2013

# The influence of distal family background and proximal family status on the occurrence and timing of post-baccalaureate enrollment

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# THE INFLUENCE OF DISTAL FAMILY BACKGROUND AND PROXIMAL FAMILY STATUS ON THE OCCURRENCE AND TIMING OF POST-BACCALAUREATE ENROLLMENT

by

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A thesis submitted in partial fulfillment of the requirements
for the Doctor of Philosophy degree in
Educational Policy and Leadership Studies (Higher Education)
in the Graduate College of The University of Iowa

December 2013

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PH.D. THESIS

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To
My wonderful husband, Adam, our delightful children, Alex and Madison
My dear friend and mentor, Liz Loveless

Institutional supports for all graduate student parents have the potential to attract and retain a diverse and intellectually rigorous student body that includes talented mothers and fathers.

Springer, Parker, & Leviten-Reid, 2009

## ACKNOWLEDGMENTS

I thank my family, Adam, Alex, and Madison. Without your encouragement and the occasional chants and cheers I could not have endured this journey. May you always value higher education and the satisfaction of hard work. Adam, thank you for never wavering in your support and care of me and our family.

I express my gratitude for Liz Loveless. I could not have asked for a better mentor, both personally and professionally, than I have in you. You have forever changed my life and have left me better off than you found me. You empower me to define the trajectory of my career now and into the future.

I thank my parents for demonstrating both the hard work and rewards of advanced education. Thank you for instilling in me a love of learning.

To my family and friends, thank you for asking about my school work and research even though you likely dreaded my long reply.

To my dissertation committee chair, Dr. Brian An, thank you for your support in this process. Your deep knowledge of statistics and stratification, along with your thorough and constructive feedback, is greatly appreciated.

To my dissertation committee members, Dr. Michael Paulsen, Dr. Ernest Pascarella, Dr. David Bills, and Dr. Mary Noonan, thank you for your service on my committee. Your participation made this project stronger.

## ABSTRACT

Graduate students represent 15% of the students and one-third of the graduates of colleges and universities across the United States. They are leading thinkers in higher education institutions and businesses across the country and around the world. In many fields, such as law, graduate or professional school is required for entry-level employment, whereas in other fields, such as business, graduate education may enhance performance and opportunities for promotion.

The educational stratification and college-choice literature document the influence of family background (distal family) on educational attainment. These literatures focus on the traditional undergraduate student without considering the different preferences and responsibilities (context) of potential graduate students considering enrollment. Potential graduate students are often older than high school students making a college choice, are independent from their parents, and may have a spouse and children (proximal family) at the forefront of their educational plans.

This dissertation builds on the educational stratification and college-choice literature by considering post-baccalaureate (graduate) enrollment specifically. This study explores the effects of marriage, parenthood, and any corresponding gender effects on whether and when a bachelor's degree recipient enrolls in graduate education.

To investigate these proximal family effects and gender effects, I analyzed data from the National Center for Education Statistics' Baccalaureate and Beyond Longitudinal Study 1993/03—a longitudinal study that surveyed over 11,000 students at the time of their bachelor's degree completion and three additional times over 10 years.

Using survival analysis (event history analysis), I measured the amount of time between baccalaureate degree completion and first graduate enrollment. Using this measure, I compared differences in the odds of graduate enrollment and timing of graduate enrollment based on marital status, parental status, and gender.

Overall, more women than men enrolled in graduate education, and men enrolled sooner than women. The results showed that being a parent had a negative effect on if and when an individual enrolled in graduate school. Being married also had a negative effect on if and when an individual enrolled in graduate school, with married men experiencing a slightly stronger negative effect than married women. The combined effect of being married and being a parent had the strongest negative effect on graduate enrollment for men and women, but more so for women.

By better understanding graduate college choice, institutions can more effectively use resources and improve the opportunities and experiences for graduate students and, specifically, graduate students with families. Minimizing barriers to entry may level the playing field between graduate degree aspirants with families and those without families.

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# CHAPTER 1

## THE NEED FOR LONGITUDINAL STUDIES OF THE EFFECTS OF MAJOR LIFE EVENTS ON POST-BACCALAUREATE ENROLLMENT

At any given time throughout the United States, over 20 million students are enrolled in some type of post-secondary education (Snyder & Dillow, 2012). An individual's path toward educational attainment is influenced by the varied personal and environmental factors encountered along the way. A large part of the educational attainment and college choice literature on which this dissertation is based is the conceptualization of educational attainment in terms of levels of schooling (Mare, 1980). In other words, students transition from one educational system to another, such as the transition from grade school to middle school or from high school to college. Through the dual lenses of educational attainment and college choice, this project considers how specific proximal family characteristics (such as being married and having children) influence post-baccalaureate[1] enrollment.

Because social scientists typically focus their attention on undergraduate education, there is ample empirical research on preparation, aspiration, access, enrollment, impact, and attainment of a baccalaureate degree (Alexander & Eckland, 1975; Azmitia & Cooper, 2001; Freeman, 1997; Hossler, Schmit, & Vesper, 1999; Kao & Thompson, 2003; Pascarella & Terenzini, 2005; Paulsen & Smart, 2001; Perna, 2006). Thus, researchers have established the prominent factors of influence and stratification in undergraduate education, including habitus, social class, cultural capital, and others (An, 2010; Cabrera & La Nasa, 2001; Charles, Roscigno, & Torres, 2007; Engberg & Allen, 2011; Karabel & Astin, 1975; McDonough, 1997; Nora, 2004; Paulsen & St. John, 2002; Perna, 2000; Perna, 2004; St. John, 2000). However, there is a gap in the research on post-baccalaureate (i.e., graduate) education including preparation, aspiration, access,

[1] Throughout this dissertation I use the terms "post-baccalaureate" and "graduate" interchangeably.

enrollment, and degree attainment. This dissertation focuses on post-baccalaureate enrollment.

Our understanding of the role of graduate education in the transition process is limited for at least four reasons. First, although prior research found that distal family background strongly influences a student's undergraduate college choices (An, 2010; Cabrera & La Nasa, 2001; Charles et al., 2007; Hossler et al., 1999; McDonough, 1997; Perna, 2006), distal family background may not have a direct effect on an individual's post-baccalaureate choices. Research has shown that the influence of distal background declines as an individual increases his or her level of educational attainment (Ethington & Smart, 1986; Mare, 1980; St. John, Asker, & Hu, 2001). In addition, students with bachelor's degrees are typically 22 to 24 years or older and are likely to form their own households after graduation (Snyder & Dillow, 2012). Thus, a student's proximal family characteristics, such as having a spouse or children, may exert a stronger influence on graduate enrollment, whereas distal family background, such as parents' education, may exert a weaker influence on graduate enrollment.

Second, prior studies that focused on the undergraduate college choice decision considered students as dependents of their parents and guardians and did not examine the influence of their spouse and children. Most undergraduate students are not married and are not parents at the time of enrollment in college (typically around age 18). Also, students who do have children before completing a bachelor's degree are different from the typical undergraduate (Fairchild, 2003; Polson, 2003). At baccalaureate degree completion, 71% of graduates are not married and 84% do not have children (Cataldi et al., 2011). It is important to understand the role of having a spouse and children in the educational transition process to graduate school given the age range of prospective graduate students and their stage in the life course. Given that the median age of first marriage is 29 for men and 27 for women, men and women are potentially entering into marriage and parenthood around the same time as they are considering graduate school

(Median age of first marriage, universe: Population 15 to 54 years of age, 2011 American community survey 1-year estimates.).

Third, despite the closing gap between men's and women's educational and occupational attainment over the last 30 years, women with professional degrees continue to follow highly variable career paths due to family roles and responsibilities (Moen, 2001). Therefore, being married and having children may negatively influence decisions to attend graduate school for women more so than for men. For example, data show that of individuals with children who enrolled in graduate school, fathers enrolled sooner after baccalaureate degree completion than did mothers (Nevill & Chen, 2007). Although men may help with family care responsibilities, women still assume most of the burden (Seay, 2010). Therefore, gender may influence graduate enrollment decisions for individuals who are married and/or parents.

Fourth, few researchers consider the timing of life events (e.g., graduation from college, marriage, and childbearing) and their relation to the timing of graduate enrollment. Studies have found a relationship between the timing of schooling and the timing of marriage (Mare, 1991). Also, the effect of the time between leaving school and entering marriage is stronger at higher levels of schooling than at lower levels (Mare, 1991). Of individuals who enroll in graduate school, single people enroll sooner after baccalaureate degree completion than do those who are married, cohabitating, divorced, separated, or widowed (Nevill & Chen, 2007). Therefore, one's marital status is shown to influence graduate enrollment decisions.

For my dissertation, I contribute to the literature on graduate education and college choice by first investigating whether distal family background, such as parental education and parental income, influences an individual's likelihood of enrolling in graduate school. I further investigate whether an individual's marital and parental statuses influence his or her decision to enroll in graduate school. Moreover, I consider gender differences in the influence of marriage and childbearing on graduate enrollment. Finally,

I examine the influence of the timing of life events and their relation to the timing of graduate enrollment. Stated differently, I investigate the sequence of major life events including college completion, first marriage, first childbearing, and first graduate enrollment. In this dissertation, I do not compare never married individuals to ever married individuals, but rather the individuals' marital status at the time of graduate enrollment. I also expand previous studies incorporating parental status at the time of graduate enrollment.

## Why Does Graduate Education Matter?

Graduate enrollment requires further investigation because, like primary, secondary, and post-secondary education, the effects of graduate education are not linear. Put differently, the effect of each additional year of education is not equal. Measuring education in number of years completed masks the achievement of educational *levels*, such as attaining a high school diploma, attaining a college degree, and attaining a master's degree (Baum, Ma, & Payea, 2010; Mare, 1980). Instead, considering educational levels allows for testing the effects of persisting to the next educational transition and may yield a better decision model than years of education. In many fields, such as medicine, graduate or professional school is required for entry-level employment, whereas in other fields such as teaching, graduate education may enhance performance and opportunities for promotion.

### Graduate Enrollment is a Significant Portion of Total Enrollment

Since tracking graduate enrollment began in the late 1960s, graduate students have comprised about 15% of all higher education enrollments and this proportion continues to rise (Snyder & Dillow, 2012). Almost one-third of the degrees conferred in 2011–2012 were graduate-level degrees (Ginder & Kelly-Reid, 2013). According to Snyder and Dillow (2012), post-baccalaureate enrollment was steady in the 1970s and 1980s, but saw a large increase between 1985 and 2010. In recent years, there are almost

4 million students enrolled in master's, doctoral, first-professional, or post-doctoral programs (Ginder & Kelly-Reid, 2013). Additionally, from 1967 to 1987 the number of males exceeded the number of females in total fall post-baccalaureate enrollment, whereas from 1988 to 2009, the number of females exceeded the number of males. This trend held true despite full- or part-time enrolled status (Snyder & Dillow, 2012).

To explain the increase in graduate enrollment in the 1970s and 1980s, Zhang (2005) noted that following the boom of the bachelor's degree after World War II and the Korean and Vietnam Wars with the accompanying educational benefits for veterans, individuals with a post-baccalaureate education in the 1970s and 1980s set themselves apart from others. Because of this differentiation, a graduate education became important for achieving the most prestigious professions and the greater financial and social status associated with them (Zhang, 2005). Thus considering graduate enrollment adds an important lens to post-secondary education knowledge.

**Graduate Education Recipients Earn Greater Income than Baccalaureate Degree Recipients**

Individuals with a graduate education tend to earn more income and have better working conditions than those with less education. An individual with a master's degree gains one-third more in lifetime earnings than an individual with a bachelor's degree (Baum et al., 2010). An individual with a doctoral or professional degree earns double or more than that of an individual with a bachelor's degree. In 2008, the median annual earnings of full-time workers over 35 years of age with a bachelor's degree was $47,000 for females and $65,800 for males; with a master's degree was $57,500 for females and $81,000 for males; and with a doctoral degree was $74,000 for females and $100,000 for males (Baum et al., 2010). There are significant fiscal implications related to educational attainment that bear further scrutiny.

**Graduate Education Leads to Professional Credentialing**

In the 19th century, there were close to 200 medical schools in the United States, and most medical schools did not require a high school diploma or college degree for admission (Thelin, 2004). In comparison, the law profession in the 1800s was even less structured than the medical field. Few lawyers had academic training, and state licensure and exams did not require a college degree. Later, professional training involved practice and apprenticeship experiences. It was not until the 1900s that professional practice required certification and formal education (Thelin, 2004). Now, professions such as medicine and law require many years of post-baccalaureate education, clinical or professional residency, and experience. Thus, the path to many professions require advanced education beyond high school diplomas and baccalaureate degrees.

**Graduate Education Benefits Society**

A graduate education provides more than monetary benefits. A graduate education also enhances the skills, knowledge, and productivity of the individual and of society overall (Perna, 2004). Thus, graduate education prepares students to influence society as they return to the workplace and contribute to their professions and communities (Baum et al., 2010). A graduate education enhances the knowledge and understanding, ability to connect theory and practice, analytical ability, and communication skills of the individual. The companies that employ individuals with a graduate education benefit from having more competent, confident, and productive employees. Graduate education promotes equity in the workplace as a result of preparing people from all backgrounds for leadership positions in society (Baum et al., 2010).

An increase in advanced college-degree holders makes the United States better prepared to compete internationally. A highly educated population also helps to perpetuate complex knowledge by continuously building on the knowledge already established (Zhang, 2005). The extent of complex knowledge is most evident in the number of years of post-baccalaureate education currently required to enter the law,

medical, engineering, biological sciences, and other science professions (Nevill & Chen, 2007). Individuals with a graduate education contribute more to society with higher tax contributions, increased productivity, greater community participation, and less need for government spending on social support programs (Baum et al., 2010). Given the proportion of students enrolled in graduate education and the monetary and non-monetary benefits associated with a post-baccalaureate degree, there is a need for further study on the factors that affect post-baccalaureate enrollment and whether they differ from undergraduate enrollment factors.

The remaining chapters of my dissertation are as follows. Through the literature review in Chapter 2, I highlight the gaps in post-baccalaureate education research and the dissertation hypotheses. In Chapter 3, I discuss the data set and hypotheses tests. In Chapter 4, I present my findings including survival analysis results, summary statistics, trends, and themes. In Chapter 5, I conclude with discussion of the findings, offer recommendations for policy and practice, limitations of the study, and opportunities for future research.

# CHAPTER 2

# A REVIEW OF STATUS ATTAINMENT, COLLEGE CHOICE, AND POST-BACCALAUREATE ENROLLMENT LITERATURE

Graduate students and alumni are a significant part of society, not only because of the number they represent in higher education institutions across the country, but also because they earn more, benefit society, and represent advanced knowledge and experience that is integral across professions. This chapter summarizes the post-baccalaureate enrollment literature and also details the gaps in the literature as it relates to status attainment and college-choice inquiry. The status attainment model incorporates education as a means to transcend socioeconomic classes. This literature does not directly address post-baccalaureate educational attainment (i.e., master's or doctoral degree), but instead addresses years of education. Post-baccalaureate students and those considering post-baccalaureate education are largely different from those individuals considering a post-secondary education. The post-baccalaureate students are older and may see a waning effect of parental and socioeconomic background. Their proximal family may exert more influence on their educational choices than their distal family. Once students are in their early 20s, these family influences may vary between men and women. In this chapter, I discuss these deficiencies in the literature and explain how this dissertation addresses those deficiencies.

## Theoretical Framework for This Study

I focused on the graduate education enrollment decision to contribute to the research on educational attainment and college choice. The framework for my study was based on the status attainment and college choice models. The status attainment literature has shown that family background—a parent's educational and occupational attainment in particular—has a strong effect on a child's educational attainment through the presence or absence of parental encouragement to attend college (Blau & Duncan, 1967; Carter, 1999; Mullen, Goyette, & Soares, 2003; Sewell & Hauser, 1972). Blau and Duncan

(1967) found that socioeconomic background, specifically the fathers' educational and occupational status, strongly influences their educational aspirations, which in turn influence their sons' educational aspirations. Similarly, Carter (1999) found that mothers with higher educational attainment tend to have children with high degree aspirations after 2 years in college.

The college choice model extends certain aspects of the status attainment model, and Hossler and Gallagher's (1987) three-phase model is the dominant model of college choice. The first phase is predisposition, in which a student considers whether he or she will enroll in college after high school. Students' characteristics such as socioeconomic status, high school and college characteristics, significant others, educational activities, and educational aspirations influence the college decision (Hossler et al., 1999; McDonough, 1997; Perna, 2006). These factors together form the student's predisposition toward attending college.

Search is the second phase of the Hossler and Gallagher (1987) college choice model. During this stage, students research the options available and create a list of potential institutions that fit their preferences. Students further narrow this list of institutions to a finite choice set to which they may decide to apply. Choice is the final phase when students make their actual decision regarding the institution at which to enroll.

Educational attainment and college choice is not just a binary decision of whether to enroll or not at the completion of a particular level of education. Qualitatively different choices appear at enrollment decision points. The specific career chosen instigates the baccalaureate and post-baccalaureate pathways the student follows. For example, an aspiring lawyer would pursue a baccalaureate degree and then a law degree involving post-baccalaureate study, while an aspiring nurse would likely pursue a registered nurse (RN) program rather than, say, a baccalaureate degree in education. Students enroll in

education to meet specific job-related needs, such as for specific skills or career preparation (Fairchild, 2003).

Breen and Jonsson (2000) argue that Mare's (1980) educational transitions model is limited in two ways. The first limitation is Mare's assumption that individuals progress through the educational system in a sequential manner. As just explained, there are many alternative pathways between family background and educational attainment, and each path may have different educational transition probabilities. The second limitation is that class origins have an effect on the probabilities of choosing among educational options, and Mare's (1980) model cannot accommodate for that effect. Breen and Jonsson (2000) argue that each educational pathway has different transition probabilities. Although Breen and Jonsson (2000) believe that Mare's model could not handle differentiated educational pathways, their research did not study the transition into graduate enrollment and, therefore, their analysis is not directly applicable to the transition to graduate school.

## Post-baccalaureate Gap in Status Attainment and College-choice Inquiry

There is a gap in the educational transitions, status attainment, and college choice literature addressing post-baccalaureate enrollment decisions. The research has focused on undergraduate college enrollment but not on post-baccalaureate enrollment, and therefore the research models do not easily or appropriately transfer to populations beyond traditional undergraduates (Paulsen & St. John, 2002). In contrast to the traditional undergraduate, a graduate student may be 22 years or older, attend higher education part-time, work full-time, have a spouse or significant other, be a parent, commute to campus, finance most of his or her own higher education, and/or attend classes at an off-campus location (Fairchild, 2003; Polson, 2003). As explained previously, the theories of educational transitions and college choice may not fit the post-baccalaureate population because of their preferences and responsibilities, which may include responsibilities at work, in their families, and in their communities.

Social scientists have framed the college choice discussion around the decision-making process of high school students on whether to enroll in college or to work full-time. At the graduate level, the context of the decisions may be different. First, there is often a time lapse between baccalaureate completion and post-baccalaureate enrollment (Nevill & Chen, 2007). Second, as students progress through college and attain their degrees, they become more independent and begin to emerge from the control and influence of their parents (Mare, 1980; Stolzenberg, 1994). Typically during this post-baccalaureate life stage, individuals are making personal and professional life plans. These shifts in time and influence suggest that a graduate education decision is quite different in context from the traditional undergraduate college choice.

**Time Gap Between Baccalaureate and**

**Post-baccalaureate Enrollment**

There is not always an immediate graduate enrollment decision upon graduation from college. Outside of some specific fields and occupations, such as law, medicine, and health care, most graduate enrollment does not take place immediately after baccalaureate completion. For those in professional fields such as health care (e.g., nursing, physical therapy, and occupational therapy), law, and medicine, 70% enroll within a year or less after bachelor's degree completion (Nevill & Chen, 2007).

Conversely, in fields such as business and education, 70% enroll after 1 year, and the average time gap is 3 years (Nevill & Chen, 2007). The decision to enroll in graduate school is often tied to work experience and projected career paths for these fields, and graduate education for these disciplines is often thought of as discretionary. Those who enroll in a first-professional (such as chiropractic, dentistry, law, medicine, or optometry) or doctoral degree within 10 years of bachelor's degree completion typically enroll full time; however, those in master's degree programs typically enroll part time (Nevill & Chen, 2007).

**Emerging Independence from Parents**

Prior research considered educational attainment based on levels of education, specifically high school and college completion. It did not distinguish the graduate school enrollment decision from the undergraduate experience. During the baccalaureate years and beyond, parents have a waning influence in the form of a gradual diminishing of the parental role as the student matures (Mare, 1980; Stolzenberg, 1994). During the time between enrolling in college and enrolling in graduate education, the individual typically gains independence from parents and may add the influence of significant others such as spouse and children. Following college graduation, students are likely to be financially and socially independent of their parents, although individuals from affluent families who benefit from social reproduction may have less financial and social independence than individuals from less affluent families (Stevens, 2007).

Given their independence from parents, graduate students are typically financially self-sufficient and supporting their own households. For example, following graduation from college, most students seek full-time employment. Subsequently, they may assume more responsibility for financing their own graduate education. Factors influencing the education decisions of students with a bachelor's degree are different from those influencing high school students because their priorities and responsibilities at the time of deciding to attend graduate school are different than when they decided to attend college. For example, prospective graduate students may consider times or flexibility of course offerings, while prospective undergraduate students may consider institution location and extracurricular activities. The opportunity costs of a graduate student are higher than those of a traditional student (DesJardins, Ahlburg, & McCall, 2002). In most cases, at the time of the graduate school decision, the potential student may have responsibilities at work, in their families, and in the community. The time away from any of these responsibilities is an opportunity cost of graduate school. Older students have already experienced many of the life events and experiences that are the focus of traditional-

student models (Paulsen & St. John, 2002), and they have a shorter amount of time to see a return on their investment in higher education (DesJardins et al., 2002).

Two explanations for the decline in parental background effects for each additional educational transition include the life course perspective and the maximally maintained inequality perspective (Elder, Kirkpatrick Johnson, & Crosnoe, 2003; Lucas, 2001; Raftery & Hout, 1993). Each individual's life course is constructed by the decisions made within their social circumstances (Elder et al., 2003). The life course perspective explains the waning effect of family background based on the declining strength of the parent–child relationship; the students are older at each transition and less dependent socially and financially on their parents. Lesser dependence implies lesser influence of family background.

The premise of the maximally maintained inequality (MMI) hypothesis is that upper class families work in ways to maintain their privilege over working class families (Raftery & Hout, 1993). Specifically, the MMI perspective posits that parents with high socioeconomic status seek to maintain or perpetuate high socioeconomic status for their children by helping their children obtain further education. The MMI theory implies that as social support for a particular level of education increases, the importance of an individual's social background in making the transition to that level of education decreases (Lucas, 2001). As upper class families saturate a particular level of education, the inequality of social class shifts to the next level of education. Therefore, the level of independence of an individual from his or her parents depends on social contexts and support for the subsequent level of education. Although the effect of parental influence on post-baccalaureate enrollment is waning, this may not be the case for individuals from affluent families. As the MMI perspective implies, both children and parents of affluent families may maintain strong dependence in order to perpetuate the affluence. Despite the tendency for upper class families to maintain their social position, it is possible to reduce class gaps.

**Waning Effect of Parental Socioeconomic Background**

In the status attainment literature, researchers showed the influence of socioeconomic background on educational and occupational attainment (Blau & Duncan, 1967). Socioeconomic status comprises the income, educational attainment, and occupational status of the student's parents, meaning that parental socioeconomic status influences the educational and occupational attainment of the offspring. Sewell and Hauser (1972) demonstrated large differences in educational attainment between socioeconomic groups independent of ability and gender. However this model only considered post-high school education attainment in either a binary manner (attended post-high school or not) or years of post-high school education without distinguishing between associate's, bachelor's, master's, doctoral, or post-professional degree levels.

Within the limited research on graduate enrollment, Mullen et al. (2003) found that family educational background affects graduate enrollment and that a baccalaureate degree does not equalize the opportunity for graduate enrollment among those with different family backgrounds. Mullen et al. ascertained that parents' level of education indirectly influences the graduate enrollment of their children by influencing the children's expectations for themselves, their opportunities for success in school, and their choice of majors. Socioeconomic status may have an indirect effect on educational attainment by shaping the choices made up to a particular transition decision, such as institution and college major selection on eventual graduate enrollment (Breen & Jonsson, 2000; Mullen et al., 2003).

The college-choice literature has shown a strong tie between a student's family background and the decision to attend college and which college to attend (Hossler et al., 1999; McDonough, 1997). Parental socioeconomic status becomes a factor as parents advise their children regarding which type of college they can afford, if any. Parental socioeconomic status also helps the students frame how far "someone like them" can go in education and occupation (Hossler et al., 1999). However, the parental influence tends

to lessen during the search stage when the student develops his or her list of potential colleges to attend (Hossler et al., 1999). The Hossler and Gallagher (1987) model and other college choice models are based on the undergraduate college decision, and few researchers have tested this model on the graduate school decision. I expect that the parental influence on a college graduate considering graduate enrollment is different than on a high school student contemplating college (Ethington & Smart, 1986; Fairchild, 2003; Hossler & Gallagher, 1987; McDonough, 1997).

Contrary to findings at the undergraduate level, I argue that a student's socioeconomic background as defined by one's parents is not a significant predictor of graduate enrollment. Mare's (1980) research supports the assertion that parental socioeconomic status does not affect the offspring's graduate enrollment based on his finding that the effects of background declined rapidly from the first schooling transition to elementary school to the last when the effect was virtually zero for college graduates pursuing graduate education. Although the socioeconomic background of students influences the completion of primary, secondary, and post-secondary education, I argue a minimal effect at the post-baccalaureate level. Aspirations and professional interests change as adults move through the life cycle (St. John et al., 2001). As previously discussed, graduate students are typically independent of their parents. Because of this independence, graduate students' own financial status defines their means and ability to pay for graduate education. As Ethington and Smart (1986) demonstrate, during college there is a declining direct influence of socioeconomic background characteristics on graduate school enrollment, but there remains an indirect influence of socioeconomic background through choice of undergraduate institution and extent of involvement at that institution. Family and socioeconomic background are more limited in explaining the path non-traditional students, such as graduate students, follow than the path of traditional students (Milesi, 2010). When the decision is made to attend graduate school,

the socioeconomic status of the individual and those in his or her household are more likely to play a primary role regardless of his or her aspirations and conditioning.

**Influence Shifts from Parents to Proximal Family**

Researchers of educational stratification describe significant others' influence on educational attainment as comprising actions of encouragement by the student's parents, teachers, and friends (Hauser, Tsai, & Sewell, 1983; Sewell, Haller, & Portes, 1969; Sewell, Haller, & Ohlendorf, 1970). The parents' success in education and occupation helps frame their perspectives and contributes to the amount of encouragement they give their children to attend college.

The literature on college choice further supports this assertion. In the predisposition stage of the Hossler and Gallagher (1987) college choice model, the parents have the most influence on their child's decision to attend college. Parental encouragement and the more tangible parental support (e.g., saving for post-secondary education, taking a child to campus visits, and attending financial aid workshops) have a considerable influence on the child's predisposition toward college. However, these factors, as found in the college choice models, are based on the undergraduate decision process, and these same factors may not apply to graduate enrollment. Although the literature makes clear the importance of parents as significant others in the child's predisposition toward college education, the literature does not investigate the parental influence on graduate enrollment.

In the current study, I argue that the influence of significant others on graduate enrollment no longer includes the student's parents, but instead the student's spouse and children. Mare (1980) found that parental influence has the greatest impact on the child's entering college but not on continuing education after the baccalaureate degree. As Stolzenberg (1994) discussed, college and college graduation is a time when students begin to make plans and form attitudes without their parents' participation. Thus, college begins the process that severs the direct link of parental socioeconomic status and the

child's post-baccalaureate enrollment and socioeconomic achievement. The expected result is that parents no longer have a significant effect on the educational aspirations and future plans of their child.

It is reasonable to assume that for independent adults, having a spouse and children has more influence on their educational or vocational decisions than the influence of their parents. The significant others of prospective graduate students could also include their employers, college faculty, mentors, and friends. However, in the current study, I focused on the significant others who may reside within the household of the college graduate: spouse and children. In traditional undergraduate student models, parents exert influence on college enrollment because of their shared social status (cultural capital and social capital) and financial status (McDonough, 1997; Nora, 2004; Stevens, 2007). This principle holds for adults; however, their social and financial status is tied to those with whom they reside and share financial resources, family responsibilities, and civic responsibilities. Graduate students with competing graduate student and parent identities rely on the emotional support of spouses (Lynch, 2008).

As Carter (1999) demonstrated, students make decisions about educational goals through consideration of their social (family) circumstances (constraints). Baccalaureate students with children tend to have lower educational aspirations after 2 years in college (Carter, 1999). Individuals with children may question the amount of time they have available to earn higher degrees.

## Gender Changes Proximal Family Effects on Graduate Enrollment

Much of the early research on educational attainment focused on males (Blau & Duncan, 1967; Sewell & Hauser, 1972). In the decades since the pioneering work of Blau and Duncan and Sewell, Haller, and Portes, research evolved to include females as well. The gender gap in college completion that once favored males in the 1960s has been reversed in recent history. In 1960, men received 65% of all bachelor's degrees. In 2005,

women received 58% of all bachelor's degrees (Buchmann, DiPrete, & McDaniel, 2008). Although researchers included both genders in the educational attainment model and later in the college choice model, most of that literature did not address the effects of marriage and parenthood on educational enrollment and attainment because it considered undergraduate college attainment and not beyond. Despite the educational and occupational advancement of women over the past few decades, gender differences remain. Even in the 21st century, it is possible that family care responsibilities may inhibit women from fulfilling aspirations to enroll in graduate school.

Although men may help with family care responsibilities, women still assume most of the burden (Bianchi, Milkie, Sayer, & Robinson, 2000; Bianchi, Sayer, Milkie, & Robinson, 2012; Conaway, 2005; England, 2005; Seay, 2010). A gender gap in time spent on housework and childcare still persists despite a decreasing gap over past decades (Bianchi et al., 2000; Bianchi et al., 2012; Conaway, 2005; England, 2005). Gupta (1999) found that as couples enter into marriage or cohabitation, the time women spend on housework increases while the men's time decreases. Bianchi et al. (2000) also found that while married men's time spent on housework has increased, married women continue to bear most of the load. Gupta (1999) concluded that there is "strong evidence for a causal relationship between marital status and housework time" (p. 710).

Having children tends to increase the time spent on housework and childcare more for women than men (Bianchi et al., 2000; Bianchi et al., 2012). For example, in 2009–2010 women did approximately 1.6 times the housework of men; wives did approximately 1.7 times the housework of husbands; and married mothers did approximately 1.9 times the housework of married fathers (Bianchi et al., 2012). As Bianchi et al. (2012) reveal, housework can be postponed while childcare, especially of young children, can not.

The childcare responsibilities at home carry over into the workplace. Recent labor market research shows that gender wage differences are not evident until having a child

and is largely explained by women's childrearing responsibilities (Bianchi et al., 2012; Conaway, 2005; England, 2005). Fathers are not as disadvantaged in the workplace as mothers and, in fact, may see workplace benefits of being a parent (Astone, Dariotis, Sonenstein, Pleck, & Hynes, 2010; Boss, 2007). For example, men may attempt more work hours upon having a child in order to provide financial support for that child. That could lead to further responsibility at work or promotion. However, mothers may be the primary caregivers with sick children and miss more work than fathers. Highly skilled women (women who scored in the top third on a standardized ability test) experience a wage reduction during the first 5 years after they have a child while highly skilled men do not experience a negative wage change (Conaway, 2005). Amuedo-Dorantes and Kimmel (2005) confirmed that mothers earn less than childless women and the penalty doubles for mothers of two or more children than mothers of one child. The motherhood penalty is less for college-educated women (Amuedo-Dorantes & Kimmel, 2005).

As discussed above, the presence of a spouse and children may influence the prospective student's decision to attend graduate school. It is important to investigate the magnitude and direction of the influence of being married and having children on graduate enrollment. I expect that the influence of marriage and parenthood on graduate enrollment to be negative for both men and women with women experiencing a stronger negative effect. In a related study, Stolzenberg (1994) found that early marriage, defined as marriage immediately after college graduation, had little effect on post-baccalaureate enrollment in Master of Business Administration (MBA) programs for men and a strong negative effect on women.

In a qualitative study of graduate student mothers, Lynch (2008) reported that graduate student mothers struggle with the conflict between the mother and the student roles and the demand for total commitment and devotion from each role. The stress inherent in this struggle is a leading factor in increased attrition of student mothers (Lynch, 2008). Given the effect of role conflict on attrition, role conflict likely has a

significant effect on the decision to enroll in graduate education as well. Familial factors such as family pressures and starting a family are of primary importance to non-completers and at-risk completers of doctoral study (Lovitts, 2001). It is likely that gender affects the influence of marriage and children on post-baccalaureate enrollment.

## Timing of Life Events

As just demonstrated, women tend to assume the household and family care responsibilities. and there are proven labor market effects of these responsibilities. As such, it is important to understand the corresponding effects of marriage and childbearing on whether an individual enrolls in graduate school, but also the effects on the timing of graduate enrollment. First, what is the marital and parental status of the males and females who enroll in graduate school? In addition, how have marriage and family decisions impacted the timing of enrolling in graduate school? Conversely, how has the decision to enroll in graduate school impacted the timing of getting married and starting a family? I investigated the timing of these major life events and their relationship in time with graduate enrollment.

As explained in the previous section, parenthood may cause wage differences between men and women. Research shows that the *timing* of parenthood may also affect wage differences, especially for women. Delaying motherhood beyond age 30 reverses the motherhood wage discrepancy previously discussed. Amuedo-Dorantes and Kimmel (2005) show the motherhood wage gap of women who became mothers in their twenties (6.5%) reverses to a 6% wage bonus over their childless counterparts and a 13% bonus over mothers who did not delay childbearing. For college-educated women who become mothers in their thirties, the wage bonus is 19% more than their childless counterparts and 21% more than college-educated women who did not delay childbearing to their thirties (Amuedo-Dorantes & Kimmel, 2005). It is clear the timing of parenthood may influence the associated effects of parenthood. Other research showed a relationship between the timing of schooling and the timing of marriage (Mare, 1991). Likewise, the

effect of the time between leaving school and entering marriage is stronger at higher levels of schooling than at lower levels (Mare, 1991). Overall, the sequence and timing of marriage and family decisions are key factors to consider in post-baccalaureate inquiry.

To study educational attainment and the educational pathways to reach it, it is important to consider simultaneously the timing of the educational transitions (e.g., age and timing since prior degree), the sequence of educational events, and the type of educational experiences (Milesi, 2010). Breen and Jonsson (2000) extended Mare's (1980) educational transitions model to account for varied transition probabilities from one educational level to the next which may be influenced by the student's educational pathways. The American higher education system is less standardized than the K-12 system and therefore less able to support a structured flow of students through it and into the labor market (Milesi, 2010). Fluid educational trajectories have the capacity to stratify students. Non-traditional educational trajectories tend to affect students negatively. The association between students' trajectories and degree completion may differ at each post-secondary degree level. A key component of non-traditional pathways to degree completion is a nonstandard timing of educational stages. Graduate students (one type of non-traditional student) have varied pathways between high school completion and the end of their graduate education careers. Understanding the various pathways to a graduate education and the influences along the way are vital to understanding graduate students.

## Research Questions

This study addressed post-baccalaureate enrollment as an extension of the literature on the college choice process. Specifically, I argue that the influence of significant others and socioeconomic background on post-baccalaureate enrollment are less likely to include that of the individual's distal family and more likely to include that of the individual's proximal family, including spouse and children. I further argue that

marriage and parenthood each have a negative effect on post-baccalaureate enrollment decisions for men and women, with a stronger negative effect for women.

To assess my claims, I first investigated whether distal family background, such as parental education and parental income, directly influences an individual's likelihood of enrolling in graduate school. Extant research on college choice shows distal family background strongly influences a student's undergraduate college choices (An, 2010; Charles et al., 2007; Engberg & Allen, 2011; Hossler et al., 1999; McDonough, 1997; Perna, 2006). I argue that distal family background may not have an effect on an individual's post-baccalaureate choices since research reveals the distal background effect declines as an individual increases his or her level of educational attainment (Ethington & Smart, 1986; Mare, 1980; St. John et al., 2001). Since students with a baccalaureate degree are typically older than traditional undergraduates, a student's proximal family makeup (such as spouse or children) may exert a stronger influence on graduate enrollment, whereas distal family background may exert a relatively weaker influence (Snyder & Dillow, 2012).

Second, I investigated whether the presence of a spouse and children influence an individual's decision to enroll in graduate school. Previous research on the undergraduate college choice decision did not examine the influence of spouse and children, but instead considered students as dependents of their parents and guardians (McDonough, 1997). This makes sense since most undergraduate students are not married and are not parents at the time of enrollment in college (Nevill & Chen, 2007). Also, students who do have children before completing a bachelor's degree are different from the typical undergraduate. Following baccalaureate degree completion, individuals are of an age and stage in the life course when it is important to understand the role of a spouse and children in the educational transition process to graduate school. A large proportion of individuals marry (median age is 29 for men and 27 for women) or become parents for

the first time in their mid- to late-20s (Median age of first marriage, universe: Population 15 to 54 years of age, 2011 American community survey 1-year estimates.).

Third, I investigated gender differences in the influence of marriage and childbearing on graduate enrollment. Even with the closing gender gap in education and the workplace, women with professional degrees continue to follow highly variable career paths due to family roles and responsibilities (Moen, 2001). Although men may help with family care responsibilities, women still assume most of the burden (Bianchi et al., 2000; Bianchi et al., 2012; Conaway, 2005; Seay, 2010). Therefore, marriage and children may influence decisions to attend graduate school more negatively for women than for men.

Fourth, I investigated the timing of life events (e.g., graduation from college, marriage, and childbearing) and their relation to the timing of graduate enrollment. Studies show a relationship between the timing of school, the timing of marriage, the timing of children, and the effects of any of these timings on each other and on educational attainment (Mare, 1991). Of individuals who enroll in graduate school, single people enroll sooner after baccalaureate degree completion than those who are married, cohabitating, divorced, separated, or widowed (Nevill & Chen, 2007). Therefore, marital status is shown to influence graduate enrollment decisions.

In Chapter 3, I describe in detail the hypotheses, data set, and methods for testing these research questions. Further details are provided on the analysis variables, as well.

# CHAPTER 3

## SURVIVAL ANALYSIS OF *BACCALAUREATE AND BEYOND 1993/2003*

I highlighted the gap in post-baccalaureate education research in the previous chapter's literature review. In Chapter 3, the methodology for testing the hypotheses is explained in depth. First, I detail the null and alternative hypotheses along with the prediction based on the literature review. Second, I detail the data set, analysis variables and coding, and sample selection and design. Finally, I present the data analysis methodology.

### Hypotheses

For each of the following four hypotheses, I performed two steps. First, I compared survival functions of the comparison groups on the basis of magnitude and direction. The survival function, often depicted in a survival curve, captures the probability that an individual survived (did not enroll in graduate school) longer than a specific period of time given survival up to that point. Second, I used the log-rank test statistic, chi-square ($\chi^2$), to compare the survival curve (survival function) of individuals with a particular characteristic to the survival curve of individuals without the characteristic to determine if there was a statistically significant difference between the two curves. The p-value for the log-rank test is determined from the chi-square distribution table for degrees of freedom equal to the number of compared groups minus one. With a p-value approaching zero (p-value $\leq 0.05$), the null would be rejected signifying that an individual with the characteristic has a different probability of survival (not enrolling in graduate school) than someone without the characteristic. These methods are detailed at the end of Chapter 3 in the methodology section.

#### Hypothesis 1: Distal (Parental) Family Background Does Not Have a Direct Influence on Graduate Enrollment

Although distal family background has been shown to influence directly baccalaureate enrollment and degree completion, I argued that it would not directly

influence graduate education enrollment. I tested this argument using survival analysis with two distal family background variables: parental education and parental financial support.

**Parental Education**

The null hypothesis ($H_0$) was that there was no difference between the survival curve of respondents with at least one parent with a master's degree or higher and the survival curve of respondents with both parents holding less than a master's degree. That is, at time $t_{10}$:

$$H_0: \chi^2_{\text{EITHER PARENT MASTER'S}} = \chi^2_{\text{NEITHER PARENT MASTER'S}}$$

I hypothesized that the null would be true, that parental education would have a statistically insignificant effect on graduate enrollment within 10 years post-baccalaureate degree receipt.

**Parental Financial Support**

The null hypothesis ($H_0$) was that there was no difference between the survival curve of respondents with a parent(s) who contributed financially to the respondent during the 1992–1993 academic year (which corresponds to the last year of baccalaureate education) and the survival curve of respondents without parental financial contributions. That is, at time $t_{10}$:

$$H_0: \chi^2_{\text{PARENTAL FINANCIAL SUPPORT}} = \chi^2_{\text{NO PARENTAL FINANCIAL SUPPORT}}$$

I hypothesized that the null would be true, that parental financial support would have a statistically insignificant effect on graduate enrollment within 10 years of post-baccalaureate degree receipt.

**Hypothesis 2: Proximal (Spouse and Children) Family Background Has a Direct Influence on Graduate Enrollment**

In this study, I posited that an individual's proximal family would serve as significant others who directly influenced the individual's graduate enrollment decision. I tested this hypothesis using survival analysis. Three pairs of survival curves were

compared: the survival curves of married respondents versus unmarried respondents, the survival curves of respondents with children versus respondents without children, and the survival curves of married respondents with children versus unmarried respondents without children. Specifically, at time $t_{10}$:

$H_0: \chi^2_{\text{MARRIED}} = \chi^2_{\text{NOT MARRIED}}$

$H_0: \chi^2_{\text{PARENT}} = \chi^2_{\text{NOT PARENT}}$

$H_0: \chi^2_{\text{MARRIED PARENT}} = \chi^2_{\text{NEITHER}}$

I hypothesized that the nulls would be rejected, that marital and parental status would have a statistically significant effect on graduate enrollment within 10 years post-baccalaureate degree receipt.

**Hypothesis 3: Gender Differences in the Effect of Marital and Parental Status on Graduate Enrollment**

Given this study's focus on proximal family influences (spouse and children), it was likely that there would be gender differences in the effects of such influences on graduate enrollment. I hypothesized that being married and having children would have a stronger negative influence on graduate enrollment for women than for men. I tested this hypothesis using survival analysis. In this section of the data analysis, the previous sections' analysis of marriage and having children are broken down further by gender. Three pairs of survival curves were compared: the survival curves of married males versus married females, the survival curves of fathers versus mothers, and the survival curves of married fathers versus married mothers. That is, at time $t_{10}$:

$H_0: \chi^2_{\text{MARRIED MALES}} = \chi^2_{\text{MARRIED FEMALES}}$

$H_0: \chi^2_{\text{FATHERS}} = \chi^2_{\text{MOTHERS}}$

$H_0: \chi^2_{\text{MARRIED FATHERS}} = \chi^2_{\text{MARRIED MOTHERS}}$

I hypothesized that the null would be rejected, that gender would have unequal influence on graduate enrollment within 10 years post-baccalaureate degree receipt.

### Hypothesis 4: Timing of Life Events

The fourth and final hypothesis addressed the sequence and timing of life events, namely getting married and having children, and their relationship in time with graduate enrollment.

Given the personal nature of the hypotheses, a survey of college graduates would have generated the data necessary to test these hypotheses. However, the breadth of graduate disciplines and programs and the wide range of aspirations, experiences, and financial abilities would have required a large sample size. In addition, graduate enrollment is not always an endeavor undertaken immediately following college graduation and may not occur for several years. Such a study would need multiple follow-ups over an extended period of time to capture individuals with bachelor's degrees who waited to enroll in graduate school. Therefore, to test these hypotheses I used the large-sample, 10-year longitudinal survey Baccalaureate and Beyond Longitudinal Study 1993/03 (B&B).

## Data Set

I used the B&B restricted-use data set for this study. The B&B survey captured unique information on the value of the baccalaureate degree to the individual during a time when degree recipients are most likely to be established in their careers (Wine, Cominole, Wheeless, Dudley, & Franklin, 2005). The first survey of this cohort was done with the National Postsecondary Student Aid Study (NPSAS, Wine et al., 2005). The NPSAS is a nationally representative sample of over 11,810 postsecondary students and institutions. Participants were interviewed a total of four times over 10 years, the first with the NPSAS in 1993 and the last three with the B&B in 1994, 1997, and 2003. The B&B researchers questioned college graduates about marriage, childbirth(s), employment, income, debt repayment, demographic background, expectations regarding work, participation in community service, and aspirations, enrollment, and persistence in graduate education (Wine et al., 2005).

The B&B offers nationally representative data on students' educational aspirations. In addition, the data include factors that research shows affect enrollment, including socioeconomic variables such as types of aid used in financing higher education, sources of self-funding for higher education, income, spouse's income, household income, and various household expenses. The B&B data set also includes family details such as marital status and parental status. This data set allows for the comparison of enrollment with age at marriage, marriage length at time of enrollment, number and ages of children, and age of children at time of enrollment in addition to many other pieces of data. Since B&B is a longitudinal data set, it offers 10 years of data over four time points with a high likelihood of capturing an individual's first enrollment in graduate education if the individual were ever to enroll.

The B&B: 93/03 restricted-use data set includes the derived variables, interview files for all four interviews, transcript data, institutional records, government data, and admissions test data from NPSAS: 93 through B&B: 93/03 (Wine et al., 2005).

## Baccalaureate and Beyond: 1993/2003 Sample Selection and Design

The 1993 B&B cohort (B&B:93/03) consisted of approximately 12,480 cases that included all 11,810 students who completed the original interview (NPSAS:93), parent survey data for 370 students who did not complete the original interview, and a subsample of the institutionally provided 1992–1993 baccalaureate degree recipients and potentially eligible cases as shown in Table A1 (Wine et al., 2005). It is important to clarify that all results referencing sample numbers are rounded to the nearest 10s. The National Center for Education Statistics (NCES) requires this rounding in order to prevent the identification of respondents.

### NPSAS: 1993 Sample

The 1992–1993 National Postsecondary Student Aid Study (NPSAS: 93) targeted all postsecondary students enrolled in institutions in the U.S., District of Columbia, and

Puerto Rico during the 1992–1993 academic year, except those students enrolled in GED programs or concurrently in high school (Loft et al., 1995). The 1990–1991 Integrated Postsecondary Education Data System Institutional Characteristics file and the Office of Postsecondary Education Data System institutions file were used to identify the approximately 1,100 participating institutions. The researchers stratified the institution sample by the type of institution (private vs. public), highest degree offered, size of graduate and professional enrollment, and the number of bachelor's degrees awarded in education (Green et al., 1996). Institutions were not eligible for NPSAS if they (a) served only secondary students; (b) provided only avocational, recreational, or remedial courses; (c) offered only in-house business courses, only seminars of less than 3 months' duration, or only correspondence courses; or (d) were United States service academies because of their unique funding bases (Green et al., 1996).

NPSAS: 93 sampled 1,386 postsecondary institutions of which 143 were deemed ineligible based on the criteria outlined above. Eighty-eight percent of the 1,243 eligible institutions participated (Green et al., 1996). These postsecondary institutions supplied enrollment files and graduation lists which were the basis of the NPSAS: 93 (B&B: 93) sample. The participating institutions provided locating, enrollment, and financial aid data for the approximately 82,000 students selected. The institutionally supplied student data included comprehensive academic, extracurricular, and financial information including the amount of financial aid awarded and the student's and family's income and assets (Loft et al., 1995).

In addition to the institutionally supplied student data, a subsample of parents of approximately 18,000 students were identified for telephone interviews. The parental interview sought data on the effects of postsecondary education on family finances including parental financial support, dependents, employment, parent demographics, and attitudes (Loft et al., 1995). Approximately 62% of the parents participated.

The students selected for NPSAS: 93 (B&B: 93) were contacted for a telephone interview with a computer-assisted telephone interview (CATI) system preloaded with student record data to minimize the telephone interview length. Approximately 53,000 of the 77,000 (70%) CATI-eligible sample students completed the interview.

**B&B: 1994 Sample**

The first follow-up interview (B&B: 93/94) to the NPSAS: 93 took place in 1994, 1 year after participants completed their baccalaureate degrees. All student cases sampled in the NPSAS: 93 were part of the B&B: 93/94 sample regardless of whether they responded to the NPSAS: 93 survey (Green et al., 1996).

All 12,480 sample members of the B&B: 93/94 were sent an informational mailing in the summer of 1994, and telephone interviewing began about a week later. Of this sample, 1,520 were found to be ineligible, which yielded a total eligible sample size of approximately 10,960. Approximately 20% of the sample declined to participate at some point in the interviewing effort with a final response rate of 74%. Approximately 34% of the sample was not locatable at some point with a final response rate of 88% (Green et al., 1996). The overall response rate for B&B: 93/94 was 92%.

In addition to student telephone interviews, B&B: 93/94 included transcript data from the student's bachelor's degree-granting institution. The transcript data included institutional information such as school type, schedule, and grading system, as well as student information such as courses, credit hours, and grades (Green et al., 1996).

**B&B: 1997 Sample**

The second follow-up interview (B&B: 93/97) to the NPSAS: 93 took place in 1997, 4 years after participants completed their baccalaureate degrees. Approximately 11,190 individuals were eligible for B&B: 93/97 (Green, Myers, Veldman, Pedlow, & Knepper, 1999). Non-respondents from either or both NPSAS: 93 and B&B: 93/94 were invited to participate in the B&B: 93/97 follow-up. All eligible sample members were sent an informational mailing in the spring of 1997, and telephone interviewing began

about 1 week later. Approximately 10,090 individuals of the 11,190 eligible participated in the B&B: 93/97 follow-up, which was more participation than in the first follow-up. Eighty-three percent of the cohort participated in all three surveys, 1993, 1994, and 1997. Approximately 15% of the sample declined to participate at some point in the interviewing effort with a final response rate of 75% (Green et al., 1999). The overall response rate for B&B: 93/97 was 90%.

**B&B: 2003 Sample**

The third and final follow up (B&B: 93/03) took place in 2003, 10 years after participants completed their baccalaureate degrees. Approximately 11,150 individuals were eligible for B&B: 93/03 (Wine et al., 2005). All respondents (approximately 10,090) and one-third of the non-respondents (approximately 350) from B&B: 93/97 were invited to participate in B&B: 93/03 for a total sample size of approximately 10,440. All sample members were sent an informational mailing 3 months before, a reminder postcard 2 weeks before, and procedural packets 1 week before the start of February 2003 data collection (Wine et al., 2005). Approximately 9,730 (93.5%) of the 10,440 eligible individuals were located. Approximately 8,970 (92%) of the individuals located participated in B&B: 93/03 for an overall response rate of 86%.

Effectively tracing and locating sample members was predicted to be difficult. Tracing efforts began 18 months preceding data collection including batch tracing of the entire sample through several tracing data bases and pre-data-collection mailings. During data collection, intensive tracing efforts were also ongoing. Researchers used a $20 cash incentive to encourage both an early (first 3 weeks) response and to reduce non-responses later in data collection.

For the first time, the B&B: 93 cohort study members were offered the opportunity to conduct their interviews online in a single, web-based self-administered interview. The online data collection instrument was also developed for administration to

respondents by telephone using CATI or with a trained in-person interviewer (Wine et al., 2005).

### Validity

The B&B: 93/03 data set offers high validity and is grounded in a strong methodology. This is evident with the comprehensive data collection process that yielded a massive sample size. In addition, the researchers attempted to follow all respondents and varied proportions of non-respondents for 10 years. The B&B: 93/03 design incorporated a strong representation of institutions regarding geography, control, size, type, and degree offerings. The survey question topics were extensive and comprehensive. For these reasons, the B&B: 93/03 is a strong longitudinal study with high validity.

### Sample Selection

The final sample used in this project only includes respondents who participated in all four surveys. Respondents who did not participate in one or more surveys (2,780) were dropped from the analysis. It was important to include only individuals who responded to all four surveys in order to ensure thorough graduate enrollment and proximal family information such as date of first graduate enrollment (obtained in 2003 survey) and date of first marriage and date of first childbirth (obtained in 1997 survey). The large sample size allowed for this requirement without a substantial drop in analytical sample size.

## Variables and Coding

The Baccalaureate and Beyond researchers went to great lengths to capture data on the bachelor's degree recipients' lives, experiences, and timelines since degree receipt. Most of the measures in the current study had corresponding data variables in the B&B: 93/03 data set. The analysis variables are briefly described below and listed in Table A2.

**Dependent Variable**

The event of interest in this study was first graduate enrollment. This study did not address persistence, completion, or subsequent enrollments, but focused solely on the act of enrolling in graduate education for the first time. For the purpose of this study, I defined graduate education as post-baccalaureate-level enrollment, including master's, doctoral, and first-professional courses, programs, and certificates. The B&B: 93/03 restricted-use data set included variables for the month and year of first graduate enrollment along with program, program level (master's, professional, doctoral), and program discipline.

The dependent variable is the amount of time between a respondent's baccalaureate degree completion and first post-baccalaureate enrollment. A dichotomous variable was generated to capture if the respondent ever enrolled in a graduate program. The variable for the start date of the respondent's earliest graduate enrollment was constructed from the B&B: 93/03 variable for month and year of first graduate enrollment, and the first day of the month was used for all date variables. This variable was converted into the Stata date format for data analysis. Given that the study is centered around time elapsed since baccalaureate degree completion until the respondent's first graduate enrollment, having the censored time value for those identified as enrolling in graduate education is essential. As such, those respondents who specified enrolling in graduate education but had a missing graduate enrollment start date were dropped. The dichotomous graduate enrollment variable was coded one for respondents who specified enrolling in graduate education and provided a graduate enrollment start date. Respondents who specified not enrolling in a graduate education were coded zero.

**Demographic**

The analysis included two demographic variables: gender and race/ethnicity. I hypothesized that there would be a gender difference in the timing and sequence of life

events including graduate enrollment; therefore, gender was included as a variable. The B&B: 93/03 restricted-use data set includes a variable for gender. This variable is a dichotomous variable with zero for males and one for females. The data set included a variable for race. This variable is a categorical variable that included white, black, American Indian/Alaskan Native, Asian or Pacific Islander, and other. In addition, there was a dichotomous variable to capture if the respondent is of Hispanic origin. For the analysis I used a variable that integrated the race and ethnicity measures. It is a categorical variable that included American Indian/Alaskan Native; Asian or Pacific Islander; Black, non-Hispanic; Hispanic; and White, non-Hispanic.

**Distal Family**

As discussed earlier, I hypothesized that an individual's proximal (own adult) family would influence graduate enrollment more than an individual's distal family (parents). To test this hypothesis, commonly cited familial factors were tested, such as parents' educational attainment and parents' contribution to respondent's education (Hossler et al., 1999; Perna, 2006). Specifically, the analysis included a dichotomous variable identifying if either parent of the respondent had a master's degree or greater. This dichotomous variable was created by the categorical variable identifying the highest level of education by either parent, including high school graduate, associate's degree, bachelor's degree, master's degree or equivalent, first-professional degree, doctorate, or other advanced degree.

A dichotomous variable was created to capture if the respondents received parental financial support for their education. This was derived from a restricted-use variable noting the amount of parental monetary contribution to the student during the last academic year of his or her baccalaureate education. Respondents were asked for the amount of combined direct monetary contribution from both parents, regardless of their marital status. If the amount was greater than zero, the record was coded one. If no monetary contribution was provided, the record was coded zero.

Ideally, parental occupation and income would be included in the analysis. Two variables that captured the occupation of the respondent's mother and father were provided in the restricted-use data set. These occupations were categorized into 30 categories such as professional-engineer, craftsman/precision product/repair, sales, school teacher, etc. Almost 70% of both the mother's occupation and the father's occupation variables contained missing values. Given the high proportion of missing values, these variables were not used in the analysis. Unfortunately, due to this high missing rate, strong parental occupation data were not available. Parental income was similarly difficult in that many students were considered independent of their parents at the point of bachelor's degree completion. Therefore including parental income may be misleading for the respondent's financial status at graduate enrollment. The variable for an independent students' adjusted gross income had 80% missing a value. Also, parents' adjusted gross income had 80% missing a value. As such, the variable combining independent students' or dependent students' parents' adjusted gross income had more than 65% of the records missing a value. Similarly, the variable for household income as of 2002 was not necessarily reflective of the current financial status at the time of first graduate enrollment since that enrollment could occur any time between 1993 and 2003. Therefore, the variable for parental financial support was the strongest alternative representation of the respondent's socioeconomic status because of the reflection of parental emotional support for higher education, as well as the parents' ability to support the student financially beyond loans.

**Proximal Family**

This study investigated the role of proximal family influences on graduate enrollment. I measured marital status and parental status in three ways. First, I measured the timing of marriage and parenthood with the date of first marriage and date of birth of first child. Next, I generated a dichotomous variable for married the year before graduate enrollment and another for having children the year before graduate enrollment. Third, I

created a dichotomous variable for whether the respondent was married and another for whether the respondent had children within the first 4 years following bachelor's degree completion. I describe each of these steps below.

The B&B: 93/03 restricted-use data set includes variables to generate the date of first marriage through the second follow-up (or third survey) in 1997. I constructed the date of first marriage as the month and year of first marriage since baccalaureate degree completion through the second follow-up in 1997, and the first day of the month was used for all date variables. I then converted the date into a Stata date format in order to conduct my analysis. I used this date to create the dichotomous variable for whether the respondent was married within the first 4 years following bachelor's degree completion. The final sample for the survival analysis dropped individuals who specified being married before bachelor's degree completion but did not provide the date of first marriage.

Although marital status was obtained at all four survey points, the date of first marriage was not obtained during the last survey in 2003. Not having the date of the respondent's first marriage if it occurred during the last 6 years (1997–2003) of the study is a significant deficit. As referenced earlier, the median age of first marriage in the U.S. is 29 for men and 27 for women. If a respondent was 22–24 when they completed their bachelor's degree, they would be around age 26–34 during the last six survey years, meaning the date of first marriage was not obtained for a large part of those respondents who married within 10 years of their bachelor's degree.

The variable identifying those married the year before graduate enrollment was derived by collapsing the B&B: 93/03 categorical variable for marital status the year before graduate enrollment into zero for single, divorced, separated, or widowed respondents and one for married respondents.

Parenthood was another key life event of interest for this study of graduate enrollment. Research has shown that family responsibility is a frequent reason individuals

do not enroll in graduate education (Moen, 2001; Nevill & Chen, 2007). Therefore, this study included the timing and sequence of a respondent's entry into parenthood. The B&B: 93/03 restricted-use data set included variables to capture the date of birth of the respondent's first child through the second follow-up in 1997. The first child's date of birth variable was constructed from the B&B: 93/03 variable for month and year of first child's birth since baccalaureate degree completion until the second follow-up in 1997 and the first day of the month was used for all date variables. This variable was converted into the Stata date format for data analysis. I used this date variable to create a new dichotomous variable identifying those respondents who became parents within the first 4 years after bachelor's degree completion. Individuals who specified having children but did not provide the date of birth of that first child, including those with children before bachelor's degree completion, were dropped from the final sample.

It is important to highlight that the date of birth of the respondent's first child was only captured for the first 4 years of the study. It was not sought in the final follow-up. Again, not having the date of the respondent's first child if it occurred during the last 6 years of the study is a significant deficit. Although it takes away precise timing, the data available still allow for an understanding of the sequence of this major life event and graduate enrollment, as explained in the next variable.

The dichotomous variable identifying those with children the year before graduate enrollment was derived by the B&B: 93/03 variable for number of dependent children the year before graduate enrollment. Records with one or more children were coded to one and those without children were coded to zero. This dissertation focused on the influence of having children on graduate enrollment. Since it did not focus on the effects of a varied number of children, all respondents with one or more children were grouped together.

I generated an interaction variable that combined the dichotomous variables for married within the first 4 years of baccalaureate degree completion and had children within the first 4 years of baccalaureate degree completion.

**Baccalaureate Performance and Experience**

In the current study of the timing and sequence of major life events related to post-baccalaureate enrollment, the baseline time, $t_0$, was baccalaureate degree receipt. The B&B: 93/03 restricted-use data set included variables to capture the date of bachelor's degree completion. This variable was constructed from the B&B: 93/03 variable for month and year of baccalaureate degree completion and the first day of the month was used for all date variables. I converted this variable into the Stata date format for data analysis. Approximately 10% of the records had missing values for date of bachelor's degree completion and were dropped. Given that the study is based upon time elapsed since baccalaureate degree completion, having the baseline time, $t_0$, is essential.

Undergraduate major, grade point average (GPA), and college entrance exam score are included in the models as control variables because of their common practice as college performance predictors and indicators (Thelin, 2004). The respondent's undergraduate major field of study was categorized into a new nine-category variable: humanities, social and behavioral sciences, life and physical sciences, engineering/math/computer science, education, business and management, health, vocational/technical, and other technical/professional. The respondent's undergraduate cumulative grade-point average was populated directly from transcripts from the institution. The analysis included an SAT variable and ACT variable. A variable was created to merge ACT and SAT scores into the SAT scale. This variable used SAT scores when supplied. For individuals who only took the ACT, the ACT score was converted into the SAT scale. These were then combined into the college entrance exam score variable.

**Educational Aspirations**

To account for the respondents' aspirations as they leave their baccalaureate experience (1992–1993), several variables capturing educational aspirations were included. Specifically, there is a dichotomous variable for if a respondent at baccalaureate degree completion expected to attain a master's degree or higher. This variable was derived from a restricted-use variable that captured the respondent's highest level of education expected. Respondents identifying a master's, doctoral, or first professional degree were coded one and those identifying a certificate, associate's, or bachelor's degree were coded zero.

**Imputation of Missing Values**

To maximize the sample size, model variables with missing values were imputed. The parental financial support variable had the largest proportion missing at 14%. See Table A2 for information on the imputed variables including the frequency that were missing. The variables were imputed with Stata's multivariate normal regression function. The technique first obtains initial values and then performs the MCMC procedure to obtain imputations. The data in this study used the Stata default Expectation-Maximization (EM) algorithm which uses other variables to impute an expected value, then checks whether that is the maximized or most likely value. If not, it imputes again. This repeats until the value is maximized. EM imputations are superior than mean imputations because relationships with other variables are utilized. The EM converged in 25 iterations which predicted the MCMC procedure would converge in approximately 25 iterations. A total of 1,000 iterations of MCMC were performed. The first 100 were used for the burn-in period. The first imputation was calculated from the last iteration. Subsequent imputations were calculated after another 100 iterations. A total of 10 imputations were performed.

### Sampling and Weights

There are many flag variables that were used to identify respondents to each of the surveys. In addition, there were other flag variables for indicating respondent's eligibility for each survey.

A longitudinal weight was incorporated to balance oversampling. This study utilized those people who responded to all four surveys: NPSAS:93, B&B:94, B&B:97, B&B:2003. The panel weight variable adjusted for nonresponse to all four surveys (Wine et al., 2005). The predictor variables used by NCES to adjust for nonresponse included age, race/ethnicity, gender, attendance status, institution control, and numerous other variables. The exhaustive list can be found in the methodology report.

## Data Analysis Methods

This study considered the 120 months (10 years) between baccalaureate degree completion and the end of the B&B: 93/03 study. With the dichotomous variables of enrolling or not enrolling in graduate education, marrying, having children, and gender, this study furthered the understanding of graduate enrollment through sub-group comparisons.

Beyond sub-group comparisons, I used the B&B: 93/03 10-year longitudinal study data to construct survival functions over the 120 months for the aforementioned sub-groups using the survival analysis (also referred to as event history, hazard modeling, duration analysis, and discrete time) method. Survival analysis took into account complex and diverse educational trajectories to investigate the transitions to graduate education enrollment (Milesi, 2010). I considered the timing of graduate educational enrollment by studying when (in time elapsed from baccalaureate completion) the transition to graduate enrollment occurred. In studying the timing of major life events post-baccalaureate degree, I evaluated whether the sequence of events had any bearing on the probability of ultimately enrolling in a post-baccalaureate program. Overall, is the sequence of major

life events and decisions associated with the likelihood of enrolling in graduate education?

**Benefits of Survival Analysis Method**

Survival analysis is beneficial over the regression model method frequently used in education research for a number of reasons. First, survival analysis allowed me to incorporate student graduate enrollment status information at different points in time instead of one arbitrary point in time, which is important in studying the same individual over an extended period (Ishitani, 2003). Second, ordinary least squares regression assumes residuals are normally distributed and would also assume time-to-failure would follow a normal distribution. It would be difficult to defend this assumption when failure times are often not symmetrical (Box-Steffensmeier & Sokhey, 2010; Cleves, Gutierrez, Gould, & Marchenko, 2010). Third, with survival analysis, I used a highly skewed dichotomous dependent variable, such as enrollment status, which violates the assumption of ordinary least square regression (Ishitani, 2003). Fourth, since survival analysis is a method like regression, I could apply it to longitudinal data to determine whether the variables had time-varied effects and how the variables related to the event of interest at different points in time (Ishitani & DesJardins, 2003). This method allowed the best analysis of the graduate enrollment decision because that decision does not happen at a discrete point in time, but over a potentially extended period of time following baccalaureate degree completion. Survival analysis allowed for a more systematic analysis and sophisticated use of the rich, longitudinal data that the B&B: 93/03 provided.

I used a survival analysis (Kleinbaum & Klein, 2005) to estimate the association at any given time between life events (marriage and having children) and the likelihood of enrolling in graduate school. The survival analysis method (Kleinbaum & Klein, 2005) used data from respondents who enrolled and did not enroll during the 10-year period, as well as respondents who dropped out of the study or were lost with or without enrolling.

Survival analysis allowed assessment of the relationship of explanatory variables to survival time, that is, the impact of getting married and having children on graduate enrollment (Kleinbaum & Klein, 2005).

**Survival Time**

The outcome variable of interest in this survival analysis was the time from baccalaureate degree completion until graduate enrollment. In the Baccalaureate and Beyond Longitudinal Study, participants were under observation from the date they completed their bachelor's degree in the 1992–1993 academic year until 2003. The origin of this study or onset of risk is the date of baccalaureate degree completion. From this date, $t_0$, the subject is considered at risk, in this case, at "risk" of enrolling in graduate education. The observation period is from time $t_0$ until the subject is right-censored.

**Censoring**

Censoring (right-censoring in particular) occurs when a participant is no longer being observed, such as those who drop out, are lost, or not yet failed at the end of the study (Kleinbaum & Klein, 2005; Yamaguchi, 1991). In this study censoring is assumed to be random, meaning that when controlling for the explanatory variables, censoring times are independent of the failure event times (Allison, 1984). The failure event in this study was the respondent's first graduate enrollment since baccalaureate degree completion. Only one failure was studied so the analysis did not incorporate subsequent enrollments. Unlike ordinary least squares regression, survival analysis is able to deal with censored data by means of the hazard rate and uses all information from all respondents, even those censored (Box-Steffensmeier & Sokhey, 2010). All respondents who had not failed by the end of the study were censored as of the date of the last follow-up in 2003. What this means is that individuals considering graduate school, but not yet enrolling within the 10 years were censored.

**Continuous Versus Discrete**

Survival analysis can be conducted using data in two different setups: discrete or continuous. Discrete-time survival analysis uses data in discrete time intervals, such as college start terms, months, quarters, years, decades, etc. (Allison, 1984). It can be thought of as a categorical view of time. Researchers using discrete-time survival analysis convert data into person-period records, also known as wide-form data. For each discrete unit of time, each record has a set of data.

For several reasons, this dissertation analyzes time in a continuous manner. First, converting the dates into discrete time periods, such as months, for the entire 10 years of the study would create a large amount of data (120 months multiplied by 11,190 participants). Second, with multiple dates incorporated into this study (baccalaureate degree completion, birth of first child, date of first marriage, and date of earliest graduate enrollment), rounding these dates to discrete time periods could cause a loss of information (Yamaguchi, 1991). Third, the Stata survival analysis functionality can swiftly analyze the richer continuous time data therefore not requiring additional computational time.

**Parametric and Semi-parametric Modeling**

Parametric methods make assumptions about the distribution function (or shape) such as exponential, Weibull, Gompertz, or log-logistic (Allison, 1984; Box-Steffensmeier & Jones, 2004; Box-Steffensmeier & Sokhey, 2010; Yamaguchi, 1991), meaning that parametric models assume the time-dependency nature of the data. However, there could be serious errors and very different results with the wrong parametric model specified because it would be difficult to distinguish between substantive results and results from parametric model mis-specification (Allison, 1984; Box-Steffensmeier & Jones, 2004; Box-Steffensmeier & Sokhey, 2010; Yamaguchi, 1991).

Conversely, semi-parametric models, such as the Cox model (Cox, 1972; Cox, 1975), do not specify the baseline hazard distribution (Allison, 1984; Box-Steffensmeier & Jones, 2004; Box-Steffensmeier & Sokhey, 2010; Yamaguchi, 1991). The Cox model allows estimating the covariates without making assumptions about the failure time distribution (Box-Steffensmeier & Jones, 2004; Box-Steffensmeier & Sokhey, 2010). The Cox model is also beneficial because it can utilize data from censored observations whereas traditional regression models do not.

The Cox model is often referred to as a proportional hazards model because the hazard is assumed to be fixed across time and not time-dependent (Box-Steffensmeier & Sokhey, 2010). The Cox proportional hazards model is estimated with partial maximum likelihood analysis not full maximum likelihood because it does not use the full failure time information. The partial likelihood method uses time only in ordering the failures. It assumes the intervals in between failures do not provide information (Box-Steffensmeier & Sokhey, 2010). Again, that is why the Cox model is referred to as semi-parametric because the ordered failure times of the covariates are estimated (parameterized) but the distribution form is not.

The partial likelihood formula uses a conditional probability of failure at a specific time based upon cases still at risk at that specific time. (Note this risk set includes the data for respondents who are later censored; one of the benefits of survival analysis.) Since the Cox partial likelihood method is based on ordered failure times, tied failures may occur. Many respondents may fail at the same time (August, for example, is a common enrollment month) making it difficult to put the failure times in order. The Cox model has the ability to deal with many tied records and this is inherent in statistical software computations (Box-Steffensmeier & Sokhey, 2010). Also, the issue of ties is less problematic because the large sample size means the number of failures at each time is small relative to the size of the group at risk (Cleves et al., 2010).

**Survival Function and Hazard Rate**

Survival analysis provides a survival function and a hazard function (Kleinbaum & Klein, 2005). The survival function captures the probability that an individual survived longer than a specific period of time given survival up to that point. In other words, the survival function shows the probability that an individual with a bachelor's degree did not enroll in graduate education at a specific time given not enrolling up to that point. The survival function, S($t$), is the probability that the random variable for a person's survival time, $T$, exceeded the specified time of interest, $t_{(j)}$, given survival to at least that time $t_{(j)}$, or the probability that a respondent did not enroll in graduate education within 10 years, $0 \leq t \leq 10$ years (Kleinbaum & Klein, 2005).

The survival function allows researchers to understand how the risk of an event occurring (often expressed as a hazard rate or hazard ratio) fluctuates in response to specific independent variables. The independent variables considered in this dissertation include demographic, distal family, proximal family, baccalaureate performance and experience, and graduate education aspirations (as listed in Table A2), that is, for example, determining how proximal family variables shorten or lengthen the time between bachelor's degree completion and graduate enrollment.

Although the survival function describes the overall survival of participants, the hazard rate measures the instantaneous potential of a participant to fail at a given time. The survival function and hazard rate have a definitive relationship to one another and are simply two ways to depict the same occurrence (Kleinbaum & Klein, 2005). If the survival function is known, then the hazard rate can be calculated, and the reverse. In the statistical analysis of survival functions and hypotheses tests the hazard rate is used because of its instantaneous risk potential instead of the survival function's cumulative measure (Kleinbaum & Klein, 2005). When considering the terms "survival" and "risk," it is important to remember that failing is considered a positive thing—enrolling in graduate education—unlike many survival analyses where failure is death.

**Survival Function Equality Test**

The most common test of the equality of survival functions of two or more groups is the log-rank test (Allison, 1984; Box-Steffensmeier & Jones, 2004; Cleves et al., 2010; Yamaguchi, 1991). The log-rank test compared survival functions (curves) based on a chi-square test statistic to determine if the functions were statistically significantly equivalent. The log-rank test compares at each failure time the expected number of failures with the observed number of failures. The comparisons are then summed over all observed failure times (Kleinbaum & Klein, 2005). The log-rank and other equality of survival function tests do not test the equality of the survival functions at one specific point in time, but instead compare survival functions over the entire analysis time period (Cleves et al., 2010). The null hypothesis of the log-rank test is that the survival function of one group is equal to the survival function of the comparison group, for example, the survival functions of men to women. If the null is rejected, then there is a statistically significant difference in the hazard of the two groups, or the risk of enrolling in graduate education for men is different from the risk for women.

The difference in survival functions of two groups can be quantified with the hazard ratio, also known as relative hazard. The hazard ratio is the risk of failing for people within one group compared to the failure risk for people not within that group. Said another way, the hazard ratio is a measure of the effect of a characteristic on the likelihood of failure for those with that characteristic compared to those without that characteristic (Kleinbaum & Klein, 2005). Hazard ratios may be interpreted like odds ratios. A hazard ratio equal to one means the variable has no effect on the outcome. A hazard ratio greater than one means the coefficient has a multiplied effect on the outcome. For example, a hazard ratio equal to 1.2 for an independent variable means a respondent with that characteristic has 20% more hazard than those without that characteristic. Equally, a hazard ratio of 0.8 means a respondent with that characteristic has eight-tenths (80%) the hazard of or two-tenths (20%) less hazard than those without

the characteristic. A larger hazard ratio means more risk for failing. In this case, a higher hazard ratio means the respondent with that characteristic is more at risk of enrolling in graduate education than a respondent without that characteristic. Unlike survival studies in the medical field where failing may signify illness or death, in this dissertation a failure is considered a positive occurrence—enrolling in graduate education. In the next chapter, I discuss the results of testing the hazard effect of a singular variable when not controlling for other variables. In addition, I discuss the hazard effects of singular variables while nested in a model controlling for other variables.

**Cox Model Equality Test**

The log-rank test was used to compare the effects of a particular characteristic independent of other characteristics. The likelihood-ratio chi-square test was used to compare the log-likelihoods of two models to test whether the two *sets* of variables (models) are equal (Allison, 1984). This is a chi-square distribution test with degrees of freedom equal to the difference in number of variables between the two models. If the null is rejected, then the fit (log-likelihood) of the two models is not equal.

In the following chapter, I present my findings including summary statistics, trends, and themes. The findings report the results of survival function equality tests of singular analysis variables (parental financial support, advanced parental education, marital status, parental status, baccalaureate major, baccalaureate GPA, SAT scores, and educational aspirations) and groups of analysis variables (distal family and proximal family measures).

# CHAPTER 4

# EFFECTS OF DISTAL FAMILY, PROXIMAL FAMILY, AND GENDER ON POST-BACCALAUREATE ENROLLMENT

The previous chapter detailed the methodology for testing the four hypotheses. This chapter contains the results of the hypotheses tests. First, I tested each null and alternative hypothesis and presented the results. The log-rank test compared the hazard (or risk of failure) of an individual with one particular characteristic to those without that characteristic, all else equal. (Control variables were not included in the log-rank tests of individual characteristics.) This test yielded a hazard ratio that quantified the difference between individuals with that characteristic and those without it. (The log-rank test results are addressed individually in the following narrative, as well as listed in Table A3.) A hazard ratio over one indicates a higher risk (higher odds) of enrolling in graduate school, and a hazard ratio less than one indicates a lower risk (lower odds) of enrolling in graduate school for a respondent with that characteristic. For example, if married males have a 0.5 hazard ratio, then married men have half the odds as others, all else equal, to enroll in graduate school. That hazard is relative to all unmarried men, married women, and unmarried women. (Refer to Table A4 for marriage and parenthood frequencies.)

Second, several models using the explanatory variables and the influence of each on the outcome "failure" of enrolling in graduate education for the first time were shared. In the following models, the hazard ratio and coefficient are displayed for each analysis and control variable. The likelihood-ratio chi-square test was used to compare the log-likelihoods of two models to test whether the two *sets* of variables (models) are equal (that is, no statistically significant difference). For example, I tested the difference in fit of the fully specified model and the model with distal family variables. The model results are discussed later in this chapter and also shown in Table A5. Given that I asserted there is a gender difference in the effect of proximal family characteristics on graduate enrollment, I repeated the same models and stratified by gender. (See Table A6 for

details.) Finally, summary statistics and themes are shared. Chapter 5 will include a discussion and conclusions based on these results.

## Hypotheses

### Distal (Parental) Family Background Has a Direct Influence on Graduate Enrollment

Parental education and parental financial support have a statistically significant effect on graduate enrollment within 10 years of post-baccalaureate degree receipt. This is contrary to my original hypothesis that parental education and parental financial support would have a statistically insignificant effect on graduate enrollment.

First, I compared the survival curves for those respondents with at least one parent with a master's degree or higher to those respondents without a parent with an advanced degree. The differences in magnitude and direction of the two survival functions are graphed in Figure B1. As shown with the Kaplan-Meier survival curves, those respondents with one or two parents with a master's or more advanced degree experienced graduate education enrollment at a greater frequency. The gap between the two curves is statistically significant (with a p-value less than 0.01).

The Cox regression test for equality of survival curves determined that if the respondent had at least one parent with a master's degree or greater, the respondent's hazard ratio was 1.3 (see Table A3), meaning that a respondent had 30% more "risk" or 30% higher odds of enrolling in graduate education if one or both parents had a master's degree or higher, all else equal. The resulting p-value was less than 0.01; therefore, there is a statistically significant difference in the effect of parental education on graduate enrollment. There was not a statistically significant difference in the timing of graduate enrollment based upon parental education.

Second, I compared the survival curves for those respondents with either parent contributing financially to the respondent during the last year of baccalaureate education and those respondents without such parental financial support. Refer to Figure B2 for a

graphical representation of the differences in magnitude and direction of the two survival functions. As demonstrated with the survival curves, respondents with parental financial support were more likely to enroll in graduate education. Unlike the parental educational attainment in the hypothesis above, the gap between respondents with parental financial support and respondents without parental financial support is much smaller. The difference is still significant but at a lesser magnitude.

The Cox regression test for equality of survival curves determined that if the respondent had financial support from his or her parents, the respondent had 4% higher odds of enrolling in graduate education. The resulting p-value of the test of parental financial support was less than 0.05; therefore, parental financial support has a statistically significant effect on graduate enrollment within 10 years of post-baccalaureate degree receipt. Parental financial support does not have a statistically significant effect on the timing of graduate enrollment.

Third, I combined both dichotomous variables for advanced parental education and parental financial support for analysis. Respondents with parental financial support and at least one parent with an advanced education were more likely to enroll in graduate education than all other individuals. Conversely, those without parental financial support or advanced parental education were least likely to enroll in graduate education. This statistically significant difference in survival functions is most clear when looking at the Kaplan-Meier survival curves in Figure B3. When taken together, respondents with at least one parent with a master's degree or higher and parental financial support had a hazard ratio of 1.35, meaning that a respondent has 35% higher odds of enrolling in graduate education if one or both parents have a master's degree or higher *and* parental financial support. This is in contrast to respondents with neither a parent with an advanced education nor parental financial support. Their hazard ratio was 0.87, meaning that the respondent has 13% lower odds (1-0.87) of enrolling in graduate education. The difference in the magnitude of the effect of parents with an advanced education and

parental financial support is obvious in Figure B3 as well. Parents with an advanced education influence their children's enrollment in graduate education more than by providing them financial support. Distal family background has a statistically significant effect on post-baccalaureate enrollment. Next, I investigate the influence of proximal family on post-baccalaureate enrollment.

**Proximal (Spouse and Children) Family Background**

**Has a Direct Influence on Graduate Enrollment**

Confirming hypothesis 2, marital status and parental status have a statistically significant effect on and timing of graduate enrollment within 10 years post-baccalaureate degree completion.

First, I used the dichotomous variable for being married the year prior to graduate enrollment and compared the survival curves for those respondents married the year prior to graduate enrollment to those not married the year prior to graduate enrollment. As demonstrated with the survival curves in Figure B4, respondents who enrolled in graduate education were more likely to be unmarried than married the year prior to graduate enrollment. The difference between the two survival curves is statistically significant with a p-value of less than 0.01.

Respondents who were married during the year preceding graduate enrollment had a hazard ratio of 0.5. Overall, there was a wide difference in the influence of marriage on graduate enrollment where married respondents had 50% lower odds (1-0.5) of enrolling in graduate school than unmarried respondents.

Also, unmarried graduate students enrolled sooner after bachelor's degree completion than married graduate students. The difference is evident with 25% of unmarried graduate students enrolled at half a year after bachelor's degree completion while 25% of married graduate students enrolled at over 4 years after bachelor's degree, 75% of unmarried graduate students enrolled by 3.5 years, and 75% of married graduate students enrolled by 7.5 years.

In the second test, I compared the survival curves for respondents with at least one child to respondents without children prior to graduate enrollment using the dichotomous variable for having at least one child the year prior to graduate enrollment. Figure B5 includes the Kaplan-Meier survival curves for parenthood effects. The difference between the two survival curves is statistically significant with respondents who enrolled in graduate education more likely not to have children than to have children the year prior to graduate enrollment.

Respondents who were parents before enrolling in graduate school had a hazard ratio of 0.6, meaning that respondents who were parents had 40% lower odds (1-0.6) of enrolling in graduate school than non-parent respondents. In addition, non-parent graduate students enrolled sooner after bachelor's degree completion than graduate students who were parents. Specifically, half of non-parents enrolled by 1.5 years after their bachelor's degree and half of parents enrolled by 4.5 years after their bachelor's degree.

For the third test, I paired the dichotomous variables for marital status and parental status used above for survival curve comparisons. Specifically, I compared the survival curves of respondents with all possible combinations of marital and parental status the year before graduate enrollment. The vast differences in magnitude and direction of the survival functions can be seen in Figure B6. Respondents who were married and a parent during the year preceding graduate enrollment had a hazard ratio of 0.4, meaning that a married respondent with one or more children had 60% lower odds (1-0.4) of enrolling in graduate school than all others. If the respondent was neither married nor a parent during the year prior to graduate enrollment, the respondent's hazard ratio was 1.3 (30% higher odds). Recall, I found the hazard for married respondents to be 50% and parent respondents to be 40% lower in odds. The combined effect (60% lower odds) is even greater. Conversely, respondents who were single and without children experienced over 30% higher odds of graduate enrollment. Marriage has a stronger effect

than having children on graduate enrollment with the combined effect of being married and having children being strongest.

Those respondents who were married and had children were more likely than all others to postpone graduate enrollment. Conversely, unmarried respondents without children enrolled in graduate school much sooner. In fact, 25% of unmarried graduate students enrolled within 6 months following baccalaureate degree completion, whereas 25% of married graduate students enrolled within 4 to 6 years following their bachelor's degree. The difference between the survival curves is significant with a p-value of less than 0.01. Marital status and parental status have a statistically significant effect on graduate enrollment within 10 years post-baccalaureate degree receipt.

The time to first graduate enrollment of married respondents of both parental statuses overlapped until 4 years after bachelor's degree completion. At year four, married parents postponed graduate enrollment compared to married non-parents. Proximal family status has a statistically significant effect on post-baccalaureate enrollment. Now I consider any gender effects.

**Gender Changes the Effect of Marital and Parental Status on Graduate Enrollment**

Overall, I found women were more likely than men to enroll in post-baccalaureate education. Women experienced a 6% boost while men started with 6% lesser odds of enrolling in graduate education. Despite this difference, men and women experienced similar timing of graduate enrollment with men enrolling slightly sooner than women. Gender also had a statistically significant difference on the effect of marriage and parenthood on graduate enrollment within 10 years post-baccalaureate degree receipt. However, contrary to my original hypothesis, this effect was not consistently negative for women. When I repeated the previous tests for the effect of marriage and parenthood on graduate enrollment and stratified by gender (see far right columns of Table A3), I found that married men were more negatively affected than married women while fathers

experienced a weaker negative effect than mothers. The combined effects of marriage and parenthood are considerably more negative for women than for men.

Gender has a statistically significant difference in the effect of marriage on graduate enrollment within 10 years post-baccalaureate degree receipt (see Figures B7a and B7b). I tested an interaction term for gender and marital status. The results were statistically significant. Gender moderates the effect of marriage on graduate enrollment but not the timing of graduate enrollment. Women who were married during the year preceding graduate enrollment had a hazard ratio of 0.50 compared to a hazard ratio of 0.46 for married men, meaning that married women have 50% lesser odds (1-0.50) of enrolling in graduate school whereas married men have 54% lesser odds (1-0.46) of enrolling in graduate school. This demonstrates that marriage had more of a negative influence on men than on women, meaning that married women were slightly more likely than married men to enroll in graduate school. However, gender does not moderate the effect of marriage on timing of graduate enrollment.

Gender has a statistically significant difference in the effect of parenthood on graduate enrollment within 10 years post-baccalaureate degree receipt. There was a statistically significant difference in the survival curve of fathers and the survival curve of mothers (see Figures B8a and B8b). Fathers had a hazard ratio of 0.8 compared to a hazard ratio of 0.6 for mothers, meaning that fathers had 20% lower odds (1-0.8) of graduate enrollment and mothers had 40% lower odds (1-0.6) of graduate enrollment. This demonstrates a statistically significant difference in the effect of parenthood on graduate enrollment between men and women, with fathers more likely to enroll in graduate school than mothers. Gender moderates the effect of parenthood on graduate enrollment and the timing of graduate enrollment. Although fathers enrolled in graduate education less than non-fathers, the timing difference was minimal with fathers starting to enroll faster than non-fathers at year seven. Conversely, non-mothers enrolled sooner than mothers, and this timing difference widened as more time elapsed since bachelor's

degree completion. For example, half of women without children enrolled by 2 years after bachelor's degree completion while half of all mothers enrolled at 3.5 years.

Gender has a statistically significant difference on the *combined effect* of parenthood and marriage on graduate enrollment within 10 years post-baccalaureate degree receipt. As demonstrated earlier, marital and parental status had a statistically significant effect on graduate enrollment within 10 years post-baccalaureate degree receipt. To recap, respondents, regardless of gender, that were both married and a parent during the year preceding graduate enrollment had 60% lower odds and unmarried, non-parent respondents had 30% lower odds of enrolling in graduate school. When I repeated this test and stratified based on gender, I found statistically significant gender differences for married mothers and married fathers (see Figures B9a and B9b). Married mothers had 70% lower odds and married fathers had 40% lower odds of enrolling in graduate education.

I found that gender moderates the marriage effect, the parenthood effect, and the joint marriage and parenthood effect on graduate enrollment. First, non-parent (both married and unmarried) men and women experienced similar timing for first graduate enrollment. Second, married mothers and married fathers experienced similar timing up until 3 years after bachelor's degree completion. After 3 years, married fathers enrolled sooner than married mothers. Third, the largest timing difference was for single parents. Single fathers enrolled in half the time of single mothers. Overall, gender moderates the joint effect of marriage and parenthood on timing of graduate enrollment.

Overall, despite women starting with a higher chance of enrolling in graduate education, marriage and parenthood was a greater barrier for women than for men. Gender has a statistically significant difference in the effect of marriage and parenthood on enrolling in graduate education and the timing of enrollment within 10 years post-baccalaureate degree receipt.

In conclusion, the log-rank tests for equality of survival functions identified a stronger effect of marriage and parenthood the year before graduate enrollment than advanced parental education and parental financial support. Although these distal and proximal family characteristics influenced whether an individual enrolled in graduate education, the proximal family characteristics had the strongest effects on whether but also on *when* he or she enrolled. Of these variables, marriage had the strongest effect (52% lower odds of graduate enrollment) followed by parenthood (40% lower odds). Advanced parental education had a stronger role in graduate enrollment (33% higher odds) than parental financial support (4% higher odds). Neither advanced parental education nor parental financial support influenced the timing of graduate enrollment. However, marriage and parenthood postponed graduate enrollment for men and women, but more so for women.

## Survival Models

The Cox regression models that follow are different from the log-rank tests in the previous section in that the models now incorporate other variables. The log-rank tests did not control for other variables, but the Cox regression models in this section do. It is important to identify and remember that the following models use proximal family status variables for entry into marriage and parenthood *within the first 4 years following bachelor's degree completion*. If I had used the variables identifying those married or a parent the year before graduate enrollment, as done with the comparison of survival functions earlier, the models would have been reflective only of those who actually enrolled in graduate education and therefore would have included only approximately half the sample size. In this section, proximal family variables are reflective of early marriage and early parenthood that were defined as occurring between bachelor's degree completion and the 4 years following.

I conducted the Cox regression modeling process on four model specifications. See Table A5 for the hazard ratios, coefficients, and respective standard errors of the

variables in each model. The first model, Model 1, included the demographic variables for gender and race, baccalaureate major, baccalaureate GPA, college entrance exam scores (in SAT scale), and aspirations for a master's degree or greater. Model 2 built upon the first model by adding two distal family variables measuring if the respondent's parent(s) had a master's degree or greater and if the respondent received parental financial support. Model 3 builds upon the Model 1 where I added three proximal family variables (but not distal family variables) measuring if the respondent was married, had a child, and was married with a child within 4 years of bachelor's degree completion. This modeling allowed me to compare the influence of distal family with the influence of proximal family factors. Model 4 was a fully specified model with all predictor variable groups: demographic, distal family, proximal family, baccalaureate major and GPA, college entrance exam scores, and educational aspirations. Subsequently, I stratified the fully-specified model on gender to highlight gender differences in effects.

**Test Proportional-Hazard Assumption**

The Cox model is based on the proportional-hazards assumption. I conducted a diagnostic test using the Schoenfeld residuals on each model. This test fits a smooth time function to the residuals and tests whether there is a relationship between time and the residuals (Cleves et al., 2010). If the variables in the models truly had a proportional hazard over time, the residuals would be equal over time and have a nonzero slope. All four models failed the test, which meant each model had one or more time-dependent variables. To remedy this, an interaction term for each time-varying covariate was added (Box-Steffensmeier & Jones, 2004; Cleves et al., 2010; Kleinbaum & Klein, 2005; Yamaguchi, 1991). The interaction term was the product of the corresponding variable and time. These interaction terms can be found in the lower portion of the models.

**Baseline Model (Model 1)**

Model 1 included measures for gender, race, baccalaureate major, baccalaureate GPA, college entrance exam scores, and aspirations for a master's degree or greater. This

model's chi-square test for goodness-of-fit was statistically significant with a p-value of less than 0.01. Not surprising, several baccalaureate majors were statistically significant influencers of graduate enrollment. Specifically, life and physical sciences majors had almost 70% higher odds of enrolling in graduate school, when controlling for gender, race/ethnicity, GPA, SAT scores, and educational aspirations. Unlike life and physical sciences majors, humanities, business and management, vocational or technical, and other technical or professional majors had 40 to 50% lower odds of enrolling in a graduate program (e.g. 1-0.6). The strongest statistically significant predictor is the variable identifying respondents who expect to attain a master's degree or greater. These respondents were 135% (2.35-1) higher in their odds of enrolling in graduate school than respondents who reported not aspiring to a master's degree or more advanced, when controlling for the other model variables. This model shows gender was not statistically significant. In all four models, gender had a slightly negative effect on post-baccalaureate enrollment. In Model 2, I added distal family factors to examine whether the family background of a student continues to influence whether he or she attends graduate school.

**Distal Family Model (Model 2)**

To test the significance of distal family predictors, Model 2 added the variables for advanced parental education and parental financial support (see Table A5). Model 2 remained statistically significant with a p-value of less than 0.01. This model was second in goodness-of-fit only to the full-specified model (Model 4) discussed later. The variable identifying if the respondent had a parent with a master's degree or greater was statistically significant. When controlling for the other variables, respondents with a parent with a master's degree had 25% higher odds of enrolling in graduate education themselves. The parental financial support variable was not statistically significant although the hazard ratio showed respondents had 8% higher odds of enrolling in graduate education if they received parental financial support during their undergraduate education.

**Proximal Family Model (Model 3)**

To test the significance of two foremost proximal family characteristics, Model 3 added the dichotomous variables for being married or having a child within the first 4 years post-baccalaureate degree completion and the interaction variable for being married and a parent within the first 4 years of bachelor's degree completion. Model 3 remained statistically significant with a p-value of less than 0.01. However, it was of weaker fit than the fully specified model. Including the proximal family variables did not cause any strong changes to other predictor variables. Although the proximal family variables were not statistically significant, the resulting hazard ratios showed that being married, having a child, or being married with a child may have decreased the odds of enrolling in graduate education. Model 3, which included proximal family variables, was a weaker fit than Model 2 which instead included distal family variables. This proved a stronger influence for distal family variables than for early marriage and early parenthood variables.

**Full Model (Model 4)**

The fourth model was the fully specified model in that it included all predictor variables. This model's chi-square test for goodness-of-fit was statistically significant with a p-value of less than 0.01. Aspirations for a master's degree or higher had a strong statistically significant effect in this model and all other models. A respondent with aspirations for a master's degree more than doubled the hazard ratio, making the respondent have 130% (2.3-1.3) higher odds of enrolling in graduate education. Following master's degree aspirations, several majors had strong statistically significant effects on the odds of enrolling in graduate education. These majors were negative influencers and included business and management, vocational or technical, humanities, and other technical or professional majors. These majors reduced the odds of enrolling in graduate education by at least half. Black, non-Hispanic respondents experienced a statistically significant effect on graduate enrollment with a 60% increase in the odds of

enrolling in graduate education. Similarly, a one-point increase in undergraduate GPA increased the odds of graduate enrollment by 48%, all else equal.

The fully specified model also included several weaker effects. SAT scores were the weakest statistically significant influencer on graduate enrollment. A 10 point increase on the SAT scale predicted 1% greater odds of enrolling in graduate education. Although statistically insignificant, a respondent married within the first 4 years after bachelor's degree completion experienced a 0.4% increase in odds of graduate enrollment. Overall, the fully specified model demonstrated that aspirations for graduate education, baccalaureate major, and being a black, non-Hispanic were the strongest predictors of graduate enrollment. Proximal family characteristics for early marriage and parenthood (as defined by marriage and parenthood within 4 years of bachelor's degree) were statistically insignificant when controlling for all other variables. However, this statistical insignificance may be the result of a small number of respondents marrying or having a child within the first 4 years. For example, 38.9% (1,740 ÷ 4,470) of respondents who married within 10 years did so within 4 years after bachelor's degree completion, whereas, 20.2% (600 ÷ 2,970) of respondents who had a child within 10 years did so within 4 years of their bachelor's degree (see Table A4).

**Gender Stratified Model**

In the four Cox models, when controlling for other variables, gender was not statistically significant despite earlier finding proximal family characteristics with statistically significant gender differences, such as marital and parental status the year prior to graduate enrollment (refer back to Table A3). To test gender another way, I stratified the fully specified model (Model 4) on gender. The log-likelihood (goodness-of-fit) difference between the male and female models was statistically significant; there was a difference in the effect of gender on graduate enrollment overall and for specific variables (see Table A6).

Within the distal family predictors, there were large gender differences in the effects of advanced parental education and parental financial support on post-baccalaureate enrollment. Advanced parental education was a stronger statistically significant predictor for men than for women. Conversely, parental financial support had a stronger and positive influence for women (15% higher odds of enrolling) but a weaker and negative for men (2.5% lower odds of enrolling).

Proximal family status variables (in terms of early marriage and parenthood) were not statistically significant when stratified on gender. It appeared that if they were married or had a child, women were more likely than married men or men with a child to enroll in graduate education. However, men who were married and had a child were more likely than women who were married and had a child to enroll. In fact, married men with children appear to be of greater risk for enrolling (46% higher odds).

When compared to the fully specified Model 4, the gender stratified model highlighted some effect differences in race/ethnicity and baccalaureate major. When stratified by gender, the black, non-Hispanic measure lost statistical significance for men. Conversely, the Hispanic measure lost statistical significance for women, meaning that black, non-Hispanic women were more likely than black, non-Hispanic men and Hispanic men were more likely than Hispanic women to enroll in graduate education. The most notable change in majors when stratified by gender was the doubling of the hazard ratio for men who majored in life and physical sciences over women. This measure was no longer statistically significant for women, but made men 115% higher in their odds of enrolling in graduate school (2.15-1). Similarly, the health majors variable became statistically significant when stratified by gender, with men having 66% (1.66) higher odds and women having 36% lower odds (1 – 0.64) of enrolling in graduate school.

In conclusion, the Cox models highlighted the continued importance of graduate education aspirations on eventual enrollment in graduate school. Following educational

aspirations, baccalaureate majors and GPA were the strongest predictors of graduate enrollment. In addition, advanced parental education consistently influenced graduate education within 10 years of bachelor's degree completion. Throughout the models, neither early marriage nor early parenthood were statistically significant predictors of graduate enrollment.

## Patterns in Timing of Life Events

The fourth and final hypothesis addressed the sequence and timing of life events, namely getting married and having children, and their relationship in time with graduate enrollment (see Table A4). The analytical sample of this dissertation was approximately 5,950. Approximately 2,850 respondents (48%) of this sample enrolled in post-baccalaureate education within 10 years of baccalaureate degree completion. Of those 2,850 that enrolled in post-baccalaureate education, 12% were married before their first post-baccalaureate enrollment and 5% were a parent before their first post-baccalaureate enrollment. Only 1.5% were both married and a parent before their first post-baccalaureate enrollment. This demonstrates that for those enrolling in post-baccalaureate education, marriage and parenthood came later than the first enrollment.

Nearly one-third of all respondents were married and one-tenth had a child within 4 years of bachelor's completion with 75% of all respondents married within 10 years after bachelor's completion. Only one-tenth of all respondents had a child within 4 years of bachelor's completion with 50% of all respondents becoming parents within 10 years after completing their bachelor's degree. Taken together, it is clear marriage and parenthood are more commonly entered into after first graduate enrollment and after 4 or more years after baccalaureate degree completion. Marriage and, more so, parenthood were delayed for those entering graduate school. This confirms the conclusions of the survival analysis earlier in this chapter that found married individuals delayed graduate enrollment, individuals with children delayed even longer, and married individuals with children delayed the longest.

## Summary Trends and Themes

I used two survival methods, the log-rank variable test and Cox regression survival models, to evaluate the effect of distal family background, proximal family background and gender on post-baccalaureate enrollment and timing of post-baccalaureate enrollment within 10 years of baccalaureate degree completion. The same variables for gender and distal family background (advanced parental education and parental financial support) were used in both methods. Researchers asked this information of all respondents in every survey which helped to minimize missing values.

I used different measures for marital status and parental status in the two survival methods. In the log-rank test, I used the binary variables for marital status and parental status *the year before first post-baccalaureate enrollment*. These variables represented the most accurate statuses just prior to the first post-baccalaureate enrollment at the time when graduate enrollment decisions are made. Since these variables represented marital status and parental status the year prior to post-baccalaureate enrollment, only respondents who enrolled in post-baccalaureate education provided the information (were asked the question).

Ideally, I would have used marital status and parental status every year of the study, but this information was not obtained by the researchers. Instead I used marital status and parental status within the first 4 years after baccalaureate degree completion (referred to as early marriage and early parenthood) for the Cox regression survival models. Whether an individual enrolled in graduate education was the binary outcome variable for the Cox regression survival models, so it would have made little sense to use the marital status and parental status the year before first post-baccalaureate enrollment since it was only populated for respondents who enrolled in graduate education. While the Cox models are informative, they only consider the effects of early marriage and early parenthood.

The purpose of this dissertation was to investigate the effects of being married and having a child on if and when one enrolls in post-baccalaureate education. As such, using the binary variables identifying marital and parental statuses just prior to post-baccalaureate enrollment are most appropriate. The log-rank tests used these variables and the Cox models did not. The concluding section of this chapter and the discussion in Chapter 5 hone in on the marital status and parental status the year before first post-baccalaureate enrollment, therefore referencing the log-rank tests.

Almost half of bachelor's degree holders enrolled in post-baccalaureate education within 10 years. Distal family characteristics, proximal family characteristics, and gender had an effect on if and when bachelor's degree recipients enrolled in graduate school. Distal family background, as defined by advanced parental education and parental financial support, had a statistically significant direct effect on graduate enrollment within 10 years of post-baccalaureate degree receipt. Parents' having an advanced education had a stronger influence on their child's graduate education enrollment than did providing them financial support. However, advanced parental education and parental financial support did not have a statistically significant effect on the timing of graduate enrollment.

Although the Cox models showed that distal family variables had a stronger influence on graduate enrollment than the early proximal family variables of early marriage and parenthood within 4 years, the outcomes of the log-rank tests showed a stronger effect of marriage (52% lower odds) and parenthood (40% lower odds) the year before graduate enrollment than advanced parental education (33% higher odds) and parental financial support (4% higher odds) on graduate enrollment.

Proximal family characteristics, as identified by marital status and parental status the year before graduate enrollment, had a statistically significant effect on graduate enrollment and the timing of graduate enrollment within 10 years post-baccalaureate degree completion. Respondents who enrolled in graduate education were more likely to

be unmarried than married the year prior to graduate enrollment. Respondents who enrolled in graduate education were more likely not to have children than to have children the year prior to graduate enrollment. Without controlling for other factors, being married had a stronger effect than having children on graduate enrollment, with the combined effect of being married and having children being the strongest. Graduate students who were married or had children enrolled later than unmarried or non-parent graduate students. Respondents who were both married and had children were more likely than all others to postpone graduate enrollment (half of unmarried, childless respondents enrolled within 18 months, whereas half of married parent respondents enrolled within 8 years). When controlling for demographic, distal family, baccalaureate experience, and educational aspiration variables, early proximal family statuses, as defined by marriage and/or having children within 4 years of bachelor's degree completion, were not statistically significant. Early proximal family characteristics remained statistically insignificant when stratified on gender.

Gender had a strong influence on graduate enrollment within 10 years post-baccalaureate degree receipt. Overall, women were more likely than men to enroll in post-baccalaureate education. Men and women who were not parents, regardless of marital status, experienced similar timing of first graduate enrollment with men enrolling slightly sooner. Gender also had a statistically significant difference for the effect of marriage and parenthood. Gender moderated the effect of marriage on graduate enrollment, but not the effect of marriage on the timing of graduate enrollment. Married women were slightly more likely than married men to enroll in graduate school.

Gender also moderated the effect of parenthood on graduate enrollment and the timing of graduate enrollment. Fathers (as of the year before graduate enrollment) were more likely to enroll in graduate school than mothers when considered independently. However, when controlling for other variables in the full model, mothers (within the first 4 years following bachelor's completion) were more likely to enroll in graduate school

than fathers. While fathers enrolled in graduate education less often than non-fathers, the timing difference was minimal, with fathers starting to enroll sooner than non-fathers after 7 years following bachelor's degree completion. Mothers delayed graduate enrollment longer than non-mothers, and this timing difference widened as more time elapsed since bachelor's degree completion.

In addition, gender had a statistically significant difference for the combined effect of marriage and parenthood on graduate enrollment and timing of graduate enrollment within 10 years post-baccalaureate degree receipt. Married mothers and married fathers experienced similar timing up until 3 years after bachelor's degree completion. After 3 years, married fathers enrolled sooner than married mothers. The largest timing difference was for single parents. Single mothers took twice the time of single fathers to enroll in graduate school. Marriage and, more so, parenthood occurred mostly after first graduate enrollment and after 4 or more years after baccalaureate degree completion.

In this chapter I presented and explained the results of each null and alternative hypothesis tested. I also described several models using the explanatory variables and the impact of each on enrolling in graduate education. Finally, summary trends and themes were shared, focused predominantly on the log-rank test results. Chapter 5 will include a discussion and conclusions based on these results.

# CHAPTER 5

# DISCUSSION

To review, I hypothesized that bachelor's degree completion marks the time when the influence of significant others and the socioeconomic background of the student's parents decreases and the influence of the student's own family characteristics, including having a spouse and children, increases. Further, I hypothesized that the influence of marriage and parenthood on post-baccalaureate enrollment would be negative and more negative for women than for men. I tested these concepts using the Baccalaureate and Beyond Longitudinal Study 1993/2003 data set and survival analysis method. I first compared the survival functions of individual predictor variables using log-rank tests. Then I analyzed Cox survival regression models which contained multiple predictor and control variables. Finally, I considered the sequence and timing of bachelor's degree completion, marriage, having children, and graduate enrollment.

In this chapter, I summarize and analyze the findings. Then I offer policy and practice recommendations based on the results. I conclude Chapter 5 with the limitations of this study and opportunities for future research.

I conducted survival analysis using log-rank tests and Cox regressions. With the log-rank test I assessed the influence of individual distal family variables (advanced parental education and parental financial support), proximal family variables (marital status and parental status the year before first graduate enrollment) and gender on if and when an individual enrolled in graduate education, all else equal. The Cox regression assessed a full survival model including early marriage, early parenthood, distal family variables, gender, and several other control variables, such as baccalaureate major and educational aspirations. I will focus on the log-rank test results because the marital status and parental status the year before first post-baccalaureate enrollment is better aligned to the dissertation's fundamental research question than the models using early marriage and early parenthood variables.

I found that marriage and parenthood the year before graduate enrollment had a stronger effect than advanced parental education and parental financial support on post-baccalaureate enrollment. Although these four family characteristics influenced *whether* an individual enrolled in graduate education, the proximal family characteristics had the strongest effects on whether and also *when* graduate students enrolled. Unlike the proximal family characteristics, advanced parental education and parental financial support did not change the timing of graduate enrollment. Marriage had the strongest effect, followed by parenthood, and both postponed graduate enrollment for men and women, but more so for women. Gender had a statistically significant difference in the effect of marriage and parenthood on enrolling in graduate education and the timing of enrollment within 10 years post-baccalaureate degree receipt. Jointly, marriage and parenthood were a barrier, and this barrier was stronger for women than men. However, when considered separately, marriage was a stronger barrier for men than for women. As predicted, parenthood was a stronger barrier for women than for men. Regardless of marital or parental status, men enrolled in graduate school sooner than women.

## Analysis and Implications

This dissertation detailed some of the college choice differences between traditional undergraduate students and prospective graduate students. Often times, higher education institutions develop policies and procedures and formulate plans based upon the traditional undergraduate student. The decision to go to graduate school does not occur in isolation. As the findings suggest, being married and having children negatively influence the decision to enroll in graduate school and when to enroll. There were differences between men and women in the effect of marriage and children on post-baccalaureate women.

### Educational Stratification Researchers

Research shows that women are excelling in graduate education (Ginder & Kelly-Reid, 2013). Women comprise more than half of the graduate students and more than half of the graduate degree recipients in colleges and universities across the U.S. However, as the findings in this dissertation reveal, women with children are held back from graduate school. Women may be holding themselves back as they deal with the conflicting roles of graduate student, mother, and employee. At the same time, higher education policies and institutions may be creating an unwelcome environment for women striving to "do it all." If higher education policies and institutions were more accommodating, would there be even more women excelling in graduate education? To purport that there is only a motherhood penalty in graduate education would be untrue. The parenthood penalty also applies to men as well, although to a lesser degree. Having children creates a barrier for individuals otherwise interested in a graduate education. It also makes persistence in a graduate program difficult. I share some recommendations for practice later in the Policy Recommendations section.

### Social Scientists

One of this dissertation's findings highlights a gap in the graduate enrollment patterns between married men and married women. It was surprising to find that married men enrolled in graduate school at a lower rate than married women. Does this imply that men are more held back from graduate school by their wives than women are held back by their husbands? Perhaps, instead, this is only due to the greater numbers of female graduate students. Given that men enroll in graduate education sooner after bachelor's degree completion and men marry later in age than women, perhaps the gap is a natural result. Either way, the graduate enrollment gap between married men and married women warrants further investigation.

**Policy Recommendations**

Higher education institutions can lobby for further graduate student parent support. First, the U.S. Department of Education could offer childcare subsidies for graduate students with children (Springer, Parker, & Leviten-Reid, 2009). Not only could these subsidies support full-time childcare, it could also offer support for back-up childcare and childcare funding for the graduate student to attend conferences and professional development. Childcare is not only needed for when the graduate student is in class, but when he or she is studying, doing research, participating in networking or professional development, or if the regular childcare provider is unavailable.

Second, graduate students should have access to affordable health insurance (Springer et al., 2009). Often times the health insurance available, especially family plans over individual plans, is not aligned with a graduate student's budget. Having national and institutional policies that support graduate students is key to recruitment and retention.

**Practice Recommendations**

With the findings in mind, higher education institutions may see enrollment and retention gains if practices are more graduate-student friendly, thereby minimizing the negative influence of having a family on post-baccalaureate enrollment (Springer et al., 2009). For example, policies may need to be revised to accommodate the enrollment delay of graduate students with families. In addition, policies and services may need to be expanded to accommodate graduate students with families. Research shows that institutional support for graduate student parents is insufficient (Springer et al., 2009). Often times flexibility occurs, but on an individual basis. Flexibility needs to be institutionalized to allow for consistency across students and departments (Springer et al., 2009).

Higher education administrators may consider offering flexible and convenient courses, expanding student services, providing greater access to advisors, lengthening

graduate examination expiration dates, and hosting activities for graduate students' families. First, offering such features as convenient course meeting days and times, online and hybrid course delivery options, flexibility within classes, and accelerated degree completion options may make the college or university more inviting to graduate students with families. If a graduate student is going to assume the responsibility of graduate school, he or she will seek out the most convenient and least disruptive program. Moreover, having options for graduate students allows them to find a class schedule and course delivery to suit the unique needs of their families (O'Connor, 2004).

Second, higher education administrators may consider expanding services to students with families. This may include offering childcare during class times and providing meals for students and/or their families prior to or during class meeting times. Further, institutions may have local residency options so graduate student parents need not relocate temporarily with children or leave them behind with another guardian. In addition, allowing mothers to take a semester off of graduate school in order to have a child without forfeiting assistantships or violating time-to-degree expectations may help retain graduate student women.

Third, colleges and universities may need to expand access to academic advisors. Perhaps the hours and days advising is available should be extended to include evenings and weekends. Similarly, providing clear graduate programming details on websites may help inform prospective graduate students of the requisite time commitment of graduate school.

Fourth, higher education institutions may lengthen graduate examination expiration dates. Many institutions accept graduate entrance exams, such as the GRE or GMAT, for admission to a graduate program, but require the scores be within 5 to 7 years of the date of application to graduate school. Perhaps the policy could be changed to extend the date of such scores. A similar argument could be made for the expiration time of transfer credits. On occasion, credits from a bachelor's degree may be applied toward

the required credits of a master's degree. However, many institutions only transfer in such credits if they are taken within a particular timeframe, say 10 years of graduate school application.

Finally, to minimize the strain for both the graduate student and the graduate student's family, higher education institutions may consider offering activities for the graduate students' families. These experiences may create a sense of community for the families and connect them with other families experiencing the same adjustment. They could be events for only the families and events for the graduate student with his or her family. This is one means to creating a family-friendly culture (Springer et al., 2009). Similarly, perhaps institutions can set aside some child-friendly spaces, lactation rooms for new mothers, changing tables in restrooms, and peer support groups.

## Limitations of Study

I proposed that this study consider the timing of first marriage and first child birth after baccalaureate degree completion and the effects of each, along with gender, on post-baccalaureate enrollment. Unfortunately, the Baccalaureate and Beyond Longitudinal Study 1993/2003 researchers did not obtain the date of first marriage and date of birth of first child in the fourth (final) follow-up survey. As such, the survival analysis herein only considered the dates of first marriage and first birth within the first 4 years after baccalaureate degree completion. Not having marriage and birth date data for the last 6 years of the 10-year study limited the analysis. While this was a considerable constraint, using data identifying the respondent's marital and parental status the year preceding first graduate enrollment helped minimize the disadvantage. However, these variables only captured marital and parental status of respondents who actually enrolled in graduate study. Despite the limitations of the data available, this study contributes to the gap in the educational stratification and college-choice literature specific to graduate school enrollment decisions. The survival analysis method allowed me to make maximum use of the rich data available in the B&B data set.

## Opportunities for Future Research

It would be interesting to repeat the study with the current *Baccalaureate and Beyond Longitudinal Study: 2002/2012* cohort. Comparing the data with the current study may highlight cohort differences. For example, one change between the 1993–2003 and 2002–2012 timeframes is the expansion of online education. Perhaps greater online opportunities have expanded the access of graduate education to individuals with families. In addition, the researchers may capture the date of first marriage and date of first child birth in all the surveys in the current cohort. It would be interesting to replicate this study with 10 years of date data.

There may be an opportunity to expand the student services literature by conducting utility studies of graduate student family engagement activities. Do graduate students enroll at a higher rate when there is stronger support for their families? What types of activities stimulate graduate enrollment and improve retention the most?

This study not only added to the educational attainment literature and the college choice literature but also formulated conclusions for researchers and practitioners in higher education institutions. By better understanding graduate college choice, institutions can more effectively use resources and improve the opportunities and experiences for post-baccalaureate students. Minimizing barriers to entry may level the playing field between master's degree aspirants with families and those without families. The results suggest opportunities for higher education graduate enrollment administrators to influence post-baccalaureate enrollment decisions by offering services specific to graduate students with families. "Institutional supports for all graduate student parents have the potential to attract and retain a diverse and intellectually rigorous student body that includes talented mothers and fathers" (Springer et al., 2009, p. 454).

# APPENDIX A

# TABLES

Table A1

*Baccalaureate and Beyond Longitudinal Study 1993/03 (B&B) Sample Sizes*

| Sample Members | Sample Number | |
|---|---|---|
| *B&B: 93 Cohort* | | |
| B&B: 93 Sample total | 12,480 | |
| B&B: 93 Respondents | 11,810 | (95%) |
| | | |
| *B&B: 94 Sample* | | |
| B&B: 93 Respondents | 11,810 | |
| B&B: 93 Others eligible | 670 | |
| B&B: 94 Ineligible | 1,520 | |
| B&B: 94 Sample total | 10,960 | |
| B&B: 94 Respondents | 10,080 | (92%) |
| | | |
| *B&B: 97 Sample* | | |
| B&B: 94 Respondents | 10,080 | |
| B&B: 94 Others eligible | 1,110 | |
| B&B: 97 Sample total | 11,190 | |
| B&B: 97 Respondents | 10,090 | (90%) |
| | | |
| *B&B: 03 Sample* | | |
| B&B: 97 Respondents | 10,090 | |
| B&B: 97 Others eligible | 350 | |
| B&B: 03 Sample total | 10,440 | |
| B&B: 03 Respondents | 8,970 | (86%) |

*Note.* Response rates are in parentheses. Sample sizes are rounded to the nearest 10. Adapted from *1993/03 Baccalaureate and Beyond Longitudinal Study (B&B: 93/03) Methodology Report*, by J. S. Wine, M. B. Cominole, S. Wheeless, K. Dudley, and J. Franklin, 2005. 

Table A2

*Baccalaureate and Beyond Longitudinal Study 1993/03 (B&B) Analysis Variables, Summary Statistics*

| Variable | Mean | S.D. | Missing (%) |
|---|---|---|---|
| *Dependent Variable* | | | |
| Ever enrolled in graduate education | 0.48 | 0.50 | 0.2 * |
| *Demographic* | | | |
| Female | 0.55 | 0.50 | 0.2 * |
| Race/Ethnicity | 4.67 | 0.82 | 3.4 * |
| American Indian or Alaskan Native | 0.00 | 0.07 | 3.4 * |
| Asian or Pacific Islander | 0.04 | 0.21 | 3.4 * |
| Black, non-Hispanic | 0.06 | 0.24 | 3.4 * |
| Hispanic (reference group: white, non-Hispanic) | 0.05 | 0.21 | 3.4 * |
| *Baccalaureate Performance and Experience* | | | |
| Field-of-study for baccalaureate major, categorical | 4.34 | 2.46 | 1.3 * |
| Humanities (reference group: social and behavioral sciences) | 0.12 | 0.33 | 1.3 * |
| Life and physical sciences | 0.11 | 0.32 | 1.3 * |
| Engineering, math, computer science | 0.11 | 0.32 | 1.3 * |
| Education | 0.13 | 0.34 | 1.3 * |
| Business and management | 0.13 | 0.34 | 1.3 * |
| Health | 0.06 | 0.24 | 1.3 * |
| Vocational or technical | 0.02 | 0.16 | 1.3 * |
| Other technical or professional | 0.10 | 0.30 | 1.3 * |
| Reported GPA for baccalaureate degree (4.0 scale) | 3.10 | 0.57 | 8.0 * |
| SAT score | 1,007.54 | 189.14 | 12.7 * |
| *Educational Aspirations* | | | |
| Aspire for a master's or higher, as of 1993 | 0.89 | 0.32 | 7.2 * |
| *Distal Family* | | | |
| Either parent has a master's degree or more | 0.29 | 0.45 | 4.3 * |
| Received parental financial support | 0.71 | 0.45 | 14.3 * |
| *Proximal Family* | | | |
| Married year before first graduate enrollment | 0.12 | 0.32 | |
| Had child year before first graduate enrollment | 0.05 | 0.21 | |
| Married within 4 years of bachelor's completion | 0.29 | 0.45 | |
| Had child within 4 years of bachelor's completion | 0.10 | 0.30 | |
| Married and child within 4 years of bachelor's | 0.05 | 0.22 | |

*Note.* * denotes imputed variables. Sample size is 5,950 respondents.

Table A3

*Hazard Ratios, Log-rank Test for Equality of Survival Functions*

| | Total | Males | Females | Diff.† |
|---|---|---|---|---|
| Female | 1.06 * | | | |
| Race/Ethnicity | | | | |
| American Indian/Alaskan Native | 0.63 | 1.29 | 0.33 | * |
| Asian or Pacific Islander | 1.14 | 1.25 | 1.03 | * |
| Black, Non-Hispanic | 1.06 | 0.96 | 1.07 | * |
| Hispanic | 1.12 | 1.36 | 0.96 | * |
| White, Non-Hispanic | 0.98 | 0.97 | 1.00 | * |
| Baccalaureate Major | | | | |
| Humanities | 0.92 | 1.08 | 0.83 * | * |
| Social and behavioral sciences | 1.28 ** | 1.22 * | 1.33 ** | * |
| Life and physical sciences | 1.88 ** | 2.18 ** | 1.61 ** | ** |
| Engineering/math/computer science | 1.07 | 1.11 | 1.13 | ** |
| Education | 1.30 ** | 1.20 | 1.29 ** | |
| Business and management | 0.62 ** | 0.59 ** | 0.67 ** | |
| Health | 1.04 | 1.90 ** | 0.78 | * |
| Vocational/technical | 0.49 ** | 0.44 ** | 0.65 | * |
| Other technical/professional | 0.73 ** | 0.62 ** | 0.81 * | * |
| Either parent has a master's degree | 1.33 ** | 1.43 ** | 1.25 ** | * |
| Parental financial support | 1.04 * | 1.03 | 1.05 * | * |
| Parent master's degree, parental financial support | | | | |
| No master's, no support | 0.87 ** | 0.88 ** | 0.86 ** | |
| No master's, support | 0.92 ** | 0.88 ** | 0.96 ** | ** |
| Master's, no support | 1.24 ** | 1.35 ** | 1.15 ** | |
| Master's, support | 1.35 ** | 1.45 ** | 1.27 ** | |
| Married year before first graduate enrollment | 0.48 ** | 0.46 ** | 0.50 ** | |
| Child year before first graduate enrollment | 0.60 ** | 0.83 | 0.56 ** | |
| Married, child year before first graduate enrollment | | | | |
| Not married, no child | 1.34 ** | 1.27 ** | 1.43 ** | |
| Not married, child | 0.80 ** | 1.42 ** | 0.75 ** | * |
| Married, no child | 0.50 ** | 0.45 ** | 0.53 ** | |
| Married, child | 0.39 ** | 0.59 ** | 0.33 ** | ** |

*Note.* B&B:93/03. Sample size is 5,950 respondents. Each variable was tested for equality of survival function not controlling for any other variables. Chi-square test. † denotes the gender difference in hazard ratios is statistically significant. * $p \leq .05$. ** $p \leq .01$.

Table A4

*Frequencies, Post-Baccalaureate Enrollment and Proximal Family Status*

| | Frequency | Sample Size | Percent |
|---|---|---|---|
| Enrolled in post-baccalaureate education | 2,850 | 5,950 | 47.9% |
| Married the year prior to post-baccalaureate enrollment | 340 | 2,850 | 11.9% |
| Parent the year prior to post-baccalaureate enrollment | 140 | 2,850 | 4.9% |
| Both married and a parent the year prior to post-baccalaureate enrollment | 40 | 2,850 | 1.4% |
| Married within 4 years of baccalaureate completion | 1,740 | 5,950 | 29.2% |
| Parent within 4 years of baccalaureate completion | 600 | 5,950 | 10.1% |
| Both married and a parent within 4 years of baccalaureate completion | 300 | 5,950 | 5.0% |
| Ever married (prior to end of study) | 4,470 | 5,950 | 75.1% |
| Ever parent (prior to end of study) | 2,970 | 5,950 | 49.9% |

*Note.* B&B:93/03.

Table A5

*Cox Models: Hazard Ratios (HR), Coefficients (β)*

| | Model 1 Baseline | | Model 2 Distal Family | | Model 3 Proximal Family | | Model 4 Full Model | |
|---|---|---|---|---|---|---|---|---|
| Variable | HR | β | HR | β | HR | β | HR | β |
| Female | 0.980 | -0.020 | 0.972 | -0.028 | 0.977 | -0.024 | 0.967 | -0.034 |
| | (0.071) | (0.073) | (0.071) | (0.073) | (0.072) | (0.073) | (0.071) | (0.073) |
| Race/Ethnicity [a] | | | | | | | | |
| American Indian or Alaskan Native | 0.645 | -0.438 | 0.666 | -0.406 | 0.663 | -0.410 | 0.675 | -0.392 |
| | (0.278) | (0.430) | (0.290) | (0.435) | (0.286) | (0.432) | (0.294) | (0.436) |
| Asian or Pacific Islander | 1.301 | 0.263 | 1.133 | 0.125 | 1.115 | 0.109 | 1.126 | 0.119 |
| | (0.185) | (0.142) | (0.134) | (0.118) | (0.137) | (0.122) | (0.134) | (0.119) |
| Black, non-Hispanic | 1.334 | 0.288 * | 1.351 | 0.301 * | 1.580 | 0.458 ** | 1.591 | 0.465 ** |
| | (0.178) | (0.133) | (0.179) | (0.132) | (0.153) | (0.097) | (0.156) | (0.098) |
| Hispanic | 1.271 | 0.240 * | 1.324 | 0.280 * | 1.272 | 0.241 * | 1.317 | 0.276 * |
| | (0.142) | (0.111) | (0.151) | (0.114) | (0.143) | (0.112) | (0.151) | (0.114) |
| Baccalaureate Major [b] | | | | | | | | |
| Humanities | 0.627 | -0.467 ** | 0.612 | -0.491 ** | 0.623 | -0.474 ** | 0.611 | -0.493 ** |
| | (0.063) | (0.100) | (0.062) | (0.102) | (0.061) | (0.099) | (0.060) | (0.099) |
| Life and physical sciences | 1.695 | 0.528 ** | 1.702 | 0.532 ** | 1.702 | 0.532 ** | 1.701 | 0.531 ** |
| | (0.174) | (0.103) | (0.175) | (0.103) | (0.176) | (0.103) | (0.176) | (0.103) |
| Engineering, math, computer science | 0.904 | -0.100 | 0.924 | -0.079 | 0.913 | -0.091 | 0.923 | -0.080 |
| | (0.104) | (0.114) | (0.106) | (0.115) | (0.105) | (0.115) | (0.106) | (0.114) |
| Education | 0.990 | -0.010 | 1.007 | 0.007 | 1.009 | 0.009 | 1.025 | 0.025 |
| | (0.080) | (0.081) | (0.081) | (0.081) | (0.082) | (0.081) | (0.083) | (0.081) |
| Business and management | 0.512 | -0.669 ** | 0.521 | -0.652 ** | 0.513 | -0.667 ** | 0.521 | -0.651 ** |
| | (0.047) | (0.091) | (0.048) | (0.092) | (0.047) | (0.091) | (0.048) | (0.092) |

(*continued*)

*(Table A5, continued)*

| | Model 1 Baseline | | Model 2 Distal Family | | Model 3 Proximal Family | | Model 4 Full Model | |
|---|---|---|---|---|---|---|---|---|
| Variable | HR | β | HR | β | HR | β | HR | β |
| Health | 0.835 | -0.180 | 0.853 | -0.159 | 0.851 | -0.161 | 0.868 | -0.141 |
| | (0.105) | (0.125) | (0.109) | (0.128) | (0.107) | (0.126) | (0.112) | (0.129) |
| Vocational or technical | 0.495 | -0.704 ** | 0.512 | -0.669 ** | 0.511 | -0.671 ** | 0.529 | -0.638 ** |
| | (0.103) | (0.208) | (0.106) | (0.207) | (0.107) | (0.209) | (0.110) | (0.207) |
| Other technical or professional | 0.642 | -0.443 ** | 0.648 | -0.434 ** | 0.637 | -0.451 ** | 0.643 | -0.442 ** |
| | (0.066) | (0.103) | (0.066) | (0.102) | (0.066) | (0.103) | (0.066) | (0.103) |
| Undergraduate GPA | 1.469 | 0.385 ** | 1.475 | 0.389 ** | 1.475 | 0.389 ** | 1.480 | 0.392 ** |
| | (0.061) | (0.041) | (0.060) | (0.041) | (0.062) | (0.042) | (0.061) | (0.041) |
| SAT/ACT | 1.001 | 0.001 ** | 1.001 | 0.001 ** | 1.001 | 0.001 ** | 1.001 | 0.001 ** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| Expect master's degree or greater | 2.354 | 0.856 ** | 2.306 | 0.835 ** | 2.362 | 0.859 ** | 2.312 | 0.838 ** |
| | (0.250) | (0.106) | (0.245) | (0.106) | (0.251) | (0.106) | (0.245) | (0.106) |
| Either parent has a master's degree | | | 1.248 | 0.222 ** | | | 1.246 | 0.220 ** |
| | | | (0.069) | (0.055) | | | (0.068) | (0.055) |
| Parental financial support | | | 1.080 | 0.077 | | | 1.087 | 0.083 |
| | | | (0.062) | (0.057) | | | (0.064) | (0.059) |
| Married within 4 years of bachelor's | | | | | 0.995 | -0.005 | 1.004 | 0.004 |
| | | | | | (0.078) | (0.079) | (0.078) | (0.078) |
| Child within 4 years of bachelor's | | | | | 0.903 | -0.102 | 0.968 | -0.032 |
| | | | | | (0.100) | (0.110) | (0.112) | (0.116) |
| Married, child within 4 years of bachelor's | | | | | 0.934 | -0.069 | 0.868 | -0.142 |
| | | | | | (0.180) | (0.193) | (0.173) | (0.199) |

(*continued*)

*(Table A5, continued)*

| | Model 1 Baseline | | Model 2 Distal Family | | Model 3 Proximal Family | | Model 4 Full Model | |
|---|---|---|---|---|---|---|---|---|
| Variable | HR | β | HR | β | HR | β | HR | β |
| *Time-Dependent Interaction Variables* | | | | | | | | |
| Female | 1.003 | 0.003 | 1.003 | 0.003 | 1.003 | 0.003 | 1.003 | 0.003 |
| | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) | (0.002) |
| Life & physical sciences | 0.992 | -0.009 ** | 0.991 | -0.009 ** | 0.991 | -0.009 ** | 0.991 | -0.009 ** |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Engineering, math, computer science | 0.993 | -0.007 * | 0.993 | -0.007 * | 0.993 | -0.007 * | 0.993 | -0.007 * |
| | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) | (0.003) |
| Asian or Pacific Islander | 0.995 | -0.005 | | | | | | |
| | (0.004) | (0.004) | | | | | | |
| Black, non-Hispanic | 1.005 | 0.005 | 1.005 | 0.005 | | | | |
| | (0.003) | (0.003) | (0.003) | (0.003) | | | | |
| Married within 4 years of bachelor's | | | | | 0.996 | -0.004 * | 0.995 | -0.005 * |
| | | | | | (0.002) | (0.002) | (0.002) | (0.002) |

*Note*. B&B:93/03. [a] reference group is white, non-Hispanic. [b] reference group is social and behavioral sciences. [c] Chi-square is the chi-square statistic or -2 x (LL4 - LLx), where LL4 is the log-pseudolikelihood of Model 4 and LLx is the log-pseudolikelihood of the model being compared to Model 4. Standard errors are in parentheses. Sample size is 5,630. Chi-square test. * $p \leq .05$. ** $p \leq .01$.

Table A6

*Cox Models Stratified by Gender: Hazard Ratios (HR), Coefficients (β)*

| | Full Model Males | | | Full Model Females | | |
|---|---|---|---|---|---|---|
| Variable | HR | β | | HR | β | |
| Race/Ethnicity [a] | | | | | | |
| American Indian or Alaskan Native | 1.551 | 0.439 | | 0.327 | -1.117 | |
| | (0.835) | (0.538) | | (0.203) | (0.621) | |
| Asian or Pacific Islander | 1.180 | 0.166 | | 1.089 | 0.085 | |
| | (0.178) | (0.151) | | (0.190) | (0.174) | |
| Black, non-Hispanic | 1.401 | 0.337 | | 1.646 | 0.499 | ** |
| | (0.266) | (0.190) | | (0.195) | (0.118) | |
| Hispanic | 1.475 | 0.389 | ** | 1.131 | 0.123 | |
| | (0.212) | (0.143) | | (0.191) | (0.169) | |
| Baccalaureate Major [b] | | | | | | |
| Humanities | 0.773 | -0.258 | | 0.532 | -0.630 | ** |
| | (0.112) | (0.145) | | (0.065) | (0.123) | |
| Life and physical sciences | 2.146 | 0.764 | ** | 1.097 | 0.093 | |
| | (0.319) | (0.149) | | (0.122) | (0.111) | |
| Engineering, math, computer science | 0.997 | -0.003 | | 0.708 | -0.345 | * |
| | (0.148) | (0.148) | | (0.109) | (0.154) | |
| Education | 1.058 | 0.056 | | 0.985 | -0.015 | |
| | (0.161) | (0.152) | | (0.092) | (0.094) | |
| Business and management | 0.529 | -0.637 | ** | 0.517 | -0.659 | ** |
| | (0.074) | (0.140) | | (0.062) | (0.121) | |
| Health | 1.657 | 0.505 | ** | 0.639 | -0.448 | ** |
| | (0.322) | (0.194) | | (0.103) | (0.161) | |

(*continued*)

*(Table A6, continued)*

| | Full Model Males | | Full Model Females | |
|---|---|---|---|---|
| Variable | HR | β | HR | β |
| Vocational or technical | 0.505 (0.146) | -0.690 * (0.292) | 0.548 (0.165) | -0.602 * (0.301) |
| Other technical or professional | 0.649 (0.113) | -0.433 * (0.174) | 0.625 (0.079) | -0.470 ** (0.127) |
| Undergrad GPA | 1.450 (0.081) | 0.372 ** (0.056) | 1.625 (0.092) | 0.486 ** (0.057) |
| SAT/ACT | 1.001 (0.000) | 0.001 ** (0.000) | 1.001 (0.000) | 0.001 ** (0.000) |
| Expect master's degree or greater | 2.706 (0.413) | 0.996 ** (0.153) | 2.012 (0.297) | 0.699 ** (0.148) |
| Either parent has a master's degree | 1.379 (0.111) | 0.321 ** (0.081) | 1.170 (0.086) | 0.157 * (0.074) |
| Parental financial support | 0.975 (0.084) | -0.025 (0.086) | 1.151 (0.091) | 0.141 (0.079) |
| Married within 4 years of bachelor's | 0.934 (0.086) | -0.069 (0.092) | 0.940 (0.102) | -0.062 (0.109) |
| Child within 4 years of bachelor's | 0.844 (0.286) | -0.170 (0.339) | 1.000 (0.119) | 0.000 (0.119) |
| Married, child within 4 years of bachelor's | 1.456 (0.571) | 0.376 (0.392) | 0.677 (0.164) | -0.391 (0.243) |

*Note*. B&B:93/03. [a] reference group is white, non-Hispanic. [b] reference group is social and behavioral sciences. Standard errors are in parentheses. Sample size is 2,540 males and 3,090 females. Chi-square test. * $p \leq .05$. ** $p \leq .01$.

# APPENDIX B

# FIGURES

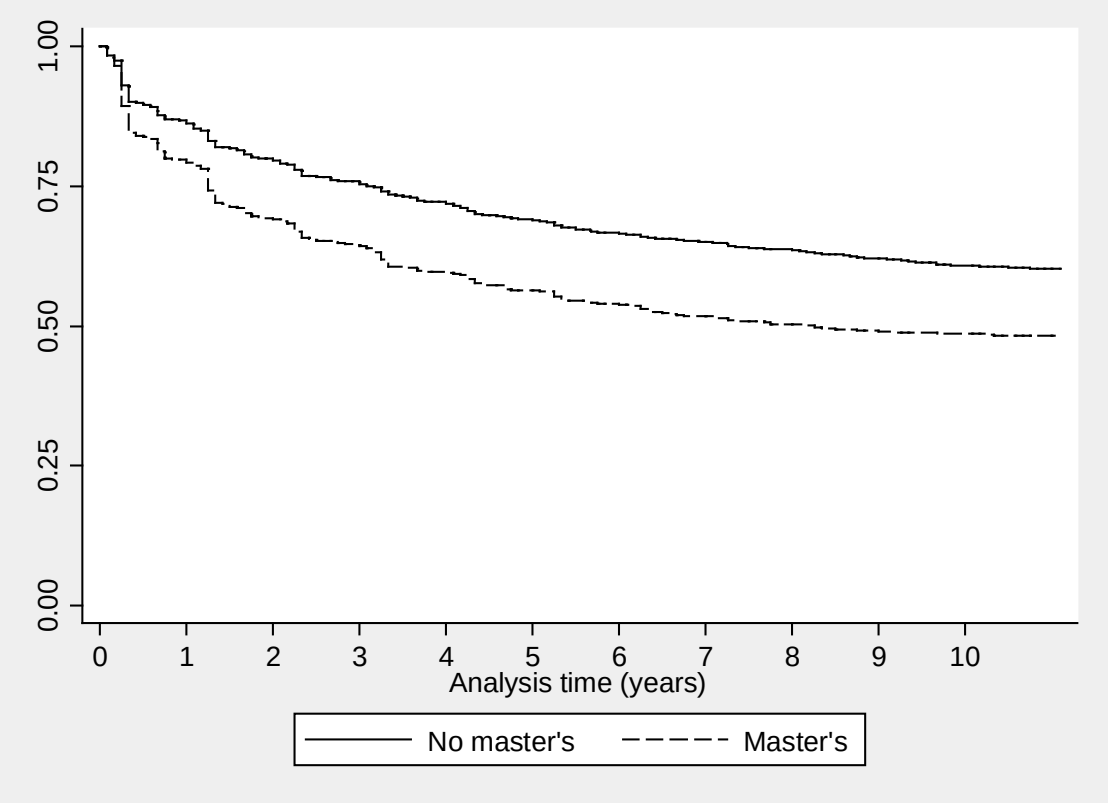


*Figure B1.* Kaplan-Meier survival curve stratified by advanced parental educational attainment.

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*Note.* Sample size is 5,950 respondents.

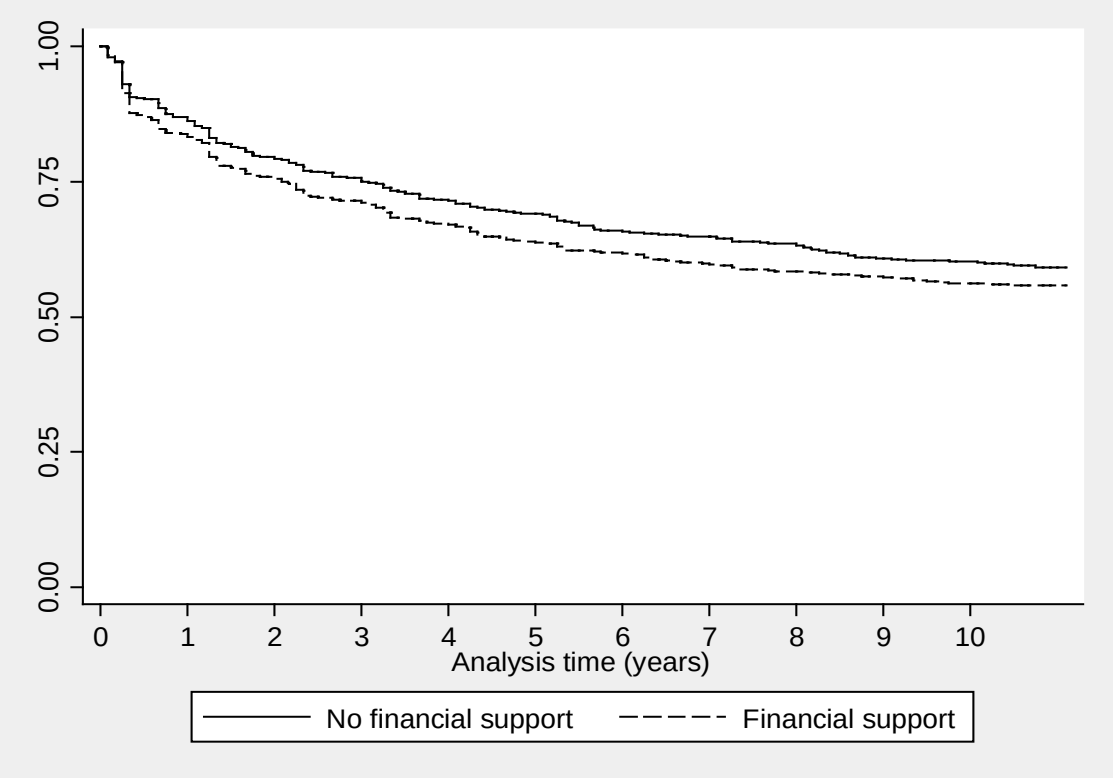


*Figure B2.* Kaplan-Meier survival curve stratified by parental financial support.

*Note.* Sample size is 5,950 respondents.

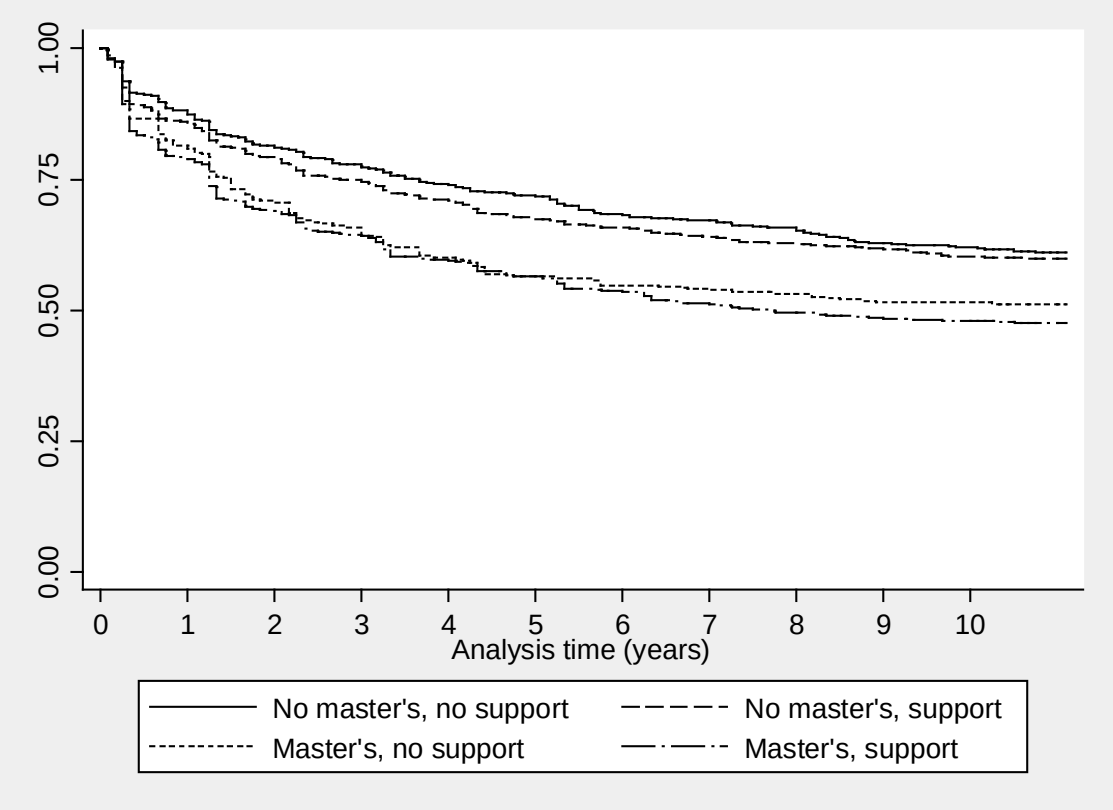


*Figure B3.* Kaplan-Meier survival curve stratified by parental financial support and advanced parental education.

*Note.* Sample size is 5,950 respondents.

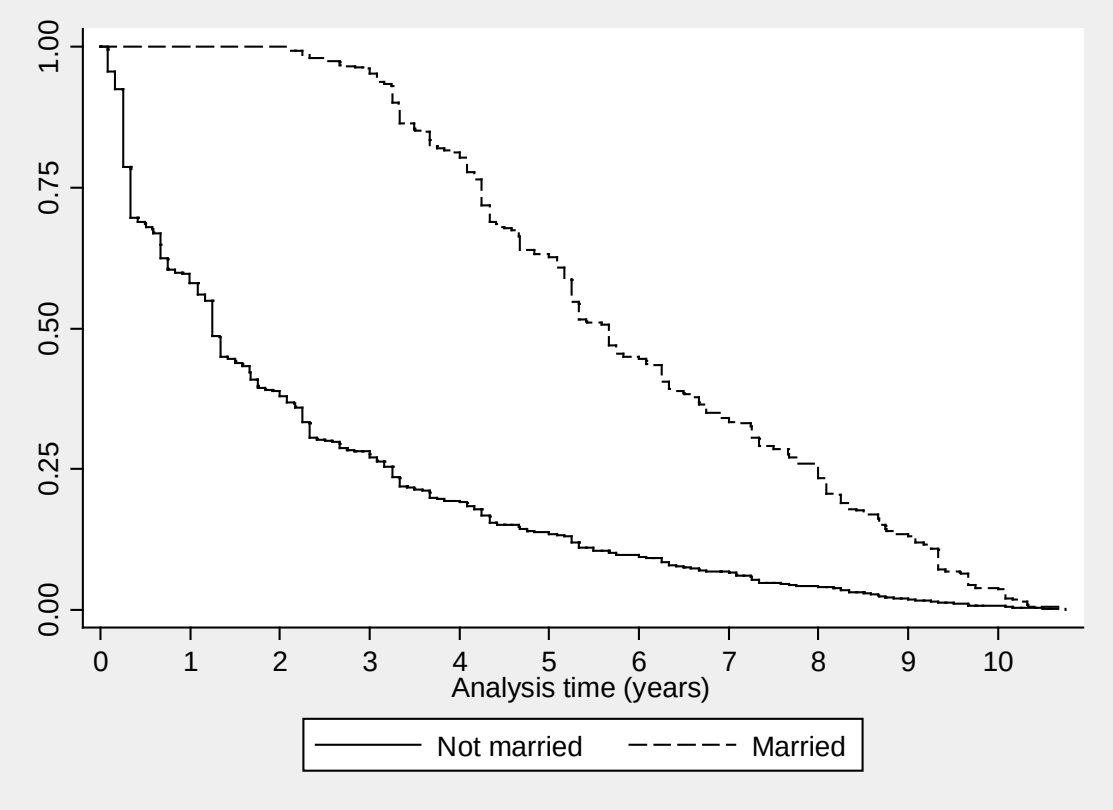


*Figure B4.* Kaplan-Meier survival curve stratified by marital status year before graduate enrollment.

*Note.* Sample includes 2,850 respondents who enrolled in graduate education.

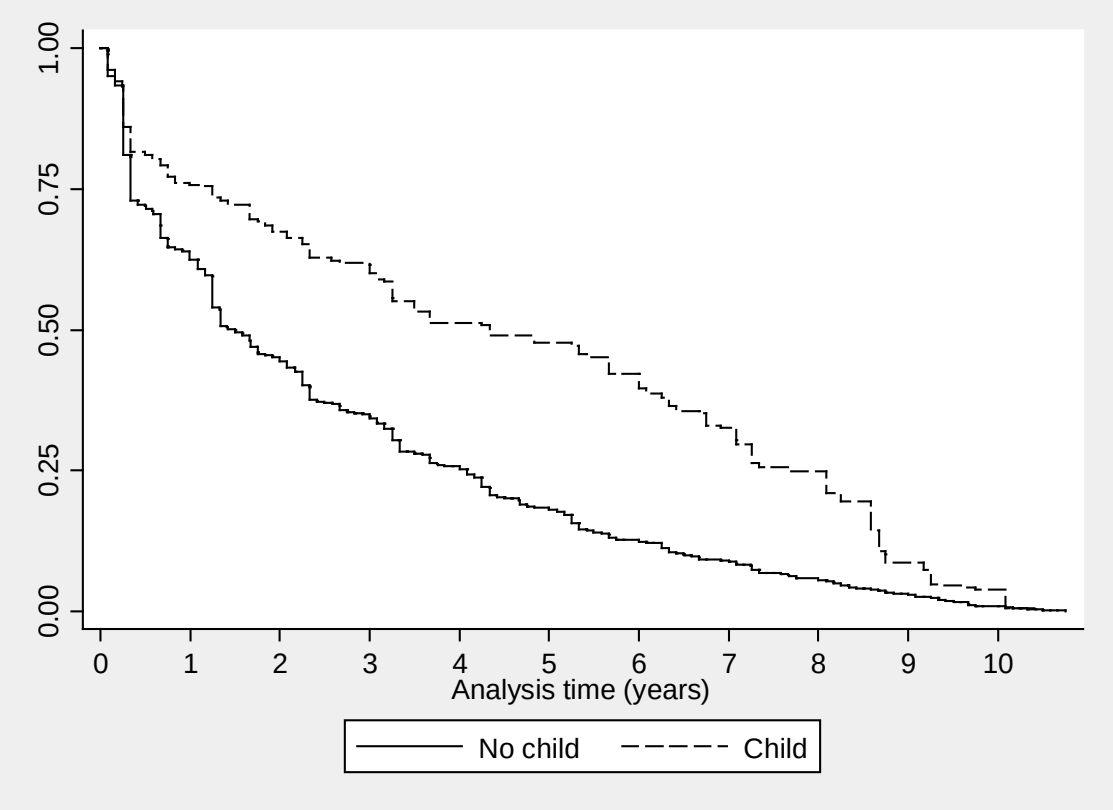


*Figure B5.* Kaplan-Meier survival curve stratified by parenthood status year before graduate enrollment.

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*Note.* Sample includes 2,850 respondents who enrolled in graduate education.

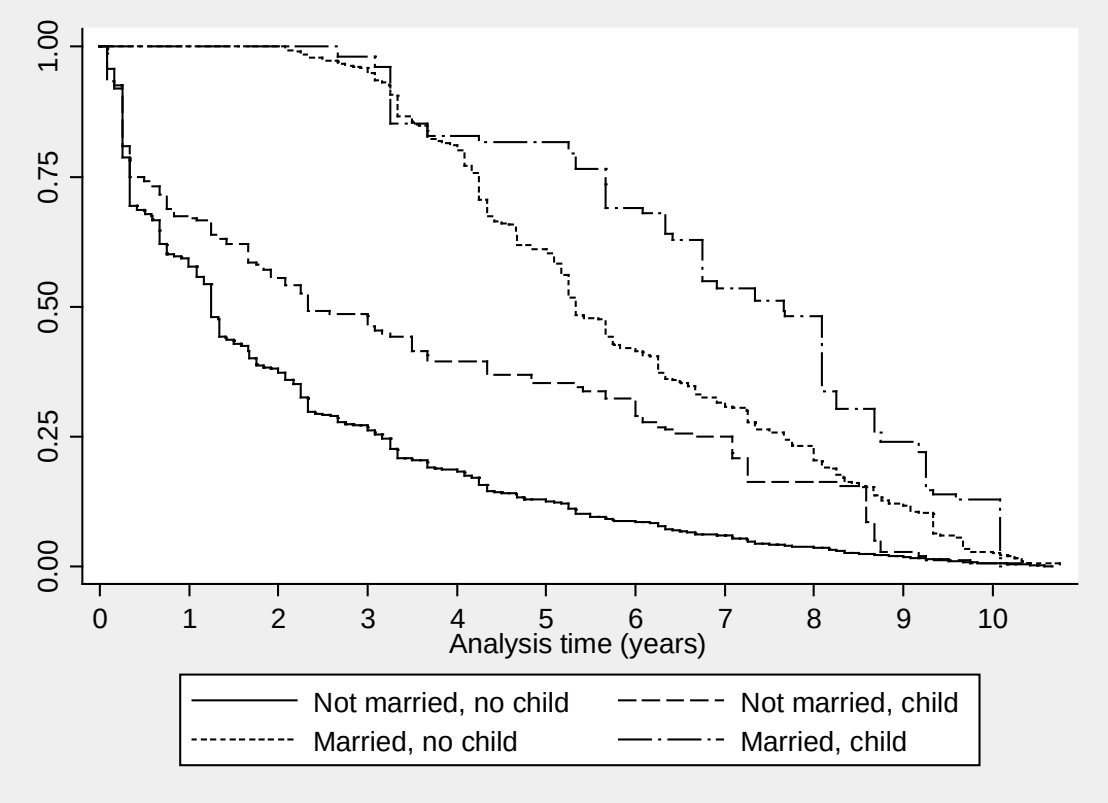


*Figure B6.* Kaplan-Meier survival curve stratified by marital status and parenthood status year before graduate enrollment.

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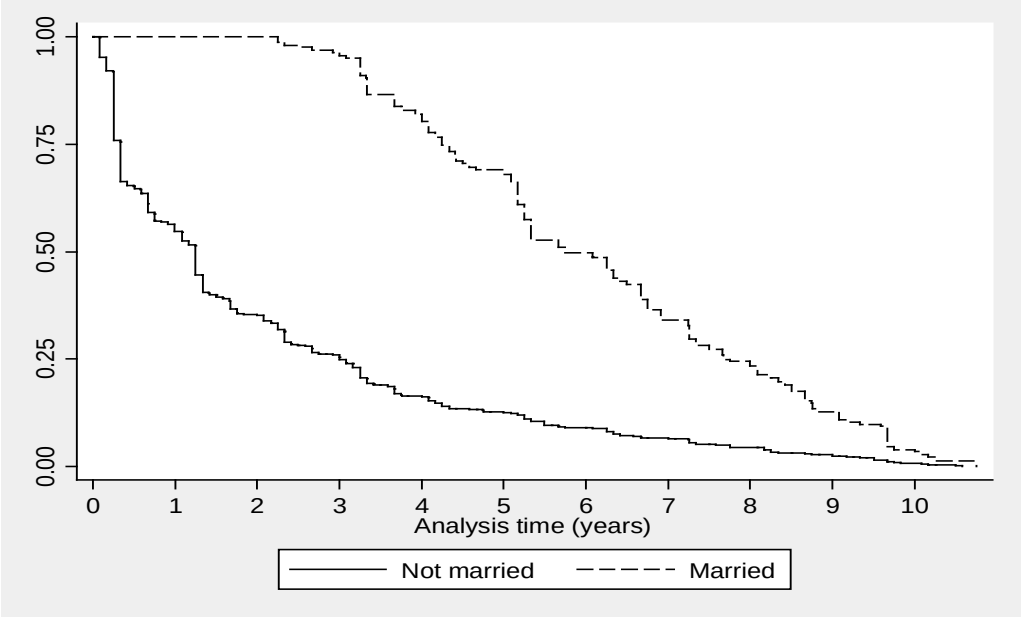
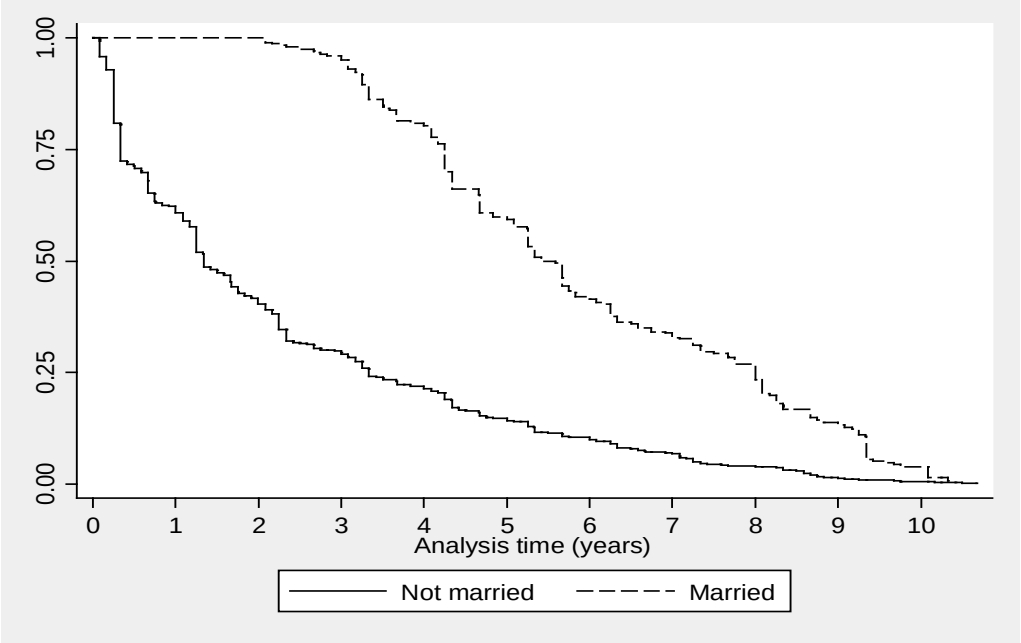
*Note.* Sample includes 2,850 respondents who enrolled in graduate education.




*a.* Males.




*b*. Females.

*Figure B7*. Kaplan-Meier survival curve stratified by marital status year before graduate enrollment.

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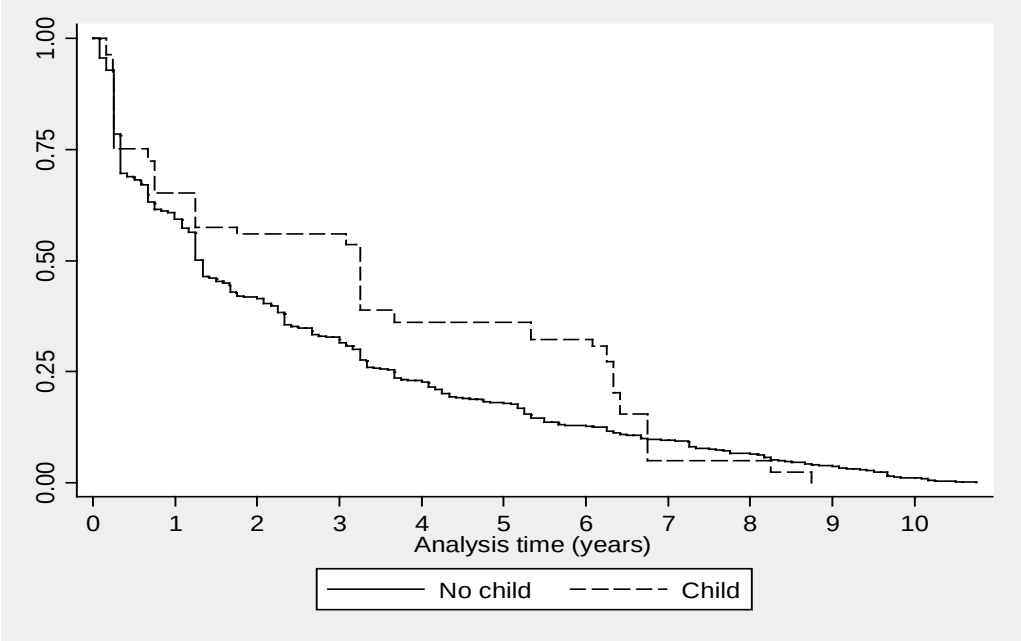
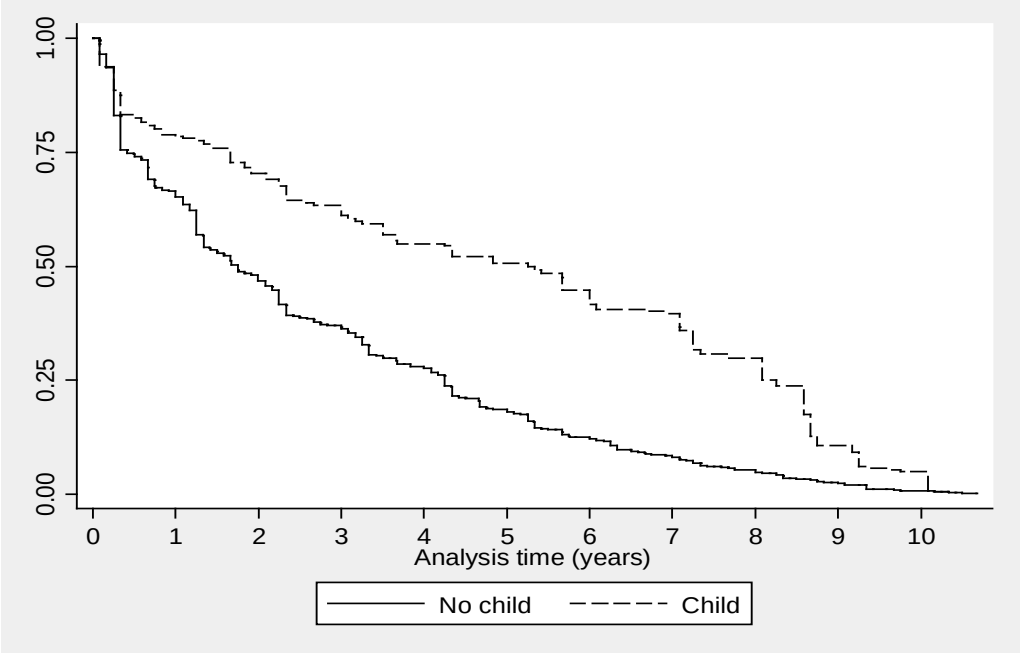
*Note.* Sample includes 2,850 respondents who enrolled in graduate education.




*a*. Males.




*b*. Females.

*Figure B8.* Kaplan-Meier survival curve stratified by parental status year before graduate enrollment.

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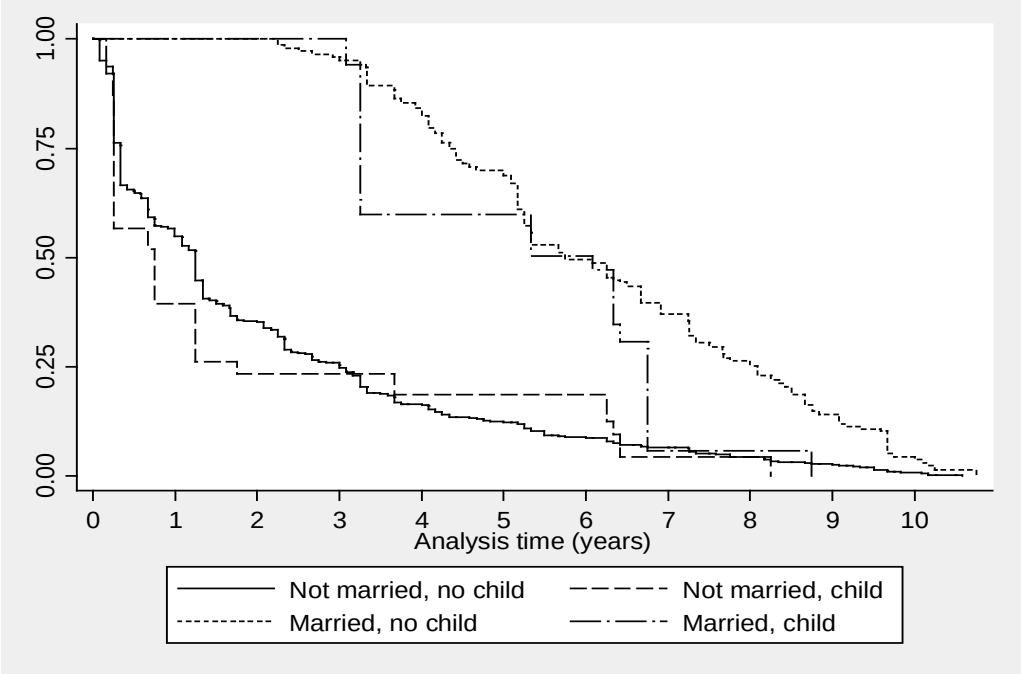
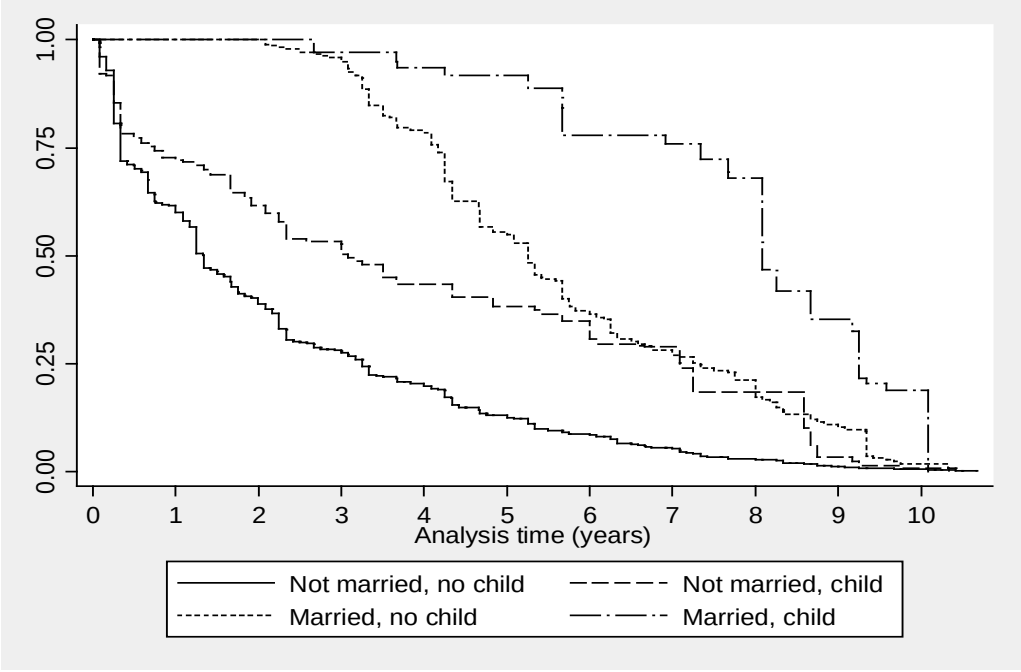
*Note.* Sample includes 2,850 respondents who enrolled in graduate education.




*a.* Males.




*b*. Females.

*Figure B9.* Kaplan-Meier survival curve stratified by marital status and parental status year before graduate enrollment.

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*Note.* Sample includes 2,850 respondents who enrolled in graduate education.

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