EFFECT OF AN ON-TIME DEGREE COMPLETION PROGRAM ON GRADUATION OUTCOMES

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ABSTRACT

College degree attainment benefits both private citizens and society. Historically, degree attainment rates have differed based on students' race, income, and parental education. Along with differences in degree attainment rates, time to degree has been increasing for all students nationally. Increased time to degree has adverse effects for students as it increases the cost of a degree and decreases future earnings through a delayed entry into the workforce.

In recent years, colleges and universities have implemented programs to address challenges with graduation rates at their institutions and improve on-time degree completion. Beginning in 2014, a large public university located in the Mid-Atlantic region of the United States, implemented an on-time degree completion program to address its four-year bachelor's degree completion rate. In addition to increased academic support for all program participants, up to 500 students with high-financial per cohort were given additional grant funding towards their cost of attendance.

The Theory of Planned Behavior frames the process of shaping human behavior as the combination of changing the attitude towards completing the behavior, shifting norms to reflect desired outcomes, and reducing perceived barriers to behavior completion. The on-time degree completion program uses a participant contract and a series of checkpoints to encourage positive behavior, shown through research, to increase graduation rates: priority registration, meeting with an academic advisor, earning a minimum of 30 credits per academic year, and completing a degree audit.

The current study analyzed the checkpoint and on-time degree completion data for three consecutive first-time, first-year cohorts at a large public university. The total

number of participants included in the study totaled 13,323. Using a combination of descriptive and predictive statistics, I found that both checkpoint completion and on-time degree completion differed based on several participant characteristics, including academic preparation, race, family income, and parental education. However, even when controlling for participant background characteristics, checkpoint completion had a positive relationship to on-time degree completion. Therefore, while there are improvements to be made in the checkpoint completion rates and the equality of those outcomes, the program checkpoints predict on-time graduation. Further, for program participants who receive the program grant funding, there is a correlation between multiple years of grant funding and improvements in on-time graduation rate.

Further research should be conducted to understand the reasons students fail to complete checkpoints and the barriers to checkpoint completion for some student groups. Additionally, for participants who were not retained until graduation, a study tracking participants' degree completion across institutions would help explore the true degree completion rate for the participants, as opposed to at the individual institution.

This dissertation is dedicated to all journeys, both big and small.

To adventures and inspiring others to achieve theirs.

And to my son Cameron,

who I hope grows up to be curious.

“Blessed are the curious, for they shall have adventures.”

– Lovelle Drachman

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When your journey is complete and you finish on the mountaintop, take a minute, enjoy the view, reflect on the process, and then look towards what is next.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure Page

CHAPTER 1

INTRODUCTION

The United States economy and workforce are becoming increasingly knowledge-based and a majority of jobs require a college degree. A 2013 report by the Georgetown Public Policy Institute on the economy and economic growth reported that, by 2020, 65% of the United States jobs would require a college degree (Carnevale et al., 2013). In addition to education increasingly being required for employment, college degree attainment yields many additional benefits. Ma et al. (2016) analyzed national datasets from the National Center for Education Statistics, Bureau of Labor Statistics, and the National Center for Health Statistics. Their findings reinforced the individual and societal importance of earning a college degree. Ma et al. found that degree attainment yields higher rates of employment and earnings.

Along with increased employment, persons with a college degree enjoy higher levels of retirement benefits and health care coverage, decreased reliance on public assistance, and increased levels of health (Ma et al., 2016). The public also benefits from a more educated citizenry, as college degree attainment has been shown to reduce the use of social services, increase tax revenue, and improve civic participation (Baum et al., 2013; Museus et al., 2017; Sass et al., 2018). While not a guarantee, college degree attainment for low-income students helps move them into a higher income bracket and increases social mobility (Ma et al., 2016). This mobility provides subsequent generations an increased chance of college completion and benefits of degree attainment and financial security, as parental education is a predictor of a student's graduation rate (Ishitani & DesJardins, 2002).

Despite the benefits, many students are not finishing college and are incurring debt without obtaining a degree. In addition to degree completion challenges, the length of time for students to complete their degree is often twice the expected time, which increases cost of attendance (U.S. Department of Education, 2010). Of students who enter as first-time, first-year students in public institutions, only 60% graduate in six years, one and a half times the length required for completion of the degree (U.S. Department of Education, 2019b). The National Student Clearinghouse Research Center reported that students are taking longer to graduate than at previous points in time, as transferring between schools and taking semesters off is increasingly commonplace on the road to degree completion (Sedmak, 2019).

The National Center for Educational Statistics (NCES) did not begin comprehensive institutional reporting of cohort-based graduation rates until the entering cohort of 1991. Prior to 1991, the number of graduates was reported, but the time to degree was not calculated for a given cohort (Denning et al., 2019). To understand the historical time to degree, Bound et al. (2012) analyzed data from the National Longitudinal Study (1972) and the National Educational Longitudinal Study (1988) and found that between the 1970s and 1990s on-time degree completion rates decreased. Further, Bound et al. found that the increased time to degree was more prevalent at less selective institutions and community colleges. Further, comparing the 1972 cohort and the 1992 cohort, while the credit earned in four years of college decreased for the 1992 cohort, the credits earned in eight years remained the same.

Bound et al. (2012) focused on institutional factors as a possible reason for a delay in graduation, including institution type and student-faculty ratios. They found that

student-faculty ratios at public institutions below the top fifty explained 3.5% of the 20.8% increase in time to degree between 1972 and 1992 for that group. Bound et al. used student-faculty ratios as a proxy for institutional resources. Lastly, Bound et al. hypothesized that based on the student employment data, an increase in hours worked by students may be related to the increase in educational costs, thus prohibiting a student from being enrolled full-time and increasing the time to degree. While student employment data and college cost information could support this hypothesis, no conclusions can be made as the credit hour completion data are not available in the dataset and the reason for the possible decrease in credits enrolled is unknown. The data used by Bound et al. are not a comprehensive dataset inclusive of all college students; therefore, the findings are limited by the sample itself, though the sample is nationally representative.

The Integrated Postsecondary Education Data System (IPEDS) started collecting cohort-based graduation data starting with the 1996 cohort. IPEDS graduation data are limited to first-time, first-year (FTFY) students completing college at the same institution at which they started; therefore, graduation rates are based on institutional data and do not follow the student once they depart that institution. The six-year graduation rate has stayed relatively static from 1996 (54.4%) through 2010 (54.7%), rising only slightly in 2013 (59.5%) (National Center for Education Statistics, n.d.). On-time graduation, or four-year graduation, rates for bachelor's degree-granting institutions are not regularly published or analyzed. As expected, the on-time graduation rate is lower than the more commonly reported six-year graduation rate. According to data submitted by public four-

year degree-granting institutions[1], the average four-year graduation rate was 37% for the 2011 cohort.

Although access has improved for low-income and minority groups, the degree attainment rate for these groups differs significantly. Low-income students graduate at a lower rate than their higher income peers (Ginder et al., 2018; Sass et al., 2018). Nationally, among the 2011 entering FTFY cohort, 48% of Pell Grant recipients earned their bachelor's degree in six years compared to 60% of the cohort in total (Ginder et al., 2018). Since the federal Pell Grant program awards financial assistance to students based on low family income and cost of attendance, Pell Grant recipients are often used as a proxy to identify low-income students in research studies. The National Center of Education Statistics released the *Condition of Education 2019* report and, using the High School Longitudinal Study of 2009, showed that among the study participants, only 28% of students in the lowest income quintile attended college; as compared to 78% in the highest income quintile (U.S. Department of Education, 2019a). There is a problem with college attendance and the degree completion rates of low-income students and, more broadly, students in general.

Public media outlets, including newspapers, magazines, and broadcast media, frequently report on the increasing amount of student loan debt and the cost of a college education. In response to public concern regarding college affordability and graduation outcomes, a Mid-Atlantic public university created an on-time degree completion

[1] The average four-year graduation rate was calculated based on data from Integrated Postsecondary Education Data System (IPEDS) 2019 collection year and included all United States public four-year colleges and universities that awarded bachelor's degrees and enrolled first-time, first-year students (n = 547). https://nces.ed.gov/ipeds/datacenter/

program. Starting in the fall 2014 semester, all entering FTFY students were eligible to participate in the program and, among the participants, up to 500 entering students of high need were awarded additional program grants. The degree completion program (DCP) grant recipients received $4,000 per year (28.5% of the in-state tuition rate, at that time) awarded primarily based on financial need, and renewable for four years provided the students maintained the requirements of the program each year. The program contract required students to complete two checkpoints each semester: priority registration and meeting with their advisor. In addition to the contract required completing a minimum of thirty credits per academic year and a degree audit during junior year. In return, students who required additional courses to complete their degree after four years could complete the remaining courses to finish their degree free of charge at the university. The program requirements were intended to increase the four-year graduation rate by engaging students in a purposeful education plan through advising and Priority Registration checkpoints to promote on-time degree completion.

Theoretical Background

The on-time degree completion program of a Mid-Atlantic university addressed four components of students' academic decision making and intended to encourage their behavior to complete checkpoints and complete their bachelor's degree in four years. The program motivated students by providing a financial incentive that, if students followed the program and were unable to graduate in four years, they would not incur additional tuition costs to complete their degree. The program prompted students to complete actions by having them sign an agreement. Students who signed the agreement stated that they wished to participate in the program, knew which actions they must complete, and

by when the actions must be completed. Given its emphasis on concrete and measurable decisions by students, this study applies the lens of behaviorism to study the degree completion program.

Much of behaviorism is rooted in the field of public health and, by derivation, psychology. Behaviorism comes from a set of theories within psychology including behavioral psychology, cognitive psychology, humanistic psychology, and social psychology. Behavioral psychology is an early field of psychology where human behavior is said to be a set of conditioned responses (Edberg, 2020). Early behaviorists included Ivan Pavlov and John Watson. Pavlov is most known for his experiments on dogs and classical conditioning, whereas a response (salivating) became a conditioned response for a bell ringing due to the association with meat powder. John Watson studied human behavior and is well known for his controversial experiment on an orphaned boy whom he conditioned to fear white rats (Encyclopaedia Britannica, n.d.).

As the field evolved, behavioral psychology transitioned from classical conditioning, as performed by Pavlov and Watson, to operant conditioning. Operant conditioning, introduced by B. F. Skinner, uses a series of positive and negative reinforcement as a response to desired and undesired behaviors (Edberg, 2020). In this way, undesired behaviors can be deconditioned, and desired behaviors can be reinforced or conditioned. The operant conditioning model is also referred to as behavior modification and is how public health behavior modifications, like smoking cessation, are typically approached (Edberg, 2020). In the on-time degree completion program, the program checkpoints are an example of desired behaviors and tuition guarantees are the corresponding reinforcements.

The second area of social science theory that is part of modern behaviorism is cognitive psychology. Whereas behavioral psychology focuses on physical cause, effect, and conditioning, cognitive psychology focuses on the mental aspect of human behavior. A twentieth-century Swiss cognitive psychologist, Jean Piaget, claimed that people process information in two ways: assimilation and accommodation (Edberg, 2020). Where assimilation describes how people understand new information into their current categories of knowledge, accommodation is the process of changing one's beliefs to accommodate new information (Edberg, 2020). Cognitive psychology helps explain a person's behavior based on risk and reward or expected outcomes.

Third, humanistic psychology is incorporated into behaviorism and addresses human agency, or decision-making ability, and that people will act in a way to achieve their potential (Edberg, 2020). Unlike the pure behaviorists who think people can be conditioned based on a set of conditions and responses, humanists believe people will make choices in their best interest. Abraham Maslow, the psychologist who developed the hierarchy of needs, was a humanist and adapted behaviorism to say that people will act to attain their potential, but only after their basic needs are met (Edberg, 2020).

Finally, social psychology is a field that addresses how people interact with their surroundings, such as relationships or other groups. Social psychology helps address how someone's behavior is motivated by social factors and is not an isolated set of actions based on information or responses to a condition. In 1885, Gustav Le Bon, a French sociologist, hypothesized the concept of a “crowd mind” (Le Bon, 2009). Le Bon claimed that when people are gathered together, they sometimes act in ways contrary to their personal beliefs or values to be part of a homogeneous group. The influence of a crowd

can both improve the performance of an individual (Green & Benjamin, 2009) as well as cause deviant behavior.

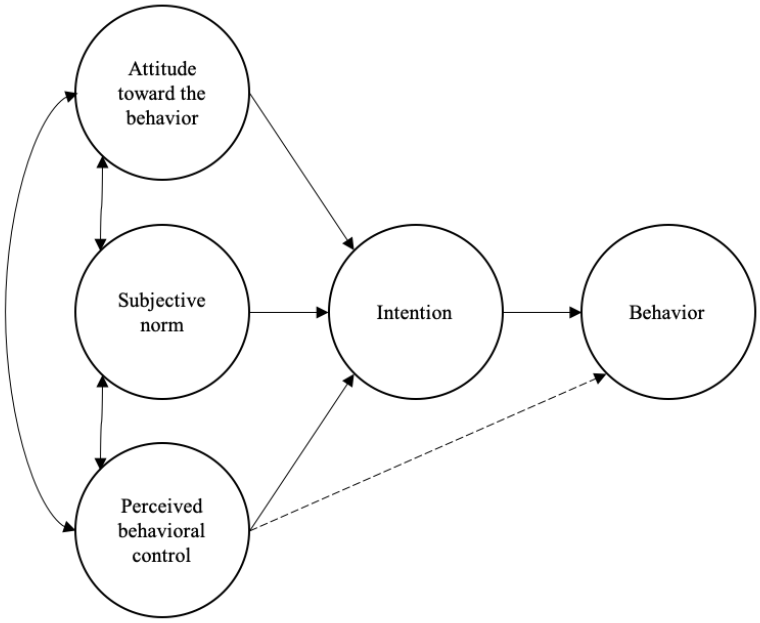
Behaviorism, in the field of public health, is based on these four psychological theories, and, at its root, is a theory that combines awareness of the problem, understanding of the positive and negative outcomes of an action, conditioned response (action), motivation, triggers (stimulus), and ability to understand why humans behave in certain ways and, thus, how to change behavior. While traditionally behaviorism has been applied to health improvement programs in the field of public health, these theories can also be applied to education and can help theorize why people behave how they do within an educational setting and how that behavior may be modified to improve outcomes.

Theoretical Framework

The Theory of Planned Behavior (TPB), introduced by Icek Ajzen (1991), is an extension of the Theory of Reasoned Control (Fishbein & Ajzen, 1975). Ajzen added to the Theory of Reasoned Control to account for behaviors occurring when a person does not have complete control in their decision to complete an action, for example, lacking resources or opportunities. TPB defines a person's behavior as their intention to perform the behavior and the effects of their attitude towards the behavior, norms, and perceived behavioral control on their intention (Ajzen, 1991). Implicit in this model is actual behavioral control. In other words, a person cannot complete a behavior regardless of their intention if they do not have the resources or opportunity to do so. The TPB model is illustrated in Figure 1.

Figure 1.1

Theory of Planned Behavior Model



Note. From "The Theory of Planned Behavior," by Icek Ajzen, 1991.

Going beyond actual behavioral control, the factor of perceived behavioral control is what Ajzen added to the Theory of Reasoned Control. Based on Bandura's idea of self-efficacy (Bandura, 1977), perceived behavioral control factors in a person's belief that they can perform the behavior (Ajzen, 1991). As shown in the model in Figure 1, there is a direct link between perceived behavioral control and intention, as well as a predictive relationship to performing the actual behavior. Ajzen describes this relationship as controlling for both a personal belief they can achieve a behavior, in addition to actual behavioral control, as a person is not likely to believe they can achieve something if they know they do not have the resources to do so. Based on a series of empirical studies assessing the model's predictive ability, the overall predictive validity of the

"combination of intention and perceived behavioral control" to predict behavior outcomes was statistically significant and the average correlation was $r = .51$ (Ajzen, 1991, p. 186). When using the full model, including attitudes and norms, the average correlation was $r = .71$ (Ajzen, 1991, p. 189).

Examples of the Theory of Planned Behavior in Research

While behaviorism has its foundation in psychology and public health research, higher education researchers are beginning to utilize the Theory of Planned Behavior as a model to understand behaviors in an educational context. Thus far, the research using TPB has included student behaviors involving many different academic activities, but not degree completion.

Burns et al. (2018) studied how instructor confirmation may help cultivate student communication behavior with instructors. The researchers surveyed students in a college communication course ($n = 343$) about their perception of their instructor's confirmation with their students using the Perceived Teacher Confirmation Scale (PTCS; Burns et al., 2018). In addition to the PTCS, the researchers included questions to address each of the factors included in the Theory of Planned Behavior: subjective norms, perceived behavioral control, intention, and attitude. The survey results were validated and each of the scales used to measure the TPB factors were reliable. Within their factor analysis, Burns et al. found that the level one factors of TPB (norms, perceived behavioral control, and attitude) were correlated to each other, as may be expected. Burns et al. (2018) found that all three factors from the PTCS questions were significant and related to all three of the level one factors of the TPB model. The researchers suggest that TPB may be a useful model for examining other types of student behavior within education.

Fitzsimmons et al. (2013) used TPB to analyze students' decisions regarding short- or long-term study abroad opportunities. Fitzsimmons et al. surveyed undergraduate business students (n = 204) at a single university regarding their intentions to study abroad and their attitudes, perceived behavioral controls, and norms about these experiences. They found that all short-term and long-term intention to study abroad was positively correlated to the three elements of TPB. There were variations between the perceived barriers for long-term versus short-term study abroad opportunities as measured by perceived behavioral control. The researchers posit that understanding influences on students' decisions to study abroad and the duration of the experience can help universities target communication and information sessions, focus institutional resources to support students, and reduce barriers to the desired student behavior.

An additional example of using the Theory of Planned Behavior in higher education research was completed by Hsiao (2015) and explored the behavior of cheating within undergraduate students and its relationship with a student's employment level. Hsaio offers three hypotheses that she connects to TPB— a favorable attitude towards cheating, group norms that is supportive of cheating, and perceived opportunities to cheat (behavioral control) all positively affects the intention to cheat.

Hsiao's (2015) study was conducted in Taiwan at a business school (n = 544) and included both part-time night and full-time day students who answered a questionnaire with Likert scale questions. The survey tool results were validated and deemed a reliable measure based on a confirmatory factor analysis and appropriate values for Cronbach's alpha ($\alpha > .70$). She found that all elements of TPB were positively correlated with behavioral intention and perceived adverse outcomes were negatively correlated with the

intended behavior of cheating. When students were grouped by their employment status, Hsiao found differences between groups; however, one factor, a student's attitude towards cheating, was positively correlated in all groups. Also, as the student's employment level increased, the positive correlation of subjective norms decreased and became insignificant. Additional research is needed to explore this relationship to see if, as students work more hours, their level of connectedness to the institution decreases, thus affecting the strength of subjective norm influence.

Application of the Theory of Planned Behavior in Studying the On-Time Degree Completion Program (OTDC)

While not widely used as a grounding theory in higher education research, the Theory of Planned Behavior provides a useful lens to analyze the effectiveness of the on-time degree program at a Mid-Atlantic university. The program encouraged on-time degree completion by guiding students to complete four different academic behaviors shown to improve degree completion. The program was widely adopted by the incoming student cohorts and checkpoint completion normed into the institutional culture. Through opting into the program and encouraging participation using the tuition guarantee and program grant, the institution sought to direct students' behavioral intention to on-time graduation. Students were given the resources to achieve these behaviors (actual behavioral control); however, despite the program's resources, information, and institutionalizing of behaviors, some students still did not graduate on-time or failed to graduate. Previous studies using the Theory of Planned Behavior tested the relationship of the theory's factors and the theory's validity and reliability within higher education. While the current study will not be testing the individual elements of TPB, the theory's

constructs will be used to analyze the effect of the on-time degree completion program on student outcomes.

Problem Statement

Using the behavior checkpoints of the degree completion program (registering during priority registration and completing an advising meeting each semester, completing thirty credits per academic year, and completing a degree audit in the junior year), I will explore the following areas of interest:

1. On-Time Degree Completion:
    a. How does the rate of on-time degree completion differ between program participants with various background characteristics?
2. Program Checkpoints:
    a. Which checkpoints do program participants complete most often?
    b. How does the checkpoint completion rate differ by participant background characteristics (e.g., program-grant recipient v. non-grant recipient, race, first-generation status, Pell Grant award, high school GPA, parental education, and family financial position)?
    c. What is the relationship between the number of checkpoints completed and on-time graduation? Does this relationship remain when controlling for participant characteristics?
3. Program Grant Recipient Outcomes:
    a. Dose the number of years a participant received program grant funding effect the rate of on-time graduation?

Based on previous research, I hypothesize that on-time degree completion will vary based on participant characteristics. Participants from low-income households, who are first-generation, or have weaker academic preparation will graduate on-time less frequently than the general study population. Related to checkpoint completion, I hypothesize that checkpoint completion will likely vary as well; however, each checkpoint may have different causative factors. For example, for priority registration, low-income students may not complete this checkpoint as frequently as higher-income peers due to financial constraints that affect their registration status, as students with account balances are typically held from registration until their balance is fulfilled. However, this relationship may not hold true among program-grant recipients since these students have received additional financial support toward their educational expenses, thereby reducing their financial burden. I would also expect that students who enter higher education less academically prepared, as measured by high school GPA, will struggle to complete thirty credits per academic year as compared to participants with higher high school GPAs, as they may be placed in remedial courses or struggle with college-level coursework. For the final question, I hypothesize that participants who miss checkpoints and therefore lose program grant funding will graduate on-time less often than those who receive the grant for all four years.

CHAPTER 2

LITERATURE REVIEW

On-time graduation rates at four-year colleges hover around 60% nationally. As a result, institutions have implemented programs to try to address student challenges and increase graduation rates. In addition to overall graduation rates, the National Student Clearinghouse Research Center reported that "many students in college today are taking longer to graduate, particularly those who transfer, attend multiple schools, or find themselves stopping out or dropping to part-time while working or caring for family members" (Sedmak, 2019, para. 3).

In the fall 2014 semester, a public research university located in the Mid-Atlantic region of the United States introduced a four-year degree completion program to address the on-time graduation of entering first-time, first-year undergraduate students. The program's cornerstone was a set of four checkpoints students completed to encourage on-time degree completion: registering during priority registration each semester, meeting with an academic advisor each semester, completing thirty credit hours per academic year, and completing a degree audit in the junior year. These checkpoints encourage behaviors that have been shown to improve college outcomes.

Impacts of Time to Degree

Student completion data show that many students are not graduating from college, and others are taking longer than the expected time to graduate. Students who take longer to complete their degree typically incur additional tuition costs, as they are enrolled additional semesters, and experience delayed post-graduation earning potential, as their entry into the workforce is also delayed. Adelman (2006), in a U.S. Department of

Education study using National Educational Longitudinal Study 1988-2000 data (NELS:88/2000), examined the path of high school students' matriculation into higher education and subsequent degree completion. Typically, retention and graduation studies follow a student's completion success through a single institution; however, Adelman's study followed students through all post-secondary institutions attended for eight and a half years, twice the regular time to a bachelor's degree. His approach provides a broader analysis of completion at the student level, as opposed to the student level completion within the context of a single institution. This method of tracking the student is important, as more than half of bachelor's degree recipients attend multiple institutions before graduating (Shapiro et al., 2016).

In his study, Adelman (2006) defines continuous enrollment as no more than one semester of non-enrollment, excluding summers. He found that continuous enrollment increases the likelihood of graduation by 43%. Adelman used a correlational analytical approach to the longitudinal data analysis and found that academic momentum is an important factor in degree completion. Factors that impede academic progress, such as stop-outs, withdrawals, low credit completion per semester, and course remediation, delay a student's progress towards graduation.

A study like Adelman's (2006) has not been completed in the last decade. Therefore, there are likely factors he did not include that would affect the findings of his study if conducted today. While Adelman's dataset was national in scope, it did not include every high school senior; therefore, the generalizability of findings may be limited. In addition, the dataset did not take into account variations in high school curricula, which affect a student's preparedness for higher education.

Extending the research of Adelman (2006), Attewell et al. (2012) studied academic momentum and narrowed the approach to reduce causal circularity among the factors. Attewell et al. used the same dataset as Adelman but limited their study to those to whom all academic transcripts were obtained in the data collection. While Adelman used mostly descriptive and correlational statistical methods, Attewell et al. used a multilevel regression model to answer their research questions. Both studies found that the number of credits a student enrolls in per semester is a measure of academic momentum with a strong positive relationship to degree completion. A possible limitation of Attewell et al. is that they decided to include all attempted credits despite the outcome or level (developmental versus credit-bearing). While attempted credits indicate a student's initial momentum at the start of a semester, not completing all credits decreases degree progress and increases time to degree, just as taking developmental credits slows credit accumulation towards graduation.

Similar to Adelman (2006), Attewell et al. (2012) found that students who enrolled in a higher number of credits in their first semester continued to take higher amounts of credits in subsequent semesters. Thus, the gap between students who took fewer credits in the first semester and those who took larger numbers of credits increased over a student's academic career. Additionally, Attewell et al. found that students who delay entry into college after high school tend to be weaker academically and come from lower-income families. Further, students who delay entry graduate at a lower rate than those who enter college directly after high school, even after controlling for academic preparation and socioeconomic status. This finding suggests that academic momentum

once enrolled, but also a delay in matriculation from high school, affect academic outcomes.

As would be expected from using the same dataset, Adelman's (2006) and Attewell et al.'s (2012) studies have similar findings. Both suggest that maintaining or increasing academic momentum can improve degree completion rates. Neither study addresses the effect of momentum on on-time degree completion. While both address the completion of summer coursework as a positively associated method of maintaining momentum, a study using more recent data may address how other curricular innovations, like online education and predictive advising, may affect momentum.

Focusing less on individual student momentum but rather on demographic differences, Bound et al. (2012) conducted a study using student data included in the National Longitudinal Study of the High School Class of 1972 (NLS:72) and the National Educational Longitudinal Study (NELS:88). Bound et al. limited their work to students who began their undergraduate degree within two years of high school graduation and students' degree outcomes within eight years of graduating from high school. Bound et al. found that time to degree varies by institution type, with lower on-time graduation rates for those attending less selective colleges (29.1% of the time) and those who began their undergraduate studies at a community college (23.6% of the time). They also found, consistent with previous research, that students' academic preparation, as measured by SAT scores, has a positive relationship with time to degree, indicating that students with higher SAT scores complete a degree in less time than their counterparts with lower SAT scores. However, after controlling for institution type, academic preparation as approximated by SAT scores is no longer significant. This relationship may exist because

more selective institutions filter students by academic preparation through the admissions process. However, it is also interesting to note that highly prepared students attending less selective institutions do not realize the same increase in graduation rate.

Bound et al. (2012) present evidence for one explanation of difference by institution type — institutional resources as measured by faculty to student ratio. They found that as the student-to-faculty ratio decreased, the time to degree also decreased. While they do not explore this finding further, it could be connected to a more personal classroom experience or faculty connectedness, which have been shown to affect retention and graduation (Young-Jones et al., 2013). However, like Adelman (2006) and Attewell et al. (2012), study data were collected several decades ago and may not reflect the complexities of higher education today.

Garibaldi et al. (2012) took a different approach and studied an institutional tuition policy and its effects on time to degree over a period of 10 years. Garibaldi et al. conducted research at a college located in Italy. Students at the institution were placed in a tuition bracket based on family income. The researchers used a regression discontinuity design to compare otherwise similar students, but who pay different tuition amounts based on being immediately above or below the threshold of tuition bands. Garibaldi et al. found that if tuition were to increase by 1,000€ (approximately $1,200), the likelihood of graduating late would decrease by 5.2%. This finding suggests a positive relationship between tuition costs and time to degree and that time to degree can be incentivized through changes to net tuition price.

The generalizability of the study to institutions in the United States is limited by its location, Italy, and the institution's scope, as the institution studied only offers degrees

in economics. Additionally, institutions in the United States do not explicitly vary tuition price by students' income level; instead, they address differing abilities to pay the cost of attendance by offering financial assistance. As also described by the researchers, the amount of €1,000 can only be applied to another institution with a similar tuition structure, cost, and institutional characteristics. Nevertheless, encouraging on-time graduation by using an institutional policy, in this case a financial disincentive, is an interesting approach that requires further exploration.

Differing Completion and Time to Degree by Student Characteristics

Although access to higher education has improved for traditionally underrepresented groups, those groups' degree attainment rate differs significantly. Sass et al. (2018) found that one in ten students from the bottom income quartile graduate from college; whereas, their upper-income counterparts graduate at a rate of 80%. In their study, Sass et al. proposed a theoretical framework that used socioeconomic, psychosocial, and student success variables to predict student retention. Although their research focuses on retention and not graduation, returning to the following year of education is required if a student is to graduate. Therefore, Sass et al. (2018) provide a broad understanding of the complex web of factors that affect retention of different student groups and reports differences between them.

Sass et al. (2018) used mediating factors, such as SAT scores and psychosocial variables, to investigate the relationship between socioeconomic status and college success as measured by final course grade. They conducted their research at a large university with a substantial Hispanic population. The researchers surveyed undergraduate students in introductory biology courses, and of the 1,470 students

enrolled, just under 40% attended the class on the day of the survey and completed the survey (n = 498). The attendance on the day of the sample is a limitation of the study, and the students not in attendance could be significantly different from those in the sample. Additionally, although they selected the introductory biology classes in order to sample many undergraduate students moving into different disciplines, a sample across academic disciplines may provide a more generalizable result.

Sass et al. (2018) used a Bayesian confirmatory factor analysis to analyze the survey results and confirm the proposed factors, followed by structural equation modeling to test the relationship's strength and direction within the model. The researchers found psychosocial variables such as "problem-solving, academic efficacy, connectedness to professors and college, were good mediating variables when predicting GPA and retention" (Sass et al., 2018, p. 126). Through their analysis, Sass et al. found that being connected to professors predicted students' connectedness to the institution, which was associated positively with retention.

Although Sass et al. (2018) included many demographic and psychosocial measures in their model, they suggest additional predictor and moderator variables need to be included to improve the model's predictive ability. Their model explains around half of the variance in student retention; however, that leaves the other 50% unexplained.

Underrepresented Minorities

While individual studies that examined student characteristics, such as race, ethnicity, socioeconomic status, and first-generation status, have not been considered in relation to time to degree, many studies have been completed which address retention and graduation rates more broadly for these groups.

Flores et al. (2017) studied the difference in graduation rates between underrepresented minority students and White students in Texas. Flores et al. found that student pre-college variables, such as family finances, academic preparation, and high school characteristics, account for 61% of the variation in graduation rates. The researchers limited their study (n = 35,712) to a single cohort of students who entered a four-year institution in Texas in Fall 2002 and graduated within a six-year graduation limit (2008). Their sample methodology was also a limitation, as their sample selected for higher achieving students who graduated high school on time and immediately entered a four-year college. This selection methodology may affect the generalizability of the results to an overall population. The six-year degree completion rate in the sample was 65.5% for White students, 51.4% for Hispanic students, and 43.6% for Black students. Using logistic regression and variance decomposition analysis, Flores et al. identified variables that were most strongly associated with degree completion and the amount of variance they explained.

Flores et al. (2017) claimed that the differences in students' degree completion rate based on their race or ethnicity, was actually a function of the differences in other student background characteristics, such as academic preparedness, that also differs between race and ethnic groups. Among Hispanic students, individual characteristics and academic preparedness account for 37.1% of the variance in degree completion as compared to White students. Specifically, a student's economic status accounts for 17.1% of the variance between the two groups. In addition, 7.1% of the variance was accounted for by academic preparation, which was measured by if the student took trigonometry while in high school. Similarly, 38.8% of the total variance in completion rates between

Black students and White students were accounted for by the same individual characteristics and academic preparedness variables. Economic status (11.9%) and academic preparedness (11.9%) were two highly associated variables for Black students as they were for Hispanic students. Flores et al. (2017) focused on the underlying characteristics to claim that if Black and Hispanic students were at the same income level and academic preparedness level as their White classmates, the graduation rates could, theoretically, be the same. Therefore, the focus on the degree completion gap should not be based on students from different races, but rather students from different backgrounds and levels of preparation.

Studying differences in degree attainment of underrepresented minority students differently, Ciocca Eller and DiPrete (2018) studied the degree completion rate of Black students compared to White students in relation to external factors. While many studies broadly examine differences of degree completion among groups of students by student demographic characteristics and relate decreased degree attainment to deficiencies within the student, Ciocca Eller and DiPrete looked at external factors that affect minority students' degree attainment. Specifically, the researchers found that the gap in degree completion was related to the process of decision-making about attending college, the "match between student preparation and college destination," "college quality," and student experience (p. 1,174). Using data from the Education Longitudinal Study of 2002 (ELS 2002), the researchers used Fairlie's decomposition technique, which includes "logistic regression and counterfactual substitution of coefficient values to assess the difference in outcomes between two groups" (Ciocca Eller & DiPrete, 2018, p. 1,181). The final sample included students who identified as White (n = 7,410) or Black non-

Hispanic (n = 1,570) and were enrolled in a four-year school by September 2006. Reflecting on the sample, and noted by the researchers, the sample of Black students is not large enough in relation to White students to examine specific characteristics of enrollment across all institution types.

As seen in Bound et al.'s study (2012), institutional resources affect degree completion and time to degree. Relatedly, Ciocca Eller and DiPrete (2018) found that minority students are more likely than White students to "undermatch" to institutions and that these students are typically from low-socioeconomic backgrounds and are first-generation students. Institutions attended in an undermatch are typically less resourced than those the student would have been eligible to attend. In Ciocca Eller and DiPrete's study, undermatching is used to describe students who academically could have attended higher-ranked institutions but attended less selective and less academically rigorous institutions. Degree completion rates at less-resourced schools are also lower than in more resourced ones. In a related study, Bowen et al. (2009) showed that undermatching at an institution decreases on-time graduation rates by 15%. Bowen et al. studied the high school senior student population in North Carolina (N = 60,000) and their path from high school graduation until college enrollment and through graduation. Using a combination of high school GPA and SAT score, Bowen et al. predicted students' admissions outcome and compared that information to the institution that students chose to attend. They found that students from lower-income families, first-generation students, or Black students undermatched more often than their peers.

Beyond the degree completion effects of undermatching by some groups, Ciocca Eller and DiPrete (2018) also found that once enrolled in college, a student's academic

performance is the greatest predictor of academic degree attainment, and Ciocca Eller and DiPrete found that, Black students have lower academic performance both in terms of academic preparation as well as college grades. Despite lower grades, Black students' college aspirations are higher than comparable White students and positively related to degree outcomes.

The sample size of Black students was previously discussed as a limitation of the dataset used in the study. Another limitation of the dataset is the small number of social engagement variables available. This limitation affected the analysis the researchers could conduct in this area, although previous research has shown social engagement to be a positive predictor of degree completion.

Students of Low Socioeconomic Status

Students with limited financial capacity have been shown to graduate at a lower rate than those with higher socioeconomic status. Since the federal Pell Grant program awards financial assistance to students based on family income, Pell Grant eligibility is often used as a proxy for identifying low-income students. Alon (2011) conducted a study investigating need-based grants and college persistence based on students' socioeconomic status. He used data from the National Postsecondary Student Aid Study (NPSAS) and the Beginning Postsecondary Students Longitudinal Study (BPS) from 1995-1996 and found that, both in terms of retention from first-year to second-year as well as graduation, students from lower-income quartiles persist (64%) and graduate at a lower rate (48%) than those from higher-income groups (75% and 74% respectively).

Walpole (2003) used data from the Cooperative Institutional Research Program (CIRP) and the subsequent surveys (n = 12,376): Student Information Form (SIF-1985),

the Four-Year Follow-Up Survey (1989), and the Nine-Year Follow-Up Survey (1994). The sample was restricted to four-year institutions. Unlike the previous studies in which Pell Grant recipient status served as a proxy for low-income, Walpole's study determined socioeconomic status using parental income, education level, and occupation from the SIF survey. The sample was further limited to only those in the highest (n = 2,475) and lowest socioeconomic quintiles (n = 2,417); the groups were approximately equal in size. Using descriptive statistics and multivariate analysis, Walpole found that students with low socioeconomic status were less likely to spend time in student clubs, organizations, or student activities. While the reasons for the low participation are not known, participation in extracurricular activities has been shown to increase student persistence through increased student engagement. Evidence that, on average, students with low-socioeconomic status work more than 16 hours per week (52%) as compared to high-socioeconomic status students (37%) was cited as a reason for this decreased involvement. Finally, Walpole found that students of low socioeconomic status have lower GPAs than high-socioeconomic status students. Since Walpole's sample focused on traditional-aged four-year college students, the study cannot be generalized to colleges outside of the scope of this study, for example, community colleges or institutions serving non-traditional students.

As opposed to Alon (2011) and Walpole (2003) who studied graduation at the level of student characteristics, Morrison (2012) used institution-level data from the Education Trust (n = 428) to study if institutional characteristics affected graduation. Using logistic regression, Morrison found that, while holding all other variables constant, as the percent of enrolled Pell Grant students increases, the likelihood that the

institution's graduation rate falls below the national median also increases. Using SAT scores as a measure of academic preparation, Morrison analyzed the relationship between the percentage of students receiving Pell Grants and graduation rate when considering the mean SAT score, or a student's academic preparation. While institutions with higher average SAT scores have higher graduation rates than those with lower scores, institutions with lower Pell Grant percentages have higher graduation rates within the same SAT percentile range. This finding suggests that despite stronger pre-college preparation by entering students, students with low-socioeconomic status still struggle to complete college. While Morrison's study shows interesting relationships between socioeconomic status, SAT scores, and graduation outcomes at the institution level, the data are not disaggregated, so the analysis is limited to aggregate findings. Across all three studies, the researchers similarly found that low-income students graduate from college at lesser rates than their more affluent peers.

Another way to study the effect of a student's financial means on degree outcomes is to analyze students' unmet need. Long and Riley (2007) studied trends in financial aid and financial barriers to education. They define unmet need as the "educational costs minus the EFC [expected family contribution] and financial aid" (2007, p. 52). The U.S. Department of Education defines the cost of attendance as the total cost to attend an institution including tuition, fees, room and board or living expenses, as well as ancillary costs like transportation, books and supplies, and other miscellaneous expenses (Federal Student Aid, n.d.). What is counted as financial aid in a calculation of unmet need varies and sometimes includes only grants or aid that does not need to be repaid, and other times includes both grants and loans (Long & Riley, 2007).

Using data from the National Postsecondary Student Aid Survey 2004, Long and Riley found that the average unmet need for students after all financial aid was $5,742 for full-time dependent students at a public four-year institution. The level of unmet need increased for those in the lowest income quartile ($6,167) and more students (77%) had unmet need as compared to those in the highest income quartile ($4,894, 12%; Long & Riley, 2007). The average amount of unmet need and the percentage of students with unmet need vary between institution type, income level, race, and ethnicity.

Both the states of Washington (Benson, 2018) and Maryland (Maryland Higher Education Commission, 2016) studied the graduation rates in their respective state four-year institutions in relation to unmet need and found that as the amount of unmet need increased, the rates of degree completion decreased. Benson (2018) studied students who attended Washington state public colleges and universities and received need-based financial aid. He found that students at four-year institutions, as opposed to two-year institutions, and students with higher high school GPAs had lower levels of unmet need than the rest of the study population. Similar to Long and Riley's (2007) definition, Benson used all sources of financial aid (grants and loans) in his definition and calculation of unmet need. Using the six-year graduation rate, Benson found that, at four-year institutions in Washington, female students in the lowest quartile of unmet need graduated 84% of the time, while those with the highest level of unmet need graduated 71% of the time. Male students in the highest quartile of unmet need graduated 61% of the time, whereas male students with the lowest level of unmet need graduated 78% of the time (Benson, 2018).

Similarly, a report published by the Maryland Higher Education Commission (MHEC; 2016) reported that, among students in the Maryland public higher education system, 48.7% of those with family income in the lowest quintile graduated in six-years, whereas 79.7% of those in the highest income quintile did. When overlaying students' unmet need status, 55.2% of students in the lowest income quintile with no unmet need graduated in six years; however, those in the same income quintile with unmet need graduated 47.5% of the time. The MHCE data show that students who receive more financial aid and have less unmet need graduate more often than those with unmet need, regardless of the income level. However, like Benson's study, students in the lowest income bracket are more likely to have higher levels of unmet need than peers in the highest income bracket. The MHEC report also found a relationship between income level and college GPA, with lower-income students more likely to have lower college GPAs than students from upper-income brackets. More specifically, the researchers who published the MHEC report completed a regression analysis and found, after controlling for other variables, that for every $1000 decrease in the amount of unmet need, the chance of graduating in six years increased approximately 4%.

First-generation Students

Another student group that often struggles to graduate at the average rate are first-generation students. While researchers often look at the differences in academic success based on parental education, there is not a standard definition of what constitutes a "first-generation" college student. Toutkoushian et al. (2018) conducted a study using Educational Longitudinal Study (ELS) data from 2002 to investigate if the definition of first-generation changed the relationship with or differences between student outcomes.

Using the data available in ELS, Toutkoushian et al. constructed eight different measures of first-generation by varying the combination of the number of parents and levels of parental education in the definition. In all cases, the data showed that an increase in parental education was related to an increase in the likelihood of taking the SAT, applying to college, and enrolling in college. Further, students whose parents had at least a bachelor's degree were more likely to enroll in a four-year institution. One common definition of first-generation status is that neither parent graduated college. Toutkoushian et al. found that students who met this definition were 9% less likely than students with two parents with college degrees to apply to college and 9.6% less likely to enroll when controlling for personal, family, and school characteristics. However, the researchers also found that students with one college-educated parent were more likely to apply and enroll in a four-year college than students with no college-educated parent, but less likely than students whose parents were both college-educated. Based on their findings regarding student college outcomes and the definitions of first-generation, a broader definition of first-generation to include not only attending but also graduating with a bachelor's degree can be supported.

Pascarella et al. (2004) analyzed National Study of Student Learning (NSSL) data that spanned from 1992-1995 and focused on "learning and cognitive development during college" (p. 252). The sample included 18 colleges and universities across 15 U.S. states. These participating institutions were chosen as a diverse representation of institutional types, sizes, and enrolled student demographics. Although the dataset includes several institutions and a range of institutional characteristics, the sample is small compared to the total number of four-year colleges in the United States, limiting the

study's generalizability. In addition, not all students enrolled at the institutions in the study participated in the survey and all follow-up surveys. Therefore, it is unknown if there are differences between the respondents and non-respondents to the survey. Finally, race was dichotomized, so differences between first-generation students of different races are unknown in this study since race was consolidated into two variables, White and not White.

For their study, Pascarella et al. (2004) identified students where one parent earned a bachelor's degree or neither parent earned a college degree, in relation to students with both parents having earned a bachelor's degree. Pascarella et al. found that first-generation students, using both definitions, completed fewer credits per semester than continuing-generational students and were more likely to work more hours, participate less in extracurricular activities, have lower GPAs, and live off-campus; all of which are factors shown to decrease degree attainment and increase time to degree. Some of these variables may be related. For example, working more hours may decrease the time students have to participate in extracurricular activities. However, no direct analyses were conducted to examine this relationship.

Ishitani (2006) analyzed the NELS:88 and the Postsecondary Education Transcripts Study 2000 (PETS:2000) data and used event history modeling to explore first-generation students' behavior related to retention and degree completion. The sample included 4,427 students who enrolled in both private and public four-year institutions. Unlike other studies, Ishitani differentiated between first-generation students in the sample where neither parent attended college (14.7%) or only one attended college (34.8%). Using the Kaplan-Meier survivor function, a nonparametric statistical method,

Ishitani found that the gap between first-generation students' retention and multi-generational students widened over the first two years of college enrollment. The national dataset used follows students across institutions, not just a singular institution; thus, the data showed first-generation students' overall withdrawal behavior through 2000. The outcome of lower retention for first-generation students continued into Ishitani's degree completion analysis through logistic regression. Specifically, first-generation students were 51% less likely to graduate in four years than those whose parents had attended college. Ishitani's study was limited by the dataset available, specifically college GPA, which would have allowed the researcher to control for academic performance.

Finally, Mehta et al. (2011) used a questionnaire with a seven-point Likert scale at a mid-sized southwestern state university to survey students (n = 452). Before the study, the researchers validated the survey instrument by running a pilot study. Using exploratory factor analysis, the researchers identified significant factors comprised of groupings of survey questions. Mehta et al. found that first-generation students had lower family incomes, which has been shown to negatively affect degree completion. First-generation students were also less involved in social activities and worked more hours than continuing-generation students. Additionally, they found that first-generation students were more likely to have lower undergraduate GPAs than continuing-generation students. The findings of Mehta et al.'s study agree with previous findings regarding the factors that may affect first-generation students' status and the performance of these students in higher education.

Mehta et al.'s (2011) results are limited by the cross-sectional nature of the data, as they do not represent a longitudinal view of a student's academic career. In addition,

the sample was from a single mid-sized institution and cannot be generalized to other institutions or institution types. Despite the limitations, the study was completed more recently than many of the others which use national datasets. In addition, the findings are similar, and first-generation students' outcomes appear not to have changed significantly. First-generation students continue to have lower degree attainment rates than continuing-generation students, and a more recent longitudinal study is needed to confirm earlier work on this topic.

Institutional Interventions and Time to Degree

As implied by the Sass et al. (2018) model, students with various demographic differences are retained and graduate at different rates. Fisher (2007) claims that student groups' differences in academic outcomes are only partially due to factors such as family background, financial resources, and academic preparation; therefore, institutional factors must also play a role in a student's success. Fisher used the National Longitudinal Survey of Freshmen (NLSF: 1999), which is a sample from 28 institutions across the United States (n = 3,924). The stratified random sample includes an equal number of Black, Hispanic, Asian, and White students, which is not reflective of the national distribution of post-secondary students but does allow for equal between-group analyses using parametric statistical techniques.

For some student groups (White and Black students), having more ties off-campus decreased their college GPA; however, no significant difference was found for Asian or Hispanic students. Previous research shows that social integration on campus increases retention and degree completion (Tinto, 1975; Wolniak et al., 2012). The inverse of a similar question showed that all students, regardless of race, who were more involved on-

campus improved their GPA and retention. Finally, for all groups, the more satisfied a student was with their college experience, the less likely they were to withdraw. There are many reasons a student could be dissatisfied with their college, and that could vary by student groups or individuals. Nevertheless, the cumulative findings are that students need to form bonds on campus and be satisfied with their experience.

While the findings of Fisher's study (2007) are consistent with other research, it is important to note that the institutions sampled for the survey were more selective institutions, and the students were all first-time, first-year students. The findings may differ in less selective institutions where students are less academically prepared or attending less-resourced institutions. Additionally, the students only included the first-time, first-year students; therefore, the study findings may differ for transfer students or non-traditional aged students.

As previously shown, a student's time to degree often exceeds the expected four years for a bachelor's degree, and there are negative consequences to extending the time to degree. In addition, degree completion rates differ according to various student demographic indicators as well as institutional influences. While many studies use data that are more than two decades old, the findings seem to agree with more contemporary studies done at single institutions. Colleges continue to focus on degree completion and decreasing time to degree by addressing institutional structures that may improve outcomes, including registration practices, advising, and academic momentum, as measured by credits per semester.

On-time Registration

As previously mentioned, the on-time degree completion program implemented by the institution in the current study required a degree completion checkpoint related to registration. This checkpoint required program participants to register by the priority registration deadline, which was determined by the student's degree level and credits earned. Although there have been numerous dissertations written on the topic of registration and graduation rates, a limited number of peer-reviewed research studies have been published on this topic. Of those published, a majority studied registration trends at community colleges. Therefore, less is known about these trends at four-year, non-profit institutions.

Ford et al. (2008) used a correlational design to study if registration timing is related to course outcomes and found that the closer to the start of the course the student registered, the lower their grade in the course (r = -.21). Further, using the student's cumulative undergraduate GPA as a dependent variable, it was found that students with higher GPAs register earlier than those with lower GPAs. Ford et al. identified a few alternative reasons for the relationship between registration and performance, including the limited availability of courses closer to the start of the semester, offering less desirable course times or instructors.

Ford et al. (2008) used registration records for five psychology classes (n = 253) at a mid-sized public university to study relationships between when a student registered for a class and the student's final grade for the course. The study sample represented approximately two percent of the university's undergraduate student population (Ford et al., 2008). The sample in this study was a convenience sample, as three of the researchers

were the professors of the studied courses, and it was limited to a single academic subject area. While the professors did not know when the students in their courses registered, a fourth researcher analyzed the data and had no student contact. Separating the student contact from the analysis provided an independent evaluation. However, the primary concern with a convenience sample is the generalizability of the result (Mertens, 2020). The researchers did not provide specific demographic descriptions of the sample, and it is unclear how students who enroll in psychology courses may differ from other disciplines. Therefore, generalizability to the larger student population at the university or undergraduate students more generally is limited. Further, Ford et al. (2008) did not consider other student characteristics, such as race, gender, income level, or first-generation status, nor reasons for late registration, such as accounts payable holds. These factors have been shown in previous research to be related to student success and retention.

Like Ford et al. (2008), Bass and Ballard (2012) conducted a study based on the registration method at a four-year university. Bass and Ballard compared the student outcomes of two cohort groups, entering freshman in Fall 2010 and Fall 2011, based on the registration method. In Fall 2010, the entering student body registered themselves during orientation, just before the start of the semester, after the returning students registered. The Fall 2011 cohort was registered by advising staff over the summer based on students' responses on an entering questionnaire. The result was that in 2011 the students were registered earlier in the summer than the previous cohort. Using a correlational design, Bass and Ballard found a stronger positive relationship between the cohort group and both semester GPA and retention for cohort 2011 than cohort 2010,

showing a higher GPA and retention rate for students who were registered earlier in the summer and by advising staff than the group who registered themselves later in the summer.

Although Bass and Ballard (2012) compared the two cohorts to assess if the new registration method resulted in positive increases in GPA and retention, using the 2010 cohort as the baseline group, they did not compare the two groups to confirm that the demographics of the group were similar. Therefore, it is unknown if the differences between groups for GPA and retention are due to differences in the group or related to the registration method. Further, the registration timing also differed, so it is not known if there was greater course availability during the middle of the summer when the 2011 cohort was registered than the previous cohort.

Ford et al. (2008) and Bass and Ballard (2012) both studied students' registration timing and student outcomes at four-year institutions finding similar results despite different study designs. Similarly, Hale and Bray (2011) studied registration and its relationship to student outcomes; however, Hale and Bray's research was conducted in the context of community colleges. Hale and Bray used registration data from three rural community colleges in Mississippi with similar student demographics. Further, Hale and Bray limited the participating institutions to community colleges where there were distinct registration periods and analyzed data over four semesters, two academic years (2001-2003), at the three similar institutions. Like the Bass and Ballard study, Hale and Bray used the entire student population for all courses, thereby reducing concerns over generalizability outside the sample as there is not sampling bias.

Hale and Bray (2011) identified two limitations of their study: other factors that influence final course grade and the different definitions of registration periods between the three schools. Again, unlike the Ford et al. (2008) study, Hale and Bray analyzed demographic details about the students to determine if the outcomes varied by gender, age, ethnicity, socioeconomic status, and program of study. Using regression with registration period as the dependent variable and demographic variables as independent variables, Hale and Bray found that women, Caucasian students, students that received Pell Grants, and students with higher GPAs all registered earlier than men, other ethnic groups, those who did not receive Pell Grants, and those with lower GPAs. The finding regarding GPA is consistent with the findings from the previously mentioned studies.

In their second regression analysis, Hale and Bray (2011) used course grade as the dependent variable, and the independent variables were the student's demographic information and registration timing. They found that students who registered later for a course received lower grades in that course than those that registered earlier (Hale & Bray, 2011). In addition to higher grades, students who registered earlier were also more likely to finish their course and not withdraw or fail. Both credit completion and course grades have been found in previous research to affect degree completion positively.

Focused explicitly on retention as opposed to specific course outcomes, Gurantz's study (2015) examined the relationship between registration delay (in minutes) over a smaller registration time frame and the student's likelihood to return the following semester. Gurantz studied the relationship between when a student registered for a course, how vigorous they were in their registration attempts (number of registration actions), registration success (measured in credits), and retention within the context of a California

community college. Guarantz quantified vigorous registration attempts as the number of requested registration actions a student made to complete their schedule, as he found that many students who registered late tried to register for courses that were closed. He also found that students who register earlier in their registration period take more credits and are more likely to return the subsequent semester (Gurantz, 2015). Finally, he discovered that students who attempt more credits, regardless of when they registered and how actively they tried to enroll in classes, are more likely to return the following semester. He hypothesizes why students may delay registration and why some may try more actively to register than others, including lack of guidance and difficulty in the transition from K-12 education. This finding suggests that students who are advised to take additional courses and are provided guidance on course selection may have a better retention rate than those who delay registration and register for fewer credits.

The sample in Gurantz's (2015) study was restricted to students who attempted to register for at least one course during the 2011 fall semester and was divided into three groups: continuing students, second-semester students, and new students. The three groups were able to access registration at different times; therefore, course availability differed for these groups. Students at the community college received an assigned registration appointment, which is a period of time they register, described as a series of weekdays between 9:00 a.m. and 2:00 p.m. (Gurantz, 2015). The study was further limited to courses that met general education transfer requirements but excluded courses that did not. Therefore, the registration sample excludes courses that met the associate's degree requirements, but not transfer agreements. Gurantz rationalizes this restriction by stating that general education transfer classes represent examples of the largest

overcrowding and that that subset of classes reflects the pathway of the majority of the school attendees.

A limitation with the study sample was that Gurantz (2015) focused his analysis on returning students and non-matriculated new students, but not matriculated new students. Gurantz defined non-matriculated as students who did not complete matriculation steps before July 18; however, these students may differ significantly from matriculated students who did complete the steps on time and received earlier registration appointments. The reasons for his sample exclusion of matriculated new students was unclear. A further limitation is a focus only on courses that met the transfer requirements, thus restricting the analysis of registration behavior to students who are likely motivated to transfer to a four-year university, which may differ from students without transfer aspirations.

Smith et al. (2002) conducted a quantitative analysis of registration data and student outcomes at a community college in Texas. The sample was limited to all students enrolled in credit-bearing on-campus courses ($N = 3{,}950$). Registration at the community college was performed in three phases: early registration (five days in April/May), regular registration (three days in late August), and late registration (eight days in early September at the start of the semester). Smith et al. used a stratified random sampling technique to ensure equal distribution between all registration groups and new and returning students. Their final sample for the study was 251 students or approximately six percent of the total eligible population. The findings of Smith et al. were consistent with the other studies presented. Using ANCOVA and Chi-square analyses, they found that

students who registered late were less likely to persist to the next semester, have lower GPAs, and complete fewer credits during the semester.

Much of the prior research regarding student registration behavior and student outcomes took place in the early 2000s; however, a few more contemporary studies conducted at community colleges have been completed. Tompkins et al. (2019) completed a quantitative study looking at the connection between the time of registration and student outcomes; however, as online courses have increased in popularity and availability, Tompkins et al. include the differences by course type as well. The research team used logistic regression to look at the course outcome (dependent variable) as related to registration timing, course type, and other student demographic data.

Tompkins et al. (2019) also limited their sample by employing an "ex post factor matched samples research design" and matched their sample based on seven criteria (p. 373). While Tompkins et al. claim that this research design allows for an approximation of a randomized control trial with random assignment to the treatment and control groups, there are also concerns over which students are being left out of the study due to no match being found. However, when comparing the sample's demographic distribution and the college's full population characteristics, the sample was reasonably similar, validating the sample as representative of the population.

Tompkins et al. (2019) found that students who registered late were 50% less likely to complete the course successfully than those who registered on-time (p.376). Further, after controlling for course delivery method and if a student completed a college success course, the act of registering late still accounted for a statistically significant decrease in the course completion success. Apart from the possible limitations based on

the sampling method, there is limited generalizability of the study based on analysis of data from one community college, despite similar demographics to a national sample. Lastly, specific student demographics, such as high school preparation and first-generation status, have been shown in previous studies to have been related to college success.

Despite variations in the institution types studied and sampling methods, consistent findings regarding positive relationships between earlier registration and student course outcomes have been found in the above studies. With limited research at four-year institutions and with limited samples, further research at a four-year institution longitudinally across a student's enrollment is likely needed to identify the long-term impact of early or on-time registration on student success and, ultimately, degree completion.

Academic Advising

Students in the on-time degree completion program at the studied institution must meet with their advisor at least once a semester. Advising and clear pathways to degree completion are vital to improving graduation outcomes. Surprisingly little has been studied about the effects of academic advising on degree completion specifically, as studies typically focus on students' satisfaction with advising. Young-Jones et al. (2013) surveyed undergraduate students in psychology classes at a Midwestern university (N = 611) and found that students who met with an advisor showed improved responsibility, self-efficacy, and study skills, and those factors showed a positive relationship with higher GPA. They also found students that meeting with an advisor at least one time during the semester was related to higher levels of perceived support than for those that

met less frequently. Additionally, the authors also found that students with greater study skills and higher self-efficacy levels have higher GPAs. Lastly, they found that meeting with an advisor was related to student responsibility, self-efficacy, study skills, and perceived support.

The survey instrument used included 95 student assessment questions, and Young-Jones et al. (2013) used confirmatory factor analysis to identify common factors within the survey questions. They found six factors including the following, the percent of variance explained by each factor is in parenthesis: advisor accountability (10.8%), advisor empowerment (9.07%), student responsibility (7.46%), student self-efficacy (5.75%), student study skills (4.57%), and perceived support (3.57%; Young-Jones et al., 2013). Using GPA to measure student success, the researchers used multiple regression to analyze each factor related to GPA and controlled for high school GPA and class standing. They also looked at how often a student met with their advisor and if it was related to the above factors.

The university at which Young-Jones et al. (2013) completed their research requires students who have completed less than 75 credits to meet with their advisor each semester. Before declaring a major, students are advised by an Academic Advisement Center, whereas after a student declares a major, they are advised by faculty within the department. The institutional context of this study is important, as Young-Jones et al. found that 66% of students met with their advisors once each semester. The researchers do not discuss if the percent of students who met with an advisor changes with class standing. The sample is also limited to students from psychology classes. The generalizability of this study to an institution with a different advising structure or other

disciplines is not possible due to the sample's limitations. However, Young-Jones et al. do show evidence for strong connections between academic advising and student outcomes.

In a qualitative study, Luedke (2017) explored the cultural and social capital gained by Latinx, biracial, and African American students through faculty mentorships and interactions with university staff. She found that holistic interactions with faculty and staff helped students build social and cultural capital on campus through advising and mentorship. The research took place at two predominately White institutions (PWI) in the Midwest. Luedke used purposeful chain sampling to select both undergraduates and staff from the two institutions ($N = 24$), interviewed the participants, and had them complete a demographic questionnaire.

Through her analysis of the interviews using a grounded theory approach, Luedke (2017) found that students of color struggled to build relationships with White staff. Further, students of color sought out relationships with staff of color to have conversations extending beyond academics to personal situations and their families. Luedke argues that students of color acquired cultural capital to be successful in college through the social capital established through these staff relationships. While Luedke did include participants from two separate institutions in her study, additional studies should be conducted in different contexts before attempting to generalize this study. Nevertheless, in the context Luedke studied, students sought out mentoring relationships to navigate the complexities of college and found those relationships essential for success. In addition, the connections to success were narrative accounts and not substantiated by quantitative findings. Her findings serve as a cautionary reminder, who

the advisors and mentors are, how they are similar or different to the students they serve, and how that may affect student outcomes.

Berumen et al. (2015) completed a study in Indiana on a statewide program that focuses on the diversity of college access within the state. While the intervention program starts with students who are in high school, students continue to receive college support services through regional offices. In addition to academic counseling, students are also eligible for additional last dollar financial assistance. Berumen et al. conducted a qualitative study using a case study design and used group interviews with students (N = 150) and individual interviews with administrators (N = 76). Different research team members independently coded the interview transcripts, and the final codebook was confirmed by consensus. Berumen et al. found that students in the program reported mentorship programs and academic advising were helpful resources in transitioning to higher education not only academically but also in social and emotional matters. While the Berumen et al. study provided rich description of students in the Indiana program across multiple campuses, the nature of the research does not allow the results to be generalized to a broader student population; however, the findings support other quantitative studies that show mentorship and advising are positive factors that are related to increased graduation rates.

Academic Progress

There are two quantitative measures mandated by the U.S. Department of Education and woven into the federal financial aid policy related to academic progress: the definition of full-time student status and the requirement for students to achieve satisfactory academic progress (SAP). For students to qualify for the maximum amount

of financial aid, they must be considered a full-time student. While enrollment in 12 credits is the minimum credit load to maintain full-time student status by the federal definition, the minimum credit load will not allow students to graduate on-time in four years. Bound et al. (2012), as previously discussed, found that students who earn credits at a slower rate have an extended time to degree completion. In addition, they found that this trend has increased over time and varies based on the type of institution, with public institutions having a longer time to graduation and more selective schools graduating closer to on-time.

The second part of the federal financial aid requirements is that students maintain SAP each year. For Title IV financial aid, SAP is defined by each institution but must meet specific minimum standards, including a minimum GPA not less than the requirement of graduation and progress not to exceed 150% of the allowed time for the degree (34 CFR § 668.34). The expected time to completion for a bachelor's degree is four years; therefore, students may only receive financial aid towards a bachelor's degree for a maximum of six years, or 150% of the time to the degree. Once a student takes longer than six years, they may no longer receive any federal financial aid as they have not maintained SAP. While this regulation is set up to ensure a student does not continue to receive financial aid without reasonable progress toward a degree, students may use a minimum number of credits (12) and fulfillment of SAP as their guide for an appropriate semester load, not realizing the financial implications of extended time towards their degree. However, meeting the minimum credit requirements for SAP does not lead to on-time degree completion, as 30 credits per academic year, or 15 credits per semester, is required to reach the 120 credit minimum for all bachelor's degrees (PA DOE §31.21.b3).

Although losing financial aid due to not maintaining SAP can be detrimental to a student's degree completion, there is research showing that regular course completion increases graduation rates. Using data from the National Education Longitudinal Study to construct a multilevel model, Attewell et al. (2012) found that the regular enrollment and completion of full-time semesters improves graduation rates. The Attewell et al. study also showed that students who took more credits in their first semester continued to take the same or more credits in subsequent semesters; therefore, the gap widens between the highest and lowest momentum students as time goes on. The regulation and research are complementary and requiring students to make on-time progress towards their degree (30 credits per year) supports a four-year degree completion goal. Therefore, the research previously discussed, which supports decreased time to degree, is also related to the normal academic process required to maintain the academic momentum required to graduate in four years.

Conclusion

Previous research has shown that degree completion rates vary across institution types and different student demographic groups, such as socioeconomic status, parental education, and race. Additionally, the time to degree often exceeds the regular four-year bachelor's degree timeframe, which increases the cost of education and impacts future earnings. While students may enter higher education with different academic preparation and types of social supports, institutional programs and structures, like advising and registration, can affect degree outcomes.

In response to degree completion rates and length of time to degree, a Mid-Atlantic public institution implemented a program with a series of checkpoints to

improve on-time degree outcomes. Although the individual program checkpoints singularly have been part of previous research studies, a study addressing them in combination with measurable interventions and degree outcomes has not been completed.

CHAPTER 3

METHODOLOGY

This study explored student success through the lens of an on-time degree completion (OTDC) program and compared the program participants' four-year graduation rates in relation to the rate of checkpoints' completion. In addition, some of the program participants of low-socioeconomic status received an institutional grant, which was renewed for four years, provided that the recipient completed all program checkpoints each year. The second part of the study investigated program-grant recipients and how the rate of checkpoint completion related to academic success as measured by on-time degree completion. The study analyzed a set of predictor and moderating variables to understand the relationships between participants, as categorized by the variables, and their ability to maintain program eligibility through checkpoint completion.

Study Setting

The study was conducted at a large, urban public research university in the Mid-Atlantic region of the United States. The on-time degree completion program studied is a graduation partnership program between entering bachelor's degree seeking students and the university to encourage students to graduate in four years. The university's undergraduate enrollment is approximately 30,000 students. The 2010 first-time, first-year cohort's four-year graduation rate was 44%, and the six-year graduation rate was 71%, with women and White students graduating at a higher rate than men and non-white students.

The first cohort of students eligible to join the degree completion program matriculated in fall 2014 with an anticipated four-year graduation date of spring or

summer 2018[2]. The first cohort eligible to enter the program totaled 4,472 students, and, of those, 3,973 (89%) accepted the program agreement. The participation rate in the 2015 and 2016 cohorts were 93% and 94%, respectively. The program participant cohorts, on average, consisted of 56% women, 58.1% White students, an average family income of approximately $70,000, and 33% were first-generation.

Study Population

The current study used data from the first three program cohorts, 2014-2016. For the inaugural cohort, students who did not opt into the program predominately came from middle and upper-income families and accepted less loan funding than program participants (Hewitt, 2019). Presumably, the program's tuition guarantee did not entice the students with the financial means to pay for college, and therefore, they did not opt-in. The second research area was limited to the program-grant recipients. The grant recipients were chosen primarily based on financial need. Therefore, the program-grant group (N = ~500 per cohort) had a lower family income than those in the non-grant group. Also, related to family income, the parental education level was lower among the grant recipients than those who did not receive the grant. Compared to the total number of participants, a higher percentage of non-white students received a program grant (66%) than in the total study population (42%). Lastly, the grant recipients included more first-generation students (66%) than the full cohort population (33%).

[2] Four year graduation rates include all students who completed their bachelor's degree in four years or less. In addition, when calculating graduation rates, students who graduate by the end of the summer semester are counted as graduating in that academic year and added to the number of spring graduates for reporting.

Data for this study were provided by the Institutional Research and Advancement Office at the university studied. The dataset contained demographic indicators for each entering student in each of the three cohorts as well as their data from the New Student Questionnaire (NSQ), undergraduate admission application, financial aid award, Free Application for Federal Student Aid (FASFA), and academic record. All entering first-time, first-year (FTFY) students in the cohorts who participated in the on-time degree completion program (N = 13,323) were included in the study. Due to the small number of transfer students eligible to participate in the program and receive grants, this study only focused on traditional FTFY students in the on-time degree completion program.

For an analysis to achieve power ($\beta = 0.8$) with an alpha level of 0.05, the minimum sample size for a two-tailed hypothesis is approximately 130 participants (Krejcie & Morgan, 1970; Soper, 2019). Since the study used the entire program population and each entering student cohort at the university was large (N > 4,000), the study easily achieved power. In addition, since this study analyzed the sub-groups of students, the power requirement of 64 students per group to retain this level of power was maintained (Soper, 2019).

Research Model

The research focused on student success, measured by the program participants' on-time degree completion. The research was divided into three central research areas: on-time degree completion rates for the cohort, program checkpoints completion rates and the relationship to on-time graduation, and the effect of receiving the program grant on on-time degree completion.

Variables

The study's dependent variables were on-time graduation and checkpoint completion (Table 3.1). On-time graduation was defined as whether the student completed their degree within four years and is a binary variable. Given that the goal for the degree completion program is on-time degree completion, the four-year graduation rate was used. Checkpoint completion included four checkpoints categories per student and is interval, reflecting the percentage of completed checkpoints (i.e., the number completed divided by the total number required).

Table 3.1

Outcome Variables for OTDC Research

Variable	Variable Description	Coding	% Missing	*M*
On-Time Degree Completion	Binary. Indicates if the participant completed their bachelor's degree within four years	0 = No 1 = Yes	0% missing	56%
% Advising	Interval. Percentage of Advising checkpoints completed.	Percentage 0-100%	0% missing	69%
% Graduation Audit	Interval. Percentage of Graduation Audit checkpoints completed.	Percentage 0-100%	0% missing	52%
% Advancing Standing	Interval. Percentage of Advancing Standing checkpoints completed.	Percentage 0-100%	0% missing	72%
% Priority Registration	Interval. Percentage of Priority Registration checkpoints completed.	Percentage 0-100%	0% missing	59%

Note. A participant who is no longer enrolled in the institution, was recorded as not completing the checkpoint while not enrolled.

To determine how the rate of on-time degree completion differs between program participants with various background characteristics I ran descriptive statistics on the study population and used a crosstab analysis to examine the on-time graduation rate for the cohort, as well as differences in on-time graduation by student variables. Chi-square tests were run to test for the significance of the differences. To compare the on-time degree completion rate based on the rate of program checkpoint completion I used an ANOVA. In addition, Pearson correlations were run to test for associations between student variables (Table 3.2) and rates of both program checkpoint completion and on-time graduation. For the analysis of checkpoint completion by race, a MANOVA analysis was completed to compare the rates of completion between racial groups. A further analysis was completed by limiting the sample to understand these differences. The final research question addressed program-grant recipients' on-time degree completion in relation to checkpoint completion. A one-way ANCOVA was run to test if the participants who received the program grant differed in on-time graduation rate from non-program-grant recipients and how it differed based on the number of years the participant received the grant. Finally, while controlling for all program checkpoint types, an ANCOVA was run to explore how the number of years the grant was received was related to the on-time graduation rate.

Predictor variables included gender, race, family income, Pell Grant recipient status, high school GPA, parental education level, first-generation status, and program-grant recipient status. The variable names, types, descriptions, coding, missing values, and means are listed in Table 3.2. Given the minimal amount of missing data and the

large number of cases in the current study, cases were excluded in a given analysis for variables where there are missing values.

There were two areas where multiple variables measured similar constructs: family education and family income. In these areas, to capture the essential concept of the data, a principal component analysis (PCA) was run to create a single component variable. For example, family income, unmet financial need, and receiving a Pell Grant measure similar things, as for students to be Pell Grant-eligible, they have to meet certain expected family contribution thresholds (EFC) mostly driven by family income. Similarly, a student's amount of unmet need is the relationship between the cost of attendance, awarded financial aid, and their EFC. A PCA was run to create a single financial position variable to capture the combined effect of these variables while eliminating the issues of collinearity if all were used in a single analysis. Another similar relationship exists between first-generation and both parent's education. Since first-generation is derived from the combination of both variables, a PCA was run to create a Parental Education variable.

These predictor variables were chosen as possible variables to include in the model as previous research has shown differences in graduation rate by race, income level, and parental education level. Typically, non-white students graduate at a lower rate than White students, with the exception of Asian students. Low-income students are more often also first-generation, and both separately as well as combined typically predict lower graduation rates than a continuing-generation student or students from middle or upper-class families.

Table 3.2

Predictor Variables for OTDC Research

Variable	Variable Description	Coding	% Missing	*M*
Gender	Binary. Gender, self-reported by the student on their admission application.	0 = Male 1 = Female	0% missing	56% female
Race	Nominal. Self-reported race based on IPEDS race/ethnicity categories.	1 = White 2 = African-American 3 = Asian 4 = Hispanic 5 = Other Races/ Unknown	0% missing	N/A
Family Income	Ordinal. Supplied on the New Student Questionnaire. Participants select from predefined income bands.	1 = Less than $20K 2 = $20K - $39,999 3 = $40K - $59,999 4 = $60K - $79,999 5 = $80K - $99,999 6 = $100K - $124,999 7 = $125K - $149,999 8 = $150K+	5.4% missing	4.69
Pell Grant recipient	Binary. Based on the calculated EFC, federal guidelines determine if a student receives Pell Grant funding.	0 = Did not receive Pell Grant 1 = Received Pell Grant	0% missing	34%
Mother's Education	Ordinal. Reported on the FASFA. The parent's education is based on predefined categories.	1 = Did not graduate from HS 2 = Graduated HS 3 = Some college 4 = Completed bachelor's degree 5 = Postgraduate or Professional Degree	1.3% missing	3.46
Father's Education	Ordinal. See above, Mother's Education	Same as Mother's Education	1.6% missing	3.34

Table 3.2 continued

Variable	Variable Description	Coding	% Missing	*M*
First-Generation[a]	Binary. Calculated value based on FASFA responses to mother's and father's education.	0 = One or more parents graduated from college 1 = Neither parent graduated from college	1% missing	33%
OTDC program-grant recipients	Binary. Indicates if the student has received a program grant	0 = Did not receive the grant 1 = Received grant	0% missing	11%

Note.

[a] If neither parent graduated college, coded as value 1-3 in mother's/father's education, then the participant is classified first-generation.

Lastly, several variables were used as moderator variables in the analysis of the research questions (see Table 3.3). The institutional calculation of unmet need and estimated hours worked was used to control for a student's financial burden. High school GPA was used to control for the level of college preparation through secondary schooling.

Table 3.3

Moderating Variables for OTDC Research

Variable	Variable Description	Coding	% Missing	*M*
Unmet Financial Need	Continuous. Calculation of the amount of unmet need based on student EFC and aid awarded	Monetary value ranging from $0 to $47,335	13% missing	$7,934
Hours Worked (per week)	Interval. Self-reported number of hours a student anticipants working per week. Gathered on NSQ[a].	0 = None 1 = 1-15 hours 2 = 16-20 hours 3 = 21-25 hours 4 = 25+ hours	3% missing	1.23
High School GPA	Continuous. High school GPA as reported on their final high school transcript. Broadly speaks to pre-college academic achievement.	1.70 - 4.00	1% missing	3.53

Notes.

[a] NSQ is an abbreviation for the New Student Questionnaire. The NSQ is completed by incoming students the summer directly prior to starting their first fall semester.

Overall, the variables used had minimal concerns of validity and reliability. The data collection was consistent and primarily was sourced from institutional or standardized sources. The family income variable has some possible reliability concerns as the data were collected on the New Student Questionnaire (NSQ) in the summer before matriculation, and students may have estimated their family's income as opposed to referencing tax information or earnings statements. Parental education level shares a similar concern as the data are collected on the FASFA and NSQ, and students may be

filling out the application and the parents may not be verifying the information before submission. In addition to the reliability of the data, the data are valid and have content and construct validity. The variables have clear definitions and, in several instances, are based on federal definitions and categorizations. Regarding the predefined categories for race, the categories a student can select from are based on the Integrated Postsecondary Education Data System (IPEDS), which is the annual mandated reporting for most higher education institutions. The gender variable has a similar concern, as currently, the allowable categories for gender on IPEDS are binary (female, male), which restricts those who do not identify with the binary construct.

Research Design

This study used a non-experimental correlational design. Therefore, the study utilized existing data about the entering cohort, including demographic characteristics, academic performance, program participation data, financial aid data, graduation outcomes, and checkpoint completion data to study the effects of checkpoint completion on on-time graduation. No manipulation of the variables was possible as the study used extant data.

Data Analysis

All variables were analyzed using descriptive statistics to observe the mean, distribution, and differences between participants who completed their degree on-time and those who did not. Each nominal and ordinal variable was analyzed using chi-squared distribution tests. Similarly, binary and continuous variables were analyzed using ANOVA analyses. As the study's outcome variable was binary (on-time graduation), post-hoc tests were not needed to follow up on the ANOVA results.

Research Area 1# (On-Time Degree Completion): How does the rate of on-time degree completion differ between program participants with various background characteristics? The first question evaluated the program participants' overall on-time degree completion rates. I explored the distribution of the background characteristic variables (gender, race, family income, and parental education) of all study participants and how they differed between participants who completed their degree on-time and those who did not. Chi-Square analyses were run on each of the non-binary variables to study the effect size.

Research Area 2# (Checkpoints): What is the rate that each checkpoint type was completed? Does the checkpoint completion vary based on student variables? What is the relationship between checkpoint completion and on-time degree completion? The second question analyzed participants' program checkpoint behavior (independent variables), operationalized by successful completion of the individual program checkpoints and the relationship to on-time degree completion. The effect of the independent variables on student success was moderated by individual student variables (Table 3.2).

Descriptive statistics were used to analyze the percent of participants who completed each checkpoint type and how completion differed based on student variables. Chi-squared and ANOVA analyses were used based on the variable type. Finally, logistic regression was used to build a model to identify which factors were most strongly predictive of on-time degree completion. Logistic regression is a predictive analysis that helps explain the relationship between the binary outcome variable and a predictor variable. Each binary checkpoint was analyzed separately first, and the variables with the strongest relationship to the outcome variable were used in the final model.

Research Area 3# (Grant Recipients): For grant recipients, does their academic success, as measured by on-time degree completion, differ based on the number of academic years they received program grant funding? How do graduation outcomes vary based on checkpoint completion for grant recipients? The third question focused on the group of program-grant recipients (N = 1,475; approximately 500 per cohort). Descriptive statistics were run to analyze the rate of checkpoint completion and on-time graduation, comparing the program-grant recipients to the total study population. Using ANCOVA, I investigated if the rate of checkpoint completion is related to participants' on-time degree completion rate. As with the second research question, I controlled for the same covariates to explore if some variables were related to a more significant difference in outcomes than others.

Conclusion

This study aimed to understand the relationship between students' on-time degree outcomes and the degree completion program checkpoints when controlling for student demographic differences. Previous research had been completed that looks at each program checkpoint individually; no study had looked at the combination of institutional interventions within a longitudinal context of on-time degree completion for several cohorts.

CHAPTER 4

RESULTS

The results of the quantitative analyses described in Chapter 3 are presented in this chapter. Chapter 4 describes assumptions and decisions made as part of the statistical analyses used to investigate the research questions. This chapter also presents descriptive statistics of the program participants, and includes sections that address each research question and sub-questions.

Description of the Dataset

The data analyzed for the current study included demographic, financial, and academic information collected as part of the admission application, New Student Questionnaire (NSQ), academic records, financial aid records, and advising database. The program checkpoint data were created partly from the advising database and partly from student academic records. The four checkpoints are: advising appointments, priority registration, graduation audit, and annual advancement of class standing.

The admission application and NSQ are participant submitted data and rely on the truthful submission of data for authenticity. Program checkpoint data from the advising database regarding advising and Graduation Audit checkpoints are recorded by the program participant's advisor at the time of the advising meeting. The accuracy of the program checkpoint data relies on the correct recording of student interactions. The academic and financial aid records were generated by the university studied as part of regular record keeping and are the official records of the student. Similarly, checkpoint data for priority registration and advancing academic progress are based on the official academic records and errors in the data are not expected.

While most variables were used as gathered, a few decisions were made regarding some variables based on the distribution of responses. As the focus of this research is on-time degree completion, degree completion is recorded as "yes" if the student graduated with their bachelor's degree within four years of their admission, inclusive of the summer semester prior to the start of their fifth fall semester. Additional research could be completed in the future to examine the graduation of students beyond a four-year timeframe; however, that is not within the scope of this research. The issue of students not retained related to the binary classification of participants as completing on-time. For the purposes of this study, all participants who entered in one of the three cohorts included in this study and opted in to the OTDC program are included in the study (N = 13,323), regardless of the length of time the student was retained by the institution.

Race, as collected by the university, is based on an eight-category classification consistent with IPEDS[3] reporting categories. Students who self-identified as American Indian, Pacific Islander, Two or More Races, or Unknown were categorized as "Other/Unknown" due to the low number of participants in each group. The other categories of White, Black/African American, Asian, and Hispanic remain as self-reported.

Participants' academic preparation for undergraduate education was measured by high school grade point average (GPA). The value for high school GPA was collected from the participant's high school transcript during the admissions process. The reported

[3] IPEDS is the acronym for The Integrated Postsecondary Education Data System. IPEDS is the annual reporting completed by higher education institutions and mandated by the Department of Education's National Center for Education Statistics.

high school GPAs were normalized to a 0 - 4.0 scale. Some researchers have used SAT or ACT scores to measure academic preparation (Haveman & Smeeding, 2006; Wessel et al., 2006); however, there were a large number of missing scores due to the institution's test optional admission policy. Therefore, the decision to use high school GPA and not use standardized test scores was made.

Study Population

The analysis combined the first three on-time degree completion (OTDC) program cohorts and included students who opted into the OTDC program from the entering first-time, first-year cohorts of 2014, 2015, and 2016. The total population of students in the study was $N = 13{,}323$. The study population was 55.7% female, 58.1% White, and more than half of the participants in the cohort (52.7%) came from families that earn at least $80,000 per year.

Cohorts

In order to ensure homogeneity of the cohorts and to ensure differences in degree outcomes and checkpoint completion were not the result of differences between cohorts, chi-squared and ANOVA analyses were conducted to compare cohorts. There were no significant differences in the distribution of gender between the cohorts ($p = .820$). While the cohorts are statistically different for the following demographic variables, the effect sizes for all were less than .009 and thus very small: first-generation, Pell Grant recipients, and high school GPA. Effect size is an important measure when interpreting the relationship between variables and is especially important when working with large sample sizes as results with minuscule effects can have p-values equal to .000 (Levine & Hullett, 2002). Based on the analysis, it can be concluded that the cohorts are relatively

similar, and outcomes should not differ between cohorts based on demographic differences.

Demographic nominal variables were analyzed for differences between cohorts using a chi-square analysis. Cramer's V is reported as a measure of strength of association (Akoglu, 2018). The following variables were analyzed and there were no association or a very weak association between the cohort and each of the following variables: race/ethnicity, mother's education, father's education, anticipated hours worked, and family income. The values of Cramer's V showed a weak relationship between all variables, thus identifying similarities between the cohorts[4]. In other words, there is a small effect size or weak relationship between each variable across the cohorts thus showing a similarity of the demographics of the participants throughout all cohorts. Therefore, findings about on-time graduation outcomes and checkpoint completion should not be affected by differences in cohort demographics.

Study Population and On-Time Degree Completion

The first research question asked how on-time degree completion differed by student characteristics. As shown in Table 4.1, there are differences in the demographic characteristics of participants who did and those who did not complete their degree on-time. Female participants in the study population completed their degree on-time (59.1%) more often than male participants (40.9%). In addition, White participants completed their degree on-time (62.3%) more often than their non-white counterparts (44.4% -

[4] Cramer's V can be interpreted as follows: between 0 and .05 = No or very weak relationship, between .05 and .10 = weak relationship, between .10 and .15 = moderate relationship, between .15 and .25 = strong relationship, and greater than 0.25 very strong relationship (Akoglu, 2018).

59.1%). Finally, there was a difference between the on-time graduation rates of participants from higher income families (> $150,000 at 66.2%) compared to lower income families (< $20,000 at 43.6%).

Table 4.1

Demographic Characteristics of the Study Population

		Completed Degree On-Time		Did Not Complete Degree On-Time	
		N = 7,731 (58.0%)		*N* = 5,592 (42.0%)	
Demographic Variable	% of N	Frequency	Percentage	Frequency	Percentage
Gender					
Female	55.7%	4568	61.5%	2857	38.5%
Male	44.2%	3163	53.6%	2735	46.4%
Race					
African American	11.4%	672	44.4%	843	55.6%
Asian	12.0%	869	54.3%	730	45.7%
Hispanic	6.2%	401	48.3%	429	51.7%
White	58.1%	4820	62.3%	2920	37.7%
Other	12.3%	969	59.1%	670	40.9%
Family Income [a]					
Less than $20,000	8.6%	474	43.6%	613	56.4%
$20,000 to $39,999	12.6%	790	49.7%	801	50.4%
$40,000 to $59,999	12.7%	866	54.3%	728	45.7%
$60,000 to $79,999	13.4%	943	55.8%	746	44.1%
$80,000 to $99,999	12.9%	996	61.4%	625	38.6%
$100,000 to $124,999	15.7%	1229	62.1%	751	37.9%
$125,000 to $149,999	7.7%	630	64.8%	342	35.2%
More than $150,000	16.4%	1367	66.2%	697	33.8%

Table 4.1 continued

Demographic Variable	% of N	Frequency	Percentage	Frequency	Percentage
First-Generation[b]					
Not First-Generation	66.8%	5239	61.8%	3360	38.2%
First-Generation	33.2%	2223	50.8%	2155	49.2%

Note.

[a] There are 725 missing values for responses to the Family Income question from the NSQ for grant recipients. This reflects 5.4% of the sample. (n = 12,598)

[b] There are 346 missing values for responses to the Parental Education question from the NSQ for grant recipients. This reflects 2.6% of the sample. (n = 12,977)

Chi-square tests were conducted for each of the variables in Table 4.1 and there were significant differences between all three variables for on-time graduation. The relationship between gender and on-time graduation is weak (V = .079); whereas, both race (V = .127) and family income (V = .140) show moderate effect sizes as measured by Cramer's V.

Table 4.2

Chi-Square Results by On-Time Graduation

Demographic Variable	Pearson Chi-Square	p	V
Gender	84.090	.000**	.079
Race/Ethnicity	215.421	.000**	.127
Family Income	247.109	.000**	.140

*$p < .05$, **$p < .01$

In addition to academic preparation, according to previous research, both first-generation students (Ishitani, 2006; Mehta et al., 2011; Pascarella, et al., 2004; Toutkoushian et al., 2018) and students who receive a Pell Grant (Alon, 2011; Morrison,

2012) have lower graduation rates than those students whose parents graduated from college or were from households with incomes exceeding Pell eligibility. Within the overall study population of this study, 33% of the participants were first-generation college students and 34% received a Pell Grant. As can be seen in Table 4.3, participants who were first-generation or a Pell Grant recipient were less likely to complete their degree on-time. ANOVA results indicate that the difference in on-time graduation for Pell Grant recipients ($\eta_p^2 = .015$) and first-generation ($\eta_p^2 = .011$) was statistically significant, but the partial eta squared value reflects a small effect size[5]. Students with a greater amount of unmet need were also less likely to graduate on-time, and while the difference was statistically significant, the effect size was small ($\eta_p^2 = .030$). The lower graduation rates within the OTDC population for these groups is consistent with previous studies.

[5] Eta squared can be interpreted as follows: .01 is a small effect size, .06 indicates a medium effect size, and .14 is a large effect. Eta squared can be interpreted as the percentage of the variance explained by the dependent variable (Cohen, 1973).

Table 4.3

ANOVA Results on Higher Risk Populations by On-Time Graduation

	Completed Degree On-Time	Did Not Complete Degree On-Time		
Variable	*M*	*M*	*p*	η_p^2
Parental Education	58.1%	41.9%	.000**	.011
First Generation	38.2%	49.2%		
Multi-Generation	61.8%	50.8%		
Pell Grant Recipient	58.0%	42.0%	.000**	.015
Received Pell	29.4%	41.2%		
Did not Receive Pell	70.6%	58.8%		
Unmet Financial Need	$3,712	$7,803	.000**	.030

**p < .05, **p < .01*

Program Checkpoint Completion

Completion of checkpoints constitutes a critical component of the on-time degree program. Program participants' completion of checkpoints fulfills their program contract and ensures their continued eligibility in the OTDC program. Previous research has shown that early course registration, engagement in academic advising, and credit completion leading to academic momentum all increase the rate of degree completion.

The second research question examined the effect of these checkpoints on the on-time degree outcomes for program participants. Specifically, the second research question asked which of the four program checkpoints are completed more often and does the rate of completion differ by the student variables in Table 4.1? A sub-question explored the relationship between the number of checkpoints completed and on-time graduation, when

controlling for program participant background characteristics. When including all participants and examining each checkpoint type separately, those who graduate on-time complete the Priority Registration checkpoints, on average, 97% of the time, whereas, those who do not graduate in four years only complete priority registration 59% of the time ($p = .000$; $\eta_p^2 = .351$). There is also a strong relationship between on-time graduation and credit hour completion. Among those who graduate in four years, 95% earned at least 30 credits each year (advancing standing); yet only 40% of the students who did not graduate on time completed at least 30 credits each year ($p = .000$; $\eta_p^2 = .487$). Of the checkpoints, the Advising checkpoint had the weakest relationship with on-time graduation, although still demonstrating a strong effect size. Participants graduating in four years completed 82% of Advising checkpoints; however, those who did not graduate in four years only completed 51% of their Advising checkpoints ($p = .000$; $\eta_p^2 = .262$). These results are presented in Table 4.4.

Table 4.4

ANOVA Results for Checkpoint Variables by On-Time Graduation

Variable	Population	Grad 4 Years	Not Grad 4 Years		
Checkpoint Variable	*M*	*M*	*M*	*p*	η^2
% Advising	69%	82%	51%	.000**	.262
% Priority Registration	81%	97%	59%	.000**	.351
% Advance Standing	72%	95%	40%	.000**	.487
% Graduation Review	52%	79%	16%	.000**	.393

*$p < .05$, **$p < .01$*

The previous analysis, presented in Table 4.4, includes all participants regardless of their registration status in the semester the checkpoint was due to be completed. This method, while a true measure of the completion rate of a participant during their cohort's program duration, may overstate the effect of the checkpoint on degree completion, since some students were not retained for the full four years of the program. When changing the completion calculation to reflect their completion percentage while enrolled, the completion rate of all checkpoint types still differ between on-time degree completers and those who do not; however, the effect sizes differ from the results in Table 4.4. The completion rate for Table 4.5 was calculated by indicating if the participant enrolled in one or more credits during the term the checkpoint completion was expected. The total number of completed checkpoints was divided by the total number of possible checkpoints while enrolled to yield the completion rate. The result was a higher checkpoint completion rate among participants who did not graduate on time since checkpoints not completed due to non-enrollment were omitted in the calculation.

Using this new calculation for checkpoint completion which reflects actual checkpoint completion while enrolled, all checkpoints are still statistically significant, but the effect size decreased. Most drastically, the Advising checkpoint decreased from an effect size of $\eta^2 = .262$ to $\eta^2 = .086$.

Table 4.5

ANOVA Results for Checkpoint Variables by On-Time Graduation while Participants were Enrolled

Variable	Population	Grad 4 Years	Not Grad 4 Years		
Checkpoint Variable	*M*	*M*	*M*	*p*	η^2
% Advising	79%	85%	70%	.000**	.086
% Priority Registration	86%	97%	72%	.000**	.223
% Advancing Standing	78%	95%	53%	.000**	.328
% Graduation Review	63%	79%	25%	.000**	.259

Note. The completion rate was calculated by taking the total number completed checkpoints (by type) divided by the total number of enrolled semesters when the participant's checkpoint was scheduled to be completed. Participants not enrolled in the semester, would not have a checkpoint outcome recorded.

$*p < .05$, $**p < .01$

After comparing the results of the two calculation methods, the decision was made to keep the calculation used in Table 4.4 for the duration of the study. This calculation includes the total checkpoints completed (regardless of enrollment status in the semester eligible to be earned) divided by the total number of checkpoints for that type. As the scope of the study is the analysis of the effect of program checkpoint completion on on-time graduation, all participant's on-time graduation status, regardless of length of enrollment, are included in the study. Similarly, participant's checkpoint completion should also reflect the full length of the OTDC program, four years.

Checkpoint Completion by Program Participant Demographics

Previous research has shown that different participant demographic and background characteristics are related to degree completion differences. Since Tables 4.4

- 4.5 show that there are significant differences in on-time graduation based on checkpoint completion, a sub-question asked whether checkpoint completion varies based on student characteristics. To answer this question, each checkpoint was individually analyzed using either a Pearson Correlation or Chi-Squared Analysis based on the independent variable type, to examine if there are statistically significant relationships between the variables or differences by group.

The program checkpoint completion variables computed over the program length (Table 4.4) was used and the variables were computed that represent the percentage of a given checkpoint completed by a program participant in relation to the total number of checkpoints of that type available to complete. The maximum number of completions vary by checkpoint type: Advising checkpoints (eight checkpoints), Priority Registration checkpoints (seven checkpoints), advancing academic standing (three checkpoints) and graduation audit (one checkpoint). All checkpoint completions range between 0% and 100%. The Graduation Audit checkpoint was the least frequently completed (52%) and the Priority Registration checkpoint was completed the most often (81%).

Pearson correlations were computed separately for each of the four variables that measure percentage of checkpoint completion by academic preparation variables, family demographics, financial need, and academic variables[6]. It was found that the completion rates of the different checkpoints were strongly and positively correlated with each other. This suggests that students who are likely to complete one checkpoint are also highly

[6] Using Pearson's interpretation of the Pearson correlation coefficient's measure of the strength of relationship for behavioral sciences, $r > .50$ indicates a large correlation, $.30 > r > .50$ indicates a medium correlation, and $r < .30$ a low correlation (Courtney, 2018).

likely to complete other checkpoints. Further, each checkpoint is strongly and positively correlated with on-time graduation (Table 4.6).

Table 4.6

Pearson Correlation between % Checkpoint Completed and On-Time Graduation Variables

Variable	% Priority Registration	% Advancing Standing	% Graduation Audit	% On-Time Graduation
% Advising	.748**	.606**	.603**	.515**
% Priority Registration	---	.718**	.531**	.596**
% Advancing Standing	---	---	.583**	.699**
% Graduation Audit	---	---	---	.629**

*$p < .05$, **$p < .01$

Focusing on each checkpoint type separately and the correlation with student demographic, financial need, and academic variables, many correlations were statistically significant but with a small effect size. Although a weak correlation, several of these correlations are worth noting. Academic preparation, high school GPA ($r = .248$, $p < .01$), show a positive correlation to advancing in class standing. In addition, students with a higher high school GPA showed a positive correlation to completing a larger percentage of all checkpoints. Other positive correlates included parental education, as a higher level of parental education for both the mother and father were positively correlated with advancing in class standing. Finally, family income was also positively correlated with an increase in completing the Priority Registration checkpoint ($r = .136$, $p < .01$) as well as advancing in class standing ($r = .158$, $p < .01$).

Conversely, some student demographics were negatively correlated with completion of checkpoints. Students with larger amounts of unmet financial need were less likely to complete all checkpoints. Completion of the Priority Registration checkpoint was negatively correlated with financial need (r = -.205, p < .01), indicating that participants with higher levels of financial need completed the Priority Registration checkpoint less often. Related to low income is the number of hours a student anticipated working during the academic year (Carnevale & Smith, 2018). While a large percent of students work while attending college, lower income students work more hours than higher income students. In the current study, participants who reported a plan to work more hours were less likely to complete all checkpoint types. The full results from the Pearson correlations are presented in Table 4.7.

Table 4.7

Pearson Correlation for % Checkpoints Completed by Demographic Variables

Variable	% Advising	% Priority Registration	% Advancing Standing	% Graduation Audit	On-Time Graduation
High school GPA	.130**	.180**	.248**	.188**	.206**
Unmet financial need	-.133**	-.205**	-.191**	-.109**	-.156**
Level of mother's education	.018*	.069**	.113**	.045**	.096**
Level of father's education	.037**	.102**	.134**	.055**	.106**
First generation student	-.042**	-.097**	-.133**	-.055**	-.105**
Family income	.038**	.136**	.158**	.072**	.136**
Pell Grant recipient	.000	-.097**	-.135**	-.055**	-.123**
OTDC grant recipient	.055**	-.039**	-.045**	.018**	-.049**
Anticipated hours worked	-.111**	-.161**	-.163**	-.105**	-.137**

*$p < .05$, **$p < .01$

Differences in Checkpoint Completion by Race

Differences in the rate of checkpoint completion by race were analyzed using a MANOVA. When analyzed together, all checkpoint types significantly differed by race; however, all relationships had a small effect size as measured by partial eta squared (Λ = .945, $F(4,16) = 47.759$, $p = .000$, $p\eta^2 = .014$). The complete findings are presented in Tables 4.8 – 4.9.

Table 4.8

Means and Standard Deviations for Race and Checkpoint Types

Checkpoint	Race/Ethnicity	*N*	*M*	*SD*
% Advising	White	7740	70.56%	28.97%
	African-American	1515	65.72%	31.39%
	Asian	1599	72.46%	27.60%
	Hispanic	830	64.79%	31.72%
	Other Races/Unknown	1639	65.05%	31.53%
	Total	13323	69.20%	29.71%
% Priority Registration	White	7740	83.46%	29.20%
	African-American	1515	67.80%	36.69%
	Asian	1599	84.03%	27.97%
	Hispanic	830	72.27%	34.89%
	Other Races/Unknown	1639	79.65%	32.00%
	Total	13323	80.58%	31.19%
% Advancing Standing	White	7740	76.33%	36.45%
	African-American	1515	57.34%	42.31%
	Asian	1599	70.06%	39.54%
	Hispanic	830	62.77%	41.99%
	Other Races/Unknown	1639	71.30%	39.38%
	Total	13323	71.96%	38.79%
% Graduation Audits	White	7740	55.04%	49.75%
	African-American	1515	44.29%	49.69%
	Asian	1599	54.03%	49.85%
	Hispanic	830	43.13%	49.56%
	Other Races/Unknown	1639	49.91%	50.02%
	Total	13323	52.32%	49.95%

Table 4.9

MANOVA Table Reporting Univariate Effects for Race and Checkpoint Types

Dependent Variable	*df*	Mean Square	*F*	*p*	$p\eta^2$
% Advising Checkpoints	4	23497.58	26.825	.000**	.008
% Priority Registration	4	97405.19	103.18	.000**	.030
% Advancing Standing	4	127079.02	93.65	.000**	.027
% Graduation Audits	4	59794.28	24.14	.000**	.007
MANOVA	$\Lambda = .945$, $F(4,16) = 47.759$, $p = .000$, $p\eta^2 = .014$				

*$p < .05$, **$p < .01$

As the MANOVA analysis was statistically significant for all variables and included independent variables with more than two groups, a post hoc test was conducted to compare groups. The null hypothesis for each checkpoint type was that there would be no difference in checkpoint completion percentage by race. The results of the Tukey post-hoc test showed that the difference in checkpoint completion rate for White students differed significantly and was higher than African-American and Hispanic students for all checkpoints. The differences in means were more notable for the priority registration and advancing standing checkpoints. The full results are presented in Table 4.10.

Table 4.10

Tukey Post-Hoc Test for Race and Checkpoint Types

Checkpoint	Race/Ethnicity	African-American	Asian	Hispanic	Other/ Unknown
% Advising	White	4.84%**	-1.90%**	5.77%**	5.51%**
	African-American	-	-6.74%**	0.93%	0.66%
	Asian	-	-	7.67%**	7.40%**
	Hispanic	-	-	-	0.27%
% Priority Registration	White	15.66%**	-0.57%	11.19%**	3.82%**
	African-American	-	-16.24%**	-4.47%**	-11.85%**
	Asian	-	-	11.76%**	4.39%**
	Hispanic	-	-	-	-7.38%**
% Advanced Standing	White	18.99%*	6.27%*	13.56%*	5.03%*
	African-American	-	-12.73%*	-5.43%*	-13.97%*
	Asian	-	-	7.29%*	-1.24%
	Hispanic	-	-	-	8.53%*
% Graduation Audits	White	10.75%**	1.01%	11.91%**	5.13%**
	African-American	-	-9.74%**	1.16%	-5.67%**
	Asian	-	-	10.90%**	4.13%**
	Hispanic	-	-	-	-6.78%**

Note. Table reports the difference in means.
*$p < .05$, **$p < .01$

Differences between checkpoint completion by race for high risk students.

Based on the MANOVA findings presented in Tables 4.8 – 4.10, there is a significantly lower rate of completion of all checkpoint types for African American and Hispanic participants as opposed to White participants. All checkpoint types are highly correlated with on-time graduation. In addition, academic preparation, as measured by high school GPA, family income, and parental education are strong predictors of college graduation (Table 4.7). For the study population, the average high school GPA of on-time degree completers was 3.58 and the average family income was around $80,000. In addition, parental education correlates with college completion and father's education (r = .106**) is a stronger correlate than mother's education (r = .096**).

To further explore the differences by race, I limited my dataset to participants whose demographic profile is equal to or greater than the mean value for on-time graduates in the study population: participant's fathers earned at least a bachelor's degree, have a family income equal to or greater than $80,000 and who earned at least a 3.58 GPA in high school. These participants would have been the most likely to graduate on-time based on the mean values. When limiting the dataset to this group of students (n = 2,123), checkpoint completion rates, when analyzed together, show there are still differences by race, but the effect size is very low ($p\eta^2$ = .007). However, when examining the univariate results, only the graduation audit and advancing standing checkpoint completion have statistically significant differences (Table 4.12). In both cases, the effect

size is low. The complete MANOVA results for Sample A[7] are in Tables 4.11 – 4.13. The finding is important as it suggests that among higher academically prepared and resourced students, differences by race do not exist or are very low.

As the independent variable has more than two groups and the Advancing Standing and Graduation Audit checkpoints showed a statistically significant difference, a Tukey post-hoc test was performed. When comparing the differences in checkpoint completion rates between racial groups, for the Advancing Standing and Graduation Audit checkpoints, the only groups to show a statistically significant difference were White and African-American participants for both checkpoint types. In both cases, African-American participants completed fewer checkpoints in each category than the White participants. As the graduation audit takes place in the participant's junior year and the advancing in academic standing checkpoint completion is also low, these completion rates may suggest difficulty of African-American participants from progressing to their junior year.

[7] Sample A (n = 2,123) are participants with family income >= $80,000, earned a high school GPA >= 3.58, and have fathers with at least a bachelor's degree.

Table 4.11

Means and Standard Deviations for Race and Checkpoint Types (Sample A)

Checkpoint	Race/Ethnicity	*N*	*M*	*SD*
% Advising	White	1509	73.46%	26.48%
	African-American	99	71.09%	28.04%
	Asian	227	71.59%	25.88%
	Hispanic	70	76.79%	21.63%
	Other Races/Unknown	218	69.50%	29.46%
	Total	2123	72.85%	26.68%
% Priority Registration	White	1509	89.43%	23.25%
	African-American	99	84.27%	26.88%
	Asian	227	91.50%	20.49%
	Hispanic	70	88.57%	21.01%
	Other Races/Unknown	218	87.22%	25.67%
	Total	2123	89.15%	23.37%
% Advanced Standing	White	1509	87.89%	27.45%
	African-American	99	74.41%	38.34%
	Asian	227	91.63%	22.47%
	Hispanic	70	86.67%	28.60%
	Other Races/Unknown	218	86.54%	29.20%
	Total	2123	87.49%	27.95%
% Graduation Audits	White	1509	66.20%	47.32%
	African-American	99	48.48%	50.23%
	Asian	227	65.20%	47.74%
	Hispanic	70	60.00%	49.34%
	Other Races/Unknown	218	60.55%	48.99%
	Total	2123	64.48%	47.87%

Table 4.11 continued

MANOVA	$\Lambda = .974, F(4,16) = 3.479, p = .000^{**}, p\eta^2 = .007$

Note. Sample A (*n* = 2,123) are participants with family income >= $80,000, earned a high school GPA >= 3.58, and have fathers with at least a bachelor's degree.

**p < .05, **p < .01*

Table 4.12

MANOVA Table Reporting Univariate Effects for Race and Checkpoint Types (Sample A)

Dependent Variable	*df*	Mean Square	*F*	*p*	$p\eta^2$
% Advising	4	1192.11	1.676	.153	.003
% Priority Registration	4	1140.74	2.093	.079	.004
% Advanced Standing	4	5328.97	6.898	.000**	.004
% Graduation Audits	4	8673.88	3.806	.004**	.007

Note. Sample A (*n* = 2,123) are participants with family income >= $80,000, earned a high school GPA >= 3.58, and have fathers with at least a bachelor's degree.
**p<.05, **p < .01*

Table 4.13

Tukey Post-Hoc Test for Race and Checkpoint Types (Sample A)

Checkpoint	Race/Ethnicity	African-American	Asian	Hispanic	Other/ Unknown
% Advanced Standing	White	13.48%**	-3.74%	1.23%	1.35%
	African-American	-	-17.22%	-12.26%	-12.13%
	Asian	-	-	4.96%	5.09%
	Hispanic	-	-	-	-0.12%
% Graduation Audits	White	17.72%**	1.00%	6.20%	5.65%
	African-American	-	-16.71%	-11.52%	-12.07%
	Asian	-	-	5.20%	4.65%
	Hispanic	-	-	-	-0.55%

Note. Sample A (n = 2,123) are participants with family income >= $80,000, earned a high school GPA >= 3.58, and have fathers with at least a bachelor's degree.

*$p < .05$, **$p < .01$*

On the opposite end of the spectrum, participants who did not graduate on-time entered the institution having earned a mean high school GPA of 3.44 or less, have fathers without a bachelor's degree, and with a family income of $60,000 or less. When limiting the dataset to participants whose demographic profile is less than or equal to these metrics (n = 1,436), the differences by race are more pronounced. Using a MANOVA, when analyzing the checkpoint variables in combination, there is a statistically significant difference between completion rates, with a small effect size (Λ = .925, $F(4,16) = 7.078$, $p = .000$**, $p\eta^2 = .019$). Separately, all checkpoint types except the Graduation Audit checkpoint differ significantly in completion by race (Table 4.15). The full MANOVA results are presented in Tables 4.14 – 4.15.

Table 4.14

Means and Standard Deviations for Race and Checkpoint Types (Sample B)

	Race/Ethnicity	*N*	*M*	*SD*
% Advising	White	587	64.33%	30.95%
	African-American	360	61.32%	31.96%
	Asian	175	69.50%	30.16%
	Hispanic	151	60.84%	33.69%
	Other Races/Unknown	165	60.15%	33.74%
	Total	1438	63.36%	31.82%
% Priority Registration	White	587	73.74%	35.67%
	African-American	360	61.39%	37.92%
	Asian	175	75.10%	32.62%
	Hispanic	151	61.40%	37.17%
	Other Races/Unknown	165	69.87%	36.80%
	Total	1438	69.07%	36.61%
% Advanced Standing	White	587	61.61%	41.16%
	African-American	360	49.07%	42.79%
	Asian	175	51.43%	40.86%
	Hispanic	151	45.70%	42.27%
	Other Races/Unknown	165	61.82%	42.01%
	Total	1438	55.59%	42.20%
% Graduation Audits	White	587	40.72%	49.17%
	African-American	360	36.67%	48.26%
	Asian	175	37.71%	48.61%
	Hispanic	151	33.11%	47.22%
	Other Races/Unknown	165	42.42%	49.57%
	Total	1438	38.73%	48.73%

Table 4.14 continued

MANOVA	$\Lambda = .925$, $F(4,16) = 7.078$, $p = .000$**, $p\eta^2 = .019$

Note. Sample B (n = 1,436) are participants with family income <= $60,000, have fathers with less than a bachelor's degree, and earned a high school GPA <= 3.44.

*$p < .05$, **$p < .01$*

Table 4.15

MANOVA Table Reporting Univariate Effects for Race and Checkpoint Types (Sample B)

Dependent Variable	*df*	Mean Square	*F*	*p*	$p\eta^2$
% Advising	4	2826.106	2.806	.025*	.008
% Priority Registration	4	12350.14	9.432	.000**	.026
% Advanced Standing	4	15197.844	8.718	.000**	.024
% Graduation Audits	4	2760.98	1.163	.325	.003

Note. Sample B (n = 1,436) are participants with family income <= $60,000, have fathers with less than a bachelor's degree, and earned a high school GPA <= 3.44.
*$p < .05$, **$p < .01$*

Finally, a Tukey post-hoc test was completed for the MANOVA analysis since the results were statistically significant and the independent variable had more than two groups. The advising checkpoint significantly differed between Asian participants and both Hispanic and Other/Unknown groups. For the Priority Registration checkpoint, White participants successfully completed a greater number of checkpoints than African-American and Hispanic participants. Lastly, White participants completed the advancing standing checkpoint more often than African-American, Asian, and Hispanic participants. As compared to Sample A (Tables 4.11 – 4.13), there are a greater number of significant differences in checkpoint completion between racial groups. These differences are

especially pronounced in both the Priority Registration and Advancing Standing checkpoints. These findings suggest that among lower resourced and lower prepared participants, checkpoint completion rates differ between racial groups more significantly.

Table 4.16

Tukey Post-Hoc Test for Race and Checkpoint Types (Sample B)

Checkpoint Type	Race/Ethnicity	African-American	Asian	Hispanic	Other/ Unknown
% Advising	White	3.01%	-5.17%	3.49%	4.18%
	African-American	-	-8.18%	0.48%	1.17%
	Asian	-	-	8.65%**	9.35%**
	Hispanic	-	-	-	0.69%
% Priority Registration	White	12.35%**	-1.36%	12.34%**	3.87%
	African-American	-	-13.71%	-0.01%	-8.48%
	Asian	-	-	13.70%**	5.23%
	Hispanic	-	-	-	-8.47%
% Advanced Standing	White	12.54%**	10.18%**	15.92%**	-0.21%
	African-American	-	-2.35%	3.38%	-12.74%
	Asian	-	-	5.73%	-10.39%
	Hispanic	-	-	-	-16.12%

Note. Sample B (n = 1,436) are participants with family income <= $60,000, have fathers with less than a bachelor's degree, and earned a high school GPA average <= 3.44.

*$p < .05$, **$p < .01$

Effect of Checkpoint Completion in Predicting On-Time Graduation

As presented in Table 4.4, there are significant differences between checkpoint completion among those students who graduated on-time and those who did not graduate on-time. Using binary logistic regression, I created a model to predict on-time graduation

based on checkpoint completion while controlling for student demographic, academic, and financial variables which were shown singularly to correlate with checkpoint completion and on-time graduation (Table 4.7).

Some variables are related, although measure the same concept using a slightly different approach. For example, a student's family income is related to receiving a Pell Grant, as Pell Grant eligibility is partly based on a student's Expected Family Contribution (EFC) as calculated on the FAFSA. Similarly, the amount of a student's unmet need is related to both their EFC, cost of education, and financial aid awarded, which may not exclusively be need based. Therefore, instead of selecting one of these variables for the regression analysis, I created a derived variable using principal component analysis.

Principal component analyses (PCA) are used when there are several variables that are believed to measure a similar construct and are strongly correlated. The derived variable created through principal components analysis accounts for most of the variance of the individual variables included in the analysis. A PCA was conducted for three of the student financial variables that reflect financial need and family income on the 13,323 program participants. Using Kaiser's criteria, components with an eigenvalue greater than one were retained (Kaiser, 1960). PCA revealed three components, with one component having an eigenvalue greater than one. This component explained 64.83% of the variance (Table 4.17). The component matrix showed a strong positive relationship between the amount of family income and unmet need, where families with higher income also have less unmet need (measured by a negative number). As would be expected, a higher family

income is negatively correlated with receiving a Pell Grant. The results of the PCA are presented in Tables 4.17 and 4.18.

Table 4.17

Principal Component Analysis – Financial Position: Total Variance Explained

	Initial Eigenvalues		
Component	Total	% of Variance	Cumulative %
1	1.945	64.830	64.830
2	.726	24.200	89.030
3	.329	10.970	100.00

Note. Extraction Method: Principal Component Analysis.

Table 4.18

Rotated Structure Matrix for PCA with Varimax Rotation

	Rotated Component Coefficients
Variables	Component 1
Pell Grant recipient	-.869
Family Income	.867
Unmet Need	.661

Note. Extraction Method: Principal Component Analysis. No rotation due to one component being extracted.

The parental education variables (mother's education, father's education, and first-generation status) were also run through a PCA to create a single component variable (n = 13,078). One component with an eigenvalue greater than one was revealed

(Tables 4.19 and 4.20). The resulting component score for each program participant were used in the regression analysis as a variable to reflect participants' parental education.

Table 4.19

Principal Component Analysis – Parental Education: Total Variance Explained

	Initial Eigenvalues		
Component	Total	% of Variance	Cumulative %
1	2.307	76.897	76.897
2	.466	15.540	92.437
3	.227	7.563	100.00

Note. Extraction Method: Principal Component Analysis.

Table 4.20

Rotated Structure Matrix for PCA with Varimax Rotation

	Rotated Component Coefficients
Variables	Component 1
First generation student	-.925
Mother's Education	.865
Father's Education	.839

Note. Extraction Method: Principal Component Analysis. No rotation due to one component being extracted.

A logistic regression analysis to predict the rate of on-time degree completion of program participants based on completed checkpoints and demographic variables was conducted. The dependent variable, on-time graduation, and the covariates were tested to verify there was no violations of the assumptions of a logistic regression. Each covariate

was first analyzed singularly with the dependent variable to select the variables that explained the greatest amount of the variance to add to the model (Table 4.21).

Table 4.21

Logistic Regression of On-Time Graduation and Various Covariates

Variable	*B*	*SE*	*p*	ExpB
High School GPA	**1.220**	**.053**	**.000****	**3.388**
Parental Education (PCA)	**.237**	**.018**	**.000****	**1.267**
Mother's Education	.168	.015	.000**	1.183
Father's Education	.175	.014	.000**	1.192
First generation student	-.451	.037	.000**	.637
Financial Strength (PCA)	**.369**	**.020**	**.000****	**1.446**
Family Income (NSQ)	.125	.008	.000**	1.133
Pell Grant	-.521	.037	.000**	.594
Unmet Need	0.000	.000	.000**	1.000
Race: White	.416	.036	.000**	1.515
Race: African American	-.623	.055	.000**	.536
Race: Asian	-.17	.054	.001**	.843
Race: Hispanic	-.418	.072	.000**	.658
Different Majors	**-.08**	**.024**	**.001****	**.923**
Anticipated hours worked	-.308	.020	.000**	.735
% Advising Checkpoints	**.042**	**.001**	**.000****	**1.043**
% Graduation Audits	**.03**	**.000**	**.000****	**1.031**
% Priority Registration	**.065**	**.001**	**.000****	**1.067**
% Advanced Standing	.056	.001	.000**	1.057

Note. Each variable was analyzed separately using a logistic regression. Bold values indicate variable was used in the logistic regression model to predict on-time graduation.
**p < .05, **p < .01*

Based on the odds ratio (ExpB) the following covariates were chosen for the logistic regression model: high school GPA, Parental Education (PCA), Financial Need (PCA), Different Majors, and percent Advising, percent Graduation Audits, and percent Priority Registration completed. Percent Advanced Standing was excluded from the model, because while it was statistically significant and ExpB = 1.057, the Box-Tidwell (1962) procedure determined the relationship with the dependent variable was not linear. All other variables passed the Box-Tidwell test. The logistic regression results are presented in Table 4.22. Four models are presented, each adding a group of covariates, and the dependent variable for each model is if a student graduated on-time, which is within four years for a bachelor's degree. The on-time graduation variable is binary, where a successful graduation within four years is coded as 1 and not graduating in four years is coded as 0.

To test for multicollinearity between the predictors, I used the variation inflation factor (VIF) score. The VIF score is a measure of collinearity and a score equal to one indicates "potential collinearity" where a higher score indicates a greater likelihood of collinearity between the covariates (Stuart-Hamilton, 1995). It is accepted that a VIF value greater than four indicates that further investigation is needed and VIF scores greater than ten indicate multicollinearity between the predictors (Thompson et al., 2017). When the predictors were analyzed, all VIF scores were less than two except % Advising Checkpoints (2.742) and % Priority Registration checkpoints (2.574) which were below three. All VIF scores indicate a low collinearity between the predictors.

Table 4.22

Logistic Regression Results on On-Time Degree Completion

Variable	Model 1 Coefficient [Exp(B)]	Model 2 Coefficient [Exp(B)]	Model 3 Coefficient [Exp(B)]	Model 4 Coefficient [Exp(B)]
Constant	-4.372* [.013]	-4.253 [.014]	-4.101* [.017]	-6.396* [.002]
High School GPA	1.326* [3.765]	1.297* [3.657]	1.299* [3.667]	.665 * [2.049]
Financial Strength		.299* [1.349]	.300* [1.349]	.229 * [1.257]
Parental Education		.119* [1.127]	.117* [1.124]	.130* [1.139]
Different Majors			-.109* [.897]	-.588* [.556]
% Advising				.000 [1.000]
% Graduation Audits				.022* [1.022]
% Priority Registration				.050* [1.052]
Model Chi-Squared [df]	841.397 [3]	857.167 [4]	6822.765 [7]	6852.664 [11]
Block Chi-Square [df]	333.095 [2]	15.770 [1]	5965.598 [3]	5946.936 [3]
% Correct Predictions	60.6%	62.8%	62.9%	84.5%
Nagelkerke R Square	.101	.103	.632	.634

Note. The Wald statistics are distributed chi-square with 1 degree of freedom.
* Indicates that the coefficient is statistically significant at, at least, the .05 level.

The logistic regression model presented in Table 4.22 correctly predicts 84.5% of a participant's on-time graduation outcome, given the covariates in the model. All covariates, except the percent of Advising checkpoints a participant completes, are statistically significant. The strongest predictor is a program participant's high school GPA, which itself predicts 60.6% of on-time graduation outcomes. Participants with a higher high school GPA graduate on-time more often than those with lower high school GPA. When taking into account a participant's family financial strength and parental education level variables, the prediction rate increases to 62.8%. Family demographics show that program participants whose parents are more educated have better on-time graduation outcomes. In addition, the component score of the financial factor variable (Table 4.17) showed the participant values within the component with greater levels of unmet need, also have lower family incomes, and were more likely to have received a Pell Grant. The relation of the financial factor variable to the logistic regression shows that the greater the family financial strength the better rate of on-time graduation.

The effect of the program checkpoints are notable. The addition of the program checkpoints as covariates in the model increases the predictive strength of the model from 62.9% to 84.5%. However, the percentage of Advising checkpoints completed is not significant to the model.

Effect of Receiving the OTDC Grant on On-Time Graduation Outcomes

The OTDC program awarded around 500 grants per cohort to participants with high levels of financial need. The $4,000 grant was renewable for four years provided the recipient was in compliance with the OTDC contract and successfully completed all program checkpoints each year. Therefore, for grant recipients, the second research

question asks how on-time degree completion differs based on the number of years the student successfully received OTDC program grant funding.

As compared to the full population of the OTDC program (Table 4.1), there is a greater percentage of OTDC grant recipients who are female than the study population. In addition, OTDC grant recipients are also more racially diverse, more heavily first-generation students, and primarily from families with income under $60,000 per year (Table 4.23).

The average number of years a grant recipient successfully received the OTDC grant was 2.7 years (*SD* = 1.326). When comparing the checkpoint completion rate of OTDC grant recipients to the full population of OTDC program participants a pattern emerges. The two checkpoints that are related to staff-student interactions, the Advising checkpoint (73% vs. 69%) and the Graduation Audit checkpoint completed by advisors (55% vs. 52%), are completed more often than the full population. However, priority registration (77% vs. 81%) and advancing standing (67% vs. 72%) are completed less often than the full study population. Lastly, grant recipients were less successful in completing their degree on-time (51%) than the full population (58%). These results are presented in Table 4.24.

Table 4.23

Demographic Characteristics of the OTDC Grant Population

		Completed Degree On-Time		Did Not Complete Degree On-Time	
		N = 755 (51.2%)		*N* = 720 (48.8%)	
Demographic Variable	% of Grant Population	Frequency	Percentage	Frequency	Percentage
Gender					
Female	66.6%	217	44.0%	276	56.0%
Male	33.4%	538	54.8%	444	45.2%
Race					
African American	22.5%	144	43.40%	188	56.6%
Asian	22.7%	179	53.40%	156	46.60%
Hispanic	12.5%	79	42.90%	105	57.10%
White	34.4%	292	57.6%	215	42.40%
Other	7.9%	61	52.10%	56	47.90%
Family Income[a]					
Less than $20,000	33.2%	223	47.2%	249	52.8%
$20,000 to $39,999	40.6%	306	52.9%	272	47.1%
$40,000 to $59,999	17.5%	142	57.0%	107	43.0%
$60,000 to $79,999	5.1%	30	41.1%	43	58.9%
$80,000 to $99,999	1.7%	12	50.0%	12	50.0%
$100,000 to $124,999	1.1%	10	66.7%	5	33.3%
$125,000 to $149,999	0.4%	3	50.0%	3	50.0%
More than $150,000	0.4%	3	50.0%	3	50.0%
First Generation[b]					
Not First Generation	34.2%	273	54.6%	227	45.4%
First Generation	65.8%	478	49.7%	483	50.3%

Table 4.23 continued

Note.

[a] There are 52 missing values for responses to the Family Income question from the NSQ for grant recipients. This reflects 3.5% of the sample. (n = 1,423)

[b] There are 14 missing values for responses to the Parental Education question from the NSQ for grant recipients. This reflects < .01% of the sample. (n = 1,461)

Table 4.24

Comparison Between the Checkpoint Completion of Grant Recipients v. the Total Program Population

	Total Population		OTDC Grant Recipients			
Program Variables	*M*	*SD*	*M*	*SD*	*p*	η_p^2
% Advising	69.20%	29.71%	72.83%	30.60%	.000**	.003
% Priority Registration	80.59%	31.19%	77.15%	33.31%	.000**	.002
% Graduation Audit	52.32%	49.94%	54.85%	49.78%	.040*	.000
% Advancing Standing	71.95%	38.79%	67.00%	40.89%	.000**	.002
On-Time Degree Completion	.58	.494	.51	.500	.000**	.002

**p < .05, **p < .01*

Checkpoint and On-Time Degree Outcomes:

Comparing the Full Population to the OTDC Grant Recipients

The lower rate of on-time graduation for the participants who received the program grant is expected, as the demographics of the grant recipients are students with a lower family income and a greater percentage of first-generation students (Tables 4.1, 4.23) (Alon, 2011; Morrison, 2012; Pascarella et al., 2004; Toutkoushian et al., 2018). A sub-question considers whether the grant improves on-time degree outcomes when

controlling for student variables. Further, an additional sub-question examines how on-time degree outcomes vary based on the number of a years a student received the grant.

Limiting the population to students who were enrolled at least eight semesters to account for students not retained for four-years (n = 7,767), a one-way ANCOVA was conducted to determine if the on-time degree outcomes for the grant recipients varied from the non-grant recipients after controlling for the demographic variables included in the regression model (Table 4.22): high school GPA, financial strength, and parental education. There was a significant difference in the on-time graduation outcome for program grant participants with a small effect size ($F(1,7762) = 15.380$, $p = .000$, $\eta p^2 = .002$). Comparing the estimated marginal means (EMM), when controlling for the covariates, students that received the grant showed a greater estimated rate of on-time graduation than those who did not receive the grant. Therefore, when controlling for student background characteristics that are highly correlated with on-time graduation, the group who received the grant performed better than expected and outperformed the non-grant group (Table 4.25).

Table 4.25

Comparison of Actual Means v. Estimated Marginal Means for On-Time Graduation by Program Grant Group While Controlling for Covariates[1]

		Descriptive Statistics		EMM	
Outcome Variable	*n*	*M*	*SD*	*M*	*SE*
Did not Receive Program Grant	6828	.71	.453	.700	.005
Received Program Grant	939	.68	.467	.768	.016
Total	7767	.71	.455		

Notes:

[1] Covariates include high school GPA, financial strength, and parental education

Finally, for program-grant recipients who were enrolled at least eight semesters, does the rate of on-time degree completion vary based on the number of years they received the program grant funding? The population was limited to program participants who received the program grant upon matriculation and were retained for at least eight semesters (n = 1,019). The sample was limited to those enrolled at least eight semesters to control for those students not retained for the full four academic years. Using the program grant population, a one-way ANOVA was conducted for on-time degree completion and number of years of program grant funding. The ANOVA results, $F(3, 1015) = 144.185$, MSE = .154, $p = .000$, $\eta p^2 = .299$, demonstrated that there was a statistically significant difference with a large effect size between the on-time graduation of grant recipients based on the number of years they received the funding. The means and standard deviations are presented in Table 4.26. As there were more than two groups in the years grant received variable, a Tukey post hoc test was performed. It was found that there were significant differences at the $p < .01$ level between receiving the grant all

four years and all other years, as well as receiving the grant for one year and three years, or between two and four years (Table 4.27).

Table 4.26

Means and Standard Deviations on the Measure of On-Time Graduation by Years of Program Grant Received for Grant Recipients

	On-Time Graduation		
Years of Grant Received	*n*	*M*	*SD*
1 Year	168	.29	.453
2 Years	128	.37	.484
3 Years	98	.47	.502
4 Years	625	.88	.331
Total	1019	.68	.469

Table 4.27

Tukey Post-Hoc test for On-Time Degree Completion by Years of Program Grant Received for Grant Recipients

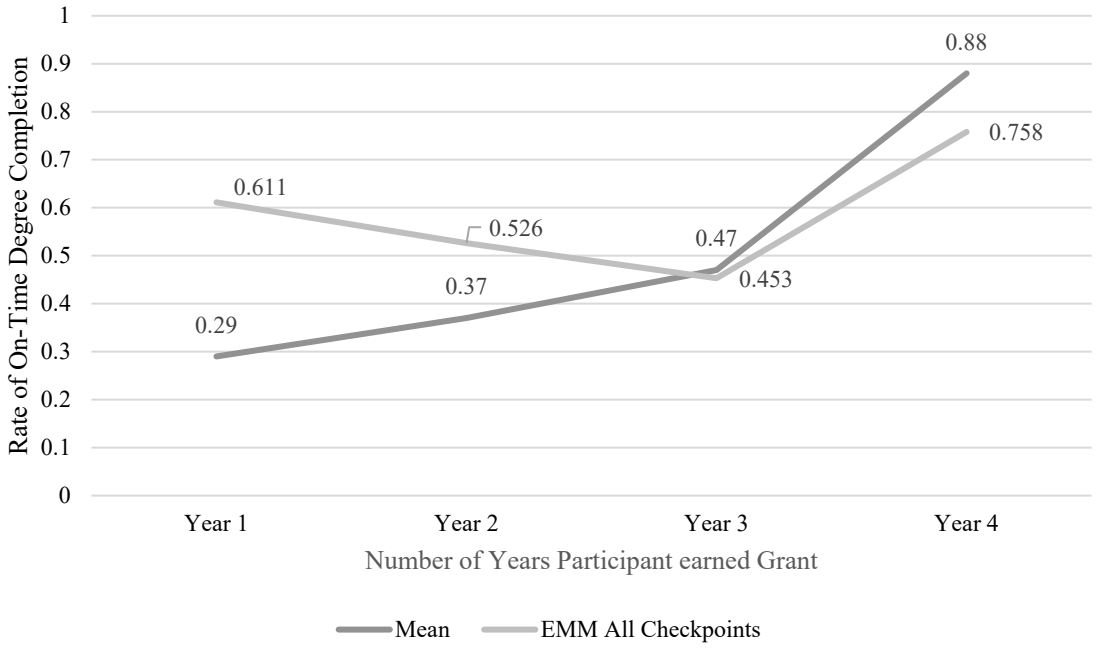
Years Received the Grant	2 years	3 years	4 years
1 year	-.08	-.181*	-.59*
2 years	--	-.10	-.51*
3 years	--	--	-.41*

Note. Mean differences are shown.
* $p < .01$, ** $p < .05$

Effect of Grant on On-Time Graduation while Controlling for Checkpoint Completion

The number of years the student received the grant is the product of completing all checkpoints in a year. The final subquestion asks, when controlling for checkpoint completion, what is the relationship between the number of years a participant received the OTDC grant and on-time graduation? An ANCOVA was conducted for On-Time Graduation by Years of Program Grant while controlling for total percentage of checkpoint completion. The findings were statistically significant with a moderate effect size [$F(3, 1014) = 21.799$, $p = .000$, $\eta p^2 = .061$]. When comparing the mean on-time graduation rate and the estimated marginal means for the number of years a program participant received the grant, it shows that, when controlling for checkpoint completion, in the first two years of enrollment, participants that received the grant performed better than checkpoint completion alone can account for; however, in years three and four the rate of on-time graduation is predicted more by checkpoint completion (Figure 4.1).

Figure 4.1 : Comparison of Mean of On-Time Degree Completion by Years of Grant Received when controlling for total % of Checkpoints Completed



Priority Registration and On-Time Graduation for Grant Recipients

The checkpoint type most strongly correlated with unmet need for program grant participants is the percent of Priority Registration checkpoints completed (r = .201**). As shown in the literature, registration is often affected by administrative rules about holds from registration for unpaid tuition bills. Students with higher levels of unmet need may also be more likely to be held from registration for this reason. Therefore, controlling for only the percent of priority registration completed, grant recipients were more likely to graduate on-time when receiving the grant for more years.

To explore if the number of years a participant earned the grant was still significant when controlling for both the percent completion of the Priority Registration checkpoint and participant background characteristic differences, an ANCOVA was

conducted. After controlling for these covariates, there was a statistically significant difference in on-time graduation completion based on the years a student received the grant ($F(3, 930) = 81.317$, $p = .000$, $\eta p^2 = .208$). On-time graduation rates were greater the for participants who earned the grant for more years and the differences were statistically significantly. The full ANCOVA results are presented in Table 4.28.

Table 4.28

ANCOVA Results for On-Time Degree Completion by Number of Years Participants Earned Grant with Registration and Control Variables

Control Variable	*SS*	*df*	*F*	*p*	ηp^2
% Priority Registration	1.493	1	9.792	.002*	.010
High School GPA	.081	1	.534	.465	.001
Financial Strength (PCA)	.197	1	1.291	.256	.001
Parental Education (PCA)	.028	1	.181	.671	.000
Total Years Received Grant	37.195	3	81.317	.000*	.208
Error	141.798	930			

Since the variable, Total Years Received Grant, had more than two groups, a post-hoc test was run to compare the differences between groups. Comparing the mean difference between groups, it was shown than once a participant received the grant for at least three years, the increase in on-time degree completion was significant when controlling for both participant background characteristics and the Priority Registration checkpoint (Table 4.29). When the post-hoc test results are compared to the findings without controlling for participant background characteristics of Priority Registration completion (Table 4.27), the significance of receiving the grant less than three years is eliminated.

Table 4.29

Post-Hoc for On-Time Degree Completion by Years of Program Grant Received for Grant Recipients

Total Years Received the Grant	2 years	3 years	4 years
1 year	-.067	-.133**	-.523*
2 years	--	-.065	-.455*
3 years	--	--	-.390*

Note. Mean differences are shown.
* $p < .01$, ** $p < .05$

CHAPTER 5

DISCUSSION

While approximately 70% of high school graduates enroll in college immediately after high school, nationally, fewer than 60% complete their bachelor's degree in six years (National Center for Education Statistics, 2020; National Student Clearinghouse Research Center, 2019). Although there are significant benefits to graduating with a college degree, many students withdraw before attaining this goal. In addition, the rate of graduating on-time, four years for a bachelor's degree, has even lower levels of attainment than the typically published six-year graduation rate.

The current study investigated the effect of an on-time degree completion program implemented in 2014 at the institution studied. Applying the Theory of Planned Behavior, the on-time degree completion program encouraged the intended outcome, on-time degree completion, by normalizing and incentivizing academic success behaviors (checkpoints). Although previous studies explored the relationship between institutional activities (e.g., registration) or interventions (e.g., advising) and graduation, no study had investigated the interplay between several interventions and the effect on graduation rates for a large cohort of students.

This chapter describes the findings of the current study. The discussion is organized by research question, addresses the findings of the analyses in Chapter 4, and situates these findings within the context of previous research. The chapter includes a discussion of the implications for higher education practice and provides insight for institutions to improve on-time graduation rates through programming efforts. This chapter also offers suggestions for future research.

Summary of Findings

The institution studied implemented an on-time degree completion program starting with the entering 2014 cohort. The current study aimed to analyze the effects of the on-time degree completion (OTDC) program on on-time graduation by analyzing the primary components and program checkpoints. The study revealed that on-time graduation rates were higher for participants who completed more program checkpoints than those who completed fewer, thus supporting the use of the selected checkpoints for improving on-time degree outcomes. This result persisted when analyzing different student characteristics including race, family income, parental education, and academic preparation. However, the study also revealed that the rate at which participants completed program checkpoints differed based on checkpoint type and the participant's demographic characteristics. A secondary aim of the current study was to analyze the effect the program grant had on on-time graduation for those who received program funding. Participants who received the grant for a greater number of academic years graduated at a higher rate than those who only received the grant for one or two years. Lastly, when controlling for academic preparation, family's financial strength, and parental education, the number of years a student received the grant was significant and improved on-time degree completion.

Discussion of Findings

On-Time Degree Completion Rates Within the Study Population

The current study aimed to understand the rate of on-time degree completion within the study population. As this study focused on on-time degree completion of bachelor's degrees at the institution studied, comparisons of the four-year degree

completion rate of participants were examined. I hypothesized that similar to the findings from previous research, there would be a difference in the graduation rate of study participants based on their demographic profile. Consistent with previous research about graduation rates more generally, the study population differed in degree completion rate by race, family income, unmet financial need, Pell Grant receipt, and first-generation student status. Based on the findings, I rejected the null hypothesis that there would be no significant difference in graduation rates.

Degree Completion and Race

Complementary to Ciocca Eller and DiPrete's (2018) findings, participants in the current study varied in completion rate based on their race. The degree completion rate of White participants was 62.3%, whereas participants that identified as African American (44.4%), Hispanic (48.3%), and Asian (54.3%) graduated on-time less often. Ciocca Eller and DiPrete have pointed to Black students' "academic performance and social engagement" as possible reasons for differences in degree attainment by race (p.1172). The difference in graduation rate by race is statistically significant, and underlying institutional structures behind different degree attainment rates based on race should be examined further.

Degree Completion and Financial Factors

Differences in a participant's financial situation are also related to variations in on-time degree completion rates. Three family financial strength measures were used to explore differences in graduate rates: family income, unmet financial need, and Pell Grant receipt. In the final analyses, a composite variable was created using factor analysis

to capture the unique variance of each of these variables; however, the individual relationships to on-time graduation rates in the cohort are worth exploration.

There was a clear linear relationship between the percent of participants who graduated on-time and their family's income. The less money a participant's family earned, the less likely they were to graduate on-time. Participants from families earning less than $20,000 per year graduated on-time at a rate of 43.6%, whereas participants from families earning $60,000-$79,999 graduated at a rate of 55.8%, and those in the top income bracket (more than $150,000) graduated on-time 66.23% of the time. The current study's findings echoed Walpole's (2003) findings, showing that a greater level of income was related to higher graduation rates.

Benson (2018), Long and Riley (2007), and the Maryland Higher Education Commission (2016) studied the relationship between unmet financial need and graduation rates. Each of these studies found that students who had higher levels of unmet financial need were at a greater risk of not graduating than those with less unmet financial need. Similarly, the current study found that those participants who graduated on-time had a lower amount of unmet need ($3,712 per year) than those who did not complete their degree on-time ($7,803 per year). The calculated amount of unmet need is based on the cost of education minus the expected family contribution (EFC) and the awarded financial aid. Typically, students with higher incomes also have lower levels of unmet need; therefore, it is logical that the two variables, unmet financial need and family income, have similar relationships with on-time graduation rates.

Finally, Pell Grant recipients in the study population also varied in on-time graduation rates from those who did not receive a Pell Grant. In part, Pell Grant

eligibility is determined by family income; therefore, those with lower family income are more likely to receive a Pell Grant. In the current study population of participants who graduated on-time, 29% received a Pell Grant, whereas 41% of participants who did not graduate on-time were Pell Grant recipients. Again, the current study supports the findings of previous studies (e.g., Alon, 2011) by demonstrating that Pell Grant recipients have lower graduation outcomes than the rest of the study population.

Degree Completion and Parental Education Level

The final area of student characteristics examined in the current study was differences in on-time graduation rates of study participants by parental education level. Studies conducted by Pascarella et al. (2004) and Toutkoushian et al. (2018) found that students whose parents had enrolled in and completed a college degree program were more likely to attend and graduate from college than those whose parents did not complete a college degree. In the current study, first-generation students graduated on-time at a lower rate (50.8%) than the continuing-generation college students (61.8%) participants.

In all areas explored in the current study, the findings of differences in on-time graduation rates are congruent with the findings of previous studies. These similarities support the use of the study population to explore the principal foci of the current study, comparing the findings to previous research, and extending the understanding of institutional interventions to improve on-time graduation rates.

Program Checkpoint Completion

The second focus of the current study was to analyze the rate of checkpoint completion among the study participants to examine whether completion rates differed by

checkpoint and the demographic profile of the participants who completed them. The four checkpoint types that are components of the on-time degree completion (OTDC) program include meeting with an advisor, registering during priority registration, maintaining academic progress through credit completion (30 credits per academic year), and completing a graduation audit with an advisor. As completion of the academic success behaviors underpinning the checkpoints is associated with increased degree completion rates, I hypothesized that participants with higher checkpoint completion rates would also show higher rates of on-time degree completion.

When examining the relationship between checkpoint completion and on-time graduation, there was a strong relationship between the variables showing that as the rate of checkpoint completion increased, the rate of on-time graduation also increased. This finding supports the use of the program checkpoints to guide participants towards on-time graduation. The checkpoint with the strongest association was Advancing Standing. The relationship is intuitive; attaining a bachelor's degree on-time requires the completion of at least 30 credits per academic year.[8] The checkpoint with the weakest association was the Advising checkpoint, although the strength of the relationship is very strong ($r = .515$, $p < .01$). Based on the findings that checkpoint completion and on-time graduation were positively correlated, the null hypothesis was rejected as higher rates of checkpoint completion were correlated with higher rates of on-time graduation.

[8] The minimum number of credits required for a bachelor's degree is 120 credits (International Affairs Office, 2008).

As previously discussed, participants with specific demographic characteristics, on average, graduate on-time less often than other groups. In the current study, minority, first-generation, less academically prepared, and lower-income students graduated on-time less frequently than participants with other background characteristics. When analyzing the relationship between checkpoint completion and these same demographics groups, the relationships held true. Across most participant demographic variables, higher checkpoint completion rates were correlated with higher rates of on-time graduation. Among the variables included, there was one exception, OTDC grant recipients.

OTDC grant recipients included more first-generation (65.8%) and low-income participants[9] (91.3%) than the whole study population (33.2% first-generation, 34.0% low-income). Both low-income (49.9%) and first-generation participants (50.8%), on average, have lower degree completion rates than mid to upper-income (62.0%) and continuing-generation participants (61.8%). Therefore, the finding that on-time graduation rates were lower for grant recipients was expected.

Reflecting on the four checkpoints, they seemingly fall into two categories based on activity type: personal relationships and academic systems. The personal relationship category includes the checkpoints that track students' meetings with an academic advisor at least once a semester and completing a graduation audit with an advisor in the junior year. The academic systems grouping includes registering during priority registration and completion of at least 30 credits per academic year. While OTDC grant recipient status is

[9] Low-Income was classified as a family income less than $60,000.

negatively correlated with on-time degree completion and priority registration, it positively correlated with the Advising and Graduation Audit checkpoints. The positive association with receiving the OTDC grant and the two personal relationship checkpoints is weak. Further investigation into systems or structures that reduce the completion of on-time registration and advancing academic standing for grant recipients needs further exploration.

Differences in Checkpoint Completion by Race

Differences in degree attainment rates between racial groups have been previously studied (Ciocca Eller & DiPrete, 2018). Bensimon (2005) introduced the equity cognitive framework to consider differences in educational achievement. Bensimon contends that when differences exist, administrators should self-reflect and ask what institutional structures exist that may be perpetuating these inequities. When exploring the differences in checkpoint completion by race, for all checkpoints, there was a significant difference in completion rates. As previously noted, checkpoint completion is highly correlated with on-time degree completion.

Examining the completion rates of the two checkpoints focused on personal relationships (advising and graduation audits), there was a difference in completion rates based on the participant's race. White participants were both more likely to complete a higher number of checkpoints when compared to African-American and Hispanic participants. While the differences existed for all checkpoint types, they were more pronounced for the two academic systems checkpoints (priority registration and advancing academic standing). It is not clear if there are underlying structures that limit

checkpoint completion by non-White participants or what other barriers may exist that inhibit completion.

In an attempt to isolate the effects of race from interrelated issues of family income, parental college degree attainment, and academic preparation, I included subsets of the study population to examine if the racial inequities in checkpoint completion still existed if given a more homogenous sample. To answer this research question, I analyzed each checkpoint to examine potential differences. For the first sample, I selected those participants who had a greater chance of degree completion based on the aforementioned variables. When limiting the sample in this way, the differences between racial groups were small and, for some checkpoint types, not significant, implying that when the participants are similarly resourced (higher levels of family income, parents who completed college and graduated high school with a high GPA), checkpoint completion is not strongly affected by race.

For the second sample, I limited the population to those participants who were at a greater risk of not completing their degrees on-time (lower family income, parents without college degrees, and with a lower higher school GPA). When analyzing the checkpoint completion rates for this sample, the completion rate differences by race were present and strong. These findings suggest that among less-resourced participants, the effects of race are more pronounced, and non-white participants complete all checkpoints less frequently than White participants.

Applying the Theory of Planned Behavior, introduced in Chapter 1, the institution studied should seek to identify what aspect of the framework is not resulting in the execution of the desired behavior: attitude, norm, behavioral control, or intention. It

seems that more resourced participants, regardless of race, are completing checkpoints at a high rate and are likely to graduate on-time. However, when considering the sample of the lower resourced participants, their completion of checkpoints decreases, and there was a greater stratification between participants of different races. Therefore, I hypothesize that behavioral control may need to be addressed in the forms of either physical barriers, such as financial or time constraints, or social barriers, in terms of support or belonging.

Effect of Checkpoint Completion on Predicting On-Time Graduation

Checkpoint completion and on-time graduation were highly correlated; however, like the analysis by race showed, checkpoint completion varied based on participant demographics. Four participant variables were identified as strong predictors of on-time degree completion: high school GPA, financial strength, parental education, and the number of times a student changed their major. Two of the program checkpoints remained a strong predictor of on-time degree completion when controlling for these four participant variables: Priority Registration checkpoint and completing a graduation audit. The model itself did not include the Advancing Standing checkpoint. The Advancing Standing checkpoint was excluded from the model due to high multicollinearity between the Advancing Standing checkpoint and on-time graduation. In effect, they measure very similar constructs, as to graduate in four years requires that a student complete at least 25% of the credits required for a degree (or 30 credits) per academic year and the Advancing Standing checkpoint requires 30 credits per year to be considered complete. The Advising checkpoint was not statistically significant when controlling for the other variables in the model.

The Graduation Audit checkpoint is completed in a participant's junior, or third, year. Therefore, participants must be enrolled in the institution to complete the checkpoint. Therefore, it is logical that completion of the Graduation Audit checkpoint is a significant predictor of on-time graduation.

Priority Registration is of particular interest. Singularly, there is a strong correlation between completion of priority registration and on-time degree completion. When controlling for other participant demographic variables, a strong relationship between completion of Priority Registration checkpoints and on-time degree completion persists. However, as shown in the discussion of checkpoint completion and race, there are significant differences in the checkpoint completion rate by participants from different racial groups. In addition to differences by race, the rate of Priority Registration checkpoint completion also differs by academic preparation (high school GPA), financial strength, and parental education level. In all instances, the less-resourced and academically prepared the participant, the fewer Priority Registration checkpoints the participant completed. Since Priority Registration checkpoint completion is strongly associated with on-time degree completion, increases in the completion rate of this checkpoint should likely also improve on-time graduation for less-resourced participants.

On-Time Degree Completion Grant and Graduation Outcomes

The On-Time Degree Completion (OTDC) program awarded approximately 500 grants per entering cohort. The grant primarily targeted lower-income participants. OTDC grant recipients continued to receive their funding annually, provided the participants completed all checkpoints from the previous academic year. The final aim of the current study focused on the group of OTDC grant recipients and analyzes the effect

of receiving grant funding on on-time degree completion rates. I hypothesized that the greater the number of academic years a participant received the grant, the greater the increase in on-time degree completion rate would be.

Students who received the program grant are, on average, less likely to graduate on-time due to factors such as a lower family income or being a first-generation student. When analyzing the percent of checkpoints completed among grant recipients, two separate relationships became evident compared to the non-grant recipients. Among the two checkpoints categorized given their focus on relationships (Advising and Degree Audit checkpoints), the grant recipients complete these checkpoints at a slightly higher rate than non-grant recipients. However, among the two academic system based checkpoints (Registration and Advancing Standing), OTDC grant recipients complete them at lower rates. Although this study did not have data to explain the cause of the delayed registrations or lower rates of advancing standing, the institution studied prevents students with account balances from registering for courses. Therefore, one potential reason for the decrease in rates of on-time registration could be related to students' financial means to pay their tuition bill on-time given the large amount of low-income students and the level of unmet need. Policies related to registration holds or other institutional systems that affect access to registration could improve these outcomes.

Rates of On-Time Graduation for Program Grant Recipients

Both the rates of checkpoint completion and rates of on-time graduation vary between grant and non-grant recipients. On average, those participants who did not receive the grant graduated on-time 59% of the time; whereas, grant recipients graduated on-time 51% of the time. The difference in graduation rates is not surprising given the

demographics of participants' who were awarded the grant. The grant, however, is aimed at increasing the rate of graduation for the recipients. When controlling for the participants' demographics (high school GPA, financial strength, and parental education), the estimated marginal means showed that the grant recipients performed better than the non-grant group. This finding supports the awarding of the OTDC grant and shows an increase in the grant recipients' on-time graduation rates.

Number of Years Receiving the Grant

The OTDC grant was renewable for each of the four years of undergraduate education, provided the program participants completed all checkpoints each academic year. The final goal of the current study was to investigate a possible relationship between the number of years the participant earned the grant and on-time graduation rates. As would be expected, participants who earned the grant all four-years had a higher on-time graduation rate than grant recipients who earned the grant for fewer years. The result is expected because those who earned the grant all four years completed all checkpoints through at least their junior year, and checkpoint completion is positively associated with increased rates of on-time graduation. However, when controlling for the checkpoint completion rate, there was still a statistically significant relationship between the number of years a participant earned the grant and on-time graduation rates. There was a greater effect on on-time graduation for the first two years the program participant earned the grant than the latter two. This shows a benefit of grant funding for on-time graduation for grant recipients; however, that effect is less significant as the student progresses to their junior year. Based on the findings that, while controlling for

covariates, the on-time degree completion rate of grant recipients increased as the number of academic years the grant was earned increased, the null hypothesis was rejected.

Limitations

Although the academic, financial aid, and checkpoint data used for the study were mostly institutionally generated data, some data were collected from students' admissions application or self-reported responses to the New Student Questionnaire. As is the case for self-reported data, there may be some reliability concerns. Examples of self-reported data included in this study include a participant's race/ethnicity, parental education level, family income, and anticipated hours worked. Additionally, decisions were made in both the handling of the data in this study and the scope of the current study. The data decisions mentioned in Chapter 4 include reducing categories of race/ethnicity, normalization of high school GPA to a 4.0 scale, and the calculation of on-time graduation as the four-year graduation rate of students. These data decisions are unlikely to threaten the validity or reliability of the study nor result in substantially different findings.

There were a few primary limitations of the current study. First, the Graduation Audit checkpoint is highly correlated with on-time degree completion. The completion of the Degree Audit checkpoint occurs during the participant's junior year, and thus the completion of the checkpoint is tied directly to retention through the participant's junior year. Although the Graduation Audit checkpoint is completed least often, participants enrolled into their third year are more likely to graduate; therefore, using the Degree Audit checkpoint as a variable to predict on-time graduation may undermine the statistical significance of these variables.

Related to this limitation is the challenge of addressing checkpoint completion rate in a population that may no longer be academically enrolled for the full duration of the study. In order to capture the on-time graduation rate of the population, all students, regardless of continuing enrollment, were retained in the analysis for the study. This decision, however, has the possibility of overstating the effect of checkpoint completion on on-time degree completion. An initial analysis comparing the differences of checkpoint and on-time degree completion for the full population versus a calculation of checkpoint completion which took into account the number of semesters enrolled, yield some differences in effect size, but did not change the statistical significance of the results. Additional research could be completed to study the difference in results when continued enrollment is taken into account.

Second, the focus of this study is on-time bachelor's degree completion at a four-year university. The outcome variable in this study is binary. However, nuances regarding a participant's on-going enrollment and degree completion are eliminated by this approach. For example, a participant who took a semester or year off and did not graduate on-time is categorized the same as a participant who withdrew or transferred from the university after their first year and never graduated. These students have different degree outcomes, but, in the current study, both are classified as not completing their degree on-time.

Third, this quantitative study allowed me to examine the correlations and relationships between checkpoint completion and on-time graduation, as well as differences in checkpoint completion by various participant background characteristics (i.e., race, parental education, family income, high school GPA). However, I could not

explore the participants' experiences to understand why checkpoint completion may vary and which factors may have contributed to not completing their degree on-time.

Finally, this study was conducted at a single institution; therefore, the findings lack external validity limiting the generalizability of this study to other institutions.

Directions for Future Research

The current study used extant data to study the on-time graduation rates of multiple incoming student cohorts at a large public research university. It focused on-time graduation of the program cohort, since this is the primary aim of the OTDC program. However, a similar study exploring the six-year graduation rate of program participants would also be of merit. The six-year graduation metric is one used by both the U.S. Department of Education on the College Scorecard and the primary value used when comparing graduation rates across institutions. Further, a more detailed study investigating why a participant did not graduate on-time would help explore the program's effectiveness toward degree-completion more specifically. These details may include participant transfer status with longitudinal tracking of the participants across institutions, permanent withdrawal, and participants who took a short leave of absence extending their time to degree, but did not permanently withdraw from the institution.

As noted as a limitation, this quantitative study was able to generalize participant data and establish relationships between checkpoint completion and on-time graduation. However, a qualitative study using the same OTDC program may help explore areas where the checkpoint and on-time degree completion were lower than expected. One area of note are the differences by race explored in the current study. A study conducted by Flores et al. (2017) explored differences in degree completion by race as attributed to

other characteristics, such as family income and academic college preparation, and not race itself. In the current study, I found that when limiting the population by family income, parental education, and high school GPA, differences in Priority Registration checkpoint completion by race were present when the sample included low-income and lower-performing students. However, differences by race were not present when selecting for upper income and higher-performing students. Additional research into possible institutional factors or underlying conditions that would perpetuate these differences would also be beneficial.

In the logistic regression used to answer part of research question two, the number of times a participant changed their major was included as an independent variable and was found to be statistically significant when predicting on-time graduation. Specifically, as the number of times a participant changed their major grew, the on-time graduation rate decreased. Related, further research into the relationship between the academic discipline or major the participant was completing and on-time graduation would be interesting. Differences in degree completion rate based on academic disciplines may also differ by the background characteristics highlighted in this study. This research could yield insight into challenges encountered by some students in degree completion.

Additional research into the OTDC grant's effect on on-time degree completion would be useful. The current study's findings suggest there is some benefit to receiving the program grant; however, the question remains if $4,000 per year is an optimal amount to encourage students to graduate on-time and off-set financial strain. A study that models different grant amounts in relation to unmet need amounts and on-time graduation

rates may begin to uncover the linkage between the amount of program grant money and links to checkpoint completion behavior for participants.

Finally, as previously mentioned, this study was conducted at a single institution. An additional direction for future research includes the analysis of other on-time degree completion programs at other institutions, comparing the similarities and differences of the effect on on-time degree outcomes.

Recommendations to Improve Higher Education Practice

Differences in degree completion rates have been shown both in the current study and in previous research. Findings of the current study showed a positive relationship between program checkpoint completion and on-time degree completion. However, while there was a positive association of the OTDC program checkpoints with degree completion rates, the checkpoint completion rate differed based on student background characteristics. Despite this study's generalizability limitations, I believe suggestions for improvements to higher education can be made. First, institutions like the one studied, whose degree completion rates differ significantly based on students' background characteristics, should look at institutional barriers to success for those groups. These barriers may include access to or effectiveness of advising appointments, academic policies that would decrease participation in priority registration, or differences in completion based on majors. In addition to barriers, institutions should analyze the support systems in place for student success to ensure they are supporting all students in the ways needed. This recommendation is also reflective of Bensimon's (2005) research and her work on the Equity Scorecard.

Second, administrators should identify the student success behaviors essential at their institutions to encourage on-time degree completion. At the institution studied, student success behaviors included priority registration, advising appointments, a graduation audit, and advancing academic standing, but other behaviors may be identified at other institutions. Using the theoretical framework of the Theory of Planned Behavior, guiding students to on-time graduation is a multipronged approach that requires changing the norms around behaviors and outcomes, reducing barriers to completing a behavior, and shaping an individual's attitude around the behavior. Through careful analysis of institutional structures, student barriers to success, and institutional culture around on-time degree completion and related behaviors, administrators can start to shift student outcomes with directed resources and programming.

Conclusion

Degree completion is the ultimate goal of enrollment in a bachelor's degree program, and on-time degree completion reduces the student's financial cost and decreases the delay in receiving future earnings post-graduation. Institutions have struggled with increased time to degree and the public has become increasingly critical of graduation rates as educational costs rise. The institution studied established an on-time degree completion program in response to these trends. The current study analyzed the underlying behavioral elements of the OTDC program, checkpoints, and how on-time degree completion was related to checkpoint completion.

The Theory of Planned Behavior suggests that a combination of a person's attitude towards the behavior, norms, and perceived behavioral control leads to a person's intention to perform the behavior and then the behavior itself. Typically applied in public

health settings, the Theory of Planned Behavior can also be used to think about how students' actions are associated with improved on-time graduation rates. The OTDC program normalized degree completion in four years versus the more typically publicized six-year graduation rate within the institution. Through the OTDC program contract signed upon matriculation, the program starts to shape the participants' attitudes around the behaviors needed to be successful: on-time registration, meeting with academic advisors, completing graduation audits, and enrolling in and completing a minimum of 30 credits per academic year.

Based on the results presented in Chapter 4, there is a difference in on-time degree completion between those who complete more checkpoints and those who complete fewer. However, based on the analysis described herein, there appears to be a difference in the completion rate of checkpoints and on-time degree completion based on student characteristics. Similar to previous studies' findings as discussed in Chapter 2, participants from lower-income families, first-generation participants, and participants with lower high school GPAs all tend to complete fewer checkpoints and graduate on-time less frequently than the total population. The OTDC program grant, focused on participants with high financial need, does appear to effect on-time degree completion. This finding is important as it suggests that grant money tied to degree completion checkpoints may encourage students to graduate on-time.

REFERENCES

Adelman, C. (2006). The toolbox revisited: Paths to degree completion from high school through college. U.S. Department of Education.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes,* 50, 179-211. https://doi.org/10.1016/0749-5978(91)90020-T

Ajzen, I. (2005). *Attitudes, personality, and behavior* (2nd ed.). Open University Press.

Ajzen, I., & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Prentice Hall.

Akoglu, H. (2018). User's guide to correlation coefficients. *Turkish Journal of Emergency Medicine, 18(*3), 91–93.

Alon, S. (2011). Who Benefits Most from Financial Aid? The Heterogeneous Effect of Need-Based Grants on Students' College Persistence. *Social Science Quarterly, 92*(3), 807–829. https://doi.org/10.1111/j.1540-6237.2011.00793.x

Attewell, P., Heil, S., & Reisel, L. (2012). What is academic momentum? And does it matter? *Educational Evaluation and Policy Analysis, 34*(1): 27-44. https://doi.org/10.3102/0162373711421958

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review, 84*(2), 191–215. https://doi.org/10.1037/0033-295X.84.2.191

Bass, L. H., & Ballard, A. S. (2012). Student engagement and course registration methods as possible predictors of freshman retention. *Research in Higher Education, 18*, 13.

Baum, S., Ma, J., & Payea, K. (2013). Education Pays 2013: The Benefits of Higher Education for Individuals and Society. CollegeBoard. https://research.collegeboard.org/pdf/education-pays-2013-full-report.pdf

Bensimon, E. M. (2005). Closing the achievement gap in higher education: An organizational learning perspective. *New Directions in Higher Education, 131,* 99-111.

Benson, G. (2018). *Unmet need among financially needy college students in the state of Washington*. Education Research & Data Center. https://erdc.wa.gov/publications/student-outcomes/unmet-need-among-financially-needy-college-students-state-washington

Berumen, J. G., Zerquera, D. S., & Smith, J. S. (2015). More than access: The role of support services in the transitional experiences of underrepresented students in a statewide access program. *Journal of Student Financial Aid, 45*(1), 27-44.

Bound, J., Lovenheim, M. F., & Turner, S. (2012). Increasing time to baccalaureate degree in the United States. *Education Finance and Policy, 7*(4), 375-424. http://doi.org/10.1162/EDFP_a_00074

Bowen, W. G., Chingos, M. M., & McPherson, M. S. (2009). High schools and undermatching In *Crossing the finish line*: completing college at America's public universities (pp. 87-111). Princeton University Press.

Box, G. E. P., & Tidwell, P. W. (1962). Transformation of the independent variables. *Technometrics, 4*, 531-550.

Burns, M. E., Houser, M. L., & LeBlanc Farris, K. (2018). Theory of planned behavior in the classroom: An examination of the instructor confirmation-interaction model. *Higher Education*, *75*, 1091-1108. http://doi.org/10.1007/s10734-017-0187-0

Carnevale, A., & Smith, N. (2018). Recovery: Job growth and education requirements through 2020. Georgetown Public Policy Institute. https://cew.georgetown.edu/cew-reports/recovery-job-growth-and-education-requirements-through-2020/

Carnevale, A., Smith, N., & Strohl, J. (2013). Balancing work and learning: Implications for low-income students.. Georgetown Public Policy Institute. https://cew.georgetown.edu/cew-reports/learnandearn/

Ciocca Eller, C., & DiPrete, T. A. (2018). The paradox of persistence: Explaining the black-white gap in bachelor's degree completion. *American Sociological Review, 83*(6), 1171–1214. https://doi.org/10.1177/0003122418808005

Cohen, J. (1973). Eta-Squared and partial eta-squared in fixed factor anova designs. *Educational and Psychological Measurement, 33*(1), 107–112. https://doi.org/10.1177/001316447303300111

Cohen, J. (1992). A power primer. Psychological Bulletin, 112(1), 155–159. https://doi-org.libproxy.temple.edu/10.1037/0033-2909.112.1.155

The CollegeBoard, ACT, Inc. (2018). *ACT / SAT Concordance.* https://www.act.org/content/dam/act/unsecured/documents/Excel-ACT-SAT-Concordance-Tables.xlsx

Courtney, M. (2018). Pearson correlation coefficient. In B. Frey (Ed.), The SAGE encyclopedia of educational research, measurement, and evaluation (Vol. 1, pp. 1229-1233). SAGE Publications, Inc. https://doi.org/10.4135/9781506326139.n510

Denning, J. T., Eide, E. R., & Warnick, M. (2019). *Why have college completion rates increased?* EdWorking Paper: 19-77. Retrieved from Anneberg Institute at Brown University: http://www.edworkingpapers.com/ai19-77

Edberg, M. (2020). *Essentials of health behavior: Social and behavioral theory in public health.* Jones & Bartlett.

Encyclopaedia Britannica. (n.d.). John B. Watson. *Encyclopaedia Britannica.* https://www.britannica.com/biography/John-B-Watson

Federal Student Aid. (n.d.). *What does the cost of attendance (COA) mean?* https://studentaid.gov/help-center/answers/article/what-does-cost-of-attendance-mean

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Addison-Wesley.

Fisher, M. J. (2007). Settling into campus life: Differences by race/ethnicity in college involvement and outcomes. *The Journal of Higher Education, 78*, 125–161.

Fitzsimmons, S. R., Flanagan, D. J., & Wang, X. (2013). Business students' choice of short-term or long-term study abroad opportunities. *Journal of Teaching in International Business*, *24*(2), 125-137. http://doi.org/10.1080/08975930.2013.819710

Flores, S. M., Park, T. J., & Baker, D. J. (2017). The racial college completion gap: Evidence from Texas. *The Journal of Higher Education, 88*(6), 894-921. https://doi.org/10.1080/00221546.2017.1291259

Ford, G. G., Stahl, K. J., Walker, M. E., & Ford, A. M. (2008). Better late than never? The relation of registration date to class performance. *College Student Journal, 42*(2), 402-407.

Garibaldi, P., Giavazzi, F., Ichino, A., & Rettore, E. (2012). College cost and time to complete a degree: Evidence from tuition discontinuities. *The Review of Economics and Statistics, 94*(3), 699–711. https://doi.org/10.3386/w12863

Ginder, S. A., Kelly-Reid, J. E., & Mann, F. B. (2018). Graduation rates for selected cohort, 2009-14; Outcome measures for cohort year 2009-10; Student financial aid, Academic year 2016-17; and admissions in postsecondary institutions, Fall 2017 (Report No. 2018-151). https://nces.ed.gov/pubs2018/2018151.pdf

Green, C. D., & Benjamin, L. T. (2009). *Psychology Gets in the Game : Sport, Mind, and Behavior, 1880-1960.* University of Nebraska Press.

Gurantz, O. (2015). Who loses out? Registration order, course availability, and student behaviors in community college. *The Journal of Higher Education, 86*(4), 524–563.

Hale, J. M., & Bray, N. J. (2011). The impact of registration timing on student performance. *Community College Journal of Research and Practice, 35*(7), 556–573. https://doi.org/10.1080/10668920802289984

Haveman, R., & Smeeding, T. (2006). The role of higher education in social mobility. *The Future of Children, 16*(2), 125-150.

Hewitt, J. (2019). *Fly in four: Low-income student outcomes*. Unpublished manuscript.

Hsiao, C. (2015). Impact of ethical and affective variables on cheating: comparison of undergraduate students with and without jobs. *Higher Education, 69*, 55-77. http://doi.org/10.1007/s10734-014-9761-x

International Affairs Office, US Department of Education. (2008). *Structure of the U.S. education system: credit systems*. www2.ed.gov/about/offices/list/ous/international/usnei/us/credits.doc

Ishitani, T. T. (2006). Studying attrition and degree completion behavior among first-generation college students in the United States. *The Journal of Higher Education, 77*(5), 861-885. http://www.jstor.org/stable/3838790

Ishitani, T. T., & DesJardins, S. L. (2002). A longitudinal investigation of dropout from college in the United States. *Journal of College Student Retention, 4*(2): 173-201. https://doi.org/10.2190/V4EN-NW42-742Q-2NTL

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement, 20*, 141-151.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement, 30*(3), 607-610. https://doi.org/10.1177/001316447003000308

Le Bon, G. (2000). *Crowd : A study of the popular mind*. ProQuest Ebook Central.

Levine, T. R., & Hullett, C. R. (2002). Eta squared, partial eta squared, and misreporting of effect size in communication research. Human Communication Research, 28(4): 612–625. https://doi-org.libproxy.temple.edu/10.1111/j.1468-2958.2002.tb00828.x

Long, B. T., & Riley, E. (2007). Financial aid: A broken bridge to college access. *Harvard Educational Review, 77*(1): 39-63.

Luedke, C. (2017). Person first, student second: Staff and administrators of color supporting students of color authentically in higher education. *Journal of College Student Development, 58*(1), 37-52. https://doi.org/10.1353/2fcsd.2017.0002

Ma, J., Pender, M., & Welch, M. (2016). Education pays 2016: The benefits of higher education for individuals and society. College Board. http://files.eric.ed.gov/fulltext/ED572548.pdf

Maryland Higher Education Commission. (2016, September). *Report on unmet need and student success at Maryland public four-year institutions*. https://files.eric.ed.gov/fulltext/ED589992.pdf

Mehta, S. S., Newbold, J. J., & O'Rourke, M. A. (2011). Why do first-generation students fail? *College Student Journal, 45*(1), 20-36.

Mertens, D. M. (2020). Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods. SAGE Publications.

Morrison, M. (2012). Graduation odds and probabilities among baccalaureate colleges and universities. *Journal of College Student Retention, 14*(2), 157-179. https://doi.org/10.2190/CS.14.2.a

Museus, S. D., Yi, V., & Saelua, N. (2017). The impact of culturally engaging campus environments on sense of belonging. *The Review of Higher Education, 40*(2): 187-215. https://doi.org/10.1353/2frhe.2017.0001

National Center for Education Statistics. (n.d.). Trend generator. https://nces.ed.gov/ipeds/TrendGenerator/app/answer/7/19

National Center for Education Statistics. (2020). *The Condition of Education 2020 (2020-144), Immediate College Enrollment Rate.* https://nces.ed.gov/fastfacts/display.asp?id=51

National Student Clearinghouse Research Center. (2019, December). *Completing College, 2019 National Report.* National Student Clearinghouse. https://nscresearchcenter.org/wp-content/uploads/Completions_Report_2019.pdf

Pascarella, E. T., Pierson, C. T., Wolniak, G. C., & Terenzini, P. T. (2004). First-generation college students: Additional evidence on college experiences and outcomes. *The Journal of Higher Education, 75*(3), 249-284. https://doi.org/10.1353/jhe.2004.0016

Sass, D. A., Castro-Villarreal, F., Wilkerson, S., Guerra, N., & Sullivan, J. (2018). A structural model for predicting student retention. *The Review of Higher Education, 42*(1): 103-135. https://doi.org/10.1353/rhe.2018.0035

Sedmak, T. (2019, February 12). 60 percent of all college students graduate with a bachelor's, associate or certificate degree within eight years. https://studentclearinghouse.org/blog/60-percent-of-all-college-students-graduate-with-a-bachelors-associate-or-certificate-degree-within-eight-years/.

Shapiro, D., Dundar, A., Wakhungu, P. K., Yuan, X., Nathan, A., & Hwang, Y. (2016, September). Time to Degree: A National View of the Time Enrolled and Elapsed for Associate and Bachelor's Degree Earners (Signature Report No. 11). National Student Clearinghouse Research Center.

Smith, A. B., Street, M. A., & Olivarez, A. (2002). Early, regular, and late registration and community college student success: A case study. *Community College Journal of Research and Practice, 26*(3), 261-273. https://doi.org/10.1080/106689202317245455

Soper, D. S. (2019). A-priori sample size calculator for student t-tests [Software]. http://www.danielsoper.com/statcalc

Stuart-Hamilton, I. (1995). Dictionary of psychological testing, assessment and treatment: Second edition. ProQuest Ebook Central https://ebookcentral.proquest.com

Temple University. (n.d.). Fly in 4 Graduation Partnership: Checkpoints. https://fly.temple.edu/get-started/checkpoints

Thompson, C. G., Kim, R. S., Aloe, A. M., & Becker, B. J. (2017). Extracting the variance inflation factor and other multicollinearity diagnostics from typical regression results. *Basic and Applied Social Psychology, 39*(2), 81-90. https://doi.org/10.1080/01973533.2016.1277529

Tinto, V. (1975). Dropout from higher education: A theoretical synthesis of recent research. *Review of Educational Research*, 45, 89–125. https://doi.org/10.3102/00346543045001089

Tompkins, P., Williams, M. R., & Pribesh, S. (2019). An examination of late-registering students' success in online and on-campus classes. *Community College Journal of Research and Practice, 43*(5), 370-381. https://doi.org/10.1080/10668926.2018.1487889

Toutkoushian, R. K., Stollberg, R. A., & Slaton, K. A. (2018). Talking 'bout my generation: Defining "first-generation college students" in higher education research. *Teachers College Record, 120*(4): 1-38.

U.S. Department of Education. (2010). Tracking students to 200 percent of normal time: Effect on institutional graduation rates. https://nces.ed.gov/pubs2011/2011221.pdf

U.S. Department of Education. Institute of Education Sciences, National Center for Education Statistics. (2019a). Condition of education: Young adult educational and employment outcomes by family socioeconomic status (May 2019). https://nces.ed.gov/programs/coe/indicator_tbe.asp

U.S. Department of Education. Institute of Education Sciences, National Center for Education Statistics. (2019b). Condition of education: Educational attainment of young adults (May 2019). https://nces.ed.gov/programs/coe/indicator_caa.asp

Walpole, M. (2003). Socioeconomic status and college: How SES affects college experiences and outcomes. *The Review of Higher Education, 27*(1): 45-73. https://doi.org/10.1353/rhe.2003.0044

Wessel, R. D., Bell, C. L., McPherson, J. D., Costello, M.T., & Jones, J. A. (2006). Academic disqualification and persistence to graduation by financial aid category and academic ability. *Journal of College Student Retention, 8*(2), 185-198.

Wolniak, G. C., Mayhew, M. J., & Engberg, M. E. (2012). Learning's weak leak to persistence. *The Journal of Higher Education, 83*(6), 795-823. https://doi.org/10.1080/00221546.2012.11777270

Young-Jones, A. D., Burt, T. D., Dixon, S., & Hawthorne, M. J. (2013). Academic advising: Does it really impact student success? *Quality Assurance in Education, 21*(1), 7–19. https://doi.org/10.1108/09684881311293034