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Insuring Graduation: An Analysis Of The Association Between Student Health Insurance And Graduation

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INSURING GRADUATION:
AN ANALYSIS OF THE ASSOCIATION BETWEEN STUDENT HEALTH INSURANCE AND GRADUATION

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ABSTRACT

Most college students have access to basic health services through their campus' college health program. Unfortunately, students who lack health insurance may be limited in their access to health services beyond the acute care provided, which may manifest in a myriad of adverse outcomes; ultimately resulting in withdrawal from college without graduating. Student health insurance plans (SHIPs) are high-quality, affordable insurance plans specially designed to meet this need. This study utilized survival analysis to examine the temporal nature of college graduation behavior, as it related to student health insurance status. The results of this study show no significant relationship between student health insurance and a student's risk of graduating. Based on these findings, health care and higher education administrators should carefully consider mandating student health insurance policies until more data is available. Additionally, the need for additional studies on the empirical relationship between student health-related factors, academic performance, and graduation are noted.

Keywords: college health, student health, health insurance, graduation, survival analysis

DEDICATION

To my mother, Penny, whose encouraging voice

still rings in my ears,

"Quit thinking about it and just turn it in!"

You believed in me when I didn't believe in myself.

To my dad, the original Dr. Lovett,

for being a man worth imitating.

To my wife, Jessica, for being my

counselor, comforter, sanity, and strength.

To my boys, Mason, Cooper, and William,

for being a constant source of love and motivation.

To you, I dedicate this dissertation.

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INTRODUCTION

Background

College health is a niche healthcare field that focuses on the medical, mental, and behavioral health care of college-aged (18 to 24-year-old) students. Though most students have access to basic health services through their campus' college health program, regardless of ability to pay, a student's insurance status (insured or uninsured) may limit their access to health services beyond the acute care college health programs provide (Foss, Lyon, Jackson, & Plumly 2014). This barrier impairs a student's ability to access proper health care, which may manifest in a myriad of adverse outcomes (i.e., inability to perform due to health-related issues, excessive medical bills); ultimately resulting in withdrawal from college without graduating.

In an attempt to address this issue, college health and higher education administrators have collaborated with insurance providers to create student health insurance plans, commonly referred to as SHIPs. SHIPs are high-quality, affordable insurance plans specially designed to meet this need. SHIPs offer students robust health insurance at nearly half of the cost of similar employee benefit plans (Foss et al., 2014).

From a strategic management perspective, SHIPs allow college health and higher education administrators to serve students' needs by providing access to quality care beyond the acute care offered on-campus. Anecdotally, college health and higher

education administrators believe that this provision of affordable health insurance may be responsible for a set of cascading health and academic behaviors and outcomes that may lead to a greater likelihood of graduation. Graduating from college and obtaining a degree is the goal of both students and administrators. Colleges are funded based on their ability to graduate a student within the critical window of four to six years, which colleges are mandated to report (S.580, 1990).

Despite the current debate surrounding the value of higher education, American colleges and universities are projected to see an increase in enrollment of 3 percent from the years 2016 to 2027 (McFarland et al., 2018). Though this estimation does represent a slowing in the overall rate of enrollment, the net increase in students is still estimated to result in 20.5 million new college enrollees by 2027 (McFarland et al., 2018). However, with a national graduation rate averaging 45%, nearly nine million of those students will leave college without securing a degree ("Digest of Education Statistics, 2017," 2017). These dropouts not only represent costs to the individual students but also costs to individual colleges due to the significance of graduation rates set by Congress.

In 1990, Congress passed the Student Right-to-Know and Campus Security Act (P.L. 101-542) which required colleges to begin publishing their six-year degree completion rates and established the formulas for determining such rates (S.580, 1990). Further, it allowed colleges to exclude students from their graduation statistics such as students serving on deployment in the military, on church missions, or with foreign aid services such as The Peace Corps (S.580, 1990).

Making graduation rates public information placed a newfound priority on this statistic and gave colleges an additional level of accountability to their stakeholders.

Since 1990, improving graduation rates has been a leading priority for colleges. Most noticeably, following the passage of this law, research surrounding graduation and graduation rates sharply increased (Astin, 1997; Astin, 2005; Avalos, 1996; Dey & Astin, 1993; Gramling, 2013; Goenner & Snaith, 2004; Orozco & Cauthen, 2009; Wine, Heuer, Wheeless, Francis, Franklin, & Dudley, 2002).

Interestingly, the literature suggests linkages between health insurance status (insured or uninsured) and graduation. For example, access to and utilization of health care has been associated with improved individual health status (Baker, Sudano, Albert, Borawski, & Dor, 2002; Chung, 2017; Franks, Clancy, Gold, & Nutting, 1993; Freeman, Kadiyala, Bell, & Martin, 2008; Wallace & Sommers, 2016). Additionally, health status has been associated with better performance academically (Bradley, Santor, & Oram, 2016; Grizzell & McNeil, 2009; Lust, Ehlinger, & Golden, 2008). Finally, better academic performance has been associated with a higher likelihood of graduating from college (Gershenfeld, Ward Hood, & Zhan, 2016; Nora, Barlow, & Crisp, 2005).

Purpose of the Study

Traditionally, research in higher education has a bent toward a focus on solving students' problems (Shushok & Hulme, 2006) rather than looking for ways to reinforce or support positive qualities (Demetriou & Schmitz-Sciborski, 2011). Therefore, a significant portion of the early literature focuses more on why students fail than why they may be succeeding. Demetriou & Schmitz-Sciborski (2011) hypothesize that studies on successful student experiences may illuminate new opportunities to support students that have been missed.

Student attrition causes both financial and reputational damage to the institution, affecting the perception of key stakeholders such as students, parents, alumni, and donors (Stillman, 2009). A handful of studies have shown positive associations between health and academic success (Adams, Wharton, Quilter, & Hirsch, 2008; Bradley et al., 2016; Grizzell & McNeil, 2009; Lust et al., 2008). Though college health as a field has led to improvements in student health, wellbeing and academic performance, a direct empirical link has yet to be shown (Demetriou & Schmitz-Sciborski, 2011).

The purpose of this study is to bridge this gap in the literature and investigate the impact student health insurance may have on academic performance and ultimately graduation rates. Therefore, this research examined whether college students with health insurance were more likely to graduate, in relation to their peers. Using human capital theory as a theoretical framework, this study seeks to address the following research questions:

Research Questions

1. Does having health insurance increase a student's risk of graduating?
2. Does having health insurance increase a student's risk of graduating within 4 years of enrollment (≤ 12 semesters)?
3. Does having health insurance increase a student's risk of graduating within 6 years of enrollment (≤ 18 semesters)?

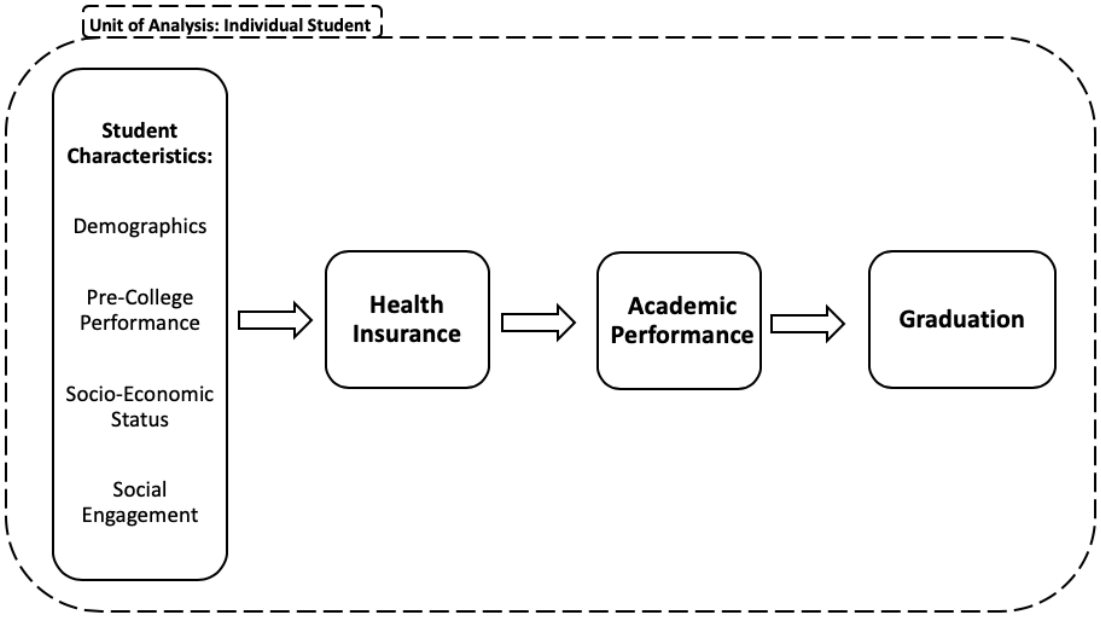

Figure 1. Conceptual Framework

Significance of the Study

Human capital theory, simplified, is a theory explaining how investing in human beings ultimately yields positive outcomes in the organization, the family, and the community. This is relevant because student health insurance plans are a near perfect conceptualization of such an investment. Anecdotally, college health professionals understand the positive impact student health insurance has on students' academic performance and graduation rates, through the mechanisms of improved health service utilization and health outcomes. Students with health insurance are theoretically more likely to utilize health services, which should improve their health outcomes, making them better able to perform their best academically, which has the potential to produce better academic outcomes, ultimately resulting in successfully graduating from college. However, stakeholders, administrators, legislators, and academics do not accept such

anecdotes as evidence. Therefore, a study such as this is needed to provide some empirical evidence showing this association exists – or doesn't.

By analyzing the association between student health insurance plans and graduation, this study has the potential to inform policy recommendations and strategies and to provide knowledge for the student health and wellbeing field. The wealth of literature surrounding retention and graduation highlights the significance of graduation for students, institutions, and communities (Astin, 1997; Astin, 2005; Gramling, 2013; Orozco & Cauthen, 2009; Spady, 1970; Tinto, 1987; Wessell Jr, Engle, & Smidchens, 1978; Wine et al., 2002). Unfortunately, health-related factors are not often associated with academic performance and therefore have largely been ignored by the research.

Disparities exist in every community – disparities in income, access to healthcare, proper nutrition, etc. However, as a society, we are responsible for ensuring that we are actively seeking to support the basic human needs of our fellow man. Just as we would never imagine refusing to feed a school child lunch based on their inability to pay, we should be equally as committed to ensuring that college students do not have to forego basic healthcare due to a lack of affordable, quality health insurance.

As college health executives and higher education administrators, it is our charge to create the conditions, offer the skills, and provide the support to ensure our students have the highest likelihood of succeeding at and graduating from our institutions. This aim may only be obtained through the continual evaluation and implementation of evidence-based ideas, practices, and policies. This study hopes to add empirical evidence to the body of health and higher education literature by investigating the potential association between student health insurance plans and graduation.

CHAPTER 2

LITERATURE REVIEW

This chapter reviews the existing literature surrounding the association between student health insurance and graduating from college. The first half of this review introduces college health programs, college student health, and student health insurance plans. The second half focuses on the empirical linkages between health insurance, health service utilization, health status, academic performance, and graduation. Finally, this chapter closes with an explanation of the theoretical framework underpinning the research question and the development of a research hypothesis based on the literature.

College Health Programs

College health programs are networks of on-campus health services and facilities designed to serve the healthcare needs of college student populations (Lookout Mountain Group, 2017). The service lines, facilities, and services offered vary from college to college; however, most college health programs focus primarily on the provision of medical and psychological services (Lookout Mountain Group, 2017). Most remarkably, enrolled students characteristically have unrestricted access to these services, regardless of their income, level of need, or ability to pay.

A Chief Health Officer or Vice President for Health and Wellness typically manages a college's health program. However, unlike traditional healthcare

administrators, college health administrators are simultaneously healthcare administrators and higher education administrators (Lookout Mountain Group, 2017). This dual role means that college health administrators must ensure that campus resources support both student health and wellbeing and academic success.

The growing number of health concerns in the college-aged population coupled with the rising rate of uninsured or under-insured young people make college health administration increasingly more complicated (Adams et al., 2008; Ahrnsbrak, Hedden, Lipari, & Park-Lee, 2017).

College Student Health

Health is a foundational component of one's ability to function in the world. Individuals with health complications and those who engage in risky behaviors face many hurdles in their day-to-day lives, as compared to healthy individuals. College students are not immune to these struggles.

College students are traditionally viewed as "young invincibles" – happy and healthy individuals in the prime of their lives (Huhman, Quick, & Payne, 2016, p. 487). In actuality, the data show that college-aged students (18 to 26 years old) have experienced a more rapid decrease in overall health, over the past decade, than individuals over the age of 26 (Ahrnsbrak, Hedden, Lipari, & Park-Lee, 2017). Though some of the decrease in overall health is due to chronic, genetic conditions, many are preventable. A study from the New England Journal of Medicine found that Americans are only receiving half of the preventative care services recommended to maintain optimal health (Koh & Sebelius, 2010).

College students' susceptibility to illness and injury is exacerbated due, in part, to increases in stress, sleep deprivation, and substance misuse precipitated by the college environment (Grizzell & McNeil, 2009; Hershner & Chervin, 2014). Increases in destructive inputs such as stress and decreases in positive inputs like sleep and proper nutrition have been shown to weaken the immune system, increasing college students' susceptibility to acute health issues like colds, flu, and sore throat (Simpson, Haack, & Mullington, 2017). Along with acute health issues, college students face an increasing number of serious mental health complications.

The most recent data released by the Substance Abuse and Mental Health Services Administration (SAMHSA) self-reported depression and anxiety are associated with bronchitis, ear infection, sinus infection, and strep throat in a survey of college students. The prevalence of severe mental illness has nearly doubled (3.8% to 5.9%) since 2008. Further, ninety-three percent (93%) of individuals diagnosed with a substance use disorder did not receive treatment. Only 64% of individuals 18 and older received treatment for severe mental illness (Adams et al., 2008; Ahrnsbrak, Bose, Hedden, Lipari, & Park-Lee, 2017).

Without access to preventative care, health complications can grow to affect more than just health status (Wallace & Sommers, 2016). Poor health compromises college students' ability to go to class, complete assignments, and take exams that may have a substantial impact on their academic performance and ultimately their ability to graduate (Bradley et al., 2016). Further, many health issues have comorbidity associated with them – meaning they may exacerbate or trigger additional adverse health consequences, leading to student attrition (Adams et al., 2008).

Barrier to Student Healthcare

In 2009, the Bill and Melinda Gates Foundation funded a study of young Americans to discover the reasons so many students drop out prior to graduation. The aim of the study was to examine commonly held assumptions about why college students fail to graduate and identify potential solutions to this issue. Over 600 young adults (22 to 30 years of age) were surveyed. Individuals who started a degree but did not finish were asked why they left. Their experiences were then compared to students that successfully obtained a two or four-year degree (Johnson & Rochkind, 2009).

One question asked students to put a check next to those responses they believed would best help someone, whose circumstances were similar to theirs after high school, obtain a college degree. Of those that did not graduate, nearly 70% said that providing "health insurance to all students" would help someone whose circumstances were similar to theirs after high school in getting a college degree. More surprisingly, 55% of those who graduated reported that the provision of health insurance would be helpful to someone similar to them after high school (Johnson & Rochkind, 2009, p. 20).

These statistics illuminate one of the most significant barriers for college students to receiving timely, quality healthcare – the lack of health insurance. Data published in 2017 indicated that nearly 1.7 million students are uninsured (Lookout Mountain Group, 2017). Though the Patient Care and Affordable Care Act (2010) did increase access to healthcare by allowing students to stay on their parents' plan as a dependent until age 26, college students remain the largest cohort of Americans without health insurance. However, this development still leaves millions of American college students uninsured or underinsured.

Fortunately, organizations like the American College Health Association (ACHA) exist with the mission of advocating for, educating about, and researching all things related to college student health (American College Health Association, 2016). Recently, the ACHA has been the most active voice in advocating for radical policy change and standardization of best practices aimed to improve student access to health insurance (American College Health Association, 2016).

Student Health Insurance Plans

Student health insurance plans, commonly referred to as SHIPs, were created through a collaboration between college administrators and insurance companies (American College Health Association, 2016). SHIPs are quality (equivalent to gold or platinum level private insurance), inexpensive insurance plans specially created to meet the health insurance needs of college students (American College Health Association, 2016; Foss et al., 2014). SHIPs allow college health and higher education administrators to provide college students full access to healthcare services ranging from acute care to in-patient treatment for serious illness or injury.

Though many colleges offer some form of a SHIP, access, cost, benefits, and coverage can vary greatly from college to college. Much like private insurance companies, colleges have been known to offer insurance products not well suited for students – such as high deductible plans. For a college student, such plans are impractical since many students do not possess the financial resources needed to pay a high deductible should the need arise. Fortunately, members and member organizations of the

ACHA have been a pioneering force in the creation and implementation of standards and evidence-based practice for SHIPs.

Standards and Features

In 2017, the ACHA instituted a set of standards to guide colleges in establishing quality, reliable health insurance plans for students (American College Health Association, 2016). Many of the standards and features set forth by the ACHA mirror (by design) those established by the Patient Protection and Affordable Care Act (ACA) (American College Health Association, 2016). To qualify, plans must include a series of essential benefits and features (Rosenbaum, 2011). The common objective of both the ACA and ACHA was to universally improve access to healthcare, via affordable health insurance coverage, for all consumers. Both the ACA and ACHA standards seek to maximize the benefits to the consumer while minimizing the risk of adverse selection.

To be considered a "credible student health insurance program" by the ACHA, a list of ten standards were introduced to ensure uniformity in the benefits and management of SHIPs (American College Health Association, 2017, p. 1-2) (Appendix C). These standards not only empower students but give significant leverage to college health administrators in negotiating contracts with payors. Insurers are incentivized to enter into such contracts due to the high number of relatively low risk enrollees to be acquired through a student health insurance program (Lookout Mountain Group, 2017). Three of the most notable features included in both the ACA and ACHA standards are the individual mandate, community-rated premiums, and pre-existing condition clauses.

Individual mandate. The most contentious, and arguably most important, feature of both the ACA and ACHA standards is the individual mandate. ACHA Standard I mandates that, as a condition of enrollment, all students must either enroll in the SHIP or show evidence of equivalent coverage by submitting an insurance waiver (American College Health Association, 2017). Much like the debates surrounding the implementation of the ACA, opponents feel that being forced into a SHIP is a financial penalty or "tax" on students (Dalen, Waterbrook, & Alpert, 2015). However, proponents debate that this is a necessary step to spreading the risk among the pool of insured, allowing prices to remain low (Sommers, Maylone, Blendon, Orav, & Epstein, 2017).

Pre-existing conditions. Standard II set forth by the ACHA states that all students with pre-existing conditions should be covered, in compliance with the practices set forth by the ACA (American College Health Association, 2017). This critical provision in both the ACA and ACHA standards is designed to increase accessibility of coverage for individuals previously deemed too risky to insure based on the existence of a health-related condition (Blumberg et al. 2014). However, the individual mandate balances this requirement by including more "healthy" students in the risk pool. This underscores the importance of the totality of these sets of standards and how they work in conjunction with one another to improve access while simultaneously keeping health insurance affordable.

Community-rated premiums. The final feature is an extension of the pre-existing conditions clause. Both the ACA and ACHA standards dictate that individuals cannot be

charged more based on their individual health status (Blumberg et al. 2014). This feature, known as community rating, sets premiums based on a community's estimated risk rather than individual underwriting (Du, 2018). For SHIPS, students are pooled together, and a standard premium is defined for all students regardless of their age, gender identity, marital status, physical size, race, sex, etc. (American College Health Association, 2017).

Key takeaways for students (i.e. consumers) are included in Standards I, II, and X (Appendix C). The remainder of the ACHA Standards deal with plan administration, the role of the institution as fiduciary of the plan, and requirements for potential vendors. These standards illuminate the opportunity to support students, strengthen institutional commitment to their students, lower the community-rated risk, and increase health-related outcomes (Lookout Mountain Group, 2017).

SHIPs give college health administrators the opportunity to provide access to quality healthcare to their student population, which has the potential to improve individual student health, generate revenue to on-campus services, and hopefully increase students' ability to engage in their academics and obtain a college degree (American College Health Association, 2016). However, the linkage between the provision of such plans and their effect on academic performance, retention, and graduation is unknown. The upcoming sections review empirical studies indirectly linking health insurance to graduation from college.

Graduation and Attrition

"Student mortality" was the seminal terminology used in the 1930s to describe college attrition or failure to graduate from college (Berger & Lyon, 2005). Though the

terminology has improved since the 1930s, the focus of this research in this field has remained narrowly constrained around two types of variables – academic and social integration (Astin, 1985; Tinto, 1987). This is generally due to the fact that new college enrollees are often young, full-time, on-campus freshmen attempting to simultaneously find their place within campus social structures and navigate life and academics on their own (Astin, 1985; Tinto, 1987).

As a precursor to the literature surrounding graduation and attrition, key terminology is defined. The following was adapted from (Berger & Lyons, 2005):

Attrition: a student fails to reenroll in college the following semester

Dropout: a student seeking a college degree fails to obtain it and leaves

Graduation: a student successfully matriculates through college, earning a degree

Persistence: the desire and action of a student seeking a college degree

Retention: the ability of a college to keep a student from enrollment to graduation

Withdrawal: the voluntary departure of a student from college

Though scholars would debate the importance of the nuances related to the aforementioned terms, they essentially describe processes ending in one of two outcomes – college degree or no college degree. This study focuses on graduation because it is the most straight-forward measure that essentially encompasses persistence and retention – all of which aim at increasing the likelihood of a student earning their degree (Berger & Lyons, 2005).

Impact of Attrition

The impact of attrition affects more than a single student's college career. Losing a student to attrition (i.e. not returning to campus) causes both financial and reputational damage to the institution, affecting the perception of key stakeholders: students, parents, alumni, and often impacts the surrounding community (Stillman, 2009). Furthermore, the literature shows that students who fail to earn a college degree earn less than those who successfully graduate (Bishaw & Semega, 2008).

At the institutional level, colleges are impacted both directly and indirectly. Colleges are directly impacted by a loss of tuition dollars and student fee-related revenue (Schuh & Gansemer-Topf, 2005). Indirectly, reputational damage may ensue if graduation rates drop in relation to national averages (Schuh & Gansemer-Topf, 2005). Lastly, college towns are negatively impacted. Students in college towns boost the economy, drive up real estate values, and contribute labor to local job forces.

Predictive Factors

For this study, it was essential to identify the factors statistically proven to affect graduation rates, in order to control for their effects. Since this is a quantitative study, the factors were selected based on the likelihood of their availability in the prospective dataset. Based on a review of the literature, five categories of factors emerged as having a strong association with the likelihood to graduate from college: demographics (age, gender, race) (Astin, 1993; Astin, 1997; Gramling, 2013; Tinto, 2007), pre-college performance (high school GPA, ACT score) (Astin, 1993; Astin, 1997), financial (Pell Grant eligibility) (Astin, 1993; Bean, 1982; Tinto, 1975; Tinto 2007), academic (overall

GPA) (Astin, 1993; Bean, 1982; Gramling, 2013; Tinto, 1975; Tinto, 2007), and social (Astin, 1993; Bean, 1982; Tinto, 1975; Tinto, 2007).

From Insurance to Graduation

The association between health insurance and graduation is not initially intuitive, unless you work in the field of College Health. After an extensive literature review, only one study was found to directly address the association between student health insurance coverage and GPA (Lust et al., 2008). This study surveyed postsecondary students from Minnesota. A majority of the students (87%) reported having health insurance. The results showed that students with health insurance had a statistically significantly higher mean GPA (3.33 with, 3.26 without) than students without health insurance (Lust et al., 2008).

Though additional studies directly linking health insurance and academic performance were not found, studies were discovered which present indirect linkages from health insurance to health service utilization (Chung, 2017; Freeman et al., 2008), health service utilization to health status (Baker et al., 2002; Franks et al., 1993; Freeman et al., 2008), health status to academic performance (Bradley et al. 2016; Grizzell & McNeil, 2009; Lust et al., 2008), and academic performance to graduation (Gershenfeld et al., 2016; Nora et al., 2005). These logically informed linkages from the literature provide a causal chain rationale in support of the hypotheses of this study. See Table 1 for a list of the empirical linkages between insurance and graduation.

Table 1. Summary of Empirical Linkages Between Insurance and Graduation

Author	Topics Investigated	General Conclusions
Baker et al., 2002	Health Insurance and Health Status	Individuals who lost health insurance coverage in 1992 showed a decline in health by 1994. A major decline when compared to individuals who remained insured.
Bradley et al. 2016	Health Status and Academic Productivity	Students diagnosed with depression were associated with half a letter grade decrease in GPA
Chung, 2017	Insurance and Utilization	White, having health insurance, or having serious mental illness are factors that increase one's likelihood to use mental health services.
Franks et al., 1993	Health Insurance and Health Status	Persons without health insurance had significantly lower levels of subjective health status than did persons with insurance.
Freeman et al., 2008	Health Insurance, Health Services Utilization, Health Status	Having insurance causes an increase in health services utilization and improves health status
Gershenfeld et al., 2016	Academic Productivity and Graduation/ Attrition	Logistic regression models indicated low first-semester GPA was statistically significantly associated with attrition
Grizzell & McNeil, 2009	Health Status and Retention	Students surveyed cited medical reasons for their departure from college prior to obtaining a degree
Lust et al., 2008	Health Insurance and Academic Productivity	2008 Minnesota study showed a positive relationship between college students having health insurance and GPA
Nora et al., 2005	Academic Productivity and Graduation	Poor first-year academic performance for first-time college students was highly associated with dropping out

Theoretical Framework

Human Capital Theory

> *"The most valuable of all capital is that invested in human beings"*
>
> (Marshall, 2009, p. 564).

Since its inception in the 1950's, human capital theory has been of interest in a variety of fields, ranging from economics to education and sociology (Becker, 1965; Becker 1975; Garibaldi, 2006; Marshall, 2009; Mushkin, 1962; Schultz,1963; Schultz, 1993; Sweetland, 1996; Tan, 2014). Popularized by economist and Nobel laureate Gary Becker, human capital theory refers to the inherent skills, talents, or abilities of people that make them productive (Becker, 1964). Becker (1964) theorized that, just as an investment in physical capital can produce positive economic returns for a firm, investments in individual humans (human capital) can produce returns in human productivity – benefitting both the individual and the firm.

The concept of human capital formation rests on two notions. First, people are "improved" by investments in things like education and health. Second, expenses sunk into investments like health and education will ultimately yield returns in the future (Mushkin, 1962). Derived from the neoclassical school of thought in economics, human capital theory is based on the assumption that humans will seek to economically maximize their own interests (Tan, 2014). Therefore, human capital theory assumes that

individuals invest in things like education, training, or healthcare in hopes of receiving greater economic income in the future.

In the economic study of health, what consumers demand when they purchase health services are not the services themselves. Consumers purchase health services in exchange for "good health" (Grossman, 1972). Based on this basic demand, the theory of human capital has been taken a step further to show that investments in health as a form of human capital yield improved educational outcomes and productivity (Grossman, 1972). If an individual's health is viewed as a stock, then investments in said stock (through better access to or higher quality health benefits) should raise its value. Accordingly, health as a form of capital also follows the principles of supply and demand. Thus, human capital theory provides a near perfect conceptualization of the management of individual health benefits.

Application of Human Capital Theory

For the purpose of this study, student health is conceptualized as a form of human capital. As such, every student has an inherent value of health that can either be improved upon through intentional practices or degraded through neglect. An investment in an individual student's health through the mechanism of health insurance is hypothesized to increase that student's health through greater access to and utilization of health services. This potential increase in the individual student's health is further hypothesized to increase said student's academic productivity and performance over time.

Central to this study is the idea that it may be possible to increase the likelihood of a student graduating from college, by investing in their health and academic

productivity through the provision of student health insurance. Therefore, health as a form of human capital should also follow the economic principles of supply and demand. If good health is demanded, investments in healthcare, nutrition, and exercise can be made to raise the value of said health stock. If health is not valued (and therefore neglected), the value of said stock may fall, diminishing its value and utility (Becker, 1975; Grossman, 1972.

Students with SHIPs (whether university-sponsored or individually obtained) have received an investment in their health capital. This produces a positive return via the ability to utilize health services, such as preventative care, and the peace of mind that comes with the ability to access and utilize health services if needed. In return, the student's overall health capital is raised. Ultimately, the hypothesized outcome is an increase in their likelihood to graduate. Graduating and obtaining a postsecondary degree presents many additional benefits to the individual, college, and society at large (Foss et al., 2014).

Most obviously, students benefit individually from an investment in their health capital in terms of greater health and productivity, which should lead to graduation and obtaining a postsecondary degree (Gershenfeld et al., 2016; Nora et al., 2005). In turn, the college also benefits by increasing its overall graduation rate, which may influence the amount of federal and state funding it receives (Sav, 2013). Finally, society benefits by increasing its tax base, adding to the labor force, and adding a statistically more responsible citizen to its population (Altbach, Reisberg, & Rumbley, 2010). Further, college-educated citizens have been shown to consume less governmental funds in the form of health care, criminal justice, and welfare (Belfield & Levin, 2007).

Hypotheses

Based on a review of the relevant literature and human capital theory, the following research hypotheses were tested in this study:

Hypothesis 1: Health insurance increases college students' risk of graduating.

Hypothesis 2: Health insurance increases college students' risk of graduating within 4 years (≤ 12 semesters).

Hypothesis 3: Health insurance increases college students' risk of graduating within 6 years (≤ 18 semesters).

CHAPTER 3

METHODOLOGY

This chapter describes the methods of this quantitative study, including its design, data source, sample population, measures, and approaches to statistical analysis. The University of Alabama at Birmingham (UAB) Institutional Review Board approved this study (Appendix A).

Study Design

The present study used survival analysis to examine the temporal nature of college graduation behavior, as it relates to student health insurance status. Survival analysis (also known as event history analysis) is a method used to determine the rate at which events occur over a defined period of observation. Originating from the field of biostatistics, survival analysis is a regression-like method that allows researchers to study the timing and occurrence of events (DesJardins, 2003; Singer & Willett, 1991).

Survival analysis has become more popular in fields like education for its ability to study multifaceted, longitudinal processes such as graduation (DesJardins, 2003; Singer & Willett, 1991). The time dimension included in survival analysis allows researchers to focus on time periods when students are at the greatest "risk" for a particular event (e.g. graduation). The term "risk" is common language in survival

analyses because the terminal event of interest was historically a negative event such as contracting a disease or death.

The primary analysis concentrated on the "risk" of graduation for full-time, first-time freshmen entering in the 2012, 2013, and 2014 cohorts at UAB. In addition to the primary analysis, additional analyses were performed using a 4-year and 6-year graduation threshold as the survival event. The last data available was for the Summer 2019 semester.

Study Population

The primary observational unit for this study was the individual student. The study includes first-time, full-time undergraduate freshmen students entering a large, non-profit, four-year, public institution in 2012, 2013, or 2014. These cohorts were chosen for their ability to capture a 4-year graduation time horizon for all three cohorts and a 6-year graduation time horizon for two of the three cohorts. These timeframes were utilized because 6-year graduation is the standard upper limit of time to be included in a college's graduation rate statistics (before the 7th fall), as outlined in the Student Right-to-Know Act of 1990 (S.580, 1990).

Inclusion and Exclusion Criteria

Students that meet the following criteria were eligible for inclusion in this study (Cohodes, Grossman, Kleiner, & Lovenheim, 2016):

- First-time student – not previously enrolled at another institution
- Full-time student – must be taking more than 9 credit hours per semester
- Undergraduate freshmen

Exclusion:

- Part-time students taking less than 9 credit hours per semester
- Transfer Students
- Mid-semester enrollee
- Graduate / Professional students

Data Source

The data for this study was drawn from UAB's institutional student databases, BANNER and Student Health Services, and provided by UAB's Office of Institutional Effectiveness. The BANNER database contains student demographic, financial, background, and educational data for all students at UAB. The Student Health Services database maintains student health records, including records of student health insurance. BANNER and Student Health Services data were merged and deidentified, and random identifiers were assigned by UAB's Office of Institutional Effectiveness (Appendix B).

Measures

Failure Variables

The study includes three failure variables. The first failure variable was a dichotomous variable indicating whether a student graduated within the period of observation (from enrollment to Fall 2019) (1=student graduated during the observation period, 0=student did not graduate within the observation period). The second failure variable was a dichotomous variable indicating whether a student graduated within four years of matriculation (1=student graduated in ≤ 12 semesters; 0=student did not graduate in ≤ 12 semesters). Similar to the previous failure variable, the third failure variable was a dichotomous variable indicating whether a student graduated within six years of

matriculation (1=student graduated in ≤ 18 semesters; 0=student did not graduate in ≤ 18 semesters).

The 4-year (≤ 12 semesters) and 6-year (≤ 18 semesters) failure variables are more restrictive tests of the same hypothesis; however, it is still of value to this study based on the standards put forth in the Student Right-to-Know Act of 1990 (S.580, 1990). The Right-to-Know Act requires "postsecondary institutions to report the percentage of students who complete their program within 150 percent of the normal time for completion (e.g., within 6 years for students pursuing a bachelor's degree)" (S.580, 1990). Restated, this means that a student was counted toward the institution's graduation statistics if they graduated within six years from their initial enrollment. For a four-year institution such as UAB, that means the percentage of students who earn a bachelor's degree within a six-year period. Therefore, hypotheses involving both four- and six-year graduation rates (while partially redundant) are relevant for this study.

Time Variable

To perform a survival analysis, a time-based variable must be created. The student graduation data for this study was gathered on a per semester basis. Therefore, a time-to-event variable was constructed to describe the number of semesters elapsed from initial enrollment to graduation.

Primary Independent Variable

The primary independent variable of interest in this study is insurance status, which was a dichotomous variable (1=student was noted to have student health insurance

or a waiver verifying equivalent private insurance (this includes students under the age of 26 that are still on their parents' insurance); 0=student was not noted to have health insurance by UAB).

Control Variables

This study included ten additional independent variables as controls. These control variables were selected based on the review of literature and their likelihood of positively or negatively affecting student graduation (Astin, 1993; Astin, 1997; Bean & Metzner, 1985; Gramling, 2013; Tinto, 1987).

Three demographic characteristics were included as control variables (age, gender, race). Age was a continuous variable operationalized as the number of years since birth. Gender was a binary variable operationalized as Male (1) or Female (0). Race was a series of dummy variables operationalized as Black or African American (1), Asian (2), Hispanic (3), Other Non-White Minority (4), and White (0).

One institutional characteristic was included as a control variable (college). College was a series of dummy variables operationalized as Business (1), Education (2), Engineering (3), Health Professions (4), Public Health (5), Arts & Sciences (0).

Two pre-college performance descriptors were included as control variables (high school GPA, ACT score). High school GPA was operationalized as a number representing the student's overall high school GPA. Some high school GPAs appeared abnormally high (e.g. 5.5 and 6.0), based on the national standard 4.5 scale. Therefore, all high school GPAs were capped at a maximum of 4.5 (range = 0 – 4.5). ACT score was operationalized as a number representing the student's ACT score (range = 0 – 36).

One academic trait was included as a control variable (Overall GPA). Overall GPA was operationalized as a number representing the overall, average GPA for each UAB student (range = 0 - 4.0).

One financial attribute was included as a control variable (Pell Eligibility). Pell eligibility was a binary variable operationalized as Pell eligible (1), Non-Eligible (0), representing whether or not a student meets the minimum financial eligibility requirements to receive Federal Pell Grant funds. To qualify for a Pell Grant, a student must first be eligible for financial aid. Next, "significant financial need" must be demonstrated. Students are determined to have a "significant financial need" if their expected family contribution (EFC) is lower than the levels set annually by the Department of Education ("Federal Pell Grant Program," 2015).

Finally, two measures of social engagement were included as control variables (Student Athlete and Greek Affiliation). Student Athlete was a binary variable operationalized as Student Athlete (1) or Non-Athlete (0). Greek was a binary variable operationalized as Greek (1) or Non-Greek (0).

Table 2, on the following page, summarizes a complete list of variables to be included in this analysis, variable coding and labeling, and category data.

Statistical Methods

The present study includes univariate, bivariate, and multivariate analyses, each of which are detailed in the following sections. The unit of analysis for this study was the individual student. Stata 15 was used to conduct all statistical analyses (StataCorp, 2017). All hypothesis tests were assessed at a significance level of 0.05.

Table 2. Summary of Variables and Coding

Variable	Type	Coding
Semesters to Graduation	Time Variable	Count of semesters from enrollment to graduation
Graduation	Failure Variable	Yes (1), No (0)
4-year Graduation	Failure Variable	≤ 12 semesters (1), > 12 semesters (0)
6-year Graduation	Failure Variable	≤ 18 semesters (1), > 18 semesters (0)
Student Insurance	IV	SHIP or Waiver (1), Unknown (0)
Age	IV	Continuous
Gender (Binary)	IV	Male (1), Female (0)
Race (Group)	IV	Black or African American (1), Asian (2), Hispanic (3), Other Non-White Minority (4), White (0)
College	IV	Business (1), Education (2), Engineering (3), Health Professions (4), Public Health (5), Arts & Sciences (0)
Pell Eligible	IV	Pell Eligible (1), Non-Eligible (0)
High School GPA	IV	0.0 – 4.5
ACT Score	IV	0 – 36
Overall GPA	IV	0.0 – 4.0
Student Athlete	IV	Athlete (1), Non-Athlete (0)
Greek Member	IV	Greek (1), Non-Greek (0)

** IV = Independent Variable*

Univariate Analysis

Descriptive statistics for the continuous and categorical variables are reported, including means and standard deviations for the continuous independent variables (Table 3) and frequencies and percentages for categorical independent variables (Table 4). Statistically significant differences are indicated.

Bivariate Analysis

Bivariate analyses were performed to describe the sample using the following methods. A chi-square test of independence was performed for categorical control variables to examine the relationship between student insurance status and the failure event variables (Grad, Grad_4, Grad_6) (Table 5). All tests were two tailed.

Multivariate Analysis

The present study used survival analysis to examine the temporal nature of college graduation behavior, as it relates to student health insurance status and other covariates of interest. More specifically, the Cox proportional hazards model was used to analyze the relationship between the covariates and semesters-to-graduation.

This analysis concentrated on the "risk" or hazard of graduating for full-time, first-time freshmen entering in the 2012, 2013, and 2014 cohorts at UAB. In addition to the primary analysis, analyses were run with 4-year and 6-year graduation rates as the survival event, since not all cohorts had the opportunity to graduate within 6-years. Including a time variable (semesters to graduation) in this study gives the ability to focus on the time periods when college students are "at greater risk" of experiencing the failure

event of interest (graduation). The basics of survival analysis are presented below to familiarize the reader to this methodology.

Censoring. Censoring is an important factor in survival analysis. When studying longitudinal data, it is understood that the failure event of interest may not be observed for some individuals within the period of observation. Censoring represents this specific type of missing data.

Observations are "censored" when information about their survival time is missing or incomplete. Survival analysis methods incorporate censored and uncensored observations when estimating the parameters of the model. Failure to account for these censored observations can lead to extreme bias or loss of information when using traditional statistical methods, such as logistic regression (Desjardins, 2003).

There are two types of censoring – right and left. Left censoring occurs if the time of origin in the study is unknown for a given participant, making the exact length of participation unknowable. Since specific student enrollment timing was one of the inclusion criteria for this study (first-time freshman), left censoring is not a concern. The remainder of this explanation will emphasize right censoring.

Right censoring is the most common form of censoring in survival analysis. Data is right censored when a participant is either terminated before the period of observation ends (drop out) or continues past the final point of observation (t_n) without experiencing a terminating or failure event (DesJardins, 2003; Singer & Willett, 2003; Willett & Singer, 1991; Willett & Singer, 1993). Figure 2 illustrates right censoring.

For the given period of observation (from t_1 to t_n), graduation is the failure variable or outcome of interest. According to this figure, Student 1 is the only participant known to experience the event within the observational period. Students 2 and 3 were both right censored. Even though Student 3 experienced the failure event (graduation), they are considered right censored because the failure event occurred outside of the data collection period. At point t_n, both Student 2 and Student 3 were still at risk of graduating. Student 4 is also right censored because they experienced a terminating event (drop-out) before the failure event (graduation). By leaving the institution before the end of the observational period, they were no longer at risk of graduating.

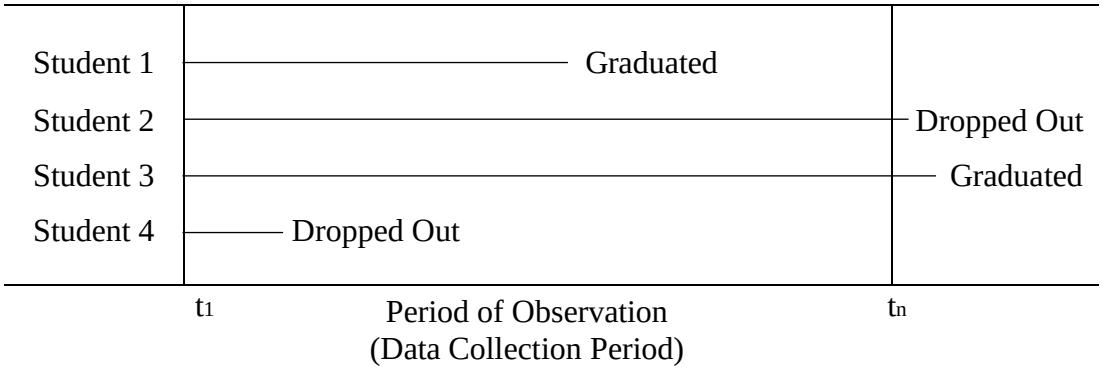

Figure 2. Survival Analysis Example

** Adapted from (Bates, 2012, p. 50)*

Survivor function. Survival analyses begin with the survivor function. This function plots survival probabilities (chronologically) to illustrate a cumulative summary of the percentage of participants that have not experienced the failure event yet (Bates 2012, Singer & Willett, 1991; Willett & Singer, 1993). T is the time interval of the event (1, 2, … , J) and S_j is the probability of "surviving" past time interval *j* (Bates, 2012):

$$S_j = P\,(T > j)$$

Since the data for this study were gathered by the institution on a per semester basis, the survival probabilities for this study were computed by adding the number of students that had not graduated by the end of each individual semester, then dividing by the total number of students in the study. Therefore, the survivor function for the present study is a plot of survival probabilities, by semester, over the period of observation.

Hazard function. The hazard function is a necessary component of survival analysis. The survival function, though important, does not capture the distribution of risk across time because it fuses the data from the previous semesters together (Bates, 2012; Singer & Willett, 1991). For this study, the survival function creates a cumulative summary of the percentage of students that have not yet graduated, which does not allow for the ability to make time-bound, per-semester inference on risk. The hazard (h_j) represents the instantaneous threat of a failure event occurring within a given time interval. It is a conditional probability of the failure event occurring at time interval *j*, as long as the failure event has not occurred prior to time interval *j* (Bates, 2012):

$$h_j = P\,(\,T = j \mid T \geq j\,)$$

Willett and Singer (1993) state the hazard function is the cornerstone of survival analysis for three distinct reasons. First, the hazard function communicates the desired information – if and when failure events occur. Second, it calculates hazard probabilities for every time interval that events occur (without ignoring censored data). Third, the hazard function gives researchers the ability to directly compute the survival function for time intervals that are not included due to censoring.

Cox proportional hazards model. The Cox proportional hazards model is the primary means of analyzing the hypotheses of this study. This model provides information regarding the relationship between the hazard function and predictor variables (see Table 2). The Cox model can explain whether one group is at greater risk of experiencing the failure event (within the given period of observation) than the baseline group. For this study, three Cox models were run for the three observational periods of interest (Grad, Grad_4, Grad_6).

In the Cox (1972) proportional hazards model, the hazard is presumed to be:

$$h(t) = h_0(t) \exp(\beta_1 x_1 + \cdots + \beta_k x_k)$$

The hazard ratio for this model is similar to the odds ratio in logistic regression and reports the effect the covariates have on the probability of the failure event occurring within the period of observation (as long as the failure event has not occurred).

CHAPTER 4

RESULTS

This chapter details the results obtained following the methods outlined in the previous chapter. First, descriptive statistics are provided, including means and standard deviations for the continuous independent variables and frequencies and percentages for categorical independent variables. Next, descriptive statistics for the bivariate analyses are provided. This chapter concludes with a presentation of the results of the multivariate analysis (survival analysis) and functions of this sample. Statistically significant differences are indicated by asterisks. Results with p-values at or below 0.05 were deemed statistically significant.

Descriptive Statistics

Table 3 presents a summary of the descriptive statistics for continuous variables. A total of 4,826 individual students met the inclusion criteria for this study. This sample encompassed three cohorts of first-time, full-time freshmen who enrolled in the Fall 2012, Fall 2013, and Fall 2014 semesters, respectively. This sample was largely traditionally aged, with a mean age of 18.2. The students in this sample entered UAB with a mean high school GPA of 3.58 (on a scale of 0.0-4.5) and a mean ACT score of 24.7. Their mean overall GPA at UAB was 2.88. Of those that graduated, the mean length of time-to-graduation was 14.1 semesters, or a little over 4 years.

Table 3. Summary of Descriptive Statistics for Continuous Variables

Variable	Obs	Mean	Std. Dev	Min	Max
Age	4,826	18.2	0.92	18	46
High School GPA	4,826	3.58	0.53	0	4.5
ACT Score	4,773	24.7	3.87	16	36
Overall GPA	4,826	2.88	0.89	0	4
Semesters to Graduation	4,826	14.1	3.17	5	20

Table 4 presents a summary of the descriptive statistics for the categorical variables. Of the 4,826 first-time, full-time freshmen in this sample, 59% (2,829 students) graduated within the period of observation. Additionally, 1,797 (37%) graduated within 4 years (≤ 12 semesters) and 2,804 (58%) graduated within 6 years (≤ 18 semesters). This sample consisted of 42% male and 58% female students. White students made up 61% of the sample, with 39% representing non-white, minority students.

Students in this sample were disproportionately enrolled in the College of Arts & Sciences (72%). Further, the majority of this sample was non-Greek (79%) and non-athlete (94%) The sample was split roughly equally in regard to Pell Grant eligibility – 44% eligible, 56% not eligible. Most notably, only 10% of the sample (463 students) was noted as being enrolled in UAB's student health insurance plan or equivalent private insurance.

Table 4. Summary of Descriptive Statistics for Categorical Variables

Variable	Frequency	Percent
Entering Cohort		
Fall 2012	1,532	31.74 %
Fall 2013	1,643	34.04 %
Fall 2014	1,651	34.21 %
Insurance Status		
Insured	463	9.59 %
Unknown	4,363	90.41 %
Graduated		
Yes	2,829	58.62%
No	1,997	41.38%
Graduated ≤ 4 Years		
Yes	1,797	37.24%
No	3,029	62.76%
Graduated ≤ 6 Years		
Yes	2,804	58.10%
No	2,022	41.90%
Gender		
Male	2,041	42.29 %
Female	2,785	57.71 %
Race		
White	2,937	60.86%
Black or African American	1,120	23.21%
Asian	335	6.94%
Hispanic	121	2.51%
Other Non-White Minority	313	6.49%
College		
Arts & Sciences	3,445	71.38%
Business	447	9.26%
Education	176	3.65%
Engineering	545	11.29%
Health Professions	182	3.77%
Public Health	31	0.64%
Pell Eligibility		
Pell Eligible	2,112	43.76 %
Non-Eligible	2,714	56.24 %
Greek Organization Member		
Greek	1,004	20.80 %
Non-Greek	3,882	79.20 %
Student Athlete		
Student Athlete	315	6.53 %
Non-Athlete	4,511	93.47 %

Bivariate Analysis

A chi-square test of independence was performed to examine if there are differences in the graduation rates of students with health insurance and unknown (Table 5). The chi-square tests revealed that, of the students with health insurance, 68.90% graduated within the period of observation compared to 57.53% of the students with unknown health insurance graduated with the period of observation (X_2: 22.31, $p<0.001$). Furthermore, 42.76% of the students with health insurance graduated in four years or less and 68.03% graduated in six years or less, compared with 36.65% and 57.05% of the students with unknown health insurance, respectively (X_2: 6.70, $p\leq0.01$; X_2: 0.76, ≤0.001; respectively). These analyses show that there are some differences in the graduate rates of those with known health insurance and those with unknown health insurance status

Table 5. Results of Bivariate Analyses

	Insured		Unknown		X_2 or t-stat
Variable	Freq.	Percent	Freq.	Percent	
Graduated					**22.31*****
Yes	319	68.90%	2,510	57.53%	
No	144	31.10%	1,853	42.47%	
Graduated ≤ 4 Years					**6.70****
Yes	198	42.76%	1,599	36.65%	
No	265	57.24%	2,764	63.35%	
Graduated ≤ 6 Years					**20.76*****
Yes	315	68.03%	2,489	57.05%	
No	148	31.97%	1,874	42.95%	

* $p \leq 0.05$ / ** $p \leq 0.01$ / *** $p \leq 0.001$

Multivariate Analysis

To better understand the probability of graduating within a particular time interval, a survivor analysis was conducted. This section presents results, graphs, and tables of the estimates of the survivor and hazard probabilities, which give a clear picture of the graduation behavior for this study sample. Finally, Cox proportional hazard models are presented, comparing within-group differences in hazard and graduation rates.

Survivor Probabilities

As discussed earlier, the survival function plots survival probabilities (chronologically) to illustrate a cumulative percentage of participants that have not experienced the failure event yet (i.e. not graduated). The survivor function is presented in Figure 3 and the related survival probabilities are listed in Table 6. In Table 6, you can see that Semester 5 was the earliest semester that students graduated, and the greatest number of students graduated in Semester 11. Approximately 37% of the students in this sample graduated in four years or less (by Semester 12) and 63% graduated in six years or less (by Semester 18). At the end of the period of observation, roughly 35% of the students in this study had not graduated – representing a 65% graduation rate.

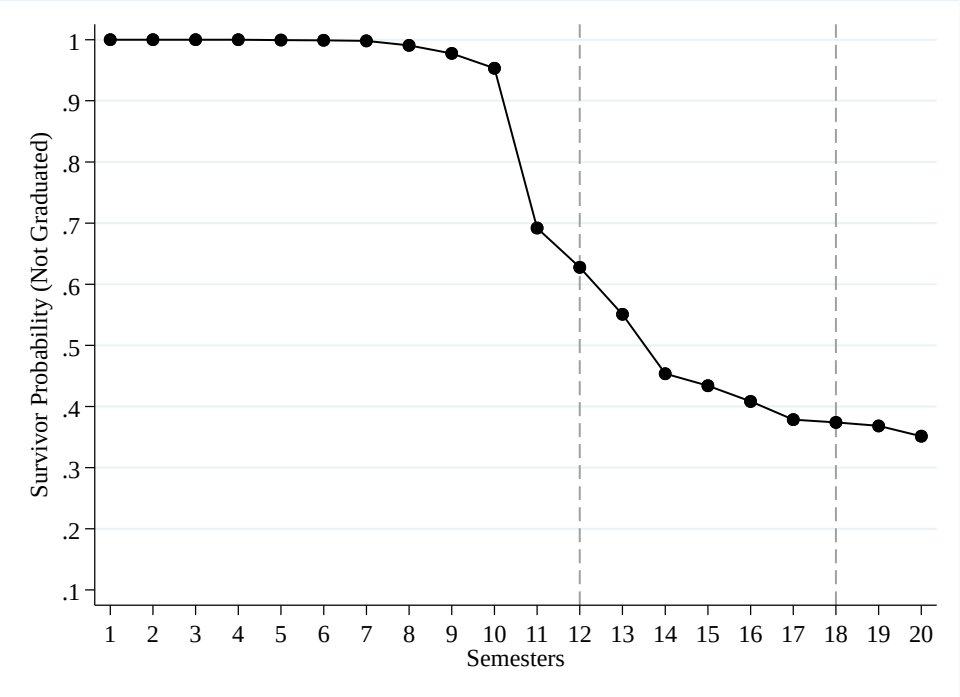

Figure 3. Survivor Function for Semesters to Graduation

Table 6. Survival Probabilities for Semesters to Graduation

Semester Interval		Term	Survivors (Not Grad)	Grad Per	Censored	Survival Probability	% Not Grad
1	2	Fall	4826	0	0	1.000	100.0%
2	3	Spring	4826	0	0	1.000	100.0%
3	4	Summer	4826	0	0	1.000	100.0%
4	5	Fall	4826	0	0	1.000	100.0%
5	6	Spring	4826	3	0	0.999	99.9%
6	7	Summer	4823	2	0	0.999	99.9%
7	8	Fall	4821	4	0	0.998	99.8%
8	9	Spring	4817	36	0	0.991	99.1%
9	10	Summer	4781	63	0	0.978	97.8%
10	11	Fall	4718	118	0	0.953	95.3%
11	12	Spring	4600	1261	0	0.692	69.2%
12	13	Summer	3339	310	0	0.628	62.8%
13	14	Fall	3029	371	0	0.551	55.1%
14	15	Spring	2658	402	757	0.454	45.4%
15	16	Summer	1499	65	0	0.434	43.4%
16	17	Fall	1434	85	0	0.408	40.8%
17	18	Spring	1349	76	612	0.379	37.9%
18	19	Summer	661	8	0	0.374	37.4%
19	20	Fall	653	10	0	0.368	36.8%
20	21	Spring	643	15	628	0.351	35.1%

Hazard Probabilities

The hazard function presents a chronological plot of the risk of a failure event at specific time intervals within the period of observation. The hazard function for this study is presented in Figure 4, and the related hazard probabilities are listed in Table 7. Table 7 clearly shows that students are at the highest risk of graduating (on schedule) during the final three Spring semesters of the observational period (11, 14, 17). Students are at the greatest risk of graduating in Semester 11. The spikes at 11, 14, and 17 are logical based on the traditional academic calendar of universities. The valleys at 12, 15, and 18 represent Fall semesters, which are not typically high-volume periods for graduation.

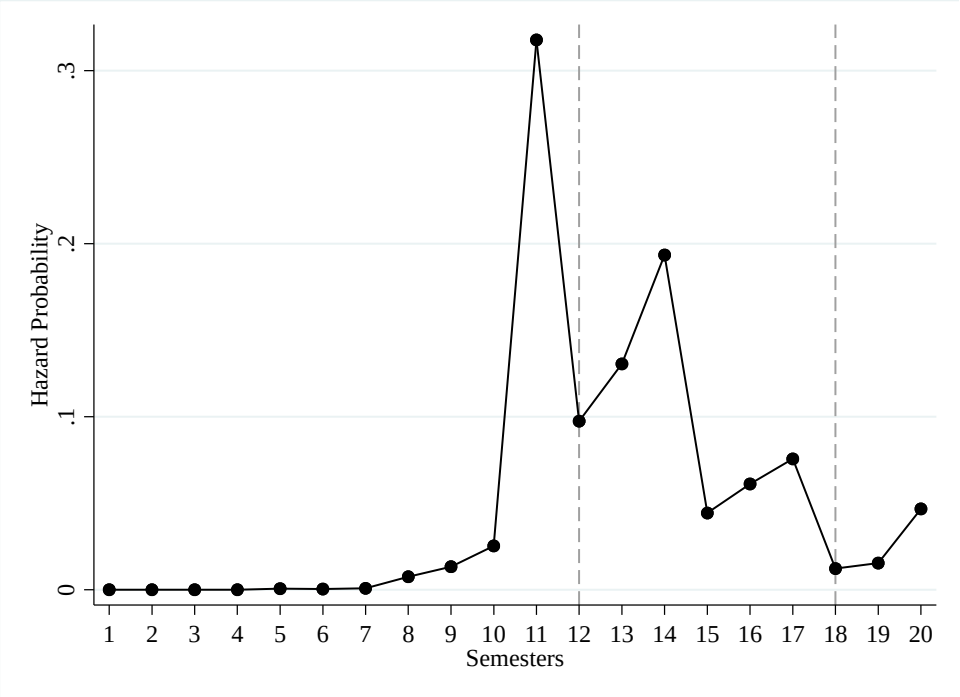

Figure 4. Hazard Function for Semesters to Graduation

Table 7. Hazard Probabilities for Semesters to Graduation

Semester Interval		Term	Beg. Total	% Grad	Hazard Probability	Hazard
1	2	Fall	4826	0.0%	0.000	0.0%
2	3	Spring	4826	0.0%	0.000	0.0%
3	4	Summer	4826	0.0%	0.000	0.0%
4	5	Fall	4826	0.0%	0.000	0.0%
5	6	Spring	4826	0.1%	0.001	0.1%
6	7	Summer	4823	0.1%	0.000	0.0%
7	8	Fall	4821	0.2%	0.001	0.1%
8	9	Spring	4817	0.9%	0.008	0.8%
9	10	Summer	4781	2.2%	0.013	1.3%
10	11	Fall	4718	4.7%	0.025	2.5%
11	12	Spring	4600	30.8%	0.318	31.8%
12	13	Summer	3339	37.2%	0.097	9.7%
13	14	Fall	3029	44.9%	0.131	13.1%
14	15	Spring	2658	54.6%	0.193	19.3%
15	16	Summer	1499	56.6%	0.044	4.4%
16	17	Fall	1434	59.2%	0.061	6.1%
17	18	Spring	1349	62.2%	0.076	7.6%
18	19	Summer	661	62.6%	0.012	1.2%
19	20	Fall	653	63.2%	0.015	1.5%
20	21	Spring	643	64.9%	0.047	4.7%

Cox Proportional Hazards Model

The Cox proportional hazards model provides information regarding the relationship between the hazard function and predictor variables of interest for this study. The results of the Cox model analysis are presented in Table 8, including hazard ratios and 95% confidence intervals for each of the covariates and time periods. Statistically significant variables are indicated by asterisks. Results with p-values at or below 0.05 were deemed statistically significant.

As demonstrated in Table 8, the primary independent variable of interest (Student Insurance) was not statistically significant in any of the three observational periods studied. The variables of interest were not statistically significant at any of the three time intervals: H1- student insurance at interval: Grad (p-value = 0.839), H2- student insurance at interval: Grad_4 (p-value = 0.093), or H3 - student insurance at interval: Grad_6 (p-value = 0.631).

All three hypotheses for this study were not supported, based on the lack of statistical significance at the 95% confidence level. Though, the relationship between all three observational periods and student insurance status was statistically significant in the bivariate analyses, the significance of those relationships went away in the presence of the control variables. However, five of the independent variables were found to be statistically significant (Race: Asian, College: School of Health Professions, Pell Eligibility, Greek Membership, and Overall GPA) in relation to graduation in all three observational periods (Graduation, 4-year Graduation, 6-year Graduation) and lend support to the literature on graduation and attrition.

Table 8. Results of Cox Proportional Hazards Model

Variable	Graduated		Graduated ≤ 4		Graduated ≤ 6	
	Hazard Ratio	95% CI	Hazard Ratio	95% CI	Hazard Ratio	95% CI
Student_Insurance	0.982	[.83, 1.2]	0.817	[.65, 1.0]	0.959	[.81, 1.1]
Gender_Male	0.975	[.90, 1.1]	**0.8665****	[.78, .96]	0.968	[.89, 1.1]
Race_Group						
Black	**1.305*****	[1.2, 1.4]	1.124	[.98, 1.3]	**1.305*****	[1.2, 1.4]
Asian	**1.248*****	[1.1, 1.4]	**1.201****	[1.0, 1.4]	**1.248*****	[1.1, 1.4]
Hispanic	1.258	[1.0, 1.6]	1.134	[.83, 1.5]	**1.279***	[1.0, 1.6]
Other	1.010	[.86, 1.2]	1.061	[.88, 1.3]	1.019	[.87, 1.2]
College						
Business	1.094	[.96, 1.2]	1.118	[.95, 1.3]	1.094	[.96, 1.2]
Education	0.827	[.67, 1.0]	0.800	[.61, 1.1]	0.818	[.66, 1.0]
Engineering	0.896	[.79, 1.0]	**0.721*****	[.61, .85]	**0.865***	[.76, .98]
Health Professions	**1.325****	[1.0, 1.7]	**1.492****	[1.1, 2.0]	**1.351***	[1.1, 1.7]
Public Health	0.958	[.57, 1.6]	1.253	[.65, 2.4]	0.976	[.58, 1.6]
Pell_Eligible	**0.908****	[.84, .99]	**0.8405*****	[.76, .93]	**0.899***	[.83, .98]
Student_Athlete	0.994	[.85, 1.2]	1.005	[.83, 1.2]	1.003	[.86, 1.2]
Greek	**1.455*****	[1.3, 1.6]	**1.392*****	[1.3, 1.5]	**1.448*****	[1.3, 1.6]
Age	0.902	[.81, 1.0]	0.952	[.82, 1.1]	0.908	[.81, 1.0]
HS_GPA	1.024	[.93, 1.1]	**1.228****	[1.1, 1.4]	1.025	[.93, 1.1]
ACT_Score	1.010	[1.0, 1.0]	**1.018***	[1.0, 1.0]	1.011	[1.0, 1.0]
Overall_GPA	**4.792*****	[4.4, 5.2]	**5.039*****	[4.4, 5.8]	**4.838*****	[4.4, 5.3]

* $p \leq 0.05$ / ** $p \leq 0.01$ / *** $p \leq 0.001$

Supplementary Analysis

Two supplementary analyses were performed on this data. The first analysis tested for multicollinearity among the covariates. A logistic regression was performed, and the variance inflation factors (VIFs) were tested. All VIFs were under 2.0 for all covariates. Based on this data, we believe that no multicollinearity exists among the covariates.

Second, since student health insurance was the primary independent variable of interest for this study, additional statistics were generated to describe the differences between the insured and unknown student populations in this sample. Table 9 presents a summary of the continuous variables and Table 10 presents a summary of the categorical variables for insured students.

Only 463 of the 4,826 students (9.59%) in this sample were documented as having student health insurance or a waiver verifying equivalent private insurance (see Table 9). The sample of insured students was traditionally aged, with a mean age of 18.2. However, insured students mean high school GPA, ACT score, and overall GPA were all higher than the sample population mean. Of those that graduated, the mean length of time-to-graduation was 13.1 semesters – a semester earlier than the sample population.

Table 9. Summary of Continuous Variables for Insured Students vs. Unknown

	Insured		Unknown		t-test p-value
Variable	Mean	Std. Dev.	Mean	Std. Dev.	
Age	18.2	0.93	18.2	0.83	0.1795
High School GPA	3.67	0.50	3.57	0.53	0.0001
ACT Score	25.2	4.01	24.6	3.85	0.0025
Overall GPA	3.11	0.64	2.85	0.91	0.0000
Semesters to Graduation	13.2	2.57	14.2	3.21	0.0000

The majority of the insured student sample (57.24%) enrolled in Fall 2014. Additionally, the graduation percentage of students with health insurance increased for all three periods of observation. The percentage of insured students that graduated within 4 years (≤ 12 semesters) was 5% higher (42%) than the overall sample population (37%) and the percentage of insured students that graduated within 6 years (≤ 18 semesters) was 10% higher (68%) than the overall sample population (58%).

The gender, Pell Grant eligibility, and Greek member ratios remained consistent with the overall sample population. However, non-white, minority students represented a majority of the insured student population (55%). The two most heavily represented colleges in this sample of insured students was Arts & Sciences (42%) and the School of Health Professions (39%), making up over 80% of the insured student population. A mere 3% of student athletes (15) are documented as having health insurance.

Table 10. Summary of Categorical Variables for Insured Students vs. Unknown

Variable	Insured		Unknown		X_2 or t-stat
	Freq.	Percent	Freq.	Percent	
Entering Cohort					**121.08*****
Fall 2012	90	19.44%	1,442	33.05%	
Fall 2013	108	23.33%	1,535	35.18%	
Fall 2014	265	57.24%	1,386	31.77%	
Graduated					**22.31*****
Yes	319	68.90%	2,510	57.53%	
No	144	31.10%	1,853	42.47%	
Graduated ≤ 4 Years					**6.70****
Yes	198	42.76%	1,599	36.65%	
No	265	57.24%	2,764	63.35%	
Graduated ≤ 6 Years					**20.76*****
Yes	315	68.03%	2,489	57.05%	
No	148	31.97%	1,874	42.95%	
Gender					0.0004
Male	267	57.67%	1,845	42.29%	
Female	196	42.33%	2,518	57.71%	
Race					**83.81*****
White	212	45.79%	2,725	62.46%	
Black	122	26.35%	998	22.87%	
Asian	41	8.86%	294	6.74%	
Hispanic	20	4.32%	101	2.31%	
Other	68	14.69%	245	5.62%	
College					**2.1*****
Arts & Sciences	196	42.33%	3,249	74.47%	
Business	19	4.10%	428	9.81%	
Education	7	1.51%	169	3.87%	
Engineering	28	6.05%	517	11.85%	
Health Professions	182	39.31%	0	0.00%	
Public Health	31	6.70%	0	0.00%	
Pell Eligibility					3.64
Pell Eligible	222	47.95%	1,890	43.32%	
Non-Eligible	241	52.05%	2,473	56.68%	
Greek Member					3.56
Greek	112	24.19%	892	20.44%	
Non-Greek	351	75.81%	3,471	79.56%	
Student Athlete					**9.07****
Student Athlete	15	3.24%	4,063	93.12%	
Non-Athlete	448	96.76%	300	6.88%	

* $p \leq 0.05$ / ** $p \leq 0.01$ / *** $p \leq 0.001$

CHAPTER 5

DISCUSSION

This chapter provides a summary and discussion of the key findings related to the relationship between student health insurance and a student's risk of graduating at different graduation intervals. A summary and discussion are provided for each of the hypotheses tested. Then, the limitations and future research opportunities associated with this study are described.

The purpose of this study was to explore the effects of student-related factors (namely health insurance) at various graduation intervals. Survival analysis was used as the primary statistical method. The foundation of the proposed conceptual framework was based on human capital theory and prior research related to health and academic performance. Based on the reviewed literature, human capital theory centers around the belief that investing capital (health insurance) in individuals (students) is ultimately an investment in the organization (improved institutional outcomes via increased risk of graduation) (Becker, 1964; Grossman, 1972).

Review of Findings

The following section explains the findings related to the research questions and hypotheses proposed in the previous chapters.

Research Question 1: Graduation

Does having health insurance increase a student's risk of graduating?

In this study, the bivariate analysis initially pointed to a statistically significant relationship between health insurance and graduation. However, once control covariates were included, there was ultimately no evidence to support the hypothesis that having health insurance increases a student's individual risk of graduating. These results are inconsistent with the argument that health insurance coverage may be associated with greater risk of graduating. Empirical relationships were established in the literature between health insurance and health service utilization (Chung, 2017; Freeman et al., 2008), health service utilization and individual health status (Baker et al., 2002; Franks et al., 1993; Freeman et al., 2008), individual health status and academic performance (Bradley et al. 2016; Grizzell & McNeil, 2009; Lust et al., 2008), and academic performance and rates or risk of graduation (Gershenfeld et al., 2016; Nora et al., 2005). However, based on the results of this study, the relationship between health insurance coverage and greater risk of graduating may be too indirect to capture a significant relationship.

Research Question 2: 4-Year Graduation

Does having health insurance increase a student's risk of graduating within 4 years of enrollment (≤ 12 semesters)?

Consistent with the first hypothesis, there was no evidence to support the secondary hypothesis that having health insurance increases a student's individual risk of

graduating within 4 years of enrollment (≤ 12 semesters). These results were also inconsistent with the linkages established and expanded upon earlier in Table 1.

Research Question 3: 6-Year Graduation

Does having health insurance increase a student's risk of graduating within 6 years of enrollment (≤ 18 semesters)?

Finally, as with the first two hypotheses, there was no support for the third hypothesis that having health insurance increases a student's individual risk of graduating within 6 years of enrollment (≤ 18 semesters). These results were ultimately inconsistent with the inferred relationships exposed in the review of literature and outlined in Table 1. Based on the collective findings of the three hypotheses, the length of each period of observation did not affect the relationship between student health insurance and the risk of graduation.

Limitations and Opportunities for Future Research

The present study has limitations worthy of discussion. The first limitation of this study is in the generalizability of its findings. All of the findings from this study relate to students from a single, four-year, public institution. Further, the survival analysis results are indissolubly linked to the particular period of observation used in each analysis (Willett & Singer, 1993). Therefore, though the time duration studied may be the same, institutional and environmental factors related to the observational period will always vary. Therefore, any statistically significant findings from this study may not apply to all colleges or time periods.

For this study, students with university-sponsored plans or those from mandated colleges were the only individuals with reliable health insurance data. Therefore, a second limitation is the presumption that the dataset is incomplete and may not capture all students with health insurance. UAB's Registrar and Office of Institutional Effectiveness attests that the current data represents the most complete records regarding UAB student health insurance. However, with only 10% being reported as having insurance, it seems more plausible that student health insurance data was under-reported. An opportunity for future research should begin with how university data is collected. Future research on this topic will rely on the thorough, accurate documentation of all students' insurance status – university-sponsored, waiver, uninsured, underinsured, etc. Otherwise, there is no way to truly make inference about the role health insurance is playing on graduation rates or graduation risk associated with a given population.

Thirdly, the temporal stability of the health insurance variable is questionable. For this study, the health insurance variable was recorded and reported as "yes" or "unknown" – 1 or 0. However, this variable has the potential to change over time. A student may experience a change in their insurance status (having or not having insurance) over the period of observation. Such fluctuations in insurance status may have adversely affected the results of this study by attributing successful graduation to a student without health insurance or vice versa. Future researchers conducting survival analyses on university data should seek to obtain as much time-varying data as is available. Factors such as health insurance status, hours enrolled, employment status, and Pell eligibility can change from semester-to-semester. Survival analyses rely on the accurate reporting of such time-dependent factors. If such data are not collected on a per

semester basis, efforts could be made to amend university policies to ensure the regular collection of such variables.

Finally, the limiting factor for this study could be the utilization of a secondary source of data. The data were not designed or collected for research purposes, and thus may present certain limitations (e.g. missing data, inconsistencies in recording variables). Therefore, this may be considered a limitation to the accuracy and completeness of the results of this study. As administrators, efforts could be made to amend data collection policies and practices with future research endeavors in mind.

Implications for College Administration

Despite the inconclusive results regarding the impact of health insurance on graduation risk and the limitations outlined above, there are still useful implications that can be drawn from this study. First, the results suggest that additional resources should be allocated to support students in their 15th, 16th, and 17th semesters. The outcomes presented in Table 7 and visualized in Figure 4, show that graduation risk dropped sharply from semester 14 (19.3%) to semester 15 (4.4%). This appears to be a critical time period and ongoing support should be given to help students at risk of dropping out or continuing past semester 18 (the 6-year graduation limit).

Students persisting to this stage in their academic career may have met challenges and need additional support. College administration should also consider increasing targeted interventions for students persisting past semester 14 to support student graduation prior to semester 18. Such interventions would support students that are often

"lost in the system", encourage timelier graduation, and may increase institutional graduation rates.

Second, this study discovered a statistically significant relationship between five of the independent variables and graduation (Race: Asian, College: School of Health Professions, Pell Eligibility, Greek Membership, and Overall GPA). Two of these variables hold actionable implications for practice for administrators – GPA and Greek Membership. The first factor that holds clear implications for administrators was overall GPA. The relationship between college academic performance (as measured by GPA) and persistence to graduation has been well documented in the literature (Gershenfeld et al., 2016; Stewart, Lim, & Kim, 2015). College administrators should continue to utilize GPA as a diagnostic tool to determine of student well-being and academic success – targeting interventions to support students falling below university standards.

The second factor that holds implications for administrators was Greek organization membership. This factor was included based on research revealing the relationship between social integration and persistence to graduation (Astin, 1993; Bean, 1982; Gramling, 2013; Tinto, 1975; Tinto, 2007). As shown in Figure 5, Greek students had a consistently higher risk of graduating within this observational period of this study. Researchers such as Walker et al (2015) report similar findings that membership in Greek organizations leads to higher levels of campus involvement, which is predictive of higher persistence and graduation rates. These findings are in line with human capital theory, in that investments in the social experience of college students will lead to improved academic performance and increase their likelihood of graduation.

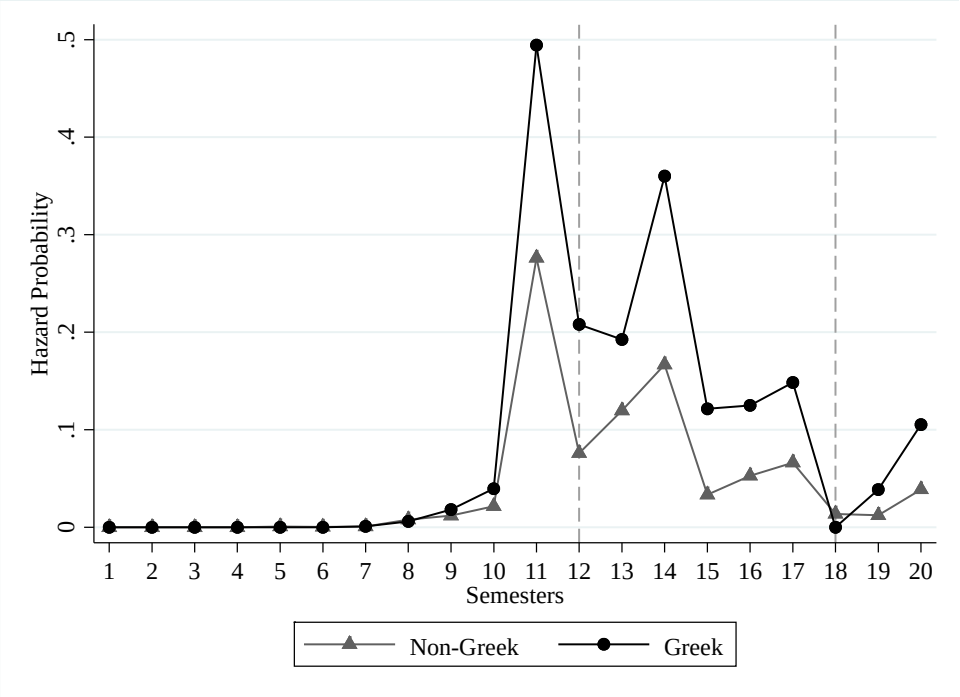

Figure 5. Hazard Function for Semesters to Graduation (Greek)

This study's findings on the effect of Greek organization membership on graduation risk suggests that interventions aimed at increasing persistence and graduation should encompass attention to helping students to access social groups of support when entering college. College can often induce feelings of isolation or a lack of belonging, requiring a significant period of adjustment for students. Helping students access networks of peer support, such as Greek organizations, should positively impact retention and graduation rates.

Conclusion

While this study does confirm many factors that were previously associated with affecting a student's likelihood of graduation, the primary variable of interest (student

insurance) was not found to have any effect. Based on these findings, health care and higher education administrators should carefully consider mandating such policies until more data is available. Additional studies on the empirical relationship between student health-related factors and academic performance, persistence, and graduation should continue to be prioritized. An expansion of the literature in this area is needed to make informed, evidence-based decisions to positively impact student lives and university outcomes.

As long as graduation rates are tied to institutional performance and funding, college health executives and higher education administrators will continue to prioritize research initiatives to gain a greater understanding of the influential factors related to student success and graduation. The present study used survival analysis to research the temporal influence health insurance may have on a student's risk of graduation. This study opens the door to taking an intentional look at the intersectionality of health care interventions and higher education outcomes.

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APPENDIX

APPENDIX A

UAB Institutional Review Board Approval

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM
Office of the Institutional Review Board for Human Use

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Lovett, John R

University of Alabama at Birmingham Institutional Review Board
Federalwide Assurance # FWA00005960
IORG Registration # IRB00000196 (IRB 01)
IORG Registration # IRB00000726 (IRB 02)

02-May-2019

IRB-300003208
An Analysis of the Association Between Student Health Insurance and Graduation

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The IRB reviewed and approved the Initial Application submitted on 25-Apr-2019 for the above referenced project. The review was conducted in accordance with UAB's Assurance of Compliance approved by the Department of Health and Human Services.

	Exempt
	4
Determination:	Exempt
	02-May-2019
	No Continuing Review

- usepermission(UABRegistrar).190425
- datacollection.190409
- response.190425
- datacollection.190425
- hsp.190409.clean
- usepermission(institutionaleffectiveness).190409

APPENDIX B

OIE UAB Office of Institutional Effectiveness Data Disclosure

THE UNIVERSITY OF ALABAMA AT BIRMINGHAM
Office of Institutional Effectiveness and Analysis

April 16, 2019

To Whom It May Concern:

For the purposes of this study, de-identified data will be generated by the UAB Office of Institutional Effectiveness and Analysis for John Lovett. The following data elements will be de-identified:

- UAB Graduation Date
- Student Health Insurance Status
- UAB College or School Enrolled
- Birth Date
- Sex
- Race
- Pell Eligibility
- High School GPA
- ACT Composite
- UAB Term GPA
- UAB Cumulative GPA
- Student-Athlete Status
- Greek Affiliation

The population will include undergraduate students who were first-time, full-time, baccalaureate degree-seeking freshmen entering in Fall 2012, Fall 2013, or Fall 2014. Only those students age 18 and up as of Fall Census will be reported. Any student with a Privacy Hold will be excluded. Please contact me at aycock@uab.edu with any questions.

Regards,

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APPENDIX C

ACHA Standards for Student Health Insurance/Benefit Coverage

NOVEMBER 2017

ACHA Guidelines

Standards for Student Health Insurance/Benefits Coverage

The American College Health Association has instituted these standards to guide institutions of higher education in the establishment of an appropriate, credible student health insurance program. The standards apply to both fully insured and self-funded student health plans.

Standard I.

The institution, as a condition of enrollment, requires students to provide evidence that they have health insurance coverage.

Standard II.

The institution recognizes that students enrolled in its sponsored health plan rely on it as if it is their primary source of coverage.

Adequate and appropriate scope of coverage is provided, including, but not limited to:

- Coverage for immunizations, screenings, and other preventive services consistent with ACHA recommendations and state and federal mandates.
- Coverage for illness and injury.
- Coverage for prescription medications.
- Coverage for pre-existing conditions.
- Continuity of coverage up to plan limits for students requiring a medically-necessary leave-of-absence.

Additionally,

- The program encourages use of campus health and counseling services, when doing so provides optimal access to high quality and cost-effective care for students.
- Plan benefits, limitations, exclusions, special provisions, and definitions are reviewed to assure they are consistent with common practices of the student health insurance market and the Affordable Care Act.

Standard III.

The institution acknowledges it has a fiduciary responsibility to manage student health insurance programs in the best interest of students covered by the programs.

Standard IV.

The student health insurance program is annually reviewed to assure it is in full compliance with all applicable federal and state statutes and regulations.

Standard V.

Student consumers, student health program staff, and other internal or external experts, as appropriate, are involved with the selection, monitoring, and evaluation of the student health insurance program.

Standard VI.

The student health insurance program is reviewed annually to ensure the program:

- meets the needs of covered individuals,
- provides desired benefits at the least possible cost, and
- returns as much of the premium or fund contributions as possible to covered individuals in the form of benefits.

Reserve funds may also be maintained to assure short- and long-term financial viability for the program and are for the sole use by and for the plan.

Standard VII.

Commercial insurance carriers, agents, brokers, and all others providing services to the student health insurance program are required to provide a full description of estimated claims, reserve estimates, administrative expenses, and all other fees.

The student health insurance program is audited periodically and the results are provided to appropriate institutional officials and student consumers. Each year, a summary financial report for the program is published and made available to student consumers and campus officials responsible for management of the student insurance program.

Standard VIII.

The selection of vendors for the student health insurance program adheres to institutional and/or applicable governmental requirements relative to competitive vendor selection processes.

Standard IX.

Agents, brokers, consultants, and program managers do not have relationships that could be construed to be a real or potential conflict of interest. Agreements with consultants or brokers are fully disclosed and clearly define the services to be performed and the compensation to be received.

Standard X.

The student health insurance program is available to all eligible students regardless of age; gender identity; gender expression; marital status; physical size; psychological, physical, or learning ability; race/ethnicity; religious, spiritual, or cultural identity; sex; sexual orientation; socioeconomic status; or veteran status.

ACHA American College Health Association
advocacy•education•research

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