From dropout to degree: The GED pathway to and through Iowa community colleges

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From dropout to degree: 
The GED pathway to and through Iowa community colleges

by

Andrew Joseph Ryder

A dissertation submitted to the graduate faculty
in partial fulfillment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

Major: Education (Educational Leadership)

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Iowa State University
Ames, Iowa
2011

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DEDICATION

In honor of my family,
Joe, Sylvia, and Chris Ryder,
who shaped my character and showed me how to persist.

In memory of my maternal grandparents,
Edwin and Sadie Gilbert,
who gave me my love of learning and encouraged me to try.
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ABSTRACT

This study analyzed available individual-level data on the fiscal year 2004 cohort of Iowa GED candidates to identify demographic, economic, academic ability, and educational goal factors that predicted students’ success from earning the GED to completing a community college credential. The theory of planned behavior (Ajzen, 1985; Fishbein & Ajzen, 1975), persistence theory for adult learners (Bean & Metzner, 1985), and human capital theory (Becker, 1992; Schultz, 1961) supported a conceptual framework asserting that a positive GED experience, mediated by demographic, economic, and ability considerations, may contribute to increased aspirations toward additional schooling. Probit models were used to determine statistically significant predictors for earning the GED (e.g., age, Latino, Black, goal of earning GED), enrolling in community college (e.g., female, age, GED reading score, goal of attending college) and completing a community college credential (e.g., female, age, GED writing score, goal of transferring to a four-year institution). Discrete-time hazard analysis was used to model the conditional probabilities of credential completion from fiscal year 2004 to fiscal year 2009. The study represents a first-of-its kind analysis of GED students in the state of Iowa.
CHAPTER 1. INTRODUCTION

In his book *The World is Flat: A Brief History of the Twenty-First Century*, Pulitzer Prize winning columnist and author Thomas L. Friedman (2007) explained the advances and forces that have created our globalized economy. His thesis was that the revolution in information technology and the rise of developing economic powers such as China and India created global interconnectedness has blunted the United States' educational and economic competitiveness. He persuasively argued that Americans must pursue more education and gain more technical and flexible skills. Because “in a flat world there is no such thing as an American job. There is just a job, and in more cases than ever before, it will go to the smartest, most productive... worker—wherever he or she resides” (p. 279).

Since assuming office in January 2009, President Barack Obama has tried to convert this argument into national policy. For reasons of both personal and national economic security, the President has repeatedly called upon Americans to obtain more postsecondary education. In the midst of the greatest economic crisis since the Great Depression, the President addressed a joint session of Congress and challenged each American “to commit to at least one year or more of higher education or career training” (Obama, 2009, para. 66). His goal is that by 2020 the United States will regain the global economic advantage of having the highest proportion of adults with postsecondary education.

A major obstacle to raising the proportion of Americans with postsecondary education is the prevalence of high school dropout (Gonzalez, 2010). Recent data from the U.S. Department of Education show that the national rate of entering high school freshmen who graduate within four years, the Average Freshman Graduation
Rate (AFGR), at public high schools from 2001 to 2007 fluctuated between 71.7% and 74.7%. The AFGR for 2007 was 73.9% (Aud et al., 2010). A U.S. Department of Education report, citing data from the 2007 Current Population Survey, revealed that 8.7% of all 16-24 year-olds not attending school and residing in the United States had not earned a high school diploma or equivalent credential (Cataldi, Laird, & KewalRamani, 2009). The Pew Hispanic Center reported that dropout rates of Latino students may be as much as five times higher (Fry, 2010). President Obama (2010a) has acknowledged this problem, calling it “America’s dropout crisis” (para. 3) and noting that only 70% of entering high school freshmen ultimately graduate every year costing the U.S. over $300 billion annually in potential earnings.

In Iowa, public high schools’ AFGR consistently rank in the top 10 nationwide (Aud et al., 2010). Despite its ranking, Iowa is not immune from problems of high school dropout. Figures published by the Iowa Department of Education (2011) showed that the annual state dropout rate for students in grades 9-12 is trending upward. Since 2005, the dropout rate has increased nearly one and one-half percentage points, from 2.14% to 3.41% in 2010, the year for which the most recent data are available.

Scholarly literature in both education and economics documents the problems encountered by high school dropouts. Numerous studies have shown that high school dropouts earn significantly less over time than high school graduates (Cameron & Heckman, 1993; Heckman, Humphries, & Mader, 2010; Murnane, Willett, & Boudett, 1995; Rumberger, 1987; Song & Hsu, 2008). Rumberger (1987) asserted that dropouts have lower levels of academic skill making steady work and training opportunities harder to obtain, resulting in accumulating wage
disadvantages. Depressed wages drive up the expense of both government and philanthropically supported social service programs. Meanwhile, employed dropouts earn lower salaries and are contributing less in terms of sales, property, state, and federal taxes. Rumberger also suggested that dropouts have lower levels of physical and mental health. Levin (1972) identified further consequences that include increased criminal activity, lower civic engagement and voting, and reduced likelihood of intergenerational mobility. More recently, Song and Hsu (2008) found that, among dropouts, GED recipients, and high school graduates, dropouts lag far behind in political engagement as measured by voter registrations and voting in the most recent presidential election, volunteering, engagement in their children’s education as measured by assisting in learning activities, and self-reported personal health and use of preventive medical services. Song and Hsu noted that use of preventive medical care is likely strongly related to dropouts’ relative lack of health insurance coverage compared to that of GED recipients and high school graduates.

The General Educational Development program, or GED, has long been a means of addressing the dropout problem. The GED gives people who did not complete high school a second chance to obtain a high school equivalent credential by earning the GED certificate. Though some degree of selection bias may be the cause, Heckman, Humphries, and Mader (2010) asserted that GED earners enjoy higher average lifetime wages than dropouts who lack secondary school credentials. They found that wage differences appear to be somewhat greater for women (+1.7%) than men (<1%). Clark and Jaegar (2002, 2006) found that the GED has a particularly strong positive effect on wages for immigrants educated outside of the United States. Cameron and Heckman (1993) and Murnane, Willett, and Boudett
(1997) found that the GED has positive predictive benefits for pursuing further training and postsecondary education.

Since the advent of the GED in 1943 in the midst of World War II, over 17 million Americans have availed themselves of this second chance and earned this proxy for a high school diploma. In 2007, 600,000 Americans completed the full GED test battery with 429,000 people (71%) earning a passing score (GED Testing Service, 2008; Zhang, 2010). In 2007, 3,760 candidates in Iowa completed the full test battery and 3,722 (99%) candidates were awarded the high school equivalency credential. Iowa’s pass rate ranked first overall in the United States (GED Testing Service, 2008).

**Problem**

GED earners represent a large and largely uncultivated population of potential postsecondary students. The GED Testing Service (2008) reported that 60% of persons passing the GED in 2007 gave an educational reason for taking the test: 28% expressed the desire to attend a two-year college, and 21% planned to enroll in a four-year institution. These aspirations represent over 257,000 potential new students nationwide in some segment of postsecondary education, including 120,000 new students for community or technical colleges and 90,000 new students at four-year institutions. Yet, despite stated educational goals, less than one-third of GED earners enroll in postsecondary education (Reder, 2007). Higher rates of college participation and completion among GED earners would boost the percentage of U.S. adults with postsecondary education and contribute positively to the United States’ overall economic and intellectual global competitiveness.
While having GED earners reach their postsecondary educational goals would certainly contribute to improving nationwide educational attainment, the most significant effects would be felt at the individual and family level through upward economic and social mobility. It is difficult to be economically or socially mobile without a job. According to Bureau of Labor Statistics (2011) data, the people most adversely affected by lingering unemployment from the recession of 2007-2009 are those with the least amount of education. Current Population Survey data averaged between August 2010 to August 2011 revealed an unemployment rate of only 4.4% for individuals with a bachelor’s degree or higher. People with some college education (up to a two-year degree) had an unemployment rate of 8.2% while individuals with a high school diploma or equivalent had a 9.7% unemployment rate. The average unemployment rate for people with less than a high school education was a staggering 14.5%. Increased college enrollment and completion for GED earners may help shield them from some of the harshest effects of economic downturns.

Moreover, researchers at the Center on Education and the Workforce at Georgetown University argued that lack of education limits the employment options of persons with a high school diploma or less to low-wage jobs in the food service, sales, office support, and low-skilled blue-collar sectors. Their research has shown that the jobs in greatest demand are high-wage positions in managerial, health care, science and technology, education, and industrial sectors requiring a minimum of a postsecondary certificate (Carnevale, Smith, & Strohl, 2010). And, despite high levels of unemployment both during and after the declared end of the recession, as much as 32% of the nation’s manufacturers reported unfilled skilled positions
because candidates lacked the proper technical training (Manufacturing Institute, 2011). Successfully navigating the pathway from GED to college credential can help provide a sustaining wage and facilitate entry to the middle class.

Subsequently, the problem addressed by this study is that so few GED earners continue on to postsecondary education. Using data from the 2003-2004 cohort of GED candidates, this study reports that 41% of the students who earn the GED enrolled in some for-credit course or program at an Iowa community college prior to June 2009. Of those who enrolled in an Iowa community college, 15% completed a community college credential—either a short-term certificate or diploma or longer-term two-year degree—by the end of June 2009. While these results may appear frustratingly poor to policy makers, they compare quite favorably to national data on GED to postsecondary transitions. This study shows what the data reveal about the GED to college credential pathway in Iowa and argues the broader implications of the results for policymakers and practitioners.

**Purpose of the Study**

Despite Iowa’s relative success in moving high school dropouts from the GED program to college, the need for greater success at the national level remains. The purpose of this study was to analyze the available individual level data on the 2003-2004 fiscal year cohort of Iowa GED candidates and identify the factors that predict students’ success along the path of their journey from preparing for and earning the GED to enrolling in an Iowa community college to earning some type of for-credit community college credential.

While earning a community college credential is the culminating point for this study, each step along the pathway from GED to college degree marks a
significant educational milestone. Accordingly, this study examined the factors that contributed to each point of educational success: Earning the GED, enrolling in an Iowa community college, and earning a postsecondary education credential. The research also explored those factors that effect how long it takes GED earners who enroll in a community college to earn their postsecondary credential.

The pathway from GED to a community college credential is a road of educational attrition. Very few students who attempt the GED ever complete a postsecondary credential. While the national economy will continue to require low-skill, low-wage workers, the pressing national demand is for a more educated workforce. Jobs that require more education offer financially sustaining wages that facilitate entry to the middle class. This research revealed potential areas where state and federal education and training policy and community college practices can intervene and support students in achieving their educational goals.

Research Questions

This study was divided into four stages that represent GED students’ journey from GED to degree. The first stage of analysis examined candidates from preparation for the GED to completion of the test battery. The second stage studied GED completers’ enrollment in a for-credit course or program at an Iowa community college. Question one addressed the first phase, completing the GED between the time of enrollment in the GED preparation program in fiscal year 2004 through the end of fiscal year 2010. Question two focused on stage two, community college enrollment between earning the GED and the end of fiscal year 2009, as college enrollment data were not available beyond that point:
1. Among the 2003-2004 Iowa GED candidates, what factors (demographic, economic, academic ability, educational goals) predict successful completion of the GED?

2. Among students who earned the GED, what factors (demographic, economic, academic ability, educational goals) predict enrollment in a for-credit postsecondary education course or program at an Iowa community college?

A third stage of analysis examined factors that affect the community college outcome—earning a credential—for students who enroll in a for-credit program between completing the GED and the end of fiscal year 2009. Question three addressed this stage:

3. Among students who enroll in a for-credit postsecondary education program at an Iowa community college, what factors (demographic, economic, academic ability, educational goals) predict earning a community college credential?

A fourth and final stage of analysis extended the analysis of question three to examine time to credential within the six discrete time periods between fiscal year 2004 and fiscal year 2009. Question four investigated this stage:

4. Based on the factors examined so far (demographic, economic, academic ability, and educational aspirations) what is the likelihood of earning a community college credential over time?

**Theoretical Framework**

This study drew upon three theories to support its design and structure. The theory of planned behavior (Ajzen, 1985; Fishbein & Ajzen, 1975) provided guidance
on how goals and intentions guide behaviors. Because the outcome variables for the study related to a series of progressive educational achievements that build on one another—earning the GED, enrolling in community college, and earning a college credential—persistence theory (Bean & Metzner, 1985; Spady, 1970; Tinto, 1975) informed the research design. Lastly, earning a community college degree or certificate, or even completing a year of coursework has wage benefits that can dramatically improve economic prospects beyond what individuals can expect upon earning the GED (Grubb, 1995; Kane & Rouse, 1995, 1999). Human capital theory, concerned with the accrual of education, training, and other benefits that increase individuals’ productivity, (Becker, 1992, 1993; Schulz, 1961; Sweetland, 1996) drove educational intentions and clarified the overall significance of the study.

The Theory of Planned Behavior

The theory of planned behavior (Ajzen, 1985) extended Fishbein and Ajzen’s (1975) earlier theory of reasoned action. Both of these psychosocial theories explain how beliefs, attitudes, and intentions guide behavior. Belief is the information about an object that links it to a set of attributes. In this study, postsecondary education is the object, and among the set of attributes are basic aptitudes, such as reading, writing, and mathematics required for success in college and how education can improve economic opportunities. Attitudes are shaped by beliefs about the object, as well as positive or negative experiences with the object (Fishbein & Ajzen, 1975). GED candidates’ attitudes toward education may be ambivalent at best. For GED earners, however, their success may generate an attitudinal shift toward both the value of education as well as their ability to have educational success. Intention is
the plan or likelihood of performing behavior based on belief and attitude (Fishbein & Ajzen, 1975; Godin & Kok, 1996).

Reasoned action assumes that behavior is volitional and an individual “should perform those behaviors he intends to perform” (Fishbein & Ajzen, 1975, p. 15). Ajzen (1985) recognized that this assumption often does not always hold true because individuals may not be able to achieve what they intend because of lack of resources or abilities. He posited that putting intent into action requires a degree of perceived behavioral control that mediates intention (Ajzen, 1985). Greater perceived control, such as having the money, time, or academic ability to pursue postsecondary education, strengthens intention and grants a sense of agency (Ajzen, 1985; Madden, Ellen, & Ajzen, 1992). In this study, planned behavior was indicated by variables reporting GED candidates’ future educational plans upon obtaining the GED (e.g., keep or get a new job, enroll in college) and GED earners’ goals for enrolling in for-credit community college courses (e.g., transfer to a four-year institution, explore career options).

**Persistence Theory for Adult Learners**

Persistence theories attempt to explain why students dropout or remain in school until completing a degree. The most widely cited persistence theory is Vincent Tinto’s student integration model, which holds that students’ integration into the social and academic aspects of their institution, plus student investment in academic goals and their institution, equals a greater likelihood of persistence through degree completion. Tinto’s theory relies heavily upon students’ social experience. GED earners who continue on to a community college may be nontraditional students who attend school part-time or intermittently skip one or
more semesters, work full-time, and live with family. As such, they are more likely to be rooted in their home and work lives instead of the campus academic and social environment.

Bean and Metzner (1985) proposed a theory for adult learners that relies less on social engagement and is more appropriate to the study of GED earners who go on to college. They theorized that adults’ college persistence decisions are most directly determined by background variables (demographics, enrollment status, educational goals), academic variables (study habits, advising, course availability), environmental variables (finances, hours worked, family), academic performance, psychological outcomes (goals, satisfaction), and intent to leave. Bean and Metzner’s persistence theory was operationalized in this study with various background and financial variables, as well as indicators of educational goals.

**Human Capital Theory**

Human capital theory helped explain why earning a GED and continuing to pursue additional education are important. The individual economic benefits of accruing additional human capital through additional education are both an outcome of the study as well as an impetus for GED candidates’ and GED earners’ educational pursuits. Economist Adam Smith introduced human capital theory in 1776 in *The Wealth of Nations*, writing that workers contributed not only raw labor, but also qualitative inputs of their individual skills and abilities (Sweetland, 1996). It was not until the 1960s however that the role of education in advancing human capital was established by Nobel laureate Theodore Schultz (1961), who cited adult education programs as one of the ways of developing human capital. Human capital theory explains how educational attainment drives individuals’ economic
wellbeing (Davis & Noland, 2003). Education is considered a long-term investment that yields economic returns long after education costs are paid (Becker, 1992; Schenk & Matsuyama, 2009).

**Methodology**

This study used a quantitative research design. Specifically, the research was a post hoc analysis of a student-level dataset provided through an agreement with the Iowa Department of Education’s Division of Community Colleges and Workforce Preparation.

The dataset can be described as having two parts. Part one of the dataset included pre- and post-GED information for students who were candidates for the GED in Iowa between the beginning of July 2003 and the end of June 2004. GED candidates were tracked through fiscal year 2010. GED program administrators collected these data using the Comprehensive Adult Student Assessment Systems (CASAS) Tracking of Programs and Students (TOPS) system. Variables include demographic and economic characteristics, educational goals or aspirations declared by candidates upon enrolling in the GED preparation program, pre-GED preparation academic ability scores, GED test scores, and an indicator as to whether individual candidates passed the GED tests.

Part two of the dataset included enrollment and academic progress data (exclusive of grades or grade point averages) for GED earners who enrolled in for-credit courses at Iowa community colleges during the six fiscal years between 2004 and 2009. These data come from the Management Information System file of Iowa community college students as supplied by Iowa’s 15 community colleges.
Variables include demographic and economic characteristics, goals or aspirations for community college study, and credentials earned.

The methods for data analysis included descriptive statistics, probit and ordered probit regression, and event-hazard analysis. Ordered probit regression was appropriate to questions with ordered categorical outcomes (did not take the GED, did not pass the GED, passed the GED), such as research question one (Long & Freese, 2006). Probit regression was facile for multiple continuous and categorical independent variables and dichotomous outcomes, such as research questions two and three (Allison, 1999; Gujarati, 2006; Hoffmann, 2004; Long & Freese, 2006). Event-hazard analysis permitted the analysis of the likelihood of a result over a defined period of time and allowed time to be used both as an outcome as well as a predictor (Kleinbaum & Klein, 2005; Singer & Willett, 2003). A discussion of analytic methods for each research question is presented in Chapter 3.

Limitations

This study is limited to the 2003-2004 cohort of GED candidates in the state of Iowa. The individuals in the study were tracked as they progressed from GED candidacy to earning the GED to enrolling in an Iowa community college to earning a postsecondary credential. Individuals who did not transition from one educational stage to the next, i.e., move from GED candidacy to earning the GED, were not included in the next stage of analysis.

Because Iowa allows students to enroll in for-credit courses without a high school diploma or its equivalent, some individuals who were GED candidates enrolled in a for-credit program at an Iowa community college despite not earning the GED. These individuals were not included in this analysis as the study was
limited to those persons who earned the GED. Additionally, some individuals in the GED preparation dataset enrolled in for-credit courses in an Iowa community college prior to 2003. These individuals were also not included in this analysis.

Persons over the age of 50 at the time of GED candidacy were not included in this analysis. The numbers of GED candidates over the age of 50 were very low and the time horizon from earning the GED to obtaining a community college credential may negate the long-term human capital benefits of securing additional education and training for older students.

Only those GED earners who enrolled in an Iowa community college were tracked beyond the GED. While it is possible and even likely that some GED earners moved out of state during the period of analysis or that some individuals living in Iowa attended an institution across state lines in Illinois, Minnesota, Missouri, Nebraska, South Dakota, or elsewhere, they were not tracked in this study.

Lastly, earning an academic credential through for-credit coursework was considered the ultimate outcome for individuals in this study. However, many GED candidates and GED earners may also participate in noncredit community college programs that also provide educational and economic benefits. Noncredit courses and programs were not included in this analysis because of the lack of available data indicating program completion.

**Significance of the Study**

President Obama (2009; 2009a) has called upon Americans to invest in at least one year of postsecondary education so individuals can obtain jobs in emerging fields and so our nation can remain economically competitive compared to other nations. Pundits and academics alike have repeatedly advised that jobs in greatest
demand, and those jobs least likely to be moved offshore, are those requiring a year or more of college (Carnevale, Smith, & Strohl, 2010; Friedman, 2007). The people who pass the General Education Development test each year represent both a significant pool of potential postsecondary students as well as a population of individuals who could directly benefit from further education.

By following the Iowa 2003-2004 GED candidate cohort from test preparation through community college enrollment until the end of the 2009 fiscal year, this research investigated the viability of the GED as a pathway to a community college credential. By identifying the demographic, economic, academic ability, and academic goal factors that contributed to GED earners’ postsecondary success, recommendations for GED and community college administrators and education policy makers are presented to make this alternate route more navigable for students and more productive for the State of Iowa and the nation.

GED preparation in Iowa occurs only through the programs offered at the state’s community colleges and their affiliate community centers. As a practical matter, this study represents the first analysis of Iowa GED candidates from GED preparation through college enrollment and the attainment of a credential. From examination of variables in the GED dataset to matching GED attainment with community college enrollment, this research uncovered descriptive data previously unexplored by the Iowa Department of Education. This study provides analysts in the adult education and community college divisions of the Iowa Department of Education with new insights into data they have collected as well as a methodology for understanding the impact of GED preparation and GED to community college transition programs throughout the state.
Definitions

Academic transfer goal – A goal students may declare upon enrollment in a credit program at an Iowa community college. The goal is to complete courses at the community college level, often up to completion of an associates degree, in order to transfer to a four-year college or university.

Basic skills – Basic skills refers to remedial reading, writing, mathematics, or other skills typically below the level necessary to successfully complete the GED program. Improving basic skills is a goal option for GED candidates upon start of the preparation program, appearing on a list of choices in the Comprehensive Adult Student Assessment Systems (CASAS) Tracking of Programs and Students (TOPS) system used to register and track GED students.

Community college credential – an award for academic achievement at a community college that signals successful completion of a prescribed academic program. The program may be a short-term (one month, six weeks, one academic term) certificate-awarding program, a one-year diploma program, or a two-year program that awards an Associate of Arts or Associate of Arts and Sciences degree.

Discrete-time hazard analysis – a quantitative research method that uses time, as well as other continuous and categorical variables to predict the likelihood of a target event (i.e., earning a college credential) occurring in a single one of a series of time periods (i.e., a semester or fiscal year) and the probability of an event occurring by the end of time as measured in the analysis (Singer & Willett, 2003).

General Educational Development or GED – a battery of tests covering five subject areas (writing, reading, mathematics, science, and social studies) that is the most commonly pursued alternative credential to the traditional high school
diploma (Tyler, 2005). “GED” is often used interchangeably to refer both to the battery of tests as well as the credential it provides.

GED candidate – an individual who enrolls in the Iowa GED preparation program to develop the necessary skills to successfully complete the GED test battery.

Human capital theory – a theory from the field of economics that explains the relationship between additional education or training and improved economic and social opportunities (Schultz, 1961; Becker, 1992).

Persistence theory for adult learners – a theory from the higher education literature used to explain how adult learners decide to enroll in and finish a college program or choose to stop-out or dropout of postsecondary education. The theory focuses on the relationships between students’ backgrounds, academic performance, personal circumstances, goals, and satisfaction and their intent to persist to completion or leave (Bean & Metzner, 1985).

Theory of planned behavior – a psychosocial theory explaining how beliefs, attitudes, intentions, and perceived control governs human behavior. Previous experiences form a feedback loop to reshape beliefs and attitudes while the level of perceived control mediates intent to act (Ajzen, 1985).
CHAPTER 2. REVIEW OF LITERATURE

For high school dropouts, the GED represents the most commonly utilized second chance for obtaining a high school credential (Tyler, 2005). By itself, however, the GED is rarely enough to bolster economic and life opportunities as GED recipients perform only marginally better than non-credentialed dropouts and lag behind high school graduates on nearly every key economic indicator (Cameron & Heckman, 1993; Heckman & LaFontaine, 2006; Murnane, Willett, & Boudett, 1995). GED earners best capitalize on the achievement of completing their high school credential when they pursue further education (Grubb, 1995; Kane & Rouse, 1995, 1999). The path most followed to postsecondary education winds through community colleges, given both their access-oriented mission and their efforts in remedial and adult education and transitioning GED earners into additional training and educational programs (Bragg, Kim, & Barnett, 2006; Cohen & Brawer, 2008).

This chapter provides a comprehensive review of the literature on the GED and the GED pathway to and through community colleges. The first section sets the GED in context of the community college mission both nationally and in the state of Iowa. The second section provides an overview of the General Educational Development credential, including its history and the format and measurement properties of the test battery. Next, factors contributing to high school dropout and the ramifications of failure to complete high school are explored. The fourth section reviews literature from economics and education on the consequences of earning the GED, particularly compared to high school graduates. The final section examines the pathway from earning the GED to enrolling in a credit-bearing postsecondary education program and earning a credential.
The Community College Mission and the GED

Basic skills and remedial instruction are part of the diverse and varied missions of community colleges (Bogart, 1994; Cohen & Brawer, 2008; Lorenzo, 1994; Oudenhoven, 2002). Remedial education has been part of their mission since the advent of community colleges, while adult education—including GED preparation—emerged following World War II (Spann Jr. & McCrimmon, 1994; Ratcliff, 1994). Bailey and Morest (2004) have described such programs as part of community colleges’ “horizontal” (p. 7) mission of actively reaching out to people of varying skills across their service areas.

Perhaps students for whom basic or remedial education is intended were under-served in their previous educational experiences. It could be that basic skills students performed poorly in high school and their tenuous skills have atrophied over time, or maybe they dropped out of high school altogether out of frustration with traditional schooling models or due to illness or family responsibilities. These students may lack basic literacy and numeracy skills, have become unemployed, have been rendered homeless, or have recently immigrated to the United States without language skills necessary to navigate their new community (Ratcliff, 1994). Whatever their experiences, a significant number of people in American society are likely to need basic or remedial education before attempting collegiate-level instruction. While community college missions vary across localities and states, adult basic and adult secondary education, as well as GED preparation, are often overlooked as ways community colleges expand access to education (Dougherty & Townsend, 2006; Ratcliff, 1994).
Community colleges typically offer adult basic and secondary education programs and GED preparation as part of their array of noncredit courses and programs (Cohen & Brawer, 2008). Some students enrolling in these programs may only be functionally literate, but seek a path to increased education and enhanced personal and economic opportunities. For these students, noncredit education represents a more affordable, less risky path toward credit-bearing postsecondary training and education. While many noncredit programs are offered on community college campuses, GED preparation and remedial courses in most states are also delivered at community centers, workforce training centers, houses of worship, or homeless shelters in an effort to deliver services in proximity to the students for whom they are intended. And, course times are often arranged to fit an array of individual schedules. Furthermore, noncredit basic or developmental courses may serve as a “bridge” (Grubb, Badway, & Bell, 2003, p. 220) to for-credit opportunities once students have demonstrated relevant academic competencies.

The structure and organization of GED program delivery in Iowa is similar to that in most other states. In Iowa, GED preparation and testing programs are part of the state’s adult literacy program and administered by the Iowa Department of Education. A distinguishing factor for Iowa is that all GED preparation and testing occurs at the state’s community colleges or at campus-operated adult education centers using community college adult education instructional staff (Iowa Department of Education, 2009a, 2010a, 2010b). Adult literacy in Iowa is organized to include adult basic education (ABE), English-as-a-second language (ESL), and adult secondary education (ASE). ASE includes GED preparation (Iowa Department of Education, 2009b, 2010b).
Each Iowa community college also offers GED students assistance transitioning to postsecondary education or employment. Programs are determined by the local colleges and include assistance learning requirements of admissions, financial aid, and college-level work, as well as resume writing and interviewing. Academic skills covered include computer literacy, communications, and critical thinking. Iowa Lakes Community College, Iowa Central Community College, Iowa Western Community College, and Southwestern Community College employ Transition Specialists to move GED and developmental education students toward postsecondary enrollment. Several colleges, including Indian Hills Community College, Kirkwood Community College, and North Iowa Area Community College, have formed partnerships between GED and adult education and academic programs (e.g., Health Occupations, Advanced Technology, Welding, Certified Nursing Assistant training, Tool and Die) to establish postsecondary education pathways. The colleges also partner with Iowa Workforce Development, the United Way, and local businesses and industries to assist with GED students’ transitions (A. Harris, personal communication, August 23, 2011).

The General Educational Development Program

Origins and Early Development of the GED

The present day battery of General Educational Development tests originated as part of a series of efforts to increase the morale and further the education of U.S. Army enlisted soldiers during World War II (Strehlow, 1967). Developed at the request of the U.S. Army Institute, the GED tests originated in 1942 and were designed to measure soldiers’ cognitive skills relative to requirements for the armed services (Tyler, 2005). The GED provided soldiers who enlisted prior to high school
graduation with a credential they could use to reenter the workforce or to continue their education upon return to civilian life at the end of the war (GED Testing Service, 2008; Ginzberg & Bray, 1953; Houle, Burr, Hamilton, & Yale, 1947; Strehlow, 1967; Tyler, 2005).

The philosophical underpinnings of the GED crystallized in the 1930s as part of the Progressive educational movement. Reformers favored general education curricula emphasizing practical competencies such as democratic principles, work skills, reading, and general mathematics. They deemed subject-based college preparatory and vocational education programs to be of little value (Quinn, 2002). The scholars who would be instrumental in the development of the GED, as well as the American Council on Education (ACE), the organization that would eventually assume ownership of the test battery, supported the Progressive educational philosophy that promoted general education, emphasizing reading, mathematics, and work-related skills (Quinn, 2002; Tyler, 2005).

In 1942, the Army contracted with the University of Chicago to develop educational testing and evaluation procedures; the head scientist on the project was general education advocate Ralph Tyler (Quinn, 2002; Rachal & Bingham, 2004; Tyler, 2005). Among the tasks with which Tyler and his colleagues were charged was to provide a means for determining soldiers’ educational level to help them resume schooling once they returned to civilian life (Houle et al., 1947). The test they developed was the GED (Quinn, 2002; Tyler, 2005).

Among the civilian researchers Tyler called to join this effort was E. F. Lindquist, a testing expert from the University of Iowa. They agreed the best way to determine soldiers’ education level was through a battery of general education tests.
Their expertise guided them toward test instruments that could be easily and objectively graded and norm-referenced against results for other test takers of similar educational levels. Lindquist had already written the Iowa Test of Educational Development, a multiple choice test battery that included exams on natural sciences, reading, quantitative thinking, and social sciences, among others. And, the Iowa tests had already been norm-referenced on over 40,000 high school students in Iowa, making them an easy choice as the template to follow in developing the GED (Quinn, 2002; Tyler, 2005). By the end of 1942, the first GED tests were written and included sub-tests of English grammar, social sciences and history, natural sciences, humanities, and mathematics. Soldiers who had dropped out of high school to join the war effort were first able to take the GED in 1943 (Strehlow, 1967; Tyler, 2005).

In addition to the faculty members at the University of Chicago, the Army engaged a number of other civilians in its education programs for soldiers. In 1943, the Army retained the services of the American Council on Education to evaluate and develop a system to award academic credit for military service. ACE had been following the work of Lindquist and Tyler and had actively lobbied for reforms toward a general education curriculum in American high schools in the 1930s (Quinn, 2002). Given the alignment of the tests of General Education Development with their educational philosophy, it is not surprising that ACE determined that service members who passed the GED should be awarded with a credential of equivalent status to a high school diploma (Houle et al., 1947; Strehlow, 1967).

With the victory declared in Europe, troop demobilizations started in the late spring of 1945. When Japan surrendered that summer, service members left the field
of combat even more rapidly and the Army expanded efforts to prepare troops for reentry in civilian life, including job skills training and preparation for further education (Strehlow, 1967). However, Army and civilian education efforts to issue high school credit and diplomas to soldiers based on their service records were discouraged by the American Council on Education. Having received a copyright for the GED and having prepared a civilian version of the test battery, ACE encouraged the Army to use its tests instead (Quinn, 2002). A grateful nation welcomed home returning veterans and, as a result of the GI Bill, colleges and universities welcomed service members to campus. The GED was used to determine college readiness for veterans who had not completed high school (Tyler, 2005). ACE called for high school diplomas to be issued to returning veterans based on their GED scores, marking the origin of the GED as a high school equivalency credential (Quinn, 2002).

In early 1946, staff from ACE visited state education departments across the U.S. to promote the GED as a means of awarding high school credentials. By the end of the year, every state except Maine, Massachusetts, New Jersey, and New York awarded veterans high school credit or diplomas using results from the GED tests (Quinn, 2002).

**Early Growth and Critiques of the GED Program**

In 1947, New York became the first state to allow civilian high school dropouts to use the GED credential in place of a high school diploma (Quinn, 2002; Tyler, 2005). By mid-1948, 21 other states had followed and, to prevent students from taking the GED in lieu of finishing high school, states established minimum ages for taking the test battery, ranging from 18-22. Adoption of the GED for
civilian use increased slowly but steadily and by 1959, ACE announced that the number of civilians taking the test battery had exceeded the number of military veterans taking the GED. In 1963 the program was fully identified as a civilian program with the establishment of the GED Testing Service (C. A. Allen & Jones, 1992; Quinn, 2002).

In the early 1950s, the American Council on Education commissioned research on veterans’ college performance to demonstrate the benefits of the GED. Their efforts, however, revealed more shortcomings than advantages. This first study, conducted by Paul Dressel and John Schmid, found that students who scored an average of 55 out of 80 points on each subtest experienced success in college, but students with lower scores struggled. Consequently, they recommended raising the passing standard on the exam from the 7th percentile to the 50th percentile, norming the tests against current high school students, and adding writing samples to the test (Quinn, 2002).

Another ACE-hired researcher, Benjamin Bloom, a faculty member at the University of Chicago and former student of Ralph Tyler, conducted a re-norming study of the GED in 1955. Bloom also found that the passing norms—7th percentile—were far too low to represent any valuable knowledge or learning. Dressel and Schmid and Bloom all recommended raising the passing standards for the GED, but ACE chose not to act (Quinn, 2002).

Ralph Tyler refuted the results of the Dressel and Schmid report, but his own study yielded similar findings (Quinn, 2002). Tyler compared the college performance of GED recipients to the performance of high school graduates as part of a larger study of passing norms for the GED battery and found that GED students
fell short of those who obtained a diploma (C. A. Allen & Jones, 1992; Quinn, 2002). ACE formed a committee to report Tyler’s findings. To save face, the committee equivocated, noting that neither the GED test battery nor the completion of high school reflected all the qualifications necessary for success in college or the world of work (Quinn, 2002). Ironically, while ACE and educational researchers debated raising GED passing standards beyond the 7th percentile, public and political anxiety over the state of American education and science was on the rise in response to the Soviet Union’s successful launch of the Sputnik satellite.

**Expansion of GED Program in the 1960s and 1970s**

Participation in the GED testing program increased rapidly in the 1960s after incremental growth in the previous decade. In 1950, 36,500 people took the GED. In 1960, 61,000 people completed the full test battery and by 1969, the number taking the tests swelled to 293,500. The number of testing centers in operation had similarly expanded, growing from 563 in 1950 to 658 in 1960 to 1,566 in 1969 (General Educational Development Testing Service, 1978). Also in 1969, Nova Scotia became the first Canadian province to offer the test battery and the test was first published in Spanish. In 1971, a French edition was published at the request of education officials in the provinces of New Brunswick and Quebec (C. A. Allen & Jones, 1992).

Quinn (2002) and Tyler (2005) attribute the sharp increase in GED participation to the advent of Federal support for adult basic and secondary education programs as part of the Great Society legislation of the 1960s and baby boomers’ rise to adulthood. The GED was also considered a cost-effective method for providing further education and an educational credential by students,
instructors, and legislators alike. Quinn (2002) noted “Adult educators championed GED test instruction, which was far less costly than full-fledged high school completion programs and still capitalized on students’ motivation to secure a high school credential” (p. 50).

The Adult Basic Education Program was codified by Title IIB of the Economic Opportunity Act of 1964, the centerpiece legislation of President Lyndon Johnson’s War on Poverty. The act funded instruction for persons 18 years or older whose literacy or English language skills prevented them from getting or keeping a job (“Economic Opportunity Act,” 1964; Quinn, 2002; Tyler, 2005). The first state plans for Adult Basic Education were approved by the U.S. Department of Health, Education, and Welfare in 1965 and all states began delivery of these programs in July 1966 (Tyler, 2005).

Tyler (2005) noted three further events in the 1960s that contributed to the surge in GED participation: The advent of the Federal Guaranteed Student Loan program in 1965, the Vietnam War, and the Civil Rights Movement. Applicants to the loan program were required to have a secondary education credential. Tyler argued that high school dropouts likely chose obtaining a GED and continuing on to college with help from the Guaranteed Student Loan program rather than going to war in Vietnam. The Civil Rights Movement emphasized increased education as a route to political and economic equality for African-Americans. Combined with increased federal support of education for the poor, this commitment to education helped bolster African-American participation in GED programs.
Changes in the GED Program Since 1978

In 1978, ACE and the GED Testing Service released the first major revision of the GED tests since 1942, reducing the amount of reading required of test takers. Math questions were changed to be more practically oriented and the overall testing period was reduced from 10 to six hours (Tyler, 2005). In 1979, the GED Testing Service published the first practice tests for the GED (C. A. Allen & Jones, 1992).

In 1980, the American Council on Education and the GED Testing Service increased the subtest passing score from 35 to 40, or from the 7th to the 16th percentile of the high school comparison group. ACE made the change because the official passing score of 35 was too close to the likelihood of passing by guessing at random. However, the exam period was also increased from 60 to 75 minutes per subtest (Quinn, 2002).

ACE responded to calls for higher standards in secondary education in the 1980s by including a 45-minute essay portion in the writing skills subtest. This third generation test was released in 1988 and essays were graded on writing mechanics and students’ abilities to support their arguments (C. A. Allen & Jones, 1992; Tyler, 2005). In the 1980s, elementary and secondary educators were responding to the report of the National Commission on Excellence in Education, A Nation at Risk: The Imperative for Educational Reform. The report, commissioned by the U.S. Department of Education under President Ronald Reagan, called for every high school student to complete four years of English, three years of math, science, and social studies, and at least one semester of computer science-related coursework (National Commission on Excellence in Education, 1983). All but 12 states raised their high school graduation requirements in response to the report and 18 states added competency
tests for high school graduation (Quinn, 2002). Changes to the GED seemed minor in comparison.

The fourth generation of GED tests was released in 2002 and these tests are in use at the time of this writing by the GED Testing Service (Tyler, 2005). The 2002 tests came from revisions to the 1988 forms performed in the late 1990s by content specialists in English, math, science, and social sciences. Changes to the tests were designed to align the GED Tests with national secondary curricula standards (Ezzelle & Setzer, 2009). In addition to an emphasis on adult contexts and practical applications, changes included adding essay organization to the scoring rubric for the writing test and, for the first time, allowing students to use a calculator on the math subtest (Ezzelle & Setzer, 2009; Tyler, 2005).

Over the past twenty years, a significant change in the GED has been in the age of the test-takers (Quinn, 2002; Rachal & Bingham, 2004). At the start of the civilian-based GED program, candidates for the GED had to be at least 20 years of age. This requirement was intended to discourage students from using the GED as a substitute for completing high school (Quinn, 2002). While the largest age group of GED candidates continues to be those 20 to 24 years of age, Rachal and Bingham (2004) found a steady rise in candidates as young as 16 and 17 years. They also found that, in 1989, 1.1% of GED test-takers were 16 years old and 6.7% were 17 years old. By 1996, those percentages had increased to 2.6 and 11.0, respectively, and to 2.9 and 11.4 by 2001. Between 1996 and 2001, the number of 16 year olds taking the GED increased by 42%, while the number of 17 year olds taking the GED increased by 32%. Growth of 16 and 17 year olds taking the GED far outstripped overall growth in the GED program (27%) during the same five-year period.
The 2002 Series GED Tests

The research and analysis included in this study are based on results of the 2002 series revision of the GED test battery. The technical manual outlining the philosophical underpinnings, curricular focus, and measurement properties notes that this battery of tests assesses content knowledge reflective of high school attainment. In a change from the 1930s reformist philosophy that eschewed college preparatory and vocational education and guided the development of the first tests, the 2002 GED series places “an increased emphasis on the workforce and higher education” (Ezzelle & Setzer, 2009, p. 2). Similar to previous test versions, the 2002 series GED measures candidates’ cognitive abilities relative to a sample of graduating high school seniors. The 2002 series is not intended to measure non-cognitive skills such as leadership, ethics, or personal responsibility.

Test structure and format. The 2002 series GED test battery consists of five subtests: Language Arts, Writing; Language Arts, Reading; Social Studies; Science; and Mathematics. The Language Arts, Writing test consists of a section of multiple-choice questions focused on document editing and a section requiring test takers to write an essay in response to a prompt and use supporting examples from their own experiences. The Language Arts, Reading exam tests students’ reading comprehension by presenting a short text followed by a series of multiple-choice questions. The Social Studies and Science tests require students to read and interpret various source materials (i.e., texts, charts, maps and other graphics) to correctly answer multiple-choice items. The Mathematics test consists of two parts; students are issued a calculator to assist with part one, but all calculations in part two must be performed by hand. Total time allotted to complete the full test battery
is 425 minutes, or just over seven hours (Ezzelle & Setzer, 2009). Table 1 summarizes the format, content areas, and time allotted for the five subtests.

**Scoring.** Even though the number of items on each test in the GED battery differs, each test has a standard score range of 200 to 800. Percentile ranks are also reported; a test taker’s percentile rank on any given test shows the percentage of other examinees earning a lower score (Ezzelle & Setzer, 2009). Tests are scored according to classical test theory, which holds that the reported test score is the sum of a respondent’s true score plus an error score that accounts for varied item difficulty as well as intentional and unintentional distractors introduced into test items (M. J. Allen & Yen, 2002; Lord & Novick, 1968).

Standardized scores permit comparison of an examinee’s achievement across the five content areas. Each GED subject test has more than one test form and the use of standard scores accommodates for slight differences in difficulty among the test forms. The scale mean for the GED is 500 and one standard deviation equals 100 points. The standard scores and percentile ranks were derived from test results from a nationally representative cohort of graduating high school seniors who took the GED tests during a norming study conducted in 2001 (Ezzelle & Setzer, 2009).

The written essay portion of the Language Arts, Writing test is scored by trained readers. The essay evaluation rubric includes: Response to the prompt, organization, development and details, conventions of edited American English, and word choice. Essays are evaluated on a four-point scale where one is low and four is high. Two readers review and score each essay, and the mean becomes the officially recorded score (Ezzelle & Setzer, 2009).
## Table 1

Format and content of the 2002 Series GED tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Format</th>
<th>Time Allotted</th>
<th>Content Emphasized</th>
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<tbody>
<tr>
<td>Language Arts, Writing</td>
<td>Part one: 50 multiple-choice questions, based on written texts</td>
<td>Part one: 75 minutes</td>
<td>Part one: • Organization of text, including editing decisions</td>
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<td>• Sentence structure</td>
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<td>• Language usage</td>
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<td>• Mechanics</td>
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<td>Part two: Written essay</td>
<td>Part two: 45 minutes</td>
<td>Part two: • Expository writing</td>
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<td>• Present an opinion or explain a situation</td>
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<td>Language Arts, Reading</td>
<td>40 multiple choice questions, based on written texts</td>
<td>65 minutes</td>
<td>• Literary and non-fiction texts</td>
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<td></td>
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<td>• Reading comprehension</td>
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<td></td>
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<td>• Interpretation and application of texts to new situations</td>
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<tr>
<td>Social Studies</td>
<td>50 multiple choice questions, based on written and visual texts</td>
<td>70 minutes</td>
<td>• U.S. history</td>
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<td>• World history</td>
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<td>• Civics and government</td>
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<td>• Geography</td>
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<td>• Economics</td>
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<tr>
<td>Science</td>
<td>50 multiple choice questions, based on written and visual texts</td>
<td>80 minutes</td>
<td>• Physical science</td>
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<td></td>
<td></td>
<td>• Life science</td>
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<td>• Earth and space science</td>
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<tr>
<td>Mathematics</td>
<td>Part one: 25 multiple choice and self-recorded answer questions; calculator-assisted</td>
<td>Part one: 45 minutes</td>
<td>Part one: • Number operations and number sense</td>
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<td></td>
<td>• Measurement and geometry</td>
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<td></td>
<td>• Data analysis, statistics, probability</td>
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<tr>
<td></td>
<td>Part two: 25 multiple choice and self-recorded answer questions; no calculator</td>
<td>Part two: 45 minutes</td>
<td>Part two: • Algebra, functions, and patterns</td>
</tr>
</tbody>
</table>

**Passing standards.** Passing standards for the GED 2002 series tests are also based on the results of the norming study. A GED advisory panel, as well as experts in the fields of adult education and psychometrics, examined the test scores and results from the norming study. They compared the failure rates of the high school seniors with those of examinees using the previous test edition, the 1988 series GED. While the failure rate for the new Mathematics test was 6% higher, failure rates for the other new tests were similar to the 1988 battery. Based on their norming data, the GED panel of advisors and experts set the passing standard for the GED at a score on each test of 410 and an overall average score of 450 across the five tests. These experts set the passing standard to reflect a high level of achievement of GED candidates without far surpassing the performance of recent high school graduates (Ezzelle & Setzer, 2009).

**Test reliability and validity.** Very few studies of the reliability and validity of the 2002 series GED tests have been published, and no studies independent of the GED Testing Service and the American Council on Education are readily available. The Technical Manual for the 2002 series GED tests notes that the K-R 20 reliability coefficient is used to measure internal consistency (Ezzelle & Setzer, 2009). The K-R 20 reliability coefficient ranges from 0 to 1 and can be interpreted in the same manner as Cronbach’s alpha. The benefit of the K-R 20 coefficient to the GED, however, is that it may be used for items with dichotomous responses such as correct or incorrect (Carmines & Zeller, 1979). K-R 20 coefficients reported by the GED Testing Service for the various forms of the test range from .92 to .96 (Ezzelle & Setzer, 2009; Robinson, 2008). The K-R 20 coefficient has the advantage of also being
a good measure of reliability among related forms of the same test (Kuder & Richardson, 1937).

The GED also uses the standard error of measurement, or SEM score, as a measure of reliability. A lower SEM score is preferable. Because every test is subject to some form of measurement error, the SEM score shows the estimated variance between the reported score on an imperfect test and the true score on a test free of measurement error (Ezzelle & Setzer, 2009; Robinson, 2008). Reliability on the 2002 series GED essay tests are produced through inter-rater reliability, where two or more evaluators read and score the same essays according to the GED Testing Service scoring guidelines (Robinson, 2008).

The GED Testing Service used three checks to make sure the 2002 series GED tests satisfy their intended purpose: Measuring knowledge of high school core content (Ezzelle & Setzer, 2009). One measure used by the GED Testing Service is content validity. Outside experts in mathematics, science, history, political science, geography, English, and other content areas assisted with item development (Robinson, 2008). A second measure employed by the GED Testing Service is the validity of the internal test structure, as determined by nonlinear exploratory factor analysis. This technique, used to establish construct validity, makes certain that each subject test represents a single construct and all subject test items measure that construct (Carmines & Zeller, 1979). The proportion of variance accounted for each 2002 series GED subtest is reported by the GED Testing Service and ranges from .41 to .60 (Ezzelle & Setzer, 2009). Lastly, the GED was tested against external measures of the high school academic proficiency, also known as criterion-related validity (Carmines & Zeller, 1979). External references included the high school grades and
previous high school instruction of those high school seniors who participated in the 2002 series GED standardization and norming studies (Ezzelle & Setzer, 2009).

Lastly, validity checks were performed to determine if test items were easier for certain subgroups of respondents to answer correctly than others. Test items that behave this way have differential item functioning (DIF). The GED Testing Service checks for DIF by comparing the likelihood of overall success, as measured by the total raw score, for two groups—a focal group and a reference group—using a two-stage Mantel-Haenszel (M-H) procedure. DIF checks are performed for gender, languages other than English, and for non-White racial and ethnic groups (Latino, American Indian/Alaska Native, Asian, Black, Native Hawaiian/Pacific Islander). No check for DIF is performed for age groups. Because sample sizes for test development studies were too small, DIF checks were made using completed GED tests where the examinees gave permission for their tests to be used in research (Ezzelle & Setzer, 2009; Robinson, 2008).

The first stage of the M-H procedure matches the total raw scores of a reference group (i.e., Whites) and focus group (e.g., Asians) on specific items. Then an odds ratio is calculated that compares the likelihood of correct responses by the reference group with the likelihood of correct responses by the focus group. Odds ratios are then converted to absolute values on a delta scale. Items with absolute delta values higher than 1.5 and significantly greater than 1 are removed from calculations for the second stage of the DIF process. The second stage repeats the first stage process, excluding the removed items, with additional items being flagged for reconsideration (Ezzelle & Setzer, 2009).
Final decision over excluding test items for potential bias rests with a panel of expert reviewers. Analyses performed for 18,480 possible test items on the 2002 series GED tests (11 test forms x 240 items per form x 7 comparison groups) resulted in 435 DIF items (2.4%). The Language Arts, Writing test had the highest incidence of dubious test items (178) and the focal groups with the greatest number of DIF items were White-Asian (184) and primary language other than English (114; Ezzelle & Setzer, 2009; Robinson, 2008).

The GED in Iowa

While the states may stipulate higher GED passing standards, Iowa follows the baseline recommendations of the GED Testing Service and the American Council on Education (Iowa Department of Education, 2010c). Iowa GED candidates must achieve a score of at least 410 on each test in the GED battery, with an average score of 450 on each test. Known as a compensatory scoring model, this flexibility allows candidates to offset a weaker performance on one test with a stronger performance on another (Ezzelle & Setzer, 2009).

Iowa adults lacking a traditional high school diploma may seek either a community college adult high school diploma by passing a series of courses offered through the community college or a high school equivalency diploma by completing a community college-based GED preparatory program and passing the GED tests. The high school equivalency diploma route has proven far more popular, as fewer than 70 community college adult high school diplomas were awarded in 2008 and fewer than 160 were awarded in 2009. Total statewide GED enrollment, while down since 2007, was over 10,000 in 2008 and 9,300 in 2009 (Iowa Department of Education, 2009a, 2010b). This dramatic differential is likely explained by the
structured course and enrollment requirements for the community college adult high school diploma, compared to the more independent, self-directed test preparation required prior to sitting for the GED tests.

In 2008, 5,999 candidates sat for the GED tests in Iowa. The average GED candidate was a 25 year-old White male who had completed 11th grade and been out of school for seven years. Reasons most often reported by candidates for earning the GED were personal satisfaction (56%), to get a better job (45%), and to attend a two-year college (29%). Of these candidates, 65% completed the tests and 99% of completers earned their GED diploma, giving Iowa the nation’s highest pass rate (Iowa Department of Education, 2009b).

The High School Dropout Problem

In Iowa and across the nation, the GED primarily serves those persons who did not finish high school and earn a diploma: High school dropouts. Determining high school graduation and dropout rates has been the subject of recent dialog among scholars, policymakers, and politicians. While the high school dropout problem has percolated since at least the 1960s, scholars continue to study the factors that contribute to students’ early departure from high school (Fry, 2010; Levin, 1972; Rumberger, 1987; Suh, Suh, & Houston, 2007). Despite the range of personal and societal consequences for failing to earn a high school diploma, high school dropout continues to plague American society, regardless of how graduation rates are measured.

Measuring High School Graduation and Dropout Rates

Various methods for calculating high school graduation and dropout rates are used by states, policy makers, and researchers, making consistent measures
difficult to find. Individual states have used different formulas for measuring high
school completion and, until very recently, have lacked unique data identifiers to
track individual student’s progress (National Governors Association, 2005).
Heckman and LaFontaine (2007) found that the many ways of measuring high
school graduation yield vastly different and sometimes overly optimistic results.
Rather than a national high school graduation rate of 85-90%, as reported by the
National Center for Education Statistics (NCES), they argue it is closer to 75-76%.
Heckman and LaFontaine studied varying measures and found that agencies such
as NCES and the U.S. Census Bureau rely on studies such as High School and
Beyond, the National Education Longitudinal Survey, and the National
Longitudinal Survey. They posit that each of these data sources inflates estimates of
high school graduation rates by as much as 10-15%. Over-estimation comes from
counting GED earners, excluding people who are incarcerated or institutionalized,
accepting proxy surveys from one family member for the entire household, and
improperly weighting random samples.

In 2005, the National Governors Association (NGA), under then-chairman
Mark Warner of Virginia, noted the challenges presented by the lack of student
identifiers and different state reporting formulas and acknowledged that data
inaccuracies likely meant a more troublesome high school dropout situation
(National Governors Association, 2005). Additionally, states faced new data
requirements under the No Child Left Behind Act of 2001 that prohibited states from
counting earners of GED diplomas, certificates of attendance, and adult high school
diplomas in their reporting of high school graduation rates (United States Congress,
2001). As a result, NGA recommended a new formula for all states to implement in
counting high school graduates and calculating graduation rates. Under the formula, only those students earning a high school diploma as well as students requiring more time to graduate because of educational needs are counted as graduates. Dropouts are classified as those individuals who earn a GED or an adult high school diploma, who cease attending school, or who transfer out of a school district without providing information on their new school district. The formula stipulated by the NGA is Graduation Rate = \([\text{on-time graduates in year } x] \div [\text{(first-time entering ninth graders in year } x-4) + \text{(transfers in)} - \text{(transfers out)}]\) (National Governors Association, 2005, p. 7).

The State of Iowa refers to this formula as the cohort graduation rate and first used it to calculate the high school graduation rate starting with the 2008 graduating class. Iowa applies the formula by dividing the number of on-time graduates in a given year by the cohort’s tenth grade enrollment, minus the number of students who transferred out, plus the number of students who transferred in to the state’s high schools (Iowa Department of Education, 2008). Prior to the 2006-2007 school year, the Iowa Department of Education calculated high school graduation and dropout rates by “dividing the number of high school regular diploma recipients in a given year by the estimated number of ninth graders four years previous” (Iowa Department of Education, 2006, p. 35). Ninth grade enrollment was estimated by summing the number of diploma recipients with the number of dropouts from the previous four academic years.

**Factors Contributing to High School Dropout**

Factors related to students’ families, their academic standing, and individual behaviors seem to be the primary predictors of dropout. Using data and variables
from the 1997 National Longitudinal Study of Youth, Suh, Suh, and Houston (2007) performed three different logistic regression models to examine socioeconomic status, academic achievement, and incidents of suspension as determinants of dropout. Their model investigating socioeconomic status showed students with a lower SES had a greater likelihood of dropping out of school if their mothers had low level of educational attainment, if they had moved from school to school, and had engaged in sex prior to age 15. Students with low academic achievement were more likely to dropout of high school when they had higher rates of absenteeism and lower levels of optimism about the future. Students who had been suspended were more likely to dropout of school, especially males, and if they had a history of fighting in school, or lived in a large-sized household. Having a positive outlook or optimism about the future, consistent with research on “self determined motivation,” played a strong role in each model in predicting graduation (Suh et al., 2007, p. 202). Additional research has argued that dropout is a process of educational disengagement that begins before students begin elementary school. A longitudinal study tracking 177 at-risk students in the Minneapolis area from birth to age 19 found that a poor home environment, inadequate early caregiving, low SES, and negative relations with peers contributed significantly over time to students’ risk of dropping out (Jimerson, Egeland, Sroufe, & Carlson, 2000).

**Ramifications of High School Dropout**

Research has shown that dropping out of high school has significant, negative personal consequences and societal impacts. While a generalization, the lack of a high school diploma signals lower academic skill and intellect, which makes finding continuous employment that pays a living wage difficult. Lower wage affects
accrue over time, reducing lifetime earnings. High school dropouts may also experience reduced levels of psychological wellbeing and poorer mental and physical health (Rumberger, 1987). Societal impacts include increased levels of unemployment contributing to an increased strain on the social safety net, lost earnings, lower tax revenues, and higher crime rates. Other effects are reduced political participation, increased financial stress on the public healthcare system, lack of engagement in children’s education, and stagnant social mobility. These effects are exacerbated for racial and ethnic minorities (Levin, 1972; Rumberger, 1987; Song & Hsu, 2008).

A Second Chance: Economic and Educational Outcomes for Earning the GED

“Especially where it concerns education, the United States is a land of second chances” (Tyler, 2005, p. 46). While the most commonly pursued second chance for high school dropouts is the GED, what is its value as measured by the economic and educational outcomes for people who earn the credential? Numerous studies have concluded that the GED does little to improve earners’ economic fortunes when treated as a terminal credential (Cameron & Heckman, 1993; Heckman & LaFontaine, 2006; Murnane, Willett, & Boudett, 1995; Tyler, 2005; Tyler, Murnane, & Willett, 2000a). Studies of future educational and training outcomes for GED earners offer greater optimism, though GED earners take longer to progress to a postsecondary credential (Osei, 2001; Reder, 2007; Tyler & Lofstrom, 2008). The challenge—and subsequent economic rewards—for GED earners appears to be earning college credit and some sort of postsecondary credential (Grubb, 1995; Kane & Rouse, 1995, 1999).
Earnings and Employment Returns to the GED

Wage and income studies from the fields of economics and education indicate that GED earners’ consistently experience stronger earnings and employment returns than high school dropouts without a secondary school credential and weaker returns than high school graduates (Tyler, 2005). Murnane, Willett, and Boudett (1995) found that wages for male GED earners grew at a slightly faster rate as they accrued work experience than did wages of non-credentialed dropouts. Potential employers seem to regard the GED as a measure of skills greater than those possessed by non-credentialed dropouts, resulting in better job prospects and earnings for workers with the GED (Tyler, Murnane, & Willett, 2000a, 2000b).

Relative to traditional high school graduates, however, GED recipients can expect lower wages and overall earnings. A recent study conducted by the GED Testing Service using nationwide data from the 2003 National Assessment of Adult Literacy showed that individuals with a GED earn, on average, $50 less per week than high school graduates. In terms of total person income (including salary, investments, interest, welfare, and other sources of income), GED holders average $4,300 less per year than high school graduates (Song & Hsu, 2008).

Not surprisingly, given wage and income results, economic data indicate that GED earners experience a lower probability of employment as well as lower wages than high school graduates (Cameron & Heckman, 1993; Heckman et al., 2010; Tyler, 2005). Heckman and LaFontaine (2006), correcting upwardly biased estimates from Current Population Survey data, found that men with the GED earned 1% less per hour than non-credentialed high school dropouts while male high school graduates with no college work earned 3.6% more per hour than non-credentialed dropouts.
They also reported that female GED earners averaged wages 1.7% more per hour than dropouts, while high school graduates earned 10.6% more than the same group of non-credentialed dropouts.

The greatest economic and human capital benefits of the GED appear to accrue to low-skilled, poor performing high school dropouts. Low-skilled Whites who barely passed the GED have been found to earn as much as 10-19% more than they would have without the credential. It appears that because lower-skilled high school dropouts have more ground to make up than higher-skilled high school dropouts, they gain the most by passing the GED, even if they succeed by only a slim margin (Tyler, Murnane, & Willett, 2000b).

The GED’s value as a signal of aptitude or ability appears to be particularly diminished by its inability to demonstrate the non-cognitive skills or predispositions most desired by employers: Motivation, personal responsibility, persistence, and accountability (Smith, 2003). In other words, having a GED says nothing about a person’s ability to show up to work on time, work with limited or no supervision, produce quality work, or see a task through from beginning to end.

Educational and Economic Prospects Beyond the GED

GED candidates appear to recognize that education beyond the GED can lead to better employment and financial prospects (Tyler, 2005). The GED Testing Service (2008) reported that 60% of 2007 GED candidates planned to pursue additional schooling; 28% planned to earn a two-year degree; and 21% intended to earn a four-year degree. Community college and adult education researchers have argued that the GED provides a gateway to postsecondary education for high school dropouts. Given the prevalence of GED preparation programs and the availability
of GED-to-college programs such as Massachusetts’ Transitions program and Florida’s GED PLUS College Preparation Program, community colleges are particularly well positioned to help GED earners (Bragg, Kim, & Barnett, 2006).

GED earners who go on to college lag behind high school graduates in such measures as college enrollment, time-to-degree, and graduation rates, but they also show promising signs for success given more time to attend and complete postsecondary schooling (Reder, 2007; Tyler & Lofstrom, 2008). A study of postsecondary enrollment patterns tracked a group of educationally at-risk Texas students from eighth grade in the mid-1990s until the mid-2000s. The study compared postsecondary enrollment for students in the data panel who earned a high school diploma with those students who dropped out and earned the GED. Three years after earning the diploma or GED, the dropout group had a discrete probability of being enrolled in postsecondary education that was 29% lower than that of high school graduates. The researchers constructed similar comparison groups using National Education Longitudinal Survey of 1988 (NELS:88) data and found that, when the time horizon was extended out from three to six years, the GED earners closed the enrollment gap by 11 points (Tyler & Lofstrom, 2008).

Tyler and Lofstrom (2008) contended that program administrators and GED earners themselves need to change their expectations from the GED as a terminal credential to a gateway to further education. Because research results indicate the GED alone only has significant positive effects for low-skilled dropouts, it is advantageous for GED earners to follow through on their declared plans and pursue additional schooling. Grubb (1995) and Kane and Rouse (1995, 1999), have demonstrated that even taking some college coursework yields wage gains.
Depending on pre-credential earnings and academic field, earning an associates degree can increase wages by an estimated 15-27% (Kane & Rouse, 1999).

The GED to Community College Pathway

GED programs exist within community colleges typically under adult and basic education programs designed to help high school dropouts of all ages earn a secondary school credential. Many states, including Iowa, have developed formal pathways or transition programs to help move students from basic skills to the GED to community college enrollment. Such programs “... support student transition by straddling secondary and postsecondary education, helping students overcome hurdles or fill in gaps that would otherwise stand in their way” (Bragg, Kim, & Barnett, 2006, p. 6).

Students in GED preparation programs represent substantial demographic diversity. Despite the general racial and ethnic homogeneity of Iowa, where the population is about 95% White, the composition of the 2003-2004 pool of GED candidates is far more diverse with over 9% Latino, nearly 15% Black, and approximately 15% receiving some sort of government assistance (State Data Center of Iowa, 2010). Similarly, the nationwide make-up of GED candidates reflects students who are typically underserved by K-12 and higher education: Recent immigrants, English as a Second Language students, prisoners, rural learners, racial and ethnic minorities, and people with significant financial needs from lack of skills and education (Bragg, Kim, & Barnett, 2006). Given its expansive open access mission, it is not surprising that the community college has become the primary portal through which these students not only earn their GED, but also enter into postsecondary education (Cohen & Brawer, 2008; Dougherty, 1987). The literature
covering GED earners’ experiences in four-year institutions is scant and silent when it comes to GED students’ experiences beyond the baccalaureate degree.

Recent scholarship has demonstrated that GED students’ postsecondary achievement often lags that of high school graduates (Tyler & Lofstrom, 2008, 2009). Murnane, Willett, and Boudett (1997) found that while GED recipients seek out more postsecondary education opportunities than other dropouts, by the age 26 less than 20% of GED earners finished a year or more of college. While as much as 60% of 2008 GED candidates reported plans to pursue education at a four-year, two-year, or trade or technical institution, national historical data reveal that only a small percentage will ever actually enroll (Heckman, Humphries, & Mader, 2010). A synthesis of research by John Tyler (2003) found that only 30-35% of GED holders obtain any postsecondary education and only 5-10% finish at least one year of college. A study of 1,000 randomly selected 2003 GED candidates, conducted by the GED Testing Service, showed that only 31% of the sample enrolled in postsecondary education by 2008 and more than three-quarters of enrollees attended a two-year college. Of the GED students in the sample who pursued postsecondary education, 77% enrolled for only one semester (Patterson, Song, & Zhang, 2009).

Because students most underserved by all levels of the educational establishment are also most likely to be at the lowest socioeconomic strata, it is important to understand how and whether the GED can provide a path to postsecondary education and subsequent life and economic opportunities. A study followed 12,144 students in the National Education Longitudinal Survey of 1988 (NELS:88) from 1988 until 2000 or eight years after expected high school completion. The study compared postsecondary participation of GED earners with high school
dropouts and high school graduates across socioeconomic backgrounds to determine whether the GED provides an equally viable pathway to postsecondary education across groups. This analysis showed the inequalities by socioeconomic status. The study concluded that for the most disadvantaged students, earning the GED fails to offer any significant improvement in completion of some postsecondary education over results for a similarly matched group students who dropped out of high school (Kurlaender, 2005). A similar study conducted by the GED Testing Service, using data from the Adult Education Surveys of 2001 and 2005 confirmed this link between low socioeconomic status and poor postsecondary completion for GED earners (Zhang, 2010). Additionally, across all socioeconomic levels, postsecondary participation for GED earners was found to be closer to that of dropouts than that of high school graduates (Kurlaender, 2005).

Several studies, however, provide hope for GED recipients’ postsecondary aspirations and achievement by studying student outcomes over several years. Soltz (1996) studied over 5,600 GED completers over a 23-year period at a large Midwestern community college and found that while GED students experienced higher rates of attrition, those students who remained at the college graduated with two-year degrees at the same rate as high school graduates. Female GED completers outpaced their male counterparts on the most important academic indicators: Credits attempted, credits earned, grade point average, and degrees awarded. More recently, a comparison of GED earners, high school graduates, and those persons without a high school credential provided positive evidence for the viability of the GED to postsecondary pathway (Reder, 2007). Analyzing population data from the 2005 National Household Education Survey and the 2003 National Assessment of
Adult Literacy, the study revealed that nearly 50% of all GED earners also completed a postsecondary credential.

Further, a longitudinal cohort study demonstrated that given more time, GED earners can close the gap in postsecondary attainment with high school graduates. Using a matched set of data on a cohort of academically at-risk students in the eighth grade in 1998, Tyler and Lofstrom (2008) found that students who dropped out of high school and earned the GED were less likely to enroll in postsecondary education than their matched peers who graduated from high school. GED earners also enrolled in fewer college credits than high school graduates, and lagged behind in postsecondary completion after three years. After six years, however, GED earners started to close the gap (Tyler & Lofstrom, 2008). These results appear to support Reder’s (2007) population-based findings and the assertion that the GED provides a navigable pathway for completers seeking a college education.

**Non-Academic Challenges on the Postsecondary Pathway**

Researchers assert that differences in postsecondary achievement between GED earners and high school graduates are likely the result of traits not at all related to academic or cognitive skills, but which powerfully influence schooling behavior (Reder, 2007; Soltz, 1996; Tyler & Lofstrom, 2008). One study argued that the difference in GED earners’ postsecondary outcomes is caused by life circumstances that follow many high school dropouts. “. . . It is probably not the educational credential—GED or high school diploma—per se that affects [postsecondary education], but rather the factors associated with the journey required to earn these credentials that are important” (Tyler & Lofstrom, 2008, p. 2).
The lower socioeconomic status of most GED earners may introduce family and economic stressors that put finding a job far ahead of working toward a college degree on students’ lists of priorities. Additionally, GED earners’ parents and peers are likely to possess lower levels of education and disregard the importance of educational attainment beyond high school (Reder, 2007; Strawn, 2007). Still further, high school dropouts who earn the GED and elect to pursue postsecondary education are much more likely to be first generation college students without any postsecondary experience to draw upon in figuring out the college enrollment process and what courses to take (Reder, 2007). A qualitative study that examined the barriers to postsecondary education for low-wage students attending one of several community colleges nationwide highlighted obstacles confronted by similarly situated GED earners. Among the most salient challenges were managing family demands such as childcare and sporadic medical or financial emergencies. The need to work as many hours as possible often trumped additional schooling, and many study participants reflected on the stress caused by discrimination from employers, landlords, and college personnel who denied them various work, housing, and academic opportunities because of their family and economic status (Matus-Grossman & Gooden, 2001). Such challenges provide for GED earners with quite a mountain to climb to contemplate, much less complete, postsecondary education.

**Institutional and Academic Challenges on the Postsecondary Pathway**

GED candidates and earners may be mystified by how to pursue postsecondary education at a community college or four year institution. Because these potential students are likely unfamiliar with what is entailed in attending
college, informing them about institutional structure and expectations is helpful (Beltzer, 1985). Specifically, GED recipients may require assistance understanding what is required for admission, obtaining financial, and paying tuition as well as academic advising and registering for the appropriate courses (Strawn, 2007).

In addition to enrollment management services that provide both personal support and encouragement, matriculating GED earners benefit from academic support services that teach time and stress management skills, counseling that ensures alignment of academic and career goals, and academic advising that helps keep course loads manageable (Alamprese, 2005; Beltzer, 1985). Poor course selection, too heavy an academic load, and coursework that is ill-fitted to career aspirations can increase students’ chances of stopping out or dropping out of college altogether (Beltzer, 1985). GED earners typically require more remedial coursework than students with a high school diploma and appropriate academic support services can help make sure time required for remediation does not discourage persistence in their intended academic program (Cameron & Heckman, 1993; Ignash, 1997; Strawn, 2007).

Adult education policy researchers have argued that community college GED preparation programs must better leverage their “internal organizational connections and services” with their connections to GED earners to more seamlessly facilitate college transitions (Alamprese, 2005, p. 5). More to the point, GED preparation programs must consider students’ goals and make sure those individuals who wish to pursue college not only have the ability to pass the GED, but also possess the skills to manage college level course work—including managing
multiple courses at the same time and completing homework (Alamprese, 2005; Reder, 2007).

Where preparation programs only focus on passing the GED, their graduates who succeed in college do so through innate ability and motivation. Reder (2007) asserts that the mission of the nation’s adult education system must expand from high school equivalency to college readiness. To accomplish this shift in mission, adult education and GED preparation programs should sharpen their focus on prose, document, and quantitative literacy. According to the 2003 National Assessment of Adult Literacy, these three areas are positively correlated with avoiding remedial coursework and higher overall grade point average (Reder, 2007). GED students’ development of reading skills has been found to be particularly important for success in college (Calcagno, Crosta, Bailey, & Jenkins, 2007). Where higher institutional commitment has been shown to strongly predict persistence for high school graduates, higher grade point average has been shown to predict persistence for GED earners (Beltzer, 1985; Reder, 2007). Given commitments GED students likely have to family, as well as their financial obligations to work, it is not surprising that those who do not experience academic success early on may choose to stop out or drop out altogether to focus work and wages.
CHAPTER 3. METHODOLOGY

This chapter details the methodology that guided this study. It begins with a brief overview of the analytic approaches used in the study. Next, the research design is presented through discussion of methods and procedures for data analysis, including the variables used in the study and the conceptual framework guiding the analysis. Finally, the limitations and delimitations of the study are enumerated.

Overview

Data analyzed in this study consisted of individual records for 11,675 Iowa GED candidates who enrolled in the GED preparation programs offered only by the state’s community colleges. Each of these individuals enrolled in GED preparation between July 2003 and June 2004. All data were collected by the Iowa Department of Education, and the dataset included two sections. The first section of data was for the full cohort of Iowa GED candidates who first enrolled during fiscal year 2004. Because candidates proceed through GED preparation at their own pace instead of following a set instructional calendar, this section of the dataset spanned from July 2003 until June 2010. The second section of the dataset included enrollment and credential data for Iowa community colleges collected between July 2003 and August 2009. The nature of the dataset permitted both cross-sectional and longitudinal analysis.

Descriptive statistics, ordered probit regression, and probit regression were used to conduct a cross-sectional analysis. Cross-sectional analysis of the credentialing process was augmented using discrete-time hazard analysis to examine community college credentialing data longitudinally. Together, these analyses described the characteristics and identified key factors predicting the
success of Iowa GED candidates, from passing the GED and enrolling in a for-credit program at an Iowa community college, to earning a credential by the end of fiscal year 2009.

**Method**

**Data**

This research used a student-level dataset constructed from 14 different data files. The dataset was constructed from GED preparation and completion data files from the Comprehensive Adult Student Assessment Systems (CASAS) Tracking of Programs and Students (TOPS) and community college enrollment and credentialing data files from the community college Management Information System (MIS) file for credit programs. The Iowa Department of Education Division of Community Colleges and Workforce Preparation (IDE) provided all data files used in constructing the dataset for analysis. IDE removed the original student identification numbers to safeguard student privacy and replaced them with matching unique identifiers used to merge the individual data files.

TOPS data are collected when individuals enroll in the GED preparation program, with additional information gathered when students complete the program and earn the GED. TOPS data collected at enrollment includes student demographics (age, gender, race, ethnicity), employment and economic status, goals for participating in GED preparation, and diagnostic test scores of academic aptitude used to place students in GED preparation at their appropriate K-12 grade level. As students take and pass the GED, scores from the GED subject tests (Language Arts, Reading; Language Arts, Writing; Math; Social Studies; Science) are entered into TOPS records.
The community college MIS files report education data on students who enroll in credit-bearing courses or programs at any of the Iowa community colleges. Matching these records to students’ TOPS files permits tracking of their educational progress beyond the GED. The MIS files include demographic data (age, gender, race, ethnicity, community college) and a self-reported indicator of whether the student is economically disadvantaged. IDE does not make students’ Pell Grant status, grades, or grade-point averages available for external research. The MIS files also include the term and year of community college enrollment, single parent status, student intent for enrollment, academic major or program, credits earned, awards earned (degree, diploma, certificate), and award date.

Data Over Time

This study examined the pathway from enrolling in GED preparation and earning the GED to enrolling in an Iowa community college and earning a credential. The initial population for this analysis consisted of the 2003-2004 cohort of GED candidates, totaling 11,675 people. As these individuals were tracked over time, from fiscal year 2004 to fiscal year 2009, the number of cases in the dataset decreased. Considering this process as a path followed on a journey, from earning the GED to enrolling in postsecondary study at a community college and earning a credential, attrition in the dataset indicated that many students exited the path or discontinued their journey, while some students reentered over the period of time covered by the study. Given the time parameters of the dataset, it was not possible to know the eventual outcomes for every GED candidate. However, with data and outcomes over multiple years, the data lent itself to both cross-sectional and longitudinal analyses.
Independent Variables

Independent variables for the study were grouped into four different blocks according to the type of variable and where they appear temporally in both the dataset as well as GED candidates’ educational journey. The variable blocks are described briefly below.

**Demographic variables.** This block includes variables to account for gender, age, race, ethnicity, and primary language. While age is continuous, other data are categorical in nature. Data for these variables were collected at the time of enrollment in the Iowa GED preparation program.

**Economic variables.** This block of variables includes categorical indicators of receipt of public assistance (i.e., Temporary Assistance for Needy Families, bus fare) and individuals’ employment status. Data for these variables were collected at the time of enrollment in the Iowa GED preparation program.

**Academic ability variables.** Variables in this block consist of CASAS placement test scores measuring skills in reading and mathematics at the time of enrollment in the Iowa GED preparation program. Data are also provided for candidates’ total GED scores as well as the five subtest scores comprising the GED: Reading, writing, mathematics, science, and social studies. Each of these variables is continuous in nature.

**Educational goals and aspirations.** Variables in this block are categorical indicators of students’ goals in preparing for and taking the GED test battery as well as goals in enrolling in a for-credit program at an Iowa community college. GED goals include earning the GED, attending college, developing basic skills, and getting or retaining a job. Community college enrollment goals include transferring
to a four-year institution, career exploration, and personal development. Goal data were collected upon students enrollment in GED preparation and, later, community college. Table 2 provides variable names as well as a description and indication of the variable type and data source.

**Dependent Variables**

The study used three dependent variables. The first question used the dependent variable earned GED. This variable was coded as an ordered categorical dependent variable where 0 = did not take the GED, 1 = took the GED but did not pass, and 2 = earned GED. A missing value in this field corresponds to missing GED test scores and indicates the individual did not take the GED. This ordered approach considers different levels of accomplishment in GED preparation. Some individuals do not complete enough preparatory work or demonstrate the ability to pass the GED in Iowa and as such, they are not permitted to take the GED. Nearly all people who are deemed ready to take the GED tests by preparation faculty earn the GED, but a small percentage do not pass, perhaps because they were not fully prepared or due to test anxiety or other factors.

Research question two focused on GED earners’ community college enrollment and used a dichotomous variable indicating whether GED earners enrolled in a for-credit course or program at an Iowa community college. The third question analyzed credential completion using a dichotomous variable indicating whether GED earners who enrolled in a for-credit course or program at Iowa community college completed a credential (certificate, one-year diploma, or two-year degree). The data are coded to track the first, highest level credential earned.
Table 2

**Independent variables**

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<th>Description</th>
<th>Type</th>
<th>Data source</th>
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<td>Demographic Variables</td>
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<td>GED</td>
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<td>Age at enrollment in GED preparation</td>
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<td>Categorical</td>
<td>GED</td>
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<tr>
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<td>1 = Identified in dataset as Black</td>
<td>Categorical</td>
<td>GED</td>
</tr>
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<td>1 = Identified in dataset as Alaskan or Native American</td>
<td>Categorical</td>
<td>GED</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>1 = Identified in dataset as Asian or Pacific Islander</td>
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<td>Non-White</td>
<td>1 = A member of any group that is non-White, generated by combining all non-White racial categories into a single variable for use in later stages of analysis when sizes of individual groups drop below 50 cases.</td>
<td>Categorical</td>
<td>GED</td>
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<td>1 = Native language is English, 0 = Native language is something other than English</td>
<td>Categorical</td>
<td>GED</td>
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<td>1 = Enrolled in Temporary Assistance for Needy Families program, or recipient of other public assistance such as free bus fare, free or reduced lunch, at GED enrollment</td>
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<td>GED</td>
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Table 2

*Independent variables, continued*

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<td>GED</td>
</tr>
<tr>
<td>GED Reading Score</td>
<td>GED subtest score used to indicate reading proficiency</td>
<td>Continuous</td>
<td>GED</td>
</tr>
<tr>
<td>GED Writing Score</td>
<td>GED subtest score used to indicate writing ability</td>
<td>Continuous</td>
<td>GED</td>
</tr>
<tr>
<td>GED Mathematics Score</td>
<td>GED subtest score used to indicate math ability</td>
<td>Continuous</td>
<td>GED</td>
</tr>
<tr>
<td>GED Science Score</td>
<td>GED subtest score used to indicate science skills and scientific reasoning</td>
<td>Continuous</td>
<td>GED</td>
</tr>
<tr>
<td>GED Social Studies Score</td>
<td>GED subtest score used to indicate social science reasoning ability</td>
<td>Continuous</td>
<td>GED</td>
</tr>
<tr>
<td>Total GED Score</td>
<td>Score attained by combining the five subtest scores</td>
<td>Continuous</td>
<td>GED</td>
</tr>
</tbody>
</table>
### Table 2

*Independent variables, continued*

<table>
<thead>
<tr>
<th>Variable Block and Name</th>
<th>Description</th>
<th>Type</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Educational Goals and Aspirations</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earn the GED</td>
<td>1 = Goal is to earn the GED</td>
<td>Categorical</td>
<td>GED</td>
</tr>
<tr>
<td>Attend College</td>
<td>1 = Goal is to attend college</td>
<td>Categorical</td>
<td>GED</td>
</tr>
<tr>
<td>Get or Retain Job</td>
<td>1 = Goal is to get a job (either moving toward employment, or getting a better job) or retain current job</td>
<td>Categorical</td>
<td>GED</td>
</tr>
<tr>
<td>Personal Development</td>
<td>1 = Goal is related to self-improvement</td>
<td>Categorical</td>
<td>GED</td>
</tr>
<tr>
<td>Citizenship, U.S. Military</td>
<td>1 = Goal is related to desire to apply for U.S. citizenship or enlist in the U.S. Armed Forces</td>
<td>Categorical</td>
<td>GED</td>
</tr>
<tr>
<td>Basic Skills</td>
<td>1 = Goal is to develop basic literacy in reading, math, and writing</td>
<td>Categorical</td>
<td>GED</td>
</tr>
<tr>
<td>Transfer to Four-Year Institution</td>
<td>1 = Goal is to complete community college coursework in preparation of enrollment at a four-year college or university</td>
<td>Categorical</td>
<td>MIS</td>
</tr>
<tr>
<td>Career or Job Related</td>
<td>1 = Goal is prepare to enter the job market, explore career options, or improve skills for current job</td>
<td>Categorical</td>
<td>MIS</td>
</tr>
<tr>
<td>Personal Development</td>
<td>1 = Goal is related to self-improvement through casual course-taking</td>
<td>Categorical</td>
<td>MIS</td>
</tr>
<tr>
<td>Unknown</td>
<td>1 = Goal is not established or is undeclared</td>
<td>Categorical</td>
<td>MIS</td>
</tr>
</tbody>
</table>
The fourth research question extended the analysis of question three by examining the credential variable over the six fiscal years, 2004-2009 for which observations were available. Distribution by year for each dependent variable is provided in Table 3. Independent and dependent variables entered into the study at various points in time between July 2003 and June 2009. Figure 1 displays how the variables entered the analysis over time.

Table 3

*Distributions of dependent variables by year*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Annual Count</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earned GED</td>
<td></td>
<td>3,742*</td>
</tr>
<tr>
<td>2003</td>
<td>815</td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>1,592</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>551</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>264</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>199</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>142</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>117</td>
<td></td>
</tr>
<tr>
<td>2010</td>
<td>62**</td>
<td></td>
</tr>
<tr>
<td>Enrolled at Community College – first time</td>
<td></td>
<td>1,504</td>
</tr>
<tr>
<td>2004</td>
<td>345</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>457</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>249</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>164</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>144</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>145</td>
<td></td>
</tr>
<tr>
<td>Earned Credential</td>
<td></td>
<td>229</td>
</tr>
<tr>
<td>2004</td>
<td>79</td>
<td></td>
</tr>
<tr>
<td>2005</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>2006</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td>2007</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>2008</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>2009</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

*Note:* *A total of 347 people attempted the GED, but did not pass.*

**Persons who earned the GED after fiscal year 2009 were excluded from remaining analyses.*
Figure 1. Sequence of variables from GED candidacy to credential completion.
Conceptual Framework

The conceptual framework for the study connected the study variables with the theoretical framework articulated in Chapter 1. The theoretical framework draws on the theory of planned behavior (Ajzen, 1985; Fishbein & Ajzen, 1975), persistence theory for adult learners (Bean & Metzner, 1985), and human capital theory (Becker 1992, 1993; Schultz, 1961).

Any of the factors contributing to high school dropout could potentially limit individuals’ motivation toward pursuing additional education. Whether high school dropouts’ aspirations are hindered by family or environmental factors, or negative life circumstances (Suh, Suh, & Houston, 1997) is hard to pinpoint and beyond the scope of this study. However, many dropouts do decide to earn the GED, and a sizeable proportion of GED earners choose to continue schooling.

Dropouts may encounter a source of extrinsic motivation or develop intrinsic aspirations toward further schooling. This study posits that success in earning the GED, both in terms of earning the credential or glimpsing the potential for better job and economic prospects, may encourage additional education. As educational successes compound, former dropouts may develop greater goals and the perceived control over their ability to achieve them. The theory of planned behavior (Ajzen, 1985; Fishbein & Ajzen, 1975; Madden, Ellen, & Ajzen, 1992) explains how beliefs, attitudes, and intentions guide behavior and how positive behavioral outcomes contribute to a sense of personal control and agency. While dropouts and GED candidates may feel ambivalent toward education at first, success may positively shift their beliefs about schooling, its value, and their need and ability to pursue it.

Goal variables utilized throughout the study, as well as indicators of student success
(i.e., earning the GED, enrolling in college, earning a credential) operationalized the theory of planned behavior.

Having the resources and time available to pursue education may be as important as a motivation toward success. Bean and Metzner’s (1985) persistence theory for adult learners contributes to the understanding of the factors that support adult students’ persistence toward a college credential. Like the theory of planned behavior, adult persistence also depends on goals and how education supports those goals. However, persistence is also influenced by economic concerns such as personal finances, balancing the need to work with the desire to pursue additional education, and academic ability and performance. Demographic and economic variables, academic ability variables, indicators of student goals, as well as markers of success—earning the GED, enrolling in college, and earning a credential—operationalized persistence theory.

Human capital theory, concerned with the accrual of education, training, and other benefits that increase individual productive capacity (Becker, 1993; Schultz, 1961), explains the overarching consequences of additional education for high school dropouts. Despite opportunity costs, earning the GED and pursuing postsecondary education yield economic and social benefits for individuals long after education is complete and the costs are paid (Becker, 1993; Davis & Noland, 2003; Schenk & Matsuyama, 2010). Accordingly, human capital theory connected the theory of planned behavior with adult persistence theory. Individual goals and motivations are likely driven in some part by the desire to enjoy a higher standard of living. Furthermore, the willingness to persist to completion of a credential is likely spurred
as much by the belief in some economic benefit to self and family as the intrinsic reward of academic achievement.

Figure 2 presents the conceptual framework. This illustration maps the GED pathway to and through an Iowa community college. The framework shows that as high school dropouts develop personal, professional, or educational aspirations they may become inclined to pursue further education. Earning the GED may lead to the development of a more positive outlook on future schooling, as well as enhanced economic standing. If community college enrollment follows, goals, motivations, and success may cumulate, resulting in the earning of a credential and even broader opportunities for economic and social mobility.

Demographic, economic, and ability factors pervade the framework and may constrain individuals’ goals or their willingness or ability to achieve them. Staying on the pathway is difficult as life circumstances can easily derail educational plans for adult learners. Credentialing may take longer for adult learners, but persistence over time may lead to additional successes.

Data Analysis Procedures

As analysis moved in research questions one through three from earning the GED to enrolling in an Iowa community college to earning a community college credential, the analytic samples grew smaller. Throughout the course of analysis, descriptive statistics (frequency counts, percentages, means and standard deviations, and minimum and maximum values) are presented for the analytic samples for each research question. These statistics provide a straightforward way to view variations in the samples from GED to credential.
Demographic, economic, and ability measures affect each step along the pathway.

**Figure 2. Conceptual framework.**

**Motivation toward additional schooling**
Additionally, multivariate methods for statistical analysis were aligned with each of the four research questions that guided the study. Research question one used ordered probit regression, while questions two and three relied upon probit regression. Question four was addressed using discrete-time hazard analysis. First, the rationale for probit regression is explained, followed by a brief explanation of the application of these methods to research questions one through three. Subsequently, background on discrete-time hazard analysis is provided along with information on how it was used to address research question four.

**Probit Regression: Research Questions One through Three**

Probit regression is one of several models used for predicting categorical dependent variables. Probit analyses produce estimates with greater precision than basic logistic models; coefficients and standard errors are 1.7 times more constrained (Long & Freese, 2006). Similar to logistic regression, probit models estimate the probability of a categorical outcome variable. Odds ratios are often used to report the change in odds for a dependent variable based on values for independent variables (Allison, 1999; Gujarati, 2006; Hoffmann, 2004). Using the SPost suite of post-estimation commands, the Stata (2009) software package that was used to analyze data for this study allowed for the easy conversion of logistic and probit regression coefficients to predicted probabilities for the outcome of interest in lieu of odds ratios (Long, 2007). The command `prvalue` allows values for each individual independent variable to be set and returns a predicted probability value for the dependent variable. It also calculates differences in the predicted probability of the dependent variable given two sets of values for the independent variables. The command `prchange` returns the discrete change in the probability of the predicted
outcome, given a change in the value of a single predictor or independent variable (Long & Freese, 2006). Most substantive results reported in Chapter 4 were derived using these commands.

**Question 1: Predicting GED completion.** The first research question asked what factors (e.g., demographic, economic, academic ability, educational goals) predict successful completion of the GED by the end of fiscal year 2010 for the 2003-2004 cohort of Iowa GED candidates. Three separate outcomes were considered for the Iowa GED candidates: Did not take the GED, took the GED but did not pass, and passed the GED. Because these three outcomes are not three equally spaced points on a scale, an ordered approach was favored for analysis over a standard linear or binomial probit regression model. Given the large size of the sample for analysis ($N = 11,675$), a maximum $p$ value of $.01$ was used to establish statistical significance.

**Question 2: Predicting community college enrollment.** The second research question asked what factors (e.g., demographic, economic, academic ability, educational goals) predict enrollment in an Iowa community college for those individuals who earned the GED by the end of fiscal year 2009. The dependent variable here was dichotomous (enrolled in an Iowa community college or did not enroll), so probit regression was employed to address this question. Given the large size of the analytic sample ($n = 3,680$), a maximum $p$ value of $.01$ was used to establish statistical significance.

**Question 3: Predicting earning a community college credential.** The third research question examined students who earned the GED and enrolled in an Iowa community college by the end of fiscal year 2009, and asked what factors (e.g., demographic, economic, academic ability, educational goals) predict earning a
community college credential. The dependent variable was again dichotomous (earned a credential or did not earn a credential), so probit regression was also employed to address this question. With a smaller analytic sample \((n = 1,504)\), a more liberal \(p\) value (.05) was used to establish statistical significance.

**Discrete-time Hazard Analysis: Research Question Four**

Discrete-time hazard analysis, also often known as survival analysis, answers questions about the relationship of continuous and categorical independent variables, as well as variables that vary from one time period to the next, to the amount or length of time to a target event (Kleinbaum & Klein, 2005; Singer & Willett, 2003). The earliest uses of this method were in predicting human life expectancies given diagnoses of disease. Because the target event was death, the method came to be called survival analysis (Allison, 1999; Cox & Oakes, 1984; Singer & Willett, 2003). The analysis can be applied in measuring continuous time (e.g., seconds, minutes, days—periods of time with precise measurements) as well as discrete time (e.g., school years, financial quarters—periods of time defined in larger blocks; Singer & Willett, 2003). Within higher education, discrete-time hazard analysis has been used to estimate and compare rates of faculty members’ promotion from associate to full professor by gender and academic discipline over a 19-year period (Chatriand & Gahn, 2010). It has also been used to estimate the impact of remedial education and credit accrual on educational outcomes of community college students aged 25 and older, compared with students aged 18-25 (Calcagno, Crosta, Bailey, & Jenkins, 2006). And it has been used to model closure of private colleges and universities over a 30-year span in five-year increments given market factors and availability of financial resources (Porter & Ramirez, 2009).
Discrete-time hazard analysis requires three specific components: A target event, a clearly defined start of time where no person in the data panel has experienced the target event, and a way to track time (Singer & Willett, 2003). In this study, the target event was earning a credential. Because discrete-time hazard analysis can only handle one target event per individual, if a student enrolled in community college earned more than one credential, only the first credential was counted. Start time must be a moment when everyone in the dataset is eligible to experience the target event, but before anyone has experienced the target event. Start time in this study is defined at the beginning of fiscal year 2004 (July 2003) before anyone had earned a community college credential and time is measured in fiscal years, specifically the six fiscal years from 2004 and 2009.

Censoring is another important element of discrete-time hazard analysis. In discrete-time hazard analysis, some persons for whom there are data will not experience the target event by the end of observation. Unlike those who experience the target event—for example, earn a credential—those who do not experience the event have an unknown event time. These observations are therefore censored—specifically, right-censored—at the end of observed time (Kleinbaum & Klein, 2005). Singer and Willett (2003) argued that failure to experience the target event is not by chance and such target event nonoccurrence can be as informative as knowing target event occurrence.

Censoring also renders traditional descriptive statistics such as means and standard deviations of little use in discrete-time hazard analysis. A normal distribution cannot be assumed because time is bounded (Singer & Willett, 2003). Instead, discrete-time hazard analysis produces a hazard function for event
occurrence and a survival function for event nonoccurrence and builds on logistic regression techniques by modeling event probabilities for each period of time during which an event could occur (Kleinbaum & Klein, 2005).

The hazard function shows the probability for an individual to experience the target event in a given time period. This is known as the conditional probability because it is dependent upon the individual not having experienced the target event in any preceding time period. Probability is 0 if the target event occurred previously, but ranges between 0 and 1 if the event has not yet occurred. The survival function is calculated as the cumulative proportion of persons still eligible to experience the target event who have yet to do so (Singer & Willett, 2003). Both the hazard and survival functions are usually presented as curves on a graph. Because this study is concerned with event occurrence—earning a credential—baseline and fitted hazard models were plotted for this analysis.

**Questions 4: Likelihood of earning a credential over time.** The fourth research question, intended to extend the analysis conducted in question three, investigated the likelihood of earning a community college credential over time using discrete-time hazard analysis. The dependent variable was again earning a college credential using the same analytic sample (n = 1,504) and level of statistical significance (p ≤ .05).

It must be noted that time in this study was measured by the fiscal year, because community college enrollment data were provided in fiscal year, rather than academic year, format. Data for community college enrollment was provided from the start of fiscal year 2004 (July 2003) until August 2009 (two months after the end of fiscal year 2009). To maintain the integrity of the discrete-time period
selected for analysis, credentials earned after the end of the fiscal year \((n = 10)\) were considered part of right-censored data and omitted from analysis for research question four.

**Summary**

Table 4 summarizes the research questions, dependent variables, and methods of analysis for each of the four research questions in this study.

**Limitations**

This study analyzed data collected by the Iowa Department of Education, which included a number of theoretically interesting variables, such as educational aspirations, GED scores, and credential earned. The longitudinal nature of the dataset also provided the opportunity to examine earning a credential using a method that is relatively uncommon in postsecondary research. As with any study using secondary data, however, this research confronted certain limitations. Connections to the conceptual framework are complicated by lack of certain demographic and economic variables in particular.

Records on GED candidates do not include data on the level of schooling completed prior to high school dropout, nor do they include the reason for dropout. Both of these data points could help control for pre-GED characteristics such as academic maturity, behavioral concerns, or disposition toward schooling.

Unfortunately, data regarding parents’ education, marital status, and number of children were also not collected and therefore unavailable. These variables may have helped to further explain the circumstances under which students pursuing the GED and postsecondary education were trying to persist.
Economic variables indicating unemployment and receipt of government assistance were used throughout this study. These represented self-report data, and they were not verified or supported by the presence of other economic indicators or student income level. The Iowa Department of Education keeps Pell Grant status data, but does not make it available to external researchers.

A goal of this study was to examine the process of earning a credential from an Iowa community college both using a traditional cross-sectional analysis and a longitudinal design. This study examined GED to credential data over a seven-year period, and a longer period of observation would have been more desirable given the need to earn the GED before pursuing a community college credential. Previous research has shown that GED earners, remedial learners, and other similarly situated students require more time to make substantive education progress (Calcagno, Crosta, Bailey, & Jenkins, 2006; Tyler & Lofstrum, 2008).

Similarly, this study clocked time using fiscal years. Academic semesters would have provided a smaller unit with finer increments for measuring time. Unfortunately, not all Iowa community colleges use semester calendars, and one college has an academic term that spans from November through February complicating the comparison of statewide academic data.
Table 4

Summary of research questions, dependent variables, and methods of analysis

<table>
<thead>
<tr>
<th>Research question</th>
<th>Definition of dependent variable</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research Question 1</strong> Among the 2003-04 Iowa GED candidates, what factors (e.g., demographic, economic, academic ability, educational goal) predict earning the GED?</td>
<td>The dependent variable of interest consisted of three ordered outcomes: 1. Did not take the GED ($n = 7,586$) 2. Did not pass the GED ($n = 347$) 3. Passed/earned the GED ($n = 3,742$)</td>
<td>Ordered Probit Regression</td>
</tr>
<tr>
<td><strong>Research Question 2</strong> Among the students who earned the GED, what factors (demographic, economic, academic ability, educational goals) predict enrollment in a for-credit postsecondary education course or program at an Iowa community college?</td>
<td>The dependent variable of interest consisted of two possible outcomes: • Did not enroll in an Iowa community college ($n = 2,176$) • Enrolling in a for-credit Iowa community college program ($n = 1,504$)</td>
<td>Probit Regression</td>
</tr>
<tr>
<td><strong>Research Question 3</strong> Among students who enroll in a for-credit postsecondary education program at an Iowa community college, what factors (demographic, economic, academic ability, educational goals) predict earning a community college credential?</td>
<td>The dependent variable of interest consisted of two possible outcomes: • Did not earn credential ($n = 1,275$) • Earned a credential ($n = 229$)</td>
<td>Probit Regression</td>
</tr>
<tr>
<td><strong>Research Question 4</strong> Based on the factors examined so far (demographic, economic, academic ability, and educational aspirations) what is the likelihood of earning a community college credential over time?</td>
<td>The dependent variable of interest consisted of two possible outcomes: • Did not earn credential ($n = 1,285$) • Earned a credential ($n = 219$) The likelihood of earning a credential is analyzed over time, in each one of six fiscal years between 2004 and 2009.</td>
<td>Discrete-time Hazard Analysis</td>
</tr>
</tbody>
</table>
CHAPTER 4. RESULTS

This chapter presents the results of the Iowa pathway from completing the GED to enrolling in an Iowa community college to earning a community college credential. The analysis was conducted on data for the 11,675 individuals who signed up for the non-credit GED preparation program offered through Iowa community colleges between July 1, 2003 and June 30, 2004. As defined through the research questions guiding this study, the analysis examined how demographic, economic, academic ability, and educational goal variables contributed to GED students’ success at each step along the pathway and at each step there was considerable attrition. The last stage of analysis extended the model for earning a community college credential by examining the likelihood of earning a community college credential over time, specifically the six fiscal years for which there was observable data. This chapter presents the results of these analyses.

Attrition from GED to Credential

Before presenting results for each of the research questions, it is helpful to review the pattern of attrition from enrollment in the GED preparation program to credential completion. The GED section of the dataset included candidate records through fiscal year 2010. Of the initial study population of 11,675 GED candidates, 4,089 individuals completed the five GED subtests. Of those who finished the test battery, 3,742 people earned the credential by the end of observation in 2010. Because community college enrollment and credentialing data only extend to 2009, the study next tracked the 3,680 people who earned the GED by the end of fiscal year 2009.
After earning the GED, 1,504 students enrolled in a for-credit course at an Iowa community college in the six fiscal years between 2004 and 2009. Over this period of time, 229 students completed some sort of community college credential through a for-credit program, such as a certificate, a one-year diploma, or a two-year degree. Only 2% of the original population of the 2003-2004 GED candidate cohort earned a credential at an Iowa community college by 2009. This pattern of attrition is illustrated in Figure 3.

Earning the GED

The first research question asked: Among the 2003-2004 Iowa GED candidates, what factors (e.g., demographic, economic, academic ability, educational aspirations) predict successful completion of the GED? Data from the full cohort of individuals who entered the noncredit GED preparation program at Iowa community colleges between July 1, 2003 and June 30, 2004 and tracked until June 2010 were analyzed to address this question. Findings include descriptive statistics for the demographic, economic, academic ability, and educational goals (the independent variables) of the full cohort as well as results from an ordered probit regression analysis.
*Fiscal years 2004-2009

**Descriptive Statistics**

Table 5 provides descriptive statistics for the demographic and economic characteristics, academic ability, and goals for all 11,675 individuals in the 2003-2004 Iowa GED cohort. The majority of persons in the GED cohort were female and the average age of the cohort was 25.9 years. The largest age group was for persons
between 18 and 23 years of age (53.0%) and the size of age groups progressively diminished for older GED candidates.

Table 5

*Descriptive statistics for 2003-2004 GED candidates*

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>percent</th>
<th>M</th>
<th>SD</th>
<th>min</th>
<th>max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>6,005</td>
<td>51.4</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Age 18-23</td>
<td>6,190</td>
<td>53.0</td>
<td>25.9</td>
<td>8.0</td>
<td>18</td>
<td>50</td>
</tr>
<tr>
<td>Age 24-30</td>
<td>2,717</td>
<td>23.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 31-40</td>
<td>1,807</td>
<td>15.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age 41-50</td>
<td>961</td>
<td>8.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>English as first language</td>
<td>10,838</td>
<td>92.8</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Race and Ethnicity</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alaskan/American Indian</td>
<td>263</td>
<td>2.3</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Asian/Filipino/Hawaiian/Pacific Islander</td>
<td>216</td>
<td>1.9</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Black</td>
<td>1,722</td>
<td>14.8</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Latino</td>
<td>1,083</td>
<td>9.3</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Economic Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government Assistance (Temporary Assistance for Needy Families, free or reduced lunch, free bus pass, etc.)</td>
<td>1,731</td>
<td>14.8</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Unemployed</td>
<td>6,021</td>
<td>51.6</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Academic Ability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CASAS Pre-Score*</td>
<td>-</td>
<td>-</td>
<td>227.0</td>
<td>13.1</td>
<td>139</td>
<td>268</td>
</tr>
<tr>
<td><strong>Goals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Develop basic skills</td>
<td>6,709</td>
<td>57.5</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Earn GED</td>
<td>4,717</td>
<td>40.4</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Attend college</td>
<td>1,613</td>
<td>13.8</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Get or retain job</td>
<td>3,534</td>
<td>30.3</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Personal development</td>
<td>4,542</td>
<td>38.9</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Citizenship, Military, etc.</td>
<td>1,220</td>
<td>10.5</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

*Note:* *CASAS Pre-Score ranges from 139-268. Students can proceed in GED preparation without a CASAS score and are assigned a value of 0, which were coded as missing for the calculation of descriptive statistics. Data are based on 10,651 observations.

**Frequencies exceed 100% because GED candidates reported up to two goals for GED preparation.**

N = 11,675

Nearly all GED candidates (92.8%) spoke English as their first or native language, but the racial and ethnic characteristics of the GED cohort differed substantially from those of the State of Iowa. According to the State Data Center of
Iowa (2010), as of July 1, 2004, non-Latino Whites comprised 91.7% of Iowa’s population, followed by Latinos (3.5%), Blacks (2.3%), Asians (1.4%) and American Indians/Alaska Natives (0.3%). Within the 2003-2004 GED cohort, the proportion of Blacks (14.8%) and Latinos (9.3%) is far greater than that reported in statewide population data.

Economic status variables were based on self-reports. According to the data, 14.8% of the full GED cohort was receiving some form of government assistance (Temporary Assistance for Needy Families or TANF, free or reduced lunch, free bus fare, etc.) at the time of program enrollment. More than half (51.6%) of GED cohort members reported being unemployed when they enrolled in GED preparation.

The typical enrollment procedure for the Iowa community college GED preparation program is for individuals to take the Comprehensive Adult Student Assessment Systems (CASAS) test for proficiency in basic skills areas of reading, mathematics, and writing so they may be placed into the appropriate level of instruction for GED preparation. The CASAS score is considered an initial measure of academic ability. The mean CASAS score was 227.0 out of a possible 268 points. One standard deviation equaled 13.1 points.

Individuals are also given the opportunity to indicate a first and second goal for enrolling in the GED preparation program. Goal choices are pre-defined on the Tracking of Programs and Students Professional (TOPSpro) database component of the CASAS assessment. These options have been combined for analysis in this study and coded as five dichotomous goal variables. The first or second goal for enrolling in GED preparation most often cited by members of the 2003-2004 cohort was developing basic skills in mathematics, reading, or writing (57.5%). The second
most often cited goal was earning the GED (40.4%), followed by a personal development goal (38.9%) and, fourth, the goal of getting or retaining a job (30.3%). Trailing far behind were the goals to attend college (13.8%) and goals related to citizenship or joining the U.S. military (10.5%).

**Ordered Probit Regression Model Results**

An ordered probit regression model was used to determine which of the demographic, economic, academic ability, and goal variables predict earning the GED. The model considered three outcomes ordered by level of academic achievement: not taking the GED tests \((n = 7,586)\), taking the GED tests but not earning a passing score \((n = 347)\), and passing the GED \((n = 3,742)\). In Iowa, only those GED candidates deemed academically prepared are permitted to take the GED. Being in the GED preparation cohort and never sitting for the GED tests may indicate a lack of ability or commitment to complete the GED or completion of the GED or high school diploma through other routes (i.e., return to high school, community college adult diploma programs, GED preparation in another state). Taking but failing the test was considered an indication of academic progress because these individuals were deemed ready to test, despite falling short. Passing the GED was the ultimate goal on this step of the pathway, so it was considered the highest ordered outcome.

Complete model results are presented in Table 6, including regression coefficients and standard errors for each variable, indication of statistical significance, and the percent change in the predicted probability of the target outcome (earning the GED). The demographic variables age \((p < .001)\) and the racial and ethnic variables Latino and Black \((p < .01)\) were statistically significant. The
economic status variable unemployed \((p < .01)\) and the measure of academic ability, CASAS test score \((p < .001)\) were also statistically significant. Of the goal variables, earn GED \((p < .001)\), personal development \((p < .001)\), and citizenship or military \((p < .01)\) were statistically significant.

Table 6

*Ordinal probit regression results, predicting the probability of completing the GED*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>SE</th>
<th>(\Delta x)</th>
<th>(\Delta P(Y))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>.0012</td>
<td>.0282</td>
<td>0 to 1</td>
<td>-0.04%</td>
</tr>
<tr>
<td>(^\wedge) Age</td>
<td>-0.0891**</td>
<td>.0136</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(^\wedge) Age (^2)</td>
<td>.0009**</td>
<td>.0002</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>English as first language</td>
<td>.1530</td>
<td>.0760</td>
<td>0 to 1</td>
<td>4.97%</td>
</tr>
<tr>
<td>Latino</td>
<td>-1.897*</td>
<td>.0598</td>
<td>0 to 1</td>
<td>-6.12%</td>
</tr>
<tr>
<td>Black</td>
<td>-1.058*</td>
<td>.0408</td>
<td>0 to 1</td>
<td>-3.51%</td>
</tr>
<tr>
<td>Alaskan or Native American</td>
<td>-0.0025</td>
<td>.0904</td>
<td>0 to 1</td>
<td>-0.08%</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>-0.0865</td>
<td>.1137</td>
<td>0 to 1</td>
<td>-2.86%</td>
</tr>
<tr>
<td><strong>Economic Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government assistance</td>
<td>-.0709</td>
<td>.0401</td>
<td>0 to 1</td>
<td>-2.37%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>-.0799*</td>
<td>.0276</td>
<td>0 to 1</td>
<td>-2.71%</td>
</tr>
<tr>
<td><strong>Ability</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(\dagger) CASAS Test Score</td>
<td>.1631**</td>
<td>.0336</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>(\dagger) CASAS Test Score (^2)</td>
<td>-.0003**</td>
<td>.0001</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Goals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earn GED</td>
<td>.7513**</td>
<td>.0312</td>
<td>0 to 1</td>
<td>25.86%</td>
</tr>
<tr>
<td>Attend college</td>
<td>.0877</td>
<td>.0432</td>
<td>0 to 1</td>
<td>3.02%</td>
</tr>
<tr>
<td>Get or retain job</td>
<td>-.0017</td>
<td>.0347</td>
<td>0 to 1</td>
<td>1.67%</td>
</tr>
<tr>
<td>Personal development</td>
<td>.3135**</td>
<td>.0379</td>
<td>0 to 1</td>
<td>10.82%</td>
</tr>
<tr>
<td>Citizenship, Military, etc.</td>
<td>-.0073</td>
<td>.0567</td>
<td>0 to 1</td>
<td>-0.24%</td>
</tr>
</tbody>
</table>

McFadden’s Pseudo R\(^2\)  .17
Cut point 1: 22.08
Cut point 2: 22.17

Note: \(n = 10,651\); 1,024 observations deleted listwise for lack of CASAS Test Score

\(^\wedge\) Refer to Figure 4 to see how Age affects probability of GED completion.

\(\dagger\) Refer to Figure 5 to see how CASAS Score affects probability of GED completion.

\(**p < .001, *p < .01**

**Effect of demographic and economic variables.** Human capital theory (Becker, 1994) suggests that the relationship between age and educational
attainment is curvilinear, so a quadratic term, $age^2$, was applied in addition to age to allow for the rate of the effect to vary. A Chi-Square test of joint significance indicated that coefficients together for age and $age^2$ were not equal to zero, suggesting age has a nonlinear effect, $\chi^2 (1, n = 10,651) = 42.64, p < .001$. Controlling for other variables, age had an inverse effect on earning the GED. The predicted probability of earning the GED was greatest (40%) for persons 18 years of age and the probability declined sharply for individuals through their 20s, so that for candidates who were 30 years of age, the predicted probably fell to 21%. The rate of decline slowed for candidates aged 30 to 45 and flattened for older candidates. The predicted probability of earning the GED for a candidate 50 years of age was approximately 13%. The effect of age on earning the GED was determined using the quadratic term of age and is presented graphically in Figure 4.

Figure 4. Discrete change in probability of earning the GED for age.
GED candidates who are Black or Latino were less likely to earn the GED than Whites, the reference group. In the 2003-2004 Iowa GED cohort, the predicted probability of earning the GED was 4 percentage points less for Blacks and 6 percentage points less for Latinos.

Candidates in the GED population who reported being unemployed at the time of program enrollment had a diminished chance of successfully completing the GED compared to those who reported unemployment. The predicted probability of earning the GED was 3 percentage points less for individuals who indicated being unemployed.

**Effect of academic ability variable.** A quadratic term for CASAS test score was tested along the corresponding linear term as part of model specification. A Chi-Square test of joint significance indicated that coefficients together for CASAS test and CASAS test\(^2\), were not equal to zero, suggesting the CASAS test score has a nonlinear effect, \(\chi^2 (1, n = 10,651) = 23.59, p < .001\). Not surprisingly, candidates with higher CASAS test results had a greater probability of earning the GED than those with lower CASAS test scores, controlling for all other variables. Using the quadratic term for the CASAS test score revealed that candidates with scores lower than 200 had a very low probability (at or below four percentage points) of earning the GED, but that the likelihood of earning the GED increased quickly as scores range from over 200 to the maximum score of 268 (71 percentage points). These results are graphed in Figure 5.
Figure 5. Discrete change in probability of earning the GED for CASAS Pre-Score.

**Effect of goal variables.** GED candidates who indicated that a goal of participating in the GED preparation program was to develop basic skills served as the reference category. Candidates who reported the goal of earning the GED as a reason for participating in the program were more likely than those candidates with basic skills goals to earn the GED. Their predicted probability of earning the GED was 26 percentage points higher than those candidates with a basic skills goal. Candidates with a personal development goal were also more likely than those with a basic skills goal to successfully complete the GED, with a predicted probability of earning the GED 11 percentage points higher than candidates with a basic skills goal.

**Enrolling in an Iowa Community College**

The second research question asked: *Among students who earned the GED, what factors (e.g., demographic, socioeconomic, academic ability, educational aspirations) predict*
enrollment in a for-credit postsecondary education program or classes at an Iowa community college? Community college enrollment data were right-censored at June 2009. Therefore, only individuals who earned the GED by June 2009 were included in the analysis for this question. Findings include descriptive statistics for the independent variables for those candidates who earned the GED as well as results from a probit regression analysis.

**Descriptive Statistics**

Table 7 provides descriptive statistics for the demographic and economic characteristics, GED subtest scores, and goals for the 3,680 individuals in the 2003-2004 Iowa GED cohort who earned the GED before the end of fiscal year 2009. Sixty-two people who earned the GED in 2010 were omitted from further analysis because community college enrollment data are only available through fiscal year 2009.

The majority of GED earners between 2003 and 2009 were female and the average age of GED earners (23.4 years) was slightly younger than the full GED cohort (25.9 years of age). At this stage of analysis, the largest age group was again for persons between 18 and 23 years of age, however their proportion increased significantly in size from 53.0% of all GED candidates to 66.4% of GED earners.
Table 7

Descriptive statistics for GED earners, 2003-2009

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>percent</th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>1,853</td>
<td>50.4</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Age 18-23</td>
<td>2,442</td>
<td>66.4</td>
<td>23.4</td>
<td>6.3</td>
<td>18</td>
<td>50</td>
</tr>
<tr>
<td>24-30</td>
<td>764</td>
<td>20.8</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>31-40</td>
<td>352</td>
<td>9.6</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>41-50</td>
<td>122</td>
<td>3.3</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>English as first language</td>
<td>3,564</td>
<td>96.9</td>
<td>--</td>
<td>--</td>
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<td>--</td>
</tr>
<tr>
<td>Race and Ethnicity</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alaskan/American Indian</td>
<td>75</td>
<td>2.0</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Asian/Filipino/Pacific Islander</td>
<td>53</td>
<td>1.4</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Black</td>
<td>344</td>
<td>9.4</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Latino</td>
<td>214</td>
<td>5.8</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td><strong>Economic Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government Assistance (Temporary Assistance for Needy Families, free or reduced lunch, free bus pass, etc.)</td>
<td>481</td>
<td>13.1</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Unemployed</td>
<td>1,787</td>
<td>48.6</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

**GED Subtest and Total Scores**

<table>
<thead>
<tr>
<th>Subtest</th>
<th>n</th>
<th>percent</th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading</td>
<td>-</td>
<td>-</td>
<td>592.3</td>
<td>96.2</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>Writing</td>
<td>-</td>
<td>-</td>
<td>513.8</td>
<td>70.0</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>Mathematics</td>
<td>-</td>
<td>-</td>
<td>511.6</td>
<td>67.4</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>Science</td>
<td>-</td>
<td>-</td>
<td>562.4</td>
<td>72.5</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>Social Studies</td>
<td>-</td>
<td>-</td>
<td>555.8</td>
<td>73.9</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>GED Total Score</td>
<td>-</td>
<td>-</td>
<td>2,735.9</td>
<td>288.0</td>
<td>2,160</td>
<td>3,860</td>
</tr>
</tbody>
</table>

**Goals**

<table>
<thead>
<tr>
<th>Goal</th>
<th>n</th>
<th>percent</th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Develop basic skills</td>
<td>1,493</td>
<td>40.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Earn GED</td>
<td>2,300</td>
<td>62.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Attend college</td>
<td>705</td>
<td>19.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Get or retain job</td>
<td>1,037</td>
<td>28.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Personal development</td>
<td>1,297</td>
<td>35.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Citizenship, Military, etc.</td>
<td>235</td>
<td>6.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: *The GED passing standard for the state of Iowa is a minimum score of 410 on each of the five GED subtests. The average score across the five tests must be greater than or equal to 450, with a total GED score of 2250 or higher.**

**Frequencies exceed 100% because GED candidates reported up to two goals for GED preparation.**

n = 3,680

Nearly all GED earners spoke English as their first or native language. The racial and ethnic characteristics of GED earners continued to differ from the Iowa population with the percentage of Black GED earners at 9.4% and the percentage of Latino GED earners at 5.8%. According to self-reported data, 13.1% of the GED...
earners were receiving some form of government assistance (Temporary Assistance for Needy Families or TANF, free or reduced lunch, free bus fare, etc.) at the time of enrollment in the GED preparation program. Just less than half of GED earners (48.6%) reported being unemployed upon signing up for GED preparation.

Mean scores for GED subtests and total test score are reported in Table 7. Subtest scores for all persons who took the GED ranged from a minimum of 420 to a maximum of 800. The highest average subtest score for GED earners was in reading ($M = 592.3$, $SD = 96.2$) and the lowest average subtest score was in math ($M = 511.6$, $SD = 72.5$). The mean for the total GED score was 2736 with a standard deviation of 288 points. Because subtest scores provide more detailed information on the effects of different subject areas, these scores were used for analysis instead of the total GED score. Table 8 provides a correlation matrix for the subtest scores and overall GED score. As expected, all correlations are positive. Most correlations between subtests are moderately high, while correlations between subtests and overall GED score are strong.

The goal most frequently cited by GED earners was earning the GED (62.5%), followed by developing basic skills (40.6%) and personal development (35.2%). Attending college, the goal directly related to analysis for this research question, was fourth out of five goals and listed by 19.2% of GED earners. Developing basic skills again served as the reference category.
Table 8

Correlation matrix for GED subject test scores and total GED scores for GED earners

<table>
<thead>
<tr>
<th>GED Subtest Scores</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Reading Score</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Writing Score</td>
<td>.40</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Mathematics Score</td>
<td>.36</td>
<td>.42</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Social Studies Score</td>
<td>.54</td>
<td>.40</td>
<td>.49</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Science Score</td>
<td>.50</td>
<td>.41</td>
<td>.52</td>
<td>.61</td>
<td>.60</td>
<td>1.00</td>
</tr>
<tr>
<td>6 Total Score</td>
<td>.78</td>
<td>.68</td>
<td>.71</td>
<td>.80</td>
<td>.80</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Note: n = 3,680
All correlations are significant at the p < .001 level.

Probit Regression Model Results

A probit regression model was used to determine which of these demographic, economic, academic ability (as measured by GED subscores), and goal variables help predict enrolling in an Iowa community college among those persons in the study who earned the GED (n = 3,680). The model considered two outcomes: Enrolling in an Iowa community college (n = 1,504) or not enrolling in an Iowa community college (n = 2,176).

Complete model results are presented in Table 9, including regression coefficients and standard errors for each variable, indication of statistical significance, and the percent change in the predicted probability of the target outcome (enrolling in an Iowa community college). The demographic variables female and age (both p ≤ .001) and the racial variable Black (p ≤ .01) were statistically significant. The GED subtest scores for reading (p ≤ .001) and social studies (p ≤ .01) were also statistically significant. Of the goal variables, only attend college (p ≤ .001) was statistically significant.

Effect of demographic variables. Female GED earners were more likely than males, the reference category, to enroll in an Iowa community college. Females had
a predicted probability of enrolling in an Iowa community college that was 19 percentage points higher than males.

Because of the curvilinear relationship between age and educational attainment suggested by human capital theory, a quadratic term for age was tested again. The Chi-Square test of joint significance, however, indicated that coefficients together for age and age\(^2\), were equal to zero, suggesting that age is linear in its effects, \(\chi^2 (1, n = 3860) = .17, p = .680\). Consequently, only age was included in the final model. Controlling for other variables, age had an inverse effect on enrolling in an Iowa community college. The predicted probability of enrolling in an Iowa community college ranged from 45 percentage points for persons 18 years of age to 34 percentage points for persons 30 years of age to 19 percentage points for persons 50 years of age.

The reference category for racial and ethnic variables was White. Compared to White GED earners, Blacks who earned the GED were more likely to enroll in an Iowa community college. Black GED earners had a predicted probability of enrolling in an Iowa community college 8 percentage points higher than Whites.
Table 9

Probit regression results, predicting the probability of GED earners’ enrollment in an Iowa community college

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>SE</th>
<th>Δx</th>
<th>ΔP(Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>.4915**</td>
<td>.0480</td>
<td>0 to 1</td>
<td>18.83%</td>
</tr>
<tr>
<td>Age</td>
<td>-.0235**</td>
<td>.0036</td>
<td>10 years</td>
<td>-8.80%</td>
</tr>
<tr>
<td>English as first language</td>
<td>-.0313</td>
<td>.1469</td>
<td>0 to 1</td>
<td>-1.21%</td>
</tr>
<tr>
<td>Latino</td>
<td>-.0097</td>
<td>.1064</td>
<td>0 to 1</td>
<td>-0.38%</td>
</tr>
<tr>
<td>Black</td>
<td>.1939*</td>
<td>.0751</td>
<td>0 to 1</td>
<td>7.61%</td>
</tr>
<tr>
<td>Alaskan or Native American</td>
<td>-.3995</td>
<td>.1638</td>
<td>0 to 1</td>
<td>-14.39%</td>
</tr>
<tr>
<td>Asian or Pacific Islander</td>
<td>.3114</td>
<td>.1817</td>
<td>0 to 1</td>
<td>12.05%</td>
</tr>
<tr>
<td><strong>Socioeconomic Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government assistance</td>
<td>.1274</td>
<td>.0666</td>
<td>0 to 1</td>
<td>4.98%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>.0448</td>
<td>.0440</td>
<td>0 to 1</td>
<td>1.73%</td>
</tr>
<tr>
<td><strong>GED Scores</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>.0009**</td>
<td>.0003</td>
<td>1 SD</td>
<td>3.40%</td>
</tr>
<tr>
<td>Writing</td>
<td>.0000</td>
<td>.0004</td>
<td>1 SD</td>
<td>-0.02%</td>
</tr>
<tr>
<td>Mathematics</td>
<td>.0003</td>
<td>.0004</td>
<td>1 SD</td>
<td>0.75%</td>
</tr>
<tr>
<td>Science</td>
<td>-.0002</td>
<td>.0004</td>
<td>1 SD</td>
<td>-0.58%</td>
</tr>
<tr>
<td>Social Studies</td>
<td>.0011*</td>
<td>.0004</td>
<td>1 SD</td>
<td>3.28%</td>
</tr>
<tr>
<td><strong>Goals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Earn GED</td>
<td>.0477</td>
<td>.0507</td>
<td>0 to 1</td>
<td>1.84%</td>
</tr>
<tr>
<td>Attend college</td>
<td>.3311**</td>
<td>.0664</td>
<td>0 to 1</td>
<td>13.01%</td>
</tr>
<tr>
<td>Keep or retain job</td>
<td>.0329</td>
<td>.0602</td>
<td>0 to 1</td>
<td>1.28%</td>
</tr>
<tr>
<td>Personal development</td>
<td>-.0206</td>
<td>.0631</td>
<td>0 to 1</td>
<td>-0.80%</td>
</tr>
<tr>
<td>Citizenship, Military, etc.</td>
<td>.0923</td>
<td>.0970</td>
<td>0 to 1</td>
<td>3.60%</td>
</tr>
<tr>
<td>McFadden’s Pseudo R²</td>
<td>.06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>-2337.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Cases predicted correctly</td>
<td>61.7%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Cases of Y=1</td>
<td>x</td>
<td>predicted correctly</td>
<td>65.2%</td>
<td></td>
</tr>
<tr>
<td>% Cases of Y=0</td>
<td>x</td>
<td>predicted correctly</td>
<td>59.8%</td>
<td></td>
</tr>
</tbody>
</table>

Note: n = 3,680  **p ≤ .001, *p ≤ .01
^Reflects change in age of 10 years from the mean.

**Effect of academic ability.** Similar to the previous model for earning the GED, quadratic terms were tested for each of the GED subtest scores. The Chi-Square tests of joint significance for each pair of variables (i.e., reading score – reading score^2) were all equal to zero, suggesting that the GED subtests scores are
linear in their effects. The quadratic terms were dropped from the model. These results are reported in Table 10.

Table 10

*Chi-Square goodness of fit tests results for GED Subtest Scores and Subtest Scores-Squared*

<table>
<thead>
<tr>
<th>GED Subtest Scores</th>
<th>$\chi^2$</th>
<th>df</th>
<th>n</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading – Reading$^2$</td>
<td>.73</td>
<td>1</td>
<td>3,680</td>
<td>.39</td>
</tr>
<tr>
<td>Writing – Writing$^2$</td>
<td>.09</td>
<td>1</td>
<td>3,680</td>
<td>.76</td>
</tr>
<tr>
<td>Mathematics – Mathematics$^2$</td>
<td>.12</td>
<td>1</td>
<td>3,680</td>
<td>.73</td>
</tr>
<tr>
<td>Science – Science$^2$</td>
<td>1.26</td>
<td>1</td>
<td>3,680</td>
<td>.26</td>
</tr>
<tr>
<td>Social Studies – Social Studies$^2$</td>
<td>1.85</td>
<td>1</td>
<td>3,680</td>
<td>.17</td>
</tr>
</tbody>
</table>

The GED reading subtest was shown to be a positive indicator of community college enrollment. The reading score mean equaled 592.3 points and the predicted probability for enrolling in an Iowa community college increased by 3 percentage points as reading scores increased by one standard deviation above the mean, from 592 to 688 points. Similarly, the social studies subtest was also a positive indicator of community college enrollment. The social studies score mean equaled 556 points and the predicted probability for enrolling in an Iowa community college increased by 3 percentage points as social studies scores increased by one standard deviation to 630 points.

**Effect of goal variables.** The goal of participating in the GED preparation program to develop basic skills served as the reference category. GED earners who reported a desire to attend college as a reason for participating in the GED preparation program were more likely to enroll in an Iowa community college than those individuals with a basic skills goal. Persons who declared attending college as
a GED preparation goal had a predicted probability of community college enrollment that was 13 percentage points greater than individuals whose goal was to develop basic skills goals.

**Completing a Community College Credential**

The third research question asked: *Among students who enroll in a for-credit postsecondary education program at an Iowa community college, what factors (e.g., demographic, economic, academic ability, educational aspirations) predict earning a community college credential?* Community college enrollment and course data were right-censored, at August 2009, so only individuals who earned the GED by this point were included in the analysis for this question. Findings include descriptive statistics for the independent variables as well as results from probit regression analysis.

**Descriptive Statistics**

Table 11 provides descriptive statistics for the demographic and economic characteristics, GED subtest scores, and goals for the 1,504 individuals in the 2003-2004 Iowa GED cohort who enrolled in an Iowa community college during the period of analysis. Variables for student goals declared at the time of GED program enrollment have been replaced by indicators of student intention for enrolling in a community college credit program. Other independent variables are carried over from the GED dataset.

GED earners who enrolled in an Iowa community college were predominantly female (62.2%). The proportion of females in the dataset for analysis increased substantially from the data used to predict GED completion (51.4% female) and community college enrollment (50.4% female). Similarly, persons who
enrolled in community college (average age 22.7 years) were slightly younger than both the full GED cohort (average age 25.9) and those who earned the GED (23.4 years). The largest age group was again for persons between 18 and 23 years of age, the proportion increasing from 53.0% of all GED candidates to 66.4% of GED earners to 70.5% of community college enrollees.

Table 11

*Descriptive statistics for GED earners who enrolled in an Iowa community college, 2004-2009*

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>percent</th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>935</td>
<td>62.2</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-23</td>
<td>1,060</td>
<td>70.5</td>
<td>22.7</td>
<td>5.4</td>
<td>18</td>
<td>50</td>
</tr>
<tr>
<td>24-30</td>
<td>303</td>
<td>20.1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31-40</td>
<td>117</td>
<td>7.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41-50</td>
<td>24</td>
<td>1.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-White</td>
<td>165</td>
<td>11.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Economic Status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government Assistance (Temporary Assistance for Needy Families, free or reduced lunch, free bus pass, etc.)</td>
<td>245</td>
<td>16.3</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>761</td>
<td>50.6</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>GED Subtest and Total Scores</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>-</td>
<td>-</td>
<td>604.7</td>
<td>97.3</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>Writing</td>
<td>-</td>
<td>-</td>
<td>520.7</td>
<td>71.9</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>Mathematics</td>
<td>-</td>
<td>-</td>
<td>516.0</td>
<td>70.2</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>Science</td>
<td>-</td>
<td>-</td>
<td>565.3</td>
<td>73.8</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>Social Studies</td>
<td>-</td>
<td>-</td>
<td>561.3</td>
<td>74.7</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>GED Total Score</td>
<td>-</td>
<td>-</td>
<td>2,768.3</td>
<td>296.2</td>
<td>2,160</td>
<td>3,810</td>
</tr>
<tr>
<td><strong>Goals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer to Four-Year Institution</td>
<td>191</td>
<td>12.7</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Career or Job Related</td>
<td>766</td>
<td>50.9</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personal Development</td>
<td>127</td>
<td>8.4</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>420</td>
<td>27.9</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note:* The GED passing standard for the state of Iowa is a minimum score of 410 on each of the five GED subtests. The average score across the five tests must be greater than or equal to 450, with a total GED score of 2,250 or higher.

n = 1,504
Given the smaller proportions of Latino, Black, Alaskan or Native American, and Asian or Pacific Islanders at this stage of analysis, these categories have been conflated into a single variable, non-White. The non-White group comprises 11% of those GED earners enrolled in a community college. Measures for government assistance and unemployment were carried over from enrollment in GED preparation. Of the GED earners who enrolled in an Iowa community college, 16.3% had reported receiving some form of government assistance and slightly more than half (50.6%) had been unemployed.

Mean scores for the five GED subtests and total GED score are reported in Table 11. Subtest scores for all persons who took the GED ranged from a minimum of 420 to a maximum of 800. The highest average subtest score for GED earners was reading \( (M = 604.7, SD = 97.3) \) and the lowest average subtest score was mathematics \( (M = 516.0, SD = 70.2) \). The mean for the total GED score was 2,768 with a standard deviation of 296 points. Mean scores on all subtests and the total GED were all higher than for those scores for GED earners. Both subtest and total GED scores are used in this stage of the analysis.

The goal for enrolling in community college most frequently cited by students was career- or job-related (50.9%), including career exploration, preparing to enter the workforce, licensure, and improving skills for present job. Transferring from the community college to a four-year institution was a goal indicated by 12.7% of community college enrollees, while 8.4% enrolled for reasons of personal development. The enrollment goal was unknown or undeclared for 27.9% GED earners who enrolled in community college.
Probit Regression Model Results

Two probit regression models were used to determine which variables help predict earning a credential (certificate, diploma, or two-year degree) for GED earners who enrolled in a credit program at an Iowa community college \((n = 1,504)\). Model 1 included all demographic, economic status, and community college goal variables, and uses the five GED subtest scores. Using the subtest scores for reading, writing, mathematics, science, and social studies revealed competencies with the greatest predictive effects. Model 2 replaced the subtest scores with the total GED score to examine how overall GED achievement may predict credential completion.

Complete model results are presented in Table 12, including regression coefficients and standard errors for each variable, indication of statistical significance, and the percent change in the predicted probability of the dependent variable (earning a community college credential). The demographic variables female and age (both \(p \leq .001\)) were statistically significant in both models, as was the variable for unemployed \((p \leq .01)\). The GED subtest score for writing \((p \leq .05)\) was a significant predictor in Model 1, while total GED score \((p \leq .001)\) was found to be statistically significant in Model 2. Of the goal variables, transfer to four-year institution \((p \leq .05)\) was statistically significant in both models.

**Effect of demographic variables.** In both models, female GED earners were more likely than males, the reference category, to earn a community college credential. In both models, females had a predicted probability of earning a credential 7 percentage points higher than males.

A quadratic term for age was tested for both models. A Chi-Square test of joint significance, however, indicated that coefficients together for age and age^2 were
equal to zero, suggesting that age is linear in its effects in both Model 1, $\chi^2 (1, n = 1,504) = 1.60, p = .206,$ and in Model 2, $\chi^2 (1, n = 1,504) = 1.67, p = .196.$ Consequently, the specified models included only a linear measure of age. Controlling for other variables, age had a positive effect on earning a community college credential. In Model 1, the predicted probability of earning a community college credential ranged from 12 percentage points for persons 18 years of age to 19 percentage points for persons 30 years of age to 35 percentage points for persons 50 years of age. Model 2 results were similar, as the predicted probability of earning a community college credential ranged from 12 percentage points for persons 18 years of age to 18 percentage points for persons 30 years of age to 34 percentage points for persons 50 years of age.

**Effect of economic variables.** GED earners who were unemployed at the time of their enrollment in the GED preparation program were less likely to complete a community college credential. In both Model 1 and Model 2, the predicted probability for completing a credential was 5 percentage points less for persons who had been unemployed.

**Effect of academic ability variables.** Model 1 tested the effect the individual GED subtest scores on earning a community college credential, while Model 2 tested the effect of the total GED score. Model 1 results indicated that individuals with a higher writing test score were more likely to earn a credential than persons with lower scores. The predicted probability for earning a credential rose by 2 percentage points as the writing test score improved from the mean (521 points) to one standard deviation above the mean (593 points).
Table 12
Probit regression results, predicting the probability of GED earners obtaining a community college credential, 2004-2009

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>SE</th>
<th>Δx</th>
<th>ΔP(Y)</th>
<th>Coefficient</th>
<th>SE</th>
<th>Δx</th>
<th>ΔP(Y)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td></td>
<td>Model 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>.3202***</td>
<td>.0935</td>
<td>0 to 1</td>
<td>6.82%</td>
<td>.3327***</td>
<td>.0894</td>
<td>0 to 1</td>
<td>7.07%</td>
</tr>
<tr>
<td>Age</td>
<td>.0255***</td>
<td>.0070</td>
<td>1 SD</td>
<td>3.06%</td>
<td>.0248***</td>
<td>.0070</td>
<td>1 SD</td>
<td>2.98%</td>
</tr>
<tr>
<td>Non-White</td>
<td>-1.493</td>
<td>.1519</td>
<td>0 to 1</td>
<td>-3.11%</td>
<td>-1.497</td>
<td>.1508</td>
<td>0 to 1</td>
<td></td>
</tr>
<tr>
<td><strong>Economic status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government assistance</td>
<td>-.1671</td>
<td>.1184</td>
<td>0 to 1</td>
<td>-3.48%</td>
<td>-.1632</td>
<td>.1180</td>
<td>0 to 1</td>
<td>-3.41%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>-.2327**</td>
<td>.0832</td>
<td>0 to 1</td>
<td>-5.17%</td>
<td>-.2353**</td>
<td>.0831</td>
<td>0 to 1</td>
<td>-5.23%</td>
</tr>
<tr>
<td><strong>GED Scores</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>.0003</td>
<td>.0005</td>
<td>1 SD</td>
<td>0.69%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Writing</td>
<td>.0013*</td>
<td>.0007</td>
<td>1 SD</td>
<td>2.11%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td>.0009</td>
<td>.0007</td>
<td>1 SD</td>
<td>1.40%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td>.0008</td>
<td>.0008</td>
<td>1 SD</td>
<td>0.02%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social Studies</td>
<td>.0004</td>
<td>.0007</td>
<td>1 SD</td>
<td>0.01%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total GED Score</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>.0007***</td>
<td>.0001</td>
<td>1 SD</td>
<td>4.60%</td>
</tr>
<tr>
<td><strong>Community College Goals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer to Four-Year Institution</td>
<td>-.3100*</td>
<td>.1491</td>
<td>0 to 1</td>
<td>-6.04%</td>
<td>-.3110*</td>
<td>.1492</td>
<td>0 to 1</td>
<td>-6.06%</td>
</tr>
<tr>
<td>Career Ed. or Job Training</td>
<td>-.0077</td>
<td>.0942</td>
<td>0 to 1</td>
<td>-.17%</td>
<td>-.0091</td>
<td>.0941</td>
<td>0 to 1</td>
<td>-.20%</td>
</tr>
<tr>
<td>Personal Development</td>
<td>.1038</td>
<td>.1564</td>
<td>0 to 1</td>
<td>2.41%</td>
<td>.1111</td>
<td>.1561</td>
<td>0 to 1</td>
<td>2.59%</td>
</tr>
<tr>
<td>McFadden’s Pseudo R²</td>
<td>.06</td>
<td></td>
<td></td>
<td>.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Log-likelihood</td>
<td>-605.67</td>
<td></td>
<td></td>
<td>-606.55</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Cases predicted correctly</td>
<td>56.7%</td>
<td></td>
<td></td>
<td>56.9%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Cases of Y=1</td>
<td>x predicted correctly</td>
<td>66.4%</td>
<td></td>
<td>66.4%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Cases of Y=0</td>
<td>x predicted correctly</td>
<td>55.0%</td>
<td></td>
<td>55.1%</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note: n = 1,504  ***p ≤ .001, **p ≤ .01, *p ≤ .05
Model 2 results indicated that individuals with a higher total GED test score were also more likely to earn a credential than persons with lower scores. The predicted probability for earning a credential rose by 5 percentage points as the total GED test score improved from the mean (2,768 points) to one standard deviation above the mean (3064 points).

**Effect of goal variables.** Variables used to indicate students’ education goals shifted from goals of enrolling in GED preparation to goals for enrolling in credit-bearing community college coursework. Individuals with unknown or undetermined goals served as the reference category. Results for both Model 1 and Model 2 indicated that GED earners with the goal of transferring to a four-year institution were less likely to complete a community college credential than persons with an unknown goal. In both models, persons with an academic transfer goal had a predicted probability of completing a credential that was 6 percentage points less than the reference group.

Finally, Table 13 provides descriptive data on those individuals who earned a community college credential. The proportion of females rose again, while the proportion of persons who were unemployed has declined by approximately 10%. Not surprisingly, all GED scores are higher for individuals who earned a credential, but the distribution of educational goals remained largely unchanged except for a decline in the proportion of persons who plan to earn a community college credential so they can transfer to a four-year institution.
Table 13

Descriptive statistics for credential earners, 2004-2009

<table>
<thead>
<tr>
<th>Variable</th>
<th>n</th>
<th>percent</th>
<th>M</th>
<th>SD</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>162</td>
<td>70.7</td>
<td>-</td>
<td>-</td>
<td>18</td>
<td>50</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-23</td>
<td>140</td>
<td>61.1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>24-30</td>
<td>57</td>
<td>24.9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>31-40</td>
<td>25</td>
<td>10.9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>41-50</td>
<td>7</td>
<td>3.1</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Non-White</td>
<td>15</td>
<td>6.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Economic Status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government Assistance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Temporary Assistance for Needy Families, free reduced lunch, free bus pass, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>13.5</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Unemployed</td>
<td>92</td>
<td>40.2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>*GED Subtest and Total Scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reading</td>
<td>-</td>
<td>-</td>
<td>627.2</td>
<td>103.0</td>
<td>430</td>
<td>800</td>
</tr>
<tr>
<td>Writing</td>
<td>-</td>
<td>-</td>
<td>542.4</td>
<td>84.1</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>Mathematics</td>
<td>-</td>
<td>-</td>
<td>532.1</td>
<td>81.3</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>Science</td>
<td>-</td>
<td>-</td>
<td>582.6</td>
<td>78.3</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>Social Studies</td>
<td>-</td>
<td>-</td>
<td>576.3</td>
<td>75.9</td>
<td>420</td>
<td>800</td>
</tr>
<tr>
<td>GED Total Score</td>
<td>-</td>
<td>-</td>
<td>2,860.6</td>
<td>326.5</td>
<td>2260</td>
<td>3,810</td>
</tr>
<tr>
<td>Goals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer to Four-Year Institution</td>
<td>20</td>
<td>8.7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Career Ed. or Job Training</td>
<td>121</td>
<td>52.8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Personal Development</td>
<td>22</td>
<td>9.6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Unknown</td>
<td>66</td>
<td>28.8</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: *The GED passing standard for the state of Iowa is a minimum score of 410 on each of the five GED subtests. The average score across the five tests must be greater than or equal to 450, with a total GED score of 2,250 or higher.

n = 229

The Relationship of Time to Completing a Community College Credential

The fourth and final research question asked: Based on the factors examined so far (demographic, economic, academic ability, and educational aspirations) what is the likelihood of earning a community college credential over time? Earning a credential at an Iowa community college was again utilized as the dependent variable. Question three applied a cross-sectional approach to determine the predictors for earning a community college credential between 2004 and 2009. This question analyzed the same data longitudinally to examine the likelihood of earning a credential each of
six discrete time periods—fiscal years 2004, 2005, 2006, 2007, 2008, and 2009. Postsecondary education occurs over time, whether in semesters or years, yet research on postsecondary education is frequently only cross-sectional in nature. This analysis was intended to extend the cross-sectional analysis from question three.

The dataset provided by the Iowa Department of Education included 10 cases where credentials were earned in July and August 2009. To maintain the integrity of the discrete time periods, data for credentialing beyond the end of the 2009 fiscal year on June 30 was omitted from analysis, resulting in 219 credentials earned instead of 229. The number of GED earners enrolled in an Iowa community college \((n = 1,504)\) included in this analysis was the same as for research question three. Findings reported include logistic regression results for the baseline and full discrete-time hazard analysis models as well as graphs of the baseline hazard functions and hazard functions for significant predictor variables.

**Hazard Model Results**

A discrete-time hazard model was used to determine which variables predict earning a community college credential in fiscal years 2004 through 2009 \((n = 1,504)\). Table 14 presents the results of the baseline and full hazard models predicting earning a community college credential.

Three variables were shown to have a statistically significant relationship with earning a community college credential: age \((p < .05)\), total GED score \((p < .001)\), and the transfer to four-year institution goal \((p < .01)\). Age was found to have a positive effect on credentialing meaning that older students have a higher conditional probability of completing a community college credential. Total GED
score also had a positive effect on credentialing. Lastly, the goal variable transfer to four-year institution was found to have a negative effect on the conditional probability of earning a credential.

**Baseline conditional probabilities.** Discrete-time hazard models represent the conditional probability that a subject in the dataset who is eligible to experience the target event (earn a credential) will experience it conditional upon not having yet experienced the event (Singer & Willett, 2003). Figure 6 shows the graphed Baseline Model hazard results for the GED earners who enrolled in an Iowa community college. The graph represents the probability of earning a community college credential in each fiscal year between 2004 and 2009, conditional on not having already earned a credential. The conditional probability of earning a credential was very low (3%) in the first year of analysis, which was not surprising given the time required to earn a certificate, one-year diploma, or two-year degree. The conditional probability climbed rather steadily through 2007 (22%) before declining a bit in 2008 and peaking in 2009 at 25%.
Table 14

Discrete-time hazard model results for earning an Iowa community college credential in fiscal years 2004-2009

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>SE</th>
<th>Coefficient</th>
<th>SE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline Model</td>
<td></td>
<td>Full Model</td>
<td></td>
</tr>
<tr>
<td>Fiscal year dummy variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
<td>-3.708***</td>
<td>.1687</td>
<td>-6.924***</td>
<td>.8056</td>
</tr>
<tr>
<td>2005</td>
<td>-2.484***</td>
<td>.1311</td>
<td>-5.709***</td>
<td>.8030</td>
</tr>
<tr>
<td>2006</td>
<td>-1.624***</td>
<td>.1337</td>
<td>-4.819***</td>
<td>.7985</td>
</tr>
<tr>
<td>2007</td>
<td>-1.253***</td>
<td>.1839</td>
<td>-4.446***</td>
<td>.8081</td>
</tr>
<tr>
<td>2008</td>
<td>-1.494***</td>
<td>.3336</td>
<td>-4.724***</td>
<td>.8704</td>
</tr>
<tr>
<td>2009</td>
<td>-1.099</td>
<td>.5774</td>
<td>-4.223***</td>
<td>1.000</td>
</tr>
<tr>
<td>Demographics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>.0395</td>
<td></td>
<td>.1667</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>.0249*</td>
<td></td>
<td>.0125</td>
<td></td>
</tr>
<tr>
<td>Non-White</td>
<td>-.3345</td>
<td></td>
<td>.3052</td>
<td></td>
</tr>
<tr>
<td>Economic status</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government assistance</td>
<td>-.2200</td>
<td></td>
<td>.2232</td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>-.2445</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GED Scores</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total GED Score</td>
<td>.0010***</td>
<td></td>
<td>.0002</td>
<td></td>
</tr>
<tr>
<td>Community College Goals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transfer to Four-Year Institution</td>
<td>-.7951**</td>
<td></td>
<td>.2823</td>
<td></td>
</tr>
<tr>
<td>Career Ed. or Job Training</td>
<td>.0232</td>
<td></td>
<td>.1712</td>
<td></td>
</tr>
<tr>
<td>Personal Development</td>
<td>.1297</td>
<td></td>
<td>.2798</td>
<td></td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-702.15</td>
<td></td>
<td>-680.74</td>
<td></td>
</tr>
</tbody>
</table>

Note: n = 2,976 (1,504 unique cases)  ***p ≤ .001, **p ≤ .01, *p ≤ .05
Figure 6. Baseline hazard function for earning a credential.

Conditional probabilities of hazard with significant predictors. The effects on hazard of the three statistically significant variables in the Full Model are graphed in Figures 7 through 9. These hazard curves take the same shape as the baseline model, but predictor variables shift the curves up or down (Singer & Willett, 2003).

Figure 7 shows the positive effect of age on earning a community college credential. The conditional probability of earning a credential is lowest for persons in the 25th percentile of age (19 years) in every time period. The conditional probabilities became progressively higher for older people. The conditional probability for earning a credential for individuals who were 19 years of age ranges from 2% to 23%; for persons who were 25 years of age (the 75th percentile of age), the
conditional probability ranges from just over to 2% to 26%. This result for age was consistent with model results in research question three.

![Graph showing fitted value of hazard over fiscal years for different age groups.](image)

**Figure 7.** Estimated hazard function for age.

Figure 8 shows the positive effect of total GED score on earning a community college credential. The conditional probability of earning a credential for persons who earned the mean total GED score (2,768) ranges from 2% to 25%. Conditional probabilities were lower in every time period for individuals with total GED scores one standard deviation below the mean (2,472), ranging from 2% to 20%. Individuals with a total GED score one standard deviation above the mean (3,064) have much higher conditional probabilities of earning a credential, ranging from 3% in FY 2004 to 31% in FY 2009. This result for total GED score was also consistent with findings from research question three.
Lastly, Figure 9 shows the negative effect of the goal variable transfer to a four-year institution. As was the case in research question three, the reference category was again goals that were unknown or undeclared. Persons specifying the goal of transfer have a lower conditional probability in every fiscal year of analysis than those individuals without a declared goal. The conditional probability of earning a credential ranged from 1% to 14% for individuals with a transfer goal, compared to 2% to 27.0% for persons without a declared goal. This result was consistent with findings for research question three. The credential most closely associated with the community college transfer function was the two-year degree (Cohen & Brawer, 2008; Mellow & Heelan, 2008). These model results likely account for the additional time necessary to earn this credential rather than certificates or diplomas, which may take less than half the time and be more easily obtained by someone without longer-term educational aspirations.
Summary

This chapter has presented the results of analyses addressing the research questions guiding this study. This analysis of the same or similar demographic, economic, academic ability, and goals of the 2003-2004 GED cohort along various steps along the path toward a community college credential, allowed for a consistent set of success indicators to emerge. For example, younger students were more likely to have success on the GED, but older students had a greater likelihood of persisting through to completion of a community college credential. GED subtest scores for reading and writing contributed positively to students’ likelihood of community college enrollment and credential completion. GED students’ goals for pursuing further education and credentialing mattered in considering their predicted probability of earning the GED, enrolling in college, and completing a credential.
Of course, the success or lack thereof for GED students cannot be distilled to a handful of variables. But closer examination of these characteristics of GED candidates who experienced success completing their high school equivalency credential, enrolled in community college, and earned a community college credential can inform practice and policy and provide new ways and ideas for examining GED student data. A discussion of results and their implications is the focus of Chapter 5.
CHAPTER 5. CONCLUSION

This chapter provides a discussion of the significant findings of the study and presents their implications for further research, policy, and practice. The chapter begins by revisiting in brief the conceptual framework that guided the study. Next, the findings for each research question are discussed in detail. New lines of quantitative and qualitative inquiry suggested by this research are then presented, followed by implications for policy and practice in Iowa’s GED preparation programs and community colleges. The chapter concludes with recommendations for policy and practice.

Discussion

The study tracked students from GED preparation and earning the GED to enrolling in an Iowa community college and earning a community college credential. Connecting theory to the conceptual framework and the conceptual framework to available data, the study posited that as high school dropouts develop personal or professional goals, they seek a path to achieve them through continued education. A positive GED program experience, resulting in the GED credential, may lead to a stronger sense of perceived behavior control (Ajzen, 1985; Fishbein & Ajzen, 1975; Madden, Ellen, & Ajzen, 1992). The GED experience may contribute to a more positive outlook on schooling, with the renewed sense of personal agency and ability resulting in greater goals and aspirations. Demographic, economic, and ability factors effect decisions to enroll and continue in college, and life circumstances can easily interrupt adult learners’ educational goals and plans (Bean & Metzner, 1985). Credentialing may take longer for adult learners, but persistence
over time may lead to even broader opportunities for economic and social mobility through accrual of human capital (Becker, 1993; Schultz, 1961).

The results of this study were interpreted through the perspective of this conceptual framework. While a substantial amount of information about the lives and circumstances of the individuals who comprised this study is not known, this framework offered an explanation of the processes that may lead high school dropouts to pursue additional schooling, especially as they move beyond the GED.

**Earning the GED**

Earning the GED is the first step for high school dropouts to further their education. The analysis of data for the 2003-2004 Iowa GED cohort revealed a number of significant predictors for earning the GED: Age, racial/ethnic status as Black or Latino, unemployment at the time of GED program enrollment, academic ability as measured by the CASAS pre-test at enrollment, and a goal of either earning the GED or completing the GED program for personal development reasons.

Age had an inverse relationship to earning the GED, with the likelihood of earning the GED highest for persons 18 years of age and declining rapidly through the 20s and early 30s. The likelihood of earning the GED appeared to decline much more slowly for persons aged 40 years and older. The fact that younger persons may have a higher predicted probability of earning the GED may be because they have a greater expected lifetime earning benefit for the credential compared to older GED candidates. Younger candidates’ success may also be attributable to their recent school experiences where concepts covered in GED preparation on the various subtests remain relatively fresh for them. Older adults not only have been
away from school longer, but they may also believe that earning the high school credential is less beneficial and less important given their stage and status in life. Such a mindset reflects what Maralani (2003) cited as the social dimension of age, where individuals may decide that the appropriate time for certain life events, such as completing a high school credential, has passed.

Blacks and Latinos in the 2003-2004 GED cohort were less likely to earn the GED than Whites. Blacks and Latinos were also disproportionately over-represented in the GED cohort, relative to Iowa population figures. This finding is particularly important, given the increasing diversity of Iowa. While many members of the GED cohort, regardless of race or ethnicity, likely come from lower economic backgrounds, this disadvantage for Blacks and Latinos may be further compounded by the lack of parents, peers, or family members who completed or understand the value of completing school.

Persons who reported being unemployed were less likely to earn the GED than those persons who reported a current job. The decrease in predicted probability (3 percentage points) was relatively small, and it is important to consider that this is a one-time measure of job status. As such, it is likely that the prevailing need to find a job and the subsequent effort to remain employed could have easily made GED completion more difficult. Job interviews and the chance to work could take priority, resulting in a situation where following through with GED preparation is analogous to the spotty college attendance patterns of some working adult students balancing work and family commitments (Reder, 2007).

Not surprisingly, higher scores on the CASAS exam, used to place members of the GED cohort at the appropriate level of instruction, resulted in a higher
predicted probability of earning the GED. Probabilities for persons earning a score of 200 on the placement exam (beginning basic skills level) were far less likely than those individuals who earned a score or 225 (advanced basic skills level) or 250 (advanced adult secondary skills level). Higher scores translated to greater readiness to pass the GED.

Goals also had a positive effect on the likelihood of earning the GED. Those individuals who indicated that a goal for enrolling in GED preparation was earning the GED had a predicted probability of success that was 26 percentage points higher than someone entering the program with a goal to develop basic skills (i.e., basic literacy and numeracy). It is likely that individuals who have completed more schooling default toward the GED goal, while persons with less academic preparation may be coached toward declaring a goal to develop basic skills. People in the GED cohort with a personal development goal were also more likely to earn the GED than those persons with a basic skills goal. People with personal development goals were usually enrolling in the GED program primarily for the sense of accomplishment that comes with completing the high school equivalency and likely possessed strong internal motivation to reach their goal.

**Enrolling in an Iowa Community College**

GED earners may decide to pursue additional education for a number of reasons. A particularly positive GED experience may have improved their attitudes toward schooling or they may believe more strongly in their ability to be successful in school. It is highly likely that their personal and professional aspirations require further education. Analysis of Iowa GED earners revealed that gender (female), age,
race (Black), GED reading and social studies scores, and having a goal to attend college were significant predictors of enrolling in an Iowa community college.

Females had a much higher predicted probability of enrolling in an Iowa community college than did males. Data trends show that women are clearly the majority on U.S. college campuses (Beattie, 2002; Goldin, Katz, & Kuziemko, 2006; Jacob, 2002). Results for Iowa GED earners may be because women are more willing to invest time and money in the career exploration and career development provided by college courses. Reasons offered for males’ diminished participation in postsecondary education have included the lack of enjoyment of secondary schooling reported by some males (Jacob, 2002) and the perception by some men that college is unnecessary to their preferred fields (e.g., construction and manufacturing) despite limited opportunities for advancement without further training (Compton, 2008). Goldin, Katz, and Kuziemko (2006) found that women’s enrollment advantage over men is greatest across the lower half of the socioeconomic distribution, a result likely to be consistent with most Iowa GED earners.

Similar to results for earning the GED, older GED earners were less likely to enroll in college. This result is consistent with the challenges to college enrollment and persistence for adults who must tend to work and family obligations as noted by Reder (2007). The inverse effect of age on community college enrollment may also stem from the perspective of older adults that going to college is no longer an appropriate activity after the late-teens and early twenties (Maralani, 2003). It is also likely that older persons perceive a diminished return on investment for attending college.
Blacks were found to have a predicted probability of enrolling in an Iowa community college 8 percentage points higher than Whites (the reference group). Given the opportunity afforded by completing the GED, perhaps Blacks who earned the GED had a greater motivation toward education that made them more likely to enroll in college than Whites. Perhaps the experience of being such a relatively small minority in a mostly White state contributed to resilience in the pursuit of further education.

GED subtest scores for reading and social studies were positive predictors of community college enrollment. The GED reading test emphasizes comprehension, interpretation, and application of selected texts to new contexts. The social studies test asks examinees to draw reasoned conclusions in history, government, economics, and geography using information and data provided by maps, charts, graphs, and written texts. Greater comprehension and interpretive skills are likely to make students feel more confident in their ability to pursue postsecondary education. GED to college transitions programs, such as those in Iowa, emphasize these skills, among others, to bolster the chances of success for students who enroll in college.

Lastly, GED earners who reported that a goal for enrolling in GED preparation was to attend college had a predicted probability of enrollment in an Iowa community college that was 13 percentage points higher than someone with a goal to develop basic skills (the reference group). This result suggests that students whose goal upon enrollment in the GED preparation program was to go to college were capable of achieving it. They appeared to possess both the commitment and
ability to persist not only in earning the GED, but also in taking the next step toward further education. No other goal variables had significant results.

**Completing a Community College Credential**

Completing a community college credential requires persistence over a period of time. For many adult learners, especially GED students, finishing a credential requires a longer time horizon and a strong desire to keep working toward the goal despite obligations to family and work. The credential may become an end to greater means with the promise of better job and financial prospects in the offing. Analysis from two different probit regression models predicting credentialing for Iowa GED earners who enrolled in an Iowa community college revealed that gender (female), age, unemployment, GED writing and overall GED score, and having a goal to transfer from community college to a four-year institution were significant predictors of earning a community college credential.

Females were more likely to earn a credential than males in both analyses. Not only did women far outnumber men as a percentage of GED earners who enrolled in community college (62%), they also comprised a large majority of those GED earners who earned a credential (71%). These models and descriptive results show that not only are women more likely than men to enroll in college, they are also more likely to persist. Perhaps, as Compton (2008) posited, males enrolled in college may be more likely to take only the courses they need to keep up their skills for employment, while women may seek credentials to provide longer-term job stability.

Age served as an inverse predictor for earning the GED and enrolling in college, but emerged as a positive predictor for earning a credential in both
analytical models for credentialing. Older GED earners enrolled in an Iowa community college were more likely to complete a credential than younger GED earners. Perhaps older students are more certain of their reason for going to college (e.g., well-defined career field, opportunity to advance in their current job) and are more committed to the completion of a specific short- or long-term credential required to fulfill that reason. Younger people may take courses as a way to explore career or job options without sequencing their course taking so as to earn a credential within the period of observation for this study. These results are consistent with findings from Calcagno, Crosta, Bailey, and Jenkins (2007) who found that controlling for race, ethnicity, full-time and part-time attendance, remediation and academic ability, and other variables that students older than 25 years of age were 1.24 times more likely to complete a community college degree than traditional age students.

Both sets of analyses also found that persons who reported being unemployed were also less likely to earn a credential. Unemployed persons who enrolled in community college may only have taken courses to gain specific skills required to get a new job, but not continued toward any sort of short- or long-term credential. It is also possible that some persons who were unemployed lacked the financial stability necessary to persist toward a credential—the very thing that may help alleviate their economic situation.

One model predicted earning a community college credential using all five GED sub-test scores (reading, writing, mathematics, science, and social studies) while the second model predicted credentialing using the total GED score. The writing score and the overall GED score were significant predictors for completing a
credential. The GED writing test emphasizes essay organization and sentence structure, as well as expository writing and the ability to state an argument or explain a phenomenon. These skills are indicative of higher-level abilities required for success in most technical and professional fields and transfer-oriented majors.

The overall GED score is a sum of the scores of all five sub-test scores. Like the writing score, the overall score had a positive effect in predicting earning a college credential. The overall GED score captures the range of competencies tested by the GED. Similar to other standardized tests scores, the overall GED score provides only a general measure of academic ability.

The sole goal variable to significantly predict earning a community college credential, transferring to a four-year institution, was negative in its effect. Credentials consisted of both short-term (certificate, one-year diploma) and long-term (two-year degree) awards. It may be expected that persons who wanted to transfer to a four-year college were among the most ambitious GED earners and having this goal would positively predict earning a credential. However, individuals intending to transfer to a four-year institution most often do so by first earning a two-year degree at the community college (Cohen & Brawer, 2008). It is very likely that the negative effect of the four-year transfer goal is caused by the longer timeframe required to complete this long-term credential. The amount of time required for the two-year degree is likely much longer for most adult learners because of part-time attendance and stop-out required to manage work, family, and varying life circumstances that can interrupt college-going (Bean & Metzner, 1985; Jacobs & King, 2002; Reder, 2007). Likewise, students enrolled with a career and job-training goal are more likely to be interested in a short-term credential or plan only
to take a few courses to explore certain fields without the intention of ever completing a credential (Compton, 2008).

**Earning a Credential Over Time**

The longitudinal discrete-time hazard model was used to extend the cross-sectional analysis of earning a community college credential. The outcome variable again was earning a credential (short-term or long-term), but this analysis examined the probability of earning a credential in any one of the six fiscal years between 2004 and 2009, conditional upon not having completed a credential in a previous time period. Results for the discrete-time model were consistent with findings for the probit regression, but only three variables displayed a significant predictive effect over time: Age, total GED score, and goal of transferring to a four-year college. Before discussing the significant predictor variables, it is important to note what the baseline hazard curve says about credential completion.

The baseline hazard curve of the discrete-time hazard model (Figure 6) provides a visual representation of the probabilities of earning a community college credential in the fiscal years of observation for the dataset (2004-2009), with the condition that a credential has not been earned in a prior time period. The shape of this curve shows the increasing likelihood of earning a credential between fiscal year 2004 and fiscal year 2007, with a decline in 2008 before the curve peaks in fiscal year 2009, the last year of observation. The shape of this curve most likely reflects the likelihood of completion of many short-term credentials (certificates and one-year diplomas) in the first three to four fiscal years of observation. The drop in likelihood of earning in a credential in 2008 before the curve peaks in 2009 represents fewer
credentials being completed in the year before completion of long-term credentials, which require more time, and causes the curve to rise.

The addition of significant predictors to the baseline model caused shifts in the magnitude of the curve, but not its shape (Singer & Willett, 2003). Consequently, the positive effect of age on credentialing is shown to occur in every time period, with older people enjoying an advantage in likelihood of earning a credential over younger people. The rationale for credentialing success for older people compared to younger individuals remains the same: Older people may have a more clearly defined purpose for attending college that leads them to complete a credential, where as younger people, at the start of their work lives, may be exploring career options by taking courses only occasionally or as needed to stay abreast of work requirements. Older learners, despite family and work commitments, may have more stable lives that allow room for and prioritization of more consistent course-taking leading to a credential.

Also, in any time period, people with higher overall GED scores had a greater likelihood of earning a credential. Again, the shape of the hazard curve that models the likelihood of earning a credential remained the same as that of the baseline curve, but the addition of the overall GED score variable showed the effects of having a lower total GED score (lower conditional probabilities of earning a credential) and a higher GED score (higher conditional probabilities of earning a credential) in every fiscal year of analysis.

Finally, the negative effect of the goal of transferring to a four-year college was experienced in every year of observation using discrete-time hazard. As discussed previously, most students planning to transfer to a four-year institution
do so by earning a two-year degree. The time required to earn this credential has a dampening effect on the likelihood of earning a credential in every time period. Consequently, it appears as though this goal variable was a proxy for individuals earning a two-year degree. This observation and year-to-year detail about credentialing for persons wanting to transfer to four-year institutions is not possible to obtain using cross-sectional methods.

**Implications for Further Research**

This study represents the first in-depth examination of Iowa GED students from enrollment in GED preparation to completion of a community college credential, and it has much to offer to researchers and policymakers in the state of Iowa and beyond. Like all first efforts, however, there remain a number of unexplored and under-analyzed aspects along the Iowa GED to community college credential pathway. This section suggests avenues for further research.

The conceptual framework for this study suggests that developing a sense of setting and achieving educational goals for GED students is linked to overcoming prior poor experiences with schooling. The framework theorized that positive educational experiences along the GED to college pathway spur further goal setting and increase motivation toward further schooling as well as persistence. Additional variables would benefit operationalization of this framework.

Data on prior high school achievement and last grade level achieved, as well as an indication of the reason for dropping out of school would allow for the distinction of poor or negative experiences with schooling as well as an additional measure of pre-GED ability. Family background data would improve controls for economic status and provide data on parents’ educational attainment. Perhaps most
importantly, repeated measures of educational goals and motivation toward education, which likely vary over time, would reveal the changing nature of educational aspirations. And finally, information on life after credentialing (job status, earnings data, additional schooling) would reveal additional educational and human capital outcomes (Sanchez & Laanan, 1998; Schenk & Matsuyama, 2009).

The current study, with additional observations across a longer period of time, lends itself to a multi-level modeling approach, where cases are nested within other multiple entities (i.e., students within community colleges; Raudenbush & Bryk, 2002). Multi-level modeling would allow controlling for student-level variables separately from the variables specific to Iowa’s 15 community colleges. Student-level variables would include gender, age, academic ability, and goals. Community college-level variables could include GED program enrollment, the nature of community college district (rural, suburban, urban), district poverty rate, and district unemployment. The multi-level approach would reveal the role that community colleges play in earning the GED, enrolling in college, and earning a credential separate from the role student characteristics play in determining these outcomes.

Attrition along the GED to college credential pathway is clearly a problem. The 2003-2004 Iowa GED cohort consisted of 11,675 GED candidates at the start, yet only 4,089 people attempted the GED by the end of fiscal year 2010. As a matter of procedure, Iowa only permits those GED students deemed ready for testing to take the GED and the result of this practice is an annual statewide pass-rate that exceeds 95%. Qualitative research methods could help reveal causes of attrition along the pathway. A phenomenological approach could study individual GED students’
prior schooling experiences and current reasons for enrolling in GED, while an ethnographic approach could study how GED candidates engage with one another, their instructors, and the process of GED preparation to reveal their level of commitment and ability in the GED preparation process (Jones, Torres, & Arminio, 2006).

Qualitative practices could also help explain why so many GED earners fail to enroll in college and why such a limited percentage of college-going GED earners complete a credential. Perhaps earning the GED or just taking a few courses provides ample education and human capital development for some individuals to be successful in their chosen field. Further study, however, could investigate how K-12 experiences and the GED preparation process affect decisions about whether to pursue additional education, clarify how GED earners decide if they have received enough education or training, and explore the barriers they perceive to additional education. Generally, interviews and focus groups with GED students and GED earners could reveal a great deal about the alignment of their educational goals and life aspirations, factors that keep them motivated, the degree of personal control or agency they feel over their own education, and what helps them decide whether or not to pursue the next levels of education. Another under-studied area where a qualitative approach would provide further knowledge is GED to college transition programs and how students experience and benefit from participating in them.

Implications for Policy and Practice

Data in this study represented educational experiences, achievements, and shortcomings. Rather than just a series of data points, however, the study concerned goals and education and their consequences for real people. High school dropout,
failure to earn a GED, or the decision to enroll in college but not persist to a credential have estimable individual costs in lost education and employment opportunities as well as tangible social costs in terms of lost tax revenue and unnecessary strain on the social safety net. This section details implications this study has for policy and practice for GED programs and community colleges in Iowa.

The study revealed or confirmed a number of predictors for GED student success, such as gender (women are more likely to enroll in a community college and earn a credential), age (older people are more likely earning a credential), and academic ability (people with higher CASAS and GED scores have a greater probability of completing the path from GED to credential). But the study also revealed a number of negative predictors that require attention: Challenges for GED completion for Blacks and Latinos and older GED candidates, decreased likelihood of men and older GED earners to enroll in college, and difficulties faced along the pathway by persons who are unemployed. Strategies to address these negative predictors are discussed first, followed by suggestions for using information about student goals and the time required to earn a credential to improve persistence and credentialing.

As Iowa becomes more and more diverse, it is imperative to make sure that racial and ethnic minorities without a high school credential are not left even farther behind. As previously noted, Latinos (9%) and Blacks (15%) were overrepresented among the 2003-2004 GED candidates in a state with a population that was 95% White at the end of the 2004 fiscal year. Furthermore, the 2010 U.S. Census showed that Latinos are the fastest growing racial or ethnic group within Iowa, growing
from 2.5 to 5% of the Iowa population between 2004 and 2010 (State Data Center of Iowa, 2010). It is important to make sure that GED preparation programs are prepared to support larger numbers of racial and ethnic minorities.

Male GED earners in Iowa were found to be less likely than females to enroll in a community college. Those males who did enroll were less likely than females to complete a credential. While results for female students’ persistence and achievement were somewhat positive, they revealed a significant gap for Iowa males. More must be done to further males’ education beyond the GED, including helping them understand work and income trajectories for GED earners compared to individuals who have completed some college or a college credential. Males who expect to work in labor fields such as construction, manufacturing, or agriculture may be surprised to learn how tenuous their employment might be and how little upward mobility they may have without at least some schooling beyond the GED.

While older persons have a greater probability of earning a credential, they were less likely to persist to earning the GED or enroll in college. GED completion and college enrollment are critical in the progression from GED to college credential. While persons who test at the lowest levels likely receive a great deal of attention given their risk of failure, older persons may also require extra support. GED preparation programs in Iowa could make a difference for older adults, particularly those over 35 years of age, by helping them with goal setting and developing step-by-step plans to earn the GED, as well as helping them understand potential job, educational, economic, and social opportunities that may become available to them with the GED in hand.
Similarly, persons who reported being unemployed were less likely to earn the GED. Combining job placement assistance with GED preparation in a one-stop format may enable unemployed persons to have better success finding a job and achieving educational successes. A combined service may be better equipped to help unemployed people manage the time commitment of searching for a new job while helping them progress up the education ladder. Such a program could be modeled after education bonus programs in Louisiana, Tennessee, and Virginia that have provided cash incentives to the most economically disadvantaged dropouts for completing the GED and taking college credit to encourage development of knowledge-economy skills (Barkley & Eades, 2009).

Successfully transitioning GED earners to college requires more than helping students become admitted and enrolled; it requires strengthening their academic skills necessary for college success (such as reading and writing), coaching them in time and stress management, and connecting them with learning support services where they enroll (Alamprese, 2005; Strawn, 2007). Rather than merely informing students where on campus to seek help, such programs must actively link students with academic advising at the community college to help make sure that GED earners find courses and programs that match their educational goals and hold their interest. Advising staff member have a responsibility for taking seriously the observations and recommendations of the transitions staff. Both transitions staff and advisors at the community college must make sure students understand the employment and wage profiles for certain programs so students make informed decisions about course taking and persisting to a credential. While some GED earners from 2003-2004 Iowa GED cohort enrolled in college, too few earned a
credential. At the very least, students must receive guidance and follow-up from college staff so they remain in school long enough to have the opportunity to complete coursework necessary to improve economic conditions for themselves and their families.

Transitions staff and academic advisers must also clarify for students the time required to reach their academic goals, whether it is to earn a credential or complete a course or sequence of courses to learn job skills. For example, it is important to help GED earners understand that extra time might be required for remedial courses that do not count for credit toward a credential, but which they must take to qualify for certain courses. GED earners also need to understand how part-time course taking may slow their progress toward a credential given course scheduling and the limited availability of some courses beyond the introductory level. Although it may be difficult to teach students persistence in getting through required coursework, realistic expectations of how much time reaching their goals may take can help alleviate future frustration and help adult students plan ahead.

At every step of the GED to community college pathway, it is important to pay attention to students’ goals. This study demonstrated that those goals matter—people who wanted to earn the GED were more likely to be successful in that endeavor, people who wanted to go to college also had a higher likelihood of reaching their goal, and people who sought to transfer to a four-year college took longer to earn a credential. Goals matter because regardless of students’ demographic, economic, or ability profile, they provide information about where students want to go. Viewing these goals as more than a checkbox on an application form—as real measures of intention—may help provide better advice and guidance
to students than making assumptions about why they are pursuing their GED or taking a college course.

Lastly, this study benefitted from the professional knowledge and helpfulness of GED and community college data experts within the Iowa Department of Education. They provided 14 individual datasets combined by the researcher into one complete dataset for this research. Each of these datasets were individually studied and cleaned before they were merged into one dataset for analysis. This example is indicative of the fragmented nature of state data systems. Improving and linking educational data systems will take time, and the technical expertise and technology needs will require significant appropriations. Yet, as all levels of education face calls for greater scrutiny and accountability from taxpayers, politicians, and public interest groups, political and agency leaders could make substantial progress toward transparency in educational quality and outcomes through the development of such a statewide database.

**Recommendations**

This study concerned improving the rates and levels of educational attainment of Iowa GED candidates, specifically moving students through the GED toward a community college credential. For dropouts without any additional schooling, having a job that pays a livable wage with the possibility of social and economic mobility is far less likely than being unemployed or working in low-wage jobs with little opportunity for advancement. Based on this research, six specific recommendations for improving educational attainment of Iowa GED candidates are provided below.
First, data showed that Blacks and Latinos in Iowa were less likely to earn the GED than Whites, so it is recommended that GED preparation programs are offered in locations accessible and welcoming to racial and ethnic minorities and staffed by instructors who can relate effectively to diverse learners. GED preparation programs in areas with higher concentrations of recent Latino immigrants should be staffed with personnel knowledgeable of language and cultural traditions, with at least some part of GED preparation offered in Spanish. Special efforts should be made to reach out to Black and Latino communities to make certain they are aware of GED preparation and other educational opportunities and educational supports available to them.

Second, it is recommended that some GED instruction sessions be offered especially for adults over 35 years of age. Such sessions would provide an environment more attuned to the needs of older students who may be less likely to recall secondary school curricula and more serious and mature about their goals and their approach to learning. GED transitions programs should work with older students in the same manner, not only helping them prepare for college enrollment academically, but also helping them develop a structured academic plan that also provides flexibility considering their obligations to family and work.

Study results indicate no difference in likelihood of earning the GED between males and females, but a definite gap with females more likely to enroll in college and complete a credential. It is recommended that GED preparation personnel work with both male and female GED candidates to explore how the GED fits into their work and educational goals and explain the economic and employment limitations of the GED as a terminal credential. GED preparation personnel and transitions
staff should work closely with males seeking work that only requires a GED to identify additional schooling choices (i.e., noncredit programs, online courses, and exploratory for-credit community college courses) to provide them with educational and employment options beyond the GED.

A fourth recommendation is that Iowa offer GED preparation services at state-run employment or workforce centers. This one-stop approach would help connect workforce demands with opportunities for additional schooling for people most in need of both services. Even after individuals find a job, such programs should encourage continued educational attainment through graduated cash incentives for progress toward the GED, earning the GED, enrolling in college, and completing a credential or course sequence providing job-ready skills. Greater levels of education may help prevent future episodes of unemployment, providing a return on investment in incentives in the form of long-term reductions in spending on social service programs.

A fifth recommendation of this study is that Iowa noncredit GED preparation programs, GED transition programs, and for-credit academic advising units develop a seamless model for GED to college advising and support. Noncredit and for-credit academic advisors should receive cross training in program requirements and institutional procedures to adequately respond to students’ concerns at each stage of the GED to college process. GED staff must be aware of what will be required of the students they are prepping for the GED and beyond, and college advisers must understand the needs and abilities of these students once they enroll. All personnel must pay close attention to GED students’ educational goals and aspirations in order to serve them properly.
Finally, Iowa should invest in the development of a state data warehouse to more readily facilitate the study and assessment of education in Iowa. Such a system should include de-identified data from K-12 schools, community college non-credit programs (including the GED) and credit programs, as well as Iowa’s public universities. To facilitate the study of educational outcomes by occupation, field, or earnings, these records should be linked with employment data, including wages, that are easily available as part of state unemployment insurance records (Sanchez & Laanan, 1998; Schenk & Matsuyama, 2009).
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