An Analysis of Degree Completion Among Female Students at Utah Valley University: A Demonstration Case for an Individualized Analysis Model in Higher Education

Tara S. Ivie
Utah State University

Follow this and additional works at: https://digitalcommons.usu.edu/etd

Part of the Higher Education Commons

Recommended Citation
Ivie, Tara S., "An Analysis of Degree Completion Among Female Students at Utah Valley University: A Demonstration Case for an Individualized Analysis Model in Higher Education" (2020). All Graduate Theses and Dissertations. 7776.
https://digitalcommons.usu.edu/etd/7776
AN ANALYSIS OF DEGREE COMPLETION AMONG FEMALE STUDENTS AT
UTAH VALLEY UNIVERSITY: A DEMONSTRATION CASE FOR AN
INDIVIDUALIZED ANALYSIS MODEL IN HIGHER EDUCATION

by

Tara S. Ivie

A dissertation submitted in partial fulfillment
of the requirements for the degree

of

DOCTOR OF PHILOSOPHY

in

Education

Approved:

Marla Robertson, Ph.D.                     Ryan Knowles, Ph.D.
Major Professor                          Committee Member

Aryn Dotterer, Ph.D.                     Sylvia Read, Ph.D.
Committee Member                        Committee Member

Kimberly Lott, Ph.D.
Committee Member

Richard S. Inouye, Ph.D.
Vice Provost for Graduate Studies

UTAH STATE UNIVERSITY
Logan, Utah

2020
Copyright © Tara S. Ivie 2020

All Rights Reserved
ABSTRACT

An Analysis of Degree Completion Among Female Students at Utah Valley University:
A Demonstration Case for an Individualized Analysis Model in Higher Education

by

Tara S. Ivie, Doctor of Philosophy
Utah State University, 2020

Major Professor: Marla Robertson, Ph.D.
Department: Teacher Education and Leadership

This study investigated an individualized analysis model of performance metrics for institutions of higher education. Research focused on degree completion as the primary metric, as it is used as a central measure of success for many institutions in the U.S. student degree completion rates relate to institutional funding, specifically in performance-based funding models. College degree completion strongly correlates with positive overall outcomes for the well-being of the graduate and their community.

Big data analytics is a burgeoning field, which provides enhanced data analysis of thousands of data points and hundreds of variables. While large-scale static and adaptive tools are important for overall institutional guidance, they may be cost prohibitive for some schools and programs. A large, public, open enrollment institution in the Western U.S. was be used as a demonstration case. This institution experiences a statistical anomaly of low female graduation rates, which contradicts a national trend of high
female degree completion. A lack of data regarding two particular variables necessitated
an external review to determine of any statistically significant relationship may be at
play.

To address the needs of the demonstration case, the author used survival analysis
as the core methodology to analyze archived completion data from three cohorts of
students. The analysis increased understanding of the relationships between a student,
their change in marital status, change in their number of dependents, and the student’s
likelihood of degree completion. For the purposes of this study, bachelor degree
completion was the principle criteria encompassing educational attainment.
Characteristics for comparison include gender, marital status, dependent children, race,
ethnicity, and age.

Results of the research project reinforce the need for an Individual Analysis
Model when examining unique student patterns of enrollment and degree completion.
Findings indicate that female students are more likely to complete their degree than their
male peers. Both male and female students who change marital status and continue
enrollment accelerate their timeline to graduation. Male students who add a dependent
during enrollment increase their likelihood of graduating where female students have a
slight decrease in their likelihood of degree completion.
PUBLIC ABSTRACT

An Analysis of Degree Completion Among Female Students at Utah Valley University: A Demonstration Case for an Individualized Analysis Model in Higher Education

Tara S. Ivie

Higher education institutions are facing low degree completion rates on an epidemic scale. The role of a bachelor degree completion in the well-being and future life of college students is of paramount importance, impacting physical and mental health, financial stability, relationship satisfaction and duration, safety, and community engagement.

Institutions must be critical of and act to address barriers to degree completion. In addition to an intrinsic investment in the success of their students, institutions may be motivated by institutional improvement, performance-based funding, and the ethical ambition to create an educated society. Understanding when and why students drop and stop out can range from simple to very complex. Large schools with a varied student population may need to assess tens to hundreds of variables to get an accurate understanding of student behavior.

Big data and student predictive analytics are valuable tools to understand the scope and patterns of low degree completion and serve as a common first step on the path to improve completion rates (Baer & Norris, 2016). This project introduces an Individual Analysis Model through which an institution can identify degree completion challenges, then evaluate the institutional resources available as well as static and adaptive data tools
which may help leaders understand the issue. A demonstration case is used to show how the model works and provide concrete examples to the reader for reference.

Demonstration case using the Individual Analysis Model: Utah has one of the lowest female degree completion rates in the country, consistently 5-11% behind the national average. Within that data oddity, Utah Valley University (UVU) is consistently one of the lowest female degree completion rates within Utah. This anomaly has been consistent since the 1990s and is not improving at rates similar to their Utah peers. The author uses survival analysis to better understand the impact of change in marital status and change in dependents on students’ likelihood of degree completion.

Results of the research project reinforce the need for an Individual Analysis Model when examining unique student patterns of enrollment and degree completion. Findings indicate that female students are more likely to complete their degree than their male peers. Both male and female students who change marital status and continue enrollment accelerate their timeline to graduation. Male students who add a dependent during enrollment increase their likelihood of graduating where female students have a slight decrease in their likelihood of degree completion.
DEDICATION

for Brian, Chloe, and Ella

my guiding stars
ACKNOWLEDGMENTS

I would like to thank the faculty and staff at Utah State University who made it possible to complete this doctoral program; a special thanks to my instructors and committee members: Drs. Steven Camicia, Aryn Dotterer, Ryan Knowles, Suzanne H. Jones, Kim Lott, Kathleen Mohr, Sylvia Read, Marla Robertson, Courtney Stewart, Susan Turner, and Robert Wagner.

A humble thank you to Dr. Russell T. Warne for his generosity of time, knowledge, and expertise through the quantitative analysis process.

My heartfelt gratitude to my family, friends, and colleagues for their encouragement, moral support, and patience from application to graduation.

To the 2016 cohort: As humans and scholars, we supported each other through the best and the worst parts of our doctoral experience. Learning was more meaningful as we illuminated the path for one another. Thank you for the friendships forged through this curious fire.

Chloe and Ella – Thank you for uplifting me each day, from my first class to my final defense. Your minds, hearts, bodies, and spirits are capable of doing anything you put your energy into. Go forth and lead in the world.

To my partner, Brian, the most important person in my life – It is with your support that I succeed in any avenue of life and it is because of you that I do so joyfully. Thank you for our amazing life together.

Tara Ivie
# CONTENTS

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ABSTRACT ...................................................................................................................  iii</td>
</tr>
<tr>
<td>PUBLIC ABSTRACT ...................................................................................................  v</td>
</tr>
<tr>
<td>DEDICATION ...............................................................................................................  vii</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS .............................................................................................  viii</td>
</tr>
<tr>
<td>LIST OF TABLES .........................................................................................................  x</td>
</tr>
<tr>
<td>LIST OF FIGURES .......................................................................................................  xii</td>
</tr>
<tr>
<td>CHAPTER</td>
</tr>
<tr>
<td>I. INTRODUCTION ............................................................................................  1</td>
</tr>
<tr>
<td>Problem Statement ...........................................................................................  2</td>
</tr>
<tr>
<td>Statement of Purpose ........................................................................................  2</td>
</tr>
<tr>
<td>Research Questions ..........................................................................................  3</td>
</tr>
<tr>
<td>Overview of Methodology ...............................................................................  3</td>
</tr>
<tr>
<td>Researcher Assumptions, Limitations, and Delimitations ...............................  4</td>
</tr>
<tr>
<td>Key Terminology .............................................................................................  5</td>
</tr>
<tr>
<td>Organization of Dissertation ............................................................................  9</td>
</tr>
<tr>
<td>Summary ..........................................................................................................  10</td>
</tr>
<tr>
<td>II. LITERATURE REVIEW ...................................................................................  11</td>
</tr>
<tr>
<td>Introduction ......................................................................................................  11</td>
</tr>
<tr>
<td>Higher Education Leadership ...........................................................................  12</td>
</tr>
<tr>
<td>Degree Completion ...........................................................................................  17</td>
</tr>
<tr>
<td>Student Success Analytics ..............................................................................  21</td>
</tr>
<tr>
<td>Conceptual Framework .....................................................................................  27</td>
</tr>
<tr>
<td>Need for Individualized Analysis ....................................................................  29</td>
</tr>
<tr>
<td>Demonstration Case ..........................................................................................  29</td>
</tr>
<tr>
<td>Individualized Analysis Model ........................................................................  34</td>
</tr>
<tr>
<td>Summary ..........................................................................................................  44</td>
</tr>
<tr>
<td>III. METHODOLOGY ...........................................................................................  46</td>
</tr>
<tr>
<td>Introduction ......................................................................................................  46</td>
</tr>
<tr>
<td>Research Questions ..........................................................................................  47</td>
</tr>
<tr>
<td>Section</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Research Setting and Context</td>
</tr>
<tr>
<td>Research Sample and Data Sources</td>
</tr>
<tr>
<td>Data Analysis</td>
</tr>
<tr>
<td>Exclusions</td>
</tr>
<tr>
<td>Scope, Limitations, and Delimitations</td>
</tr>
<tr>
<td>Summary</td>
</tr>
<tr>
<td>IV. FINDINGS</td>
</tr>
<tr>
<td>Introduction</td>
</tr>
<tr>
<td>Sample</td>
</tr>
<tr>
<td>Data Collection</td>
</tr>
<tr>
<td>From Population to Sample</td>
</tr>
<tr>
<td>Free Application for Federal Student Aid Sample</td>
</tr>
<tr>
<td>Demographic Profile of Free Application for Federal Student Sample</td>
</tr>
<tr>
<td>Marital Status and Dependent Children</td>
</tr>
<tr>
<td>Statistical Analysis: Cox Regression</td>
</tr>
<tr>
<td>Results</td>
</tr>
<tr>
<td>Answering Research Questions</td>
</tr>
<tr>
<td>Summary</td>
</tr>
<tr>
<td>V. DISCUSSION</td>
</tr>
<tr>
<td>Introduction</td>
</tr>
<tr>
<td>Discussion of Results</td>
</tr>
<tr>
<td>Limitations</td>
</tr>
<tr>
<td>Projections</td>
</tr>
<tr>
<td>Implications</td>
</tr>
<tr>
<td>Significance</td>
</tr>
<tr>
<td>Future Research</td>
</tr>
<tr>
<td>Significant Results for Utah Valley University</td>
</tr>
<tr>
<td>Recommendations and Practical Applications</td>
</tr>
<tr>
<td>Summary</td>
</tr>
<tr>
<td>REFERENCES</td>
</tr>
<tr>
<td>APPENDIX: SUPPLEMENTAL FIGURES</td>
</tr>
<tr>
<td>CURRICULUM VITAE</td>
</tr>
<tr>
<td>Table</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>1. Most Significant Predictive Variables by Institution</td>
</tr>
<tr>
<td>2. Coded Sequential Year by Cohort</td>
</tr>
<tr>
<td>3. Coding of Variables</td>
</tr>
<tr>
<td>4. Summary Demographic Statistics of Combined Sample</td>
</tr>
<tr>
<td>5. Descriptive Statistics for Free Application for Federal Student Aid Submission</td>
</tr>
<tr>
<td>6. Summary Demographic Statistics of Free Application for Federal Student Sample</td>
</tr>
<tr>
<td>7. Descriptive Statistics for Marital Status</td>
</tr>
<tr>
<td>8. Descriptive Statistics for Addition of Dependent Child(ren)</td>
</tr>
<tr>
<td>9. Descriptive Statistics for Removal of Dependent Child(ren)</td>
</tr>
<tr>
<td>10. Summary Statistics for Dependent Status</td>
</tr>
<tr>
<td>11. Case Processing Summary</td>
</tr>
<tr>
<td>12. Time Invariant Covariates Used in Cox Regression</td>
</tr>
<tr>
<td>13. Time Invariant and Time Variate Covariates Used in Cox Regression</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Individual analysis model to guide institutions through evaluation of retention, persistence, or graduation issues.</td>
<td>31</td>
</tr>
<tr>
<td>2.</td>
<td>College enrollment by gender showing national enrollment, USHE enrollment, and UVU headcount.</td>
<td>38</td>
</tr>
<tr>
<td>3.</td>
<td>Percentage of degrees awarded to female students, shown for each institution of the Utah System of Higher Education.</td>
<td>41</td>
</tr>
<tr>
<td>4.</td>
<td>Subject flow diagram of Utah Valley University’s student population from 2010, 2011, and 2012.</td>
<td>62</td>
</tr>
<tr>
<td>5.</td>
<td>Subject flow diagram of students in the free application for federal student sample and their marital status throughout observation.</td>
<td>71</td>
</tr>
<tr>
<td>6.</td>
<td>Subject flow diagram of students in the free application for federal student sample and their dependent status during observation.</td>
<td>72</td>
</tr>
<tr>
<td>7.</td>
<td>Probability of degree completion as calculated by logistic regression.</td>
<td>84</td>
</tr>
<tr>
<td>8.</td>
<td>Sequential year of marital status change: Single to married.</td>
<td>93</td>
</tr>
<tr>
<td>9.</td>
<td>Sequential year of marital status change: Married to single.</td>
<td>94</td>
</tr>
<tr>
<td>10.</td>
<td>Sequential year of dependent addition for the FAFSA sample.</td>
<td>96</td>
</tr>
<tr>
<td>11.</td>
<td>Sequential year of dependent removal for FAFSA sample.</td>
<td>96</td>
</tr>
<tr>
<td>12.</td>
<td>FAFSA sample by age at initial enrollment at Utah Valley University.</td>
<td>97</td>
</tr>
<tr>
<td>A1.</td>
<td>Free Application for Federal Student Aid (FAFSA), excerpt 1.</td>
<td>126</td>
</tr>
<tr>
<td>A1.</td>
<td>Template for data request.</td>
<td>127</td>
</tr>
<tr>
<td>A3.</td>
<td>Institutional Review Board approvals.</td>
<td>128</td>
</tr>
</tbody>
</table>
CHAPTER I
INTRODUCTION

Every August in the U.S., students prepare for one of the most life-altering experiences they will have – college (Trostel, 2015). In an idyllic world, each of those students would be on equal footing, with equal support, and an equal likelihood of completing their degree. Higher education data paints a clear picture that this utopian premise of parity is simply not reality.

Research shows that there are personal characteristics that strongly correlate with a student’s likelihood of completing their degree and most studies include gender as a determinant factor of timely degree completion (Lassibille, 2011). Nationally, those entering college are significantly more likely to be female than male. Students continue that pattern through graduation where female students are more likely to graduate than their male counterparts (Conger & Dickson, 2017). This issue is even more pronounced with men and women of color (Conger & Long, 2010). It should also be noted there is a significant lack of nonbinary gender data on degree completion in the U.S.

Over the last 10 years females continue to outpace their male peers in degree completion overall, though female degree completion in science and engineering fields has declined since 2006 (National Student Clearinghouse Research Center, 2017). In a broad review of degree completion literature “[t]he vast majority of studies reviewed show that, all else remaining the same, there is a significant gender effect among students and that male students are more likely to drop out than their female counterparts.” (Lassibille, 2011, p. 6). There is ongoing conversation about the gender gap in higher
education and the importance of addressing this challenge (Carbonaro, Ellison, & Covay, 2011; DiPrete & Buchmann, 2006).

**Problem Statement**

In contrast to the national data, the State of Utah has an inverse pattern of higher education enrollment and degree completion by gender. Low female enrollment and graduation rates in Utah trace back to the 1990s (Langston, 2010, 2014) when contemporary educational data tracking was established. These anemic rates are exacerbated at Utah’s largest public higher education institution, Utah Valley University (UVU), whose 4-year average of degrees awarded to females is the lowest among 4-year institutions in the state (UVU Institutional Research, 2017a). The 5-year average of female new student enrollment has not exceeded 48% and although bachelor degree completion has improved, females comprise only 43% of bachelor degrees completed (UVU Institutional Research, 2017a), whereas nationally female students earned 57% of all bachelor degrees (National Center for Education Statistics [NCES], 2017). Gender parity in enrollment and an equal likelihood of completing one’s degree has not yet been established at UVU.

**Statement of Purpose**

Although there is a large body of research regarding college student retention, persistence, and degree completion and a burgeoning field of student success analytics attempting to better understand these issues, available research was not fully addressing
this issue. Further, references to potential correlative factors such as family formation patterns, defined as getting married or having a child (Jeppsen, 2018), have not been quantitatively analyzed and subsequently require investigation. Therefore, using UVU as a demonstration case, this study was designed to use an individual analysis model to provide exploratory analysis of degree completion patterns and their relationship to variables relevant to the student population, marital status, and dependent status. These factors are then stratified by gender to determine if there are significant differences.

**Research Questions**

RQ1: What is the relationship between student degree completion within the observation period and their marital status?

RQ2: What is the relationship between student degree completion within the observation period and their dependent status?

RQ3: Are there differences in student degree completion probability by gender?

**Overview of Methodology**

Historical student records data from UVU were used to assess three cohorts of student graduation behavior. Undergraduate student cohorts from the 2010, 2011, and 2012 years were used for the data sample. For these anonymized students, enrollment, drop out, and graduation patterns were analyzed through the 2018-19 academic year and correlated with marital status and dependent information from financial aid records. Using survival analysis, also called time to event analysis (Willett & Singer, 2003), the
research identified the time it took students to complete their bachelor degree. 

Designating the bachelor degree as the event of interest, students who do not continue 
enrollment can be censored, resulting in a statistical assessment of whether specified 
variables had a statistically significant impact on the graduation timeline. 

**Researcher Assumptions, Limitations, and Delimitations**

To embark on this study, the researcher must assume that there may be variables 
impacting student degree completion, and that there is a difference by gender. Reflecting 
the national trend, UVU also lacks nonbinary student data. Nonbinary identifying 
students were only given two choices on their admissions application and therefore are 
categorized as female or male. Students will be referred to as female or male throughout, 
due to a lack of data regarding the students’ gender identity. Their experiences may be 
unique and yet were not represented in this analysis due to the limitation of the binary 
response. It is also assumed that individuals respond honestly to the questions asked on 
admissions and financial aid applications because the responses to these questions create 
the data set. 

To align with federal guidelines, the study used standardized student cohort 
parameters established by the Integrated Postsecondary Education Data System by the 
National Center for Education Statistics. To be included in the student cohort, individuals 
met the following criteria.

- First-time college students (high school concurrent enrollment does not 
imply this status).
- Enrolled full-time (12 or more credits their first semester of enrollment).
• Bachelor degree seeking (declared program is a bachelor degree at student census).

Students who met one criterion, but not all three, were excluded from the population data. Student census is held the third week of the semester when the majority of course adds and drops have been completed and student enrollment is considered stable. The assumption made by the researcher was that this population of students who were first-time, full-time, bachelor-degree seeking students intended to complete a bachelor degree.

Time to degree standards have also been established by the Integrated Postsecondary Education Data System (IPEDS). Students are expected to complete their degrees within 150% to 200% of time. For a bachelor degree, which is expected to take 4 years to complete, the student must graduate within 6 to 8 years of enrollment to be counted. This study used the 200% maximum for the oldest cohort and 150% of time to degree for the newest cohort to align with federal standards (NCES, 2018).

Because UVU does not track changes to student marital status or dependent status over time, this data is garnered from students’ free application for federal student aid (FAFSA). As a result, the population was delimited to a sample that only includes students who submitted FAFSA. This represents approximately 75% of first-time, full-time, bachelor degree seeking students within the three cohort years.

**Key Terminology**

For the purposes of this research project, guidance was taken from the definitions of degree completion and graduation used by IPEDS (NCES, 2018). Colleges and
universities must report specific IPEDS measures annually to remain financial aid eligible. Institutions report on a large number of factors, but the most commonly cited are first-time, full-time, bachelor degree seeking students’ 1-year retention and 6-year completion rates.

**Retention**

Student retention was measured by assessing first-time, bachelor degree seeking freshman from fall semester to fall semester. For example, Student A is enrolled fall semester of 2018 and is also enrolled fall semester of 2019; therefore, the student is counted as “retained.” Whether or not the student is enrolled in the intervening spring and summer semesters was irrelevant in this calculation.

**Persistence**

Student persistence was measured fall to fall, but only following the sophomore year. Continuing the prior example, if Student A was retained from fall semester 2018 to fall semester 2019, they are retained. If Student A is again enrolled during the 2020-2021 academic year, they have persisted. Persistence can be measured each year through the anticipated graduation date. Some institutions measure persistence fall to fall only; others include spring and summer semesters to show a more detailed picture of student enrollment patterns. Overall, if the student was enrolled in at least two semesters in an academic year, they are “persisting.”

**Degree Completion**

Degree completion means the formal posting of a specific credential – certificate,
associate, or bachelor degree. Although institutions track all degrees posted annually, what is reported to IPEDS has the specific criterion of timely degree completion. Also referred to as educational attainment (NCES, 2018).

**Progress Toward Degree**

The author combines retention, persistence, and degree completion metrics and categorizes them as *progress toward degree*. This simplified language helps identify if students are making what can be termed as positive progress while not delineating the exact status of the student.

**Time to Degree**

IPEDS defines a student’s degree as “completed” if the degree posts within 150% of anticipated time to degree (Raikes, Berling, & Davis, 2012). Because bachelor degrees are intended to be 4-year degrees, 150% of time to degree means that students have 6 years to complete that degree as a full-time student. For example, a bachelor-degree seeking student who starts in the fall 2010 semester must have their degree post by the end of the 2015-16 academic year to count as “completed.” In the data set used, there are three cohorts who began school in the 2010, 2011, or 2012 academic year. These students were tracked from their first year of enrollment through the fall semester of 2018 and results were reported for the entire observed period.

**Performance Metrics**

Performance metrics are those measures used to assess the relative success of an institution of higher education. These are commonly determined by a primary funding
source. For example, a state legislature for a state-funded or state-supported institution of higher education. IPEDS measures of retention and degree completion are the most frequently used statistics (Jongbloed, 2001).

**Institutional Insight**

This term is used to describe observations made by those working within an institution. Valuing the perspectives of faculty and staff and recognizing that they may see patterns with students that may not yet be captured in data is a valuable step in research. Employees are poised to glean information about students’ lived experiences and may have a broader perspective about what is impacting students’ abilities to succeed. Testing those insights with analysis, institutions can identify data they are not gathering and establish processes to gather this information.

**Institutional Performance Imperatives**

For effective action, institutions must identify patterns of student retention and degree completion behavior, then determine which metrics are most significant for their unique student population. This imperative step identifies opportunities for potential interventions and proactive student programming to encourage retention and completion. Needs for individual campuses may be as unique as the students they serve (Bound, Lovenheim, & Turner, 2010).

**Data-Based Leadership**

Leaders need reliable and applicable analysis to make data-informed decisions in an effort to improve retention, persistence, and degree completion. Although many best
practices exist in the academic and student affairs literature, there is simply not a magic bullet. Each institution is unique and exists in a regional and local culture, which impacts the students and institutions to varying degrees. Focusing on the student body at an individual institution and conducting rigorous research within that context may identify significant risk factors and predictors of success relevant for those students. This localized approach likely results in better information due to the individualized model of analysis. This allows school leadership to more effectively design student programming and interventions targeted to improve degree completion. Dewey’s transactional theory explains that we are part of the environment in which we exist; hence this is an important consideration to accurately assess and understand what challenges exist and what may benefit students within each institution’s unique student population. It also provides support for the argument that one analytic model may not be a fit for all situations. “Dewey believed that the thinking human organism is always embedded in and part of dynamic, local, and complex ecology” (Johnson & Christensen, 2014, p. 62).

**Organization of Dissertation**

Subsequent chapters include the following components to demonstrate the scope, impact, and outcomes of this research project: literature review, methodology, findings, and discussion. The literature review highlights the significant impact of college degree completion and its broader impact on individuals, their professional career, families, and community. Student success analytics and tools are discussed and their relation to the specific research questions in this study. The ethical and practical considerations of
higher education leadership are also discussed as they relate to student degree completion. The methodology chapter demonstrates the rationale for the selection of survival analysis as the research design and provides in depth information about sources, data, sample, related topics. The findings chapter provides the quantitative representation of the survival analysis including related data visualizations and a stratification of results by cohort, gender, age, race and ethnicity, marital status, and dependent status. The discussion section embarks on a narrative of the research findings highlighting implications, actionable information, significance, a call for future research, and recommendations for scholar practitioners.

Summary

Degree completion in higher education is not attained at equitable rates by students, and the most significant factor in the U.S. in predicting likelihood of completion is gender. Trends favoring female degree completion have been in place for well over a decade; however, Utah, and UVU specifically, have not kept with the national trendline. Leaders need to understand more about low female college enrollment and completion patterns to make data-informed decisions on how to best support degree completion for their student body. Using UVU as a demonstration case for the Individual Analysis Model, marital status and dependent status was used in a survival analysis examining time to degree because family formation was a primary factor identified as negatively impacting female degree completion and was not a factor that current data analytics could address.
CHAPTER II
LITERATURE REVIEW

Introduction

This study examined the anomaly of low female degree completion rates at UVU and used an individual analysis model developed by the researcher. To set the stage for the importance of understanding degree completion and how institutions can improve their students’ outcomes, this literature review identifies, critiques, and synthesizes prior research. Major categories of the literature review include: the context of leadership in higher education, the value of a college degree, higher education performance metrics of degree completion, student success analytics, and the importance of institutional degree completion by gender in the U.S. and in the demonstration case. The review also discusses the strengths, weaknesses, and issues in prior research and draws conclusions based on this information. It also identifies gaps where new research questions may be formed, and strategies for study are formulated.

Articles were included in this analysis if they met the following criteria: (a) published between 1990-2019, (b) published in peer-reviewed journals, and (c) examined higher education performance metric of degree completion. Exclusion criteria included (a) research population primarily non-U.S. students, (b) published prior to January 1990, and (c) article reviewed the impact of specific intervention programs to promote graduation rates.
Higher Education Leadership

Role of Leadership in Higher Education

Historically, the chief role of an institution of higher education was to provide academic courses and sufficient opportunities to earn the credits necessary to graduate, typically through a division called academic affairs (Coomes & Gerda, 2016; Demetriou & Schmitz-Sciborski, 2011). Enrollment in an ongoing basis (retention and persistence) and graduating (graduation and completion) was considered a student choice and responsibility (Allen, 1999). Institutional assessment at the federal and state levels with performance-based funding was primarily driven by enrollment numbers (Hearn, 2015; Jacobs & Stoner-Eby, 1998; Jongbloed & Vossensteyn, 2001) which reinforced recruitment practices to admit anyone and everyone, despite the students’ ability, resources, or intention to complete a degree. As a result, admission went up and retention and graduation remained steady or declined (NCES, 2017).

Although academic units focused on classroom learning, additional student support was needed, resulting in the development of a division called student affairs. These divisions were primarily tasked with supporting a holistic student experience (Marsh, 1937). Over the years, student affairs developed programs aimed to increase student success (Ludvik, 2016; Varlotta, 2016). In order to improve outcomes for students (Bettinger & Baker, 2014), it is vital for academic affairs and student affairs to coordinate efforts (Kezar & Gehrke, 2016), goals, and objectives under a shared vision (Lotkowski, Robbins, & Noeth, 2004; J. T. Murphy, 2013). This task is not insignificant and requires skilled leadership to navigate internal and external politics (Anderson, De La
Cruz, & López, 2017) while serving as agents for change (Titus, 2004).

Institutions that are committed to improving degree completion rates must establish collaboration between these divisions. This necessary collaboration is a cornerstone of this research project. Data from both academic and student affairs is essential to assess student behavior and identify opportunities, design intervention and services, and improve student trajectory toward degree completion. The unique characteristics of each institution’s academic and student affairs divisions also support the validity of conducting an individual analysis, ensuring that the best information is used, regardless of the original source. Increasing the sense of ownership of and stake in student success is a critical cultural change on any college campus.

**The Challenge for Institutional Leaders**

It is no longer enough to provide educational opportunity and allow the onus of success to be on the student, it is now a central responsibility of the institution (Evenbeck & Johnson, 2012) to ensure students are succeeding, continuing enrollment, and graduating (Corbett, Hill, & Rose, 2008; Talbert, 2012) in a timely manner. These new challenges combined with the changing landscape of post-secondary education call for innovative leadership with a “a willingness to take calculated risks” and link “past events and present trends with future scenarios while creating a compelling vision” (Coetzer, Bussin, & Geldenhuys, 2017, p. 13).

Data regarding potential predictors and barriers for students that may be impacting progress toward degree can be used by institutional leaders to develop data-based programs designed to improve performance metrics. Examining patterns of student
behavior (Astin, 1993) may provide insight into how institutions can better meet student needs and increase their likelihood of retention and degree completion (Astin, 1997). Hence, gathering and analyzing data specific to a student body is an essential step to be taken by institutional leaders, empowering them to make informed choices about programming, outreach, and funding for student completion efforts. The “role of data in developing, guiding, and sustaining organizational change” (Mandinach, Honey, & Light, 2006, p. 3) is central to programs designed to address low degree completion (Gagliardi & Turk, 2017). With the knowledge that students are underperforming in terms of degree completion, institutions have the responsibility to research and understand variables that impact degree completion negatively and positively.

**Defining Student Success**

Kinzie and Kuh (2016) describe the many definitions of student success stating that for “state and federal policymakers, student success typically means access to affordable postsecondary education, shortened ‘time to degree,’ degree completion, and post-college employment and earnings” (p. 2). A significant body of research shows that student success, defined as degree completion, is a more integrative concept. Dr. Edward Wadie Said stated, “the whole idea of education is to change and improve things, so that other cultural and political possibilities can emerge, even at moments when so-called pragmatists say this is impossible” (Higgins, 2001, p. 3). Walker (2006) stated, “Higher education, in particular, is a period when students ought to develop the maps, tools and resources, to navigate the journeys which follow” (p. 5). The skills learned during the college experience provide shape, direction, and purpose for a student’s future pathways.
This study used degree completion as the primary metric of student success. This approach reflects federal and state expectations of student graduation rates, especially because these rates are tied to performance funding.

Performance Metrics And Performance Funding

Research exploring performance metrics in higher education is abundant. The financial pressure related to an institution’s performance made these metrics a primary focus of leaders throughout the U.S. (Jongbloed & Vossensteyn, 2001). Increased oversight and publication of institutional performance has shifted the landscape and accountability for higher education for both research and teaching institutions (Arvizu et al., 2012). At the national level, institutions are assessed via the federal College Scorecard system (U.S. Department of Education, 2015) and low-performing schools may face sanctions related to federal student aid. At the local level, state governments have rapidly shifted to using performance metric models. This division of performance-based assessment creates smaller performance markets for schools within specific regions or states.

For example, degree completion in the State of Utah was added as a performance funding component in 2015 (Buhler, 2016). Examining Utah’s performance metrics over the prior 10 years, patterns demonstrated that women in the state enroll in college at lower rates than nationwide and graduate at rates lower than women nationally (Madsen & Sarin, 2013). If an institution within Utah is invested in increasing performance metrics, it is essential to better understand and address low degree completion. Little research has been done to explore correlations that may predict the likelihood of a female
student dropping out or progressing toward their degree and completing it (Hall, 2008; Mihelich & Storrs, 2003). This trend may not appear in other states and would, subsequently, not be a prioritized research or programming investment in other areas.

This example shows the importance of individualized institutional analysis to understand a student’s likelihood of graduating and why such an analysis is necessary to create effective interventions and student programming (Alexander & Eckland, 1974; M. J. Bailey & Dynarski, 2011; Spain & Bianchi, 1996) and improve degree completion. Analysis of performance metrics, specifically degree completion, is critically important and must be carried out in the context of the institution and locale.

With that broad context, if leaders intend to improve performance metrics, institutions must examine how their students define success and increase students’ understanding of the expansive ways a degree can impact their life positively in effort to help students more holistically define what success means for them. Employability and a college credential are both positive outcomes, but they should not be considered the only measures of student success or the only benefits of college. While college attendance is important, completing some college and not completing a degree is a risky proposition for most students (Shapiro et al., 2014). Completion of a degree is a critical asset to improve numerous outcomes including: health, happiness, financial stability, employability, family health, and contribution to the community (Boardman, Powers, Padilla, & Hummer, 2002; Case & Deaton, 2017; Garmise, 2018; Lawrence, 2017).

Performance metrics are key to the financial future of an institution and must be considered in the ethical question of how well one’s institution is serving students. The
study was designed to use an individualized model of analysis to identify the probability of students completing their degree within the federally prescribed 6-year time frame in order to identify patterns of students who are likely to persist to degree completion and those who are not. If a student does not retain or persist, they are technically unable to complete their degree; therefore, completion was used as the primary performance metric. Effective use of this data will inform what data is tracked institutionally, what variables are included in an analytic tool, and the design and implementation of student programs to improve the likelihood that the student will complete their degree.

**Degree Completion**

**Student Benefits of College Degree Completion**

Research demonstrates the myriad benefits of bachelor degree completion (Giani, Attewell, & Walling, 2019). However, student characteristics like race, ethnicity, age, gender, and first-generation status are significantly linked to likelihood of a student completing their degree (Bauman & Graf, 2003). This inequity is problematic for the future well-being of individuals, families, communities, and the U.S., where bachelor degree completion is a significant indicator of well-being in Western industrialized countries. Well-being factors showing significant improvement can be segmented into four general categories with some interlinking benefits.

Benefits to the college graduate include improved physical and mental health, longer lifespan, financial security, and improved self-concept and esteem (Baum, Ma, & Payea, 2013; Burd-Sharps, Elder, Lewis, & Martins, 2009). College graduates also see
professional benefits including higher employability, more secure and flexible employment, and higher wages. Benefits extend to the family, where improved marital satisfaction, longer marital duration, and healthier relationships build stronger partnerships and families (Trostel, 2015). Children also have healthier development, starting from birth where babies of college graduates are typically born at a healthier weight (Boardman et al., 2002), continuing through childhood when the children are more likely to read at grade level and participate in well-rounded developmental activities, and into adulthood where these children are more likely to have higher ratings in their own well-being (Burd-Sharps et al., 2009). Beyond individual and familial benefits, communities benefit when individuals complete their degree, resulting in increased volunteerism, increased donations to charitable causes, higher likelihood of taking leadership positions, and increased civic engagement (Trostel, 2015).

With this in mind, it is easy to see that despite the anti-higher education rhetoric seen in contemporary discussion (Caplan, 2018), completing a bachelor degree can be a transformative experience for the graduate as well as for the family and community circles which surround them. This social-ecological perspective (Bronfenbrenner, 1999) of concentric impact helps clarify the role and importance of college education, through completion, not simply through a reductive college experience as is often seen in popular media (Hua, 2015). There is ample research demonstrating that degree completion is about far more than just having a college experience or getting a better job. It is a critical step toward attaining a better quality of life (McMahon, 2009).
Institutional Benefits of Degree Completion

In the late 1980s, Dr. Vincent Tinto wrote extensively on the issue of degree completion at higher education institutions, “more students leave their college or university prior to degree completion than stay” (Tinto, 1987, p. 1). This troubling trend continues today and is one of the most prominent issues facing higher education. Increased scrutiny of institutional performance and links between institutional funding and performance metrics has led to heightened focus on student retention, persistence, and timely degree completion.

One issue is a change in funding for public institutions. Prior to 1945, institutions of higher education were primarily publicly funded based on the perceived benefits that an educated populace had on their communities (T. Bailey, Calcagno, Jenkins, Leinbach, & Kienzl, 2006; Heller, 2009). As public funding for higher education has decreased throughout the U.S., different funding models were adopted by various states (Mitchell, Leachman, & Masterson, 2016; Mortenson, 2012). Low retention and degree completion rates (NCES, 2006) resulted in the advent of performance-based funding (Hearn, 2015) and added a heightened imperative for institutions to improve retention and degree completion rates (Complete College America, 2018). Published degree completion rates are most commonly defined by the Integrated Postsecondary Education Data System (IPEDS) and are often included in the performance-based funding models at the state level (NCES, 2018). These funding models indicate how much funding a school will receive or be denied based, in whole or part, on degree completion metrics.

In light of the potentially punitive financial structure of performance-based
funding, many institutions are trying to understand why students do not complete their
degree (Astin, Tsui, & Avalos, 1996). Further, these institutions want to know how they
can increase the likelihood that a student will graduate (Barefoot, 2004), often by
building targeted student interventions and programming. One response from these
institutions to investigate degree completion is to turn to big data. Big data is the
application of large volumes of data at a rapid pace from a variety of sources into a large
analytical tool with the intent to turn that information into decision-making power
(McAfee & Brynjolfsson, 2012). The incredible surge of big data discussions in higher
education and the private market response of analytic tools being sold to colleges and
universities speaks to the prioritization of institutions trying to understand and predict
their students’ behavior and a desire to have data-enabled executives (Gagliardi & Turk,
2017). As institutions focus on improving potential outcomes for students and increasing
graduation rates, each must examine the data available to identify where strengths are and
what improvements must be made. To tackle this significant appetite for useable data,
companies have created massive analytic tools capable of processing thousands of
variables and attempting to predict a student’s likelihood of retaining and graduating.

Institutional prerogative is to increase student success, primarily defined by
student retention and degree completion, using any tools available to them. Identifying
effective processes and tools while engaging in rich data analysis is becoming an
expectation for institutions throughout the U.S. Leveraging this information in an
intelligent and strategic manner may lead to improved student outcomes.
Student Success Analytics

Student success analytics is a relatively young field, finding its roots in the 1990s business boom of data-based decision making and evolving to address higher education needs in the early 2000s (Lane, 2014). “Analytics marries large data sets, statistical techniques, and predictive modeling” (Campbell, Deblois, & Oblinger, 2007, p. 42) to provide a knowledge base for higher education leaders to understand, in simplified form, the conglomeration of thousands of data points. These large-scale analytic tools come in a variety of types with varying capabilities. Although these tools are not “panaceas for addressing all of the issues and decisions faced by higher education administrators” (Picciano, 2012, p. 9), they provide powerful and informative dashboards with a variety of applications.

Student success analytics are used in enrollment management to inform targeted student outreach and intervention to increase likelihood of retention and graduation (Ekowo & Palmer, 2016). The intent is that the analytic tools will shorten the institution’s cycle of understanding what happens with a student and why it happened, enabling the institution to act more quickly to support that student (Baer & Norris, 2015). Data is gathered from a number of variable types including student behavior (e.g., residence hall, cafeteria, student activities), learning and student success analytics (e.g., course performance, lab attendance; Arnold & Pistilli, 2012), and profile information (e.g., demographic factors, high school GPA, entrance test scores, socioeconomic status). This data is mined and put into a statistical model with predictive power and generally results in a student rating which indicates how likely individuals are to succeed (Daniel, 2015).
Retention and Completion Models

The body of research around retention and completion has two primary models, the student attrition model and the student integration model. The student attrition model looks at variables outside of the institution that may impact a student’s decision to remain enrolled. The student integration model focuses on student involvement in and throughout campus personally and academically. Research indicates that “[k]ey influences on a student’s successful integration into the institution include family background, personal characteristics, prior schooling, prior academic performance, and interactions between students and teachers” (Lassibille, 2011, p. 3). It is important to note that one must account for student characteristics when they enter college. The combination of these factors must be considered to better analyze the contributing and confounding factors of a student’s likelihood to persist through degree completion (Pascarella & Terenzini, 2005). As Lassibille noted, the combination of the student attrition model and the student integration models leads to the most effective outcomes. Results of these models have been used by multiple companies to build student analytic models and commodify the analysis process.

Predictions of contemporary research indicate that institutions who transition to “data-informed planning, decision making, and teaching and learning will hold significant competitive advantage and quality advantages over those who do not” (Arnold, Lynch, et al., 2014, p. 257). The decision to use an analytic tool or set of tools (internal or purchased) must go through a rigorous review process to ensure the wide variety of analytic options to meet the needs of each specific institution. There are two
major types of analytic tools currently available in the learning analytic market, static and adaptive analytic tools. Each tool has their own approach and function but also has fundamental differences in methodology and function.

**Static Analytic Tools**

Static analytic tools were the quickest to come to market and required the lowest annual investment of several to tens of thousands of dollars per year. These static tools, which are simpler to execute at the institution level, are typically the most affordable option in market. However, even these lower-cost tools may be financially inaccessible for institutions with challenging financial circumstances. Using a static tool may also provide challenges for some institutions. This plug and play approach may work for the campuses that most similarly approximate the design sample, but there are issues with how they can be applied when a student body does not approximate the tool’s sample. These tools typically use a small number of variables as predictive factors, ranging from 6-30 total variables. The power of these tools is limited in comparison with an adaptive tool.

**Adaptive Analytic Tools**

Adaptive analytic tools were also brought to the market, largely to address the issues seen with static models. These customizable tools can use hundreds to thousands of variables in their tool, providing robust and meaningful analysis by identifying the predictive variables for each individual student population (Milliron, Malcolm, & Kil, 2014). The cost of these tools can be prohibitive, with significantly higher annual costs,
typically upwards of $300,000 annually. For those schools that can afford both the fiscal burden and the labor necessary to operate the tool successfully, an adaptive tool typically performs at a significantly higher level than static tool peers, producing more accurate and useable predictive data. However, the dramatically higher cost may put an adaptive tool out of reach for some programs and institutions.

**Preparation for Success**

With both the static and adaptive analytic tools, there is significant preparation that must be considered. The Learning Analytics Readiness Instrument is a valuable assessment process for institutions to assess their readiness to adopt a learning analytic approach at their institution (Arnold, Lonn, & Pistilli, 2014). Topics to be considered include technical infrastructure, data governance, and culture change management (Colver, 2018). Technical infrastructure is a relatively straightforward concept, wherein the institution must have the hardware, software, and ancillary resources necessary to support data architecture, software, and execution. Data governance infers that the correct security protocols, reporting mechanisms, and policies around data collection and storage are in place. Last, all of the technical and data components may be in place and able to successfully execute a student success or learning analytic process, but if culture change management is not proactively implemented, the data will likely go unused or be greatly underused (Baldasare, Vito, & Chaney, 2017).

**Limitations of Adaptive and Static Large-Scale Analytic Tools**

As discussed by Ioakim Boutakidis, “…it is crucial that faculty and staff
understand the kinds of questions that big data can – and cannot – answer about students.” (2019, p. 1). Institutions employing analytic tools share the same challenge – they can only use the data they have available, and typically that data must be pulled from one congruent system. Poor data governance, where institutions track relevant information in multiple systems or locations, can lead to inaccessible data which could be important in understanding student success. There are also limitations on how many variables an institution can include in the tool. In static tools, this may be 6-30 variables, where an adaptive tool may use hundreds. An additional challenge exists when an institution is missing data necessary to understand their unique student body. It is paramount to remember there are potential factors impacting students that are not tracked in student records and subsequently, are not included in the analysis. Although there may be some data that is simply not feasible to track, using institutional insights such as anecdotal experiences and observation, may provide ideas of what factors are impacting students which are not on record (Komarraju, Musulkin, & Bhattacharya, 2010). In some cases, it may be appropriate to begin tracking that data and in other cases it would simply be inappropriate to do so.

**Disadvantages of Adaptive and Static Large-Scale Analytic Tools**

When inappropriately used for enrollment management, students may be unintentionally discriminated against because they are identified as less likely to succeed based on their race, ethnicity, gender, or other demographic factors. Further discrimination can occur when results are misinterpreted. Ekowo and Palmer (2016)
found that students’ likelihood to succeed was incorrectly attributed to their demographic profile, rather than other intervening or confounding variables which may impact them.

When using a large-scale analytic tool, variables which are significant for one institution may not be significant for another. In the examples provided by Campbell et al. (2007), the most influential variables for their sample institutions were fundamentally different. For Baylor students and University of Alabama students, the most important variables correlated with student retention were not at all closely related, as shown in Table 1.

Table 1

*Most Significant Predictive Variables by Institution*

<table>
<thead>
<tr>
<th>Baylor University</th>
<th>University of Alabama</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Attendance of a premier event</td>
<td>• Cumulative institution GPA</td>
</tr>
<tr>
<td>• Campus visit</td>
<td>• English course and grade</td>
</tr>
<tr>
<td>• Extracurricular interest</td>
<td>• Distance from campus to home</td>
</tr>
<tr>
<td>• High school attended</td>
<td>• Race</td>
</tr>
<tr>
<td>• Baylor level of interest score</td>
<td>• Math course grade</td>
</tr>
<tr>
<td>• SAT score</td>
<td>• Total earned hours</td>
</tr>
<tr>
<td>• Number of self-initiated contact</td>
<td>• Highest ACT or SAT score</td>
</tr>
</tbody>
</table>

*Note.* All variables from Campbell et al. (2007).

Differences between static and adaptive analytic tools are distinct. Static tools typically use preset variables and run analysis on each institution with only those variables. Simply put, a static tool will either fit an institution’s profile or it will not. If the preselected variables are not the right predictors for a specific student body, the tool is rendered useless. An adaptive tool uses upwards of 100 or more variables and using advanced modeling seeks to identify the most important predictive variables for each
institution. Although this provides more situated results for each institution, adaptive tools only work with the data that is available. If there are highly influential factors for a student’s likelihood to persist and they are not tracked by the institution, those factors are never considered and likely will remain unknown. At large institutions it is also important to assess subgroups of students to identify any unique patterns. However, these students must be uniquely tagged or identified to compare and contrast the subgroup(s) with the larger student body. These issues necessitate an individual analysis model to identify and address issues specific to each student body. Further, it is may be challenging with a large student body to identify what variables are predictive for specific subgroups of students.

Student success analytics have an important role to play in the information era. When selected carefully, implemented correctly, and executed successfully, these tools can have a significant positive return on an institution’s ability to anticipate and respond to student needs. By better understanding the barriers between a student and graduation, institutions can remove or limit some and help students navigate any barriers that are not moveable. By increasing students’ likelihood of degree completion, the institution fulfills customer, internal, and societal obligations: the ethical obligation to serve students and help them graduate, the financial imperative to graduate students, and the societal imperative to increase the educated populace contributing to the overall benefits of degree completion for individuals, families, and their communities.

Conceptual Framework

The primary reason for emphasizing degree completion as an institutional leader
is in the ethical interest of the student and for the betterment of society. Professional, personal, community, and family benefits of degree completion are numerous and broadly contribute to individual development and building a better community (Baum et al., 2013; Carnevale, Rose, & Cheah, 2011; Lawrence, 2017; Pascarella & Terenzini, 2005; Trostel, 2015; Walsemann, Bell, & Hummer, 2012). The body of research supports Dewey’s “great faith in the power of education to improve society” and abundantly supports that “[e]ducational attainment is positively associated with improved health, household economic success, marital satisfaction and duration, parenting skills, child wellbeing, civic engagement, and social and cognitive development.” (Johnson & Christensen, 2014, p. 63).

A secondary reason for emphasizing degree completion as a leader is performance-based funding (Hearn, 2015; Pew Charitable Trust, 2015), which determines, in part, the amount of funding an institution receives and the subsequent ability to support students with those funds. Helping students earn the degree they desire is not only the ethical thing to do for the student and society, there is also a financial component to consider (Barr, 2016; Schuh, 2016). In 2015, the State of Utah implemented performance-based funding, establishing new standards to which state institutions, including UVU, would be held (Buhler, 2016; Pratt & Young, 2015). One of the primary metrics is degree efficiency, as reflected in IPEDS 6-year degree completion rates (Utah System of Higher Education, 2015).
Need for Individualized Analysis

Institutional leaders must know enough about their school’s context and culture to understand what factors might be relevant in their data-based decision making. Student success analytics have powerful algorithms attempting to identify predictive variables for students on their path to graduation. Although there are many benefits of these tools, limitations around what data can be included means that outside research will always be necessary. When there is a need to better understand student enrollment patterns, the individual analysis model (see Figure 1) can be utilized to ensure all available resources are marshalled. Quality data sources are a pivotal component to successful analysis of any kind. One source that is often neglected is the institutional insight that comes from front line student service employees and faculty who work with students day to day. These are important variables to include in any analytic tool and the type and significance of those variables may change from one institution to another (see Table 1 for example). Each institution will need to use institutional insight, institutional data, and published research to identify what is most relevant for them.

Demonstration Case

UVU was selected as a demonstration case showing the need for an individual analysis model. To provide historical context, in 2015 an analytic software tool, which the researcher calls Platform A, was purchased at UVU. This tool examined 20 key variables described as critical indicators that were intended to predict student retention and degree completion. These variables were static, selected by the software company
Figure 1. Individual analysis model to guide institutions through evaluation of retention, persistence, or graduation issues.
based on prior work with other institutions and their own sample population. After an 18 month use of the tool, UVU found that none of the 20 variables were significant when attempting to predict retention and completion. The pre-packaged tool simply did not work with this student body. Platform A was designed to use data within student records to identify students who were at a statistical risk of dropout and had proven success at dozens of other campuses. After implementation at UVU, it was quickly discovered that this product’s algorithm prioritized characteristics and student behaviors that were not significant factors for UVU students and did not prioritize other characteristics that were more typical of the institution’s student body. The tool was rigid and the fixed algorithm did not provide the flexibility necessary to use different variables at different schools. Purchasing a one-size-fits-all product was simply not an effective solution for UVU. Thus, to effectively understand this institution’s performance metrics in retention, persistence, or degree completion, an analytic tool that is effective with institution-specific student data may identify patterns in student enrollment behavior that a plug and play analysis tool may not see.

In a subsequent attempt at a data solution, UVU purchased an adaptive analytic platform in 2017 which the researcher called Platform B. Those involved in the product selection hoped that the flexibility of Platform B’s selection of variables would address the issues found in Platform A. At the time of this study, UVU was in the early stages of implementation and use of Platform B and the responsive algorithms and predictive variables in the tool have proven to better represent the student body. The unique benefit of Platform B is that by using several years of historical data and selecting specific
student characteristics to monitor, Platform B can identify impact to students both positive and negative as it relates to their likelihood of persisting. In the coming years, UVU will have enough data to determine effectiveness and accuracy of this $250,000 annual investment. Other institutions have seen accuracy rates of 90% (Carling, 2018), indicating Platform B is a formidable tool from which leaders can have very powerful analytics at their disposal.

Although this adaptive tool incorporates far more variables than the preceding static tool, there are still limits to what is included in the model. The limited number of custom variables an institution may include does provide a challenge. Due to this limitation, there are some departments that believe their students are missing out on the benefit of this predictive tool because factors that are significant to that student subgroup are not included in the data. Perhaps that variable is not believed to be impactful for the larger student body, but observation shows that it may be important for a subgroup of students. Further, limitations exist; for example, departments on campus are told it is not an option to test the impact of particular variables unless you have a treatment group with a minimum of 100 students and an equal or greater sized control group. Due to service models used in student affairs, control groups may not exist (Varlotta, 2016). An even more difficult circumstance occurs when potential impactful data is not logged in a system that is integrated with Platform B or perhaps it is not tracked at all. It is challenging for a low- or mid-level leader in department or program to fully invest in an adaptive tool when the model is missing potentially important variables impacting their assigned student subgroup. This type of challenge is in effect at UVU, the demonstration
A subgroup of students is not performing at expected rates and the minimal data available regarding the issue indicates factors not used in Platform B. UVU’s experiences with these big data tools highlight the need not just for customizable tools, but individual analysis to ensure the tools are best using data unique to each student body. The localizations and patterns of student behavior are different and should be treated as such. Subsequently, the author created an individual analysis model that may be adopted to assess needs of entire student populations or subgroups of students. This is important if a group of students is defying typical statistical trends.

In order to directly address the unique needs of UVU, an individual analysis must be employed. Prior attempts at UVU to better understand degree completion patterns were not successful in regards to variables related to family formation. The use of static analytic tools failed because these items were not included in the tool. By employing the Individual Analysis Model, the goal was to help UVU better understand the marital status and dependent status variables and their relationship to students’ degree completion. Although the institution would not directly impact student choices on when to change marital status or dependent status, knowing these events are connected to enrollment behavior would allow the school to design strategic intervention and support services. Ideally, this information keeps students on a path to graduation. Degree completion allows the student to gain the life-changing benefits that come with a college degree, improve community surrounding the graduate, and improve performance-based metrics for the institution.
Individualized Analysis Model

As institutions decide that large-scale data analytics may be a beneficial resource for their decision making, it becomes imperative to review the available options and select the best fit for each institution. Although all higher education institutions have a similar goal – to educate their students – each school has its own unique characteristics, foci, and challenges. Ensuring the analytic tool selected fits the budget, labor, and outcomes of each institution is critical. However, it is not enough for leaders to adopt national practices or products and blindly apply them to their institution (Ekowo & Palmer, 2016). Rather, an individualized model must be applied to institutional data in order to identify issues relevant to that institution’s student body and the regional context in which they exist.

To better understand how to address retention and completion relevant to one’s institution, research and analysis must be conducted with institutional data and regional context to fill the knowledge gap on the possible predictors of dropout (Bean, 1980) and successful degree completion (Bound et al., 2010). This type of analysis allows for highly informed, data-based decision making. To develop effective student programs, it is essential to understand the context of the institution and student body (Wagner, 2015) to ensure designs are relevant to that unique population, which may improve student success as measured by retention, persistence, and timely degree completion (White, 2005). Figure 1 shows the Individual Analysis Model for retention, persistence, or graduation issues developed for this research study.

To demonstrate the importance of localized, individualized, institution-specific
research, this study examined the topic of female degree completion in the U.S. and Utah and how this was relevant to issues related to the chosen demonstration case at UVU. The following sections are important factors found in the research phases A through A4 of the individual analysis model and are subsequently described.

**National Performance Metrics**

Historically, women completed degrees at lower rates than men. As recently as the 1960s there were institutionalized gender bias in schooling, vocational guidance, and frequent sex-stereotyping by counselors and teachers (Tyack & Cuban, 2009, p. 27). However, in the 1980s women were enrolling in college at ever-increasing rates. By the mid-1990s, more women were completing college degrees than men by a notable margin (Goldin, Katz, & Kuziemko, 2006). This significant shift may be interpreted as a deficit for men or as an attempt to level the playing field for women who have been at a historical educational, financial, and social disadvantage (Niemi, 2017).

It was no wonder young women in the 1960s and 70s began flocking to college; they anticipated a greater likelihood of working and research began showing a myriad of social benefits (Goldin et al., 2006). Women’s increased incentives to complete a degree included higher rates of happiness and self-concept, healthier and happier relationships, more stable and flexible employment, increased happiness with their partners, and healthier and happier children who do better in school and participate in character-building after-school activities. These women are also more likely to volunteer, contribute to charitable causes, and serve in leadership roles, contributing powerful resources and insight to their communities. Degrees certainly open the door to
professional growth and opportunity, but they allow for the opportunity of so much more. The wide-spread impact of education and a degree in a woman’s life helps her become the best version of herself and positively impacts each of the circles which surround her.

Contemporary data indicates that females out-enroll, out-perform, and out-graduate their male peers by a significant margin (Conger & Dickson, 2017). With this accurate, national data, how a leader may choose to approach retention and completion at their institution would indicate that the students who are succeeding most, the female students, likely need the least help. Without employing an individual model of analysis, these leaders may assume that directed support of the female student population at their institution is not a critical part of the picture to improve degree completion. Bringing in regional context can provide crucial information and perspective in the complex performance conversation.

**Utah Performance Metrics**

Higher education institutions in Utah demonstrate an inverse trend of enrollment and degree completion when compared with national statistics (Adebayo, 2008). The demonstration case institution, UVU, is located in Utah and is a part of this inverse trend. In Utah, approximately 49% of higher education students are women compared to the national statistic of 57% (Madsen, Hanewicz, Thackeray, & King, 2010, p. 4). Utah women are also below the national averages for graduation at every certificate and degree level. Although the last 10 years show some improvement, there remains a significant gap “that keep Utah from reaching its educational and economic potential” (Jeppsen, 2018, p. 1). The Utah trend line is reflective of national female graduation percentages,
but the rates themselves are approximately 5-11% lower within each award level (Madsen et al., 2010). In short, women are not entering college, retaining, persisting, or graduating at national averages.

Research supporting the importance of diversity in higher education is well documented (Gurin, Dey, Hurtado, & Gurin, 2002). Beyond the improved learning outcomes and enriched classroom environments that learning brings, gender diversity specifically matters long after students have left college. The impact of educational attainment one’s employment potential, income, and stability are critical factors in the economic well-being of individuals (Julian, 2012; Pandey, Zhan, & Kim, 2006). Higher education elevates one’s future career. Public institutions in Utah recently reached parity in gender enrollment as shown in Figure 2. This is a significant accomplishment and it is fair to assume that institutions want all of their students to graduate so they can reap the benefits of their education and degree. However, there are issues that disproportionately impact women, enhancing the importance of a college degree for women as compared with men who do not shoulder the same challenges. First is the perception of employment patterns and family structures in Utah that influence what young women and their families believe their lives will look like (Hanewicz & Madsen, 2011). A common perception is that most young women will go on to marry, have children, and remain out of the work force as a stay at home parent while their husband provides for financial support for the family (Beaman, 2001; Hall, 2008; Madsen & Hanewicz, 2011b). Subsequently, there is no need to prepare for future employment and the ability to be independently financially stable. Utah’s divorce rates are higher than national rates,
though Utahns are also more likely to remarry (Public Health Indicator Based Information System, 2019). Modern data like this shows a very different reality:

- 27% of women in Utah never marry (Langston, 2014)
- 72% of women ages 20-59 are in the workforce (U.S. Census Bureau, 2015a)
- 58% of married Utah women work outside the home (Langston, 2014)
- 52% of single and dual-parent families with children under age six have all parents working (Kids Count Data Center, 2018)
- 26% of women in Utah are the primary or sole earner (Glynn, 2016)
- 43.9% of Utah’s workforce are women (U.S. Census Bureau, 2015b)
- 25% of homes with a female head of household live below the poverty line (National Partnership for Women and Families, 2019)

Additional factors like the gender wage gap (American Association of University Women, 2019), unequal representation in government (Stevens, 2018), and an imbalance of unpaid care work creating addition burden for women (Carlson, 2017) add to the complex challenge women face and highlight the importance of a college degree.
Research shows that “…prior to 1990 Utah women showed a higher rate of college graduation than women nationally. In the 1990s, Utah women lost their “bachelor’s degree or higher” educational edge.” (Langston, 2014, p. 2). This was a stark contrast to the current data that shows men in Utah graduate at a rate higher than the national trend (DiPrete & Buchmann, 2006). In 2014, Utah had the largest gap between female and male degree completion (Langston, 2014), with males graduating at a significantly higher rate. This is opposite the national trend and a troubling indicator. Further, many dismiss the phenomenon of female non-completion as a cultural artifact of the area. Research has yet to support this concept; there is limited data available to understand the pattern and how to prevent it. Just four miles from UVU sits a private institution, Brigham Young University (BYU) who publishes a graduation rate of 49% female and 51% male (2019b). BYU pulls from the same majority religion as UVU, however 68% of BYU’s student population is from out of Utah and 32% from within the state (Brigham Young University, 2019a). Compare this with UVU as a regional serving institution and where only 13% of students are from out of the state and 87% of the student population is from Utah (UVU Institutional Research, 2018b). This highlights the need for an individualized model that takes the institution’s context into consideration.

This critical regional context brings a completely different light to the topic of performance metrics in this state. Instead of assuming that female students would continue to retain and graduate as national data indicates, research highlights the discrepancy that female students within the Utah region and at public institutions like UVU are not graduating like their female peers throughout the country. This is notable
issue in retention and completion. Completing degrees at rates 5-11% lower in each degree level is a very significant finding in a field where 1-2% improvement is considered a highly successful endeavor.

Triangulation of data which highlighted to the demonstration case’s needs for an individual analysis model are as follows. First, Utah’s low female degree completion rates (Utah Foundation, 2009) in contrast to national trends. The publication of institutional data at UVU shows that low female degree completion is especially epidemic at this institution and is not keeping pace with improving rates at in-state peer institutions as shown in Figure 3 (UVU Institutional Research, 2017a). Second, the limited research on Utah’s low female college enrollment, persistence, and graduation is qualitative in nature and has a state-wide scope (Madsen & Hanewicz, 2011a). These projects indicate family formation patterns impact women’s college enrollment and progress (Jeppsen, 2018). Third, census data that indicates the average age of first marriage for a woman in Utah is 24, and UVU’s data shows that female students drop out before they reach age 22 (Matthews, 2017). Anecdotal observations by faculty and staff indicate that they believe students are dropping out when they get married and/or have children. Given the aforementioned data, some exploration and explanation are needed for UVU leaders to make informed decisions about how to address the low enrollment and graduation challenges. Because the institution does not track marital status or the student’s status of children dependents, the big data platform used by the institution is unable to account for these factors. In order to ask students to disclose additional personal information on an annual or more frequent basis, justification must be made. This
individualized study of the interactions of these factors that UVU’s student body provides is important to better understand the issue and support informed decision-making.

![Percentage of degrees awarded to female students](image)

*Figure 3.* Percentage of degrees awarded to female students, shown for each institution of the Utah System of Higher Education. Reprinted from “Female student retention & completion: Executive fact sheet,” with permission.

**UVU Performance Metrics**

UVU is a large, public, open-enrollment university in Utah where retention and completion are at the forefront of institutional attention (Astin, 1997). The university has made great strides in both retention and completion (UVU, 2017) in the last 10 years and seeks continued improvement based on measurements tracked by IPEDS and the College Score Card program (U.S. Department of Education, 2015). Yet, inequity in degree completion by gender is a continuing challenge. Serving approximately 40,000 students, only 47% of the student body is female in contrast with nation-wide peers who have a nearly 60:40 female to male ratio (UVU Institutional Research, 2017b). While women are
under-enrolling at UVU, there is one aspect in which UVU’s female students perform similarly to their national peers – they outperform their male peers academically. This implies that academic rigor and student ability is likely not a significant factor in the female degree completion correlates.

UVU serves as an example of why one formula does not fit all institutions. Functioning as a dual-mission institution (Deseret News Editorial Board, 2018), UVU provides technical education as well as traditional baccalaureate and master’s degree programs. The student body itself is largely nontraditional (NCES, 2006). Unique traits of the student body include a large percentage of students who are married and who have children; the majority of students also work more than 20 hours per week (Dundes & Marx, 2006; UVU Institutional Research & Information, 2016). An individualized model of analysis will provide much more accurate information for data-based leadership decisions.

There are many unique characteristics surrounding UVU, one of the most apparent is the cultural influence of the predominant religion, the Church of Jesus Christ of Latter-day Saints. UVU falls into what is called the Mormon Cultural Region (Haws, 2013) which due to church colonization during the mid-1800’s (Meinig, 2010), remains a significant influence within regional culture even with demographic trends (Perlich, 2006, 2017) shifting away from a majority religion.

Some research has already been done on the relationships between female identity and education within the religious context of Utah (Beaman, 2001; Hall, 2008; Mihelich & Storrs, 2003), but none have specifically assessed student behavior in a large student
sample or with quantitative methods. There are many potentially meaningful variables at play with UVU’s student population, a significant and consistent increase in enrollment at UVU since 2008 and a change in the age of religious service within The Church of Jesus Christ of Latter-day Saints, which draws a significant proportion of students (UVU Institutional Research, 2018a).

A recent study indicates that “Utah men and women actively pursue postsecondary education, but they do so according to different timelines and may be influenced in different ways by demographic characteristics and family formation behaviors” (Jeppsen, 2018, p. 1). Although family formation behaviors, including marrying and having children, may be correlated with women dropping out of college, a new discrepancy appears when comparing national, state, and institutional data. Institutional Research indicates that women still under-enroll at UVU compared to national rates, but they retain and persist at rates higher than their male peers until turning 21 (Matthews, 2017). At that age, women enroll at significantly declining rates. At first glance, this may support the theory of family formation behaviors influencing student enrollment. However, examining that institution data in light of national data from the Census Bureau indicates that from 2010 to 2016 the median age at first marriage for a woman in Utah went from 23.3 to 24.7. For men, it rose from 25.6 to 26.3 (U.S. Census American Community Survey, 2016). With traditionally aged freshman starting college at age 18-19, these students, both female and male, should be able to complete their degrees before marriage and children enter the picture. This institutional data indicates that for UVU, family formation may not tell the whole story. An individualized research
approach is necessary.

To better cognize UVU’s unique student population in reference to low female degree completion rates and in light of research indicating family formation is a significant factor in female college student behaviors (Jeppsen, 2018), this research project intended to better understand the relationship between student progress toward degree and their marital status and number of dependents using an individualized model of analysis. Using this model may find correlations that could inform student programming and support increased female degree completion rates. This study serves as an example of using an individualized research model to better understand a unique student population and how to address performance metric issues within an institution.

Summary

Educational research is a uniquely challenging venture (Berliner, 2002; Hoy & Adams, 2015; Labaree, 2003) and explicit cause and effect relationships are unlikely to be found. However, research may identify correlative or predictive factors that would help identify students at risk of dropout by “predicting the future status of one or more dependent variables” (Johnson & Christensen, 2014, p. 408). Also, it is in the interest of individual students, the community, and institutions to increase the percentage of citizens completing a degree. An individualized model of analysis is supported with the following example. In Utah, the low degree completion data for female students is a unique interest. Because current research indicates family formation as a potential barrier and traditional college student ages coincide with Utah’s young age of marriage and child-bearing
(Langston, 2014), it is important to understand what relationship these factors have on progress toward degree. In this demonstration case, UVU leaders will benefit from increased knowledge about the issue in order to design effective student programs (Kuh, Kinzie, Schuh, & Whitt, 2010).
CHAPTER III
METHODOLOGY

Introduction

This study describes the importance of an individualized analysis model being implemented at an institution of higher education to identify best strategic options for data analysis given that institution’s unique circumstances and student body. UVU’s unique data anomaly of low female degree completion highlights the need for an individualized analysis model. The inconsistencies in data include gaps between national female degree completion averages, state averages, and UVU’s degree completion rates. It also includes the inconsistency described by researchers as the impact of family formation (Jeppsen, 2018) on female enrollment compared with the median age of marriage and first child for the same population. Static and adaptive analytic tools were unable to answer questions raised by prior research, specifically that family formation had a significant impact on female degree completion in the State of Utah. Because marital status was not tracked after admission and dependent status was never tracked by the institution, it was not possible to include these variables in an analytic tool. To explore the relationship between marital status and dependent status and students’ degree completion, this study was conducted. The demonstration case explored the relationship between students’ likelihood of completing their degree and their marital status, dependent status, and changes in those variables. Race, ethnicity, gender, and age were used to stratify and clarify the data.
The study is exploratory in nature and results are not generalizable. Findings provide previously unknown insights to the student population and are intended to provide direction for future research and possible inclusion of these factors in a large-scale data analysis if determined appropriate. Overall, the intention of this study is to use exploratory tactics to inform decision-making in this case and foster future research while demonstrating the importance of the individual analysis model to meet unique needs both supplementing and informing the use of big data analytic tools.

**Research Questions**

RQ1: What is the relationship between student degree completion within the observation period and their marital status?

RQ2: What is the relationship between student degree completion within the observation period and their dependent status?

RQ3: Are there differences in student degree completion probability by gender?

**Research Setting and Context**

Individual analysis model phases A through A4 (see Figure 1) indicate that students marry young and have children at a young age. Census data backs this supposition, showing that Utah has a young age of first marriage compared to the national average and that there is both a high birth rate and younger average age of parents when they have their first child (U.S. Census American Community Survey, 2016). While marital status was used in UVU’s adaptive analytic tool, Platform B, the
data pulled from the student’s application data does not reflect changes to their marital status throughout their enrollment at the institution. Number of dependents is not included in the analytic tool at all because this data is not tracked by the institution in any way. Subsequently, any change in a student’s marital status or change in their dependent status were not used in the analytical tool and are not considered in persistence calculations. There were logical reasons these variables were not included; however, institutional insight based on anecdotal observation indicates that students drop out when they marry or have children. With these contradicting and influential factors at play, the institution should, at minimum, consider what impact these variables have. If exploratory research shows that there may be a relationship between these factors as the student’s progresses toward degree, it can then be considered for data capture by the institution and perhaps added to Platform B for analysis. This demonstrates that while big data platforms provide unprecedented power (Daniel, 2015), institutions still need an individualized analysis model to review and vet potential factors of each unique student body.

**Research Sample and Data Sources**

Data was obtained through a request of UVU’s Institutional Research office. The research project was approved by Institutional Review Boards at Utah State University and UVU. The data set consists of archived student record data (Johnson & Christensen, 2014, p. 242) from three student cohorts from the 2010-11, 2011-12, and 2012-13 academic years. This historical data allows analysis of three full academic cycles for students containing 150% to 200% of anticipated time to degree completion. The
observation period started in the fall semester of each cohort year and continued through the fall semester of 2018. Cohorts were leveled and tracked sequentially from year one through the observation period, to the conclusion of observation relative to the cohort start date. Table 2 exhibits the academic semesters that are included within each coded sequential year.

Table 2

Coded Sequential Year by Cohort

<table>
<thead>
<tr>
<th>Cohort</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Coded year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2010</td>
<td>Fall 2011</td>
<td>Fall 2012</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Spring 2011</td>
<td>Spring 2012</td>
<td>Spring 2013</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Summer 2011</td>
<td>Summer 2012</td>
<td>Summer 2013</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Fall 2012</td>
<td>Fall 2013</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Spring 2012</td>
<td>Spring 2013</td>
<td>Spring 2014</td>
<td></td>
<td>5</td>
</tr>
<tr>
<td>Summer 2012</td>
<td>Summer 2013</td>
<td>Summer 2014</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Fall 2012</td>
<td>Fall 2013</td>
<td>Fall 2014</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>Spring 2013</td>
<td>Spring 2014</td>
<td>Spring 2015</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>Summer 2013</td>
<td>Summer 2014</td>
<td>Summer 2015</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Fall 2013</td>
<td>Fall 2014</td>
<td>Fall 2015</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring 2014</td>
<td>Spring 2015</td>
<td>Spring 2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer 2014</td>
<td>Summer 2015</td>
<td>Summer 2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall 2014</td>
<td>Fall 2015</td>
<td>Fall 2016</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring 2015</td>
<td>Spring 2016</td>
<td>Spring 2017</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer 2015</td>
<td>Summer 2016</td>
<td>Summer 2017</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall 2015</td>
<td>Fall 2016</td>
<td>Fall 2017</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring 2016</td>
<td>Spring 2017</td>
<td>Spring 2018</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer 2016</td>
<td>Summer 2017</td>
<td>Summer 2018</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall 2016</td>
<td>Fall 2017</td>
<td>Fall 2018</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring 2017</td>
<td>Spring 2018</td>
<td>Summer 2018</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer 2017</td>
<td>Fall 2018</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall 2017</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spring 2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Summer 2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall 2018</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Each cohort year included the incoming students who were first-time students and who indicated they are bachelor degree seeking. The data set also included basic information submitted through their Free Application for Federal Student Aid (FAFSA). FAFSA is voluntary and may only be submitted once per academic year. Amendments to the original submission were possible in case of significant changes in the student’s life. FAFSA was the only mechanism that captures marital status beyond the student’s application to the institution. Dependent status was not captured on the institution application, only via FAFSA submission. For these important, time variant variables, the FAFSA submission was the only mechanism the institution uses to track marital status and dependent status in an ongoing basis.

The scope of this research project was examining how marital status and dependent status interacted with degree completion. Subsequently, the sample used in the survival analysis was limited to students who submitted FAFSA one or more times during the observation period. The dataset used in this project included the most recent version of students’ FAFSA submissions. Important FAFSA factors included in the data set included students’ marital status and whether or not the student claimed dependent(s) for each year the student submitted a FAFSA application. The questions from the federal aid application related to marital status and dependents are listed in the Appendix, Figure A1.

**Data Analysis**

For this project, the researcher selected survival analysis to most accurately
address the research questions. “Survival analysis is a collection of statistical methods that are used to describe, explain, or predict the occurrence and timing of events” (Allison, 2019, p. 86). Although primarily used in the medical field to assess treatment protocol or observe differences in patients over time, it is also often used in the social sciences, specifically education, to assess student behaviors over time and their likelihood of a certain outcome such as high school or college graduation (Murtaugh, Burns, & Schuster, 1999). This type of analysis allows the researcher to account for the timing of the event, which in this case was degree completion, along with the factors of potential impact. This method also allows for censored data, or students who stopped attending prior to the end of the observation period and for the use of multiple start times, or multiple cohorts, with meaningful analysis. To assess more than two predictors concurrently, the researcher selected the Cox proportional hazards regression model (Cox, 1972) within the survival analysis family of statistical methods.

The study used a survival analysis to determine the probability of students completing their degree within the observation period and analysis focused on how different groups of students contrast and compare. Survival analysis was used to inform and enhance data-based decision making (T. E. Murphy, Gaughan, Hume, & Moore, 2010). Specifically, if the variables showed a meaningful relationship, advocating for the collection of this data and its inclusion in an analytic tool is prudent for the data-enabled leaders at UVU.

Variables in the study included the following.

1. Marital Status (categorical variable, coded as: 0 = single/divorced/widowed, 1 = married)
a. The student’s marital status, currently indicated as married, single, divorced, or undisclosed. This is the marital status that was used in analysis for the entirety of that academic year. Changes to the marital status were reflected in the subsequent academic year. To address collinearity between years (i.e. student marital status could change at time during their student cycle), marital status were coded as a categorical variable, coded as: 0 = single, divorced, or widowed and 1 = married.

2. Dependents (categorical variable, yes or no, coded as 0 = no, 1 = yes)

a. The student’s submission of whether or not they have children who are dependent on them for at least 50% of their financial support. Changes to the number of dependents were reflected in the subsequent academic year.

3. Progress toward degree (demi-coded in levels as 0 = completed any bachelor degree within the observed timeframe, 1 = did not complete a bachelor degree in the observed time frame)

a. Degree completion (formal posting of degree or certificate) to the student’s academic transcript. Bachelor degrees granted at UVU: Bachelor of Arts, Bachelor of Fine Art, Bachelor of Music, Bachelor of Social Work, and Bachelor of Science.

The study used survival analysis to examine the probability that a student completes their degree within the observation period, ranging from 150% to 200% of anticipated time to completion. Analysis then compared probabilities when certain student characteristics were considered, such as gender, change of marital status, change in dependents, race or ethnicity, and age.

Definition of the Event

The terms “hazard,” “event,” or “hazard event” are used to describe the event of interest (Willet & Singer, 2003), in this case, completion of a bachelor degree, occurring during observation. The hazard event may occur at any time and the hazard ratio or likelihood of hazard occurring are described in the Exp(B) column of Table 12 in Chapter IV (Findings). The operational definition of the hazard event being observed is the
official awarding of a student’s completion of any bachelor degree to the student’s record. This is indicated as an awarded diploma in the data set. The inclusion of any of the following degrees indicated the event did occur: Bachelor of Arts (BA), Bachelor of Fine Art (BFA), Bachelor of Music (BM), Bachelor of Social Work (BSW), and Bachelor of Science (BS). Awarding of any other type of degree at the certificate, associate, or master levels does not result in the event occurring. If individuals have more than one event occur during observation, only the first is considered in the analysis. This aligns with the premise of the research project, where the benefits of bachelor degree completion and the institutional priority of performance metrics were specifically tied to a student’s first bachelor degree.

**Observation Period**

The observation period of the study began in fall semester of 2010 and continued through fall semester of 2018. The natural origin time (Allison, 2019) was the student’s enrollment as a college student at UVU. This origin time was also when observation begins for the purpose of this study. All students began with a cohort at three intervals, the first cohort began in the fall semester of 2010, the second cohort began in fall semester of 2011, and the third cohort began in fall semester of 2012. Per IPEDS regulations, students starting in winter, spring, or summer semesters are omitted from the cohort. If a student completed a bachelor degree during observation, the event was recorded and coded for analysis (National Center for Education Statistics, 2018).
Censoring

An imperative feature of survival analysis is the ability to right censor cases, “a phenomenon that is almost always present in longitudinal data” (Allison, 2019, p. 86) and indicates that observation ended before the individual experienced the event. Right censoring occurs because the researcher was not able to measure time to the event for any number of reasons. In this study, cases were considered noninformative and right censored (Allison, 2019) when graduation did not occur during the observation window. This may have been because the event did not occur during observation or the students stopped enrolling and simply dropped out of observation.

Time Methods

Time was treated as discrete-time because the researcher was able to identify during which academic year a student’s bachelor degree was awarded. Because it is possible for more than one student’s event to occur in the same observation period, treating observation periods as discrete-time is the most effective way to analyze the data. It is the most appropriate option “for events that can happen at any time but are only observed to occur in discrete intervals” such as sequential academic year (Allison, 2019, p. 89).

Parametric and Semi-Parametric Models

Parametric models assume specific probability distributions and are also better at managing left censoring, and as such, are not a good fit for this analysis (Bian, 2011). This study used the semi-parametric model, Cox regression of survival analysis (Cox,
1972), which is the most common survival analysis method (Willet & Singer, 2003). This method “does not make specific assumptions about the probability distribution of event times” (Allison, 2019, p. 89). Assumptions for the Cox regression were met: observations were independent and the proportionality of hazard did not vary among the cases. No assumptions are made about the shape of the hazard function.

**Covariates**

It was critical to discuss variables available in the data set to define which were used as covariates in the analysis and which were not included. Exclusion of variables with potentially strong correlations could lead to significant bias (Allison, 2019, p. 90). Variables in the data set include the following: Anonymized participant identification number, cohort, admissions type, gender, race/ethnicity, birthdate, diplomas posted with degree type and date, FAFSA marital status for each year throughout observation period, FAFSA dependent status throughout observation period, and number of credits enrolled in each semester through observation.

**Covariate Coding**

Data was coded manually and checked for accuracy. Variables not used in analysis include anonymized participant identification number, admissions type (delimitation to first-year students rendered this variable non-informative), and number of credits enrolled for each semester. The following codes were used to convert the used variables to a coded covariate data set, that would allow for simpler processing via SPSS. Table 3 describes both time invariant and time variant covariates.
Table 3

**Coding of Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Code</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent variable</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degree completion</td>
<td>Academic Year: Year One (1), Year Two (2), Year Three (3), Year Four (4), Year Five (5), Year Six (6), Year Seven (7), Year Eight (8)</td>
<td>Ordinal</td>
</tr>
<tr>
<td><strong>Independent variables: Time invariant covariates</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cohort</td>
<td>2010 (0), 2011 (1), 2012 (2)</td>
<td>Ordinal</td>
</tr>
<tr>
<td>Gender</td>
<td>Female (0), Male (1)</td>
<td>Binary</td>
</tr>
<tr>
<td>Age</td>
<td>Age (range: 0-49)</td>
<td>Continuous</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td>American Indian or Alaska Native (0), Asian (1), Black or African American (2), Hispanic (3), Multi-racial (4), Native Hawaiian or Pacific Islander (5), Non-Resident Alien (6), White (7), Unknown (8)</td>
<td>Categorical</td>
</tr>
<tr>
<td>Any change in marital status</td>
<td>Single/Divorced/Widowed (0), Married (1)</td>
<td>Binary</td>
</tr>
<tr>
<td>Any change in dependent status</td>
<td>No dependent(s) (0), Dependents (1)</td>
<td>Binary</td>
</tr>
<tr>
<td><strong>Independent variables: Time variant covariates</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change single to married</td>
<td>Academic Year: Year One (1), Year Two (2), Year Three (3), Year Four (4), Year Five (5), Year Six (6), Year Seven (7), Year Eight (8)</td>
<td>Ordinal</td>
</tr>
<tr>
<td>Change married to single</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First addition of dependent(s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second addition of dependent(s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First removal of dependent(s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Second removal of dependent(s)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Addition of dependent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removal of dependent</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* There were 2,799 total observations. Dummy coded. Whites used as reference group (0 = not in group, 1 = in group.) All time variant covariates used identical code.

**Exclusions**

The independent variables of change in marital status and change in dependents were established to identify their impact on student degree completion. In addition to these variables, gender, age, and race/ethnicity were used to control for these potential interactions.

As a nonresidential campus, UVU did not have data such as activity attendance,
dining hall use, financial status, health, or other variables which are commonly used in an analytic model. It is important to note that more than 85% of UVU’s student body hold resident status and that more than one third of the population are first generation students (UVU Institutional Research, 2017b). Due to the methods of determining first generation status and how they changed during the observation period, there were significant discrepancies and inconsistencies in the data. Subsequently this data was excluded from the data request in an attempt to avoid misconstruing or misrepresenting first generation student data due to tainted data.

Scope, Limitations, and Delimitations

As a demonstration case, this project will utilize a statistical anomaly of low degree completion rates for females in Utah and delimit to students at UVU. As stated previously, at the initiation of this research project in 2018, UVU did not gather information on students’ number of dependents and did not have the observed cohort’s marital status data beyond the students’ application to the institution. Consequently, the dataset was delimited to UVU students who submitted the Free Application for Federal Student Aid (FAFSA), which indicates both marital status and number of dependents for each year it is submitted. An unfortunate limitation is the low proportion of UVU students who apply for FAFSA. Of the overall student population of approximately 40,000, only 50-60% of those students submit FAFSA in any given year (UVU Institutional Research, 2017b). Because the sample was drawn from this population, there may be challenges with generalizability to the broader UVU population who do not apply
for financial aid and the broader Utah population. However, because this research is intended to be exploratory, these limitations were deemed reasonable to begin to understand the landscape of the topic.

The method of data collection does not allow a confirmation of how many children were added or at what time during the prior year, only that the student indicated that they provide at least 50% of the total support for dependent child(ren). There is also no mechanism to identify if students who have elected not to reenroll have changed their marital status or dependent status. We only have data to evaluate students who have continued to progress toward their degree and the outcomes they have as their marital status or dependent status change.

**Summary**

This research project examined the anomaly of low degree completion rates by female students at UVU. This institution and graduation issue were selected as a demonstration case to implement the individual analysis model (see Figure 1). By following the individual analysis model, the researcher identified that additional analysis was necessary to supplement Platform B, the adaptive analytic tool used by the institution. Data related to students’ marital status and dependent status is not collected by the institution beyond application and consequently financial aid records were requested for this anonymized historical data set. Cox regression was used to run a survival analysis, or time to event analysis, exploring the relationships between time variate and time invariant covariates and the students’ degree completion.
CHAPTER IV
FINDINGS

Introduction

This chapter reports on an exploratory survival analysis study conducted to better understand low female degree completion rates at UVU. Based on current literature’s identification of family formation strategies as having a significant impact on likelihood of graduation (Jeppsen, 2018), this project focuses on the relationship between degree completion and students’ degree completion and student marital and dependent statuses. Because of limitations of large-scale analytic tools, an individual analysis model was developed by the researcher to better understand student behavior and inform how an institution proceeds to support student degree completion and. The research sought to answer the following questions:

RQ1: What is the relationship between student degree completion within the observation period and their marital status?

RQ2: What is the relationship between student degree completion within the observation period and their dependent status?

RQ3: Are there differences in student degree completion probability by gender?

Sample

The sample of students for this research project were taken from historically archived records at UVU. Students included in the sample began at UVU as first-time,
full-time, bachelor degree seeking students in the fall 2010, fall 2011, or fall 2012 academic semesters. This sample provided 3,695 students who entered UVU with the outlined criteria and had the intent and potential to complete their bachelor degree within federally defined guidelines for timely degree completion during the observation period which allows from 150% or 200% of anticipated time to degree. Students were observed from their start of enrollment through the fall 2018 academic semester.

Data Collection

Data was retrieved from historical archived student records by UVU’s Institutional Research after Institutional Review Board approval from both UVU and Utah State University. All student records were anonymized and are not identifiable to the researcher. A sample of the data template is included in Appendix B. The data set includes enrollment, graduation, and demographic information for students from the 2010, 2011, and 2012 cohorts. Data was collected from the student’s application to the university, their enrollment over time, and submitted applications for federal financial aid. Table 4 shows a summary of demographic characteristics of the Combined Sample.

From Population to Sample

UVU’s combined student body over those 3 years totaled 97,627 students, the majority of whom were duplicate students counted over three academic years. Delimiting to first-year students leaves a cohort of approximately 6,000 each cohort year, totaling 18,940 first-year students altogether. Further delimiting to first-time, full-time, bachelor
Table 4

Summary Demographic Statistics of Combined Sample

<table>
<thead>
<tr>
<th>Variables</th>
<th>2010</th>
<th></th>
<th>2011</th>
<th></th>
<th>2012</th>
<th></th>
<th>Combined</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Students</td>
<td>1,187</td>
<td>32.12</td>
<td>1,223</td>
<td>33.10</td>
<td>1,285</td>
<td>34.78</td>
<td>3,695</td>
<td>100.00</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>566</td>
<td>47.68</td>
<td>529</td>
<td>43.25</td>
<td>566</td>
<td>44.05</td>
<td>1,661</td>
<td>44.95</td>
</tr>
<tr>
<td>Male</td>
<td>617</td>
<td>51.98</td>
<td>674</td>
<td>51.02</td>
<td>719</td>
<td>55.95</td>
<td>2,021</td>
<td>54.69</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;19</td>
<td>1,156</td>
<td>97.39</td>
<td>1,205</td>
<td>98.53</td>
<td>1,263</td>
<td>98.29</td>
<td>3,625</td>
<td>98.11</td>
</tr>
<tr>
<td>20-24</td>
<td>15</td>
<td>1.26</td>
<td>8</td>
<td>0.65</td>
<td>15</td>
<td>1.17</td>
<td>42</td>
<td>1.14</td>
</tr>
<tr>
<td>25-29</td>
<td>2</td>
<td>0.17</td>
<td>7</td>
<td>0.57</td>
<td>2</td>
<td>0.16</td>
<td>12</td>
<td>0.32</td>
</tr>
<tr>
<td>30-34</td>
<td>1</td>
<td>0.08</td>
<td>0</td>
<td>0.00</td>
<td>1</td>
<td>0.08</td>
<td>7</td>
<td>0.19</td>
</tr>
<tr>
<td>35-39</td>
<td>3</td>
<td>0.25</td>
<td>1</td>
<td>0.08</td>
<td>3</td>
<td>0.23</td>
<td>4</td>
<td>0.11</td>
</tr>
<tr>
<td>40-44</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
<td>0</td>
<td>0.00</td>
<td>3</td>
<td>0.08</td>
</tr>
<tr>
<td>45-49</td>
<td>1</td>
<td>0.08</td>
<td>2</td>
<td>0.16</td>
<td>1</td>
<td>0.08</td>
<td>3</td>
<td>0.08</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>10</td>
<td>0.84</td>
<td>9</td>
<td>0.74</td>
<td>4</td>
<td>0.31</td>
<td>23</td>
<td>0.62</td>
</tr>
<tr>
<td>Asian</td>
<td>11</td>
<td>0.93</td>
<td>10</td>
<td>0.82</td>
<td>10</td>
<td>0.78</td>
<td>31</td>
<td>0.84</td>
</tr>
<tr>
<td>Black or African American</td>
<td>13</td>
<td>1.10</td>
<td>13</td>
<td>1.06</td>
<td>10</td>
<td>0.78</td>
<td>36</td>
<td>0.97</td>
</tr>
<tr>
<td>Hispanic</td>
<td>114</td>
<td>9.60</td>
<td>148</td>
<td>12.10</td>
<td>148</td>
<td>11.52</td>
<td>410</td>
<td>11.10</td>
</tr>
<tr>
<td>Multi-Racial</td>
<td>14</td>
<td>1.18</td>
<td>27</td>
<td>2.21</td>
<td>21</td>
<td>1.63</td>
<td>62</td>
<td>1.68</td>
</tr>
<tr>
<td>Native Hawaiian or Pacific Islander</td>
<td>17</td>
<td>1.43</td>
<td>6</td>
<td>0.49</td>
<td>8</td>
<td>0.62</td>
<td>31</td>
<td>0.84</td>
</tr>
<tr>
<td>Non-resident Alien</td>
<td>11</td>
<td>0.93</td>
<td>11</td>
<td>0.90</td>
<td>13</td>
<td>1.01</td>
<td>35</td>
<td>0.94</td>
</tr>
<tr>
<td>Unknown</td>
<td>64</td>
<td>5.39</td>
<td>119</td>
<td>9.73</td>
<td>80</td>
<td>6.23</td>
<td>263</td>
<td>7.12</td>
</tr>
<tr>
<td>White</td>
<td>933</td>
<td>78.60</td>
<td>880</td>
<td>71.95</td>
<td>991</td>
<td>77.12</td>
<td>2,804</td>
<td>75.89</td>
</tr>
</tbody>
</table>

Note: There were 3,695 total observations. Age: Mean = 18.16, Median = 18.00, SD = 1.54.

degree-seeking students then brings the combined sample to 3,695 students. Of the combined sample of students, 75% submitted the Free Application for Federal Student Aid (FAFSA) at some point during their enrollment, creating a combined FAFSA sample of 2,799 students. This combined FAFSA sample was used for analysis. Figure 4 diagrams the subject flow from the institution’s student population to the combined FAFSA sample used in survival analysis.
Figure 4. Subject flow diagram of Utah Valley University’s student population from 2010, 2011, and 2012.
Free Application for Federal Student Aid Sample

The total sample in the data set includes all first-time, full-time, bachelor degree seeking students, resulting in 3,695 students as a three-cohort cumulative total. Within this total sample, 896 (24.25%) students did not apply for federal financial aid (FAFSA) during the observation period. The remaining 2,799 (75.75%) students in the sample submitted FAFSA one or more times during the observation period. The FAFSA-submitting sample includes data not available elsewhere in the student’s record and therefore was the focus of the study. However, this summary in Table 5 includes a comparison of total sample to FAFSA sample to ensure representation in the analysis is clear.

Table 5

<table>
<thead>
<tr>
<th>FAFSA submission</th>
<th>Frequency</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total sample</td>
<td>3,695</td>
<td>100.00</td>
</tr>
<tr>
<td>Submitted FAFSA during observation</td>
<td>2,799</td>
<td>75.75</td>
</tr>
<tr>
<td>Did not submit FAFSA during observation</td>
<td>896</td>
<td>24.25</td>
</tr>
</tbody>
</table>

Note. 3,695 total observations.

The combined FAFSA sample represents 75% of the first-time, full-time, bachelor degree seeking students and only 14.7% of the combined first-year cohort, which includes first-time and transfer students, full time and part time students, and students pursuing any certificate, associate, or bachelor level degrees. Because changes in marital status and dependent status were not tracked in UVU student records, it was imperative to capture this data by limiting the sample to students who submitted FAFSA.
Demographic Profile of Free Application for Federal Student Sample

Using the combined FAFSA sample, students were stratified using demographic characteristics. Each characteristic is described first in narrative, then in a summary table combining all characteristics. Descriptive statistics are used to establish context of the combined FAFSA sample.

Cohorts

The cohorts were of similar size from 2010, 2011, and 2012 with students in the total sample numbering 1,187 (32.12%), 1,223 (33.09%), and 1,285 (32.16%) respectively. In the delimited combined FAFSA sample, the cohorts were 911 (32.55%), 949 (33.90%), and 939 (33.55%). In both the total sample and FAFSA sample, each cohort constituted approximately one third of their respective group. The observation periods for each cohort are as follows: 8 years for the 2010 cohort, 7 years for the 2011 cohort, and 6 years for the 2012 cohort. For complete information, see Table 6.

Gender Representation

Of the 3,695-student total sample, 56.5% selected female and 43.4% selected male on their admissions application, which offered only those two options. In the FAFSA sample of 2,799 students, 1644 (41.26%) selected female and 1155 (58.74%) selected male. The FAFSA application only offers a dichotomous choice in the gender category, so all students must select female or male as their response. Female students made up a marginally smaller proportion (3.69%) of the total sample as compared to the FAFSA sample and male students made up a marginally larger proportion (4.05%),
indicating that more male students in the sample submit FAFSA than their female counterparts. For complete information, see Table 6.

### Age Representation

The majority of students in the total sample started college at a traditional age with 3,624 (98.10%) students aged 19 and under, 42 (1.13%) students aged 20-24, 12 (0.32%) students aged 25-29, seven (0.18%) students aged 30-34, four (0.10%) students

<table>
<thead>
<tr>
<th>Variables</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students</td>
<td>911</td>
<td>949</td>
<td>939</td>
<td>2,799</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>378</td>
<td>386</td>
<td>391</td>
<td>1,644</td>
</tr>
<tr>
<td>Male</td>
<td>533</td>
<td>563</td>
<td>548</td>
<td>1,155</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤19</td>
<td>880</td>
<td>931</td>
<td>918</td>
<td>2,729</td>
</tr>
<tr>
<td>20-24</td>
<td>19</td>
<td>8</td>
<td>14</td>
<td>41</td>
</tr>
<tr>
<td>25-29</td>
<td>3</td>
<td>7</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>30-34</td>
<td>6</td>
<td>0</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>35-39</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>40-44</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>45-49</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Race/ethnicity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>10</td>
<td>7</td>
<td>4</td>
<td>21</td>
</tr>
<tr>
<td>Asian</td>
<td>7</td>
<td>7</td>
<td>9</td>
<td>23</td>
</tr>
<tr>
<td>Black or African American</td>
<td>12</td>
<td>13</td>
<td>8</td>
<td>33</td>
</tr>
<tr>
<td>Hispanic</td>
<td>94</td>
<td>119</td>
<td>111</td>
<td>324</td>
</tr>
<tr>
<td>Multi-Racial</td>
<td>12</td>
<td>23</td>
<td>18</td>
<td>53</td>
</tr>
<tr>
<td>Native Hawaiian or Pacific Islander</td>
<td>16</td>
<td>5</td>
<td>6</td>
<td>27</td>
</tr>
<tr>
<td>Non-resident Alien</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Unknown</td>
<td>51</td>
<td>85</td>
<td>64</td>
<td>200</td>
</tr>
<tr>
<td>White</td>
<td>706</td>
<td>689</td>
<td>718</td>
<td>2,113</td>
</tr>
</tbody>
</table>

Note. There were 2,799 total observations. Age: Mean = 18.20, Median = 18.00, SD = 1.76.
aged 35-39, three (0.08%) students aged 40-44, and three (0.08%) students aged 45-49. The majority of students in the FAFSA sample started college at a traditional age with 2,729 (97.50%) of the group beginning college at age 19 or younger. Of the remaining students in the sample, 41 (1.46%) students were ages 20-24, 12 (0.43%) students were ages 25-29, 7 (0.25%) students were ages 30-34, 4 (0.14%) students were ages 35-39, 3 (0.11%) students were ages 40-44, and 3 (0.11%) students were ages 45-49. No students were age 50 or older at the start of their first semester and the mean age of the FAFSA sample is 18.229. Changes in representation from the total sample to the FAFSA sample showed that students starting college at or younger than age 19 applied for FAFSA at a slightly lower rate with a 0.61% decrease in the FAFSA sample. All other ages applied at slightly higher rates with the following increases in the FAFSA sample: ages 20-24 (0.33%), ages 25-29 (0.10%), ages 30-34 (0.06%), ages 35-39 (0.03%), ages 40-44 (0.03%), and ages 45-49 (0.03%). For complete information, see Table 6.

**Race and Ethnicity Representation**

During the application process, students selected one of the following race and ethnicity categories: American Indian or Alaskan Native, Asian, Black or African American, Hispanic, Multi-Racial, Native Hawaiian or Pacific Islander, Non-resident Alien, Unknown (chose not to respond), or White. In the total sample of 3,695 students, 23 (0.62%) students selected American Indian or Alaskan Native, 31 (0.83%) students selected Asian, 36 (0.97%) students selected Black or African American, 410 (11.09%) students selected Hispanic, 62 (1.67%) students selected Multi-racial, 31 (0.83%) students selected Native Hawaiian and Pacific Islander, 35 (0.94%) students selected
Non-Resident Alien, 263 (7.11%) students selected Unknown, 2804 (75.88%) students selected White. In the FAFSA sample of 2,799 students, 21 (0.75%) students selected American Indian or Alaskan Native, 23 (0.82%) students selected Asian, 33 (1.18%) students selected Black or African American, 324 (11.58%) students selected Hispanic, 53 (1.89%) students selected Multi-racial, 27 (0.96%) students selected Native Hawaiian and Pacific Islander, 5 (0.18%) students selected Non-Resident Alien, 200 (7.15%) students selected Unknown, 2113 (75.49%) students selected White. Changes in racial and ethnic representation from the total sample to the FAFSA sample changed as follows: American Indian or Alaskan Native increased 0.13%, Asian decreased 0.02%, Black or African American increased 0.20%, Hispanic increased 0.48%, Multi-Racial increased by 0.22%, Native Hawaiian or Pacific Islander increased by 0.13%, Non-resident Alien decreased by 0.76%, Unknown increased by 0.03%, and White decreased by 0.39%. For complete information, see Table 6.

**Marital Status and Dependent Children**

Change in marital status and number of dependents was only tracked by FAFSA application; therefore, all statistics related to change in marital status and change in the number of children used the student data in the FAFSA sample (2,799 students). Students who did not submit a FAFSA during the observation period were excluded from the subsequent analyses. UVU collects no ongoing information on students’ marital status or number of dependents until they choose to submit FAFSA. For the purposes of this study, the author will assume student status from their first FAFSA submission. Because this
study was exploratory in nature, the results may indicate a benefit to the institution of tracking this type of data on an ongoing basis for all enrolled students, rather than exclusively through voluntary FAFSA submission, which represents approximately 50% of the student body.

**Marital Status**

Within the FAFSA sample, 2,239 (79.99%) did not have a change of their marital status during the observation period and 560 (20.01%) changed their marital status one or more times during the observation period. It was notable that students may fall into more than one category of marital status change; for example, they may marry and later divorce. Students changed their status to married on the following timeline (percentages are expressed as the proportion of the 560 students who married during that given year): 53 (9.46%) during year two, 104 (18.57%) during year three, 122 (21.79%) during year four, 152 (27.14%) during year five, 88 (15.71%) during year six, 27 (4.82%) during year seven, and 14 (2.50%) during year eight. For complete information about the sequence of marital status changes, see Table 7.

Within the subgroup who changed their marital status during observation, the largest proportion started college at age 19 or younger, comprising 554 (98.93%) of the group. An additional five (0.89%) students aged 20-24 married, with a remaining one (0.18%) student aged 30-34 upon enrollment. For complete information, see Table 7.

Among the FAFSA sample, there were no students who changed status from single/divorced/widowed to married who identified as non-resident alien in the race and ethnicity category. With the remaining students who changed status from single/divorced/
Table 7

Descriptive Statistics for Marital Status

<table>
<thead>
<tr>
<th>Changes in marital status</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicated change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No change in martial status</td>
<td>2,239</td>
<td>79.99</td>
</tr>
<tr>
<td>Any change in martial status</td>
<td>560</td>
<td>20.01</td>
</tr>
<tr>
<td>Marital status no change (N = 2,239)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Remained single</td>
<td>1,986</td>
<td>88.70</td>
</tr>
<tr>
<td>Remained married</td>
<td>253</td>
<td>11.30</td>
</tr>
<tr>
<td>Marital status change by age (n = 560)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤19</td>
<td>554</td>
<td>98.93</td>
</tr>
<tr>
<td>20-24</td>
<td>5</td>
<td>0.89</td>
</tr>
<tr>
<td>25-30</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>30-34</td>
<td>1</td>
<td>0.18</td>
</tr>
<tr>
<td>35-39</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>40-44</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>45-49</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Marital status change from single/divorced/widowed to married by race/ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>American Indian or Alaskan Native</td>
<td>2</td>
<td>0.36</td>
</tr>
<tr>
<td>Asian</td>
<td>3</td>
<td>0.54</td>
</tr>
<tr>
<td>Black or African American</td>
<td>4</td>
<td>0.71</td>
</tr>
<tr>
<td>Hispanic</td>
<td>41</td>
<td>7.32</td>
</tr>
<tr>
<td>Multi-racial</td>
<td>7</td>
<td>1.25</td>
</tr>
<tr>
<td>Native Hawaiian or Pacific Islander</td>
<td>3</td>
<td>0.54</td>
</tr>
<tr>
<td>Non-resident Alien</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Unknown</td>
<td>38</td>
<td>6.79</td>
</tr>
<tr>
<td>White</td>
<td>462</td>
<td>82.50</td>
</tr>
</tbody>
</table>

Note. 2,799 students in FAFSA sample.

widowed to married, two (0.36%) identified as American Indian or Alaskan Native, three (0.54%) identified as Asian, four (0.71%) identified as Black or African American, 41 (7.32%) identified as Hispanic, seven (1.25%) identified as Multi-racial, three (0.54%) identified as Native Hawaiian or Pacific Islander, 38 (6.79%) did not identify a race or ethnicity and were coded as Unknown, and 462 (82.50%) where white. For complete
information, see Table 7.

The combined FAFSA sample included 2,239 students who had no change in marital status during their enrollment. There were 1,986 students who started single and maintained that status throughout the observation period, 253 students who started married and maintained that status throughout the observation period, and 560 students who had a change in marital status during the observation period. The 560 students who changed status represent 20% of the combined FAFSA sample. Some of students in this subgroup experienced more than one change. For example, some married and subsequently divorced, and occasionally a student started married and divorced during the observation period. Overall, the largest group of marital change was from single to married. To better cognize the status throughout observation, Figures 5 and 6 diagram the subject flow for marital status. The figures also identifies in which year of enrollment a change in marital status occurred.

It was important to remember there may be students within the combined sample (N = 3,695) who experienced a change in marital status, but it was not captured because the student did not reenroll or submit FAFSA indicating that change. Additional research is needed to explore these student experiences. Comparison between those who reenrolled in school after a change in marital status with those who did not reenroll may highlight specific characteristics or trends to further paint the picture of understanding degree completion at UVU.

**Dependent Children**

Within the student sample who submitted FAFSA, 2,596 (92.75%) never changed
Figure 5. Subject flow diagram of students in the free application for federal student sample and their marital status throughout observation.
Figure 6. Subject flow diagram of students in the free application for federal student sample and their dependent status during observation.
their dependent status and 203 (7.25%) changed their dependent status during observation. It was important to note that students may fall in more than one category of dependent status adding and removing children on different years of FAFSA submission due to birth, death, or by legal mandate (such as a divorce decree) they declare their child on taxes every other year.

Dependent status was a complex variable that plays out as follows: 192 (6.85% of FAFSA sample) students started with no dependent children and added a dependent child during observation. They added a dependent child on the following timeline (percentages expressed as the proportion of the 192 students who added children): 13 (6.77%) during year two, 25 (13.02%) during year three, 33 (17.19%) during year four, 34 (17.71%) during year five, 42 (21.88%) during year six, 25 (13.02%) during year seven, and 20 (10.42%) during year eight. Figure 6 diagrams the subject flow of the dependent status and changes therein. The figure also denotes in which year of enrollment the change occurred.

During observation, the frequency of students adding a dependent child increased from the second to sixth year, then slows again. Table 8 indicates the frequency and proportion of students who add one or more dependent children during observation.

Table 9 describes the eight (0.29%) students who changed status from having dependent children to not having dependent children during observation on the following timeline: four (50.00%) students in year two, two (25.00%) students in year four, one (12.50%) student in year six, and one (12.50%) student in year eight. This small subsample \((N = 8)\) highlights an unusual phenomenon in data where students removed
Table 8

*Descriptive Statistics for Addition of Dependent Child(ren)*

<table>
<thead>
<tr>
<th>Year of dependent addition</th>
<th>Frequency</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>13</td>
<td>6.77</td>
</tr>
<tr>
<td>3</td>
<td>25</td>
<td>13.02</td>
</tr>
<tr>
<td>4</td>
<td>33</td>
<td>17.19</td>
</tr>
<tr>
<td>5</td>
<td>34</td>
<td>17.71</td>
</tr>
<tr>
<td>6</td>
<td>42</td>
<td>21.88</td>
</tr>
<tr>
<td>7</td>
<td>25</td>
<td>13.02</td>
</tr>
<tr>
<td>8</td>
<td>20</td>
<td>10.42</td>
</tr>
</tbody>
</table>

*Note.* 192 observations.

Table 9

*Descriptive Statistics for Removal of Dependent Child(ren)*

<table>
<thead>
<tr>
<th>Year of dependent removal</th>
<th>Frequency</th>
<th>Proportion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4</td>
<td>50.00</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>25.00</td>
</tr>
<tr>
<td>5</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>6</td>
<td>1</td>
<td>12.50</td>
</tr>
<tr>
<td>7</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>8</td>
<td>1</td>
<td>12.50</td>
</tr>
</tbody>
</table>

*Note.* Eight observations.

dependents from their records. The researcher predicts that these are likely due to divorce or the death of a child.

When examining the addition of dependent(s) by the student’s age at time of initial enrollment, 189 (98.44%) of the 192 observations were students 19 or younger at start of enrollment. The remaining three (1.56%) students were aged 20-24 at their start of enrollment. This indicates the FAFSA sample was largely traditionally aged, a typical
observation of IPEDS first-time, full-time, bachelor degree-seeking cohorts. Table 10 contains the descriptive statistics for the 203 (7.25%) students who added one or more dependent(s) and their age.

The group who added dependents consisted of one (0.52%) student who identified as Asian, one (0.52%) student who identified as Black or African American, 19 (9.90%) students who identified as Hispanic, two (1.04%) students who identified as Multi-racial, two (1.04%) students who identified as Native Hawaiian or Pacific Islander, one (0.52%) student who identified as Non-resident Alien, 11 (5.73%) students who did not identify a race or ethnicity and are coded as Unknown, and 155 (80.73%) students who identified as White. Table 10 contains the descriptive statistics for the 203 (7.25%) students who added one or more dependent(s) and their race or ethnicity.

Within the observed dependent status group of 192 students, 141 (73.44%) claimed a married status during observation and 51 (26.56%) claimed a single/divorced/widowed status throughout observation. Table 10 contains the descriptive statistics for the 203 (7.25%) students who added one or more dependent(s) and their marital status.

**Statistical Analysis: Cox Regression**

Cox proportional hazards model was used as a semi-parametric model to assess the relationships between students and their degree completion. Cox regression allows assessment of multiple covariates including time variant and invariant in order to identify if the timing of the covariate had significant impact and throughout analysis makes no assumptions about the shape of the baseline hazard function. This analysis also allows
Table 10

**Summary Statistics for Dependent Status**

<table>
<thead>
<tr>
<th>Changes in dependent status</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indicated change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dependent(s), no change</td>
<td>59</td>
<td>2.11</td>
</tr>
<tr>
<td>No dependents, no change</td>
<td>2,596</td>
<td>92.75</td>
</tr>
<tr>
<td>Added dependent during observation</td>
<td>203</td>
<td>7.25</td>
</tr>
<tr>
<td>Removed dependent during observation</td>
<td>8</td>
<td>0.29</td>
</tr>
<tr>
<td>Dependent(s), no change</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Age**

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 19</td>
<td>189</td>
<td>98.44</td>
</tr>
<tr>
<td>20-24</td>
<td>3</td>
<td>1.56</td>
</tr>
<tr>
<td>25-30</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>30-34</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>35-39</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>40-44</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>45-49</td>
<td>0</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Race/ethnicity**

<table>
<thead>
<tr>
<th>Race/ethnicity</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Indian or Alaskan Native</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td>0.52</td>
</tr>
<tr>
<td>Black or African American</td>
<td>1</td>
<td>0.52</td>
</tr>
<tr>
<td>Hispanic</td>
<td>19</td>
<td>9.90</td>
</tr>
<tr>
<td>Multi-racial</td>
<td>2</td>
<td>1.04</td>
</tr>
<tr>
<td>Native Hawaiian or Pacific Islander</td>
<td>2</td>
<td>1.04</td>
</tr>
<tr>
<td>Non-resident Alien</td>
<td>1</td>
<td>0.52</td>
</tr>
<tr>
<td>Unknown</td>
<td>11</td>
<td>5.73</td>
</tr>
<tr>
<td>White</td>
<td>155</td>
<td>80.73</td>
</tr>
</tbody>
</table>

**Marital status**

<table>
<thead>
<tr>
<th>Marital status</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Married status</td>
<td>141</td>
<td>73.44</td>
</tr>
<tr>
<td>Single/divorced/widowed status</td>
<td>51</td>
<td>26.56</td>
</tr>
</tbody>
</table>

*Note. 2,799 students in FAFSA sample.*

individuals to be censored for a number of reasons, for example, if they dropped out during observation. The case processing of the FAFSA sample with dependent variable as the year of bachelor degree completion are listed in Table 11. Case processing the
combined sample of 3,695 students revealed, 896 students who were missing data. These students comprise 24.2% of the combined sample. These students were excluded from further analysis because they were missing necessary data. That left 2,799 students in the FAFSA sample used as cases available for analysis. Of those students, 803 experienced the event and 1,996 were right-censored. It is possible that the censored students introduces bias to the analysis. These students may have experienced changes in marital status and dependent status, but that information was not captured. This missing data reaffirms the importance of this research being viewed as informative, not generalizable.

Table 11

*Case Processing Summary*

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cases available in analysis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Event</td>
<td>803</td>
<td>21.70</td>
</tr>
<tr>
<td>Censored</td>
<td>1,996</td>
<td>54.00</td>
</tr>
<tr>
<td>Total</td>
<td>2,799</td>
<td></td>
</tr>
<tr>
<td><strong>Cases dropped</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cases with missing values</td>
<td>896</td>
<td>24.20</td>
</tr>
<tr>
<td>Cases with negative time</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Censored cases before the earliest event in a stratum</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>896</td>
<td>24.20</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>3,695</td>
<td>100.00</td>
</tr>
</tbody>
</table>

*Note.* Dependent Variable: Year of bachelor degree completion.

**Time Nonvarying Covariates**

The data set offered 13 covariates that did not have the option to change over time. Static variables like these may change in reality, but that change was not logged at the institution. Each of the invariant covariates were captured during census week at the third week of students' first fall semester. These covariates are listed in Table 12 and
include the following:

- Cohort
- Gender, categorized as female (0) or male (1)
- Age
- Race/Ethnicity, categorized as Native American, Asian, Black, Hispanic, Multiracial, Pacific Islander, Nonresident Alien, or Unknown
- Child status change
- Marital status change

Table 12

*Time Invariant Covariates Used in Cox Regression*

<table>
<thead>
<tr>
<th>Invariant Covariates</th>
<th>B</th>
<th>SE</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort</td>
<td>-0.098*</td>
<td>0.044</td>
<td>0.026</td>
<td>0.907</td>
</tr>
<tr>
<td>Male</td>
<td>-0.577**</td>
<td>0.078</td>
<td>0.000</td>
<td>0.562</td>
</tr>
<tr>
<td>Age</td>
<td>-0.079*</td>
<td>0.038</td>
<td>0.041</td>
<td>0.924</td>
</tr>
<tr>
<td>Native American</td>
<td>-0.276</td>
<td>0.449</td>
<td>0.539</td>
<td>0.759</td>
</tr>
<tr>
<td>Asian</td>
<td>-0.442</td>
<td>0.502</td>
<td>0.379</td>
<td>0.643</td>
</tr>
<tr>
<td>Black</td>
<td>0.053</td>
<td>0.319</td>
<td>0.867</td>
<td>1.055</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-0.322*</td>
<td>0.123</td>
<td>0.009</td>
<td>0.725</td>
</tr>
<tr>
<td>Multiracial</td>
<td>-0.747*</td>
<td>0.356</td>
<td>0.036</td>
<td>0.474</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>-1.585*</td>
<td>0.709</td>
<td>0.025</td>
<td>0.205</td>
</tr>
<tr>
<td>Nonresident alien</td>
<td>-0.402</td>
<td>1.002</td>
<td>0.688</td>
<td>0.669</td>
</tr>
<tr>
<td>Unknown</td>
<td>-0.527*</td>
<td>0.167</td>
<td>0.002</td>
<td>0.590</td>
</tr>
<tr>
<td>Child status changed</td>
<td>-0.143</td>
<td>0.133</td>
<td>0.281</td>
<td>0.867</td>
</tr>
<tr>
<td>Marital status changed</td>
<td>0.490**</td>
<td>0.084</td>
<td>0.000</td>
<td>1.633</td>
</tr>
<tr>
<td>Male x child interaction</td>
<td>0.701**</td>
<td>0.202</td>
<td>0.001</td>
<td>2.016</td>
</tr>
</tbody>
</table>

*Note.* Gender is coded as Female (0) and Male (1).
Chi-square = 149.248.
* p < .05.
**p < .001.

**Time Varying Covariates**

To understand the impact of the marital and dependent status variables related to the research question, it was necessary to add coded time varying covariates. Time invariant covariates indicate how significant each variable’s relationship to degree
completion is. Adding time varying covariates shows whether when something happens was statistically significant. Adding these time varying covariates shows context for how the change of status and the sequence of that change was related to degree completion. The data set offered eight covariates which had the potential to change over time. The time varying covariates were used to assess changes in these factors over time and the relationship of that change to the student’s likelihood of degree completion. These covariates include the following and are also shown in Table 13.

- Marital status, change to married – T_COV_1
- Marital status, change to single – T_COV_2
- Sequence of first dependent change – T_COV_3
- Sequence of second dependent change – T_COV_4
- First decrease in number of dependents – T_COV_5
- Second decrease in number of dependents – T_COV_6
- First change in number of children – T_COV_7
- Second change in number of children – T_COV_8

Results

Survival Analysis of UVU’s FAFSA sample from the first-time, full-time, bachelor degree seeking students of the 2010-2012 academic years yielded interesting results. With existing research indicating that family formation increases the likelihood of students stopping or dropping out of college, assessing the relationship between both marital status and dependent status was a critical step toward understanding the reality of the UVU student body. It is also an imperative step to determine whether changes in marital status or dependent status were significant enough to warrant tracking in UVU systems and incorporation in a large-scale analytic tool.
Table 13

*Time Invariant and Time Variate Covariates Used in Cox Regression*

<table>
<thead>
<tr>
<th>Time invariant and variate covariates</th>
<th>B</th>
<th>SE</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cohort</td>
<td>-0.107*</td>
<td>0.044</td>
<td>0.015</td>
<td>0.898</td>
</tr>
<tr>
<td>Male</td>
<td>-0.540**</td>
<td>0.078</td>
<td>0.000</td>
<td>0.583</td>
</tr>
<tr>
<td>Age</td>
<td>-0.077*</td>
<td>0.039</td>
<td>0.049</td>
<td>0.926</td>
</tr>
<tr>
<td>Native American</td>
<td>-0.295</td>
<td>0.449</td>
<td>0.512</td>
<td>0.745</td>
</tr>
<tr>
<td>Asian</td>
<td>-0.446</td>
<td>0.502</td>
<td>0.374</td>
<td>0.640</td>
</tr>
<tr>
<td>Black</td>
<td>0.031</td>
<td>0.328</td>
<td>0.924</td>
<td>1.032</td>
</tr>
<tr>
<td>Hispanic</td>
<td>-0.339*</td>
<td>0.124</td>
<td>0.006</td>
<td>0.712</td>
</tr>
<tr>
<td>Multiracial</td>
<td>-0.747*</td>
<td>0.356</td>
<td>0.036</td>
<td>0.474</td>
</tr>
<tr>
<td>Pacific Islander</td>
<td>-1.533*</td>
<td>0.709</td>
<td>0.031</td>
<td>0.216</td>
</tr>
<tr>
<td>Nonresident alien</td>
<td>-0.490</td>
<td>1.007</td>
<td>0.627</td>
<td>0.613</td>
</tr>
<tr>
<td>Unknown</td>
<td>-0.528*</td>
<td>0.167</td>
<td>0.002</td>
<td>0.590</td>
</tr>
<tr>
<td>Child status changed</td>
<td>-0.388*</td>
<td>0.188</td>
<td>0.039</td>
<td>0.679</td>
</tr>
<tr>
<td>Marital status changed</td>
<td>0.239*</td>
<td>0.121</td>
<td>0.048</td>
<td>1.270</td>
</tr>
<tr>
<td>T_COV_1</td>
<td>0.442*</td>
<td>0.144</td>
<td>0.002</td>
<td>1.556</td>
</tr>
<tr>
<td>T_COV_2</td>
<td>1.723</td>
<td>1.013</td>
<td>0.089</td>
<td>5.601</td>
</tr>
<tr>
<td>T_COV_3</td>
<td>-0.379</td>
<td>0.480</td>
<td>0.430</td>
<td>0.685</td>
</tr>
<tr>
<td>T_COV_4</td>
<td>-6.101</td>
<td>73.012</td>
<td>0.933</td>
<td>0.002</td>
</tr>
<tr>
<td>T_COV_5</td>
<td>0.954</td>
<td>0.575</td>
<td>0.097</td>
<td>2.595</td>
</tr>
<tr>
<td>T_COV_6</td>
<td>0.314</td>
<td>148.680</td>
<td>0.998</td>
<td>1.369</td>
</tr>
<tr>
<td>T_COV_7</td>
<td>0.420</td>
<td>0.248</td>
<td>0.090</td>
<td>1.522</td>
</tr>
<tr>
<td>T_COV_8</td>
<td>-0.091</td>
<td>0.913</td>
<td>0.920</td>
<td>0.913</td>
</tr>
</tbody>
</table>

*Note.* Gender is coded as Female (0) and Male (1).

Chi-square = 180.727.

* * * p < .05.

** * * * p < .001.

Results of the Cox regression, found in Table 13, describe the likelihood of each category of students graduating within the observed time frame. Any variable that has a significance under 0.05 is statistically significant. The Exp(B) articulates the odds ratio. If the odds ratio was below one the group was less likely to graduate; an odds ratio above one indicates that the group was more likely to graduate. Within this framework there were ten variables that showed statistical significance: Cohort, Gender, Age, Hispanic, Multiracial, Pacific Islander, Unknown, Child Status Change, Marital Status Change,
Change to Married. These results are discussed at length in chapter five.

Variables with statistically significant results are listed below. Each variable’s significance, odds ratio, and practical interpretation of data are included. One interaction between variables is also listed for greater context.

**Age**

Statistical significance of 0.049 and an Exp(B) of 0.898 indicates that for each year older a student was at the start of their first semester, they were less likely to complete their degree during observation. Older students were at a significant disadvantage when compared to their younger peers.

**Marital Status Changed**

Statistical significance of 0.048 and an Exp(B) of 1.27 indicates that change in marital status was significant. Students were 1.27 times more likely to graduate if they changed their marital status via FAFSA during observation.

**Child Status Changed**

Statistical significance of 0.039 and an Exp(B) of 0.679 indicates that students who changed dependent status during observation were less likely to graduate.

**Multiracial**

Statistical significance of 0.036 and an Exp(B) of 0.474 indicates that multiracial identifying students were less likely to graduate during the observation period.
**Pacific Islander**

Statistical significance of .031 and an Exp(B) of .216 indicates that Pacific Islander identifying students were less likely to graduate during the observation period.

**Cohort**

Statistical significance of .015 and an Exp(B) of .898 indicates that students in later cohorts were less likely to graduate within the observation window. This may simply be due to the number of years each cohort was observed. The first cohort had 8 years of observation, the second cohort had 7 years of observation, and the third cohort had 6 years of observation.

**Hispanic**

Statistical significance of .006 and an Exp(B) of .712 indicates that Hispanic identifying students were less likely to graduate during the observation period.

**Unknown**

Statistical significance of .002 and an Exp(B) of .59 indicates students who have unknown listed as their race or ethnicity were less likely to graduate during the observation period.

**Change to Married**

Although any change in marital status had a statistical significance of .048 and an odds ratio of 1.27, a change to married and the timing of that change was also statistically significant. A change of status to married had a statistical significance of .002 and an
Exp(B) of 1.556, indicating that when the change to married status occurred, the student was 1.55 times more likely to graduate. This increase in odds means students accelerated their timeline to graduation once marital status was changed to married.

**Gender**

Statistical significance of .000 and an Exp(B) of .583 indicates that male students were significantly less likely to graduate than their female counterparts.

**Gender by Change to Dependents**

Knowing that females were significantly more likely to graduate than males begged an additional question - what does the interaction of gender and change in dependents help explain? With statistical significance of .001 and an Exp(B) of 2.016 the Cox Regression shows that the gap closes between females and males and their likelihood to graduate. However, it does not explain whether the males improve their odds or females decrease their odds. To better understand the dynamic, a logistic regression using gender and dependent data to calculate the probabilities for Figure 7. This indicates that females with no change in child status have a 34.3% probability of graduating and males with no change in child status have a 19.4% probability of graduating. Females with a change in child status have a 33.5% probability of graduating and males who have a change in child status have a 40.5% probability of graduating. This indicates that the significance of the interaction of gender and having a child effects males more strongly than females, increasing the probability of male students completing their degree by 21.1% where the difference for females in negligable. The change in
probability is represented in Figure 7. The number of males and females who changed were small, weakening generalizability.

![Figure 7](image)

*Figure 7*. Probability of degree completion as calculated by logistic regression.

**Answering Research Questions**

**RQ1**: What is the relationship between student degree completion within the observation period and their marital status?

For most marital status changes in the observed sample, a marital change means that people are getting married. Analysis shows that getting married is a positively associated with a greater likelihood of graduating. This contradicts anecdotal observation that students drop out when they get married but must not be construed as causation. Students who have a change in marital status and do not complete both steps of re-enrolling and submitting a FAFSA with their marital change were not counted in this
group. The other 25% of the total combined sample may have stopped out, dropped out, or transferred after their change of marital status.

This finding warrants the inclusion of this data in predictive analytic models and indicates that the institution may find value in tracking this status throughout students’ education.

RQ2: What is the relationship between student degree completion within the observation period and their dependent status?

Students who have children are significantly less likely to complete their degree within the observed timeframe. There was not a statistically significant relationship between when the dependent was added and the student’s degree completion. Further research on how adding dependents impacts student degree completion would be a helpful next step. It was assumed for this research that most of the dependent additions were students who had a child. It is possible that the initial adjustment to having a child is not as negatively correlated, but the cumulative time and energy needed for that child, and any additional children, are the significant barrier to graduation.

RQ3: Are there differences in student degree completion probability by gender?

Although prior research shows that female students in Utah and UVU are graduating at significantly lower rates than their national peers, they were still outperforming their male peers. Male students were significantly less likely to graduate, showing the largest statistical significance in the model. While understanding low female degree completion was an initial goal for this study, the outcome that males are graduating at significantly lower rates than female students highlights the importance of
an individual analysis model. Low male graduation was not a problem that had been identified by UVU or the Utah community. With this new knowledge, data-informed leaders can work toward appropriate interventions and outreach to support this student population on their path to degree completion. Though female students are outperforming their male peers in degree completion, their rates still lag behind their national peers, indicating that efforts to help women graduate is still an important consideration.

**Summary**

To better understand low female degree completion rates at UVU, quantitative analysis was used to test the assertion that family formation strategies have a significant impact on progress toward degree and degree. The FAFSA sample of students who submitted federal financial aid application(s) during enrollment created a sample of first-time, full-time, bachelor degree seeking students. Cohorts from the 2010, 2011, and 2012 years were used in an exploratory study regarding the relationship between change of marital status and dependent status and the student’s degree completion.

Statistical analysis using Cox regression within a survival analysis highlighted student sub-groups who were more or less likely to complete their degree within the observation window. Groups more likely to succeed included female students and students who change their marital status to married during enrollment. Specifically, those who change status to married accelerated their timeline to graduation compared to those who did not change their marital status. Groups that had a lesser likelihood of completion included post-traditional students (over 24 years of age at start of enrollment), as well as
individuals who identified as Hispanic, multiracial, Pacific Islander, and those who had a change in their dependent status. Each of these sub-populations has unique needs and circumstances that may have confounding factors impacting their progress toward degree completion.
CHAPTER V

DISCUSSION

Introduction

Higher education institutions are facing low degree completion rates on an epidemic scale (T. Bailey et al., 2006; NCES, 2017; Shapiro et al., 2014). The role of a bachelor degree completion in the well-being and future life of college students is of paramount importance, impacting physical and mental health, financial stability, relationship satisfaction and duration, safety, and community engagement (Case & Deaton, 2017). The purpose of this study was to posit a model of individual analysis to assess the needs and options for a higher education institution to address a degree completion issue.

Bachelor degree completion is of paramount importance to the future well-being of students and is supported by a significant body of work. The personal, professional, familial, and community benefits from a student’s bachelor degree are significant for the student and their surrounding circle (Lumina Foundation, 2017; Trostel, 2015). UVU is experiencing a statistical anomaly of low female degree completion (Matthews, 2017; UVU Institutional Research, 2017a) when compared with national rates. This research project was designed in response to that anomaly and an Individual Analysis Model was developed to fill a gap in the evaluative process. Following the Individual Analysis Model, the researcher identified that other analytic resources were unable to answer a specific, literature based question, and subsequently designed and executed a survival
analysis to better understand the relationship between family formation variables and student degree completion (Jeppsen, 2018).

In addition to the value added for the graduate, degree completion is a critical measure of success for every college and university (Jongbloed, 2001; Jongbloed & Vossensteyn, 2001; Pew Charitable Trust, 2015). It is a metric by which they are evaluated on a federal level as well as numerous ranking systems. In many publicly funded institutions, the degree completion rate is factored into a performance-based funding model, which will reward or restrict public funds for an institution based on how high their degree completion rates were. Institutions must be critical of and act to address issues of non-completion. In addition to an intrinsic investment in the success of their students, institutions may be motivated by institutional improvement, performance-based funding, and the ethical ambition to create an educated society.

After identifying the gap in current literature to sufficiently explain low female degree completion, the researcher subsequently developed an Individual Analysis Model for use by any institution who is trying to better understand a unique student pattern or how a subgroup of student performs differently than others (see Figure 1). Statistically significant results can then be used to inform institutional data collection and the use of that data. The researcher followed the Individual Analysis Model to determine ways to answer the research questions for this study, using UVU as a demonstration case.

Although the market for static and adaptive analytic tools is growing and changing rapidly, an individualized model can be employed alongside any analytic tool. Once an institution selects their preferred analytic tool, the implementation, operation,
and assessment must follow. If the tool is not performing as expected, a second review process may be necessary. A demonstration case was used to exhibit how one institution evaluated and selected tools in the student success analytics marketplace because internal resources were not sufficient to address the issue. The demonstration case is a large, open enrollment, public institution in the western U.S. This case is used to show how the model works and provide concrete examples to the reader for reference.

Demonstration case using the individual analysis model: Utah has one of the lowest female degree completion rates in the country, consistently 5-11% behind the national average (Madsen & Sarin, 2013). Within that data oddity, UVU is consistently one of the lowest female degree completion rates within Utah. This statistical anomaly has been present since the late 1990s and is not improving at rates similar to their Utah peers. The limited data regarding this phenomenon is qualitatively based and cites family formation patterns as a primary reason for low female degree completion (Jeppsen, 2018). Limitations of institutional data do not allow for analysis of marital status and dependent status; hence the research will contribute to the knowledge base of the issue.

**Discussion of Results**

Statistically significant findings are reported with related groupings of variables, in descending order of significance, including their $p$ value and odds ratio. The nonstatistically significant findings are discussed in abbreviated form. Tables describing these findings are found in Chapter IV in Tables 12 and 13.
Gender

The data source only allowed for binary gender responses of female or male. Analysis showed that males were significantly less likely to graduate than female students; 0.583 less likely ($p = 0.000$) during observation. This is consistent with national trends discussed by Flashman (2013) and Alon and Gelbgiser (2011) showing that females complete at higher rates and have done so for well over a decade. It also contradicts Madsen’s (2010) Utah female degree completion research and highlights the need to better understand this discrepancy. The publication of institutional data at UVU shows that low female degree completion is especially epidemic at this institution and is not keeping pace with improving rates at in-state peer institutions (UVU Institutional Research, 2017a). While focus on female degree completion is important given the lag in improvement compared with state and national peers, this emphasizes that low male graduation is also problematic at UVU.

Marital Status Change

A student who has any change in marital status during observation resulted in greater likelihood of bachelor degree completion ($p = 0.048$). This indication that students who get married are more likely to graduate contradicts the anecdotal institutional insight that students drop out due to marriage and the prior research indicating that family formation patterns are the culprit (Jeppsen, 2018); however, these data do not tell the full story. As mentioned previously, this data does not account for students who fit one of two categories: first, those who get married and continue enrolling, but never submit FAFSA indicating any change in marital status and second,
those who get married and drop out, subsequently not submitting FAFSA indicating a change in marital status, which means they were not represented in this data set. This finding supports the notion that it is a worthy investment for UVU to begin tracking marital status each year for all students. Once marital status is tracked for all students the variable can be included in Platform B, UVU’s adaptive analytic tool, for more meaningful analysis. This sophisticated tool can use the marital status data for all students and identify if it is a significant factor for all students. Further research is needed to identify students who get married and drop out. These students may introduce bias into this analysis. The lack of data excludes them from this analysis and they simply do not fall into any cohort for which analysis can be done within Platform B. Further research may help understand these students’ patterns of enrollment and their path to degree completion.

**Sequence of Marital Status Change**

The occurrence of any marital change was significant ($p = 0.048$). Having a marital status change at some point during enrollment made a student 1.27 times more likely to graduate. Adding the timeline of when a marital status change happens during observation and isolating the change from single to married demonstrates that when the marital status change from single to married happens, the student accelerated toward degree completion ($p = 0.002$), making the student 1.556 times more likely to graduate. Not only were students who got married more likely to graduate, they also accelerated their timeline and graduated faster compared to their peers. This would indicate that students who marry and continue enrollment and FAFSA submission are less likely to
need intervention in order to graduate. Again, this sample did not contain students who may have married and dropped out, so there was some self-selection bias at play, which should be further investigated. Students changing marital status from married to single did not have a statistically significant result. Students were more likely to change their marital status from single to married during their third, fourth, and fifth years of enrollment ($N = 560$); whereas, changing status from married to single, although far less frequent, peaked in year four. See Figure 8 for the sequential marital status change from single to married and Figure 9 for sequential change from married to single.

![Figure 8](image)

*Figure 8. Sequential year of marital status change: Single to married.*

**Race and Ethnicity**

Four categories of race/ethnicity had statistically significant results, including students for whom Unknown was their listed race or ethnicity. Students in the Unknown
category ($p = 0.002$) were 0.59 times less likely to graduate. Students identifying as Hispanic ($p = 0.006$) were 0.712 times less likely to graduate during the observation window. Pacific Islander identifying students ($p = 0.031$) were 0.216 times less likely to complete their degree. Multiracial identifying students ($p = 0.036$) were 0.474 times less likely to graduate during the observation window. This supports Kao and Thompson’s findings on racial and ethnic stratification in college degree completion (2003). Non-statistically significant results were reported for students identifying as Native American, Asian, Black, and Non-resident Alien.

**Cohort**

Students who started in a later cohort were less likely to graduate during observation than those from earlier cohorts ($p = 0.015$) with an odds ratio of 0.898. The three student cohorts of 2010, 2011, and 2012 were observed for 8, 7, and 6 years,
respectively. Logically, the earlier cohort (2010) would have 33% more time to complete their degree than the latest cohort (2012) and subsequently had a larger window in which to complete their degree. It is notable that 6-year graduation rates were the primary metric used to assess graduation rates at the federal level (NCES, 2018).

**Dependent Change**

Students who had a child during observation were less likely to complete their degree. Change in dependent status was significant when the sequence of the child change ($p = 0.039$) was considered. This was largely the addition of a dependent, primarily the first dependent for the affected student. These students were 0.679 times less likely to graduate during the observed time frame. Further research is needed to understand how this related to the claim that family formation negatively impacts student enrollment and whether this change impacts different genders to different or similar degrees. Within the subgroup of students who added dependents during their enrollment ($N = 192$), students added dependents at the highest rate in their fourth, fifth, and sixth year of enrollment. The earlier and later years had lower rates of dependent additions. Note that due to the observation window constraints, the seventh year only two cohorts to observe (2010 and 2011) and the eighth year observed one cohort (2010). The sequence of students adding dependents, per their FAFSA application, is represented in Figure 10.

Only eight students removed dependents during observation. Half of these occurred in the second year of enrollment, a quarter in the fourth year of enrollment, and an eighth of these students removed a dependent in year six and eight. Figure 11 provides a visual representation of this small subsample.
Figure 10. Sequential year of dependent addition for the FAFSA sample.

Figure 11. Sequential year of dependent removal for FAFSA sample.
Student Age at Enrollment

Student age was significant predictor of a student’s likelihood of graduating ($p = 0.049$). Of the FAFSA Sample, 97.50% were students aged 19 or younger, indicating that the remaining 2.5% were split between ages 20-49. Traditional aged students between ages 18-24 comprised 98.96% of the student population. However, for each year older a student was at their start of enrollment, they were 0.926 times less likely to graduate. This compounding age factor could be quite detrimental to older students. Initial enrollment age is shown in Figure 12.

Figure 12. FAFSA sample by age at initial enrollment at Utah Valley University.

Limitations

The analysis sample was delimited to students who submitted FAFSA one or more times during enrollment. Students self-select whether or not they will submit
FAFSA and this was not a variable that the researchers can control for; subsequently, the sample was not a true representation of the entire UVU student body. Although the results are more likely to represent the population of students who submit FAFSA, that still must be considered with reservations. There were a number of reasons a student may or may not submit FAFSA including citizenship and eligibility, first generation status, socioeconomic status, understanding and awareness of FAFSA, education and support in the application process, and a number of other topics (Kofoed, 2015). Results from the analysis are not generalizable and should be viewed as exploratory and informative, encouraging further research.

In the scope of this research project, there is no data indicating why students departed. Because marital status was not tracked for these cohorts throughout their enrollment, the only place to capture the information was through an application for federal aid. Dependent status was also not collected for any UVU students unless they submitted their application for federal aid. Because the data can only draw from students who submitted FAFSA, students who did not submit FAFSA are not included. It is also possible that students had a change in marital status, did not reenroll or submit FAFSA, and subsequently were not included in the analysis.

**Projections**

Using institutional insight, there were many possible explanations that arise when trying to understand the data this project reported. For instance, people getting married may have larger support systems and, therefore, were more likely to succeed in school
and do so quickly after getting married because they want to move toward other phases of their lives. Marital status change, which was largely changing single to married, had a positive impact on student graduation degree completion specifically at the time of the marriage occurring.

Having children adds additional financial and time pressure to student lives and may negatively impact their ability or willingness to complete their degree. It is also possible that having a baby does not have a negative effect immediately, but perhaps that effect is cumulative over time, resulting in a later dropout. Hence, the timing of the dependent change does not have a statistically significant relationship. A dependent status change may add additional barriers such as financial burden of additional family member, access and affordability to child care, and simply the cognitive load needed to care for a child as well as be successful in college.

**Implications**

Results of this analysis were informative in a number of ways. First and most directly for UVU, it is imperative that UVU begin tracking changes in marital status to ensure they can best support students. Research on the non-FAFSA students are critical to identify whether or not this pattern persists or if additional intervention and support is needed. Although the institution cannot, and should not, have any commentary on when a student chooses to get married, providing additional support and information to keep students enrolled and on track will optimize an opportunity to accelerate student timelines to degree.
The negative relationship between a student’s change of dependent status and their likelihood of degree completion indicates that support may be needed for parent-students. Research by Paterson (2018), as well as Cruse, Gault, and Suh (2018), indicate on-campus child care and child care referral services prove to be impactful intervention. UVU received the CCAMPIS grant in 2018 which supports the participation of low-income parents in postsecondary education by providing campus-based child care services. Offering students hybrid and online degree completion options may also offer flexibility to parent-students that are now necessary for their circumstances. Each of these interventions presupposes that the student has a positive perception of the value of an education. If this were not the case, motivational interviewing strategies would be important earlier in the student’s educational experience and should be reinforced to help increase intrinsic motivation and goal attainment (Demetriou & Schmitz-Sciborski, 2011).

On a larger scale, the study shows the importance of understanding individual student populations and their unique characteristics and trends. This analysis would not have been possible using a large-scale analytic tool because the necessary data was not collected, rendering analytic tools useless. This supports Arnold et al.’s (2014) assertion that data governance and proper policies are critical to using big data tools successfully. By identifying significant variables through individual analysis, these variables can then be added to an analytic tool for increasingly robust assessment. The combined use of the Individual Analysis model and an analytic tool optimizes results.
Significance

This was the first known study to quantitatively evaluate the low female degree completion phenomenon at UVU. Using available research, the project was designed to evaluate the top predictor of female college drop out in the state of Utah, which was attributed to family formation (Jeppsen, 2018). Interpreting family formation as primarily getting married and/or having children, the project used historically archived FAFSA data to track student enrollment and degree completion over time and associate that with student demographic characteristics.

The research on UVU’s FAFSA Sample showed that younger students, female students, students in an earlier cohort, and students who change their marital status are more likely to graduate, contradicting Madsen’s (2013) Utah-specific research and the national work done by DiPrete and Buchmann (2006). The analysis controlled for all other independent variables as described in the study. By controlling for age, these results were likely not because the students are more mature. Whatever impact getting married had on a student’s likelihood of degree completion, it is mostly independent and works across racial, age, and gender groups. This new information provides context for UVU administrators to make informed decisions regarding the funding of student support programs. UVU and other institutions may weigh the cost and labor investments necessary for a large-scale analytic tool and determine if analyses that those used in this study are a more appropriate option to better understand their student retention and graduation patterns.
Future Research

Further assessment of the Individual Analysis Model is important to refine and enhance the process and ensure functionality for the broadest number of circumstances. Implementing the model on different types of campuses with various financial, programmatic, student, and institutional characteristics will highlight the efficiencies and short-comings. Additionally, this model must adapt as the predictive analytics market continues to evolve with new technology and user insight. The implementation of analytic tools on college campuses has existed for quite some time, but the integration and scope of these tools had exponentially grown in the last few years. The model must be continually modified to reflect the ever-changing tools as well as their effectiveness and inadequacies. Further research and publication on best practices within implementation of these tools may also prove to be beneficial for campuses looking for ways to streamline their implementation to ensure maximum efficiency (Lane, 2014). This type of work may also qualify for a grant through the U.S. Department of Education’s Supporting Effective Educator Development program (U.S. Department of Education, 2020).

More Research on Completion by Gender

To better understand the gender gap in Utah’s degree completion rates, more research is necessary. The majority of research around this phenomenon is qualitative, which adds richness to the discussion, yet is not generalizable. Additional quantitative research, perhaps using the analytic tools discussed here, is important for institutions and
the state’s collective higher education entities to understand what is happening. Increased power would come from multi-campus approaches to see what trends occur at multiple sites and which are isolated. This would provide greater insight on how to engage the community in a conversation about higher education and may build bridges between campuses as they work together.

Additional qualitative research is also needed. Two current research projects are noted here. First is Dr. Michelle Kearns’s study on female student success stories at UVU (Kearns, 2019). She intends to identify what helped these women complete their degree. Second, Drs. Jessica Pauly and Stevie Munz are interviewing female UVU students who did not complete their degree. They were focused on identifying any specific factors that led them to stop out as well as factors which may have helped them remain in school (Munz & Pauly, 2019). Similar qualitative research conducted with students of any gender identity or affinity group and those results will help refine student support structures.

**Diversity in Representation**

Ensuring a broad demographic representation within all of the recommendations for future research will help address some of the subgroup concerns identified in this project. Knowledge about historically underrepresented groups and their likelihood of persistence and degree completion is an important and complex factor to understand. It is logical that a 40-year-old student may have different needs than an 18-year-old student; understanding how to support those students through graduation, similarly and differently, based on their unique needs will enhance our understanding of how to best
serve our student. This action-based data will increase efficiency and effectiveness as an institution and ideally, will also lead to improved performance metrics. This positive cycle could result in increased funding and support if performance funding continues to lead the conversation about higher education.

**Should I Stay or Should I Go**

Perhaps the most difficult answer to gather from any student group is their motivation to stay in school or drop out. Interviews with men, older students, and those who married and dropped out would add a richness to the conversation that is currently missing. If UVU is able to gather marital and dependent data throughout enrollment, the institution can assess trends to see if they are consistent throughout the student population or if the FAFSA subset held unique findings. Further research is necessary to understand why those who return to school accelerate and why others do not return at all.

Change in dependent status was significant when added to the sequence of the child change ($p = 0.039$). Largely this was the addition of a dependent, primarily the first dependent for the affected student. These students were 0.679 times less likely to graduate during the observed time frame. Further research is needed to understand how this related to the claim that family formation negatively impacts student enrollment and whether this change impacts different genders to different or similar degrees.

Again, the analysis did not include students who may have married and dropped out, so there is some self-selection bias at play that should be further investigated. Students changing marital status from married to single did not have a statistically significant result. Students were more likely to change their marital status from single to
married during their third, fourth, and fifth years of enrollment ($N = 560$); whereas, changing status from married to single, while far less frequent, peaked in year four. It may also be helpful to understand differences between students who stayed enrolled and those who dropped out amongst those who change their status from single to married.

It is also important to consider what support students may have from their families and whether support to persist in earning a college degree is different for men and women. More research on the perspectives and behaviors of families may help inform student choice to stay enrolled or drop out. Stratifying all proposed research by socioeconomic class may also provide insight to patterns of behavior and provide an opportunity for early intervention with groups who are at high risk of not completing a college degree.

**Significant Results for Utah Valley University**

Results of the UVU demonstration case indicate actionable items for UVU leaders. As leaders gain knowledge (Fusarelli, 2008) of the student population through this new research, leaders have increased capacity for informed-decision making, especially when it comes to marshaling resources. Because “organizational resources typically outstrip the supply” (Murphy, 2013) leaders must assess all current efforts, have a metric through which impact (Marzano, Waters, & McNulty, 2005) can be measured, and make difficult decisions regarding which programs to support, cut, or develop (Hamilton, Halverson, Jackson, Mandinach, & Supovitz, 2009; Smyth & Schorr, 2009). This exploratory research project was a meaningful step toward understanding how to
better support students on their path to degree completion and also highlight areas where more understanding is needed. Important outcomes fall into three general categories: gender, age, and ethnicity or race.

**Gender and Family Formation**

Male students were graduating at significantly lower rates and there is no known research on this subject specifically at UVU. Although the national female student average continues to outperform their UVU peers, female students at UVU are improving their graduation rates and are not necessarily dropping out for the reasons previously thought. For both male and female students, changing status from single to married hastened their degree completion, which was a positive outcome. This contradicts the broader statement made by Jeppsen (2018) that family formation has a negative impact on degree completion. In support of Jeppsen’s claim, a change in dependent status did have a negative impact on student degree completion. The interaction of gender and having a child more significantly effects males than females, increasing the probability of male students completing their degree by 21.1% where the difference for females in negligible.

More research is necessary to understand the impact of adding children and a student’s likelihood to graduate. This project highlighted that the timing of a change in dependent status was not connected to the student’s non-progress. Before any meaningful outreach could be designed, this must be better understood. These findings highlight the need to avoid using the term family formation as a conflation of marriage and having children. Separating marriage and having children allows for more detailed research and
more accurate understanding of their relationship with students’ degree completion. These are major events on their own and conflation only muddies the research making it more difficult to get an accurate picture of what is happening with students. Shifting language to address marital status and the addition of dependents as unique events with their own potential impact will improve the quality of research and potential for actionable data in the future.

**Ethnicity or Race**

Similar to national trends, race and ethnicity also had a significant relationship with degree noncompletion. National trends show that people of color are less likely to complete their degree than their white peers. This was replicated in UVU’s demonstration case and further supports Bailey and Dynarski’s (2011) findings regarding gaps in college completion. White is the largest demographic race or ethnicity group at UVU, followed by Hispanic. Students who declared Unknown, Hispanic, Pacific Islander, or Multiracial were statistically significantly less likely to finish their degree within the observed time frame. This information confirms that institutional leaders need to double down on inclusion efforts and supports for their communities of color. Similar to Wagner’s (2015) research, UVU must identify what practices actually matter for their students of color. An individual analysis for these student groups may inform unique interventions relevant to each group or may find that there are commonalities; with either approach the informed practice can better serve students. Ideally this practice will lead to improved student success outcomes.
Age

The age of a student when they start enrollment at UVU was also significant when analyzing degree completion. For each year older a student was at their start of enrollment, they were significantly less likely to complete their degree extending the work of Jacobs and King (2002) and Jacobs and Stoner-Eby (1998). Support for post-traditional students is an imperative for UVU based on this data. Due to the sample size, further research specifically on post-traditional students is strongly recommended before designing intervention.

Statistically significant data found in the Cox regression and logistic regression draw attention to the potential to address retention and completion challenges with simple tools and an experienced employee. The adaptive analytic tool used is a costly endeavor, committing $250,000 annually. Perhaps a simpler and far less expensive solution could be used by employing the Individual Analysis Model.

Recommendations and Practical Applications

Leaders in higher education must better understand the student population that is unique to their institution. Many big data software businesses create analytic tools in attempt to address the broadest number of traditional college campuses, typically selective institutions with a student population of 18-24 years of age (Jayaprakash, Moody, Lauria, Regan, & Baron, 2014). This often leaves gaps in analysis and may not allow for regional context or unique variables which may impact student enrollment and degree completion. By using the Individual Analysis Model, institutions can walk
through important review steps to ensure their needs are matched with the best tool, leading to the greatest possible return on investment and best possible data. This allows institutions to design meaningful, intentional interventions with the potential to increase student success in degree completion.

The individualized model captures important steps for a number of end users. Program managers and departments with special student populations as well as institutions who cannot afford a large-scale analytic platform still need to analyze their student enrollment behavior. Exploratory research may be necessary to argue why collecting this information from students in an ongoing fashion is valuable and, dependent on results of analysis, may provide evidence for the need to include these variables in an analytic tool. The model used in this research project provides a process to evaluate the relationship between variables and the student’s progress toward degree that is simple, affordable, and quickly executable. The results provide valuable data and give direction to whether or not increased attention to these variables is warranted. A smaller test such as this serves as a good litmus to identify potentially significant variables that an institution may begin tracking or including in a big data model. As in the demonstration case, an increased understanding of student enrollment patterns and degree completion can be used to inform strategic and data-based planning. It is in combination with, not in replacement of, student success analytic tools that this approach is most successful.

**Summary**

Results of the research project reinforce the need for an Individual Analysis
Model when examining unique student patterns of enrollment and degree completion. As student success metrics are evaluated annually, any unique patterns could be identified early and an individual analysis may be used to assess how the institution should proceed.

Although student success analytic tools are outstanding resources, faults still exist. Successful implementation of the Individual Analysis Model and the outcome of the survival analysis shows that big data analytic tools are not a magic bullet at UVU. This may be applicable to other institutions where local issues may not be fully addressed using only one approach. The research project demonstrates the power of combining the Individual Analysis Model with student success analytic tools. By integrating them, as is described in the Individual Analysis Model, better analysis can be completed and that enhanced data cycle can feed into a more productive discourse and data-informed decision-making.
REFERENCES


Arvizu, D. E., Droegemeier, K. K., Abbott, M. R., Bassler, B. L., Benbow, C. P.,
Bienenstock, A., … Rolf Lehming, L. F. (2012). Diminishing funding and rising
expectations: Trends and challenges for public research universities. Retrieved from


colleges and universities: Effects of race, gender and institutional type. Los
Angeles, CA: Higher Education Research Institute Graduate School of Education.

Baer, L. L., & Norris, D. M. (2015). What every leader needs to know about student
success analytics. Retrieved from https://www.civitaslearningspace.com/what-
every-leader-needs-to-know-about-student-success-analytics?_ga=2.85396121.
1648527018.1586293385-560946510.1586293385


college entry and completion (No. 17633). https://doi.org/10.3386/w17633

Bailey, T., Calcagno, J. C., Jenkins, D., Leinbach, T., & Kienzl, G. (2006). Is student-
right-to-know all you should know? An analysis of community college graduation
s11162-005-9005-0

Barefoot, B. (2004). Higher education’s revolving door: Confronting the problem of
student drop out in US colleges and universities. Open Learning: The Journal of
Open, Distance and e-Learning, 19(1), 9–18. https://doi.org/10.1080/
0268051042000177818

McClellan & J. Stringer (Eds.), The handbook of student affairs administration (4th


Munz, S., & Pauly, J. (2019). *UVU students’ educational experiences*. Utah Valley University, Orem, UT.


APPENDIX

SUPPLEMENTAL FIGURES
**Note.** Questions used for this analysis include 47, 51, and 52.

**Figure A1.** Free Application for Federal Student Aid (FAFSA), excerpt 1.
Figure A2. Template for data request.
Utah State University

Protocol title: Historical Data Analysis of Degree Completion IRB-9955

Utah Valley University

Protocol title: Historical Data Analysis of Degree Completion Exempt

*Figure A3*. Institutional Review Board approvals.
PROFILE

EDUCATION CHANGES THE FUTURE: I chose a career in higher education because I passionately believe that education, especially educating women, is the best way to effect change in a society. This passion manifests in my daily work. I use current data to design student and community programming focused on increasing graduation rates by creating an increased understanding of the holistic value of a college degree, operating effective and efficient programs, alleviating financial barriers, and providing support as students navigate their college experience.

COLLABORATE AND INNOVATE: My strength is coordinating efforts among a variety of constituents, especially between institutional divisions. By building strong relationships, I connect to people’s passion and help them connect their passion to our objectives. I understand the higher education environment and am strongly equipped to navigate the rapidly changing landscape. UVU’s dual-mission and ability to provide quality education and student-centered learning fuels my drive to improve how we help students gain an education to improve their lives and the lives of those surrounding them.

CONNECTION: Data is a powerful tool and I love using it to tell stories of our students. Building relationships with people and bridges between areas is essential to success. My ability to see the big picture fosters an environment for innovative ideas. Coordinating those relationships and ideas with data-informed decision making leads to powerful positive movement. As a strategic analytical thinker, I love identifying ways to better serve students and our community with new programs or improvements on established services.

EDUCATION

Utah State University — PHD, Education, Leadership • 2020

Kansas State University — MS, Administration, Academic Advising • 2012

Utah Valley University — BA, Political Science, International Relations • 2008

RESEARCH INTERESTS

Education Attainment completion in historically underrepresented populations
Recruiting and retaining historically underrepresented populations in faculty and leadership roles
Higher education collaboration between academic affairs & student affairs
High impact student programming

KEY ACCOMPLISHMENTS

Institutional Advancement (2017-20) - UVU's Institutional Research identified the top reason for students dropping out of college is due to financial issues. In effort to support the financial well-being of
students and encourage persistence and completion of college degrees, I have secured private donations supporting scholarships, programming, and capital funds. Approximately $3.5 million between 2017-20. These funds provide immediate/annual support and endowed funds to support the mission of the Women's Success Center in perpetuity.

**Returning Wolverine (2017-18)** - Utah has a high percentage of working age adults who have completed some college and have no degree. I developed a program to reach out to former college students and remove barriers to increase their likelihood of returning and accelerate their timeline to graduation. Through targeted outreach by social media, costing less than $500, more than 100 students re-enrolled in college. In addition, we graduated nearly 20 students in the first semester. The program continues to operate under the model I created and brings students back to college to complete their credential and enhance their professional and personal lives. Returning Wolverine was featured as a premiere community-oriented outreach program in the Winter 2018 issue of UVU Magazine.

**Math Completion Pilot (2016-17)** - After securing a list of non-graduated students who completed all degree requirements with the exception of math, I coordinated with six campus departments to establish a special offering. This unique structure allowed students to move from placement to completion of their required math course in only six months. These students had previously enrolled in between 3-14 semesters of math without success and subsequently dropped out of school for 2-7 years. The structured outreach, support to students, and specialized course with premiere instructors resulted in an incredible success where 54% of enrolled students completed their degree within the calendar year with additional students continuing to work on their math with intent to complete in the near future.

**EXPERIENCE**

- Senior Director • Women's Success Center, UVU • 2017-PRESENT
- Assistant Director • Fye & Student Retention, UVU • 2014-PRESENT
- Career Counselor • Career Development Center, UVU • 2014
- Academic Advisor • Behavioral Science & School Of Arts, UVU • 2008-2014
- Intern • Embassy Of Turkmenistan, Washington, DC • 2007
- Outdoor Education Leader • Outdoor Adventure Center, UVU • 2006-2008
- Writer & Customer Service Supervisor • Heritage Web Design • 2005-2006
- Executive Secretary • U.S. Air force, Ramstein, Germany • 2003-2005
- Recreation Assistant • U.S. Air force, McGuire AFB, NJ • 2002-2003
- Resident Assistant • Utah State University • 2001-2002

**SKILLS**

VISION - strategic thinker, big picture perspective, data-informed decision making, student success focused

LEADERSHIP - strengths-based team development for full-time and part-time staff, recruiting/hiring/retaining individuals committed to the organizational mission, development of staff training programs

COLLABORATION - relationship building, collaborative project management, donor relations, securing businesses and private citizen contributions

ADVANCEMENT - securing privately held financial resources to support scholarships, programming funds, and capital funds with my advancement partners ($2.5M, 2017-19)
GRANTS & FUNDS - budget planning and management, building grant-compliant processes, reporting, managed $1.5M budget, oversaw distribution of $2M+ in student grants and scholarships

INCLUSION - advocate for a safe learning environment for all students, inclusion facilitator/educator

PROGRAMS - student-centric needs analysis leading to program planning and design, implementation, evaluation, and iterative improvement

DATA - research design, methodology, data analysis, interpretation, visualization, story-telling, assessment

COMMUNICATION - highly skilled public speaker, experienced trainer, open communicator, seeks feedback

TECHNOLOGY - tools to enhance performance and effectiveness, product implementation and strategic use

PRESENTATION & PANEL HIGHLIGHTS

“The Landscape of Interpersonal Violence in the State of Utah” • Conference on Domestic Violence • April 2019

“Your Path to College” • Impact Conference: Empowering Women • March 2019

“Understanding Racism and Sexism at UVU” • J. Bonner Ritchie Dialogue on Peace & Justice • March 2019

"Relationships: Building trust as a leader” • Utah Valley University • Student Success & Retention Directors • Feb 2019

"Women and Leadership” • Utah Valley University • Senior Executive Leadership Forum • March 2018

“Financial Barriers to College” • Larry H. Miller Group Community Outreach & Utah Valley University • Impact Conference: Empowering Women • March 2018

“Back to Basics: Rethinking Strategies for First-Generation Student Support” • Utah Advising Association Annual Conference • May 2017

“Barriers to First-Year Student Success” Panelist • Utah FYE Consortium • Utah Valley University • March 2017

“Respect” • Utah Valley University • Student Life Staff HEROICS Training • December 2016

"Engaged Persistence and Completion Initiatives at a Large Open-Enrollment Institution” • NASPA Assessment & Persistence Conference • Portland, Oregon • June 2016

“Early Alert Programs” Panelist • Utah FYE Consortium • Utah Valley University • March 2016

“Same Team! You are UVU!” • Utah Valley University • Staff Training, • November 2015

“Respect” • Utah Valley University • Student Success Staff HEROICS Training • September 2015
“A Personalized Approach to Student Retention” • The National Symposium on Student Retention, Consortium for Student Retention Data Exchange • Orlando, Florida • October 2015

“How Awesome Advisors Promote Internships” • Utah Valley University • Annual Advising Conference • June 2014

“Advisors are Allies: Building and Making Connections Abroad” • Utah Valley University • Annual Advising Conference • June 2014

“Major-specific Orientations: the Swiss Army Knife of Academic Tools” • Utah Advising & Orientation Association • Annual Conference • June 2013

“Online Advising Course: Teaching Nuts & Bolts” • Utah Valley University • Annual Advising Conference • June 2011

“Finances, Parental Relationships, and Life Satisfaction Among University College Students” Poster Session • National Conference on Family Relations • 2010

“From the Ground Up: Building Advisor-Inspired Training” • NACADA Region 10 Conference • March 2010

“Professional Portfolios” • Utah Valley University • Summer University • June 2009

PUBLICATIONS


CAMPUS & COMMUNITY SERVICE

UVU Women's Council • UVU • 2018-Present
CARE Task Force • UVU • 2019-Present
Woodbury 45 Degree Committee • UVU • 2019-Present
Foundations of Inclusion: Gender, Lead Facilitator • UVU • 2018-Present
Student Success & Completion Committee (SSCC) • UVU • 2014-Present
Transgender Task Force • UVU • 2018-Present
Domestic Violence Conference Planning Committee • UVU • 2018-Present
Student Affairs Department Leaders • UVU • 2017-Present
Foundations of Inclusion: LGBT, Facilitator • UVU • 2017-18
Circles Big View Team • Community Action Provo • 2016-2018
Some College, No Degree Outreach Committee (SCND) • UVU • 2016-2018
Math Initiative • UVU • 2015-2018
Student Retention Information Tracking System (SRITS) • UVU • 2014-2017
Faculty Connections & Academic Experience (FC&AE) • UVU • 2014-2017
Enrollment Management Information Technology (EMIT) • UVU • 2014-2017

RELATED PROFESSIONAL DEVELOPMENT

Fellow, Utah Women's Leadership Exchange • Utah System of Higher Education • 2019-20
AERA Annual Meeting • Toronto, Canada • 2019
NCORE Annual Meeting • Portland, Oregon • 2019
Fellow, Utah Valley Senior Executive Leadership Forum • Utah Valley University • 2017-18
CASE Development for Deans and Academic Leaders • Vancouver, BC, Canada • 2018
ASIST Suicide Intervention Training • ASIST at Utah Valley University • 2017
Fellow, Women's Leadership Institute • Laguna Niguel, California • 2016
NASPA Assessment & Persistence • Portland, Oregon • 2016
Elevating the Stature of Women’s Leadership at UVU • UWHEN at UVU • 2016
Women & College Graduation: What is Happening at UVU? • UWLP at UVU • 2016
Bridges Out of Poverty • Community Action at Utah Valley University • 201
Utah Women & Toxic Perfectionism • UWLP at UVU • 2015
CSRDE National Symposium on Student Retention • Orlando, Florida • 2015
Utah Women & Education Forum • UWLP at UVU • 2015
CPP Master Practitioner Training: Harnessing Generational and Gender Differences to Develop Leadership Skills with the MBTI Tool • 2014
Women's Business Network Annual Conference (Leadership Track) • Utah Valley University • 2012
Certified Practitioner • CPP, Inc. • Myers-Briggs Type Indicator (MBTI) and Strong Interest Inventory • 2011

CURRENT PROFESSIONAL AFFILIATIONS

American Education Researchers Association • Member since 2018
Council for Advancement and Support of Education • Member since 2017
Student Affairs Administrators in Higher Education • Member since 2015
Utah Women in Higher Education Network • Member since 2015
HONORS & AWARDS

40 Under 40 • Utah Valley BusinessQ • 2018
Student Affairs Vice Presidential Award of Excellence • Utah Valley University • 2017
Wolverine Achievement Award Finalist • Utah Valley University • 2017
Advising Administrator Award Finalist • Utah Valley University • 2017
Patriotic Employer Award • Secretary of Defense, Employer Support of the Guard and Reserve • 2017
Certificate of Achievement in HEROICS • Utah Valley University • 2016-17
Wolverine Achievement Award • Department of the Year • Utah Valley University • 2015-16
Dean's Recognition Award for Advising • Utah Valley University • 2013-14
PACE Distinguished Employee of the Year • Utah Valley University • 2013
Advisor of the Year, Wolverine Awards • Utah Valley University • 2012-13
Academic Advisor of the Year • Utah Valley University • 2011-12
Academic Advisor of the Year Nominee • Utah Valley University • 2009
National Residence Hall Honoree • 2001-2002
National Society of Collegiate Scholars • Member since 2001
Utah Volunteer of the Year • 1996