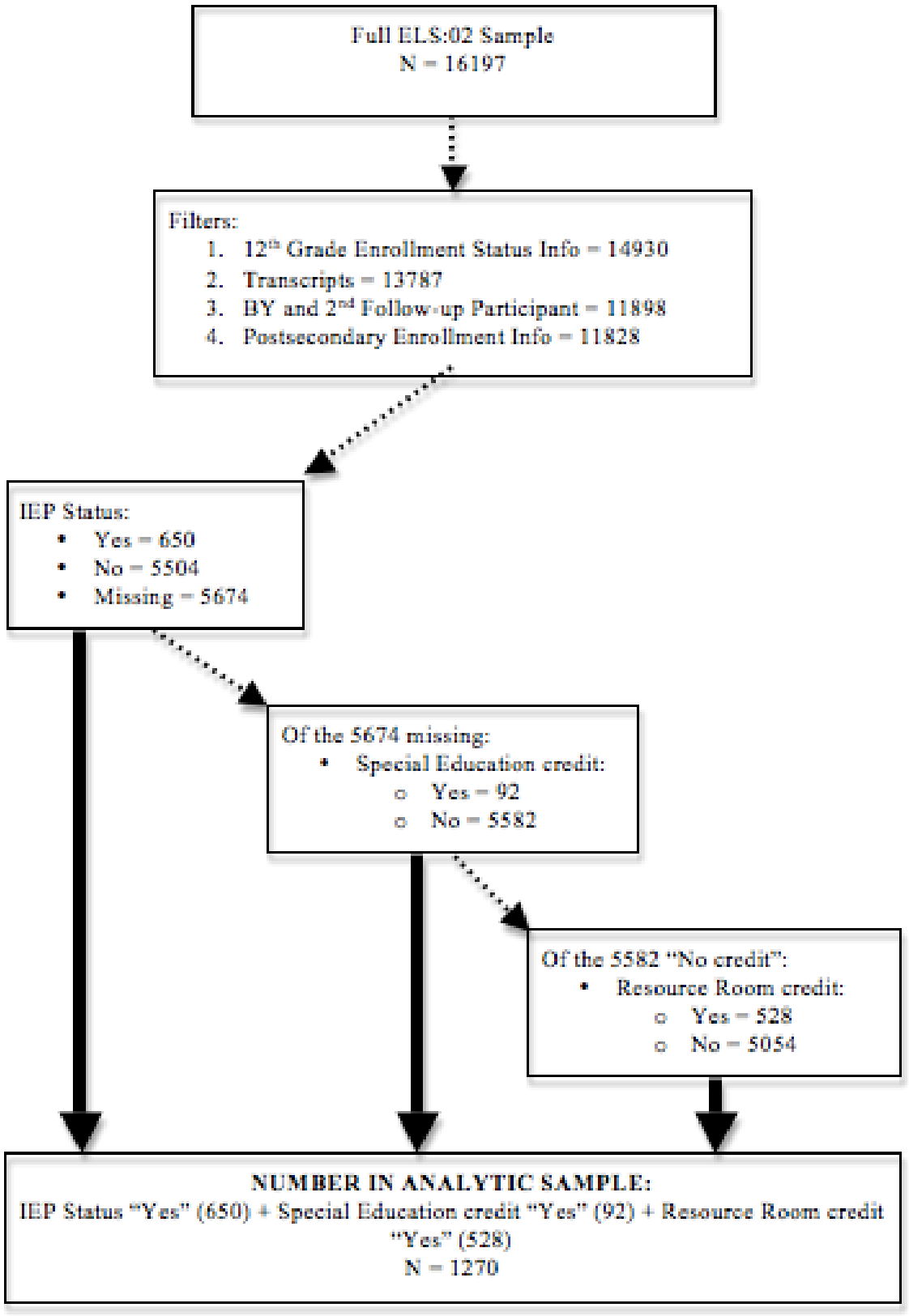

Figure 1. Selection process of the analytic sample from the ELS:02 sample.

Appendix A

Table A1

Articles Included in the Critical Review of Research Studies: Description of Purpose

Study	Description of Purpose
Astone & McLanahan, 1991	To determine if school-related parenting practices are associated with children's school achievement. Also, to determine if differences in parental behavior account for any of the negative association between family structure and children's school achievement that remains after SES is taken into account.
Barrington & Hendricks, 1989	To determine if there are characteristics that differentiate prospective graduates from those who will not complete high school, and if so, whether those characteristics are measurable using data available in students' cumulative school records and how early students at risk of noncompletion can be identified. Also, to compare the characteristics of high school graduates, dropouts, and those students who stay in high school for four years but do not graduate.
Borg, Plumlee, & Stranahan, 2007	To ascertain the effect of Florida Comprehensive Assessment Test (FCAT) graduation requirements on a student's probability of earning a high school diploma and to examine the effects of changing the numeric value of the passing score that has been in place in Florida. Also, to determine which students are most likely to be affected by the new cut-off scores in Florida, and whether there are demographic and/or school characteristics that suggest that some students are more likely to fail than others.
Ensminger & Slusarick, 1992	To examine whether early school performance in first grade is related to graduation or dropping out of school later in the child's school career and if there are protective or risk factors within the family or within the child that enhance or inhibit the relationship between early school performance and later school completion.

Finn, Gerber, & Boyd-Zaharias, 2005	To examine whether participation in small classes in the early grades (K-3) is related to the likelihood that a student will graduate from high school, and whether academic achievement in the early grades is related to high school graduation.
Hickman, Bartholomew, Mathwig, & Heinrich, 2008	To examine whether differences exist in the developmental pathways of high school graduates compared with high school dropouts and if differences do exist, which variables are responsible for the differences.
Jacob, 2001	To examine the impact of high school graduation exams on student achievement and graduation rates.
Marchant & Paulson, 2005	To examine the effect of HS graduation exams on states' graduation rates, states' aggregated SAT scores, and on individual students' SAT scores.
Reardon, Arshan, Atteberry, & Kurlaender, 2010	To estimate the effect of failing a high school exit exam in 10th grade on subsequent student achievement, course taking, persistence in high school, and graduation.
Rylance, 1997	To explore the relative roles of personal variables, vocational education, and counseling/mental health therapy in predicting whether a student identified as having a severe emotional disturbance (SED) completes high school.
Stewart, 2008	To examine the extent to which individual-level and school structural variables are predictors of academic achievement among high school students.
Warren & Edwards, 2005	To estimate the association between high school exit exam requirements and students' chances or obtaining high school diplomas, GEDs, or obtaining neither credential.
Warren, Jenkins, & Kulick, 2006	To investigate the extent to which state-mandated high school exit examinations are associated with state-level public high school completion rates in the United States.

Table A2

Articles Included in the Critical Review of Research Studies: Data Source and Analytic Sample

Study	Data Source and Sample Description	Sample Size
Astone & McLanahan, 1991	Data from the High School and Beyond (HS&B) study. Students were sophomores in high school in 1980 and were surveyed again in 1982, 1984, and 1986. Subjects in sample must have participated in all waves of data collection and must be white (not Hispanic), black, Mexican, or Puerto Rican.	10,438 students
Barrington & Hendricks, 1989	Students who entered two high schools as freshman in 1981-82 in a small city in Wisconsin	651 students
Borg, Plumlee, & Stranahan, 2007	All 10th grade students in Duval County, FL who took the Florida Comprehensive Assessment Test (FCAT) in the 1999-2000 school year.	5,206 students
Ensminger & Slusarick, 1992	Children enrolled in first grade in Woodlawn (Chicago, IL) schools in 1966-67; longitudinal data set. All children were African-American. Students were expected to graduate from high school in 1982.	1,242 students
Finn, Gerber, & Boyd-Zaharias, 2005	Sample consisted of a subset of students who participated in Tennessee's Project STAR. Students in this project were assigned at random to either a small class or a full-size class when they entered kindergarten. Students were kept in the same type of class assignment for 4 years. Graduation status was confirmed through the Tennessee State Education Department records.	4,948 students

Hickman, Bartholomew, Mathwig, & Heinrich, 2008	Purposive random sample of students enrolled across four cohorts from a school district in northeastern Arizona. They entered Kindergarten between 1990 and 1993, and were expected to graduate between 2002-2005.	119 students
Jacob, 2001	National Education Longitudinal Study (NELS), which follows a nationally representative sample of young adults from eighth grade (1988) through high school and into postsecondary education or work. Only students attending public schools who have complete data on key variables were included.	12,171 students
Marchant & Paulson, 2005	Used data from the College Board's 2001 SAT test-takers paired with state aggregated data from the National Center for Education Statistics (NCES) on graduation rates for students expected to graduate in 2002. The authors used an article by Amrein and Berliner (2002) to identify states that required students to pass a standardized test to graduate in 2002 (18 states required a graduation exam, and 33 did not).	694,400 students
Reardon, Arshan, Atteberry, & Kurlaender, 2010	Longitudinal data from four of the 10 largest school districts in California. Includes students who took the California High School Exit Exam (CAHSEE) for the first time in 10^{th} grade in Spring 2004 through Spring 2008 (students scheduled to graduate in 2006 through 2010). The authors excluded students classified as special education students because they were not subject to the CAHSEE requirement in most of the years covered by the analyses.	106,454 students
Rylance, 1997	National Longitudinal Transition Study (NLTS). Participants were 18-27 years old, had a primary disability label of severe emotional disturbance (SED), and exited school prior to 1990.	664 students

Stewart, 2008	National Education Longitudinal Study (NELS) 2nd wave data, Spring 1990. Students were nested within 715 high schools nationwide. Author states that the sample was "freshened" to generate a representative sample of 10th grade students in 1990.	11,999 students
Warren & Edwards, 2005	National Education Longitudinal Study (NELS) data. Base year sample in 1988 included more than 25,000 eighth graders in about 1,000 schools nationwide. Students for whom state of residence was unknown in 1988 were dropped from the sample. Only students who responded to the 1994 follow-up survey were included in the sample.	13,632 students
Warren, Jenkins, & Kulick, 2006	Used information from the October Current Population Surveys (CPS) and Common Core Data (CCD) to determine high school completion rates for graduating classes of 1975 through 2002 for all states that had high school exit exams during that time period.	1,428 state-years (graduating classes)

Table A3

Articles Included in the Critical Review of Research Studies: Variables Used in Analyses

Study	Data Analysis	Independent Variables	Control Variables or Covariates
Astone & McLanahan, 1991	OLS regression Bivariate probit models	Family structure Parental college aspirations Mother monitors student progress Father monitors student progress Parental supervision Communication between parent(s) and student	SES, race, region, residence, number of siblings, school dropout rate, gender
Barrington & Hendricks, 1989	One-way ANOVAs Chi square tests	Number of absences Iowa Basic Skills Test scores Achievement/IQ ratio Number of failed courses in middle and high school GPA in grades 9-12 "Negative" teacher comments from elementary school Parent occupational status Number of schools attended Special education referrals	
Borg, Plumlee, & Stranahan, 2007	Probit regression	Student characteristics: ethnicity, household income, parental education level, mobility School characteristics: teacher quality, teacher turnover, magnet school status	

Ensminger & Slusarick, 1992	Log-linear model Logistic regression Logistic regression path analysis	Family background School behavior and performance Involvement of family in school Parent-child interaction concerning school Family educational values and expectations	
Finn, Gerber, & Boyd-Zaharias, 2005	Hierarchical linear modeling	Urbanicity of school School enrollment Student gender Student race Student free-lunch status Student years in small class Student math achievement Student reading achievement	
Hickman, Bartholomew, Mathwig, & Heinrich, 2008	Independent *t* tests	Specific course grades GPA Core classes Proficiency test scores Grade retention Absenteeism Family and demographic variables (ethnicity, gender, family income) Placement in juvenile diversion or probation programs by county juvenile court	
Jacob, 2001	OLS regression	Graduation exams	
Marchant & Paulson, 2005	Multiple regression analysis	States' requirement of a graduation exam	Race, percent eligible for free/reduced lunch, percent of students with IEPs

Reardon, Arshan, Atteberry, & Kurlaender, 2010	Regression discontinuity design	Test scores and pass/fail status on math and English-Language Arts (ELA) CAHSEE	Percentage White Percentage Hispanic Percentage Black Percentage Asian Percentage Female Percentage free-lunch eligible Percentage ELL 8th grade ELA California Standards Test (CST) score (standardized) 10th grade ELA CST score (standardized)
Rylance, 1997	Hierarchical regression analysis	Family characteristics (income) Individual characteristics (age) Participation in vocational education, counseling, or mental health therapy offered by a student's high school	
Stewart, 2008	Hierarchical linear modeling	Student effort (school attachment, school involvement, school commitment) Association with positive peers Parental school involvement Parent-child discussion Demographic (family structure, gender, ethnicity, SES) School poverty Proportion of non-White students School location School size School social problems School cohesion	

Warren & Edwards, 2005	Binary logistic regression modeling 2-level HLM with and without random effects 3-level HLM with random effects STATA model	High school exit exam required by state	Student characteristics: race/ethnicity; gender; socioeconomic composite, grade 8; ever held back; Reading and Math test scores, grade 8; student education expectations; grades in reading and math, grades 6-8 School characteristics: urbanicity of school; type of school (public vs. private); total school enrollment; percent of students who are minorities; percent of students on free/reduced lunch State characteristics: Carnegie units required for graduation; GED pass criteria; per-pupil expenditures; pupil-teacher ratio; mean 1992 teacher's salary; compulsory age of attendance; percent of teachers with advanced degrees; percent of teachers with < 3 years of experience

Warren, Jenkins, & Kulick, 2006	Fixed effects modeling	Whether or not passage of a state exit exam was a requirement for obtaining a diploma Whether the exit exam was a minimum competency exam or a "more difficult" exam.	Per pupil expenditures Pupil-teacher ratios in secondary schools Difference in mean ages of 2nd and 8th graders Carnegie units required for graduation Compulsory age of school attendance Poverty rate Per capita income Unemployment rate Percent non-Hispanic Black, ages 14-21 Percent Hispanic, ages 14-21

Table A4

Articles Included in the Critical Review of Research Studies: Findings

Study	Findings
Astone & McLanahan, 1991	Factors affecting graduation: growing up in a single-parent or stepparent family (family structure); parental college aspirations; mother monitors student progress; parental supervision
Barrington & Hendricks, 1989	Factors affecting graduation: number of absences; achievement test scores; number of failed courses; GPA in grades 9-12; negative teacher comments; occupation of father; number of high schools attended; special education referrals
Borg, Plumlee, & Stranahan, 2007	Factors affecting graduation: race/ethnicity (African American or Hispanic students are less likely to pass exam and graduate); household income of less than $20,000 per year; student mobility; enrollment in a magnet school; percentage of teachers with advanced degrees; percentage of teachers who are new hires
Ensminger & Slusarick, 1992	Factors affecting graduation: gender (female students had 1.26 times the odds of graduating as male students); higher grades (A's or B's) in 1st grade; poverty at the time of 1st grade; mother with a high school diploma; family structure; aggressive behavior in 1st grade; parental involvement in PTA in adolescence; student works on homework with adult family members in adolescence; strict rules set by family; mother's educational expectations during child's adolescence; student's educational expectations during adolescence
Finn, Gerber, & Boyd-Zaharias, 2005	Factors affecting graduation: urbanicity of school; school enrollment; student gender; student free-lunch status; 4 years in a small class; student math achievement; student reading achievement
Hickman, Bartholomew, Mathwig, & Heinrich, 2008	Factors affecting graduation: K-8 academic performance/course grades; high school GPA; number of core courses taken; proficiency test scores; grade retention; absenteeism; ethnicity; placement in juvenile probation

Jacob, 2001	The requirement of a graduation exam decreases the probability of graduation among lowest ability students, but not the average student.
Marchant & Paulson, 2005	Factors affecting graduation: states' requirement of a graduation exam
Reardon, Arshan, Atteberry, & Kurlaender, 2010	The estimated effect of failing at least one section of the CAHSEE on high school graduation is statistically significant; however, the instability of the estimate causes this effect to be unreliable. Therefore, the authors conclude that there is no significant effect of failing the exit exam on high school graduation, and any effects are likely to be the result of other factors.
Rylance, 1997	Factors affecting graduation: age (older students were more likely to have earned a diploma); competency (students who were more proficient in reading, counting, telling time, and using the phone were more likely to graduate); parental income; participation in counseling; participation in vocational education
Stewart, 2008	Significant factors: school attachment; school commitment; association with positive peers; parent-child discussion; family SES; family structure; ethnicity; school cohesion
Warren & Edwards, 2005	Early 1990s high school exit exam requirements were not associated with lower rates of diploma acquisition, even among at-risk or low-achieving students.
Warren, Jenkins, & Kulick, 2006	State high school exit exams, especially "more difficult" ones, are associated with lower graduation rates in public high schools. The relationship between state exit exam policies and graduation has strengthened as states have become more racially and ethnically diverse and as poverty rates have increased.

Appendix B

Courses Listed Under Special Education Credit (Variable F1R54_C)

541001 General Math Skills
541009 Functional Math Skills, not for credit
541101 Functional Consumer Math
541109 Functional Consumer Math, not for credit
541201 Functional Vocational Math
541209 Functional Vocational Math, not for credit
542011 Functional Language Arts
542019 Functional Language Arts 1, not for credit
542021 Functional Language Arts 2
542029 Functional Language Arts 2, not for credit
542031 Functional Language Arts 3
542039 Functional Language Arts 3, not for credit
542041 Functional Language Arts 4
542049 Functional Language Arts 4, not for credit
542051 Functional Vocational English
542059 Functional Vocational English, not for credit
542101 Functional Reading
542109 Functional Reading, not for credit
542201 Functional Oral Communication
542209 Functional Oral Communication, not for credit
542301 Functional Writing
542309 Functional Writing, not for credit
542401 Functional Academics
542409 Functional Academics, not for credit
543001 Activities of Daily and Family Living
543009 Activities of Daily and Family Living, not for credit
543101 Social/Behavioral Skills
543109 Social/Behavioral Skills, not for credit
543201 Functional Leisure and Recreational Skills
543209 Functional Leisure and Recreational Skills, not for credit
543301 Functional Health
543309 Functional Health, not for credit
543401 Functional Transition Skills
543409 Functional Transition Skills, not for credit
544001 Functional Science
544009 Functional Science, not for credit
544501 Functional Social Skills
544509 Functional Social Studies, not for credit
549401 Handicapped Developmental Support Services
549409 Handicapped Developmental Support Services, not for credit

562300 Special Education Language Arts
562301 Resource Language Arts/English
562302 Developmental English 2/Resource ESE AAP English 2
562303 Developmental English 3/Resource ESE AAP English 3
562304 Developmental English 4/Resource ESE AAP English 4
562309 Developmental English 4/Resource ESE AAP English 4
562310 Special Education Reading
562311 Resource Writing
562319 Resource Reading, not taken for credit
562320 Special Education Writing
562321 Resource Writing
562322 Resource Room English 2 (Special Education)
562329 Resource Writing, not for credit
562700 Special Education Math
562701 Resource General Math
562709 Resource General Math, not for credit
562711 Resource Vocational Math
562719 Resource Vocational Math, not for credit
562721 Resource Consumer Math
562729 Resource Consumer Math, not for credit
563201 Resource Career Exploration/Pre-Vocational Skills
563209 Resource Career Exploration/Prevocational Skills, not for credit
563211 Resource Transition Skills
563219 Resource Transition Skills, not for credit
564000 Special Education General Science
564001 Resource General Science
564009 Resource General Science, not for credit
564500 Special Education Social Studies
564501 Resource Social Studies
564509 Resource Social Studies, not for credit
569001 General Tutorial Services
569009 General Tutorial Services, not for credit
569101 Resource Study Skills
569109 Resource Study Skills, not for credit
569201 School and Social Survival Skills
569209 School and Social Survival Skills, not for credit
569301 Resource Survival Skills
569309 Resource Survival Skills, not for credit
569401 Handicap Specific Support Services
569409 Handicap Specific Support Services, not for credit

Mathematics Pipeline – Courses Included in F1MAPIP

Non-Academic Math
270100 Mathematics, Other General
270101 Mathematics 7
270102 Mathematics 7, Accelerate
270103 Mathematics 8
270104 Mathematics 8, Accelerated
270106 Mathematics 1, General
270107 Mathematics 2, General
270108 Science Mathematics
270109 Mathematics in the Arts
270110 Mathematics, Vocational
270111 Technical Mathematics
270112 Mathematics Review
270113 Mathematics Tutoring
270114 Consumer Mathematics
270200 Actuarial Sciences, Other
270300 Applied Mathematics, Other
270601 Basic Math 1
270602 Basic Math 2
270603 Basic Math 3
270604 Basic Math 4

Low Academic Math
270401 Pre-Algebra
270402 Algebra 1, Part 1
270403 Algebra 1, Part 2
270409 Geometry, Informal

Middle Academic Math 1
270400 Pure Mathematics, Other
270404 Algebra 1
270406 Geometry, Plane
270407 Geometry, Solid
270408 Geometry
270421 Mathematics 1, Unified
270422 Mathematics 2, Unified
270425 Geometry, Part 1
270426 Geometry, Part 2
270427 Unified Math 1, Part 1
270428 Unified Math 1, Part 2
270429 Pre-IB Geometry
270431 IB Math Methods 1
270432 IB Math Studies 1
270436 Discrete Math
270437 Finite Math
270441 Algebra and Geometry
279900 Mathematics, Other

Middle Academic Math II
270405 Algebra 2
270423 Mathematics 3, Unified
270430 Pre-IB Algebra 2/Trigonometry

Advanced Math I
270410 Algebra 3
270411 Trigonometry
270412 Analytic Geometry
270413 Trigonometry and Solid Geometry
270414 Algebra and Trigonometry
270415 Algebra and Analytic Geometry
270417 Linear Algebra
270424 Mathematics, Independent Study
270500 Statistics, Other
270511 Statistics
270521 Probability
270531 Probability and Statistics
270532 AP Statistics

Advanced Math II
270416 Analysis, Introductory
270433 IB Math Studies 2

Advanced Math III
270418 Calculus and Analytic Geometry
270419 Calculus
270420 AP Calculus
270434 IB Math Studies/Calculus
270435 AP Calculus CD

Appendix C

Table C1

Names and Types of State Exit Exams Required for the Class of 2004

State	Name of Exam	Type of Exam
Alabama	Alabama High School Graduation Exam (AHSGE) 3rd Edition	Standards-based
Alaska	Alaska High School Graduation Qualifying Exam (HSGQE)	Minimum competency
Florida	Florida Comprehensive Assessment Test (FCAT)	Standards-based
Georgia	Georgia High School Graduation Tests (GHSGT)	Standards-based
Indiana	Graduation Qualifying Exam (GQE)	Standards-based
Louisiana	Graduation Exit Examination for the 21st Century (GEE 21)	Standards-based
Maryland	Maryland Functional Tests	Minimum competency
Massachusetts	Massachusetts Comprehensive Assessment System (MCAS)	Standards-based
Minnesota	Basic Skills Test (BST)	Minimum competency
Mississippi	Mississippi Subject Area Testing Program (SATP)	End-of-course
Nevada	Nevada High School Proficiency Examination (HSPE)	Standards-based
New Jersey	High School Proficiency Assessment (HSPA)	Standards-based
New Mexico	New Mexico High School Competency Examination (NMHSCE)	Minimum competency
New York	Regents Comprehensive Examinations	End-of-course

North Carolina	North Carolina High School Competency Tests (NCHSCT)	Standards-based
Ohio	9th Grade Proficiency Tests	Minimum competency
South Carolina	Basic Skills Assessment Program (BSAP)	Minimum competency
Tennessee	Tennessee Competency Test	Minimum competency
Texas	Texas Assessment of Academic Skills (TAAS)	Standards-based
Virginia	Standards of Learning End of Course Exams (SOL)	End-of-course

Appendix D
Results of Weighted Analyses

Table D1

Summary of Logistic Regression Analysis Predicting High School Graduation – Weighted

Variable	*B*	*SE*	*OR*	95% CI	Wald statistic	*p*
Constant	1.40	0.36	4.07		15.56	< .001
State exit exam requirement in 2004[a]						
Yes	-0.38	0.21	0.69	[0.45, 1.04]	3.12	.078
Gender[b]						
Male	-0.48	0.22	0.62	[0.40, 0.96]	4.68	.031*
Race/ethnicity[c]						
Hispanic	-0.59	0.29	0.56	[0.31, 0.99]	4.01	.045*
Black or African-American	-0.13	0.30	0.88	[0.49, 1.57]	0.20	.654
Other	-0.43	0.36	0.65	[0.32, 1.33]	1.39	.238
GPA[d]						
≥ 2.01	1.99	0.22	7.34	[4.78, 11.28]	82.77	< .001*
Number of absences[e]						
6 or fewer	0.46	0.24	1.59	[0.99, 2.53]	3.72	.054
Participation in Special Education – Vocational courses[f]						
Credit	-0.92	0.32	0.40	[0.22, 0.75]	8.31	.004*
School urbanicity[g]						
Suburban	< 0.01	0.25	1.05	[0.64, 1.71]	0.03	.861
Rural	-0.88	0.32	0.41	[0.22, 0.78]	7.47	.006*
SES (continuous)[h]	0.83	0.19	2.30	[1.59, 3.31]	19.77	< .001*
School enrollment[h]	-0.02	0.01	0.98	[0.96, 1.01]	2.00	.157

Note. CI = confidence interval for odds ratio (OR).
[a] Comparison group = No
[b] Comparison group = Female
[c] Comparison group = White, non-Hispanic
[d] Comparison group = ≤ 2.00
[e] Comparison group = 7 or more
[f] Comparison group = No credit
[g] Comparison group = Urban
[h] Continuous variable
*p<.05

Table D2

Summary of Multinomial Regression Analysis Predicting Math Coursetaking at Middle Academic and Advanced Levels - Weighted

Variable	Middle academic math courses						Advanced math courses					
	B	*SE*	*OR*	95% CI	Wald statistic	*p*	*B*	*SE*	*OR*	95% CI	Wald statistic	*p*
Intercept	1.23	0.31			16.09	< .001	-0.67	0.43			2.43	.119
State exit exam requirement in 2004[a]												
Yes	-0.07	0.17	0.94	[0.67, 1.31]	0.15	.702	0.47	0.21	1.59	[1.03, 2.33]	4.99	.025*
Gender[b]												
Male	-0.33	0.17	0.72	[0.51, 1.01]	3.62	.057	-0.45	0.21	0.64	[0.42, 0.96]	4.63	.031*
Race/ethnicity[c]												
Hispanic	0.18	0.26	1.20	[0.73, 1.98]	0.49	.483	-0.65	0.33	0.52	[0.27, 1.00]	3.86	.049*
Black or African-American	-0.02	0.24	0.98	[0.61, 1.57]	0.01	.921	-0.57	0.30	0.57	[0.32, 1.02]	3.57	.059
Other	-0.33	0.28	0.72	[0.42, 1.24]	1.41	.234	-0.96	0.37	0.38	[0.19, 0.79]	6.82	.009*
GPA[d]												
≥ 2.01	0.19	0.19	1.20	[0.83, 1.74]	0.97	.326	1.72	0.30	5.57	[3.08, 10.05]	32.43	< .001*
Number of absences[e]												
6 or fewer	0.05	0.21	1.05	[0.69, 1.58]	0.05	.831	0.25	0.27	1.29	[0.76, 2.19]	0.86	.353
Participation in Special Education – Vocational courses[f]												
Credit	-1.46	0.26	0.23	[0.14, 0.39]	31.96	< .001*	-2.35	0.44	0.10	[0.04, 0.22]	28.94	< .001*
School urbanicity[g]												
Suburban	-0.02	0.21	0.98	[0.65, 1.49]	0.01	.926	-0.26	0.25	0.77	[0.47, 1.26]	1.11	.292
Rural	-0.36	0.26	0.70	[0.42, 1.17]	1.85	.174	-1.26	0.34	0.28	[0.15, 0.55]	14.07	< .001*
SES (continuous)[h]	0.45	0.14	1.56	[1.19, 2.06]	10.02	.002*	0.82	0.17	2.26	[1.63, 3.14]	24.14	< .001*
School enrollment[h]	0.03	0.01	1.03	[1.01, 1.05]	7.16	.007*	0.04	0.01	1.04	[1.02, 1.07]	9.34	.002*

Note. CI = confidence interval for odds ratio (OR).
[a] Comparison group = No
[b] Comparison group = Female
[c] Comparison group = White, non-Hispanic
[d] Comparison group = ≤ 2.00
[e] Comparison group = 7 or more
[f] Comparison group = No credit
[g] Comparison group = Urban
[h] Continuous variable
*p<.05

Table D3

Summary of Logistic Regression Analysis Predicting Enrollment in Postsecondary Education – Weighted

Variable	*B*	*SE*	*OR*	95% CI	Wald statistic	*p*
Constant	-0.36	0.27	0.70		1.76	.185
State exit exam requirement in 2004[a]						
Yes	0.08	0.15	1.08	[0.81, 1.45]	0.29	.589
Gender[b]						
Male	-0.48	0.15	0.62	[0.46, 0.83]	10.19	.001*
Race/ethnicity[c]						
Hispanic	-0.22	0.22	0.81	[0.53, 1.24]	0.98	.323
Black or African-American	0.28	0.22	1.32	[0.86, 2.03]	1.63	.201
Other	0.07	0.26	1.07	[0.65, 1.77]	0.07	.786
GPA[d]						
≥ 2.01	1.18	0.17	3.24	[2.32, 4.52]	47.47	< .001*
Number of absences[e]						
6 or fewer	0.35	0.19	1.42	[0.98, 2.04]	3.47	.062
Participation in Special Education – Vocational courses[f]						
Credit	-0.95	0.27	0.39	[0.23, 0.65]	12.49	< .001*
School urbanicity[g]						
Suburban	0.03	0.18	1.03	[0.72, 1.46]	0.02	.889
Rural	-0.26	0.24	0.77	[0.49, 1.22]	1.25	.264
SES (continuous)[h]	1.19	0.13	3.30	[2.55, 4.27]	82.03	< .001*
School enrollment[h]	0.03	0.01	1.03	[1.02, 1.05]	12.57	< .001*

Note. CI = confidence interval for odds ratio (OR).
[a] Comparison group = No
[b] Comparison group = Female
[c] Comparison group = White, non-Hispanic
[d] Comparison group = ≤ 2.00
[e] Comparison group = 7 or more
[f] Comparison group = No credit
[g] Comparison group = Urban
[h] Continuous variable
*p<.05

Table D4

Summary of Logistic Regression Analysis Predicting Enrollment in Postsecondary Education with Interaction of Math Pipeline – Weighted

Variable	*B*	*SE*	*OR*	95% CI	Wald statistic	*p*
Constant	-1.12	0.34	0.33		11.02	.001
State exit exam requirement in 2004[a]						
Yes	-0.43	0.32	0.65	[0.35, 1.21]	1.83	.177
Math pipeline[b]						
Middle Academic	0.72	0.26	2.06	[1.24, 3.41]	7.85	.005*
Advanced	1.96	0.40	7.09	[3.26, 15.41]	24.47	< .001*
Interactions						
$MATH_{MID}$ * STATETEST	0.59	0.38	1.80	[0.86, 3.76]	2.47	.116
$MATH_{ADV}$ * STATETEST	0.18	0.52	1.20	[0.43, 3.34]	0.12	.727
Gender[c]						
Male	-0.45	0.16	0.64	[0.47, 0.87]	8.17	.004*
Race/ethnicity[d]						
Hispanic	-0.10	0.23	0.90	[0.58, 1.42]	0.20	.659
Black or African-American	0.40	0.23	1.49	[0.96, 2.32]	3.11	.078
Other	0.30	0.27	1.35	[0.79, 2.31]	1.21	.271
GPA[e]						
≥ 2.01	1.02	0.18	2.78	[1.96, 3.93]	33.17	< .001*
Number of absences[f]						
6 or fewer	0.31	0.20	1.37	[0.93, 2.00]	2.57	.109
Participation in Special Education – Vocational courses[g]						
Credit	-0.48	0.29	0.62	[0.35, 1.09]	2.71	.099
School urbanicity[h]						
Suburban	0.07	0.19	1.07	[0.74, 1.55]	0.13	.721
Rural	-0.05	0.25	0.95	[0.58, 1.55]	0.04	.837
SES (continuous)[i]	1.17	0.14	3.21	[2.44, 4.21]	70.73	< .001*
School enrollment[i]	0.03	0.01	1.03	[1.01, 1.05]	7.76	.005*

Note. CI = confidence interval for odds ratio (OR).
[a]Comparison group = No
[b] Comparison group = No math/non-academic/low academic
[c] Comparison group = Female
[d] Comparison group = White, non-Hispanic
[e] Comparison group = ≤ 2.00
[f] Comparison group = 7 or more
[g] Comparison group = No credit
[h] Comparison group = Urban
[i] Continuous variable
*p<.05

Appendix E
Results of Additional Analyses

Comparison of Participants by Presence of Exit Exam Policy – Full Analytic Sample

The graduation rates of the two groups were similar, with the students from states without exit exams achieving a slightly higher graduation rate (85.8%) than their peers from states with exit exams (84.6%). The differences between the two groups are more visible on the remaining dependent variables. While the percentage of students completing courses in the lowest category of the math pipeline is similar for the two groups, 54.3% of students in states without exit exams completed a course in the middle academic category and 20.7% completed an advanced math course. Fewer of their peers in states with exit exams completed math courses in the middle category (48.1%), but they completed advanced math courses at a higher rate (27.6%) than the students who did not have to pass an exit exam to graduate. Additionally, students with disabilities in states with exit exams enrolled in postsecondary education at a higher rate (58.6%) than students with disabilities in states without exit exams (52.8%).

As with the entire analytic sample, there were more male students than female students in each of the groups. One demographic characteristic with larger differences between the groups was race/ethnicity. Almost a quarter of the students in states without exit exams were Hispanic (24.1%) while 15.7% of the students in states with exit exams were Hispanic. Black or African-American students were overrepresented in the group with exit exams (24%) compared to the group without exit exams (11.5%). White students made up less than half of the population in both groups. More than one-third of students in states without exit exams were from families in the lowest SES quartile (38.2%) and 32.4% of their peers in states with exit exams were classified as being in the

lowest SES category. Finally, more students in states with exit exams attended high schools in rural settings (21.7%) than students whose states had no exit exam requirement (17.9%). Table E1 shows the results of the descriptive analyses for both groups of states: the states with exit exam requirements in 2004 and the states without exit exam policies in 2004.

Table E1

Comparison of Participants in States with and without Exit Exams in 2004 – Full Analytic Sample (N =1270)

	State had exit exam (N = 655)		No exit exam (N = 615)	
	n	%	*n*	%
High school graduation status				
Graduated	493	84.6	460	85.8
Did not graduate	90	15.4	76	14.2
Math pipeline				
No math/non-academic/low academic	159	24.3	154	25.0
Middle academic	315	48.1	334	54.3
Advanced	181	27.6	127	20.7
Enrollment in postsecondary education				
Yes	384	58.6	325	52.8
No	271	41.4	290	47.2
Gender				
Male	357	56.0	338	56.1
Female	281	44.0	265	43.9
Race/ethnicity				
White, non-Hispanic	300	48.6	294	49.9
Hispanic	97	15.7	142	24.1
Black or African-American	148	24.0	68	11.5
Other	72	11.7	85	14.4
SES (categorical)				
Lowest quartile (0-25%)	200	32.4	225	38.2
Second quartile (26-50%)	174	28.2	147	25.0
Third quartile (51-75%)	130	21.1	120	20.4
Highest quartile (76-100%)	113	18.3	97	16.5
GPA				
≤ 2.00	187	28.5	160	26.0
≥ 2.01	468	71.5	455	74.0
Number of absences				
6 or fewer	468	81.4	433	78.4
7 or more	107	18.6	119	21.6
Participation in Special Education – Vocational courses				
Yes	49	7.5	52	8.5
No	606	92.5	563	91.5
Mother's education level				
No high school diploma	116	18.4	132	22.1
High school diploma/GED or higher	516	81.6	466	77.9

School urbanicity				
Urban	190	29.0	188	30.6
Suburban	323	49.3	317	51.5
Rural	142	21.7	110	17.9
Continuous variables	Mean (SD)			
SES (continuous)	-0.17 (0.714)		-0.25 (0.701)	
School enrollment	1331.63 (864.371)		1307.61 (934.936)	

Validating the Math Pipeline Variable

I used the criterion-referenced IRT estimated number right variable from the first follow-up math assessment (F1TXM1IR) to validate the math pipeline variable. The purpose of this was to ensure that the math coursetaking of the sample was consistent with the students' math ability as measured by the assessment. To do this, I determined the mean scores for each level of the math coursetaking variable. These mean scores, as well as the standard deviations for each level, are presented in Table E2. The results show that the math assessment scores are consistent with the levels of math coursetaking in the study as the students who completed advanced math coursework had the highest mean score (M = 52.79) and the students who completed non-academic or low academic math coursework had the lowest mean score (M = 26.15).

Table E2

Mean First Follow-Up Math Assessment Scores by Level of Math Pipeline

Level of math coursetaking	Mean	SD
All levels	37.99	15.257
No math/non-academic/low academic	26.15	7.643
Middle academic	35.33	11.312
Advanced	52.79	15.430

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