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Ninety Percent of Life Is Just Showing Up—Evaluation of Mathematics Achievement Levels Among High School Dropouts

Abstract

The decision to drop out is a dangerous one for the student. The purpose of this quantitative study was to examine the relationship between student mathematics achievement as measured by the New York State Education Department (NYSED) Grade 4 Mathematics Test (G4MT), Grade 8 Mathematics Test (G8MT), and Integrated Algebra Mathematics Test (IAMT) and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York. Furthermore, the study examined to what extent the New York State mathematics tests served as predictors of students dropping out of high school. The 680 research participants were students who first entered Grade 9 in the 2006-2007 school year. There was no statistically significant relationship between students' mathematics achievement and dropping out of high school. However, there was a statistically significant relationship between student taking the NYSED G4MT, G8MT, and IAMT and dropping out of high school. Taking the NYSED G8MT and IAMT contributed significantly to the prediction of students dropping out of high school. Students taking the NYSED G4MT and G8MT were almost 3 times more likely not to drop out of high school. Moreover, students taking the NYSED G4MT, G8MT, and IAMT were 10 times more likely not to drop out of high school. Knowing these early warning signals could help inform district planning for interventions to address some of the reasons behind a dropout outcome.

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Ninety Percent of Life Is Just Showing Up—Evaluation of Mathematics Achievement
Levels Among High School Dropouts

By

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Submitted in partial fulfillment
of the requirements for the degree
Ed.D. in Executive Leadership

Supervised by

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Biographical Sketch

Satish Jagnandan is currently the Administrator of Math and Science (K-12) at Mount Vernon City School District. Mr. Jagnandan attended Fordham University from 1991 to 1995 and graduated with a Bachelor of Science in Chemistry. He attended the City College of New York from 1997 to 2003 and graduated with a Master of Science in Secondary Mathematics Education and a Master of Science in Administration and Supervision. He came to St. John Fisher College in the summer of 2010 and began doctoral studies in the Ed.D. Program in Executive Leadership. Mr. Jagnandan pursued his research in mathematics achievement among high school dropouts under the direction of Dr. Ronald D. Valenti and Dr. Welton Sawyer and received the Ed.D. degree in 2012.

Abstract

The decision to drop out is a dangerous one for the student. The purpose of this quantitative study was to examine the relationship between student mathematics achievement as measured by the New York State Education Department (NYSED) Grade 4 Mathematics Test (G4MT), Grade 8 Mathematics Test (G8MT), and Integrated Algebra Mathematics Test (IAMT) and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York. Furthermore, the study examined to what extent the New York State mathematics tests served as predictors of students dropping out of high school. The 680 research participants were students who first entered Grade 9 in the 2006-2007 school year.

There was no statistically significant relationship between students' mathematics achievement and dropping out of high school. However, there was a statistically significant relationship between student taking the NYSED G4MT, G8MT, and IAMT and dropping out of high school. Taking the NYSED G8MT and IAMT contributed significantly to the prediction of students dropping out of high school. Students taking the NYSED G4MT and G8MT were almost 3 times more likely not to drop out of high school. Moreover, students taking the NYSED G4MT, G8MT, and IAMT were 10 times more likely not to drop out of high school. Knowing these early warning signals could help inform district planning for interventions to address some of the reasons behind a dropout outcome.

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Chapter 1: Introduction

Introduction

The mathematics achievement levels of U.S. students fall far behind those of other developed nations. Students falling behind come predominantly from high-poverty and high-minority areas. Nearly all high-poverty students enter kindergarten with the most basic mathematical knowledge such as counting and recognizing basic shapes (West, Denton, & Reaney, 2000), however, many students end middle school ill-prepared to succeed in the rigorous sequence of college-preparatory mathematics courses in high school (Balfanz, McPartland, & Shaw, 2002). National and international comparisons of student achievement have indicated that, between fourth and eighth grade, U.S. students in general—and minority and high-poverty students in particular—fall rapidly behind desired levels of mathematics achievement (Beaton et al., 1996; Schmidt, McKnight, Cogan, Jakwerth, & Houang, 1999).

In nearly all of the nation's states there was a 30 to 50 point difference between White students and the largest minority group in the percentage of students scoring at the basic level on the eighth-grade National Assessment of Educational Progress exam (Blank & Langesen, 1999). For the high concentrations of minority students attending high-poverty urban schools, low mathematical proficiency at the end of the eighth grade has serious consequences. The ability to succeed in college-preparatory mathematics courses in high school, postsecondary schooling, and opportunities for lifelong success were compromised (Pelavin & Kane, 1990; U.S. Department of Education, 1997). In

addition, the large concentrations of poor and minority students receiving weak academic preparations in their middle school years populated the nation's largest cities' neighborhood high schools. These schools functioned as dropout factories rather than stepping-stones to a strong education and upward mobility (Balfanz & Legters, 2001).

Choosing to leave school is a problem that our nation's minority and poor students have been battling for decades. Dropout rates continue to increase and the cycle has not substantially improved during the past few decades while education reform has been high on the public agenda (Bridgeland, DiIulio, & Morison, 2006). The National Center for Education Statistics (NCES) defined a dropout as "a student who was enrolled at any time during the previous school year who is not enrolled at the beginning of the current school year and who has not successfully completed school" (Cataldi, Laird, & KewalRamani, 2009, p. 56). The epidemic of dropouts in the United States "disproportionately affect young people who are low-income, minority, urban, single-parent children attending large, public high schools in the inner city" (Bridgeland et al., 2006, p. 1).

Educators, researchers, and policymakers are working to identify effective dropout prevention approaches. One important element of such prevention efforts is the identification of students at highest risk for dropping out and then the targeting of resources to keep them in school. An early warning system that uses indicators based on readily accessible data might predict whether the students were on the right path toward eventual graduation.

Statement of the Problem

Because of federal requirements for states to decrease dropout rates by setting graduation rate goals (No Child Left Behind, 2008, Title I, Part H), school systems sought ways to identify at-risk students and provide early intervention. Dynarski et al. (2008), Jerald (2006), Rumberger (2001), and Smink and Schargel (2004) recommended that local districts develop diagnostic tools to identify potential dropouts. Consequently, districts needed to use data systems to determine which factors have predictive power in determining high school dropouts within the local community (Dynarski et al., 2008; Balfanz, Herzog, & Neild, 2007; Olson, 2006).

Across the United States 613,379 students dropped out of public high school in 2007-2008 and nearly 55% were African American, Hispanic, and Native American (Stillwell, 2010). Many of these students abandoned school with less than two years to complete their high school education. In New York State, 34,069 students dropped out from public high school in 2007-2008, an overall dropout rate of 3.9% (Stillwell, 2010). A three-year profile of a medium-size school district in the Lower Hudson Region of New York revealed similar results. More than 4% of high school students dropped out during the 2007-2008, 2008-2009, and 2009-2010 school years (New York State Education Department [NYSED], 2010). In this study, I examined the relationship between student mathematics achievement as measured by the NYSED Grade 4 Mathematics Test (G4MT), Grade 8 Mathematics Test (G8MT), and Integrated Algebra Mathematics Test (IAMT) and dropout from high school in a medium-size school district in the Lower Hudson Region of New York.

Theoretical Rationale

Dropping out is an evolving process rather than an event (Jimerson, Egeland, Sroufe, & Carlson, 2000). The process starts prior to the child entering school. Along the way the process manifests itself in a variety of risk factors such as truancy, disciplinary problems, and low school achievement (Jimerson et al., 2000). In order to understand the dropout crisis in the United States, it is important to recognize the dominant frameworks that guide how educational research frames school dropouts. There are two primary frameworks used to understand the school dropout—the individual perspective and the institutional perspective (Rumberger, 2004).

The individual framework perspective focuses on student attributes such as background characteristics, engagement in schooling, and educational performance. In this framework, there is a strong relationship between student background characteristics (race/ethnicity, gender, poverty, special education placement, and language) and dropping out of school. Equally important is what students experience once in school. Students who are engaged in learning and in the social dimensions of school are less likely to leave school. For example, Rumberger (2004) found that students may leave schools because courses were not challenging or because they developed poor relationships with their peers and teachers. Poor academic achievement, both in high school and in earlier grades, was a strong predictor of dropping out. High absenteeism, student discipline problems, and student mobility were also associated with dropping out (Rumberger, 2004; Rumberger & Arellano, 2008).

In contrast to the individual framework, the institutional perspective focuses on school characteristics, policies, and practices. Rumberger (2004) found that structural

features of schools, such as size, availability of resources, and access to highly qualified teachers influence dropout rates. School discipline policies that expel or discharge problematic students and rules governing low grades, poor attendance, and being overage in grade ultimately impact dropout rates (Rumberger, 2004). In addition, the growth of zero-tolerance policies, which automatically discharge students for violating school safety rules is another example of how school policy contributes to student dropouts (Skiba & Peterson, 1999).

Rumberger's (2004) theoretical frameworks directed attention toward the possible effects of individual and institutional characteristics on dropping out. In this context, Rumberger found that dropping out is not a spontaneous decision but rather a gradual drifting away from the school. Potential dropouts are likely to enter high school academically disadvantaged. This disadvantage is amplified by curriculum structures that result in considerably different academic experiences among at-risk students (Battin-Pearson et al., 2000; Janosz, LeBlanc, Boulerice, & Tremblay, 2000; Rumberger, 2001). In this study, using the individual perspective, I attempted to capture the evolutionary process of dropping out of high school through the lens of student mathematics achievement.

Purpose of the Study

The purpose of this quantitative study was to examine the relationship between student mathematics achievement and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York. The study sought, furthermore, to examine to what extent the New York State mathematics tests served as predictors of students dropping out of high school. Knowing these early warning signals

could help inform district planning for interventions to address some of the reasons behind a dropout outcome.

Research Questions

The following research questions were developed to address the purpose of this study:

1. What is the relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{01}): There is no statistically significant relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

2. What is the relationship between whether or not students took the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{02}): There is no statistically significant relationship between taking the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

3. What is the relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{03}): There is no statistically significant relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED

G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

4. What is the relationship between whether or not students took the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{04}): There is no statistically significant relationship between taking the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

5. What is the relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{05}): There is no statistically significant relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

6. What is the relationship between whether or not students took the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{06}): There is no statistically significant relationship between taking the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

7. To what extent can student achievement levels (1, 2, 3, and 4) on the NYSED G4MT, G8MT, and IAMT serve as predictors of students dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{07}): Student achievement levels (1, 2, 3, and 4) on NYSED G4MT, G8MT, and IAMT cannot serve as predictors of dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

8. To what extent can student taking or not taking the NYSED G4MT, G8MT, and IAMT serve as predictors of students dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{08}): Students taking or not taking the NYSED G4MT, G8MT, and IAMT cannot serve as predictors of dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

Significance of the Study

The decision to drop out is a dangerous one for the student. “Dropouts are much more likely than their peers who graduate to be unemployed, living in poverty, receiving public assistance, in prison, on death row, unhealthy, divorced and single parents with children who drop out from high school themselves” (Bridgeland et al., 2006, p. 1). Our communities and nation also suffer from the dropout epidemic because of the consequent loss of productive workers and the higher costs associated with increased incarceration, health care, and social services (Bridgeland et al., 2006).

Dropping out of high school is a process of gradual disengagement. Research shows that students who eventually drop out of high school exhibit strong predictive warning signs of dropping out, such as infrequent attendance, behavior infractions, and

course failure (Bridgeland et al., 2006). It was my hope that this study can aid educators, policymakers, and leaders to harness the predictive power of the New York State standardized mathematics assessment data to construct early warning and intervention systems to efficiently target students who are at risk of dropping out and better support them on the road to graduation, and, additionally, that the study has state and local implications for reliability and validity of standardized mathematics assessments, curriculum development, professional development and program restructuring for at-risk students.

Definition of Terms

The review of the literature contained in Chapter 2 formed the basis for the following definition of terms. Informed consideration was given to the study and how these definitions assisted the research and reader in understanding these terms.

Adequate Yearly Progress—Adequate Yearly Progress (AYP) indicates satisfactory progress by a district or school toward the goal of proficiency for all students (NYSED, 2011).

Assessment Score—The score the student achieved on the New York State standardized mathematics assessment (NYSED, 2011).

At-Risk Students—Students who could potentially drop out of school or engage in self-destructive behavior that interferes with academic success. Behaviors include absenteeism, performing below academic potential or participating in activities that are harmful to self and/or others such as substance abuse, threats and intimidation, and physical violence (American School Counselor Association, 2008).

Cohort—Students who first entered Grade 9 in the same school year (NYSED, 2011). The 2006 cohort consists of all students, regardless of their current grade level, whose date of first entry into Grade 9 (anywhere) was during the 2006-2007 school year (July 1, 2006 through June 30, 2007).

Dropout—A student, regardless of age, who left school prior to graduation for any reason except death or leaving the country and has not been documented to have entered another program leading to a high school diploma or an approved program leading to a high school equivalency diploma (NYSED, 2011).

Dropout rate—The count of dropouts from a given school year divided by the count of student enrollments within the same grade span at the beginning of the same school year (Stillwell, 2010).

Early Intervention—A strategy used by a district and schools to monitor and address early warning signals of student dropouts, including problems with attendance, behavior, and course failure; most effective in middle school through 9th grade (Dobo, MacIver, & Sturgis, 2009).

Nondropout—Student still enrolled in high school or awarded a local or Regents diploma, whose date of first entry into Grade 9 (anywhere) was during the 2006-2007 school year.

New York State Grade 4 Mathematics Test (G4MT)—Examination to evaluate student achievement of the Grade 4 mathematics learning standard and the core curriculum (NYSED, 2011).

New York State Grade 8 Mathematics Test (G8MT)—Examination to evaluate student achievement of the Grade 8 NYS mathematics learning standard and the core curriculum (NYSED, 2011).

New York State Grade Integrated Algebra Mathematics Test (IAMT)—Examination in algebra to evaluate student achievement of the New York State mathematics learning standard and the core curriculum (NYSED, 2011).

Performance Level—Information on a student’s abilities in relation to the New York State learning standards (NYSED, 2006).

Scale Score—The level of proficiency a student has in mathematics. Scale scores use a numerical scale that runs continuously from beginning skills to advanced skills. The scale scores enable comparisons from year to year because the same scale score represents the same level of achievement for the New York State learning standards, even if slight changes in the test from year to year cause slight changes in the raw scores (NYSED, 2006).

School Year—A school year is July 1 through June 30 (NYSED, 2011).

Chapter Summary

Across the United States 613,379 students dropped out of public high school in 2007-2008 and nearly 55% were African American, Hispanics, and Native Americans (Stillwell, 2010). Many of these students abandoned school with less than two years to complete their high school education. Schools and communities cannot adequately address the dropout problem without an accurate account of dropouts. This study will attempt to correlate students’ mathematics achievement (as measured by the NYSED G4MT, G8MT, and IAMT) and dropping out of high school in a medium-size school

district in the Lower Hudson Region of New York. Understanding the dropout problem can be an important first step in developing and implementing plans to reduce the number of dropouts.

The review of literature (Chapter 2) will examine the common core standards initiative, the importance of mathematics, theoretical models, and current research on risk factors associated with dropouts. Chapter 3 presents the research design methodology, including the quantitative approach of this correlational study. The results of the inquiry, as they are related to the research questions, are presented in Chapter 4. A discussion of the findings is presented in Chapter 5, with the findings' associated implications and limitations as well as the author's recommendations and conclusions.

Chapter 2: Review of Literature

Introduction and Purpose

The review of literature examined the common core standards initiative, the importance of mathematics, theoretical models, and current research on risk factors associated with dropouts. The topics in the literature reviewed include the definition of dropout and the process of dropping out related to risk factors such as high-risk demographic characteristics, early adult responsibilities, high-risk attitudes, values and behaviors, poor school performance, low socioeconomic status, retention disengagement from school, school structure, school environment, academic policies and practices, supervision and discipline policies and practices, community location and type, and community demographic characteristics.

Common Core Standards Initiative

The Obama administration advocated for education standards designed to make all high school graduates “college and career-ready” (Mathis, 2010). To achieve this end, the administration exerted pressure on states to adopt content standards, known as the “common core,” developed by the National Governors’ Association and the Council of Chief State School Officers (NGA/CCSSO). The administration called for federal Title I aid to be withheld from states that do not adopt these or comparable standards (Mathis, 2010).

Interest in college readiness indicator systems stemmed primarily from concerns that approximately one half of entering postsecondary students did not meet placement

standards and were not ready for college-level work (Kirst & Venezia, 2006). This gap between what high schools required for graduation and what colleges and universities required for college-level courses left many students inadequately prepared for postsecondary study. As a result, students failed placement tests and required extensive college-level remediation, therefore increasing the time and money spent toward earning a degree, and often reducing those students' chances of college completion. In addition, the changing economic and global landscape demands a workforce with ever increasing skills and education (Kirst & Venezia, 2006).

Mathematics and College Readiness

Algebra is a prerequisite for many high school math courses: Geometry, Algebra II, Trigonometry, Calculus, and Statistics. There is an emphasis on passing algebra in eighth or ninth grade so that students have time to take higher-level math courses before graduating from high school. Students develop a way of thinking in basic algebra that is then applied in the contexts of advanced courses in a variety of fields (Achieve, 2008). In particular, Algebra II is defined as a key threshold for college access and success, because many colleges and universities begin their credit-bearing math courses above the Algebra II level (Achieve, 2008).

Success in Algebra II in high school is linked to both college enrollment and bachelor's degree attainment (Adelman 2006). Many four-year institutions of higher education require students to have completed Algebra II to be eligible for admissions (Achieve, 2008). Students who had taken Algebra II in high school were twice as likely to earn a bachelor's degree as students who had not taken this course (Adelman 2006). On average, 22% of entering college freshmen failed placement tests for college-level

math and were placed in remedial courses for no credit (Evan, Gray & Olchefske, 2006). Two-thirds of students who took remedial math courses dropped out of college (Achieve, 2006). This demonstrates that there is a gap between the math education K–12 schools are providing and the expectations of college coursework.

Success in algebra has also been linked to job readiness and higher earnings once the student enters the workforce (Achieve, 2008). As the global economy grows more quantitative and competitive, the demands of college faculty and employers for students with advanced math skills are increasing. Many employers are concerned that our future workforce won't have the skills it needs to succeed in the new economy (Evan et al., 2006).

Theoretical Models

The NCES defined a dropout as “a student who was enrolled at any time during the previous school year who is not enrolled at the beginning of the current school year and who has not successfully completed school” (Cataldi et al., 2009, p. 56). Dropping out is an evolving process rather than an event (Jimerson et al., 2000). The process starts prior to the child entering school, and along the way the process manifests itself in a variety of risk characteristics such as truancy, disciplinary problems, and low school achievement (Jimerson et al., 2000). In order to understand the dropout crisis in the United States, it is important to recognize the theoretical models for thinking about the school dropout. Because dropping out of high school is a complex process resulting from a multitude of factors, several theoretical models have emerged to explain the phenomenon (Rumberger & Lim, 2008). While these models do not vary greatly in

predictor variables, the models differ in approach and understanding of underlying causes.

Perspective model. Rumberger (2004) developed two primary frameworks for understanding the school dropout—the individual perspective and the institutional perspective. The individual framework perspective focuses on student attributes such as background characteristics, engagement in schooling, and educational performance. In this framework there is a strong relationship between student background characteristics (race/ethnicity, gender, poverty, special education placement, and language) and dropping out of school. Equally important is what students experience once in school. Students who are engaged in learning and in the social dimensions of school are less likely to leave school. For example, students may leave school because courses are not challenging or because they have poor relationships with their peers and teachers (Rumberger, 2004). Poor academic achievement, both in high school and in earlier grades, is a strong predictor of dropping out. High absenteeism, student discipline problems, and student mobility are also associated with dropping out (Rumberger, 2004; Rumberger & Arellano, 2008).

In contrast to the individual framework's focus on the characteristics of particular students, the institutional perspective focuses on school characteristics, policies, and practices. Structural features of schools, such as size, availability of resources, and access to highly qualified teachers influence dropout rates (Rumberger, 2004). School discipline policies that expel or discharge problematic students and rules governing low grades, poor attendance and being overage in grade can ultimately impact dropout rates (Rumberger, 2004). In addition, the growth of zero-tolerance policies, which

automatically discharge students for violating school safety rules, are another example of how school policy can contribute to student dropouts (Skiba & Peterson, 1999).

Process model. Finn (1989) offered two models that suggest dropping out of high school is a process beginning in elementary school. The first model, frustration–self-esteem model, emphasizes a cyclical process of school failure and misbehavior. Specifically, early academic failure leads to low self-esteem, which manifests into behavior problems. As a result of the cascading effect of early school failure, the student either drops out of school or is removed due to behavioral issues. The frustration–self-esteem model is the foundation for studying delinquency among teenagers (Finn, 1989).

Finn’s proposed a second model, the participation-identification model, which suggests that the precursor to withdrawing from school is the lack of involvement in school. The lack of participation leads to low academic performance, less identification with school, and behavioral and emotional withdrawal from school. Students who fail to connect with the school, participate in extracurricular activities, or engage in learning activities are more likely to reject school and drop out (Finn, 1989).

Theory model. Battin-Pearson et al. (2000) identified five primary theories: (a) academic mediation theory, (b) general deviance theory, (c) deviant affiliation theory, (d) poor family socialization theory, and (e) structural strains theory. Poor academic achievement is a major factor contributing to dropping out of high school (Hammond, Linton, Smink, & Drew, 2007). However, the academic mediation theory suggests that academic progress is a mediating factor contributing to the other factors and is a powerful predictor of other predictor variables. Battin-Pearson et al. (2000) found that academic

achievement was a mediating factor with other factors including general deviance, low parent expectations, ethnicity, gender, socioeconomic status, and antisocial behaviors.

The general deviance theory and deviant affiliation theory are based on the premise that deviant behavior and association with deviant peers are predictive of dropping out of high school (Battin-Pearson et al., 2000). General deviant behaviors include delinquency, drug use, cigarette use, early sexual activity, and teen pregnancy. All factors have been found to be predictive of dropping out of high school. Involvement in general deviant behavior is a strong predictor of dropping out of high school. There is less research to support the deviant affiliation theory. High school dropouts tend to have associations with deviant friends, antisocial peers, as well as other dropouts. Research supports the notion that peers strongly influence the academic achievement of one another (Battin-Pearson et al., 2000). The impact of social relationships may influence one's decision to drop out of high school. Except association with deviant friends, these predictors are strongest when coupled with academic achievement. Association with deviant friends was a strong predictor of dropping out of high school regardless of academic achievement (Battin-Pearson et al., 2000).

The poor family socialization theory and structural strains theory link family and demographic factors to the likelihood of dropping out of high school (Battin-Pearson et al., 2000). Poor family socialization includes factors such as low parental academic expectations and lack of parental education. Independent of academic achievement, this theory does not account for a significant number of high school dropouts. However, when coupled with poor academic achievement, family socialization factors are strong predictive factors for dropping out of high school. The structural strains theory asserts

that demographic factors are strong predictors of dropping out of high school. Of the demographic factors, low socioeconomic status significantly results in students dropping out of school regardless of academic achievement. Other demographic factors, such as ethnicity and gender, were mediating factors with academic achievement and did not stand alone in contributing to dropping out of high school.

Typological model. Janosz et al. (2000) identified four types of dropouts: quiet dropouts, disengaged dropouts, low-achiever dropouts, and maladjusted dropouts. Quiet dropouts were characterized by acceptable school behavior and school attendance, a moderate level of educational commitment, and an overall positive school profile. Disengaged dropouts exhibited low to average school misbehavior, average academic performance, and a low commitment level to school. Low-achiever dropouts possessed a weak commitment to school, low to average school misbehavior, and extremely low academic performance. Finally, the maladjusted dropouts were recognized by their high level of school misbehavior, low level of commitment to school, and low academic performance.

Domain model. Researchers have found that dropping out of school stems from a wide variety of factors in four domains: individual, family, school, and community factors (Hawkins, Catalano, & Miller, 1992; Rumberger, 2001).

Individual domain. Dropping out of school is related to a variety of a student's individual characteristics, such as high-risk demographic characteristics, early adult responsibilities, high-risk attitudes, values and behaviors, poor school performance, disengagement from school, and education stability.

High-risk demographic characteristics. Studies have linked leaving school early to a number of individual factors that put students at greater risk. These include various unchangeable, background characteristics such as race/ethnicity (Schargel, 2004), gender (Battin-Pearson et al., 2000), immigration status (Rumberger & Arellano, 2008), limited English proficiency (Schargel, 2004), and having limited cognitive abilities or some other type of disability, whether it is physical, emotional, or behavioral (Lehr, Johnson, Bremer, Cosio, & Thompson, 2004; Schargel, 2004). Students with disabilities have similar types of risk factors to other students (Lehr et al., 2004), but are more likely to have multiple risk factors than other students. Students diagnosed as seriously emotionally disturbed or who have learning disabilities are particularly vulnerable to dropping out (Lehr et al., 2004).

Early adult responsibilities. A student's nonschool experiences have been found to impact dropout. When students are forced to take on adult responsibilities, it decreases their likelihood of staying in school until graduation. Responsibilities range from becoming a teen parent (Gleason & Dynarski, 2002), taking a job to assist the family (Jordan, Lara, & McPartland, 1999), or having to care for siblings (Rosenthal, 1998). Combining school with working at a job more than 20 hours a week significantly increases the likelihood that a student will leave school before graduating (Goldschmidt & Wang, 1999).

High-risk attitudes, values, and behaviors. Students may have general attitudes and behaviors that increase the likelihood they will not graduate. Early antisocial behavior, such as violence, substance use, or trouble with the law, has been linked to dropping out of school (Battin-Pearson et al., 2000). Early sexual involvement (Battin-

Pearson et al., 2000) along with having close friends who are involved in antisocial behavior or who have dropped out increases the risk that a student will drop out (Battin-Pearson et al., 2000, Cairns, Cairns & Neckerman, 1989). Similarly, low occupational aspirations (Rumberger, 2001), self-esteem, and self-confidence (Rosenthal, 1998) have been found to increase the risk of dropout.

Poor school performance. Poor academic performance, whether measured through grades, test scores, or course failure, has been consistently linked to dropping out, (Alexander, Entwisle, & Kabbani, 2001). Poor academic performance impacts dropouts starting in the first grade and continuing throughout elementary school into middle and high school (Alexander et al., 2001). Other evidence that poor school performance is a major factor in leaving school early comes from dropouts themselves. Bridgeland et al. (2006) cited poor academic performance as one of the major reasons that dropouts left school before graduation. “Got poor grades, was failing in school or couldn’t keep up with schoolwork” were reported by at least one-third of dropouts surveyed as the primary reasons for dropping out (Bridgeland et al., 2006).

Retention. Another aspect of school performance related to achievement is being retained and having to repeat a grade (Alexander et al., 2001; Rumberger, 2001). Retention at any grade level increased the chances that a student will drop out. For instance, repeating first grade was associated with a 300% increase in the dropout risk (Alexander et al., 2001). The effects of subsequent multiple retentions dramatically increased the odds that a student would drop out (Alexander et al., 2001; Gleason & Dynarski, 2002). Among multiple repeaters in elementary and middle school, dropout rates approached 94% (Alexander et al., 2001).

At the high school level, students must earn a sufficient number of credits toward graduation in order to be promoted from one grade to another, such as from 9th grade to 10th grade. Students who do not earn sufficient credits are retained in grade level. Although no national data exist on retention in high school, data from Texas showed that 16.5% of 9th graders repeated that grade level in 2005-2006 (Texas Education Agency, 2007, Table 3). Retention rates for Black and Hispanic students exceeded 20% (Texas Education Agency, 2007, Table 5). In some urban school districts, retention rates are even higher. A recent study found that more than one-third of 9th graders from the fall 2001 entering class in the Los Angeles Unified School District failed to get promoted to the 10th grade (Silver, Saunders, & Zarate, 2008).

Students with disabilities drop out of school at disproportionately higher rates than their peers. On average, when compared to students without disabilities, these students were three years behind grade level in reading and math and have had lower grade point averages and a higher likelihood of having failed a course (Wagner, 2005). Over 30% of students with disabilities were estimated to have dropped out (U.S. Department of Education, 2006).

Disengagement from school. One primary indicator of a student's level of disengagement from school has been absenteeism (Alexander et al., 1997; Gleason & Dynarski, 2002; Rumberger, 2001). In a survey of dropouts around the United States, missing too many days and having trouble catching up was the second most reported reason for dropping out of school (Bridgeland et al., 2006). Other behaviors that signal academic disengagement include cutting classes, truancy, consistently not completing homework, and coming to class unprepared (Kaufman, Bradbury, & Owings, 1992).

Misbehavior has been found to be yet another major indicator of disengagement from school (Alexander et al., 2001). Acting up in school, particularly if this behavior results in repeated suspensions or expulsion, increases a student's alienation from school (Ekstrom, Goertz, Pollack, & Rock, 1986; Wehlage & Rutter, 1986). Ensminger and Slusarcick (1992) reported elevated dropout rates among children who were rated as highly aggressive by their first-grade teachers. Furthermore, Jimerson et al. (2000) identified problem behaviors in first grade as significant predictors of later drop out behavior. Discipline problems in both middle and high school (Gleason & Dynarski, 2002) have been consistently linked to increased dropout.

School disengagement also appears in attitudes toward school. Having low educational expectations, represented either by a student being uncertain about high school graduation (Gleason & Dynarski, 2002; Rumberger, 2001) or lacking plans for education beyond high school (Alexander, Entwisle, & Horsey, 1997), significantly increased the likelihood that a student would drop out before getting a diploma. Dropouts commonly felt that they didn't belong at school, had trouble getting along with their teachers, or just had a general dislike of school (Jordan et al, 1999).

Dropouts were also more likely to have trouble getting along with peers at school or have problems with social skills (Jimerson et al., 2000). Dropouts lacked involvement in extracurricular activities at school, such as clubs, sports, science fairs, scouting, or the school newspaper (Ingels, Curtin, Kaufman, Alt, & Chen, 2002). Social engagement in high school through involvement in school, community clubs and activities played a significant role in deterring students with disabilities from dropping out (Wagner, 2005).

Education stability. Another major school-related experience that can impact dropping out is educational mobility through changing schools, particularly when it means attending multiple schools (Gleason & Dynarski, 2002; Rumberger, 2001). High mobility between schools or changes in services for students with disabilities has also been linked to increased dropout (Lehr et al., 2004).

Family domain. Dropping out of school is related to a variety of family and home experiences such as low socioeconomic status and behavior related to education.

Low socioeconomic status. A student's family background exerts a powerful influence over educational outcomes, including dropping out of school. One of the most consistent family background factors to predict dropout has been socioeconomic status, whether measured through parental education, income, or occupational level (Schargel, 2004). Low socioeconomic status has the strongest correlation with high dropout rates. Low income is defined as the bottom 20% of all family incomes for the year; middle income is between 20 and 80% of all family incomes; and high income is the top 20% of all family incomes (Cataldi et al., 2009). In 2007, dropout rates for low income students were more than seven times higher than high income students (NCES, 2010).

Behavior related to education. Not only are parents' expectations important in preventing dropout, but also their actions related to education. Parents of dropouts have tended to have infrequent contacts with the school about their child's academic performance and/or behavior (Jimerson et al., 2000), rarely talk to their child about school (Gleason & Dynarski, 2002), or hardly ever get involved in school PTA and activities (Kaufman et al., 1992). Ekstrom et al. (1986) found a link between a lack of

study aids at home and dropout, and Goldschmidt & Wang (1999) found a link between little parent monitoring of homework and dropout.

School domain. Dropping out of school is related to a variety of school factors such as structure, environment, academic policies and practices, and discipline policies and practices.

School structure. Large school size, particularly those with low socioeconomic status (Lehr et al., 2004; Rumberger, 2001), has been linked to higher dropout rates. Balfanz and Legters (2004) located the high school dropout crisis in “dropout factories” where fewer than 60% of the students who start as freshmen make it to their senior year. About 2,000 large, primarily urban, low-income high schools produce most of the dropouts in the United States (Balfanz and Legters, 2004).

School environment. School environments with high rates of absenteeism or high rates of misbehavior have been linked to higher individual dropout rates (Goldschmidt & Wang, 1999). Goldschmidt and Wang (1999) also declared that being in a school with a high-risk incoming class (a class with many individual risk factors such as low socioeconomic status, low grades and test scores, and disciplinary problems) increased the chances that a student would drop out. Feeling unsafe at school can also be a risk factor for dropout as well as being in a school with a high level of attendance, violence, and/or safety problems (Kaufman et al., 1992). Rumberger (2001) affirmed that students are more likely to drop out when large proportions of students view discipline at their school as unfair or have low ratings of teacher support. Involuntary withdrawal through academic and discipline policies may also make the environment of school so negative for students that they begin to disengage and end up leaving before graduation.

Academic policies and practices. Standards-based reforms and high-stakes testing begun in the 1990s and accelerated with the passage of the federal No Child Left Behind Act changed many schools' academic policies and practices. There is some evidence that these policies may be increasing the likelihood that low-performing students will drop out of school. Accountability and high-stakes testing may be increasing attrition between 9th and 10th grades (Abrams & Haney, 2004) as well as retention (Allensworth, 2004; Miller, Ross, & Sturgis, 2005). In an analysis of patterns in Chicago elementary schools after the implementation of high-stakes testing, researchers reported that although achievement improved, retention had dramatically increased, particularly for the most vulnerable students—those who were overage for their grade, minority students, low achievers, and English-language learners (Allensworth, 2004).

Raised standards are often put in place without providing the support such as tutoring and summer programs that students need to meet the new standards (Lehr et al., 2004; Miller et al., 2005). Schools that need the most improvement most likely have the fewest resources to make improvements (Miller et al., 2005). Surveys of dropouts reflected issues with school academic policies and practices; students reported a lack of relevant high school curriculum (Lehr et al., 2004) as well as courses being unrelated to work (Obasohan & Kortering, 1999) as main reasons for dropping out. In a recent national survey, the most common reason given by dropouts for leaving school was that their classes were not interesting (Bridgeland et al., 2006). A majority of dropouts surveyed felt that schools could improve if they provided opportunities for real-world

learning, had better teachers who made classes more interesting, and kept classes smaller to ensure more individualized instruction (Bridgeland et al., 2006).

Discipline policies and practices. Zero tolerance discipline policies that require automatic arrest and suspension or expulsion for substance possession or sales and weapons possessions impact the dropout rates. Arrests, suspensions, and expulsions have increased since the early 1990s (Miller et al., 2005). These policies often result in a double dose of punishment for students—that is they may get suspended or expelled and also have to appear in court for school misbehavior (Miller et al., 2005). Being suspended often, or expelled, significantly increases the likelihood that a student will drop out; thus, logically, policies that increase the likelihood of these consequences will increase the number of students put at risk for dropout. Pressures to suspend, expel, or transfer students who misbehave or who are generally disruptive may also increase with the push for accountability and the use of high-stakes testing practices (Miller et al., 2005). Schools may systematically discharge or exclude disruptive and misbehaving students from school (Miller et al., 2005; Rumberger, 2001).

Community domain. Dropping out of school is related to a variety of community and neighborhood factors such as location, type and demographic characteristics.

Location and type. Dropout rates are consistently higher in urban than suburban or rural schools (Lehr et al., 2004; Schargel, 2004). In the Johns Hopkins University study of the promoting power of schools, where entering freshman had less than a 50/50 chance of graduating four years later, 61% of urban schools, 20% of suburban, and only 5% of rural schools had the lowest levels of promoting power (Balfanz & Legters, 2004). Geographic location also matters for dropout: students are more likely to drop out in

Western and Southern states (Ekstrom et al., 1986; Lehr et al., 2004; Rosenthal, 1998; Schargel, 2004).

Demographic Characteristics. Dropout rates are also higher in impoverished communities (Rosenthal, 1998; Rumberger, 2001), those with higher proportions of minorities, or those with a large foreign-born population (Rosenthal, 1998). Higher dropout rates have been linked to communities with both high numbers of single-parent households or adult dropouts (Rosenthal, 1998) and with low levels of education (Goldschmidt & Wang, 1999).

Significant Empirical Findings from the Literature

The decision to drop out of school results from a combination of individual, family, school, and community factors (Rumberger, 2001). Hammond et al. (2007) declared the accuracy of dropout predictions increased when combinations of multiple risk factors were considered. For example, Gleason & Dynarski (2002) examined how well multiple factors identified students at risk of dropout. They analyzed the impact of combinations of one or more of the following risk factors: high absenteeism, being overage for grade, low grades, having a child, having a sibling who has dropped out, having previously dropped out, being unsure of graduating from high school, and spending less than one hour per week on homework. The study revealed that 25% of students classified using two of the above listed risk factors dropped out while 34% classified using three factors dropped out.

Other studies came to the same conclusion about single factors and attempted to generate a composite of factors to predict dropout. Balfanz (2007) used four 6th-grade risk factors to predict 40% of nongraduates in Philadelphia schools: attending school less

than 80% of time, poor behavior/conduct grade, failing math and failing English. Cairns et al. (1989) reported the combination of high aggression, poor performance and being older than their peers in the 7th grade were the best predictors of dropping out of school in their sample before the end of 11th grade. Of boys and girls with these characteristics 82 and 47%, respectively, left school before completing a degree.

Gaps in the Literature

Numerous studies identified risk factors for students dropping out of school across the four domains but none of the studies were able to predict dropping out of school with 100% accuracy. Longitudinal studies of cohorts of students offered the best opportunity to untangle these risk factors and understand more about what happens to students that may lead them to dropping out. The presence of empirical data that examined longitudinal studies on a comprehensive state and national level was lacking.

Longitudinal studies provide evidence that dropping out of school is not a single event but rather a long process of progressive disengagement from school that includes warning signs along the path before dropout occurs. Students who dropped out reported that they felt increasingly alienated from school from one up to three years before they decided to drop out (Bridgeland et al., 2006). Seventy-one percent lost interest in school in 9th or 10th grade, over a third (33–45%) reported missing class often the year prior to dropping out, and a majority (59–65%) reported missing class often the year they dropped out (Bridgeland et al., 2006). “Students described a pattern of refusing to wake up, missing school, skipping class, and taking three-hour lunches—and each absence made them less willing to go back” (Bridgeland et al., 2006, p. 8).

Additionally, there is limited research on the processes of dropping out, with most studies focusing on who drops out and why. If dropping out of school is viewed as a process, then student's stories should emerge as a series of decisions, events, and interactions. While each story is different, research would show how they are different and whether patterns can be identified within particular contexts. Looking at at-risk students and tracking them through the decisions, events, and interactions could provide valuable insights into how they become excluded from school while others remain enrolled and attending.

Furthermore, there is conflicting research on the significance of standardized tests (Balfanz, Herzog, & Iver, 2007; Lamm, Harder, Lamm, Rose, & Rask, 2005; Reardon & Galindo, 2002). Lamm et al. (2005) reported that students who scored greater than 65% on standardized math and science tests had a 95% graduation rate. However, Balfanz et al. (2007) reported that standardized test scores were only predictive of dropping out for the lowest 10th percentile. Similarly, Reardon and Galindo (2002) found predictive value of eighth-grade standardized test scores only for students who scored two standard deviations below the mean.

Chapter Summary

Dropout rates particularly correlated with risk factors such as high-risk demographic characteristics, early adult responsibilities, high-risk attitudes, values and behaviors, poor school performance, low socioeconomic status, retention disengagement from school, school structure, school environment, academic policies and practices, supervision and discipline policies and practices, community location and type, and community demographic characteristics. Although all of these factors were significantly

related to dropout in the research literature, no study concluded that any single factor was a reliable predictor of who would drop out of school. Instead, the best way to predict those most likely to drop out was to track multiple risk factors across several domains or to develop a model based on a combination of factors (Cairns et al., 1989; Gleason & Dynarski, 2002; Ingels et al., 2002). The accuracy of dropout predictions increased when combinations of multiple risk factors were considered.

Chapter 3: Research Design Methodology

Introduction

Mathematics has often been termed the “gatekeeper” of success or failure for high school graduation and career success (National Council of Teachers of Mathematics, 1989). Students living in urban environments, especially students from lower-income families, minority students, and English language learners, experience decreased mathematics scores across all levels of education (Plantey et al., 2008). These students are more likely to attend high-poverty elementary schools, more likely to drop out of high school, and less likely to earn a college degree (Plantey et al., 2008).

Across the United States 613,379 students dropped out of public high school in 2007-2008 and nearly 55% were African American, Hispanics, and Native Americans (Stillwell, 2010). Many of these students abandoned school with less than two years to complete their high school education. In New York State, 34,069 students dropped out from public high school in 2007-2008, an overall dropout rate of 3.9% (Stillwell, 2010). A three-year profile of a medium-size school district in the Lower Hudson Region of New York revealed similar results. More than 4% of high school students dropped out during the 2007-2008, 2008-2009 and 2009-2010 school years (NYSED, 2010).

Through a quantitative method approach, this correlational study examined the relationship between student mathematics achievement as measured by the NYSED G4MT, G8MT, and IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York. Quantitative research is appropriate

when the research will use data that can be quantified and statistically analyzed (Patten, 2007). This study sought to replicate the quantitative methods use by Balfanz, MacIver, and Byrnes (2007) to examine dropout factors in Denver Public Schools. In addition to Balfanz et al. (2007) study, several similar research studies employed quantitative methods. A quantitative approach was used by Gleason and Dynarski (2002) to examine how well multiple factors identified students at risk of dropout. Balfanz and Herzog (2006) used quantitative methods to identify 4 sixth-grade risk factors to predict 40% of nongraduates in Philadelphia schools. The use of a quantitative approach for this study is consistent with the literature review of similar studies. Eight research questions guided this study:

1. What is the relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{01}): There is no statistically significant relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

2. What is the relationship between whether or not students took the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{02}): There is no statistically significant relationship between taking the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

3. What is the relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{03}): There is no statistically significant relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

4. What is the relationship between whether or not students took the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{04}): There is no statistically significant relationship between taking the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

5. What is the relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{05}): There is no statistically significant relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

6. What is the relationship between whether or not students took the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{06}): There is no statistically significant relationship between taking the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

7. To what extent can student achievement levels (1, 2, 3, and 4) on the NYSED G4MT, G8MT, and IAMT serve as predictors of students dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{07}): Student achievement levels (1, 2, 3, and 4) on NYSED G4MT, G8MT, and IAMT cannot serve as predictors of dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

8. To what extent can students taking or not taking the NYSED G4MT, G8MT, and IAMT serve as predictors of students dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{08}): Students taking or not taking the NYSED G4MT, G8MT, and IAMT cannot serve as predictors of dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

This research was designed to provide information to educators, policymakers, and leaders on mathematics data to construct early warning and intervention systems to efficiently target students who are at risk of dropping out and better support them on the road to graduation.

Research Context

The medium-size school district in the Lower Hudson Region of New York was located in a mid-size city with the population of over 65,000 and 24,000 households (U.S. Bureau of the Census, 2008). The population of this city was diverse, representing

various ethnic and racial backgrounds. The city was predominantly African American (59%), with 28% of the population being Caucasian and 10% Hispanic. Seven percent of the population was native to the United States with 55% born to New York State (U.S. Bureau of the Census, 2008). Of the 30% foreign-born residents, 55% speak Spanish and 45% speak another language (U.S. Bureau of the Census, 2008).

The school district was comprised of 8,586 students (NYSED, 2011). According to the Accountability and Overview Report 2009-2010, 60% of the students were eligible for free lunch; 12% qualified for reduced-price lunch and 8% of the student population was categorized as limited English proficient (NYSED, 2011). The ethnicity distribution of this school district was 77% Black or African American; 15% Hispanic or Latino; 6% White and 1% Asian or Native Hawaiian (NYSED, 2011).

Research Participants

The research participants were students who first entered Grade 9 in the 2006-2007 school year. Table 3.1 illustrated the gender, various ethnic subgroups, classification and socioeconomic status of the 680 research participants.

Data Collection Instruments

The researcher used the Lower Hudson Regional Information Center Data Warehouse system and the New York State Testing and Accountability Reporting Tool to collect data pertaining to annual dropout rates and achievement levels on the NYSED G4MT, G8MT, and IAMT.

New York State Grade 4 Mathematics Test. The NYSED G4MT measured students' progress toward the seven key ideas—mathematical reasoning, number and numeration, operations, modeling/multiple representation, measurement, uncertainty,

patterns/functions—described in Standard 3 of the New York State Learning Standards for Mathematics, Science, and Technology (NYSED, 2002). The seven key ideas are listed in Table 3.2 with the approximate percent emphasis placed on each.

The NYSED G4MT was a criterion-referenced test composed of multiple-choice and constructed-response items differentiated by maximum score point. Multiple-choice items have a maximum score of 1, short-response items have a maximum score of 2, and extended-response items have a maximum score of 3. The test was administered in March over a three-day period (NYSED, 2002). Table 3.3 provided the test design for the NYSED G4MT, including the number of questions, question types, number of points, and time allotted for each testing session.

New York State Grade 8 Mathematics Test. The NYSED G8MT measured the extent to which individual students achieve the New York State Learning Standards in mathematics and to determine whether schools, districts, and the State meet the required progress targets specified in the New York State accountability system. The test assessed students on the content and process strands of New York State Mathematics Learning Standard 3. As a result of the alignment to both process and content strands, the test assessed students' conceptual understanding, procedural fluency, and problem-solving abilities, rather than solely assessing their knowledge of isolated skills and facts. The five content strands to which the items were aligned are Number Sense and Operations, Algebra, Geometry, Measurement, and Statistics and Probability. The five content strands are listed in Table 3.4 with the approximate percent emphasis placed on each (NYSED, 2006).

Table 3.1

Research Participants' Characteristics as a Percentage of the Sample

Characteristic	<i>n</i>	%
Gender		
Female	362	53.24
Male	318	46.76
Ethnicity		
Black	572	84.12
Hispanic	80	11.76
White	23	3.38
Asian/Pacific Islander	4	0.59
American Indian/Alaska Native	1	0.15
Classification		
General Education Students	573	84.26
Students with Disabilities	107	15.74
Not Limited English Proficient	669	98.38
Limited English Proficient	11	1.62
Formerly Limited English Proficient	4	0.59
Socioeconomic Status		
Economically Disadvantaged	130	19.12
Not Economically Disadvantaged	550	80.88

Note. *N* = 680.

Table 3.2

NYSED G4MT Blueprint

Key Ideas	Percentage Emphasis for Grade 4
Mathematical Reasoning	10–15
Number and Numeration	15–25
Operations	20–25
Modeling / Multiple Representation	5–10
Measurement	15–20
Uncertainty	5–10
Patterns / Functions	10–15

Note. From New York State Testing Program Mathematics Grade 4 Technical Report

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Table 3.3

NYSED G4MT Configuration

	Number of Questions	Number of Points	Time in Minutes
Session 1	30 MC	30	40
Session 2	7 SR	14	50
	2 ER	6	
Session 3	7 SR	14	50
	2 ER	6	

Note. MC = multiple-choice; SR = short-response; ER = extended-response. From *New York State Testing Program Mathematics Grade 4 Technical Report 2002* by NYSED.

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Table 3.4

NYSED G8MT Blueprint

Content Strand	Percentage Emphasis for Grade 8
Number Sense and Operations	10–15
Algebra	40–45
Geometry	30–35
Measurement	10–15
Statistics and Probability	0

Note. From *New York State Testing Program 2006: Mathematics, Grades 3–8. Technical Report* by NYSED. Copyright 2006, NYSED.

The NYSED G8MT was a criterion-referenced test composed of multiple-choice and constructed-response items differentiated by maximum score point. Multiple-choice

items have a maximum score of 1, short-response items have a maximum score of 2, and extended-response items have a maximum score of 3. The test was administered in March over a two-day period (NYSED, 2006). Table 3.5 provides the test design for the NYSED G8MT, including the number of questions, question types, number of points, and time allotted for each testing session.

Table 3.5

NYSED G8MT Configuration

	Number of Questions	Number of Points	Time in Minutes
Session 1	27 MC	27	50
	4 SR	8	40
	2 ER	6	
Session 2	8 SR	16	70
	4 ER	12	

Note. MC = multiple-choice; SR = short-response; ER = extended-response. Adapted from *New York State Testing Program 2006: Mathematics, Grades 3–8. Technical Report* by NYSED. Copyright 2006, NYSED.

New York State Grade Integrated Algebra Mathematics Test. The NYSED IAMT measured the extent to which individual students achieve the New York State Learning Standards in mathematics and to determine whether schools, districts, and the State meet the required progress targets specified in the New York State accountability system. The questions assessed both the content and the process strands of New York State Mathematics Standard 3. Each question was aligned to one content performance indicator and also to one or more process performance indicators. As a result of the

alignment to both content and process strands, the test assessed students’ conceptual understanding, procedural fluency, and problem-solving abilities rather than knowledge of isolated skills and facts. The five content strands are listed in Table 3.6 with the percentage of total credits aligned with each content strand (NYSED, 2008).

Table 3.6

NYSED IAMT Blueprint

Content Strand	Percentage of Total Credit
Number Sense and Operations	6–10
Algebra	50–55
Geometry	14–19
Measurement	3–8
Statistics and Probability	0

Note. Adapted from *New York State Regents Examination in Integrated Algebra June 2009 Administration Test Design and Development Technical Manual* by NYSED.

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The NYSED IAMT was a criterion-referenced test composed of multiple-choice and constructed-response items differentiated by maximum score point. The multiple-choice items were weighted by 2 credits each and the constructed-response items were worth 2, 3, or 4 credits. Table 3.7 shows the number of each item type on the mathematics test.

Table 3.7

NYSED IAMT Configuration

Item Type	Number of Items	Number of Credits	Time in Minutes
2-credit MC	30	60	300
2-credit CR	3	6	
3-credit CR	3	9	
4-credit CR	3	12	
Total	39	87	

Note. MC = multiple-choice; CR = constructed-response. Adapted from *New York State Regents Examination in Integrated Algebra June 2009 Administration Test Design and Development Technical Manual* by NYSED. Copyright 2009, NYSED

Descriptive Data. Descriptive statistics are used to present quantitative descriptions in a manageable form (Huck, 2008). New York State mathematics tests used raw scores, scale scores, and performance levels. Raw scores were a numerical representation of the number of correct responses. The raw score was derived by using all multiple-choice and open-ended items on the New York State mathematics test. Raw scores cannot be compared from year to year (NYSED, 2006).

The scale score showed the level of proficiency a student earned in mathematics (e.g., number sense and operations, algebra, geometry, measurement, and statistics and probability). Scale scores used a numerical scale that ran continuously from beginning skills to advanced skills. The scale scores enabled comparisons from year to year because the same scale score represented the same level of achievement for the New

York State learning standards, even if slight changes in the test from year to year caused slight changes in the raw scores (NYSED, 2006).

Students were classified into one of the four levels of performance based on their overall performance on the test as determined by their New York State Mathematics Assessment scale scores. The four performance levels were Level 1—Not Meeting Learning Standards, Level 2—Partially Meeting Learning Standards, Level 3—Meeting Learning Standards, and Level 4—Meeting Learning Standards with Distinction. A student's performance level provided information on a student's abilities in relation to the New York State learning standards (NYSED, 2006).

The researcher used performance levels derived from the New York State mathematics tests. Table 3.8 showed the definitions of the four performance levels along with the corresponding scale score range of the NYSED mathematics tests (G4MT, G8MT, and IAMT).

Reliability

A test is considered reliable if it yields consistent results (Patten, 2007). Reliability coefficients provide measures of internal consistency that range from zero to one. Two reliability coefficients, Cronbach's alpha and Feldt-Raju, were computed for the New York State Grade 4 Mathematics Test, New York State Grade 8 Mathematics Test, and New York State Integrated Algebra Mathematics Test. Both types of reliability estimates are appropriate to use when a test contains both multiple-choice and constructed response items. Calculated Cronbach's alpha reliabilities ranged from 0.88–0.94 and Feldt-Raju reliability coefficients ranged from 0.89–0.95. All reliabilities exceeded 0.85 across statistics, which was a good indication that the tests were

acceptably reliable. High reliability indicated that scores were consistent and not unduly influenced by random error (New York State Department of Education, 2002, 2006, 2008).

Table 3.8

NYSED Mathematics Test Performance Levels and Scale Score Range

Performance Level	Definitions of Performance Levels	Scale Score Range		
		G4MT	G8MT	IAMT
Level 1: Not Meeting Learning Standards	Student performance does not demonstrate an understanding of the mathematics content expected at this grade level.	448–601	480–615	0–54
Level 2: Partially Meeting Learning Standards	Student performance demonstrates a partial understanding of the mathematics content expected at this grade level.	602–636	616–649	55–64
Level 3: Meeting Learning Standards	Student performance demonstrates an understanding of the mathematics content expected at this grade level.	637–677	650–700	65–84
Level 4: Meeting Learning Standards with Distinction	Student performance demonstrates a thorough understanding of the mathematics content expected at this grade level.	678–810	701–775	85–100

Validity

A test or measurement is considered valid if it actually measures what it is designed to measure (Patten, 2007). Test validation is an on-going process of gathering evidence from many sources to evaluate the soundness of the desired score interpretation or use. This evidence is acquired from studies of the content of the test as well as from studies involving scores produced by the test (NYSED, 2002, 2006). Validity is a unitary concept. Although evidence may be accumulated in many ways, validity always refers to the degree to which that evidence supports the inferences that are made from the scores. The inferences regarding specific uses of a test are validated, not the test itself. Additionally, reliability is a necessary element for validity. A test cannot be valid if it is not also reliable.

Content validity. Generally, achievement tests are used for making predictions about students or describing students' performance (Mehrens & Lehmann, 1991). In addition, tests are now also used for the purpose of accountability and AYP. NYSED used various assessment data in reporting AYP. Specific to student-level outcomes, the New York State Testing Program documented student performance in the area of Math as defined by the New York State Math Learning Standards. To allow test score interpretations appropriate for this purpose, the content of the test must be carefully matched to the specified standards.

Logical analyses of test content indicate the degree to which the content of a test covers the domain of content the test is intended to measure. In the case of the New York State Testing Program, the content was defined by detailed, written specifications and blueprints that described New York State content standards and defined the skills that

must be measured to assess these content standards. The test development process required specific attention to content representation and the balance thereof within each test. New York State educators were involved in test constructions in various test development stages. For example, they reviewed field tests for their alignment with test blueprint. They also participated in a process of establishing scoring rubrics for constructed response items.

Data Analysis

The researcher obtained permission from the superintendent of the schools in the medium-size school district in the Lower Hudson Region of New York along with Internal Review Board approval from St. John Fisher College. Archival student data was obtained using the Lower Hudson Regional Information Center Data Warehouse system and New York State Testing and Accountability Reporting Tool.

The process of analysis can occur simultaneously with data collection by continual reflection on what is being learned (Patten, 2007). Student data was divided into different subsets according to high school status (dropout/nondropout) and Grade 4, Grade 8, and integrated algebra mathematics test performance levels. The coding of data was similar to the coding system set forth by Gleason and Dynarksi (2002):

1. Students identified as high school dropouts were coded as 0. Students identified as non-high school dropouts were coded as 1.
2. The NYSED G4MT scores were coded as follows: 0—Not Meeting Learning Standards (Levels 1 and 2) and 1—Meeting Learning Standards (Levels 3 and 4).
3. The NYSED G8MT scores were coded as follows: 0—Not Meeting Learning Standards (Levels 1 and 2) and 1—Meeting Learning Standards (Levels 3 and 4).

4. The NYSED IAMT scores were coded as follows: 0—Not Meeting Learning Standards (Levels 1 and 2) and 1—Meeting Learning Standards (Levels 3 and 4).

After coding, the data was inputted into the Statistical Package for Social Sciences 19.

The data collected was analysis using several techniques. Descriptive statistics provided a summary of frequencies, percentage and means involving demographics (gender, classification, and socioeconomic status) and mathematics achievement levels among high school dropouts and nondropouts in the 2010-2011 school year. In order to assess the relationship between two categorical variables, a chi square test was used. A chi square test is a widely used nonparametric test that examines if the frequency distribution of the observed data matches that of either the expected data or another known distribution. A typical question for this type of test is whether there is an association between two categorical variables. Using chi-square analysis, the intent was to determine, if any, a relationship between student mathematics achievement (as measured by the NYSED G4MT, G8MT, and IAMT) and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

Regression analyses are used to examine the effect of different (predictor / independent) variables on a single outcome (dependent) variable. The use of the term prediction is central to regression analyses. One examines if one variable predicts (explains / impacts) another variable. The independent, or predictor, variables must be either dichotomous (categorical variable with only 2 categories/groups) or quantitative/numerical variables. The dependent variable must be a quantitative/numerical variable (Statistical Solutions, 2009). Logistic regression analysis

was used to predict the dropout status based on mathematics achievement as measured by the NYSED G4MT, G8MT, and IAMT.

Summary

In New York State, 34,069 students dropped out from public high school in 2007-2008, an overall dropout rate of 3.9% (Stillwell, 2010). A three-year profile of a medium-size school district in the Lower Hudson Region of New York revealed similar results. More than 4% of high school students dropped out during the 2007-2008, 2008-2009 and 2009-2010 school years (NYSED, 2010). Through a quantitative method approach, this study examined the relationship of mathematics achievement and dropping out of school among high school students in a medium-size school district in the Lower Hudson Region of New York. Using logistic regression analysis provided the basis for determining significant variables in developing a predictive model for identifying potential dropouts.

Chapter 4: Results

Introduction

More than 4% of high school students dropped out during the 2007-2008, 2008-2009, and 2009-2010 school years (NYSED, 2010) in a medium-size school district in the Lower Hudson Region of New York. The intent of this quantitative study was to determine, if any, a relationship between student mathematics achievement (as measured by the NYSED G4MT, G8MT, and IAMT) and dropping out of high school. Furthermore, to what extent did the New York State mathematics tests serve as predictors of students dropping out of high school? Chapter 4 represents “preparing the data for analysis, conducting different analyses, moving deeper and deeper into understanding the data, [and] representing the data” (Creswell, 2003, p. 190).

Research Questions

The following research questions were developed to address the purpose of this study:

1. What is the relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{01}): There is no statistically significant relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

2. What is the relationship between whether or not students took the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{02}): There is no statistically significant relationship between taking the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

3. What is the relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{03}): There is no statistically significant relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

4. What is the relationship between whether or not students took the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{04}): There is no statistically significant relationship between taking the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

5. What is the relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{05}): There is no statistically significant relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

6. What is the relationship between whether or not students took the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{06}): There is no statistically significant relationship between taking the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

7. To what extent can student achievement levels (1, 2, 3, and 4) on the NYSED G4MT, G8MT, and IAMT serve as predictors of students dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{07}): Student achievement levels (1, 2, 3, and 4) on NYSED G4MT, G8MT, and IAMT cannot serve as predictors of dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

8. To what extent can students taking or not taking the NYSED G4MT, G8MT, and IAMT serve as predictors of students dropping out of high school in a medium-size school district in the Lower Hudson Region of New York?

Null Hypothesis (H_{08}): Students taking or not taking the NYSED G4MT, G8MT, and IAMT cannot serve as predictors of dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

Data Analysis and Findings

Table 4.1 illustrates the gender, various ethnic subgroups, classification and socioeconomic status among high school dropouts and nondropouts in the 2010-2011 school year. Overall, the proportion of males (50.5%) was higher than females (49.5%) among the 2010-2011 dropouts in a medium-size school district in the Lower Hudson Region of New York. Among nondropouts, the proportion of males was 46.1% as opposed females 53.9%. Blacks (87.0%) were also significantly represented among dropouts as compared to Hispanics (19.0%). About 1 in 10 dropouts (8.1%) were students with disabilities. Conversely about 1 in 10 dropouts were general education students (91.89%) and almost all dropouts were not limited English proficient (98.2%)

Table 4.1

Demographic Characteristics of Dropouts and Nondropouts

Characteristic	Dropouts		Nondropouts	
	<i>n</i>	%	<i>n</i>	%
Gender				
Female	55	49.55	307	53.95
Male	56	50.45	262	46.05
Ethnicity				
Black	87	78.38	485	85.24
Hispanic	19	17.12	61	10.72
White	4	3.60	19	3.34
Asian/Pacific Islander	1	0.90	3	0.53
American Indian/Alaska Native	0	0.00	1	0.18
Classification				
General Education Students	102	91.89	471	82.78
Students with Disabilities	9	8.11	98	17.22
Not Limited English Proficient	109	98.20	560	98.42
Limited English Proficient	2	1.80	9	1.58
Formerly Limited English Proficient	1	2.70	3	0.18
Socioeconomic Status				
Economically Disadvantaged	17	15.32	113	19.86
Not Economically Disadvantaged	94	84.68	456	80.14

Note. Adapted from *New York State Student Information Repository System* by NYSED.

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Table 4.2 shows the average student mathematics performance level on the NYSED G4MT, G8MT, and IAMT by gender, various ethnic subgroups, classification,

and socioeconomic status among high school dropouts and nondropouts in the 2010-2011 school year. Overall male and female nondropouts performed better than male and female dropouts on the NYSED G4MT, G8MT, and IAMT. Blacks, Hispanic, and White nondropouts performed significantly higher than Blacks, Hispanic, and White dropouts on the NYSED G4MT and G8MT. General education nondropouts outperformed their dropout counterparts on the NYSED G4MT, G8MT, and IAMT. Additionally, nondropout students with disabilities performed better than dropout students with disabilities. Nondropouts classified as “not economically disadvantaged or economically disadvantaged” scored better than dropouts with the same designation on the NYSED G4MT, G8MT, and IAMT. Regardless of gender, ethnic sub-group, classification, and socioeconomic status, high school nondropouts significantly outperformed dropouts on the NYSED G4MT, G8MT, and IAMT.

Table 4.2

Average NYSED Mathematics Test Performance Level of Dropouts and Nondropouts

Characteristic	NYSED G4MT		NYSED G8MT		NYSED IAMT	
	Drop	Non	Drop	Non	Drop	Non
	Gender					
Female	2.56	2.99	1.69	2.26	2.29	2.60
Male	2.75	2.85	1.27	1.90	2.00	2.53
Ethnicity						
Black	2.58	2.89	1.35	2.05	1.83	2.52
Hispanic	2.75	3.00	2.20	2.28	3.00	2.75
White	3.00	3.70	1.00	2.67	3.00	2.90
Asian/Pacific Islander	-	2.00	-	3.00	-	3.67
American Indian/Alaska Native	-	3.50	-	2.00	-	-
Classification						
General Education Students	2.86	3.05	1.55	2.18	2.22	2.69
Students with Disabilities	1.67	2.09	1.00	1.50	-	1.59
Not Limited English Proficient	2.65	2.94	1.50	2.10	2.22	2.57
Limited English Proficient	-	1.00	-	2.00	-	2.43
Formerly Limited English Proficient	-	-	-	-	-	-
Socio-Economic Status						
Economically Disadvantaged	2.33	2.64	1.50	1.62	2.00	2.11
Not Economically Disadvantaged	2.77	2.99	1.50	2.19	2.20	2.67

Note. Drop = Dropouts, Non = Nondropouts. Adapted from *New York State Student*

Information Repository System by NYSED. Copyright 2011, NYSED.

Tables 4.3, 4.4, and 4.5 show the NYSED G4MT, G8MT, and IAMT performance levels among dropouts and nondropouts respectively. Test data for the NYSED G4MT, G8MT, and IAMT were available from NYSED for 43.97% of Grade 4, 59.71% of Grade 8, and 51.03% of integrated algebra participants. NYSED G4MT data were available for 17 (15.32%) of the 111 dropouts and 282 (49.56%) of the 569 nondropouts. NYSED G8MT data was available for 24 (21.62%) of the 111 dropouts and 382 (67.14%) of the 569 nondropouts. NYSED IAMT data was available for 9 (8.11%) of the 111 dropouts and 338 (59.40%) of the 569 nondropouts.

Table 4.3

NSYED G4MT Performance Levels

Level	Dropouts (<i>n</i>)	%	Nondropouts (<i>n</i>)	%
1	1	0.90	14	2.46
2	6	5.41	69	12.13
3	8	7.21	121	21.27
4	2	1.80	78	13.71
No Data	94	84.68	287	50.44

n = 299

Table 4.4

NSYED G8MT Performance Levels

Level	Dropouts (<i>n</i>)	%	Nondropouts (<i>n</i>)	%
1	15	13.51	104	18.28
2	6	5.41	159	27.94
3	3	2.70	98	17.22
4	0	0.00	21	3.69
No Data	87	78.38	187	32.86

n = 406

Table 4.5

NSYED IAMT Performance Levels

Level	Dropouts (<i>n</i>)	%	Nondropouts (<i>n</i>)	%
1	2	1.80	56	9.84
2	3	2.70	69	12.13
3	4	3.60	178	31.28
4	0	0.00	35	6.15
No Data	102	91.89	231	40.60

n = 347

Chall (1983, as cited in Chall & Jacobs, 2003) defined the *fourth-grade reading slump* as the time when students fall behind in reading. The premise is that the slump in reading occurs because of the change in academic language required to read grade-level content texts. Starting around the fourth grade, reading shifts from “learning to read” to “reading to learn” with the inclusion of a more extensive vocabulary, a heavier content

load, and a need for more background knowledge (Chall & Jacobs, 2003). The data from the NYSED tests show a comparable slump that occurs in math achievement.

Achievement gaps in math increased as the grade level increases. Table 4.6 illustrates the decrease in math performance levels from Grade 4 to Grade 8 for the cohort, dropouts, and nondropouts.

Table 4.6

Average NYSED G4MT, G8MT and IAMT Performance Levels

	NYSED G4MT	NYSED G8MT	NYSED IAMT
Cohort	2.92	2.06	2.56
Dropouts	2.65	1.50	2.22
Nondropouts	2.93	2.09	2.57

Dropouts experienced a significant decrease (43.40%) in math achievement from Grade 4 to Grade 8 as compared to nondropouts (28.67%). Just as reading is related to academic language, math is reflective of a specific academic language. Math has two types of language, words and symbols. Although math might be considered a universal language, it can be difficult for any student to understand. Math has new terms, such as coefficient and tessellation, and common words that are used in a specific mathematical way, such as scale and change (Freeman & Crawford, 2008). Math uses terms that may be used in other subject areas with different meanings, such as *table*, *slope*, and *run*. Additionally, there are multiple math terms that mean the same thing, such as *slope*, *rate of change*, *rise/run*, and *delta y over delta x*. The academic language of math includes the ability to read, write, and engage in substantive academic conversations (Freeman & Crawford, 2008).

Research Question 1. What is the relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York? A Pearson chi-square test was conducted to examine whether there was a relationship between NYSED G4MT achievement and students dropping out of high school. The results (Table 4.7) reveal that there was no statistically significant relationship between the two variables ($\chi^2 = 1.051$, $df = 1$, $p = .305$). Since $p > 0.05$, the null hypothesis, H_{01} , was accepted. There is no statistically significant relationship between student mathematics achievement as measured by the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York. The observed difference ($p = .305$) was due to sampling.

Table 4.7

Chi-Square Test of Dropout Status and NYSED G4MT Achievement

	Value	<i>df</i>	Asymp. <i>p</i> (2-sided)
Pearson χ^2	1.051 ^a	1	.305
Valid cases (<i>n</i>)	299		

^a Zero cells (.0%) have expected count less than 5. The minimum expected count is 5.12.

A phi test was used to measure the strength of association between NYSED G4MT achievement and students dropping out of high school. Table 4.8 reveals that there was no statistically significant strength of association ($\phi = .059$; $p = .305$) between the two variables.

Table 4.8

Phi Test of Dropout Status and NYSED G4MT Achievement

	Value	Approx.		95% CI		
		<i>p</i>	<i>p</i>	LL	UL	
Nominal by nominal	phi	.059	.305	.428 ^a	.372	.484
Valid cases (<i>n</i>)		299				

Note. Based on 299 sampled tables with starting seed 2000000.

Research Question 2. What is the relationship between whether or not students took the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York? A Pearson chi-square test was conducted to examine whether there was a relationship between taking the NYSED G4MT and students dropping out of high school. The results (Table 4.9) reveal that there was a statistically significant relationship between the two variables ($\chi^2 = 44.213$; $df = 1$; $p = .000$). Since $p < 0.05$, the null hypothesis, H_{02} , was rejected. There is a statistically significant relationship between student taking the NYSED G4MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

Table 4.9

Chi-Square Test of Dropout Status and Taking the NYSED G4MT

	Value	<i>df</i>	Asymp. <i>p</i> (2-sided)
Pearson χ^2	44.213 ^a	1	.000
Valid cases (<i>n</i>)	680		

^a Zero cells (.0%) have expected count less than 5. The minimum expected count is 48.81.

A phi test was used to measure the strength of association between taking the NYSED G4MT and students dropping out of high school. Table 4.10 reveals that there was a statistically significant strength of association ($\phi = -.255$, $p = .000$) between the two variables.

Table 4.10

Phi Test of Dropout Status and Taking the NYSED G4MT

	Value	Approx.		95% CI		
		p	p	LL	UL	
Nominal by nominal	phi	-.255	.000	.000 ^a	.000	.000
Valid cases (n)		680				

Note. Based on 10,000 sampled tables with starting seed 299883525.

Research Question 3. What is the relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York? A Pearson chi-square test was conducted to examine whether there was a relationship between NYSED G8MT achievement and students dropping out of high school. The results (Table 4.11) reveal that there was no statistically significant relationship between the two variables ($\chi^2 = 3.737$, $df = 1$, $p = .053$). Since $p > 0.05$, the null hypothesis, H_{03} , was accepted. There is no statistically significant relationship between student mathematics achievement as measured by the New NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York. The observed difference ($p = .053$) was due to sampling.

Table 4.11

Chi-Square Test of Dropout Status and NYSED G8MT Achievement

	Value	df	Asymp. p (2-sided)
Pearson χ^2	3.737 ^a	1	.053
Valid cases (n)	406		

^a Zero cells (.0%) have expected count less than 5. The minimum expected count is 7.21.

A phi test was used to measure the strength of association between NYSED G8MT achievement and students dropping out of high school. Table 4.12 reveals that there was no statistically significant strength of association ($\phi = .096, p = .053$) between the two variables.

Table 4.12

Phi Test of Dropout Status and NYSED G8MT Achievement

	Value	Approx.	95% CI		
		p	p	LL	UL
Nominal by nominal	phi .096	.053	.067 ^a	.039	.095
Valid cases (n)	406				

^a Based on 299 sampled tables with starting seed 926214481.

Statistical significance is concerned with whether a research result is due to chance or sampling variability whereas practical significance is concerned with whether the result is useful in the real world. Null hypothesis significance testing (NHST) is the dominant statistical approach in quantitative research. NHST does not provide researchers with the practical significance or the magnitude of an effect size. Effect size is a statistical term that is used to determine if an observed difference is statistically

significant and meaningful. The use of an effect size enables researchers to assess the relationships within data more effectively than the use of p values, regardless of statistical significance (Nakagawa & Cuthill, 2007). The effect size of a Chi-square test can be described by phi. A phi test was used to measure the effect size between NYSED G8MT achievement and students dropping out of high school. Table 4.12 reveals that there was small effect size ($\phi = .096$) between the two variables. An increase in the number of students (dropouts and nondropout) taking the NYSED G8MT might result in a larger effect size and a statistically significant relationship between student mathematics achievement as measured by the New NYSED G8MT and dropping out of high school. In terms of the practice significance, there was a relationship between student mathematics achievement as measured by the New NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

Research Question 4. What is the relationship between whether or not students took the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York? A Pearson chi-square test was conducted to examine whether there was a relationship between taking the NYSED G8MT and students dropping out of high school. The results (Table 4.13) revealed that there was a statistically significant relationship between the two variables ($\chi^2 = 79.975$, $df = 1$, $p = .000$). Since $p < 0.05$, the null hypothesis, H_{04} , was rejected. There is a statistically significant relationship between student taking the NYSED G8MT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

Table 4.13

Chi-Square Test of Dropout Status and Taking the NYSED G8MT

	Value	df	Asymp. <i>p</i> (2-sided)
Pearson χ^2	79.975 ^a	1	.000
Valid cases (<i>n</i>)	680		

^a Zero cells (.0%) have expected count less than 5. The minimum expected count is 44.73.

A phi test was used to measure the strength of association between taking the NYSED G8MT and students dropping out of high school. Table 4.14 reveals that there was a statistically significant strength of association ($\text{phi} = -.343, p = .000$) between the two variables

Table 4.14

Phi Test of Dropout Status and Taking the NYSED G8MT

	Value	Approx.		95% CI		
		<i>p</i>	<i>p</i>	LL	UL	
Nominal by nominal	phi	-.343	.000	.000 ^a	.000	.000
Valid cases (<i>n</i>)	680					

^a Based on 10,000 sampled tables with starting seed 1314643744.

Research Question 5. What is the relationship between student mathematics achievement levels (1, 2, 3, and 4) as measured by the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York? A Pearson chi-square test was conducted to examine whether there was a relationship between NYSED IAMT achievement and students dropping out of high school. The results (Table 4.15) reveal that there was no statistically significant

relationship between the two variables ($\chi^2 = 1.291$, $df = 1$, $p = .256$). Since $p > 0.05$, the null hypothesis, H_{05} , was accepted. There is no statistically significant relationship between student mathematics achievement as measured by the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York. The observed difference ($p = .256$) is due to sampling.

Table 4.15

Chi-Square Test of Dropout Status and NYSED IAMT Achievement

	Value	df	Asymp. p (2-sided)
Pearson χ^2	1.291 ^a	1	.256
Valid cases (n)	347		

^a Zero cells (.0%) have expected count less than 5. The minimum expected count is 7.21.

A phi test was used to measure the strength of association between NYSED IAMT achievement and students dropping out of high school. Table 4.16 revealed that there was no statistically significant strength of association ($\phi = .061$; $p = .308$) between the two variables.

Table 4.16

Phi Test of Dropout Status and NYSED IAMT Achievement

	Value	Approx.		95% CI	
		p	p	LL	UL
Nominal by Nominal Phi	.061	.256	.308 ^a	.255	.360
Valid cases (n)	406				

^a Based on 299 sampled tables with starting seed 926214481.

Research Question 6. What is the relationship between whether or not students took the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York? A Pearson chi-square test was conducted to examine whether there was a relationship between taking the NYSED IAMT and students dropping out of high school. The results (Table 4.17) reveal that there was a statistically significant relationship between the two variables ($\chi^2 = 97.793$, $df = 1$, $p = .000$). Because $p < 0.05$, the null hypothesis, H_{06} , was rejected. There is a statistically significant relationship between student taking the NYSED IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

Table 4.17

Chi-Square Test of Dropout Status and Taking the NYSED IAMT

	Value	<i>df</i>	Asymp. <i>p</i> (2-sided)
Pearson χ^2	97.793 ^a	1	.000
Valid cases (<i>n</i>)	680		

^a Zero cells (.0%) have expected count less than 5. The minimum expected count is 54.36.

A phi test was used to measure the strength of association between taking the NYSED IAMT and students dropping out of high school. Table 4.18 reveals that there was a statistically significant strength of association ($\phi = -.379$, $p = .000$) between the two variables.

Table 4.18

Phi Test of Dropout Status and Taking the NYSED IAMT

	Value	Approx.		95% CI	
		<i>p</i>	<i>p</i>	LL	UL
Nominal by Nominal Phi	-.379	.000	.000 ^a	.000	.000
<i>n</i> of valid cases	680				

^a Based on 10,000 sampled tables with starting seed 334431365.

Research Question 7. To what extent can student achievement levels (1, 2, 3, and 4) on the NYSED G4MT, G8MT, and IAMT serve as predictors of students dropping out of high school in a medium-size school district in the Lower Hudson Region of New York? A logistic regression analysis was conducted to predict dropping out of high school for 680 students using mathematics achievement on NYSED G4MT, G8MT, and IAMT as predictors. Table 4.19 presented the results with only the constant or independent variable (dropout status) included before any predictors or dependent variables (NYSED G4MT, G8MT and IAMT) were entered into the equation. Logistic regression compared this model with a model including all the predictors to determine whether the latter model was more appropriate (Statistical Solutions, 2009). Table 4.19 suggests that if the researcher knew nothing about the variables and guessed that a student would drop out of high school, the researcher would be correct 97.7% of the time.

Table 4.19

Logistic Regression Classification Table

		Observed		Predicted		Percentage Correct
				Status		
				Dropout	Nondropout	
Step 0	Status	Dropout	0	4		.0
		Nondropout	0	189		100.0
		Overall Percentage				97.9

^a Constant is included in the model.

^b The cut value is .500.

The variables not in the equation table indicate each predictor (NYSED G4MT, G8MT, and IAMT) did not improve the model (Table 4.20). Since $p > 0.05$ (.185, .196, and .516), the null hypothesis, H_{07} , was accepted. Student achievement on NYSED G4MT, G8MT, and IAMT did not serve as predictors of dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

Table 4.20

Logistic Regression Variables not in the Equation

			Score	<i>df</i>	<i>p</i>
Step 0	Variables	G4MT	1.755	1	.185
		G8MT	1.670	1	.196
		IAMT	0.421	1	.516
		Overall Statistics	5.125	3	.163

Research Question 8. To what extent can students taking or not taking the NYSED G4MT, G8MT, and IAMT serve as predictors of students dropping out of high school in a medium-size school district in the Lower Hudson Region of New York? A logistic regression analysis was conducted to predict dropping out of high school for 680 students using attendance on NYSED G4MT, G8MT, and IAMT as predictors. A logistic regression analysis was conducted to predict students dropping out of high school using NYSED G4MT, G8MT, and IAMT as predictors. A test of the full model against a constant only model was statistically significant (Table 4.21), indicating that the predictors as a set reliably distinguished between dropping out and not dropping of the high school ($\chi^2 = 143.474$, $df = 3$, $p = .000$).

Table 4.21

Omnibus Tests of Model Coefficients

		χ^2	df	p
Step 1	Step	143.474	3	.000
	Block	143.474	3	.000
	Model	143.474	3	.000

According to Table 4.22, Nagelkerke's R^2 of .323 indicated a moderately low relationship between prediction and grouping. Prediction success overall was 83.7% (100% for nondropout and 0% for dropout).

Table 4.22

Model Summary

Step	-2 log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	461.721 ^a	.190	.323

^a Estimation terminated at Iteration 6 because parameter estimates changed by less than .001.

The Wald criterion (Table 4.23) demonstrated that only NYSED G8MT ($p = .001$) and NYSED IAMT ($p = .000$) made significant contributions to prediction. NYSED G4MT was not a significant predictor. $\text{Exp}(b)$ value indicated that students taking the NYSED G4MT and G8MT were 2.968 times more likely to not dropout of high school. $\text{Exp}(b)$ value indicated that students taking the NYSED G4MT, G8MT, and IAMT were 10 times more likely to not dropout of high school. The null hypothesis, H_{08} , was rejected.

Table 4.23

Variables in the Equation

		<i>b</i>	<i>SE</i>	Wald	<i>df</i>	<i>p</i>	$\text{Exp}(b)$
Step	M4(1)	-.502	.360	1.942	1	.163	.605
	1 ^a						
	M8(1)	1.088	.322	11.441	1	.001	2.968
	IA(1)	2.309	.369	39.046	1	.000	10.062
	Constant	.853	.370	5.298	1	.021	2.346

^a Variable(s) entered on Step 1: G4MT, G8MT, IAMT.

Summary

Chall's (1983, as cited in Chall & Jaccobs, 2003) fourth-grade reading slump, the time when students fall behind in reading, was compared to the slump that occurred in math achievement. Using Statistical Package for Social Sciences, there was no statistically significant relationship between student mathematics achievement (as measured by the NYSED G4MT, G8MT, and IAMT) and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York. Consequently, NYSED G4MT, G8MT, and IAMT achievement levels did not contribute significantly to the prediction of students dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

Conversely, there was a statistically significant relationship between student taking the NYSED G4MT, G8MT, and IAMT and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York. In a similar manner, taking the NYSED G8MT and IAMT contributed significantly to the prediction of students dropping out of high school in a medium-size school district in the Lower Hudson Region of New York.

Chapter 5: Discussion

Introduction

With federal requirements to decrease dropout rates, school systems must seek ways to identify students at risk for dropping out of high school in order to provide early intervention. Researchers (Dynarski et al., 2008; Jerald, 2006; Smink & Schargel 2004) recommend that local districts develop diagnostic tools to identify potential dropouts. In following this recommendation, districts need to use data systems to determine which variables have predictive power in determining high school dropouts within the local community (Dynarski et al., 2008; Neild, Balfanz, & Herzog, 2007; Olson, 2006).

A review of the literature revealed that many factors contribute to a student's probability of dropping out of high school; however, few studies have examined the use of standardized mathematics tests in developing a predictive model for identifying at-risk students. Based on recommendations to use data from the local system (Dynarski et al., 2008; Jerald, 2006), predictor variables maintained in the local system's database were used to develop a model for identifying students at risk for dropping out.

Implications of Findings

Throughout the United States, schools are being evaluated based on their students' performance on standardized tests. Because of the No Child Left Behind Act (2001), schools and teachers are being held accountable based on students' performance in more ways than ever.

As schools strive to meet the educational needs of students, the schools must also make AYP. In order to do this, high schools must increase graduation rates to an unprecedented 100% by the year 2014 (No Child Left Behind, 2001). The only way this will become possible is by early identification and intervention of at-risk students.

The focus of this study was to develop a model for identifying at-risk students in a medium-size school district in the Lower Hudson Region of New York based on NYSED G4MT, G8MT, and IAMT. However, this is only the first step. The subsequent steps are to utilize the model to identify at-risk students and then, most important, to develop an intervention plan for these students (Jerald, 2006). Once students are identified as at risk, it is imperative that schools strive to meet the individual needs of these students by providing interventions promoting student success at the high school level. Whatever the intervention, it is imperative that interventions be individualized and student focused. A multidimensional approach favors parent involvement (Bridgeland et al., 2006), guidance through transition from middle school to high school (Edwards & Edwards, 2007), changes in classroom instruction (Karlinsky, 2008; Smink & Schargel, 2004; Stanley & Plucker, 2008), providing support systems (Edwards & Edwards, 2007; Karlinsky, 2008; Smink & Schargel, 2004), and alternative schooling to address the varying needs of at-risk students (Bridgeland et al., 2006; Edwards & Edwards, 2007; Smink & Schargel, 2004).

Limitations

There were two primary limitations to this study related to the availability of the data from the school district under study and its demographics. Due to the accessibility of data, the sample in this study was taken from one public school district in a medium-size

school district in the Lower Hudson Region of New York. Furthermore, the population in this school district is 84.12% African American, and its student enrollment in the free and reduced meals program is 19.12%. Therefore, this study is not fully generalizable to other school districts with different demographics.

Even though there are a multitude of predictor variables identified in the literature as being predictive of dropping out of high school, this study was delimited to variables available through the local school data records. Three predictive variables in student data records that were identified in the research were available for this study. Furthermore, only students with complete data records for the predictor variables were included in this study. Logistic regression analysis requires the removal of incomplete data sets (Field, 2009). Therefore, 487 data sets were removed, thus reducing this study's sample size from 680 students to 193 students. High school dropouts in this study were more likely to have incomplete data sets than high school nondropouts creating an inflated nondropout rate of the sample. As a result, the sample was not a true representative sample of the district and potentially skewed the findings. Last, this study relied on the consistency and the accuracy of record keeping and record transfer by the school district.

Recommendations

If this medium-size school district in the Lower Hudson Region of New York is to significantly impact the dropout crisis, it must prioritize the implementation of systemic and research-based strategies around prevention, recuperation, and recovery of off-track students. Based on the findings of this study, it is imperative that the issue of dropping out of high school be viewed as a K–12 issue. Superintendent, central office officials, elementary, middle, and high school administrators, teachers, and parents must be part of

a graduation task force. With all stakeholders on the graduation task force, the following interventions efforts are worthy of consideration and implementation:

1. Ensure that all students take the NYSED G4MT, G8MT, and IAMT.
2. Require mathematics remediation or intervention programs for students at all grade levels when course grades or NYSED mathematics test scores do not indicate academic proficiency. Purposefully create a schedule for students with the most effective teachers.
3. Ensure that all prepared students have access to an algebra course and enroll in such a course no later Grade 8.
4. Conduct multiple transition events with feeder schools to ensure at-risk students are acclimated to the new school.

Attendance. According to Bandura's (1976) social learning theory, learning is done in the classroom through observation, modeling, and interaction among teacher and students. The school, thus, is part of the social environment of the student. A student needs to be in the social cognitive environment of the school in order to learn. If students are not in class, they have fewer chances to learn the material that enables them to succeed in school (Jacobson, 2008). Students with the best attendance score higher on achievement tests than their peers with attendance problems (Jacobson, 2008). Therefore, students must be at school to learn through interaction among the teacher and their classmates.

A standard school year is based on 180 days of instruction. Converting from instructional days to hours, using 5 hours of instructional time per day for a student, there are 25 hours of instructional time available per week. This amounts to 900 hours of

instruction per year. Calculating 90% annual attendance rate, a student would be at school for 162 days out of 180. The time absent from school is 18 days or 90 hours of instruction. Nichols (2003) found students with high absence rates had a strong correlation to poor achievement in both math and English.

At a policy level, this will involve recording not simply average attendance in a school but keeping track of how many students have very good attendance (miss less than 5 days a year), are moderately absent (missing between 10 and 19 days), are chronically absent (missing 20 or more days), or extremely chronically absent (missing 40 or more days). More significant, how many students have missed a NYSED mathematics test. This means that every absence needs to elicit a response. At first this can be simple outreach to let students know they are missed and to solve any problems standing in their way of attending school. If the absenteeism persists, more structured responses are required.

Additionally, student grades should not be administratively affected by poor attendance (e.g., lowering grades if students miss a certain number of days). Rather, give students a structure for making up missed assignments. Then address the source of the student's absenteeism, whether disengagement or issues in school, at home, or in the community. The consequences need to be modulated so that they lead to improved attendance behaviors.

Intervention. Students who enter the middle grades with poor preparation require time to build up their academic skills. For the majority of students in the cohort examined, NYSED G8MT was not a successful experience. They left the middle grades behind grade level and unprepared to succeed in challenging high school courses. Once

students are identified as at risk, it is imperative that schools and districts strive to meet the individual needs of these students by providing interventions promoting student success as early as fifth grade. Whatever the intervention, it is imperative that interventions be individualized and student focused. Despite wave after wave of reform efforts over the past 20 years, schools must implement reforms that “directly affected classroom practice—a strong schoolwide instructional program in mathematics, significantly increased teacher support and training (including in-classroom nonevaluator peer coaching), and organizational reforms to improve student-teacher interactions” (Balfanz & Byrnes, 2006, p. 156).

Access to an algebra course by Grade 8. The United States performance on the 2009 Programme for International Student Assessment (PISA), the 2009 National Assessment of Educational Progress, and the 2010 ACT results strongly indicate that reform is needed within the U.S. education system to improve the readiness and competitive position of most U.S. students (ACT, 2011). Interest in college readiness indicator systems stemmed primarily from concerns that approximately one half of entering postsecondary students did not meet placement standards and were not ready for college-level work (Kirst & Venezia, 2006). This gap between what high schools required for graduation and what colleges and universities required for college-level courses left many students inadequately prepared for postsecondary study. As a result, students failed placement tests and required extensive college-level remediation, therefore increasing the time and money spent toward earning a degree, and often reducing those students’ chances of college completion. In addition, the changing

economic and global landscape demands a workforce with ever increasing skills and education (Kirst & Venezia, 2006).

“The academic intensity of the student’s high school curriculum still counts more than anything else in precollegiate history in providing momentum toward completing a bachelor’s degree” (Adelman, 2006, p. xviii). There is a quantitative theme to the curriculum story that illustrates how students cross the bridge onto and through the postsecondary landscape successfully. The highest level of mathematics reached in high school continues to be a key marker in precollegiate momentum, with the tipping point of momentum toward a bachelor’s degree now firmly above Algebra 2 (Adelman, 2006). Unfortunately, not all high schools present adequate opportunity-to learn, and some groups of students are excluded more than others. For example, Latino students are far less likely to attend high schools offering trigonometry (let alone calculus) than White or Asian students (Adelman, 2006). Students from the lowest socioeconomic status quintile attend high schools that are much less likely to offer any math above Algebra 2 than students in the upper socio-economic status quintiles.

The Common Core State Standards (CCSS) Initiative represents one of the most significant reforms to U.S. education in recent history. The CCSS for Mathematics are organized by grade level in Grades K–8. At the high school level, the standards are organized by conceptual category (number and quantity, algebra, functions, geometry, modeling and probability, and statistics), showing the body of knowledge students should learn in each category to be college and career ready, and to be prepared to study more advanced mathematics. The CCSS mathematics pathway recommends students complete the content of 7th grade, 8th grade, and the high school Algebra I course in Grades 7 and

8, which will enable them to reach Calculus or other college level courses by their senior year.

Transition programs. The transition from elementary school to middle school and middle school to high school are challenging experiences for many students (Edwards & Edwards, 2007). For this reason, middle and high schools must seek ways to ease the transition experience. Successful transition programs begin during the sixth- and eighth-grade years and involve the parents, students, and teachers from both schools in an effort to acclimate students to middle and high school. During the multiple events, the students' fears, academic concerns, social needs, and emotional needs are addressed (Edwards & Edwards, 2007). Students are presented with information and expectations of middle and high school. Eighth graders and their parents are given the opportunity to tour the high school campus. Most important, students begin to build relationships with teachers and counselors who will serve as their advocates in middle and high school.

Conclusion

The NCES defines a dropout as “a student who was enrolled at any time during the previous school year who is not enrolled at the beginning of the current school year and who has not successfully completed school” (Cataldi et al., 2009, p. 56). Dropping out is an evolving process rather than an event (Jimerson et al., 2000). The process starts prior to the child entering school and along the way the process manifests itself in a variety of risk characteristics such as truancy, disciplinary problems, and low school achievement (Jimerson et al., 2000). In order to understand the dropout crisis in the United States, it is important to recognize the theoretical models for thinking about the school dropout. Because dropping out of high school is a complex process resulting from

a multitude of factors, several theoretical models have emerged to explain the phenomenon (Rumberger & Lim, 2008). While these models do not vary greatly in predictor variables, the models differ in approach and understanding of underlying causes.

Using correlation and regression statistical analyzes, there was no statistically significant relationship between student mathematics achievement (as measured by the NYSED G4MT, G8MT, and IAMT) and dropping out of high school in a medium-size school district in the Lower Hudson Region of New York. The NYSED G4MT, G8MT, and IAMT achievement levels did not contribute significantly to the prediction of students dropping out of high school. However, there was a statistically significant relationship between student taking the NYSED G4MT, G8MT, and IAMT and dropping out of high school. Taking the NYSED G8MT and IAMT contributed significantly to the prediction of students dropping out of high school. Students taking the NYSED G4MT and G8MT were almost 3 times more likely to not dropout of high school. Moreover, students taking the NYSED G4MT, G8MT, and IAMT were 10 times more likely to not dropout of high school.

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