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**Family Structure and Family Dynamics:**

**Examining Resources for College Entry and Success**

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# Family Structure and Family Dynamics:

# Examining Resources for College Entry and Success

**by**

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## Dedicated to:

*My husband, Nathan, who had been by my side throughout;*

*My daughter, Jenna, who is my sunshine and who has brought new wonder to our lives;*

*The memory of my mother, Penelope Ann Hoekman, who believed in my pursuit of education and supported my taking more time to figure out who I wanted to be.*

*To my father, Leroy Hoekman, who taught me the value of working hard;*

*To my sister, Marsha, my good friend and a great Aunt;*

*and to my parents-in-law, Ron and LaMay Nybroten, who have helped make this possible in so many ways.*

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**Family Structure and Family Dynamics:**
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This study investigates the influence of family structure during adolescent on college entry and success using the more recently available Postsecondary Education Transcript Study (PETS) data of the High School and Beyond (HS&B) sophomore cohort to predict college entry, baccalaureate degree completion, and persistence in the science, math, technology, and engineering pipeline at the collegiate level. I propose that family structure not only influences adolescents' preparation for higher education, but also their ability to commit to and persevere within higher education. While traditional studies of student achievement and persistence have focused on socioeconomic status or academic ability, I explore family dynamics in attempting to explain the disadvantage adolescents from non-intact families experience within higher education. While controlling for family income and parents education, this study specifically explores parental involvement,

parent's educational aspirations, and family disruption as potential mechanisms that might account for the disadvantage adolescents from non-intact families experience in terms of higher education. The findings in this study indicate that single parent families and stepparent families should be analyzed as distinct groups for greater accuracy and understanding. Moreover, parental involvement, turbulence, and parental expectations as measured in high school influence the life course of young adults in their postsecondary pursuits. The present study contributes significantly to our understanding of families, family processes and higher education conceptually, and its findings have implications for education policy.

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# CHAPTER 1

# INTRODUCTION AND BACKGROUND

## INTRODUCTION

Given the extraordinary consequences of higher education for young adults, the choices to go to college and to stay in college are among the most important in life. Family exerts great influence in the transition between adolescence and young adulthood. Therefore, family is central to the life-defining experiences of deciding to attend college, going to college, and staying in college to receive a postsecondary degree.

Forty years of research within sociology has established the crucial role of social background in one's status attainment. Central to the study of social mobility and status attainment is the premise that the social and economic characteristics of parents shape the future opportunities of their children. The classic work of Blau and Duncan (1967) and the Wisconsin school's psychological model of status attainment (Sewell, Hauser and Portes 1969) link a person's family characteristics with one's attainment of status. We also know from previous research that family structure (defined as two parent family, single parent family, and stepparent family) and children's academic achievement are linked (Coleman 1988; Astone and McLanahan 1991; McLanahan and Sandefur 1994).

The previous research, however, focuses almost exclusively on children in the primary and secondary education setting while much less is known about the relationship between family structure and higher education. In addition, the majority of previous research within higher education has likely obscured the association between family

structure and postsecondary education because previous models have either grouped single parent families with stepparent families, considering both as non-intact families in comparison to two parent families, or have grouped stepparent families with two parent families, considering both to have similar levels of family resources in comparison to single parent families.[1] In order to better identify the barriers for access to and retention in college, we need to understand the relationship between adolescent family structure and postsecondary education, and we should study these relationships with attention to the theoretical and empirical understanding of distinct family types.

Social background, including that of family structure, plays an essential role during the transition from adolescence to young adulthood. I propose that family structure not only influences adolescents' preparation for higher education, but also their ability to commit to and persevere within higher education. Beginning with the Wisconsin school tradition, we know that family resources and parents' educational aspirations play an important role in the intergenerational transmission of socioeconomic status. From the research on retention in higher education, we know that for many students "family" offers a safety net and the social support necessary for students to better cope with the demands of college (Tinto 1993). Thus, we know that family remains important in the transition to adulthood and social support is critical to collegial success. The questions remain as to whether the family processes from non-intact families are

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[1] Current researchers analyzing *elementary or secondary* education student outcomes are more likely to separate single parent family and stepparent family types in comparison to two parent families. However, in reviewing recent articles from *Sociology of Education* and *Journal of Higher of Education*, January 2003 to April and August 2006, respectively, all researchers specified family structure as a dichotomous variable for any level of student education, with the exception of Raley, Frisco, and Wildsmith (2005). Researchers still tend to control for only single parent family or non-intact family in comparison to two parent families.

different enough from intact families to may a make a difference in social support, and whether these differences lead to a disadvantage in collegial success.

The life course perspective proposes that the characteristics of the family of origin and events that occur in the family of origin, such as a parental divorce, have consequences for adolescents both during their transition out of the parental house and long after (Elder 1994; Amato and Booth 1997). Using a life course perspective, it can be argued that while anyone may attempt to attend a four–year college, it may be an easier choice for an adolescent from a two parent family in comparison to an adolescent from single parent family. Similarly, while anyone may stay in college to complete a degree it may be an easier choice for some than others (Elder 1994).

Thus, my theoretical framework for a studying the relationship between family structure and higher education success suggests that both parental resources and family dynamics may disrupt parents' ability or willingness to provide social support to adolescents during these crucial times. In this study, I will attempt to model both parental resources and family dynamics in attempting to explain the disadvantage adolescents from non-intact families experience in higher education.

The present study contributes significantly to our understanding of families, family processes and higher education conceptually, and its findings have implications for higher education policy. I systematically examine the relationship between parental family structure and children's postsecondary education. First, I capture the complexity of stratification within higher education while examining the relationship between adolescent family background and college participation. This study not only considers college entry and baccalaureate degree completion, but also a spectrum of college entry options, early entry to science and math coursework, and degree completion in science and math related fields. These are important considerations because while entering a

college is a success, entering a four-year institution confers greater benefits and a higher likelihood of eventual degree attainment (Karen 2002; Velez 1985). Further, earning a baccalaureate degree is a monumental success and a key credential, but earning a degree in a science, technology, engineering, and math (STEM) field confers much greater rewards and higher status attainment than other fields (Davies and Guppy 1997; Jacobs 1986; Mickelson 1989). Therefore, the difference between entering a two-year versus a four-year institution or staying in and earning a STEM degree versus not earning a STEM degree reflects separate levels of achievement. These differences in achievement are of particular importance for lessening income gaps for women and minorities in society. Women and minorities who earn a college degree, especially a degree with high returns have a greater likelihood of earning compatible incomes to their white male counterparts.

Second, while studies have already associated family income with educational achievement (Amato and Booth, 1997; Thomson, Hanson and McLanahan 1994), much less is known about the social aspects of family structure and educational processes. While I will control for family economics, what I am most interested in examining are the social dynamics of these family processes. For example, the family processes of single-parent and stepparent families may influence the type of college or field of study a student chooses and whether a student completes a college degree. This study specifically explores family economics, parental involvement, parent's educational aspirations, and family disruption as potential mechanisms that might account for the disadvantage adolescents from non-intact families experience in terms of higher education.

Third, both the association of family structure and postsecondary success may differ by specific types of nonintact family. Within the current field of sociology of family, most researchers recognize that stepparent families and single parent families

have distinct challenges with parenting and family relationships (Furstenburg and Cherlin 1991). Therefore, in this study single parent families and stepparent families are analyzed as distinct groups for greater accuracy and understanding.

Fourth, the associations between family structure and college entry and success are studied by gender and race. Previous evidence suggests that family structure affects boys and girls differently (Hetherington and Clingempeel 1992; Furstenburg and Cherlin 1991). Parental divorce may increase behavior problems more among boys, while parental divorce may have a greater negative influence on the educational attainment of girls. In several studies, girls had a more difficult time adjusting than boys did to the presence of a stepfather and there were more accounts of stepfather's disengagement from stepdaughters. The situation appears to be more complex for girls when studying family relationships (Peterson and Zill 1986). For these reasons, models will be presented separately for men and women. Additionally, very little is known about the intersection of race, family structure, and college participation. As black students are twice as likely in comparison to whites to live in non-traditional households, further study will contribute to our understanding of the race gap.

For these analyses, I use data from the Postsecondary Education Transcript Study (PETS) data of the High School and Beyond (HS&B) sophomore cohort and earlier waves of the HS&B sophomore cohort. HS&B is a well-known, nationally representative longitudinal study of $10^{th}$ graders that includes information regarding both family and educational processes. An advantage of using the PETS data is that transcript level data provides rich and finely tuned data about a student's postsecondary education experience. The availability of the college transcript data improves our ability to address the relationship between family structure and postsecondary education in a level of detail that has not been available before. In comparison to previous studies of college entry using

earlier HS&B data, these analyses include for HS&B participants who delayed entry into college as well as college course and degree level data for all students.

Following a discussion of background literature, Chapter 2 describes the data and methods used in this study. Chapter 3 investigates the influence of family structure on college enrollment and examines potential explanations for the disadvantage adolescents from non-intact families experience in college entry. Chapter 4 examines the STEM pipeline by examining the influence of adolescent family structure on student's calculus course-taking during the first-year of college. Chapter 5 studies both the outcome of receiving a baccalaureate degree and receiving a baccalaureate degree in a STEM field. Chapter 6 provides a discussion of the key findings presented in this study and their implications.

## BACKGROUND LITERATURE

### *Family Background, Structure, and Status Attainment*

Family background is an essential factor in status attainment. Social and economic characteristics of parents shape the future of their children. My conceptual framework for exploring how family structure influences college entry and success first builds upon the status attainment literature familiar to sociologists and educational researchers including Blau and Duncan's 1967 classic study on occupational status in America and the Wisconsin school's social-psychological model of status attainment (Sewell and Hauser 1975; Sewell, Haller, and Portes 1969; see Pascarella and Terenzini 1991 for further review). This body of research examines various family or "social" background effects on occupational and economic status. Family background is an essential factor in status attainment; the higher a father's educational and occupational status, the higher his son's status attainment. As early researchers in family background

and status attainment, the Wisconsin school tradition focuses on demographic indicators, such as family income, family size, and parents' education, in examining the intergenerational transmission of status attainment. The Wisconsin school theory also adds a psychological component; parental expectations for their child will influence their child's educational and eventual status attainment (Pascarella and Terenzini 1991). The inclusion of the variables from this tradition remain important today when studying educational attainment and achievement; family income, parents' level of education and parents' educational aspirations are all positively associated with educational attainment.

While these researchers have examined whether differences occur between different types of family background characteristics in educational achievement and attainment, they fail to address several key areas. Most importantly, how does family structure make a difference in student success within postsecondary education? Certainly family resources influence postsecondary education, but also we need to explore family social processes that may confer advantage. Additionally, we should examine whether these processes differ by type of non-two parent family. Also, previous research has focused primarily on students entering college and students earning a degree. My contribution is to examine the type of college attended and the field of study chosen, enriching traditional measures of higher education success. While a four-year degree is critical to status attainment, some degrees carry higher status or greater rewards and in terms of social stratification. In this study, I will examine entry and completion of a degree in a STEM (science, technology, engineering, and math) fields.

***Student Persistence and Adolescent Family***

Family structure plays an important role in the intergenerational transmission of socioeconomic status. Likely, family structure influences parents' educational aspirations for their children and parents' ability or willingness to pay for higher

education. However, the Wisconsin school tradition does not fully explain why family structure might make a difference. In the student affairs tradition, the educational researchers Tinto (1980, 1975), Spady (1970), and Pascarella (1980 with Terenzini, 1983), began to dissect the relationship between family structure and educational attainment when identifying the risk factors to college persistence.

In examining student persistence and departure, one of the overarching research questions is "what influences commitment?" Tinto's model of student persistence and student departure focuses on individual commitment to both the degree and the institution. His central idea is that background characteristics (family background, academic preparation, and individual attributes) interact with each other to influence commitment to higher education through goal commitment and institutional commitment. "The background characteristics of a student influences the way in which a student interacts with the college environment which leads to educational and attitudinal outcomes, which in turn culminate in a decision to stay in or drop out of school"(Tinto 1988, p.23).

Tinto's model has three main "individual roots" of student departure: intention, commitment and external forces (Tinto 1993). First, the uncertainty of educational and occupational intentions threatens student persistence. Second, commitment to higher education is the willingness to tough it out and commit time and resources to the demands of college. Third, external relationships and obligations serve to push or pull one away from college. Family relationships and obligations could serve as competing demands or may provide social support that may assist with persistence. According to social support theory, establishing and maintaining supportive personal relationships enables students to better cope with the demands of college.

Student departure occurs for two reasons, either academic dismissal or voluntary withdrawal. Only 10-25% of all institutional departure is due to academic dismissal (Tinto 1993). Pre-entry reasons for withdrawal may be due to insufficient academic preparation. The majority of after-entry reasons for withdrawal focus on the character of one's integrative experience such as the daily interactions with students, faculty, and classroom experiences. For example, research has established that students of color face greater barriers to mainstream social life at white college institutions (Baker and Velez 1996; Tinto 1988). The research remains unresolved as to the degree to which factors such as type of institution, courses selection, size of institution, student finances, and campus residence contributes to social integration. Tinto declares that it is the longitudinal process of interactions that give rise to the causes (intention, commitment, difficulty, isolation, finances) of student departure over time.

Tinto and others (Boyer 1987; Bean 1982) contend that although students become members of their college communities, their membership in external communities remain important and may play a key role in student persistence. For example, if students have weak institutional commitment or lower educational goals, the impact of the external communities can actually make the difference between persistence or departure either positively or negatively (Tinto 1993). Family support taken from the students' external communities can assist students' successful integration into their college community.

> To the degree that the individual also participates in communities external to the college (e.g. family, work, and community), the model argues, events in those communities may also shape persistence in college. When those external communities are strong, as they are for commuting students, their actions may serve to condition, if not counter, events within the college…it allows for the fact that external communities, for instance, the family, may reinforce persistence. (Tinto 1993, p.116).

I propose that adolescent family structure likely influences adolescents' educational goals and the decisions about their ability to commit to higher education for degree completion. The path between high school and college is often described as haphazard and uncertain (Boyer 1987, Tinto 1993). Further, in the U.S. more students leave college prior to degree completion than stay. The student persistence literature tells us that in order to make critical decisions to persist, social support is extremely valuable during times of uncertainty. I suggest that when young adults feel supported by their family or young adults feel able to go to their family for assistance, "family" then becomes a "safety net" by offering the necessary social support for students to better cope with the demands of college. Thus, there is an important relationship between the idea of "home," the term most young adults continue to call their family support system, and postsecondary resilience.

***Family Processes***

Sociologists of education and family also study the relationship between family structure and education; their research consistently finds that childhood family structure affects educational achievement and attainment. Children who live in a single-parent family or a stepfamily during adolescence are more likely to have lower grades, poorer school attendance, and greater problem behavior in school (Astone and McLanahan 1994; Thomson, Hanson, and McLanahan 1994; Astone and McLanahan 1991). In comparison, children from two parent (intact) families are more successful in school and more likely to graduate from high school (Astone and McLanahan 1991; Coleman 1988; McLanahan and Sandefur 1994; Sandefur, McLanahan, and Wojtkiewicz 1992).

Reflecting the influence of the Wisconsin school tradition, Sara McLanahan and Gary Sandefur (1994) analyzed data from five well-known national datasets—the NLSY, PSID, HS&B, NSFH1, and NSFH2---on several measures of adolescent and young adult

well-being. In their well-known book, *Growing Up with a Single Parent*, they compared the outcomes of adolescents who grew up in a two parent (intact) family versus adolescents who grew up in a single parent and stepparent families. Examining high school academic performance, they found the children from single-parent families had lower grades, lower test scores, poorer attendance records, and lower expectations about college. In addition, children from one parent families were twice as likely to drop out of high school as children from two parent families. According to McLanahan and Sandefur:

> Children who grow up in a household with only one biological parent are worse off, on average, than children who grow up in a household with both of their biological parents, regardless of parents' race or educational background, regardless of whether the parents are married when the child is born, and regardless of whether the resident parent remarries. Compared with teenagers of similar background who grow up with both parents at home, adolescents who have lived apart from one of their parents during some period of childhood are twice as likely to drop out of high school, twice as likely to have a child before age 20 and one and a half times as likely to be 'idle'—out of school and out of work—in their late teens and early twenties (p.1-2).

The two main theoretical explanations for differences in children's educational outcomes are family resources of time and money and parental behavior such as parental supervision and parenting practices (Hofferth, Boisjoly, Duncan 1998; Thomson et al 1994; Thomson et al 1992; Elder, Eccles, Ardelt and Lord 1995). When examining parental investments of time and money, single-parent families have a considerable disadvantage in terms of income in comparison to two-parent families. In fact, single mothers and their children have almost a 50% chance of being poor (Morrison and Ritualo 2000; Manning and Smock 1997). Noncustodial parents are less likely to contribute to the support of children partly because they have less control over how money is used or spent. Also, given the trend of serial fatherhood, noncustodial fathers

may transfer the use of their resources to their new family. Economic disadvantages for single parent families can translate into lower educational attainment (Amato and Booth 1997; Thomson, Hanson and McLanahan 1994). Families who have higher incomes can afford to live in nicer neighborhoods with better public schools**.** They can also afford to invest in extracurricular activities and provide more educational resources within their home.

In addition, an increasing body of literature tells us that parental involvement influences children's educational outcomes (Muller 1998; Muller 1995; Crosnoe 2001; Coleman 1988; Stevenson and Baker 1987; Baker and Stevenson 1986). Parental involvement represents a range of activities that may include assistance with homework, attending school events, and monitoring children's academic progress (Muller 1995). More involved parents actively seek assistance and may intervene on the behalf of their children as well as model the importance of education to their children. Crosnoe's (2001) study of parental involvement in high school found that "family advantage" defined as intact family and more highly educated parents increased parental involvement. Further, the academic achievement level of a student was related to his or her parents' involvement in the college preparatory process. Crosnoe's study confirmed Csikszentmihalyi and Schneider's (2000) finding that "social advantages, in the form of intact families, parental education, and ethnic majority status tend to predict greater involvement. Such parents are more knowledgeable about educational systems, more confident about intervening, and have more time to take an active role" (Crosnoe, p.213).

Adolescents from single parent households are at risk because single parents are constrained in amounts of time and energy. Children from single-parent families report less encouragement and parental involvement with school work and less general supervision (Astone and McLanahan 1991, Amato and Booth 1997).

As stepparent families have two adults and greater economic resources, we might expect adolescents from stepparent families to have similar academic achievement and attainment to that of children from intact families. Yet, the empirical evidence does not support this. In stepparent families, children's well-being appears to be as negative, and perhaps even more negative, than that for children with single-parents (Sandefur and Wells 1999, Cherlin and Furstenburg 1994, Astone and McLanahan 1991). Children in stepparent families report less communication with parents, less warmth in the parent-child relationship, less parental involvement with school work, and lower education aspirations on the part of their parents (Thomson, McLanahan, Curtin 1992, Marsiglio 1992, Astone and McLanahan 1991). The ambiguity of a stepparent's role in a new family may lead to lower cohesion within the family and weaker ties between stepparents and stepchildren. The role of a stepparent is "incompletely institutionalized" and the relationship between a stepparent and child is often strained (Cherlin and Furstenburg 1994, Cherlin 1978). Some say that stepfathers have a more difficult time in overcoming the stranger barrier than stepmothers, perhaps because they are less involved in the day-to-day management of the household, while others believe that stepmothers find it more difficult to develop a positive relationship with stepchildren either because stepmothers are less likely to live with the stepchildren or the stepchildren are more likely to see stepmothers as a threat to the existing relationships with biological parents (Hetherington and Clingempeel 1992). Cherlin and Furstenburg (1994) have said that "it seems likely that kinship bonds in stepfamilies are more fragile, less permanent, and not as significant" (p.375).

Several studies assert that the commitment of parental resources to children is weaker in stepfamilies (Sandefur, McLanahan and Wojtkiewicz 1992; Astone and McLanahan 1991; Hanson McLanahan, Thomson 1996). While remarriage improves the

economic status of the family, stepparents may not feel the need to provide resources and to invest time with the child as either a single parent or a natural parent would. Stepfathers, in particular, may also have obligations to other children outside of the household. Further, there could be tension between the child and his/her new stepparent that results in both a poor child-stepparent relationship and also a strained child-parent relationship. Some researchers have proposed that new partners compete with children for the biological parent's attention and resources (Biblarz and Raftery 1999; Thomson, Hanson, and McLanahan 1994; Amato and Booth 1997). The dynamics of the stepparent family may therefore reduce the transfer of parental resources to children.

An additional way family structure may influence academic outcomes is by experiencing a change in family structure during adolescence that results in lower educational achievement and attainment (Sandefur et al. 1992; Astone et al. 1991). The high school years for adolescents represents a critical time period when deciding on whether or not to continue education beyond high school. Experiencing a family disruption during this time likely interferes with college planning. In the Sandefur et al.1992 study, experiencing *any* type of family change between the ages of 14 and 17 reduced the likelihood of high school graduation for adolescents. In studying college outcomes, I expect that the transition from a two parent family structure to a single parent family structure would be particularly difficult due to the change in family income and parental time and supervision. The change from two parents to single parenthood, for whatever reason, likely results in the single parent increasing their labor force participation (compensating for decreased family income) and possibly diminishing parenting due to stress and task overload (Biblarz and Raftery 1993; Sandefur et al. 1992; Hetherington, Cox, and Cox 1978). Women and children experience a dramatic loss of economic resources following a divorce (Bianchi, Subaiya, and Kuhn 1999). It is

estimated that women and children's standard of living decreases by 21 to 30 percent in the first year following a divorce (Morrison and Ritualo 2000). In addition, diminished parenting, residential move, or loss of adults involved in a student's life results in a loss of social capital as well (Hofferth et al. 1998). The transition from a single-parent family to a stepparent family may also bring hardship to adolescents either through a reduction in the level of resources provided (if the stepparent relationship is conflictual or there are more children to provide for) or through decreased access to parents.

A number of studies debate the effect of parental divorce and remarriage by age of children (Hetherington and Clingempeel 1992). Some argue that the effect is larger when children are younger. Others argue that children have difficulty with their parents' dating and remarriage during adolescence. Adolescents are coming to understand their own sexuality and are not ready to deal with a parent's sexuality which may intensify the negative effect (Hetherington and Jodl 1994). Some argue that the negative effect is larger for adolescents when it involves the additional stepparent who may be seen as an "intruder." Stepparents, stepfathers in particular, tend to deal with conflict within the family by disengaging with their new stepchildren, a task that is more difficulty for stepmothers since they usually organize family care and activities. Preadolescents and adolescents are also known for dealing with family stress and crisis by disengaging from the family and becoming more involved with their peers and extracurricular activities. If either parents or adolescents disengage from their relationship, the potential for social support decreases which I argue is essential to higher education entry and persistence. James Coleman (1988) proposed that family structure could indicate a structural deficiency in the creation and maintenance of social capital. From Coleman's work, others have hypothesized that the production of human capital (education) in subsequent generations occurs only when social capital allows the financial and human capital of

parents to influence their children (Teachman et al. 1997). Thus, it is within close relationships that advantage, in terms of parents' education and income, may be beneficial to children and close relationships are less likely to occur in stepfamilies.

***Family Structure and the Transition to Early Adulthood***

Family structure plays an important role in this transition to young adulthood. The family research on the nest-leaving of adolescents (Goldscheider and Goldscheider 1989; Goldscheider and Goldscheider 1994), the intergenerational relations of young adults and their parents (Amato, Rezac and Booth 1995; White 1992), the mental health of young adults (Chase-Lansdale, Cherlin and Kiernan 1995), and union formation of young adults (Kiernan 1992; Thornton 1991) shows that family structure continues to influence the choices young adults make following high school. Using a life course perspective, family disruption can trigger intervening events, such as early childbearing or curtailing education, that in turn affects adult outcomes (Cherlin, Chase-Landsdale, and McRae 1998; Wu, Cherlin, and Bumpass 1996). Parental divorce during childhood and adolescence continues to have a negative effect into a person's twenties and thirties (Cherlin, Kiernan, Chase-Lansdale 1995; Amato and Keith 1991; Glenn and Kramer 1987). Some researchers propose that it is not until late adolescence or early adulthood that children begin to show an effect of parental divorce or remarriage (Wallerstein, Lewis, and Blakeslee 2000; Bray 1999). A delayed reaction or "sleeper effect" may appear once children have left the parental home (Wallerstein and Blakeslee 1989).

The research provides ample support for the argument that adolescent family structure could influence college entry and completion. From the research on "nest-leaving" expectations and behavior (Aquilino 1991; White and Booth 1985; Goldscheider and Goldscheider 1989; Goldscheider and Goldscheider 1994; Buck and Scott 1993), we know that family structure influences the timing and the pathway out of the parental

home. Parental divorce and remarriage accelerates nest-leaving. Stepparent families, by far, lead to earlier home leaving than other groups, and stepchildren are also more likely to report conflict as a reason for leaving home (Aquilino 1991; White and Booth 1985). Using NSFH data, Amato, Rezac and Booth (1995) found that parental divorce lowers children's likelihood of referring to parents as someone they can go to for help (compared with intact parental households) in young adulthood. Also, other research has found that children of divorce receive significantly less support (child care, advice, transportation, loans, and so on) than do children whose parents have remained in intact marriages (White 1992). In addition, while remarriage can either add resources to children by increasing the number of parents available for support and exchange it may also diminish resources because exchange is less likely to develop between stepparents and stepchildren due to weaker familial ties (Furstenburg, Hoffman and Shrestha 1995).

Young adult decisions about leaving home may be based in part on their expectations for continued parental support. Research shows that continued parental support to their adult children does vary by family structure; parental divorce and remarriage are associated with significantly less support (White 1992). Some evidence also suggests that noncustodial fathers and stepfathers are unwilling to continue their financial support after the age of 18, especially for the pursuit of further education (Aquilino 1991; Astone and McLanahan 1991; Amato, Rezac, and Booth 1995.)

Commitment and support from parents are crucial determinants in an adolescent's decisions about college. Expectations about continued support from parents play an important role in children's decisions about whether to pursue postsecondary education (Aquilino 1991). These differentials in either perceived or actual support may determine which students are likely to attend two-year universities, attend part-time, work during college, take time off, and stop out. Students who receive less parental support for

college preparation and less support financially for college preparation are less likely to attend a four-year college. As two-year and four-year college constitute different tracks in higher education, baccalaureate aspirants entering community colleges are less likely to complete a degree and attain less economically than comparable students entering four-year colleges. (Dougherty 1987, Dougherty 1992, Monk-Turner 1990).

***LifeCourse Perspective***

Overwhelming evidence suggests that growing up in a single parent family or stepparent family is associated with lower levels of well-being and poorer life outcomes than growing up in a two parent family (Cherlin 1999). Using the life course perspective, both characteristics of the family of origin and events that occur in the family of origin, such as a parental divorce, has consequences for adolescents both during their transition out of the parental house and long after (Cherlin, Chase-Landsdale and McRae 1998; Amato and Booth 1997; Elder 1994; Furstenburg and Cherlin 1991; Glenn and Kramer 1987). The life course research in the 1990s largely focused on the transition of adolescence into young adulthood. While this research acknowledges adolescents' agency in decision making, it also claims that parental behavior and characteristics may make certain behaviors more likely to occur. For example, coming from a two parent family may make attending college and completing a degree easier (Elder 1994).

In connecting the life course perspective to social support theory, parent's marital discord and divorce during childhood or adolescence weakens the emotional bonds between parents and children in later life (Amato and Booth 1997). This may result in less contact, less assistance and less affection between young adults and parents which may be pivotal in student persistence in college.

Another characteristic of the life course perspective is its attention to the timing and social context of events (Elder 1994). In terms of this study, social context is

extremely important. The high school years are crucial in preparing for college and deciding whether one will attend college. Leading into the 1980s it became evident that "college" was the essential educational experience for middle class America. At the same time, changes in higher education enhanced the risk factor for students from non-intact families in being successful in higher education. Financial aid programs placed the increased costs of education upon families and the increased use of two-year institutions channeled students into alternative tracks within higher education (Karen 2002; Baker and Velez 1996). Therefore, either experiencing a change in family structure or perceiving a disadvantage to yourself in terms of support, likely has a significant effect on college entry and subsequent postsecondary decisions.

***College Entry: Advantage versus Risk***

The definition of college success is contextual. Certainly, education is essential in the process of individual social mobility and status attainment. Gaining some college education might be an important status within many social contexts. For some, being the first person among a family to enter college might be defined as successful and gaining some level of college education is an important distinction for students of color (*Journal of Blacks in Higher Education 2002)*. Of particular importance, though, is the attainment of a bachelor's degree for access into prestigious occupational positions, occupations with higher ladders of promotion and greater benefits. Entering a two-year institution, delaying college entry, interrupting college attendance, and attending school part-time all negatively effect degree attainment (Goldrich-Rab 2006, Strauss and Volkwein 2004).

The phrase "persistence track" describes the traditional attendance pattern – immediate enrollment in a four–year institution and full-time attendance. Selectivity of an institution is positively associated with persistence; research has consistently shown that initial attendance at a two-year college rather than a four year institutions lowers the

likelihood of one's attaining a bachelor's degree (Tinto 1980; Pascarella and Terenzini 1991; Hearn 1992; Dougherty 1992; Dougherty 1987). While community colleges may "warm up" the aspirations for those who would not have gone to college otherwise (Swanson 1999), they have a "cooling out" effect for those with baccalaureate aspirations (Pascarella, Wolniak, Pierson 2003; Pascarella and Terenzini 1991). Even for students who do manage to transfer, they are less likely to persist for many reasons including being less prepared for the level of work required at a four-year institution, losing credits in transit, suffering a drop in grades following the transfer, receiving less financial aid, and encountering various hindrances to social integration at the new institution (Dougherty 1992). Being able to commit to college right away, having the appropriate information to decide which college to attend, and having the financial resources to attend good schools depends in part on one's family background, including family structure.

Entering college, while crucial, is only the first step in the collegiate experience. In order to study educational attainment, we need to understand the process and patterns of *persistence* in higher education. "Of the nearly 2.4 million students who in 1993 entered high education for the first time, over 1.5 will leave their first institution without receiving a degree. Of those, approximately 1.1 million will leave higher education altogether, without ever completing either a two- or four-year degree program" (Tinto, 1993 p.1).

***Science, Technology, Engineering and Math Pipeline***

In addition to studying college entry and degree completion, this research also incorporates the concept of the science, technology, engineering, and math (STEM) pipeline. The STEM pipeline holds the idea that coursework and training involved in STEM fields build consecutively and that good students "leak" out of the pipeline along

the way (Berryman 1983; Moreno and Muller 1998; Davenport et al. 1998; Catsambis1994; Stage and Maple 1996).

Women and minority students disproportionately leak out of the pipeline. This is of great concern for two reasons. First, women and minorities continue to be underrepresented within quantitative fields, and it is important that women and minorities make gains in these fields in order to close occupational and income gaps in comparison to white males. Differences observed at the undergraduate level will continue into graduate and professional levels (Stage and Maple 1996). Second, our country's students continue to lag behind other countries in math and science ability and our society needs to increase its talent pool of engineers and scientists (Hagedorn et al 1999).

In order for any student to gain access to STEM professions, students must be incorporated into the discipline early in their collegiate experience. Considering that nearly half of STEM students exit the pipeline following their first year of college, understanding the freshman year experience is critical. First-year college calculus can be considered a "gate keeper" for higher level STEM coursework (Moreno and Muller 1998). We have little systematic evidence about the patterns of loss in the math and sciences in college. This study can address who enters the pipeline, by taking first year calculus, and who remains in the pipeline through choice of degree. This study moves beyond previous studies on the choice of field by examining more than family background, race/ethnicity and income.

***Considering Family Structure within Gender Categories***

The following are four important areas in the literature that contribute to my decision to analyze the effects of family structure within gender categories.

Effects of Family Structure and Gender

The literature provides some evidence that the effects of family stress, marital disruption, and parental remarriage differs for daughters and sons. Three themes emerge from the literature when examining gender differences: short-term effects and personal reactions to the family disruption crisis; long-term effects; and quality of relationship with parents.

Following a marital disruption, the general belief is that boys react worst during the crisis period, typically thought to be two years, following a separation and divorce. Mothers going through marital disruption tend to respond more harshly to their sons' bad behavior thus influencing the quality of their parent-child relationship for some time. (Hetherington and Clingempeel 1992; Furstenburg and Cherlin 1991). It is also argued that boys and girls react differently to stress. While boys may exhibit more externally observable effects such as acting out or juvenile delinquency, girls may be internalizing stress which results in lower self-esteem and depression (Hetherington and Clingempeel 1992; Furstenburg and Cherlin 1991).

While changes in parental behavior and family structure do have long-term effects for both sons and daughters, it is well-established that women from non-intact families have a high rate of early and non-marital childbearing. In addition, the negative association of experiencing a family martial disruption and educational attainment is believed to be stronger for daughters than for sons (Amato and Keith 1991).

In examining how the influence of family structure on the parental-child relationship differs by gender, most of the research assesses relationships following a change in family structure. Marital conflict appears to influence the father-child relationship more than the mother-child relationship for children and adolescents (Amato and Booth 1997; White, Brinkerhoff, and Booth 1985). Studies of university students

found that parental divorce is associated with lowered feelings of closeness to dads, especially among daughters. Young adults reported that parental marital conflict influenced son's feelings of intimacy with mothers and both son's and daughters' feelings of intimacy with fathers (Cooney 1994).

Adolescent girls have a very close relationship with their single mothers. When a stepfather enters a family, adolescent girls may experience an increase in behavior problems. Girls in mother-stepfather families do exhibit more problem behavior than do girls in single-parent homes (Furstenberg and Cherlin 1991, Hetherington and Clingempeel 1992). As discussed previously, children of stepparent families in leave home early in general, but daughters in particular (Coleman, Ganong, and Fine 2000). The cultural norms are less defined in the family for stepfathers than for stepmothers and stepfathers may demonstrate a preference for male stepchildren because they are more likely to share interests with them (Marsiglio 1992).

Some of the literature indicates that single parent mothers are more likely to be a confidante to their daughters and that single parent mothers initiate "life talks" with the daughters to encourage their future well-being (Astone and McLanahan 1991). It is unknown if these discussions take the form of encouragement for their daughters future or admonishment against their mother's current life situation and what impact this has their daughter's higher education. When studying the close relationships of single mothers and their adolescent daughters, two themes emerge (Larson and Gillman 1999). One suggests that both parent and adolescent are able to transmit social support to one another, while the other suggests that the adolescent daughter is actually at a disadvantage in the relationship because she has to be more sensitive to the parent's stress and emotional well-being (Larson and Gillman 1999). While sons tend to have a more

troubled relationship with their single parent mother; they may also be protective of their mothers and be loyal to their nonresidential fathers.

Approximately 14% of custodial parents are fathers (Stewart 1999). Little is known about the relationship of children with custodial fathers as mothers have nearly always been the custodial parents. Typically, prior research has documented the disengagement of noncustodial fathers from their children; national studies find noncustodial fathers do not see their children or see them very infrequently (Shapiro and Lambert 1999; Furstenburg and Cherlin 1991). Some propose that men may see marriage and child care as coresidential roles (Stewart 1999). However, for those who do live in father-custodial families, indicators of the quality of parent-child relationship will be similar between children and fathers in father-custodial families and children and mothers in mother-custodial families (Aquilino 1994; Shapiro and Lambert 1999). Given the relatively new trend in non-custodial mothers, even less is known about their relationship with children. In Stewart's (1999) study of non-residential parents, she found that while nonresidential mothers maintained higher levels of contact through the use of telephone and letters, the nonresidential mothers and nonresidential fathers were similar with respect to in-person contact with their children. Nonresidential mothers also reported higher levels of extended visitation with their children.

Parental Involvement and Gender

As discussed, parental involvement may influence students' academic performance. This may occur through parent's influencing children's attitudes, self-concepts or by directly intervening in their children's academic life.

Parental involvement may differ by gender. Stevenson and Baker (1987) found that age and gender of child does influence the degree of academic parental involvement

and that parental involvement may have a stronger impact on the overall school performance of girls. In a study of parental influence on math test scores, Muller (1998) found that forms of parental involvement differed by gender in four behaviors: talking about school; attendance at school events and meetings; restricting activities; and talking about college. Additionally, parents were more likely to intervene on the behalf of sons and develop parent-child relationships outside the home while girls tend to experience both more nurturing and restriction and develop verbal relationships with parents within the home. Crosnoe (2001) found that high school girls were more likely to have involved parents, in comparison to boys, when the girls were in the remedial school track, but less likely to have involved parents when they were in the higher academics tracks. As the boy's increased their curricular status, so did their parent's involvement.

Gender and STEM

Women have made significant gains in STEM degrees. In over thirty years, women increased their bachelors STEM degrees by 106%, their masters STEM degrees by 150% and their doctoral STEM degrees by 267% (Sax 2001). However, women remain largely unrepresented at all levels which bar them from contributing to the talent pool of scientists, engineers, and researchers with strong math and science backgrounds. Perhaps even more troubling is to consider that math overall acts as a gatekeeper to many career aspirations at the collegiate level and women fall significantly behind men in self-confidence of math ability and interest in taking math courses (Zeldin and Pajares 2000; Stage and Kloosterman 1995).

In studying gender differences in math achievement, two main themes exist, beliefs about mathematics and beliefs about gender. Both are rooted in the notion of gender socialization ( Zeldin and Pajares; Stage and Kloosterman 1995; Eccles 1985).

Cultural beliefs about gender influence the beliefs about oneself as a learner of mathematics. This may start early during one's educational experience. One major reason why men are more likely to persistence in the STEM pipeline is that men make higher assessments of their mathematical ability than women. Undergraduates exposed to belief that men are better able to complete a task related to math or science or have better skills necessary for STEM fields in comparison to women are more likely to pursue math and science related fields (Eccles 1994, Hyde et al. 1990).

In one sense, men's mathematical ability is legitimized; men are seen as naturally better. When a person's status is legitimized, that person will experience less self-doubt and higher self-confidence. Self-confidence is an essential motivator in meeting educational goals. As confirmed in Eccles research (1985), self perception is a significant factor in predicting the expectation of math success and valuing math. Women who have more positive beliefs about self and math are more likely to succeed. As stated by Zeldin and Pajares (2000), "the self-efficacy beliefs that people hold influence the choices they make, the amount of effort they expend, their resilience to encounter hardships, their persistence in the face of adversity, the anxiety they experience, and the level of success they ultimately achieve"(p.218). Even when women perform equally well, they will hold a lower perception of their abilities (Correll 1994; Zeldin and Pajares 2000).

Gender and College Choice

Little attention is paid to gender differences in college entry today given women's increased participation in higher education. In fact, women enroll in postsecondary education at higher rates than do men. There are, however, a few significant findings to keep in mind. First, women are more likely to be concentrated in sectors of higher

education that yield among the smallest rates of economic returns (Beattie 2002). Women are also more likely to attend less selective colleges than men (Karen 2002; Baker and Velez 1996). Third, women's college enrollment is more influenced by family socioeconomics and college costs than are young men's (Beattie 2002).

***Considerations of Race and Ethnicity***

While we are aware of differences in family structure patterns and higher education participations patterns by race and ethnicity in the U.S., little is known about the intersection of family, race and ethnicity, and college participation. Exploring these relationships will contribute to our understanding of the race gap, since black students are twice as likely in comparison to whites to live in non-traditional households. While entering the "persistence track" and entry into a four year college institution are vital to student's college degree completion, minority students are less likely to follow the persistence track—they do not enter college immediately following high school, attend full-time, or attend a four-year college compared to whites.

In 1995, black undergraduates accounted for 11% of total college enrollment and seven percent of all bachelor degrees were awarded to African Americans. In examining immediate college enrollment rates over the last 25 years, we find that immediate college enrollment following high school increased for whites from 50% to 66% and that black enrollment rates rose steadily since 1984 from 40 to 59% (NCES, Condition of Education 2001). Comparing higher education trends from 1971 to 2000, "the gap between white and black high school completers with some college remained similar, and the gap between blacks and whites who completed college widened" (p.51). Data from the Current Population Survey shows that the percentage of 25- to 29-year old high school completers with some college in 2002 was 68.2% white and 60.8% black. High school

completers with a bachelor's degree or higher in 2000, by race and ethnicity was 36.2% white, 20.6% black, and 15.4% Hispanic (Condition of Education 2001).

To understand how the divergent collegiate experiences of racial and ethnic minority group students are related to family background, several explanations are plausible. Certainly, socioeconomic differences in terms of family income and parents' level of education should be considered as well as prior academic achievement. Low income adolescents are less likely to transition directly to college, less likely to afford postsecondary education, and more likely to attend at a two-year college in comparison to middle class adolescents. It also seems probable that emerging trends in divorce, single-parenthood, and non-marital childbearing have influenced the future life chances of children and young adults. In reviewing U.S. trends in family structure, we find substantial differences by race. In comparison to whites, black women marry at a later age and a smaller proportion will ever marry (Raley 1998, Teachman, Tedrow, and Crowder 2000; Cherlin 1992, Mare and Winship 1991). In addition, black marriages are more likely to end in divorce or to separate than white marriages, and black women are less likely to remarry (Cherlin 1992). The divorce rate for black women is more than double that of white women. Trends also show an increase in the proportion of black children born to unmarried mothers. These trends (marriage, divorce, and non-marital fertility) increase the likelihood to experience single-parenthood for black women (Teachman et al. 2000; Hernandez 1995). Black children are substantially more likely to be living in a single parent household than white children (Fields 2003; Stacey 1994; Tucker et al. 1995). Approximately half of all black children live in single parent households compared to a third of all Latino children, and a quarter of all white children.

Significant to this study, researchers investigating the race gap in achievement (Cheng and Stark 2002) have found that educational aspirations held by significant others

(like parents) differs by race. Further, family researchers have documented the importance of other family members, extended family and fictive kin in African American children's upbringing. Given the need to explore how the relationship of family structure and postsecondary processes may act differently for blacks and whites, I explore potential family interaction effects.

# CHAPTER 2

# DATA AND METHODOLOGY

In this chapter, I describe the panel data that was used to examine the relationship between adolescent family structure, family processes, and postsecondary education enrollment and success. I also describe the measurement of the variables employed as well as the analytical technique I use to estimate the association between family structure and postsecondary student outcomes.

## DATA

In this study, I analyze data from the Postsecondary Education Transcript Study (PETS) of the sophomore cohort of the High School and Beyond Longitudinal Study (HS&B:80-92) and data from the High School and Beyond Longitudinal Study (HS&B:80-92). The PETS transcript data contains information at the student level, institutional level, degree level, and course level. The sophomore cohort of the HS&B study is a large, nationally representative study of high school sophomores in spring 1980. Conducted by the National Center for Educational Statistics, U.S. Department of Education, the HS&B longitudinal study collected extensive information about a cohort of students' family and educational experience. Students were initially interviewed in 1980 and followed up in 1982, 1984, 1986, and 1992. The HS&B base year used a stratified national probability sample of over 1,000 secondary schools from which sophomores and seniors were selected. Certain types of high schools were oversampled, including public high schools with high percentages of Latino students and Catholic schools with high percentages of minority group students.

During the HS&B fourth follow-up survey, 9,881 of the 14,825 fourth follow-up respondents claimed to have attended some form of post-secondary education. Between February and August 1993, approximately 11 years after high school graduation, college transcripts were requested for 9,881 students and obtained for 9,750 of them.

I analyze data from the 1998 release of PETS data, which includes several reconstructed variables as well as suggestions offered by Cliff Adelman, Office of Educational Research and Improvement, U.S. Department of Education, for use in analyses.[2] Degree level data, transcript level data and course level data were converted into individual level data for this analysis.

There are several advantages to using the PETS and HS&B data to examine my research questions. First, the High School and Beyond study is a good, established dataset for studying education and family behavior as it contains extensive detailed information regarding both. Additionally, the HS&B contains oversamples of African American and Hispanic students. Plus, the more recent college transcripts contain information about the postsecondary processes that are beneficial to family researchers. Additionally, these data are well-suited to my study because they capture possible participation and success in postsecondary education following ten years after high school graduation.

The main limitation of the High School and Beyond Study is that the data are representative of high school sophomores in 1980 and these students may have matured in a different context than today's adolescents. Fortunately, the HS&B and PETS studies

[2] The PETS data used in these analyses are actually a revised version of the PETS data, which had been released in 1995 when the editing process was not finished. The 1998 PETS data reflects over two years of revision, edits, and reconstruction of variables completed by Cliff Adelman, Office of Educational Research and Improvement, U.S. Department of Education.

could be considered timely in capturing the expanding choices (via two-year institutions) in higher education and the corresponding increase in stratification of education between types of institutions. These trends largely occurred during the 1980s and still apply today and are especially applicable to the growing number of first-generation college students. A second limitation of the data is that family structure is a static measure taken only during sophomore and senior years of high school.

**SAMPLE**

For these analyses, I exclude Native Americans and Asians due to small sample size. I also exclude respondents with missing information on the dependant outcome variable, their race and ethnicity, and those who did not live with either a mother or father or did not provide information regarding their adolescent family structure. In predicting college entry with advantage in Chapter 3, my sample is of students who graduated with a high school diploma in 1982. [3] My sample size for Chapter 3, predicting college entry with advantage, is 8,847.

In Chapter 4 and Chapter 5, I include only students who entered postsecondary education to study the associations of family structure with first year STEM coursework, baccalaureate degree, and baccalaureate degree in a STEM field. I exclude respondents with missing information on the dependant variable. Table 2.1 outlines the different samples used for each analysis presented in this study.

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3 I select students with a high school degree as my starting sample largely because PETS respondents are already a subsample of the full HS&B sophomore cohort who participated in the high school transcript study. Postsecondary information is not available for the full HS&B sophomore sample.

**Table 2.1 Number of Sample Members in Analyses**

| Outcomes Predicted | n |
|---|---|
| In Chapter 3 | |
| College Entry | |
| Full Sample | 8,847 |
| No College Entry | 2,473 |
| College Entry with Disadvantage | 3,896 |
| College Entry with Advantage | 2,478 |
| In Chapter 4 | |
| Calculus Course Taking During First-year of college | |
| Full Sample | 6,951 |
| Calculus Course-taking student | 1,366 |
| In Chapter 5 | |
| Graduate with Baccalaureate Degree | |
| Full Sample | 6,951 |
| Graduates with Degree | 3,086 |
| **GRADUATE WITH STEM DEGREE** | |
| Full Sample | 6,951 |
| Graduates with STEM Degree | 680 |

*Source*: PETS and HS&B: Sophomore Cohort

## ATTRITION AND MISSING VALUES

The HS&B sophomore base year survey, conducted during the spring of 1980, used a stratified national probability sample of over 1,100 secondary schools as the first stage of selection. Thirty-six students, or all eligible students if less than 36 students attended a school, were selected from each high school. Over 30,000 sophomores from

1,015 schools participated in the base year. Certain types of schools were over sampled including Catholic schools with high percentages of minority students, public schools with high percentages of Latino students, and private schools. The first follow-up consisted of approximately 30,000 1980 sophomores (NCES 1995, p.4). The high rate of first-follow up participation is due to survey administration by the National Opinion Survey Research Center for individuals not at base year institutions due to transfer. A follow-up school questionnaire was requested from all schools selected in the base year. dropout, or early graduation. During 1982, 18,500 students were selected from the sophomore database for the High School Transcript Study of the HS&B. The second follow-up survey cohort of HS&B sophomores is drawn from the 18,500 students in the High School Transcript Study. Conducted during spring and summer of 1984, the second follow-up survey retained a probability sample of approximately 15,000 (81% retention rate). The sophomore cohort sample remains the same for the third follow-up as well as the fourth follow-up. By the end of the fourth follow-up, NORC identified a total of 155 deceased sample members of the sophomore cohort. The fourth follow-up had an 85.3% completion rate with 14,825 respondents (National Center for Educational Statistics, Fourth Follow-Up Report 1995).

While a composite family socioeconomic variable was available for inclusion in this analysis, theoretically it is important to distinguish between types of family socioeconomics, such as family income and parental education when examining the relationship between family structure and education. However, the use of separate measures meant addressing missing data. Mean substitution is used for missing values in the measures of family income and parental education. Additionally, mean substitution is used to address missing values for parental aspirations and high school grade point average. When mean substitution is employed, dummy variables are created and tested in

the logistic models for significance. If these variables are not statistically significant, they are not included in final models presented in this study.

## WEIGHTING

All analyses in the present study are weighted to adjust for the complex sampling design, the oversample of special populations, and the attritions that occurred between waves. As described in the *Fourth Follow-up Methodology Report* (National Center for Education Statistics 1995), the weights adjust for probability of selection and non-response.

> The general purpose of weighting is to compensate for unequal selection probabilities and to adjust for nonresponse. The weights are based on the inverse of the selection probabilities at each stage of the sample selection process and on nonresponse adjustment factors computed within weighting cells. The fourth follow-up had two major components, the collection of the survey data and the collection of the postsecondary transcript data. Nonresponse occurred during both of these data collection phases. Weights were computed to account for nonresponse during either phase. (p. 24)

In my analyses, I use the fourth follow-up survey weight (FU4WT) and the first transcript weight (PSEWT1). When studying college entry with advantage, the fourth follow-up weight is appropriate. When I study college course-taking patterns and degree attainment, the first postsecondary transcript weight (PSEWT1), computed for postsecondary students where one requested transcript was obtained, is most appropriate as suggested by Cliff Adelman, U.S. Department of Education (Adelman 1998).

## SELECTION

Whenever a subset of a sample population is nonrandomly chosen, there is a risk of sample selection bias (Berk 1983). In this analysis, potential observations are excluded based upon high school graduation and postsecondary education entry. A few previous researchers using HS&B data have predicted college entry and college degree with the full sample (McLanahan and Sandefur 1994), while most have not predicted college

outcomes. The first sample selection choice I make is to use model college entry conditional on high school completion. This is common in studies of educational transitions (see Mare 1979 for further review). An important consideration in making this choice is that high school graduates are more likely to be in the PETS data than are high school dropouts and high school graduates are less likely to have nonmissing data in regards to family structure and family background.

Sample selection bias is concerned with whether the regression estimates overstate or understate the true casual effects (Berk 1983). Previous research tells us that adolescents from single parent families are less likely to graduate from high school. By excluding high school dropouts, a concern is that negative association between single parent family structure and college outcomes may be systematically underestimated in these analyses.

## MEASURES

The variables measuring the relationship between family structure and postsecondary education enrollment and success are present in these data sets, as are the variables believed to mediate the relationship between these variables. Below is a discussion of the variables from PETS and HS&B data that I use for my analyses.

### Adolescent Family Structure

The central focus of this study is to examine the relationship between adolescent family structure and postsecondary education entry and success. During $10^{th}$ and $12^{th}$ grade of high school, student respondents answered a series of questions regarding their household living arrangements including whether they lived with their father, another male guardian (thought to be a stepfather or foster father), mother, or another female guardian (thought to be a stepfather or foster mother). Dummy variables were then

created for mother only, father only, mother-stepfather, and father-stepmother families.[4] Participants from two parent families are the reference group. In sum, adolescent family structure variables are:

*Two parent family*, lived with mother and father;
*Mother only,* lived with mother and no other guardian;
*Father only*, lived with father and no other guardian;
*Mother stepfather*, lived with mother and other male guardian; and
*Father stepmother*, lived with father and other female guardian.

## Postsecondary Student Outcomes

### *College Entry*

College entry is an ordered dependent variable created from college transcript data and has three categories with the levels being no college entry, college entry with risk, and college entry with advantage. College entry with risk and college entry with advantage are distinct and yet ordered due to their relationship with degree persistence. I created the categories college entry with risk and college entry with advantage using three measures of college entry and enrollment within PETS. These are whether college entry follows high school graduation ("on time"), whether a student enters a four-year institution, and whether the enrollment is continuous. Previous research supports the use of an ordered logit model as baccalaureate aspirants who enter higher education through community colleges, delay college entry, or attend part-time experience lower degree attainment (Dougherty 1987; Dougherty 1992; Monk-Turner 1990). Students who enter postsecondary education at a two-year institution earn a bachelor's degree at a rate of 38.4% compared to 60.4% for students who start at a four-year institution (Strauss and

4 Students in an "other" family category were not included in these analyses. This would include students living alone, in institutions, and other family structures that do not include either a mother or father.

Fredericks 2004). Students who attend part-time or whose college enrollment is interrupted are also less likely to earn a college degree (Goldrick-Rab 2006). I create this measure of college entry in order to recognize the stratification of college entry.

Prior to constructing the variable, bivariate analyses were conducted to examine the association between family structure (two parent, mother only, father only, mother stepfather, and father stepmother) and college entry, college entry on time, college entry into a four-year college, and college entry with continuous enrollment. The results of the analyses found that the association of family structure with each dependent variable were consistent with expectations based on past research and are presented in Table 2.2. Thus, in Chapter 3, I introduce the ordered dependent variable called type of college entry. Entering college with risk would include entering a two-year college, delay of college entry, or non-continuous enrollment.[5] Entering college with advantage would represent a student who enters on time and in a four year institution with continuous enrollment.

5 Enrollment patterns are represented by the PETS constructed variable CONTIN with the variable categories of continuous, non-continuous, and less than or equal to one year for those who enter postsecondary education. Continuous enrollment is considered college entry with advantage, while non-continuous enrollment or less than or equal to one year are both considered college entry with disadvantage.

**Table 2.2 Of High School Graduates, College Entry Patterns by Family Type. Weighted Results Presented. (N=8,847)**

| | % entered PSE[6] | % entered PSE on-time | % entered PSE at 4-year | % enrolled Continuously | % enrolled Non-Continuous | % enrolled ≥ one year |
|---|---|---|---|---|---|---|
| **Family Type** | | | | | | |
| Both Biological Parents | 72.9 | 54.8 | 37.4 | 45.0 | 16.8 | 6.2 |
| Mother Only | 64.4 | 46.0 | 30.1 | 36.2 | 18.3 | 6.4 |
| Father Only | 62.8 | 47.6 | 23.7 | 32.5 | 20.5 | 6.4 |
| Mother-Stepfather | 68.1 | 45.1 | 22.7 | 34.0 | 19.1 | 9.0 |
| Father-Stepmother | 61.1 | 38.3 | 26.6 | 28.5 | 22.3 | 10.7 |

*Source:* PETS and HS&B Sophomore Cohort

6 PSE represents "postsecondary education."

### *Taking Science, Technology, Engineering, and Math Coursework*

In order to capture students who enter college in high achievement fields, the second dependent variable that is used in this study is taking calculus during the first year of college. Taking calculus is a gatekeeper to advanced coursework in STEM fields.

I created calculus course taking using the taxonomy of course categories developed by Adelman. I selected categories around the classification of calculus coursework. Course code 270204 includes Pre-calculus and Calculus. Course codes 270601 and 270701 includes Calculus and beyond. I combine these three course codes to represent calculus coursework.[7] However, readers must interpret these categories cautiously, recognizing that they are not precisely defined into calculus categories. For example, it would have been more useful to identify Pre-Calculus and Calculus I as separate from each other and from other types of coursework included in code 270204 such as Analytic Geometry.

The focus of Chapter 4 is on freshman year math coursework. "Taking" Calculus coursework is measured as a student enrolling and completing the course, earning either a A, B, C, D, F grade or for which a Pass/No Grade (but credits count) is recorded (Taking Calculus=1; Taking lower level math or no math=0).[8]

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[7] For my master's thesis, I analyzed students who took math course codes 270601 or 270701 ("star" students who enter college and take calculus 2 level math) separately from students who entered college and took math course code 270202 or those who took both levels of math during the first year. The odds of students obtaining a STEM degree were almost identical for both at approximately 6.5 in comparison to students who took lower levels or no math when race, gender, socioeconomic status, and high school preparation were also controlled. Thus, the grouping of the three course categories is appropriate.

[8] Considerations of calculus grade would reduce sample size. While calculus coursework is fairly standard in progression of course sequencing, universities differ by semester systems and grading scales.

### *Baccalaureate degree*

The third student outcome predicted using logistic regression is earning a baccalaureate degree for those who entered postsecondary education. Earning a baccalaureate degree remains one of the most important credential in one's life. The dependent variable baccalaureate degree (Baccalaureate degree=1; No degree=0) is constructed from *DEGREE93* which is a consolidated measure of respondent's highest level of educational degree obtained by 1993. The sample includes all students who entered postsecondary education, although starting at a four-year institution will be accounted for in the models.

### *Science, Technology, Engineering and Math (STEM) Pipeline*

The remaining student outcome in this analysis is estimating the odds of obtaining a STEM baccalaureate degree. Following sample programming provided by Adelman, I created four "major" categories for the Math and Sciences: Engineering; Physical Science; Math and Computer Science; and Life Science. Combining these four majors creates the dummy for obtaining a STEM degree (STEM degree=1, Non-STEM degree=0).[9]

## Control Variables

Considerations of gender and race/ethnicity are essential when considering any relationship between family and access to and retention in higher education. Analyses are run separately by gender except in pooled models (*female*=1; *male*=0). Race and

[9] Only first majors were considered for analysis. Only 382 cases had second majors out of the original 14,825 students in the transcript study, and Adelman commented that in most cases the second majors appeared to be minors.

ethnicity is controlled with dummy variables (*Black*=1; *Latino*=1) with white as the reference category. Further, I include race interaction effects where significant.

Previous research has found that both high school sector and high school type are associated with academic achievement (Hoffer, Greeley, and Coleman 1985; Lichter, Cornwell, and Eggebeen 1993; Smith, Beaulieu, and Seraphine 1995). For this study, I treat high school type and sector as controls in the analyses with dummy variables. *Public high school* is the reference category for high school type (*private high school*=1; *Catholic high school*=1) and *suburban high school* is the reference category for high school sector (*urban high school*=1; *rural high school*=1). Students from Catholic high schools tend to have lower high school dropout rates and this may be due to the closer social networks among the families at those schools (Hofferth, Boisjoly, and Duncan. 1998).

Prior academic achievement is controlled upon using two measures. The first is the measure of overall *high school grade point average* (values 0 to 4). The second is the measure of *quality and intensity of high school curriculum (*ACCINTHS reverse coded)**,** which is the most elaborate reconstructed variable in the PETS dataset and also the best predictor of a baccalaureate degree[10] (Adelman 1999). *Academic intensity and quality of high school curriculum* is measured using Carnegie units in 6 academic areas. It accounts for highest mathematics studied, remedial work in English and math, and advanced placement. The construction results in a five level scale with gradations at each level. For

[10] The ACCINTHS measure is the dominant determinant of college degree completion. Adelman found test scores, high school GPA and class rank as much weaker contributors to attainment (1999). However, ACCINTHS determines intensity and quality of coursework, not performance. While both high school GPA and high school class rank are problematic given the inconsistency in which secondary institutions calculate and implement them, I include high school GPA as a measure of performance along with intensity and quality of taken high school curriculum.

example, 1= 6.5 or fewer Total Carnegie units and 6=13.5+ Core Academic Carnegie units. At the highest level, (6=13.5+ Core Carnegie units), a student's high school record included 3.75 or more units of math with no remedial courses, 3.75 or more units of English, 2 or more units of science, 2 or more units of a foreign language, and 2 units of social science.

**Mediators and Moderators**

In attempting to account for observed associations between adolescent family structure and postsecondary entry and success, a number of potential mediators and moderators are considered. These include the sociodemographic variables of gender, race, and ethnicity as well as prior high school achievement that are described above as controls.

Further, the sociodemographic measures of family income and parental education are explored as potential explanatory variables. Family income and parental education represent resources available to students and are traditional family background measures as set forth in the Wisconsin school model of status attainment. *Family income* is a student reported measure of family income during the 1st follow-up survey and is divided into 1/8ths. As noted by Cliff Adelman in the PETS codebook, this is considered the most accurate of income variables. *Parental educational attainment* represents the highest level of education of either parent. This measure is based upon student reported data on each parent during the 10th grade. I constructed the following educational categories based upon coding by Adelman for similar variables. 1= High school or less; 2=less than 2 years of college or postsecondary educational at a vocational institution; 3=2 years or more of college; 4=baccalaureate degree; 5= graduate school.

Most importantly, this study explores family processes and dynamics that might differ by family structure and might account for an association between adolescent family

structure and college entry and college entry and success. I construct three variables, *parental involvement, parental educational aspirations*, and *family turbulence*, to measure aspects of family dynamics that could influence the social support available to adolescents as they make critical decisions regarding their future.

*Parental involvement* is constructed from student reported data "mother/father keeps track of progress in school (averaged and weighted 1/3)," "parents know where I am, what I do (weighted 1/3)," and "amount father/mother influences plans after high school (averaged and weighted 1/3)." Each question was standardized before averaging. As developed and discussed in Fehrmann, Keith, and Reimers (1987), this parental involvement variable is a measure "of perceived, general involvement in students' academic and social lives" (p.332).

*Parental educational aspirations* is student reported data of perceived parental educational aspirations measured by "how far your parents wants you to go" in education. It is measured during senior year of high school with a five point scale; 1= High school or less; 2=less than 2 years of college or postsecondary educational at a vocational institution; 3=2 years or more of college; 4=baccalaureate degree; 5= graduate school.

I use a dummy variable, "*turbulence*," to identify adolescents who experienced a change in family structure between $10^{th}$ and $12^{th}$ grade of high school (1=experienced turbulence, 0=did not experience family turbulence).

**ANALYTIC METHOD**

In chapters 3 through 5 I present results from multiple logistic regression**.** Logistic regression is most often implemented in the case of a binary qualitative dependent variable with the values of 0 and 1; regression coefficients show an increase or decrease in having the predicted probability of having the dependent characteristic or event (Pampel 2000).

In chapter 4, I predict the probability of taking STEM coursework during first year of college Pr($y_i$=$j$) with the categories $j$=0 representing not taking STEM coursework and $j$=1 taking STEM coursework (Pampel 2000; Demaris 1992). In Chapter 5, I predict the probability of two educational attainment outcomes, completing a baccalaureate degree and completing a baccalaureate degree in a STEM field.

Logistic regression works with both continuous and categorical regressors. The logit model transforms the probabilities into log odds to of an occurrence of the event under study occurring. The logistic regression coefficients show a change in the predicted log odds of experiencing an event for a unit change in the independent variable. Exponentiating the logit coefficients give the odds ratios (for categorical predictors) or multiplicative effects (for continuous predictors) on the odds of occurrence of the event (Powers 2006). An odds ratio of greater than 1 indicates that the odds of an event will increase as the independent variable increases and an odds ratio of less than 1 indicates that the odds of an event will decrease when the independent variable increases (Menard 1995). When using categorical dummy variables, the odds ratio indicates the one group's odds of an event occurring in comparison to a reference category. The reference category has an odds ratio of 1.0.

Logistic regression may also be used to model a dependent variable that has more than two categories ($j$=1, 2, …..$J$) (Hosmer and Lemeshow 1989). In chapter 3, I use an ordered logit model with a three-category college entry dependent variable to for ordered categories associated with type of college entry. The three categories of the dependent variable are not entering college ($y_i$=0) , entering college with risk ($y_i$=1), and entering college with advantage ($y_i$=2). Essentially, there is one logit model with three cut points. Taking a cumulative probability approach, this model is called the cumulative logit or

proportional odds model (Powers and Xie 2000; Agresti 1996).[11] This was implemented using SAS PROC LOGISTIC descending. One feature of PROC LOGISTIC is that it assumes a parallel slopes model for the dependent variable; only the intercept is different for the equations created by categories of the dependant variable, while the effects of the independent variables are assumed to be constant across groups (Menard 1995). We have no a-priori reason to expect that mediators have different effect on the log-odds of probabilities associated with different levels of the response variable.

Logit parameters are estimated by Maximum Likelihood Estimation. The fit of the overall model is tested by the likelihood ratio statistic which approximately follows a chi-square distribution (Menard 1995).

11 A multinomial logit model would be an alternative method to modeling the relationship between family structure and college entry. Researchers may find a multinomial logit useful in assessing whether family structure effects differ across the response categories.

# CHAPTER 3

# COLLEGE ENTRY

## INTRODUCTION

Since the 1950s, several important trends have emerged in American life including a rise in divorce, remarriage, and never-married parenthood (Cherlin 1992, Teachman, Tedrow, and Crowder 2000). These changes in family life were coupled with key changes in higher education, reinforcing the stratification of opportunity within postsecondary education and enhancing the risk factor for success among students from non-intact families. The increased cost of higher education has been placed more heavily upon the family (Baker and Velez, 1996; Lucas, 1996), and since the 1980s enrollment trends have increasingly channeled students into alternative tracks within the postsecondary system (Hearn 1992; Tinto 1993; Karen 2002). While students may have gained access to higher education, the quality of the access is different.

Although the characteristics of growing up in a non-intact family have been linked with the risk of school behavioral problems and high school drop-out, few studies have attempted to analyze the role that growing up in a non-intact family may play in college entry. Using a well-known nationally representative, longitudinal study, I examine the influence of adolescent family structure on entry into postsecondary education, and also explore potential mechanisms that might account for the disadvantage adolescents from non-intact families experience in terms of higher education. While studies have already associated family income with educational achievement (Amato and Booth 1997; Thomson et al. 1994), much less is known about the social aspects of family structure and educational processes. While I will control for family economics, what I am

most interested in examining are the social dynamics of these family processes. Additionally, I expand upon traditional measures of college entry to explore whether family structure and family processes might be linked to the stratification of college entry. For example, the family processes of single-parent and stepparent families may influence the type of college a student pursues. Therefore, this chapter also takes into consideration stratification within higher education.

In studying college entry, we have good reason to investigate the continuing influence of family structure. Social background, including family structure, plays an essential role during this transition from adolescence to young adulthood. Research on the home-leaving of adolescents has shown the influence on adolescent family structure on other transitional choices to young adulthood. Stepchildren leave home earlier than others and are more likely to report conflict as a reason for leaving home (Goldscheider and Goldscheider 1989; Goldscheider and Goldscheider 1994; Aquilino 1991; White and Booth 1985). Additionally, researchers have also found that continued parental support to their adult children varies by family structure (White 1992; Amato, Rezac and Booth 1995).

I propose that family structure influences both an adolescent's preparation for higher education and their ability to commit to and persevere within higher education. The high school years for adolescents represent a critical time period when deciding whether or not to continue education beyond high school, when to attend postsecondary education, and where to enter postsecondary education. In my analysis, I explore four potential mechanisms that might account for the disadvantage adolescents from non-intact families experience in terms of college entry. In my analysis, income is examined given the economic constraints of single parent families in making these decisions. Family turbulence is considered because the change from two parents to single

parenthood, for whatever reason, likely results in the single parent increasing their labor force participation (compensating for decreased family income) and possibly diminishing parenting due to stress and task overload (Biblarz and Raftery 1993; Sandefur et al. 1992; Hetherington, Cox, and Cox 1978). The transition from a single-parent family to a stepparent family may also bring hardship to adolescents either through a reduction in the level of resources provided or through decreased access to parents. While remarriage can either add resources to children by increasing the number of parents available for support and exchange it may also diminish resources because exchange is less likely to develop between stepparents and stepchildren due to weaker familial ties (Furstenburg, Hoffman and Shrestha 1995; Hetherington and Clingempeel 1992).

Parental involvement and parental educational aspirations are different measures of social support for adolescents. Parental involvement is a general, overall measure of parental involvement in their adolescent's life, while parental educational aspirations are focused on their adolescent's postsecondary educational plans. Level of parental involvement likely is associated with quality of kinship relationships. Quality of kinship relationship may influence the level of assistance in future planning, as well as, social and financial support that could be available to them during college. Some evidence suggests that noncustodial fathers and stepfathers are unwilling to continue their financial support after the age of 18, especially for the pursuit of further education (Aquilino 1991; Astone and McLanahan 1991; Amato, Rezac, and Booth 1995.)

Researchers have raised a number of interesting questions regarding non-intact families and gender of children. Although the association of family structure and children's well-being by gender of child is unclear, some evidence suggests that family structure affects boys and girls differently (Hetherington and Clingempeel 1992; Furstenburg and Cherlin 1991). Parental divorce may increase behavior problems more

among boys, while parental divorce may have a greater negative influence on the educational attainment of girls. For single parent families, some studies suggest that mothers and teenage daughters become close friends and confidants (Larson and Gillman 1999; Astone and McLanahan 1991). While single parent mothers may have restrictions in terms of income, they may provide high levels of social support to their daughters when planning for college. In terms of stepparent families, studies have found that girls have a more difficult time adjusting than boys do to the presence of a stepfather and there are more accounts of stepfather's disengagement from stepdaughters.

We know very little about how family structure and gender influences postsecondary education. While women's college entry rates are now slightly higher than men's, men still enter at more selective institutions (Karen 2002; Baker and Velez 1996). Given these important considerations, analysis will be run separately by gender. Pooled analysis is included in the Appendix Table 3A.

In addition, my analysis will consider family structure and race interaction effects. Black students are twice as likely to live in non-traditional households in comparison to whites. Black and Latino students are also more likely to follow the non-persistence track in higher education. Thus, I explore whether family structure and family processes act differently for Black and Latino students in predicting college entry with advantage.

In sum, I investigate these following questions. What is the influence of family structure on college entry? Do family income, parents' education, family turbulence, parental involvement and parental educational aspirations appear to explain the disadvantage which adolescents from nonintact families may experience in terms of college entry? How do these relationships differ by gender? Are there race/ethnicity interaction effects?

## ANALYTIC TECHNIQUE

Attainment of a baccalaureate degree is essential in the process of individual social mobility and status attainment. However, timing of college enrollment, continuous enrollment, and entry through a two or four year institution influences degree persistence. Baccalaureate aspirants who enter higher education through community colleges, delay college entry, or attend part-time experience lower degree attainment (Dougherty 1987; Dougherty 1992; Monk-Turner 1990). Given these considerations, I use an ordered logistic regression model to capture a more detailed measure of college entry. The three categories of the dependent variable college entry are not entering college ($y_i$=0), entering college with risk ($y_i$=1), and entering college with advantage ($y_i$=2). Using an ordered logit model, the odds ratio describes the relationship between a predictor and 1) the odds of college entry with advantage or college entry with risk versus no college entry as well as 2) the odds no college entry or college entry with risk versus college entry with advantage.[12] Thus, the odds ratio describes the odds of 1.)college entry, regardless of risk or advantage, and college entry with advantage in comparison to the other categories.

As I am studying college entry based upon college transcript data collected following the fourth follow-up survey, the fourth follow-up weight is appropriate.

## SAMPLE

Weighted descriptive statistics of analysis variables of the full sample are shown in Table 3.1. Of the 8,847 high school graduates, 72 % will enter postsecondary education; 44 % will enter with indicators of risk and 28 % will enter with advantage. The means and standard deviation are reported for parental income, parental education,

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12 The odds ratio describes the covariate's effect of being in category 1 or 2 versus 0 and the odds of being in category 2 versus 1 or 0. This is the proportionality assumption to the ordered logit model (Powers 2006).

parental educational aspirations, parental involvement, high school GPA, and high school coursework intensity.

For most subcategories of high school graduates, a higher proportion of students will enter college with disadvantage versus no college or college with entry. For example, of students from two-parent families, 30.1% will not attend college, 42.9% will attend college with disadvantage and 27% will attend college with advantage. However, 52.4% of students from private high schools enter college with advantage and students from catholic high schools are closely divided with 43.4% and 42.2% between college entry with disadvantage and college entry with advantage. Conversely, there are lower proportions of students from stepparent families, father only family, Black family, and Latino family in attending college with advantage. Experiencing turbulence also appears to be negatively associated with attending college with advantage.

**OVERVIEW OF TABLES AND MODELING**

In Table 3.2, I compare two models predicting college entry. The first model includes the traditional factors in predicting college entry which are the sociodemographic variables related to family background such as race, family economics, and parents' educational background, as well as academic preparation. The second model, adds measures of family structure and family processes which have not been previously explored. This table provides a brief overview of both the potential contributions of the new explanatory variables as well as the rationale for further analysis.

In Tables 3.3 and 3.4, I first model college going with family structure variables to estimate baseline coefficients of family structure. To this model, I add race/ethnicity. In model 3, I add family dynamics indicators to estimate their independent effect on college going and whether they explain the effect of family structure. Family structure

and family dynamics were tested for interaction effects by race and ethnicity; they are modeled when significant. Model 4 adds family resources measured as family income and parental income and Model 5 adds high school preparation and high school type and sector. Although high school type and sector is not a focus of this study, they are important and will be controlled. In order to examine the effect of family structure by gender and to further explore how family dynamics might occur differently within different family types by gender, I estimate separate models for women and men. A pooled model is included in the Appendix Table 3A to test differential effects of family structure by gender on college entry.

**Table 3.1: Weighted Descriptive Statistics for Analysis Variables**

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| | Total Sample (N=8847) | No college (N=2473) | College w/ Disadvantage (N=3896) | College w/ Advantage (N=2478) |
|---|---|---|---|---|
| Variables | | Percentage Reported | | |
| Two parent family | 72.8 | 30.1 | 42.9 | 27.0 |
| Mother only family | 15.8 | 37.2 | 42.5 | 20.3 |
| Father only family | 2.8 | 38.2 | 45.4 | 16.5 |
| Mother Stepfather family | 6.7 | 35.2 | 48.8 | 16.0 |
| Father Stepmother family | 1.9 | 36.8 | 52.3 | 11.0 |
| Male | 47.3 | 36.0 | 40.6 | 23.4 |
| Female | 52.7 | 31.1 | 45.3 | 23.9 |
| White | 81.0 | 31.1 | 43.2 | 25.8 |
| Black | 12.0 | 42.6 | 42.7 | 14.7 |
| Latino | 7.0 | 47.0 | 42.4 | 10.6 |
| Public | 89.3 | 35.9 | 43.4 | 21.0 |
| Private | 3.4 | 14.4 | 33.3 | 52.4 |
| Catholic | 7.2 | 14.4 | 43.4 | 42.2 |
| Urban | 18.7 | 36.4 | 44.6 | 19.0 |
| Suburban | 49.1 | 29.9 | 43.6 | 26.5 |
| Rural | 32.2 | 37.6 | 41.2 | 21.2 |
| Experienced Turbulence | 25.8 | 41.8 | 42.6 | 15.7 |
| | | Mean (SD) | | |
| Parental Income | 4.707 (2.101) | 4.214 (2.284) | 4.721 (2.025) | 5.393 (1.832) |
| Parental Education | 2.283 (1.472) | 1.708 (1.187) | 2.276 (1.408) | 3.123 (1.462) |
| Parental Ed. Aspirations | 3.586 (1.196) | 3.040 (1.445) | 3.642 (1.077) | 4.271 (.610) |
| Parental Involvement | .001 (1.007) | -.166 (1.112) | -.018 (.994) | .272 (.853) |
| H.S. GPA | 2.592 (.748) | 2.302 (.725) | 2.561 (.688) | 3.064 (.640) |
| H.S. Coursework Intensity | 3.353 (1.516) | 2.721 (1.272) | 3.342 (1.451) | 4.282 (1.403) |

*Source*: PETS and HS&B: Sophomore Cohort

**Table 3.2 Ordered Logistic Regression Analysis Predicting College Entry: Former Models vs. Current Study (N=8847)**

| | Model 1 | | | Model 2 | | |
|---|---|---|---|---|---|---|
| **Variables** | **b** | **S.E** | **Odds Ratio** | **b** | **S.E.** | **Odds Ratio** |
| **Male** | -.148*** | (.041) | .863 | -.128** | (.042) | .880 |
| **Family Background (ref. white)** | | | | | | |
| Black | .104 | (.067) | 1.110 | -.179** | (.070) | .836 |
| Latino | -.232** | (.083) | .792 | -.399*** | (.085) | .671 |
| **Family Background Resources** | | | | | | |
| Parents' Income | .077*** | (.011) | 1.080 | .061*** | (.012) | 1.062 |
| Parents' Education | .375*** | (.016) | 1.452 | .249*** | (.017) | 1.283 |
| **Academic Preparation** | | | | | | |
| H.S. GPA | .797*** | (.033) | 2.219 | .695*** | (.034) | 2.003 |
| H.S. Coursework | .435*** | (.018) | 1.544 | .335*** | (.019) | 1.398 |
| **H.S. Type (ref Public)** | | | | | | |
| Private H.S. | .720*** | (.119) | 2.054 | .746*** | (.121) | 2.108 |
| Catholic H.S. | .557*** | (.082) | 1.745 | .482*** | (.083) | 1.620 |
| **H.S. Sector (ref. suburban)** | | | | | | |
| Urban H.S. | -.020 | (.057) | .980 | -.071 | (.059) | .932 |
| Rural H.S. | -.085 | (.047) | .919 | -.012 | (.048) | .988 |
| **Family Structure (ref. 2 par)** | | | | | | |
| Mother Only | | | | .111 | (.064) | 1.116 |
| Father Only | | | | .014 | (.133) | 1.014 |
| Mother Stepfather | | | | -.087 | (.088) | .917 |
| Father Stepmother | | | | -.385* | (.159) | .681 |
| **Family Dynamics** | | | | | | |
| Turbulence | | | | -.186** | (.051) | .830 |
| Parental Involvement | | | | .106*** | (.022) | 1.111 |
| Parents' Ed Aspirations | | | | .583*** | (.022) | 1.791 |
| **Intercept 2** | -6.307*** | (.126) | | -7.327*** | (.145) | |
| **Intercept 1** | -3.785*** | (.112) | | -4.602*** | (.130) | |
| **Model Chi-Square** | 133.344*** | | | 180.064*** | | |
| *Df* | 14 | | | 22. | | |
| *P* | <.0001 | | | <.0001 | | |
| **Improvement Chi-Square** | | | | 46.720 | | |
| *Df* | | | | 8 | | |
| *P* | | | | <.001 | | |

*** p<.001; ** p<.01; *p <.05

*Source:* PETS and HS&B: Sophomore Cohort

## RESULTS

### Family Structure and Family Dynamics in Predicting College Entry with Advantage.

Table 3.2 presents two models. The first model includes the traditional explanatory variables of gender, race and ethnicity, family income, parents' education, and high school preparation. The second model introduces the new variables of interest to this study. These are adolescent family structure dummy variables, with two parent family as the reference category, and family dynamics variables modeled as parental general involvement, parents' educational aspirations, and family turbulence.[13] Of the added family structure variables in model 2, only father stepmother family is significant ($p<.05$) in comparison to the two parent family, finding father stepmother family being negatively associated with college entry and college entry with advantage. The family dynamics variables, parent's general involvement, educational aspirations, and family turbulence are all significant predictors of college entry and college entry with advantage. The improvement of chi-square between the two models is significant at $p.<001$.

As a brief overview, table 3.2 does not tell us whether there are other significant family structure associations and if these associations have been accounted for with either traditional measures of family background or the family dynamics measures in the models presented. Additionally, there is little information about how family structure and family dynamics might be different within groups. To answer these questions, Table 3.3 and 3.4 uses a series of models to study the relationship of family structure, family dynamics and college entry within gender categories.

[13] Family income is a potential intervening variable in accounting for the disadvantage adolescents from non-intact families experience in terms of college entry. However, I use it mostly as a control in my models and according to both my theoretical framework and the literature income belongs in the first model in Table 3.1.

## College Entry by Gender

### *Women*

For the baseline model in Table 3.3, family structure alone is modeled in predicting college entry. For women, in model 1, all categories for family structure are negatively associated and statistically significant with predicting college entry (versus no college entry) and college entry with advantage (versus no college entry and college entry with risk) in comparison to adolescents from two parent families.

Model 2 adds race/ethnicity variables. Race/ethnicity does not change the negative associations of coming from all non-intact family; all categories of family structure remain negatively associated with and statistically significant in predicting college entry and college entry with advantage in comparison to two parent families. Black or a Latino students have lower odds ($p<.001$) of college entry and college entry with advantage versus white young adults.

Model 3 captures three aspects of family dynamics that may explain the possible disadvantage adolescents from nonintact families experience in terms of postsecondary education. First, experiencing a change in parental family structure during $10^{th}$ and $12^{th}$ grade, represented as turbulence, results in lowering the odds of college entry (in comparison to no college entry) and the odds of college entry with advantage (in comparison to no college entry and college entry with risk) by over 30%.

**TABLE 3.3 ORDERED LOGISTICAL REGRESSION PREDICTING COLLEGE ENTRY FOR WOMEN.** (N=4,703)

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| **Variables** | **b** | **(S.E.)** | **b** | **(S.E.)** | **b** | **(S.E.)** |
| **Family Structure (ref. 2 par)** | | | | | | |
| Mother Only | -.325*** | (.073) | -.239** | (.075) | -.079 | (.078) |
| Father Only | -.463** | (.172) | -.478** | (.172) | -.195 | (.179) |
| Mother Stepfather | -.373*** | (.099) | -.347*** | (.100) | -.292** | (.104) |
| Father Stepmother | -.926*** | (.222) | -.986*** | (.222) | -.623** | (.232) |
| **Family Background (ref. white)** | | | | | | |
| Black | | | -.407*** | (.081) | -.683*** | (.085) |
| Latino | | | -.630*** | (.108) | -.768*** | (.112) |
| **Family Dynamics** | | | | | | |
| Turbulence | | | | | -.404*** | (.066) |
| Parental Involvement | | | | | .205*** | (.031) |
| Parents' Ed. Aspirations | | | | | .859*** | (.028) |
| **Family Dynamics Interactions** | | | | | | |
| Black Parental Involvement | | | | | | |
| Latino Parental Involvement | | | | | | |
| Black Parental Ed. Aspirations | | | | | | |
| Latino Parental Ed. Aspirations | | | | | | |
| **Family Background Resources** | | | | | | |
| Parents' Income | | | | | | |
| Parents' Education | | | | | | |
| **Academic Preparation** | | | | | | |
| H.S. GPA | | | | | | |
| H.S. Coursework | | | | | | |
| **H.S. Type (ref. Public)** | | | | | | |
| Private H.S.. | | | | | | |
| Catholic H.S. | | | | | | |
| **H.S. Sector (ref. Suburban)** | | | | | | |
| Urban H.S. | | | | | | |
| Rural H.S. | | | | | | |
| | | | | | | |
| Intercept 2 | -1.079*** | (.036) | -1.007*** | (.037) | -4.025*** | (.114) |
| Intercept 1 | .909*** | (.035) | .998*** | (.037) | -1.566*** | (.099) |
| Chi-Square Likelihood Ratio | 50.829*** | | 106.416*** | | 1433.642*** | |

Table 3.3 WOMEN (cont.)

| Variables | Model 3 Family Dynamics w/Interactions b | (S.E.) | Model 4 b | (S.E.) | Model 5 b | (S.E.) |
|---|---|---|---|---|---|---|
| **Family Structure (ref. 2 par)** | | | | | | |
| Mother Only | -.089 | (.080) | .037 | (.084) | .134 | (.087) |
| Father Only | -.193 | (.183) | -.051 | (.185) | .046 | (.191) |
| Mother Stepfather | -.307** | (.106) | -.303** | (.107) | -.205* | (.101) |
| Father Stepmother | -.606* | (.239) | -.662** | (.240) | -.695** | (.243) |
| **Family Background (ref. white)** | | | | | | |
| Black | .246 | (.329) | .268 | (.331) | .313 | (.341) |
| Latino | .383 | (.405) | .512 | (.407) | .725 | (.418) |
| **Family Dynamics** | | | | | | |
| Turbulence | -.397*** | (.068) | -.398*** | (.069) | -.242** | (.071) |
| Parental Involvement | .244*** | (.035) | .218*** | (.035) | .183*** | (.036) |
| Parents' Ed. Aspirations | .903*** | (.031) | .741*** | (.032) | .595*** | (.034) |
| **Family Dynamics Interactions** | | | | | | |
| Black Parental Involvement | -.123 | (.089) | -.136 | (.090) | -.109 | (.092) |
| Latino Parental Involvement | -.442** | (.136) | -.441** | (.138) | -.377** | (.142) |
| Black Parental Ed. Aspirations | -.240** | (.082) | -.136* | (.083) | -.088 | (.085) |
| Latino Parental Ed. Aspirations | -.294** | (.108) | -.441* | (.108) | -.253* | (.111) |
| **Family Background Resources** | | | | | | |
| Parents' Income | | | .086*** | (.016) | .086*** | (.017) |
| Parents' Education | | | .332*** | (.023) | .292*** | (.024) |
| **Academic Preparation** | | | | | | |
| H.S. GPA | | | | | .775*** | (.048) |
| H.S. Coursework | | | | | .328*** | (.027) |
| **H.S. Type (ref. public)** | | | | | | |
| Private H.S.. | | | | | .493** | (.164) |
| Catholic H.S. | | | | | .428*** | (.111) |
| **H.S. Sector (ref. Suburban)** | | | | | | |
| Urban H.S. | | | | | -.064 | (.080) |
| Rural H.S. | | | | | -.014 | (.068) |
| Intercept 2 | -4.207*** | (.123) | -4.932*** | (.143) | -7.901*** | (.210) |
| Intercept 1 | -1.719*** | (.108) | -2.314*** | (.126) | -4.998*** | (.186) |
| Chi-Square Likelihood Ratio | 1462.973*** | | 1774.104*** | | 2414.873*** | |

**Source: PETS and HS&B: Sophomore Cohort**

*** p<.001; ** p<.01; *p <.05

Models also control for imputed missing data (parents' income, parents' education, parents educational expectations, parents' involvement) if significant.

Model 3 also adds parental involvement and parents' educational aspirations. An important, if not essential, factor in college planning and decision making is social support. Student's report of general parental involvement in 12th grade is positively associated ($p<.001$) with college entry. Similarly, student's reports of parents educational aspirations in 12th grade is positively associated ($p<.001$) with college entry patterns in Model 3. Each reported increase in parental level of educational aspiration reported is associated with an increase in odds by 2.360 for women in college entry as well as college entry with advantage.

In inclusion of family dynamics in Model 3 makes the mother only and father only coefficients become not significant. This indicates that the negative association of mother only and father only family structure is indirect rather than direct. The association of coming from either a mother-stepfather or a father-stepmother family during adolescence is negative ($p<.001$) for women in comparison to coming from a two parent family in predicting college entry and college entry with advantage.

Family turbulence, parental involvement, and parental educational aspirations may be explanatory variables in predicting the relationship for adolescents entering college. They may also be intervening variables for single parent families. Nevertheless, the significant association between college entry patterns and coming from a mother stepfather family or a father stepmother family continues to be negative, lowering their odds by 25% and 46% respectively of college entry and college entry with advantage.

In Model 3B, I add the interaction effects of family dynamics and race/ethnicity. While, this analysis focuses upon the relationship between family structure and college entry, there is some evidence that family structure operates differently by race in family research. For example, African American women develop strong women centered kinship bonds that assist them while single parents. Also, African American families are more

likely to have close intergenerational relations and may have grandparents living with them. I tested for interaction effects of family structure and race and ethnicity and found none. I felt also compelled to examine family dynamics by race and ethnicity in order to more fully understand the college experience of minority students. It is important to capture indicators of family support as well as the effect of the family support given the differences in college participation for Blacks and Latinos. The Latino parental involvement coefficient is negative ($p<.01$). This means that the higher parental involvement in Latino families is associated with lower rates of college going in comparison to the association between parental involvement and college going for whites. Also, the Latino and Black parental educational aspirations coefficients are negative. Higher levels of parental educational aspirations are associated with lower rates of college going in comparison to the association between parental involvement and college going for whites. The inclusion of family dynamics interactions will alter all associations between the main effects of Black and Latino and college entry, finding no significant difference relative to white students.

Model 4 adds family resources as potential intervening variables. Both parents' income and education are positively associated with college entry ($p<.001$). However, their addition changes little. The most likely predicted effect of family resources would be to influence the relationship between single parent families and college entry.[14] However, both mother only and father were already found to be indirectly associated with

[14] Single parents are constrained by income and this likely plays a role in making college decision (Tinto 1993; Cabrera, Stampen, and Hansen 1990). Finances can affect student persistence in higher education directly through by an influence on their educational goals in terms of whether to chose to attend college but also where they chose to enter college (Tierney 1980). If family dynamics were not already modeled, the negative association of single parent family (mother only and father only) would be explained by family resources.

college entry through family dynamics. The mother only coefficient becomes positive, but remains not significant.

Model 5, the full model, adds controls for academic preparation, thought to be one of the most significant factor in predicting college entry and success. Of course, both high school GPA and academic intensity of high school coursework is positively associated ($p<.001$) with college entry. Controlling on academic preparation appears to decrease the significant, negative association of mother stepfather family in comparison to two parent family in predicting college entry. Although I have included academic preparation as a control, it is plausible to argue that a potential mechanism for explaining the influence of adolescence family structure is prior school achievement.

Model 5 controls for high school type and sector. While high school type and sector are important and controlled as both are positively associated with academic achievement, these relationships are not a focus of this study. In the full model, the mother stepfather ($p.<.05$) and father stepmother family structure remains negatively associated ($p<.01$) with college entry in comparison to adolescents from two parent families for women. Controlling on all variables in the full model, adolescents from mother stepfather families have a 18% decrease in odds and father stepmother families have a 50% decrease in odds of college entry and college entry with advantage in comparison to adolescents from two parent families.

***Men***

When examining the models in Table 3.4 analyzing college entry for men, one pattern is clear. Except for the black, single parent family, there are no other associations between family structure and college entry patterns with advantage for men.

In model 1, the base model with only family structure predicting college entry, no direct effects of family structure are found. Family structure and race interaction effects

are found for men when predicting college entry in model 2. Black mother only family has a negative and significant association with college entry. In examining family dynamics in Model 3, I find that turbulence is negatively related ($p<.001$), parental involvement is positively related ($p<.001$), and parents' educational aspirations positively related ($p<.001$) for men to college entry.

In addition to finding a significant interaction effect of black, single parent family in my preliminary analyses, I also found significant interaction effects between race/ethnicity and family processes. In Model 3B, these are Black parental involvement (negative, $p<.05$) and Black parental educational aspirations (negative, $p<.01$), and Latino parental educational aspirations ($p<.001$). The inclusion of the interaction effects results in the Black and Latino coefficients becoming not significant and the Asian coefficient reducing in significance to $p<.05$ when predicting men's college entry.

When income and education are added, both important predictors of college entry, little changes in Model 4. Model 5 adds controls for high school type and sector, high school GPA, and intensity of high school academic coursework. In the full model, experiencing family turbulence becomes not significant, however, parental involvement ($p<.05$) and parents' educational aspirations ($p<.001$) remains positive and significant in their association with men's college entry. In examining the race/ethnicity interaction effects with family structure and family processes, Black Mother Only family (negative, $p<.05$) and Latino parental involvement is borderline negatively significant with college entry.

**Table 3.4 Ordered Logistic Regression Predicting College Entry for Men**. (N=4,144)

| Variables | Model 1 b | Model 1 (S.E.) | Model 2 b | Model 2 (S.E.) | Model 2B b | Model 2B (S.E.) | Model 3 b | Model 3 (S.E.) |
|---|---|---|---|---|---|---|---|---|
| **Family Structure (ref. 2 par)** | | | | | | | | |
| Mother Only | -.152 | (.082) | -.013 | (.084) | .108 | (.099) | .066 | (.105) |
| Father Only | -.217 | (.170) | -.217 | (.171) | -.218 | (.171) | -.016 | (.183) |
| Mother Stepfather | -.177 | (.135) | -.160 | (.136) | -.170 | (.135) | -.004 | (.144) |
| Father Stepmother | -.002 | (.194) | .064 | (.196) | . 046 | (.196) | .178 | (.206) |
| **Family Background (ref. white)** | | | | | | | | |
| Black | | | -.704*** | (.092) | -.540*** | (.108) | -.775*** | (.115) |
| Latino | | | -.910*** | (.109) | -.925*** | (.117) | -.947*** | (.126) |
| **Family Structure Interactions** | | | | | | | | |
| Black Mother Only | | | | | -.592** | (.208) | -.404 | (.221) |
| Latino Mother Only | | | | | .072 | (.318) | .110 | (.339) |
| **Family Dynamics** | | | | | | | | |
| Turbulence | | | | | | | -.349*** | (.073) |
| Parental Involvement | | | | | | | .154*** | (.030) |
| Parents' Ed. Aspirations | | | | | | | .860*** | (.029) |
| **Family Dynamics Interactions** | | | | | | | | |
| Black Parental Involvement | | | | | | | | |
| Latino Parental Involvement | | | | | | | | |
| Black Parental Ed. Aspirations | | | | | | | | |
| Latino Parental Ed. Aspirations | | | | | | | | |
| **Family Background Resources** | | | | | | | | |
| Parents' Income | | | | | | | | |
| Parents' Education | | | | | | | | |
| **Acad. Preparation** | | | | | | | | |
| H.S. GPA | | | | | | | | |
| H.S. Coursework | | | | | | | | |
| **H.S. Type (ref. Public)** | | | | | | | | |
| Private H.S. | | | | | | | | |
| Catholic H.S. | | | | | | | | |
| **H.S. Sector (ref. Suburban)** | | | | | | | | |
| Urban H.S. | | | | | | | | |
| Rural H.S. | | | | | | | | |
| Intercept 2 | -1.168*** | (.037) | -1.064*** | (.039) | -1.077*** | (.039) | -4.051*** | (.120) |
| Intercept 1 | .593*** | (.033) | .731*** | (.037) | .720*** | (.037) | -1.804*** | (.105) |
| Chi-Square Likelihood Ratio | 6.125 | | 127.505*** | | 136.169*** | | 1386.398*** | |

Table 3.4 MEN (cont.)

| Variables | Model 3B Dynamics w/Interactions b | (S.E.) | Model 4 b | (S.E.) | Model 5 b | (S.E.) |
|---|---|---|---|---|---|---|
| **Family Structure (ref. 2 par)** | | | | | | |
| Mother Only | .068 | (.106) | .163 | (.109) | .194 | (.112) |
| Father Only | - .003 | (.183 | -.011 | (.185) | -.007 | (.187) |
| Mother Stepfather | .002 | (.145) | .021 | (.146) | .084 | (.150) |
| Father Stepmother | .195 | (.206) | .085 | (.208) | -.092 | (.214) |
| **Family Background (ref. white)** | | | | | | |
| Black | .325 | (.423) | .423 | (.422) | .191 | (.428) |
| Latino | .331 | (.386) | .224 | (.388) | .192 | (.397) |
| **Family Structure Interactions** | | | | | | |
| Black Mother Only | - .506 | (.221) | -.545* | (.222) | -.586** | (.227) |
| Latino Mother Only | .147 | (.333) | .174 | (.334) | .031 | (.345) |
| **Family Dynamics** | | | | | | |
| Turbulence | - .338*** | (.073) | -.267*** | (.074) | -.130 | (.076) |
| Parental Involvement | .180*** | (.033) | .174*** | (.033) | .093** | (.034) |
| Parents' Ed. Aspirations | .904*** | (.032) | .786*** | (.033) | .615*** | (.034) |
| **Family Dynamics Interactions** | | | | | | |
| Black Parental Involvement | -.257* | (.101) | -.256* | (.102) | -.196 $^{t}$ | (.104) |
| Latino Parental Involvement | -.066 | (.115) | -.086 | (.115) | -.018 | (.119) |
| Black Parental Ed. Aspirations | -.275** | (.103) | -.254* | (.103) | -.097 | (.105) |
| Latino Parental Ed. Aspirations | -.351*** | (.101) | -.291** | (.102) | -.203 $^{t}$ | (.104) |
| **Family Background Resources** | | | | | | |
| Parents' Income | | | .053** | (.017) | .039* | (.018) |
| Parents' Education | | | .233*** | (.024) | .207*** | (.024) |
| **Academic Preparation** | | | | | | |
| H.S. GPA | | | | | .623*** | (.050) |
| H.S. Coursework | | | | | .328*** | (.028) |
| **H.S. Type (ref. Public)** | | | | | | |
| Private H.S.. | | | | | 1.072*** | (.181) |
| Catholic H.S. | | | | | .581*** | (.126) |
| **H.S. Sector (ref. Suburban)** | | | | | | |
| Urban H.S. | | | | | -.074 | (.088) |
| Rural H.S. | | | | | -.016 | (.070) |
| Intercept 2 | -4.212*** | (.128) | -4.682*** | (.147) | -7.033*** | (.208) |
| Intercept 1 | -1.952*** | (.113) | -2.355*** | (.132) | -4.471*** | (.187) |
| Chi-Square Likelihood Ratio | 1409.7612 | | 1562.079*** | | 2081.053*** | |

**Source: PETS and HS&B: Sophomore Cohort**

*** p<.001; **p <.01; * p<.05 $^{t}$= borderline

Models also control for imputed missing data (parents' income, parents' education, parents educational expectations, parents' involvement) if significant.

## DISCUSSION

These results provide some evidence that family structure is associated with differential college entry patterns. Additionally, these results suggest that single parent families should not be categorized with stepparent families, as researchers do when they consider both categories as missing a biological parent, nor should researchers categorize stepparent families with two parent families, as researchers consider both as having two adults and greater resources, in predicting higher education outcomes. Further, throughout these results, it appears that the mother stepfather and father stepmother families are significantly different from all others. For women, controlling for all other variables, adolescents from a mother stepfather or a father stepmother family remain at a significant disadvantage with predicting college entry in comparison to two parent families.[15]

In Table 3.2, the only significant family structure association with college entry is father stepmother. However, when the models were run separately by gender in Tables 3.3 and 3.4, the negative association of being from a father stepmother family occurs only for women and a negative association of mother stepfather family also occurs for women. Thus, family structure may have a greater influence on girls' college preparation and college enrollment. I find support for this in the pooled Table 3A, showing significant family structure interaction effects by gender. The influence of a stepparent family in comparison to a two parent family acts differently for men and women in predicting college entry with women at a greater disadvantage.

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15 As previously mentioned, a limitation of selecting high school graduates may mean these results underestimate the negative association between single parent family and college entry.

For both men and women, the three family dynamics variables, family turbulence, parental involvement and parental educational aspirations appear to have a significant influence on college preparation and enrollment. For women, the disadvantage of coming from a mother only or father only family in comparison to a two parent family appears to be explained by family processes. Interestingly, the family dynamics variables are significant predictors of college entry for men, however, family structure is not. Perhaps turbulence could be considered a measure of family structure rather than a mediator of the relationship between family structure and postsecondary education. Certainly, if one is experiencing turbulence during 10th and 12th grades this would mean a change in family form and as seen in this chapter is negatively associated with college entry. Further, experiencing "turbulence" likely means adolescents were exposed to higher levels of family conflict, diminished parenting, multiple transitions, and possible decrease in resources. Also, cohabiting parental unions are likely reported as "like stepparent families" but yet remain distinct given their lower level of union stability. Further examination of turbulence would be beneficial in future research.

For both men and women, race and ethnicity interaction effects with family dynamics are found to be significant. The results indicate that higher aspirations for Blacks and Latinos have a less positive effect on college entry in comparison to whites. Similarly, higher rates of parental involvement for Blacks and Latinos has a less positive effect on college entry in comparison to whites. Certainly more analysis of collegial paths by race and ethnicity would be beneficial. It may be that highly motivated minority students and parents are selecting two-year colleges or delayed college entry in comparison to four-year colleges or attending college on-time. Another avenue for further study is to study first generation college students by race and ethnicity. At this time, it is

important to note that there are significant interaction effects between family dynamics and race/ethnicity and that this may influence college entry.

These findings contribute to a growing body of literature about the effects of adolescent family structure during the transition to young adulthood. These results provide some evidence that the patterns of participation within higher education are different between adolescents who come from two-parent families and adolescents who do not. These early results also provide some indication that the mechanisms might be different by specific types of "non-intact" families, lending support to the argument that researchers should break apart overarching measures of "non-intact" families.

One of my overarching goals for my research is to examine whether family structure reinforces stratification within higher education. This chapter has addressed ways in which family structure might stratify students through college entry. An additional method of examining stratification within higher education is to study the science, math, engineering, and technology (STEM) pipeline. Earning a degree in STEM fields require rigorous course taking during college beginning with calculus during the first year. The next chapter will address the influence of family structure on STEM coursework.

# CHAPTER 4

# TAKING STEM COURSEWORK

## INTRODUCTION

While entering college in itself may be an important benchmark, there are certain fields of study that have greater barriers for entry and are thought to provide greater rewards from their successful completion. Higher level mathematics course are often a requirement for meeting these career aspirations. Central to this chapter is the "science, technology, engineering, and math pipeline," the concept that over one's educational career, one must meet certain academic standards or make certain decisions regarding coursework in order to continue within these fields. Along the way, students—women and minorities in particular—"leak out" of the pipeline (Moreno and Muller 1998; Davenport et al. 1998; Catsambis1994; Hilton and Lee 1988). Researchers are interested in the study of the STEM pipeline in college given the increasing need for scientific and technological positions in our society. In order to develop an adequate talent pool, college students need to enter and graduate from STEM fields in college. In addition, researchers examine the STEM pipeline because women and minorities remain underrepresented within quantitative fields and women and minorities need to make gains in these fields in order to close occupational and income gaps in comparison to white males.

In order for any student to gain access to STEM professions, students must be incorporated into the discipline early in their collegiate experience. First-year college calculus is considered a "gate keeper" for higher level STEM coursework (Moreno and Muller 1998). Considering that nearly half of STEM students exit the pipeline following

their first year of college, understanding the freshman year experience is critical (Lipson and Tobias 1991).

Sociodemographic factors associated with postsecondary education math coursework and degree outcomes in previous studies are parents' education and parents' income (Hanson 1994; Hedges and Nowell 1995; Edge and Friedberg 1984; Maple and Stage 1991). While studies have always examined gender and race, very few researchers have had the data available to study Latino college students within the STEM pipeline, notable exceptions including Moreno and Muller (1998), Seymour and Hewitt (1997), and Hilton and Lee (1988). Previous research on the STEM pipeline in college has not considered family structure as influencing choice of field. Similarly, measures of parental involvement are often included in studies of elementary and secondary mathematics achievement but not in studies of college student's choice of field.

Previous researchers have also consistently examined previous academic preparation, often represented by GPA, curriculum measures, or SAT scores, usually finding a significant association between a student's high school preparation and college coursework (Davies and Guppy 1997; Maple and Stage 1991; Wilson and Boldizar 1990). Ethington and Wolfle (1988) found high school coursework to be the most significant variable in predicting women's choice of field in college. The literature also emphasizes the advantage for students from private and Catholic high schools due to strong math curriculum, although this is more frequently modeled in predicting college entry than in predicting choice of field.

Several researchers have studied the transition through first-year math or science coursework at specific universities (Treisman 1992; Moreno and Muller 1998; Bridgeman and Wendler 1991; Edge and Friedberg 1984; Fullilove and Treisman 1990) Treisman's (1992) Berkeley study of freshman calculus found high failure rates for

African Americans even among those academically prepared. Bridgeman and Wendler's (1991) study of four universities found that average grades of women in first-year math courses were about equal or slightly higher than men's grades.

Despite what the attrition rates may imply, existing research suggests that *good* students are lost along the pipeline. Certainly, some students are lost from the pipeline in college due to lack of pre-college math preparation or low performance indicators in math achievement tests, and the loss varies by ethnicity and gender (Seymour and Hewitt 1997; Fullilove and Treisman 1990; Wilson and Boldizar 1990; Davenport et al. 1998; Boli, Allen, Payne 1985). Others (Lipson and Tobias 1991; Tobias 1990; Rigden and Tobias 1992) propose that good students are lost at the college level because the courses deliberately alienate what Tobias has termed "the second tier"—college students who have the ability to pursue STEM, but choose not to. It may be that college mathematics challenges student's beliefs about oneself as a learner, self-confidence in learning mathematics or emphasizes one's belief about the relationship between gender, race and math (Stage and Kloosterman 1995).

I have argued that the influence of family on young adult's postsecondary education experience may be direct through parent's assistance in college planning and parent's support, financial or psychological, to adult children during college. Prior researchers have suggested that parents may initiate the college attendance decision as frequently as 50% of the time and that parental college planning takes three forms: financial planning; admissions planning (being knowledgeable about college requirements); and career planning (Flint 1992). Career planning includes the active involvement of parents in selecting their children's coursework in high school and college. Entering some fields of study, such as STEM, requires a great deal more planning and commitment to a particular sequencing of courses, than other fields of

study. Coming from a non-intact family may alter both planning and initiating the college attendance decision of students. In this chapter, I examine students who have already entered college. Among college entrants, will there be a difference in who takes STEM coursework during the first year of college by family structure?

The influence family structure on young adult's decision to take calculus during first year of college could be indirect through the influence on prior academic achievement. Parental encouragement or lack of it may have already placed students on a different academic path earlier in their academic careers than other students. For example, students may have taken the level of mathematics coursework required to enter college, but not additional math electives.

While I expect to find experiencing family turbulence as significant in predicting taking demanding college coursework during freshman year, I have less expectation of finding of parents' educational aspirations and parental involvement as significant. For students who experience family turbulence between $10^{th}$ and $12^{th}$ grade, either they may have had less assistance in college planning or they may be arriving from a stressful experience and therefore may be less apt to take demanding college coursework during their first year of college. I would expect less of an effect of parents' educational aspirations than in Chapter 3 because this sample is of college entrants and it also controls on intensity of high school curriculum in predicting math course-taking during freshmen year of college. I also expect less of an association between parental involvement and first-year, college calculus course-taking as there is some suggestion that parents of high achieving adolescents on the college preparation track are less involved once they know their son or daughter is "on the right track" (Crosnoe 2001; Csikszentmihalyi and Schneider 2000).

While researchers have documented the "loss" in the math and sciences, with particular attention to gender and ethnic differences at the high school setting, we have little evidence regarding the systematic loss at the collegiate level. The purpose of this chapter is to examine first-year math coursework and to provide insight to the science, technology, engineering, and math pipeline in college. This is the first study using a large, nationally representative sample with college transcript data to study STEM student outcomes in postsecondary education.

The analysis that follows investigates whether family structure and family dynamics are associated with entering the STEM pipeline in postsecondary education, modeled as taking calculus during first-year of college. Second, once family resources (income and education) and high school academics are controlled upon, will the associations remain? In addition, does the inclusion of family structure and family processes shed further light to disadvantages women or minorities face in the STEM pipeline?

## ANALYTIC TECHNIQUE

In this analysis, I use logistic regression modeling to estimate the odds of taking calculus coursework during the first year of college. I examine the association of adolescent family background, family structure and dynamics, student's prior academic preparation, and college course-taking.

Using a taxonomy of course categories developed by Cliff Adelman, U.S. Department of Education, I created the calculus course-taking student outcome using the codes 270204, which includes Pre-calculus and Calculus, course codes 270601 and 270701, which includes Calculus II and above, and then translated course-level data into student level data. "Taking" Calculus coursework means that the student enrolled and

completed the course, earning either an A, B, C, D, F grade or for which a Pass/No Grade (but credits count) is recorded.

Due to low cell numbers, in this chapter, I collapse the categories of Mother only and Father only into "Single parent Family" and Mother Stepfather and Father Stepmother into "Stepparent Family".[16] Table 4.1 presents calculus course-taking by family type to show original distribution of before category collapse. Interpretation is made as follows, 18.9% of two parent family students take calculus during first year of college; 25.2% of two parent family sons take calculus and 13.5% of two parent family daughters take calculus during first year. In comparison, 11.6% of mother only students, 9.3% of father only students, 10.1% of mother stepfather students, and 11.0% of father stepmother students take calculus. Gender differences are present by family structure in course-taking. For example, 20.2% of men from mother stepfather families take calculus versus only 5.2% of women from mother stepfather families during first year of college.

All analysis presented are weighted. I employ a postsecondary weight (PSW1) as my sample now consists only of students who have entered college.

16 Before collapsing categories, I ensured through preliminary analysis that the direction of association was similar. I also tested models both without collapsed categories and with collapsed categories to check that significant associations were not altered. In general, the result of the collapsed categories was a decrease in standard errors, particularly for Mother-Stepfather family and Father-Stepmother family for women.

**4.1 Calculus Course Taking by Family Type. Weighted results presented.**

| Took Calculus | (Full Sample) N=1279 | (Men) N=773 | (Women) N=506 |
|---|---|---|---|
| Family Type | % | % | % |
| Two Parent | 18.9 | 25.2 | 13.5 |
| Mother Only | 11.6 | 15.3 | 9.0 |
| Father Only | 9.3 | 8.2 | 10.4 |
| Mother-Stepfather | 10.1 | 20.2 | 5.2 |
| Father-Stepmother | 11.0 | 18.5 | 1.3 |

*Source:* PETS and HS&B: Sophomore Cohort

**Table 4.2 Weighted Descriptive Statistics for Analysis Variables**

| | Total Sample (N=6,951) | Took Calculus (N=1,366) | Did not take (N=5,585) |
|---|---|---|---|
| Variables | Percentage Reported | | |
| Two parent family | 69.1 | 18.9 | 81.1 |
| Single Parent family | 16.0 | 11.2 | 88.8 |
| Stepparent family | 7.7 | 10.3 | 89.7 |
| Male | 44.9 | 21.9 | 78.1 |
| Female | 55.1 | 11.5 | 88.5 |
| White | 82.9 | 17.9 | 82.1 |
| Black | 11.0 | 7.7 | 92.3 |
| Latino | 6.0 | 7.8 | 92.2 |
| Public | 86.9 | 14.9 | 85.1 |
| Private | 4.2 | 29.2 | 70.8 |
| Catholic | 8.9 | 22.8 | 77.2 |
| Urban | 18.6 | 12.7 | 87.3 |
| Suburban | 51.0 | 19.0 | 81.0 |
| Rural | 30.4 | 13.7 | 86.3 |
| Experienced Turbulence | 22.8 | 10.3 | 89.7 |
| | | Mean (SD) | |
| Parental Income | 4.912 (2.313) | 5.545 (1.994) | 4.790 (2.351) |
| Parental Education | 2.522 (1.719) | 3.171 (1.667) | 2.397 (1.691) |
| Parental Ed. Aspirations | 3.824 (1.158) | 4.307 (.721) | 3.731 (1.204) |
| Parental Involvement | .090 (1.107) | .246 (1.025) | .059 (1.121) |
| H.S. GPA | 2.716 (.827) | 3.182 (.718) | 2.653 (.807) |
| H.S. Coursework Intensity | 3.624 (1.743) | 4.706 (1.567) | 3.414 (1.669) |

*Source:* PETS and HS&B: Sophomore Cohort

## SAMPLE

Weighted descriptive statistics of the analysis variables of the full sample are shown in Table 4.2. Of the 6,951 students who entered a postsecondary institution, 1,366 students took Calculus level math coursework during their first year of college. In examining who chose to take calculus by family type, 18.9% of students from two parent families began STEM coursework in comparison to 11.2% of students from single parent families and 10.3% from stepparent families. Men were more likely to choose Calculus coursework than women, 21.9% of men versus 11.5% of women took calculus during first year of college. A higher percentage of Whites (17.9%) took calculus in comparison to Blacks (7.7%) and Latinos (7.8%). A greater percentage of students who attended Catholic (22.8%) and private high schools (29.2%) also took calculus than public high schools students (14.9%).

## RESULTS

### First-year STEM Coursework

Taking calculus level math coursework is usually a prerequisite for advanced coursework in the math and sciences at the collegiate level. Previous researchers have emphasized that math coursework taken *during the first year of college* largely determines access to pursuing degrees within the math, science, and engineering disciplines. In Table 4.3 and Table 4.4, I predict taking calculus level coursework during the first year of college for women and men. To estimate baseline coefficients of family structure effects, I first model course-taking with family structure variables only. Then, I use family structure and family's race/ethnicity to predict course-taking. To this model, I add the family dynamics measures of family turbulence, parental involvement and parental educational aspirations. Model 3 inserts the traditional sociodemographic

controls of parents' income and parents' education to represent family background resources. Models 4 and 5 include controls for high school type and sector and high school academic preparation.

***Women***

In Model 1, first year college calculus course taking is predicted with family structure only. Both single parent family and stepparent families are negatively associated with rates of calculus course-taking during first year of college. In Model 2, coming from a single parent family ($p<.05$) and a stepparent family ($p<.001$) are negatively associated with taking calculus when controlling upon family race and ethnicity. In this model, coming from a single parent family decreases the odds of taking calculus by 24% and coming from a stepparent family decreases the odds by 66% in comparison to first-year college women from two parent families. Black family ($p<.001$) and Latino family ($p<.001$) are negatively associated with taking calculus relative to white family.

The inclusion of the three family dynamic variables in Model 3, finds two to be significantly associated with taking calculus. Parental involvement and parental education aspirations are positively associated with taking calculus during first year of college. By adding the family dynamics variables in Model 3, the single parent family structure coefficient becomes not significant for women, showing an indirect association between single parent family and taking STEM coursework. This is similar the finding for women's college entry; single parent family is indirectly associated with college entry through family dynamics.

Controlling for parental income and parental education in Model 4 predicting STEM coursework during first year for women, does not alter the associations mentioned above, although single parent family becomes positive from negative but still remains not

significant. Both parental income and parents' education are positively associated with calculus course-taking. The Latino family and parental involvement coefficients both change from p<.001 to p<.01 in significance.

Model 5 examines the relationship between high school sector and high type and calculus course-taking. Private high school (positive, p<.001) and rural (negative, p<.05) high school are found to be significantly related to calculus course-taking. Model 6 adds prior academic preparation measured by GPA and quality and intensity of high school curriculum taken, both are positively associated with taking calculus during freshman year. The inclusion of academic preparation reduced in significance the association of parent's education (p<.05) and parental involvement (p<.05) with freshman course-taking and removed the significance to the Black and Latino coefficients.

The final model finds that coming from a stepparent family reduces the likelihood of women taking calculus course-taking, significant at p<.001. Female first year college students from a stepparent family experience a 60% decrease in the odds of taking calculus in comparison to female freshmen from two–parent families. As seen in the pooled Table 4A, there is a significant negative interaction effect between stepparent family and women in predicting STEM course taking. As parents' educational aspirations increase, the likelihood of calculus course taking during the first year of college increases. Traditional measures of family resources, parental income and education are positively associated with calculus coursework, while rural high school is negatively associated in comparison to suburban high school. Both high school GPA and intensity of high school coursework are positively associated with taking calculus during

**ssion Predicting Calculus Course Taking During First Year College for Women (N=3,756)**

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | | Model 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | b | S.E. | b | (S.E.) | b | (S.E.) | b | (S.E.) | b | (S.E.) | b | (S.E.) |
| | -.387** | (.126) | -.276* | (.127) | -.116 | (.135) | .050 | (.142) | .055 | (.142) | .157 | (.151) |
| | -1.096*** | (.225) | -1.080*** | (.226) | -1.003*** | (.230) | -.983*** | (.232) | -.996*** | (.233) | -.914*** | (.244) |
| | | | -.977*** | (.186) | -1.157*** | (.190) | -.947*** | (.193) | -.900*** | (.197) | -.382 | (.207) |
| | | | -.937*** | (.251) | -1.020*** | (.256) | -.818** | (.259) | -.849** | (.261) | -.363 | (.276) |
| | | | | | -.239 | (.127) | -.269* | (.128) | -.273* | (.129) | -.234 | (.139) |
| | | | | | .191*** | (.057) | .144** | (.057) | .167** | (.058) | .130* | (.063) |
| | | | | | .899*** | (.063) | .798*** | (.066) | .790*** | (.066) | .603*** | (.073) |
| **rces** | | | | | | | .115*** | (.027) | .098*** | (.028) | .117*** | (.031) |
| | | | | | | | .152*** | (.033) | .135*** | (.034) | .080* | (.036) |
| | | | | | | | | | .530** | (.185) | .544** | (.196) |
| | | | | | | | | | .235 | (.140) | .026 | (.149) |
| | | | | | | | | | -.202 | (.130) | -.180 | (.137) |
| | | | | | | | | | | (.113) | -.376** | (.121) |
| **n** | | | | | | | | | | | .884*** | (.086) |
| | | | | | | | | | | | .607*** | (.046) |
| | -1.910*** | (.048) | -1.800*** | (.049) | -5.391** | (.276) | -6.057*** | (.304) | -5.844*** | (.313) | -10.440** | (.454) |
| | 38.630*** | | 88.499*** | | 435.456*** | | 493.094*** | | 509.437*** | | | |
| | | | | | | | | | | | 946.034*** | |

nomore Cohort *** p<.001; ** p<.01; *p <..05

first year of college. Thus, significant predictors of taking calculus for women are stepparent family, parental involvement, parents' educational aspirations, parental income, parental education, private high school, rural high school, and high school GPA and coursework.

***Men***

The baseline model establishes an interesting pattern for freshmen men. Men from single parent families appear to experience a disadvantage when entering the STEM pipeline during the first year of college. Controlling on race and ethnicity in Model 2, men from single parent families experience a 44% decrease in odds of taking calculus level math during first year of college in comparison to men from two parent families. Coming from a Black family or a Latino family in comparison to a white family has a negative and significant association with calculus course-taking.

The inclusion of the family dynamics variable in Model 3 finds that all three have a significant association with calculus course-taking. Unlike for women, turbulence is a significant predictor of first year calculus course-taking for men (negative, $p<.001$).

Model 4 brings in the traditional socioeconomic family controls of parental income and education; only parents' education is significantly associated with taking calculus. Model 5 adds controls for high school type and high school sector finding a positive, significant association for having attended a private high school ($p<.001$) in comparison to a public high school. Thus far, neither the original associations of family structure and family background have altered, nor have the associations for family dynamics identified in model 3.

In the final model 6, prior academic preparation is represented by high school GPA and intensity of high school coursework. Both are positively and significantly

associated with taking calculus. Their addition also changes the Black family and parental involvement association to non-significance. The Latino family and private high school coefficients reduce in significance. Rural high school becomes significantly, negatively associated with taking calculus during first year of college.

In the full model, significant predictors of taking calculus during freshman year are single parent family, Latino family, experiencing family turbulence, parents' education, private high school, rural high school, high school GPA and high school coursework. In the final model, coming from a single parent family reduces men's of taking calculus during freshman year by 37%. Coming from a Latino family decreases men's odds by 43%. Controlling for all other variables in Model 4, experiencing family turbulence decreases men's odds of taking calculus by 24%. Parents' education, private high school, and high school preparation are positively associated with calculus taking, while coming from a rural high school in comparison to suburban high school results in lower odds of taking calculus during the first year of college.

**ssion Predicting Calculus Course Taking During First Year College for Men** (N=3,195)

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | | Model 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **b** | **(S.E.)** | **b** | **(S.E.)** | **b** | **(S.E.)** | **b** | **(S.E.)** | **b** | **(S.E.)** | **b** | **(S.E.)** |
| | -.628*** | (.121) | -.568*** | (.122) | -.496*** | (.129) | -.429*** | (.132) | -.459*** | (.134) | -.459** | (.145) |
| | -.232 | (.157) | -.219 | (.158) | -.012 | (.168) | -.040 | (.169) | -.039 | (.170) | -.077 | (.189) |
| | | | -.738*** | (.159) | -.762*** | (.164) | -.614*** | (.167) | -.574*** | (.170) | -.035 | (.185) |
| | | | -.984*** | (.205) | -.914*** | (.211) | -.825*** | (.213) | -.815*** | (.215) | -.561* | (.235) |
| | | | | | -.492*** | (.109) | -.439*** | (.111) | -.436*** | (.111) | -.278* | (.122) |
| | | | | | .100* | (.041) | .098* | (.041) | .097* | (.041) | -.015 | (.046) |
| | | | | | .666*** | (.050) | .574*** | (.052) | .564*** | (.052) | .308*** | (.060) |
| **rces** | | | | | | | | | | | | |
| | | | | | | | .044 | (.023) | .027 | (.023) | .036 | (.026) |
| | | | | | | | .140*** | (.028) | .132*** | (.029) | .200*** | (.032) |
| | | | | | | | | | .516** | (.172) | .428* | (.189) |
| | | | | | | | | | .226 | (.128) | .007 | (.143) |
| | | | | | | | | | -.161 | (.121) | -.025 | (.133) |
| | | | | | | | | | -.137 | (.093) | -.211* | (.104) |
| **n** | | | | | | | | | | | | |
| | | | | | | | | | | | 1.053*** | (.075) |
| | | | | | | | | | | | 2.745*** | (.041) |
| | -1.176*** | (.041) | -1.083*** | (.042) | -3.584*** | (.212) | -3.844*** | (.228) | -3.679*** | (.242) | -8.412*** | (.364) |
| | 31.173 | | 81.780*** | | 413.383*** | | 457.613*** | | 471.303*** | | 1224.629 | |

homore Cohort *** p<.001; ** p<.01; *p <.05

## DISCUSSION

While entering college may be considered a successful step towards postsecondary degree attainment, taking calculus coursework during first-year college may place students on a different career path than those who do not. Therefore, we need to gain a better understanding about who is taking calculus during their first year of college as well as potential reasons for why academically prepared students are not taking calculus. Previous studies have not considered family structure in studying the STEM pipeline in college.

Of particular concern among policy makers is the continued under-representation of women and minorities in math and science related fields. When running separate models for men and women, Tables 4.3 and 4.4 show that family structure and family dynamics do not explain away the negative association of coming from a Black family or Latino family in taking STEM coursework.[17] Parents' income and parents' education also do not explain the negative associations of Black family or Latino family. Only when controlling on prior academic preparation the associations of Black family and Latino family became not significant for women. For men, Latino family remains negative and significant.

For both men and women, there are significant relationships between family structure and taking STEM coursework. Women from a stepparent family seem less likely to take calculus during freshman year of college, experiencing a 60% reduction in odds, in comparison to women from two parent families when controlling on all other factors. Men experience a 37% reduction in odds when coming from a single parent

[17]In analysis not shown, I tested for family structure and family dynamics interaction effects by race and ethnicity and none were found.

family in comparison to men from two parent families.[18] Consistent with the above findings, there are significant interaction effects between single parent family and stepparent family with gender in Table 4A.

In examining whether family dynamics assist in predicting calculus course-taking, parental educational aspirations play an important role for both men and women. However, the association of parental involvement becomes not significant once prior academic achievement is controlled for both men. Parental involvement may not be a good predictor for entry into academically challenging fields because parents of high achieving, highly motivated students may decrease their academic involvement in later high school years as found in other research (Crosnoe 2001). In addition, experiencing family turbulence is always significant in predicting the likelihood of taking calculus for men, but not for women.

Surprisingly, parental income has no significant influence on the associations modeled for men, while parental income is a significant predictor of women's STEM course taking (positive, $p<.001$). Parental education is positively and significantly associated with course-taking for women ($p<.05$) and men ($p<.001$). Parental education plays a greater role in predicting men's STEM course taking than income, and the opposite is true for women. Parental income plays a greater role in predicting women's stem course taking than parental education.

In sum, by modeling family structure in predicting STEM coursework, I find that women may be at a disadvantage if they are from a stepparent family. Further, by running models separately by gender, I find that men may be at a disadvantage if they are from a single parent family in comparison to men to from two parent families. Men may also be

[18] The Pooled Table, 4A in the Appendix, shows that the associations of single parent family and stepparent family have significant gender interaction effects.

less likely to take calculus during freshman year of college if they experience a change in family structure between 10th and 12th grade. Parents' educational aspirations are an important aspect of family dynamics as they are positively and significantly associated with STEM coursework in college for both women and men.

If college entry may be considered a successful step towards an important credential, then entering some areas of study such as math and science related fields may be considered higher achievement within postsecondary education. In the next chapter, I examine college degree outcomes. A baccalaureate degree is vital to middle class status in U.S. society. Further, gaining access to STEM professions or further graduate study in STEM requires a STEM undergraduate degree. I explore these outcomes in Chapter 5.

# CHAPTER 5

# COLLEGE DEGREE

## INTRODUCTION

In Chapter 3 and Chapter 4, I explored the influence of family structure on early college processes. The complexity of preparing for and applying to college for a high school student requires a great deal of knowledge and information. Often, family plays the pivotal role in the continuation of education beyond high school given the extensive planning required. Yet, despite taking the correct high school coursework and college entrance exams, applying for financial aid and scholarships, visiting and applying at colleges, the path between high school and college is a "haphazard and uncertain" process for the average high school student (Boyer 1987). Not only may new high school students become lost in the transition, but they may also arrive to their new college to discover a bad fit or have to reconsider their rationale in selecting a school or college attendance altogether. Also, many college students simply do not understand how higher education institutions "work" because their parents and siblings either did not go to college or stay in college. Further, to stay to earn a baccalaureate degree requires long-term commitment and perseverance within the postsecondary education system. Nationally, more students leave prior to baccalaureate degree completion than those who stay.

This chapter examines whether there is a connection between postsecondary resilience and "family." In what ways might family structure and family processes influence long-term postsecondary outcomes for young adults? This research will help inform an interesting debate within higher education. Traditional student persistence

literature emphasizes students' disengagement from prior communities and integration into their postsecondary institution (Pascarella and Terenzini 1980; Boyer 1987; Bean 1982). "In a very real sense, their staying in college depends on their becoming leavers from their former communities (Tinto, p.443, 1988). Thus, postsecondary institutions "front load" first year students through programs and activities like student orientation, freshman week, first year experience courses or first year interest groups to help students' integration into the college. According to the student persistence literature, students gradually disassociate themselves from past communities associated with place of residence or high school as they become active members of their academic community (Tinto 1993; Pascarella and Terenzini; Boyer 1987; Bean 1982). However, there is also an area within the student persistence research that indicates a student's family can provide the crucial social support and the encouragement that makes persistence possible. Students' memberships with external communities are important and may play a key role in a student's persistence, especially if the student has weak institutional commitment or low educational goals (Tinto 1993).

Given today's patterns of postsecondary education attendance, family must play an important role for college student persistence and success. More than ever before, student participation is intermittent, multi-institutional, and part-time in higher education (Schneider 2001; Baker and Velez 1986). A study using the Beginning Postsecondary Student data reported that while 16% of their sample left the first year, 36 % returned within a year (Horn 1998; Adelman 1999). Nontraditional age students, first generation college students, and low income students continue to increase their postsecondary attendance. Of real concern is that the dropout rates in higher education are highest among this expanding pool of nontraditional students. "(The) fastest growing segment of the college enrollment pool is disproportionately comprised of students who are least

likely to succeed in postsecondary education" (Schneider 2001, p. 464). Many college preparatory programs for increasing the educational attainment among minority students now require parental involvement (Perna and Titus 2005). Parental involvement in these programs provides families with access to both information regarding higher education and an increase in social networks useful in planning and decision making.

An important consideration in college planning is financial support. Finances can affect student persistence in higher education directly by influencing students' educational goals in terms of whether they chose to attend college but also where they chose to enter college (Tierney 1980). An important debate continues concerning the effectiveness of community colleges. While some researchers find community colleges may "warm" up educational aspirations and promote positive outcomes for the students who are dependent on entering higher education at these institutions, others believe that community college have a "cooling out" process " (Swanson 1999; Pascarella et al. 2003). Some characterize the cooling process as a form of tracking that leads students who aspire to a baccalaureate degree subtly towards more modest goals. An estimated 20-60% of students who enter community colleges with plans to obtain a bachelor's degree are more likely to lower their long-term educational plans (Pascarella et al. 2003). In this chapter, it will be important to consider whether family structure influences degree attainment and whether place of institutional entry plays a prominent role.

Within sociology and education research, "intact family' status is recognized as bestowing social advantage that results in higher educational achievement and attainment ( Sandefur and McLanahan 1994; Crosnoe 2001; Csikszentmihalyi and Schneider 2000). Intact families are thought to have strong social bonds and a high level of parental involvement. In comparison, stepparent families are more likely to be characterized by fragile or strained social bonds (Cherlin and Furstenburg 1994). Stepchildren report less

communication with parents, a lower level of parental involvement, lower parental educational aspirations, and a higher level of conflict with parents (Amato and Booth 1997; Astone and McLanahan 1991). Adolescents from stepparent families leave home earlier than other groups (Goldscheider and Goldscheider 1989; Aquilino 1991; White and Booth 1985). Several studies claim that the parents' commitment of resources to children is weaker in stepfamilies (Sandefur, McLanahan and Wojtkiewicz 1992; Astone and McLanahan 1991; Hanson, McLanahan, Thomson 1996). Some studies find that stepparents are less willing to continue financial support for the pursuit of postsecondary education (Aquilino 1991; Astone and McLanahan 1991; Amato, Rezac, and Booth 1995.) Two parent families and their children have greater access to resources that may facilitate college enrollment in comparison to single parent families. This acts on two levels. First, single parents are constrained economically as well as in terms of time. Second, single parents may have less time to interact with their adolescents' especially in terms of their academic progress and have weaker social networks to access information regarding postsecondary education planning and processes.

Young adults from two parent families are at an advantage in comparison to stepparent families and single parent families in terms of social support, financial support, and knowledge about higher education. This translates into students being more likely to navigate and persist through higher education. According to life course theory, characteristics or events experienced in the family during adolescence like discord or divorce weakens the emotional bonds between parents and their adult children in later life (Amato and Booth 1997). This results in less contact, less assistance and less affection between young adults and parents which is pivotal in student persistence in college.

Parents' educational aspirations is an aspect of family dynamics that is a traditionally accounted for and a strong predictor of degree attainment. This chapter

explores whether parental involvement or experiencing a change in parental composition during high school is associated with attainment of a baccalaureate degree.

In Chapter 4, I examined the relationship between family structure and persistence in the STEM pipeline at college entry by predicting whether students would take calculus level math during their first year of college. This chapter examines the long-range outcomes of the first-year math coursework in terms of a STEM degree. While first-year math coursework provides access to advanced coursework within the math and sciences, completing a degree with a STEM major is essential for either graduate work or careers in STEM fields. Studying the STEM pipeline is important as it provides insight to stratification within higher education as well as continued stratification within society for women and minorities.

Persisting in the math and science majors may require a greater commitment from undergraduate students than other majors. Students must take coursework on time and in sequence, encounter a culture of deeply-embedded competition, and often the major has more credit hours for completion. Lipson and Tibias (1991) have argued that good students are being "turned off" from the math and sciences especially at the collegiate level. An estimated 40-50% of entering undergraduates planning to major in the math and sciences leave following their first year at college. In addition, only 60% of those who do declare a STEM major will graduate in those fields (Lipson and Tobias 1991). Some argue that this selection method is appropriate; that is, introductory courses in the math and sciences are rigorous, intimidating and competitive in order to select the most motivated, best and brightest. Seymour and Hewitt (1997) report that among undergraduates, 40% leave engineering programs, 50% leave physical and biological sciences, and 60% leave mathematics.

Striking, the math and science pipeline in college has continued to differ significantly by gender and race (National Center for Educational Statistics 1997; Davenport et al. 1998). Women leave the math and sciences at higher rate than men especially during the early undergraduate years (Stage and Maple 1996). Prior researchers apply socialization theory when explaining gender differences. Women have less interest and less confidence in their math abilities; these are gendered beliefs about self and the sciences (Hagendorn et al. 1999; Stage and Kloosterman; Stage and Maple 1996; Catsambis 1994). Even women's choice of major within the STEM areas suggest the STEM fields themselves are gendered with women more likely to enter the life sciences in comparison to math or engineering. Attrition rates within STEM fields are also disproportionately high for Blacks and Latinos. Across all STEM majors, white students have a reported attrition rate of 27% while Black students' attrition rate is close to 50% and almost two-thirds of Latino students leave a STEM major. This chapter will extend the study of its first student outcome, baccalaureate degree, to also study achieving a degree in a STEM field. Previous research on the choice of field has not examined family background beyond race and ethnicity or income.

The strength of using the HS&B: sophomore cohort data to study baccalaureate degree completion is that with the 1998 restricted release of their postsecondary transcripts data (PETS) I can study entering college and persistence as a long-term study. While it is a cohort study, it follows them for approximately 12 years following high school graduation, until they are approximately 30 years old. This is important because it captures students who enter postsecondary education after a delay. According to a study using Beginning Postsecondary Education Study, another National Center for Educational Statistics Dataset which follows student who entered higher education, 27% of students were over 20 years of age during their first year of college and almost 10%

were over 30 years (Berkner, Cuccaro-Alamin, and McCormick 1996). An additional strength of the using the PETS data is that I can study higher educational persistence beyond a given institution and I study students who leave and re-enter higher education. Approximately 54% of students attended more than one institution during the 1980s and during 2000 an estimated 60% of higher education students attend more than one postsecondary institution. Fortunately, I am able to study student persistence over 11 years following high school and across institutional boundaries.

In sum, I investigate these following questions. What is the influence of parental family structure on attainment of baccalaureate degree and degree in a STEM field? Is there a disadvantage for students from nonintact families in comparison to two parent families in college persistence and will family income, parents' education, family turbulence, parental involvement and parental educational aspirations appear to explain the disadvantage? What are the influences for women and men? Are there race/ethnicity interaction effects?

## ANALYTIC TECHNIQUE

In this chapter, I use multiple logistic regression modeling to estimate the odds of earning a baccalaureate degree and baccalaureate degree in a STEM field. I examine the associations of adolescent family structure, family dynamics and family background with earning a college degree. In addition, I control for student's prior academic preparation and entry into postsecondary education at a four-year institution.

The measure of baccalaureate degree attainment is constructed from a measure of respondent's highest level of educational degree obtained by 1993, approximately when the respondents were 29 years of age. The measure for STEM degree attainment is represented by baccalaureate degrees earned in the four "major" categories in the math

and sciences in PETS: engineering, physical science, math and computer science, and life science.

As in chapter 4, I collapse the categories of mother only and father only into "Single parent Family" and mother stepfather and father stepmother into "Stepparent Family." Quality and intensity of high school curriculum remains as a measure of pre-college academic preparation. According to Adelman (1999), previous researchers found the high school curriculum measure to be most accurate and largest determinant of college degree. I control for high school type in predicting baccalaureate degree. However, high school sector is never significantly associated with baccalaureate degree and are excluded from all analysis. Similarly, when predicting baccalaureate degree in a STEM field neither high school type nor high school sector are included in the models as neither are significantly associated with predicting a STEM degree.

In predicting baccalaureate degree, entry through a four-year institution is included in the final model. In predicting baccalaureate degree in a STEM field, both entry through a four-year institution as well as taking STEM coursework during the first year of college are examined in separate models.[19]

Only students who entered a postsecondary institution are included in the sample. I employ a postsecondary weight (PSEWT1) and all analysis presented are weighted

[19] I determined four-year institutional status using their Carnegie classification codes as well as two constructed variables in PETS.

## SAMPLE

Weighted descriptive statistics of the analysis variables of the full sample are shown in Table 5.1. Of the 6,951 students who entered a postsecondary institution, 3,086 will graduate with at least a baccalaureate degree in the time period of over a decade following high school. Further, 680 students will graduate with a baccalaureate degree in a math and science related field. In the HS&B sophomore cohort, men who enter a postsecondary institution are more likely to receive a baccalaureate degree than are women (42.2% vs. 36.8%) and men are much more likely to major in a STEM field (14.3% vs. 4.9%). A higher proportion of postsecondary students from two parent families (43.3%) earn baccalaureate degrees in comparison to students from single parent families (34.4% and stepparent families (30.1%). Similarly, 6.6% of single parent family students and 5.5% of stepparent family students earn a STEM degree in comparison to 10.6% of two parent family students. Differences appear by race and ethnicity with a higher percentage of whites (43.3%) graduating with a baccalaureate degree in comparison to Blacks (21%) and Latinos (20.3). A greater percentage of whites (10.%) earn a degree in a STEM field compared to Blacks (4.9%) and Latinos (4.9%) as well.

**Table 5.1 Weighted Descriptive Statistics for Analysis Variables**

| | Total Sample (N=6951) | Baccalaureate Degree (N=3086) | STEM Degree (N=680) |
|---|---|---|---|
| Variables | Percentage Reported | | |
| Two parent family | 69.1 | 43.3 | 10.6 |
| Single Parent family | 16.0 | 34.4 | 6.6 |
| Stepparent family | 7.7 | 30.1 | 5.5 |
| Male | 44.9 | 42.2 | 14.3 |
| Female | 55.1 | 36.8 | 4.9 |
| White | 82.9 | 43.0 | 10.0 |
| Black | 11.0 | 21.0 | 4.9 |
| Latino | 6.0 | 20.3 | 4.9 |
| Public | 86.9 | 36.4 | 8.8 |
| Private | 4.2 | 68.5 | 10.2 |
| Catholic | 8.9 | 52.7 | 11.4 |
| Urban | 18.6 | 31.8 | 6.4 |
| Suburban | 51.0 | 43.3 | 10.0 |
| Rural | 30.4 | 37.0 | 9.2 |
| Experienced Turbulence | 22.8 | 29.3 | 5.7 |
| | | Mean (SD) | |
| Parental Income | 4.912 (2.313) | 5.378 (2.084) | 5.197 (2.015) |
| Parental Education | 2.522 (1.719) | 3.121 (1.665) | 3.065 (1.724) |
| Parental Ed. Aspirations | 3.824 (1.158) | 4.219 (.747) | 4.280 (.709) |
| Parental Involvement | .090 (1.107) | .240 (.991) | .209 (1.075) |
| H.S. GPA | 2.716 (.827) | 3.052 (.718) | 3.188 (.746) |
| H.S. Coursework Intensity | 3.624 (1.743) | 4.306 (1.606) | 4.585 (1.677) |

*Source:* PETS and HS&B: Sophomore Cohort

## RESULTS

### Baccalaureate Degree

#### *Women*

Of interest in Model 1 are the associations of family structure and family background with attainment of a baccalaureate degree. In addition to modeling the main effects of family structure and family background, the interaction effects of family structure by race/ethnicity are also shown. Single parent family ($p<.001$) and stepparent family ($p<.001$) are negatively associated with baccalaureate degree attainment in comparison to two parent family. Black students and Latino students have lower odds of earning a baccalaureate degree in comparison to white students. There is a positive, significant interaction effect of Black single parent family ($p<.05$).

Model 2 includes family turbulence, parental involvement, and parents' educational aspirations as measures of family dynamics as well as the interaction effects of family dynamics by race and ethnicity. Single parent family and stepparent family remain negatively associated with earning a bachelor's degree. Once I control for the interaction terms, the main Latino coefficient becomes positive, although only borderline in significance in its association with baccalaureate degree. Both Black parent's educational aspirations and Latino parent's educational aspirations are negative and significantly associated with baccalaureate degree attainment. The interpretation for the interaction terms are that white parent's educational aspirations' have a more advantageous effect on their children's educational attainment in comparison to Black and Latino parents' educational aspirations on their children's educational attainment.

**Table 5.2 Logistic Regression Predicting Baccalaureate Degree for Women** (N=3,756) *Source: PETS and HS&B*

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **b** | **S.E.** | **b** | **(S.E.)** | **b** | **(S.E.)** | **b** | **(S.E.)** |
| **Family Structure (ref. 2 par)** | | | | | | | | |
| Single Parent Family | -.269*** | (.092) | -.274** | (.105) | -.269* | (.117) | -.230 | (.129) |
| Stepparent Family | -.495*** | (.116) | -.406** | (.130) | -.390** | (.140) | -.178 | (.153) |
| **Family Background** | | | | | | | | |
| Black | -1.215*** | (.139) | .451 | (.602) | .325 | (.638) | .382 | (.675) |
| Latino | -1.075*** | (.162) | 1.394$^{t}$ | (.725) | 1.706* | (.764) | 1.716* | (.814) |
| **Family Structure Interactions** | | | | | | | | |
| Black Single Parent Family | .519* | (.233) | .597* | (.245) | .796** | (.259) | .722* | (.275) |
| Latino Single Parent Family | -.276 | (.501) | -.410 | (.510) | -.530 | (.531) | -.515 | (.562) |
| Black Stepparent Family | .351 | (.376) | .346 | (.392) | .586 | (.408) | .455 | (.438) |
| Latino Stepparent Family | -.273 | (.748) | -.037 | (.772) | .061 | (.786) | .082 | (.852) |
| **Family Dynamics** | | | | | | | | |
| Turbulence | | | -.360*** | (.087) | -.327*** | (.094) | -.344*** | (.101) |
| Parental Involvement | | | .189*** | (.039) | .179*** | (.041) | .154*** | (.045) |
| Parents' Ed. Aspirations | | | 1.036*** | (.044) | .800*** | (.048) | .567*** | (.053) |
| **Family Dynamics Interactions** | | | | | | | | |
| Black Parental Ed. Aspirations | | | -.467*** | (.173) | -.376** | (.146) | -.401** | (.154) |
| Latino Parental Ed. Aspirations | | | -.640*** | (.137) | -.644*** | (.183) | -.620** | (.195) |
| **Family Background Resources** | | | | | | | | |
| Parents' Income | | | | | .024 | (.020) | -.004 | (.022) |
| Parents' Education | | | | | .340*** | (.026) | .280*** | (.028) |
| **H.S. Type (ref. Public)** | | | | | | | | |
| Private H.S. | | | | | .707*** | (.178) | .469* | (.192) |
| Catholic H.S. | | | | | .278* | (.115) | .200 | (.124) |
| **Prior Academic Preparation** | | | | | | | | |
| H.S. Coursework | | | | | .408*** | (.025) | .310*** | (.027) |
| **Postsecondary Entry** | | | | | | | | |
| 4-year institution | | | | | | | 1.979*** | (.078) |
| Intercept 1 | -.269*** | (.035) | -4.145*** | (.180) | -5.899*** | (.229) | -5.388*** | (.244) |
| Chi-Square Likelihood Ratio | 220.526*** | | 1186.502*** | | 1791.237*** | | 2476.845*** | |

**Table 5.3 Logistic Regression Predicting Baccalaureate Degree for Men** (N=3,195)

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **b** | **(S.E.)** | **b** | **(S.E.)** | **b** | **(S.E.)** | **b** | **(S.E.)** |
| **Family Structure (ref. 2 par)** | | | | | | | | |
| Single Parent Family | -.186* | (.091) | -.087 | (.100) | -.072 | (.109) | -.166 | (.118) |
| Stepparent Family | -.473*** | (.135) | -.280 | (.147) | -.353 | (.155) | -.204 | (.169) |
| **Family Background (ref. white)** | | | | | | | | |
| Black | -.905*** | (.122) | 1.919** | (.658) | 1.997** | (.682) | 1.885* | (.755) |
| Latino | -1.090*** | (.152) | -.118 | (.691) | .044 | (.712) | .401 | (.734) |
| **Family Dynamics** | | | | | | | | |
| Turbulence | | | -.338*** | (.089) | -.263 | (.091) | -.124 | (.147) |
| Parental Involvement | | | .222*** | (.037) | .186*** | (.040) | .148*** | (.043) |
| Parents' Ed. Aspirations | | | .783*** | (.044) | .551*** | (.047) | .323*** | (.052) |
| **Family Dynamics Interactions** | | | | | | | | |
| Black Parental Expectations | | | -.697*** | (.158) | -.630*** | (.164) | -.620*** | (.181) |
| Latino Parental Expectations | | | -.234 | (.167) | -.214 | (.174) | -.255 | (.180) |
| Black Parental Involvement | | | -.404** | (.125) | -.384** | (.133) | -.303* | (.143) |
| Latino Parental Involvement | | | -.128 | (.164) | -.201 | (.167) | -.114 | (.188) |
| **Family Background Resources** | | | | | | | | |
| Parents' Income | | | | | .017 | (.020) | .020 | (.022) |
| Parents' Education | | | | | .211*** | (.026) | .188*** | (.029) |
| **H.S. Type (ref. Public)** | | | | | | | | |
| Private H.S... | | | | | .906*** | (.184) | .714*** | (.198) |
| Catholic H.S. | | | | | -.042 | (.125) | -.199 | (.135) |
| **Prior Academic Preparation** | | | | | | | | |
| H.S. Coursework | | | | | .429*** | (.025) | .368 | (.027) |
| **Postsecondary Entry** | | | | | | | | |
| 4-year institution | | | | | | | 1.902*** | (.081) |
| | | | | | | | | |
| Intercept 1 | -.124*** | (.037) | -3.045*** | (.179) | -4.577*** | (.219) | -4.471*** | (.235) |
| Chi-Square Likelihood Ratio | 133.461 | | 682.259*** | | 1134.123*** | | 1729.549*** | |

***Source:*** **PETS and HS&B: Sophomore Cohort *** p<.001; ** p<.01; *p <.05**

Model 3 includes controls for parents' education and income as well as prior college academic influences. Parents' education has a positive association ($p<.01$) with baccalaureate degree for college women, but parental income is not significant when controlling for family structure, family background, family dynamics, and prior college preparation. High school coursework has a positive association with baccalaureate degree and students who attended a private or Catholic high school have higher odds of graduating in comparison to students from public high schools.

After I control for postsecondary entry in a four-year institution in Model 4, single parent family and stepparent family are no longer significant. The type of postsecondary institution that a student first attends explains the negative associations of non-intact family structure and baccalaureate degree. The influence of single parent family and stepparent family on earning a bachelor's degree is indirect through institutional type. The interaction measure of Black single parent family remains positive and significantly associated with college degree. All measures of family dynamics remain significantly associated with baccalaureate degree, as well as the family dynamics interaction effects of Black and Latino parents' educational aspirations.

Of the family background resources, parents' education ($p<.001$) is positively associated with baccalaureate degree, while parents' income is not. Students who attended a private high school have higher odds of earning a baccalaureate degree in comparison to student who attended a public high school. Quality and intensity of high school curriculum and four-year college entry are positively associated with baccalaureate degree.

***Men***

In the baseline Model 1, single parent family and stepparent family are negatively associated with baccalaureate degree completion in comparison to two parent family.

Black students and Latino students have lower odds of a completing baccalaureate degree in comparison to white students. For men, the significant association of family structure and college degree will be quickly explained in the following models and family structure will remain no longer significantly associated with baccalaureate degree. However, the associations between family dynamics and college degree are interesting.

Model 2 adds in three measures for family dynamics: family turbulence; parental involvement; and parental educational aspirations. All three are statistically significant predictors of degree attainment at the $p<.001$; experiencing family turbulence decreases the odds of degree attainment and parental involvement and parents' educational aspirations are positively associated with degree attainment. In analysis not shown, controlling for either turbulence or parental involvement removes the significance of single parent family in comparison to two parent family in predicting baccalaureate degree. The cumulative effect of controlling for turbulence, parental involvement and parents' educational aspirations removes the significance of stepparent family in comparison to two parent family in predicting baccalaureate degree. Therefore, the influence of family structure on earning a bachelor's degree is indirect through family dynamics for men.

Model 2 also includes the interaction effects of family dynamics and race/ethnicity. Black parental expectations ($p<.001$) and Black parental involvement ($p<.01$) are negative. The interpretation for these results are that high levels of educational expectations and parental involvement for Blacks do not have as beneficial of an influence on their children's educational attainment as white parental expectations and white parental involvement have on their children's educational attainment.

Model 3 takes into account family background resources as measured by parents' income and education and prior college academic influence by controlling for high school

type and high school academic curriculum. While parental income does not have a significant association with baccalaureate degree controlling upon the other variables, parental education is positively associated with baccalaureate degree completion ($p<.001$). Attending a private high school increased students' odds by 2.78 of earning a baccalaureate degree in comparison to students who attended a public high school. High school academic coursework is a positive significant predictor of earning a baccalaureate degree ($p<.001$). In exploratory analysis not shown, none of the additional variables in Model 3 removed the significance of turbulence. Instead, it is only when I control for family background resources, high school type, and prior academic preparation that experiencing turbulence prior to college is no longer significantly associated with college degree. Controlling for the variables in Model 3, students who experienced family turbulence do not have significantly different odds of earning a college degree.

Model 4 incorporates the measure of entry into postsecondary education through a four-year institution. In the full model, significant predictors of baccalaureate degree are Black (positive, $p<.05$), parental involvement (positive, $p<.001$), parents' educational aspirations (positive, $p<.001$), Black parents' educational aspirations (negative, $p<.001$), Black parental involvement (negative, $p<.05$), parents' education (positive, $p<.001$), private high school (positive, $p<.001$) and four-year college entry (positive, $p<.001$).

**STEM Degree**

The literature has established large gender differences in persistence to a STEM degree; women are substantially less likely to earn a STEM degree. Tables 5.3 and 5.4 each present three models predicting the odds of earning a baccalaureate degree in a STEM field by gender. The purpose of running the models separately is to gain greater understanding of within category differences. That is, this analysis does not directly

compare women to men, but considers what might be the important predictors for women and what might be the important predictors for men for earning a STEM degree. Appendix Table 5B is the pooled analysis for both men and women.

First year STEM coursework acts as a gatekeeper to advanced coursework and STEM degree attainment. Alternatively, entry into a four-year institution may represent greater stability in postsecondary education attendance that allows students to pursue challenging fields. Taking STEM coursework during first year of college and entry through a four-year institution are modeled separately in predicting likelihood of earning a baccalaureate degree in a STEM field. I investigate, in part, whether the college entry and first year coursework have similar influences on the association between family structure and STEM degree. Additionally, I examine which measure appears to be a stronger predictor of STEM degree.

***Women***

In the first model for women, neither single parent family nor stepparent family have a significant direct association with earning a STEM degree. In analysis not shown, single parent family was previously significant in comparison to two parent family, but was explained by family turbulence. Stepparent family was never significant. All three measures of family dynamics are significant predictors of a earning a STEM degree in model 1. Experiencing family turbulence is negatively associated ($p<.05$) with a STEM degree, while parental involvement ($p<.05$) and parents' educational aspirations ($p<.001$) are positively associated with earning a STEM degree. Parental income is negatively associated ($p<.05$) with STEM degree. This is consistent with other research. While I can not address this with my research, students from high income families may choose to enter other rewarding fields like business or high family income may reduce financial motivation to enter STEM related fields. Parental education ($p<.01$) and quality and

intensity of high school curriculum (p<.001) are both positively associated with the likelihood of earning a STEM degree.

Model 2 adds in a control for four-year college entry which is positively associated (p<.001) to earning a STEM degree. Entering a four-year college increase women's odds of STEM degree completion by 3.06 in comparison to students who began their postsecondary education at another type of institution. Once I account for four-year college entry, parental involvement is no longer significant and parental education reduces in significance. The stepparent coefficient becomes positive, but remains not significant.

Model 3 adds in the variable of taking STEM coursework during 1st year of college which is positively associated with earning a STEM degree. In comparing Model 3 to Model 1, single parent family becomes significant in its association (negative, p<.05) with earning a STEM degree. The stepparent coefficient is positive, but not significant. Coming from a single parent family in comparison to a two parent family for women, lowers their odds of earning a STEM degree by 39 %.

In Model 3, parental involvement is no longer significant, but turbulence (negative, p<.05) and parents' educational aspirations (p<.001) remain as significant associations. Parents' income remains negatively associated (p<.001) with STEM degree and parents' education positively associated (p<.05). Taking calculus during the first year of college increases women's odds of earning a STEM degree by 14.87 in comparison to students who did not take calculus during their first year of college.

**Table 5.4 Logistic Regression Predicting Baccalaureate Degree in STEM Field for Women** (N=3,756)

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| **Variables** | **b** | **S.E.** | **b** | **(S.E.)** | **b** | **(S.E.)** |
| **Family Structure (ref. 2 par)** | | | | | | |
| Single Parent Family | -.362 | (.221) | -.367 | (.223) | -.497* | (.238) |
| Stepparent Family | -.012 | (.249) | .085 | (.251) | .426 | (.268) |
| **Family Background (ref. white)** | | | | | | |
| Black | -.197 | (.231) | -.074 | (.233) | .276 | (.248) |
| Latino | -.493 | (.379) | -.386 | (.382) | -.261 | (.398) |
| **Family Dynamics** | | | | | | |
| Turbulence | -.521* | (.203) | -.490* | (.204) | -.511* | (.215) |
| Parental Involvement | .180* | (.085) | .155 | (.086) | .100 | (.090) |
| Parents' Ed. Aspirations | .622*** | (.099) | .489*** | (.105) | .375*** | (.108) |
| **Family Background Resources** | | | | | | |
| Parents' Income | -.079* | (.039) | -.095* | (.039) | -.152*** | (.043) |
| Parents' Education | .172*** | (.049) | .125* | (.049) | .150** | (.054) |
| **Prior Academic Preparation** | | | | | | |
| H.S. Coursework | .458*** | (.052) | .373*** | (.053) | .213*** | (.054) |
| **Postsecondary Entry** | | | | | | |
| 4-year institution | | | 1.117*** | (.181) | | |
| Took STEM Coursework 1st year | | | | | 2.699*** | (.163) |
| Intercept 1 | -7.354*** | (.470) | -6.986*** | (.482) | -5.863*** | (.484) |
| Chi-Square Likelihood Ratio | 254.145 | | 297.881*** | | 560.189*** | |

***Source:*** **PETS and HS&B: Sophomore Cohort**

*** p<.001; ** p<.01; *p <.05

***Men***

In the first model for men, coming from either a single parent family ($p<.05$) or a stepparent family ($p<.001$) is associated with lower odds of earning a STEM degree. Controlling on all other variables, in comparison to students from two parent families, coming from a single parent family is associated with a 29 % decrease in odds and coming from a stepparent family is associated with a 50% in decrease in odds of earning a STEM degree. As tested in the pooled Table 5B in the appendix, the negative association of stepparent family in comparison to a two parent family for men will be significantly different than it is for women. Men are at a greater disadvantage in earning a STEM degree if they are from a stepparent family.

Both Black and Latino family are negative and significant in comparison to white family in predicting STEM degree in the first model. Of the family dynamics measures, only parents' educational aspirations are significantly associated with earning a STEM degree; higher parental aspirations are associated with an increase in odds of earning a STEM degree.

As found with women, parental income is negatively associated ($p<.01$) with earning a STEM degree. Parental education ($p<.01$) and high school curriculum ($p<.001$) is positively associated with STEM degree.

In the inclusion of four-year college entry in Model 2, changes the association of Latino and STEM degree to become no longer significant. Single parent family and parental income increase in significance and parental education decreases in significance. Four-year college entry is positively related ($p<.001$) to earning a STEM degree. Students who enter postsecondary education at a four-year institution have an increase in

odds by 2.79 of completing a STEM degree in comparison to students who did not attend a four-year institution.

Model 3 adds in the variable of taking STEM coursework during 1st year of college which is positively associated with earning a STEM degree. In comparing Model 3 to Model 1, stepparent family remains negative and significant ($p<.001$) and single parent family becomes not significant in its association with earning a STEM degree.

Being from a stepparent family in comparison to a two parent family for men decreases the odds of earning a STEM degree by 58%. Latino family and parent's education are no longer significant predictors of STEM degree once first year college coursework is controlled upon. Taking calculus coursework during the first year of college increases students odds of earning a STEM degree by 12.5 in comparison to students who did not take calculus coursework during first year of college. In Model 3, significant predictors of STEM degree for men are stepparent family, Black family, parents' educational aspirations, parent's income, high school curriculum, and first-year STEM coursework.

**Table 5.5 Logistic Regression Predicting Baccalaureate Degree in STEM Field for Men (N=3,195)**

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| **Variables** | **b** | **S.E.** | **b** | **(S.E.)** | **b** | **(S.E.)** |
| **Family Structure (ref. 2 par)** | | | | | | |
| Single Parent Family | -.339* | (.149) | -.403** | (.151) | -.126 | (.166) |
| Stepparent Family | -.704** | (.243) | -.618* | (.246) | -.874*** | (.263) |
| **Family Background (ref. white)** | | | | | | |
| Black | -.657** | (.211) | -.624** | (.213) | -.608** | (.228) |
| Latino | -.566* | (.244) | -.449 | (.248) | -.374 | (.266) |
| **Family Dynamics** | | | | | | |
| Turbulence | -.228 | (.127) | -.179 | (.128) | -.061 | (.140) |
| Parental Involvement | .045 | (.048) | .011 | (.048) | .015 | (.053) |
| Parents' Ed. Aspirations | .439*** | (.064) | .315*** | (.067) | .302*** | (.072) |
| **Family Background Resources** | | | | | | |
| Parents' Income | -.084** | (.027) | -.089*** | (.027) | -.108*** | (.030) |
| Parents' Education | .100** | (.033) | .071* | (.034) | .034 | (.038) |
| **Prior Academic Preparation** | | | | | | |
| H.S. Coursework | .368*** | (.034) | .302*** | (.034) | .133*** | (.036) |
| **Postsecondary Entry** | | | | | | |
| 4-year institution | | | 1.024*** | (.111) | | |
| Took STEM Coursework 1st year | | | | | 2.527*** | (.112) |
| Intercept 1 | -4.733*** | (.289) | -4.503*** | (.293) | -3.980*** | (.317) |
| Chi-Square Likelihood Ratio | 339.986 | | 432.068*** | | 928.248*** | |

***Source:*** **PETS and HS&B: Sophomore Cohort**

*** p<.001; ** p<.01; *p <.05

## DISCUSSION

Attainment of a bachelor's degree is essential for access into prestigious occupational positions, occupations with higher ladders of promotion and greater benefits, and reaching the middle class in the U.S. This chapter examined whether family structure influences long-term educational involvement and persistence. For men, both single parent and stepparent family have a negative association with degree completion in comparison to college students from two parent families, but once family dynamics are controlled for, no family structure effects are found. For women, single parent family adolescents and stepparent family adolescents have statistically significant lower odds of degree completion relative to adolescents from two parent families, but the negative association is explained by four-year institutional entry. The influence of single parent and stepparent family acts similarly for men and women on earning a college degree as shown in Appendix Table 5A; both types of family structure are negatively associated with degree completion in comparison to two parent families for men and women.

I find the results of family dynamics and the family interactions in the models intriguing. For men, the influence of parental expectations and parental involvement differs between Blacks and whites. For women, the effect of parental involvement for Blacks and Latinos differs from whites. Once family dynamics are controlled for, Latinos have higher odds in comparison to whites of degree attainment. Parental involvement measured during high school and parents educational aspirations are significant predictors or degree completion ($p<.001$) for both men and women. Turbulence is only negatively associated with degree completion for women.

For both men and women, when controlling for family structure, race/ethnicity, family dynamics and prior college academic preparation, I find a significant association

between parent's education and baccalaureate degree. There is not a significant association between parent's income and baccalaureate degree.

In predicting degree attainment in a STEM field, taking calculus during the first year of college is extremely important. For women, taking calculus level math resulted in an increase in odds by 14.87 and for men and increase in odds by 12.5 in comparison to students who did not take calculus. Other significant predictors of earning a STEM degree for women were single parent family, four-year college entry, parent's education and income, pre-college academics, parental educational aspirations and experiencing family turbulence between $10^{th}$ and $12^{th}$ grades. Significant predictors of earning a STEM degree for men are stepparent family, Black, parents' educational aspirations, parents' income, and high school coursework. I find a significant stepparent gender interaction effect as shown in the pooled table 5B. Men are at a greater disadvantage if from a stepparent family in earning a STEM degree. This contrasts with the earlier finding that women are at the greater disadvantage if from a stepparent family in predicting taking calculus during first year college.

In analyzing what predicts completing a STEM degree for men and women, all are related to a pre-college social context and significant effects remain including that of family structure and family dynamics. In addition, parental involvement, while not significant in the models surely assisted with prior academic preparation and decisions regarding institutional choice. Perhaps this is better captured by the parental educational aspirations measure when predicting STEM degree. Also, as proposed by some (Crosnoe 2001), parents of high achieving high school students may disengage earlier and demonstrate lower levels of parental involvement during later high school.

Interestingly, turbulence is significant for women and not for men when predicting baccalaureate degree and degree in a STEM field. This is an area for further

study. Do women from single parent homes chose majors that move them more quickly through the postsecondary system? Does experiencing turbulence result in a strain to social resources and social support, reducing the likelihood of either navigating through the college years or pursuing more challenging fields? Could it be that the effect of experiencing turbulence for women during adolescence results in lower self-esteem which later connects with societal messages regarding women's math ability in college, leading to lower rates of STEM degree? These are just a few possible avenues for further study.

For men, both single parent family and stepparent family is initially found to be associated with lower odds of STEM degree. However, when taking STEM coursework is controlled for in Model 2, the significant association disappears for single parent family. Stepparent family remains negative and significant ($p<.001$) in comparison to two parent families. Both Black and Latino were significantly associated with earning a STEM degree, but once four-year institution or taking STEM coursework were controlled for the negative association is explained.

The results indicate the need for greater support to college preparatory programs that involve parents early in their children's educational career. The strategies chosen by parents and their children will have long-term consequences for children's lives. Many parents have high educational aspirations for their children, but do not understand how to assess the information or the institutions. For most untraditional students, such as first generational college students, many parents focus on the admissions process without gaining knowledge about the subsequent career selection process. These results also indicate that researchers should further study how family dynamics influence the transition into young adulthood including college. In addition, the interactions between race and ethnicity and family dynamics deserve further attention.

# CHAPTER 6

# SUMMARY AND CONCLUSION

With this research, I set out to analyze the influence of family structure during adolescence on college entry and success. This project builds on previous studies of social mobility and status attainment (Blau and Duncan 1967; Sewell, Haller and Portes 1969), student postsecondary persistence (Tinto 1993; Tinto 1980; Pascarella and Terenzini 1980; Pascarella 1980), the influence of family structure on secondary educational achievement (McLanahan and Sandefur 1994) and the transition to young adulthood (Cherlin, Kiernan and Chase-Lansdale 1995; Amato and Booth 1997). In addition, throughout this study I use the concept of social support to propose that family of origin not only influences adolescents' preparation for higher education, but also their ability to commit to and persevere within higher education. Given the high correlation between family structure and the quality of intergenerational relations (White 1992, Aquilino 1991, White and Booth 1985), family structure serves as a indicator of social support available to adolescents when making the decisions to attend college and completing a four-year degree.

My theoretical framework for studying the relationship between family structure and higher education success proposes that both parental resources and family dynamics may disrupt parents' ability or willingness to provide social support to adolescents during these crucial times. Using the concept of family dynamics, I attempt to learn more about the social processes that occur within families and how they might account for the disadvantage adolescents from non-intact families experience in higher education. My measures of family dynamics are family disruption, parental involvement, and parent's

educational education. Researchers today recognize the importance of parental involvement in student's educational success (Crosnoe 2001), yet few researchers study the influence of family dynamics beyond parental aspirations for postsecondary student outcomes.

The literature provides ample evidence that the life course of parents and children are linked in ways that could have severe consequences for children's long-term wellbeing; growing up in a single parent family or stepparent family is associated with lower levels of well-being and poorer life outcomes than growing up in a two parent family (Cherlin 1999). Although previous researchers have established that family structure and secondary education achievement and attainment are linked (McLanahan and Sandefur 1994; Astone and McLanahan 1992; Coleman 1988) only a few researchers study the influence of family structure on postsecondary education and they are likely to only predict college entry (McLanahan and Sandefur 1994). This research predicts the student outcomes of college entry, baccalaureate degree, college coursework and choice of field and addresses the complexity of stratification within higher education. This project is one of the first to use the PETS data and also to examine the association of family structure and the STEM pipeline in postsecondary education. By examining the type of college attended and the field of study chosen, this study expands the traditional measures of higher education success. Additionally, I model single parent and stepparent families separately, as these relationships within education should be studied with attention to the theoretical and empirical understanding of the specific family types. While both single parent family and stepparent family structure may provide a disadvantage in comparison to two parent family for college students, the dynamics within these families are quite distinct and the source of disadvantage may be different for students from these families.

The findings in this research indicate that single parent families and stepparent families should be analyzed as distinct groups for greater accuracy and understanding. Moreover, parental involvement, turbulence, and parental expectations as measured in high school influence the life course of young adults in their postsecondary education pursuits. This research contributes significantly to our understanding of families, family processes and higher education conceptually, and its findings have implications.

## SUMMARY OF FINDINGS FROM ANALYTIC CHAPTERS

### College Entry

In Chapter 3, I predict college entry as an ordered dependent variable. Baccalaureate degree aspirants who enter higher education through community colleges, delay college entry or attend part-time experience lower degree attainment (Baker and Velez 1996, Dougherty 1987; Dougherty 1992; Monk-Turner 1990). Thus, college entry with advantage considers the timing of college entry, the type of college entry and enrollment patterns to create three categories: no college entry; college entry with disadvantage; and college entry with disadvantage.

In Chapter 3, I explore whether a disadvantage exists for high school graduates from non-intact families compared to high school graduates from two parent families in college entry. I also examine what might explain any disadvantage found with particular interest in family dynamics and family resources. In addition, are interaction effects found by race and ethnicity?

*Family Structure*

There are differences in the relationship between family structure and college entry by gender. Except for Black single parent family, there are no other associations between family structure and college entry for men. However, for women, all forms of

single parent and stepparent families are negatively associated with college entry in comparison to two parent family. By controlling for family dynamics, the negative associations for mother only and father only and college entry becomes not significant, indicating an indirect relationship between single parent family structure and college entry through family dynamics. In the full model, women from mother stepfather families have an 18% decrease in odds and father stepmother families have a 50% decrease in odds of college entry (versus no college entry) and college entry with advantage (versus no college entry and college entry with risk) in comparison to adolescents from two parent families.

*Family Dynamics*

For men, experiencing a change in parental composition between 10$^{th}$ and 12$^{th}$ grade of high school (turbulence) is negatively associated ($p<.001$) with college entry until academic preparation is accounted for. In comparison, for women experiencing turbulence during late high school will remain negatively associated ($p<.01$) with college entry.

Parental educational aspirations are strong predictors of college entry for both men and women. The importance of this measure of family dynamics has been well documented in the status attainment and social mobility, although it appears framed in the family resource model in the previous literature. Last, parental involvement is positively associated for men ($p<.01$) and women ($p<.001$) in the full models.

During the investigation in Chapter 3, I also found differences in family dynamics and college entry by race and ethnicity. In the final model for women, Latino parental involvement ($p<.01$) and Latino parents' educational aspirations ($p<.05$) are negatively associated with college entry. High levels of parental involvement and educational aspirations by Latino parents are associated with lower odds of college entry (versus no

college entry) and college entry with advantage (versus college entry with risk or no entry) in comparison to the high levels of parental involvement and educational aspirations by white parents and their children's odds of college entry and college entry with advantage. Although parent's income and education are controlled for, there likely are unaccounted differences between the Latino and white families. Future research could explore first generation college student status. As Boyer has described the transition between high school and college as haphazard and uncertain, differences in parents' access to information in college planning is another area for future research.

*Family Resources*

Parents' income and education are positive and significantly associated with college entry for both men and women. For men, parents' income is significant at $p<.05$ while parents education is significant at $p<.001$. For women, both are significant at $p<.001$.

*Race/Ethnicity*

After accounting for differences in family dynamics by race and ethnicity, the negative association of Black and Latino and college entry reduces to nonsignificance for women. For men, there are negative, significant associations of Black and Latino in comparison to whites as well as Black mother only family in comparison to white mother only family in predicting college entry. Once family dynamics are introduced into the model, the black mother only coefficient reduces to nonsignificance. When differences in family dynamics by race and ethnicity are accounted for through the interaction variables, the Black and Latino coefficients become positive but not significant.

**Baccalaureate Degree**

Most studies of postsecondary education attainment have been limited by focusing on immediate college entry, persistence within a single institution, or following a cohort for only a short period of time. In Chapter 5, I predict earning a baccalaureate degree which investigates the long-term persistence of the HS&B sophomore cohort for approximately eleven years following high school.

*Family Structure*

For women, intact family status has an advantage over single parent and stepparent family status in predicting college degree by influencing students' entry into more selective institutions. A negative, direct association for single parent and stepparent family and baccalaureate degree is present for women in all models, until college entry in a four-year institution is accounted for. An interaction effect for Black single parent family is positive and significant in all models presented including at $p<.05$ in the full model. For men, family dynamics appear to account for the negative association between single parent and stepparent family and baccalaureate degree.

*Family Dynamics*

All three measures of family dynamics, turbulence, parental involvement and parents' educational aspirations, are significant predictors of baccalaureate degree for women. In addition, there are significant race/ethnic interaction effects between Black and Latino parental educational aspirations in comparison to whites and earning a baccalaureate degree. High levels of parental educational aspirations by Black and Latino parents are associated with lower odds of baccalaureate degree than high levels of white parent's educational aspirations and their children's odds of baccalaureate degree.

For men, there is a positive significant association between parent's educational aspirations and parental involvement and earning a baccalaureate degree. In the models for men, there also are significant race/ethnic interaction effects between Black parental educational aspirations and Black parental involvement in comparison to whites in predicting completion of a baccalaureate degree. High levels of parental involvement and educational aspirations by Black parents are associated with lower odds of baccalaureate degree than white parents' involvement and aspirations in predicting baccalaureate degree for white students.

*Family Resources*

Parental education has a positive significant association with baccalaureate degree for both men and women when controlling for family structure, race and ethnicity, family background, and high school preparation. Parental income is not significantly associated with earning a college degree for either men or women.

*Race/Ethnicity*

Compared to whites, Latinos and Blacks disproportionately do not graduate with a baccalaureate degree. For both men and women, the base models find negative associations for Black and Latino in comparison to white in earning a college degree. For men, family dynamics and its interaction terms accounts for the negative association for Latinos, changing the coefficient to positive and not significant. For Black students, the addition of family dynamics changes the black coefficient to positive and significant ($p<.01$). In the full model, Black remains positive ($p<.05$) relative to white in predicting earning a baccalaureate degree.

For women, both the Black and the Latino coefficients are negative in the base model in comparison to whites, although there is a positive interaction effect ($p<.05$) for

Black single parent family in predicting college degree. After family dynamics are controlled for, the negative Black main effect is removed and the Latino coefficient becomes positive and significantly associated with baccalaureate degree.

For both men and women, interaction terms are tested and modeled. Race and ethnic differences are found in the associations between family structure, parental educational aspirations, and parental involvement and baccalaureate degree.

**STEM Coursework and Degree**

I investigate course taking in calculus during first year of college in Chapter 4 and earning a baccalaureate degree in a STEM field in Chapter 5 to expand the traditional measures of postsecondary success. Greater attention is being given to the stratification within higher education including the types of fields students choose to study and earn degrees. Earning a baccalaureate degree in a STEM field confers greater rewards and higher status attainment than types of majors (Davies and Guppy 1997; Jacobs 1986; Mickelson 1989). Therefore, studying and earning a degree in a STEM field reflects a difference in level of achievement at the postsecondary level differences in recognizing that as there are differences between types of institutions reflects separate levels of achievement that may be reached within postsecondary institutions. These differences in achievement are of particular importance for lessening income gaps for women and minorities.

*Family Structure and STEM*

In Chapter 4, I predict entry into calculus level math coursework in order to capture students who enter college in high achievement fields and as an indicator of persistence in the STEM pipeline at the collegiate level. Previous research has indicated that first year calculus is of particular importance for continued persistence at the

undergraduate level (Moreno and Muller 1998). For women, the significant, negative association of single parent family is explained by family dynamics, but the association between stepparent family and taking calculus is always negative and significant even in the full model, lowering women's odds of taking calculus by 60% in comparison to women from two parent families. For men, there is a significant, negative association for single parent family in comparison to two parent family that is never explained. In the full model, men from a single parent family experience a 37% decrease in odds in comparison to men from two parent families in taking calculus during the first year of college. For both men and women, family structure has a predictive role in entering a high achievement field in college.

In Chapter 5, I predict graduating with a baccalaureate degree in a STEM field. Increasing the rate of degree completion in STEM related fields is of great interest given our society's technological and scientific demands for skilled scientists and teachers. Women and minority students disproportionately "leak out" of the stem pipeline during college and do not choose a STEM major. In order for our society to increase its pool of scientists and to decrease stratification for women and minorities this should be of concern. In predicting a STEM degree for women, single parent family is negative and significant when controlling for taking STEM coursework in comparison to two parent family. For men, the models predicting STEM degree include negative, significant associations for both single parent and stepparent families in comparison to women. When controlling for taking STEM coursework, the direct effect of single parent family becomes not significant. Stepparent family is associated with lower odds ($p<.001$) in comparison to two parent families in earning a STEM degree when controlling for family background, family dynamics, family background, academic achievement and first-year coursework taking.

*Family Dynamics and STEM*

For women, parental involvement and parents' educational aspirations are positively associated and significant in predicting calculus course taking. In predicting STEM degree for women, turbulence is negatively associated ($p<.05$) and parental educational aspirations is positively associated ($p<.001$). For men, turbulence and parental educational aspirations are significant predictors of taking calculus during first year of college and parents' educational aspirations significantly associated with STEM degree.

It is clear that parental educational aspirations are strong predictors for both men and women. Turbulence also plays a role in both men and women's participation in the STEM pipeline. Parental involvement is associated with women entering college calculus coursework. Although I can only speculate, parental involvement for adolescent girls may have included encouragement to consider STEM fields and to think beyond traditional gendered ideas of math and science.

*Family Resources and STEM*

In predicting STEM coursework, only education is a significant predictor for men while for women both income and education are significant predictors although the significance of education is greatly reduced for women once academic preparation is controlled. In predicting STEM degree, both income and parents' education are positively and significantly associated for women while for men only parents' income is significant. Parent's education was significant in predicting degree in STEM field for men until taking calculus coursework was controlled. Thus for men, parent's education is significant for early pipeline participation and in predicting later outcomes it is also significant until I control for early participation. For both men and women, the

association of income and STEM degree is negative. Thus, students from higher income levels are less likely to earn a degree in a STEM field.

*Race and STEM*

There is a negative, significant association for Black and Latino in comparison to white with taking STEM coursework for women until prior academic preparation is controlled for. There are no associations by race and ethnicity and STEM degree for women. Similar to women, for men a negative association for Black is present in predicting taking STEM coursework, but is removed once prior academic preparation is included. For Latinos, though, the negative association remains ($p<.05$). In examining the outcome of a degree in a STEM field, the negative association of Latino is explained by either four-year entry or taking calculus during first year. However, the negative association is not removed for Black men ($p<.01$).

**LIMITATIONS TO THESE FINDINGS:**

Readers should consider the following limitations to this study when interpreting its results. The HS&B sophomore cohort graduated from high school and attended college in the 1980s and early 1990s. These students may have matured in a different context than today's students. Family structure and family dynamics are measured during students' high school experience, but the study of college participation continues for eleven years following high school graduate. This study is very beneficial as a long-term examination of student persistence; however, at what point, if any, does adolescent family structure matter less for postsecondary entry and persistence? For example, is there an age, marital status or amount of employment experience at which adolescent family is not as important for education outcomes? Another limitation to this study is that turbulence is measured only as a change in parental composition between $10^{th}$ and $12^{th}$

grade. While this is a time period closely linked to college entry, I do not know the source of turbulence (loss of parent, divorce, or remarriage). Finally, by selecting high school graduates as my base sample, I likely underestimated the negative relationship between single family structure and postsecondary entry.

## IMPLICATIONS AND FUTURE RESEARCH

The results presented find that family structure is associated with postsecondary education outcomes. Additionally, there is evidence that presenting the results separately by gender is beneficial and that single parent families and stepparent families should be categorized separately. In addition, I recommend the further study of family dynamics as indicators of advantage or disadvantage.

Most studies in postsecondary education debate whether social class or academic skills is the greater determinant for student success. One encompasses socioeconomic resources and the other academic resources. Within this literature, family structure has been linked to a resource model; the status of single parent family could act as a measure of social class given the income constraints particularly of single parent mothers and their children. I propose that family structure and family dynamics provide another resource, that of social support. Further consideration and study should be given to the concept of family structure, family dynamics, postsecondary education and the work of Coleman and Bourdieu.

Families may serve as the most influential external community to college students. The student persistence literature emphasizes the social integration of students into their postsecondary education institutional community while disassociating themselves from their external communities. Yet, I suggest that greater partnership between postsecondary institutions and parents would be in the interest of both. Parents and families hold high educational expectations for their children; more parents than ever

before want their children to attend college (Schneider and Stevenson 1999). However, increasing access to information as well as help in their planning both before college and during college would be of particular importance to students from single or stepparent families, minority students, first generation or low income students. Higher educational institutions are faced with increased demand for institutional accountability. At the same time, students are increasingly choosing nontraditional patterns of postsecondary attendance and persistence. The challenge is for postsecondary institutions to test whether measures could be taken to help parents become more knowledgeable and involved or to help potential students who have less parental involvement in the planning process and whether this results in increased persistence rates at that institution.

Within the students' high school community there is greater need to support college preparatory programs with early parental involvement. This may be particularly important within communities with high proportions of single parent families. These programs could be quite useful in not only increasing their access to information but also in building social networks for parents and adolescents.

One area for further study is to include financial aid in the study of family structure and college outcomes. An important question is whether traditional financial aid assessments that considers two parents families as both two parent biological and stepparent families is fair. The relationships between the two types of families are quite different and previous research has found that stepparents are financially less willing to support student's postsecondary plans (Aquilino 1991; Astone and McLanahan 1991; Amato, Rezac, and Booth 1995).

Further attention should be given to the differences in family dynamics by race and ethnicity. In addition, the measurement of family structure based on parents' composition as well as "parental" involvement or "parental" educational aspirations also

should be further considered as the influence of other family members in Black and Latino families is greater than in white families. An older sibling or aunt may have a great influence on an adolescent's preparation for college. Perhaps a better measurement of involvement and educational aspirations would be "family" versus "parental."

Last, taking calculus level coursework has enormous consequence for eventual STEM degree attainment. This means that students must enter college ready and willing to take calculus level math. In order to accomplish this, appropriate coursework must be taken ahead of time and the student must know to take calculus during their first year.

# Appendix A

## gression Predicting College Entry: Pooled Analysis, selected models (N=8,847)

| | Model 1 | | Model 2 | | Model 3 with dynamics interactions | | Model 4 | | Model 5A | | Model 5B | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | b | (S.E.) | b | (S.E.) | b | (S.E.) | b | (S.E.) | b | (S.E.) | b | (S.E |
| **ar)** | | | | | | | | | | | | |
| | -.313*** | (.073) | -.137 | (.083) | -.018 | (.087) | .091 | (.090) | .103 | (.091) | .170 | (.09 |
| | -.447** | (.171) | -.466** | (.172) | -.192 | (.181) | -.091 | (.183) | -.088 | (.183) | .009 | (.18 |
| | -.359*** | (.099) | -.331*** | (.100) | -.300** | (.105) | -.306** | (.106) | -.283** | (.106) | -.205 | (.10 |
| | -.897*** | (.222) | -.969*** | (.222) | -.613*** | (.237) | -.667** | (.238) | -.656** | (.239) | -.711** | (.24 |
| | -.218*** | (.043) | -.220*** | (.044) | -.198*** | (.046) | -.236*** | (.047) | .225*** | (.047) | .622*** | (.04 |
| **ions** | | | | | | | | | | | | |
| | .155 | (.110) | .147 | (.110) | .044 | (.116) | .067 | (.117) | .041 | (.117) | .025 | (.12 |
| | .221 | (.242) | .240 | (.242) | .203 | (.255) | .120 | (.256) | .110 | (.257) | .030 | (.26 |
| | .174 | (.168) | .155 | (.168) | .319** | (.177) | -.358* | (.179) | .360* | (.179) | .325 | (.18 |
| | .895** | (.295) | 1.010*** | (.296) | .832** | (.313) | .760* | (.315) | .768* | (.316) | .622* | (.32 |
| **white)** | | | | | | | | | | | | |
| | | | -.476*** | (.072) | -.270 | (.264) | .343 | (.264) | -.378 | (.264) | -.238 | (.27 |
| | | | -.750*** | (.083) | -.398 | (.279) | .393 | (.280) | -.443 | (.280) | -.480 | (.28 |
| **actions** | | | | | | | | | | | | |
| | | | -.223 | (.134) | -.185 | (.142) | -.226 | (.143) | -.224 | (.143) | -.221 | (.14 |
| | | | -.146 | (.215) | -.250 | (.225) | -.268 | (.226) | -.242 | (.226) | -.331 | (.23 |
| | | | | | -.369*** | (.049) | -.337*** | (.050) | -.322*** | (.050) | -.192*** | (.05 |
| | | | | | .206*** | (.024) | .191*** | (.024) | .191*** | (.024) | .131*** | (.02 |
| | | | | | .905*** | (.022) | .765*** | (.023) | .759*** | (.023) | .607*** | (.02 |
| **tions** | | | | | | | | | | | | |
| t | | | | | -.163* | (.066) | -.170* | (.067) | -.179** | (.067) | -.121 | (.06 |
| nt | | | | | -.214* | (.086) | -.227** | (.086) | -.232** | (.087) | -.163 | (.08 |
| Expect. | | | | | -.256*** | (.064) | -.215*** | (.064) | -.207** | (.064) | -.094 | (.06 |
| Expect. | | | | | -.326*** | (.073) | -.276*** | (.074) | -.284*** | (.074) | -.226** | (.07 |
| **urces** | | | | | | | | | | | | |
| | | | | | | | .070*** | (.012) | .063*** | (.012) | .062*** | (.01 |
| | | | | | | | .281*** | (.016) | .267*** | (.016) | .247*** | (.01 |
| | | | | | | | | | .820*** | (.118) | .749*** | (.12 |
| | | | | | | | | | .624*** | (.080) | .493*** | (.08 |
| **n)** | | | | | | | | | | | | |
| | | | | | | | | | -.121* | (.057) | -.066 | (.05 |
| | | | | | | | | | .017 | (.047) | -.014 | (.04 |
| **on** | | | | | | | | | | | | |
| | | | | | | | | | | | .692*** | (.03 |
| | | | | | | | | | | | .332*** | (.01 |
| | -1.022*** | (.033) | -.940*** | (.034) | -4.123*** | (.091) | -4.705*** | (,104) | -4.704*** | (.110) | -7.383*** | (.14 |
| | .858*** | (.033) | .965*** | (.034) | -1.747*** | (.081) | -2.2347*** | (.093) | -2.212*** | (.100) | -4.656*** | (.13 |
| o | 70.855*** | | 243.216*** | | 2866.824*** | | 3309.675*** | | 3417.768*** | | 4456.443** | |

Sophomore Cohort *** p<.001; ** p<.01; *p <.05

# Appendix B

## gression Predicting Calculus Course Taking During First Year College: Pooled Analysis (N=6,951)

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | | Model 5 | | Model 6 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | b | S.E. | b | (S.E.) | b | (S.E.) | b | (S.E.) | b | (S.E.) | b | (S.E.) |
| ar) | | | | | | | | | | | | |
| | -.387** | (.126) | -.288* | (.127) | -.131 | (.132) | -.031 | (.135) | -.032 | (.135) | .028 | (.144) |
| | -1.096*** | (.225) | -1.083*** | (.225) | -.993 *** | (.230) | -.979*** | (.230) | -.989*** | (.230) | -.900*** | (.241) |
| | .734*** | (.063) | .727*** | (.063) | .769*** | (.066) | .756*** | (.066) | .763*** | (.066) | .915*** | (.073) |
| ions | | | | | | | | | | | | |
| e | -.241 | (.174) | -.274 | (.175) | -.377* | (.181) | -.362* | (.182) | -.388* | (.182) | -.416* | (.195) |
| | .865** | (.274) | .868** | (.275) | .977*** | (.283) | .953*** | (.285) | .964*** | (.285) | .866** | (.304) |
| white) | | | | | | | | | | | | |
| | | | -.845*** | (.121) | -.939*** | (.124) | -.775*** | (.126) | -.732*** | (.128) | -.194 | (.137) |
| | | | -.966*** | (.159) | -.952*** | (.163) | -.818*** | (.165) | -.822** | (.166) | -.451* | (.180) |
| | | | | | -.390*** | (.083) | -.386*** | (.083) | -.386*** | (.084) | -.290** | (.090) |
| | | | | | .132*** | (.033) | .115*** | (.033) | .118*** | (.033) | .034 | (.037) |
| | | | | | .763*** | (.039) | .665*** | (.041) | .656*** | (.041) | .436*** | (.046) |
| urces | | | | | | | | | | | | |
| | | | | | | | .068*** | (.018) | .052** | (.018) | .065*** | (.020) |
| | | | | | | | .148*** | (.022) | .137*** | (.022) | .107*** | (.024) |
| | | | | | | | | | .505** | (.126) | .458*** | (.135) |
| | | | | | | | | | .217* | (.094) | .007 | (.103) |
| n) | | | | | | | | | | | | |
| | | | | | | | | | -.177* | (.088) | -.101 | (.095) |
| | | | | | | | | | -.184* | (.072) | -.271*** | (.078) |
| on | | | | | | | | | | | | |
| | | | | | | | | | | | .980*** | (.056) |
| | | | | | | | | | | | .598*** | (.030) |
| | -1.910*** | (.048) | -1.800*** | (.049) | -4.772*** | (.173) | -5.182*** | (.187) | -4.998*** | (.195) | -9.767*** | (.290) |
| o | 256.753*** | | 356.233*** | | 1020.796*** | | 1110.824*** | | 1138.288*** | | 2235.383*** | |

phomore Cohort  *** p<.001;  ** p<.01;  *p <.05

# Appendix C

**gression Predicting Baccalaureate Degree: Pooled Analysis (N=6,951)**

| | Model 1 | | Model 2 | | Model 3 | | Model 4 | |
|---|---|---|---|---|---|---|---|---|
| | b | S.E. | b | (S.E.) | b | (S.E.) | b | (S.E.) |
| **2 par)** | | | | | | | | |
| | -.269*** | (.088) | -.258** | (.097) | -.247* | (.105) | -.181 | (.116) |
| | -.495*** | (.114) | -.371** | (.124) | -.347** | (.132) | -.134 | (.145) |
| | .162*** | (.048) | .163** | (.053) | .080 | (.056) | .077 | (.061) |
| **actions by Gender** | | | | | | | | |
| ale | .199 | (.122) | .143 | (.132) | .197 | (.140) | .044 | (.152) |
| e | .005 | (.174) | .099 | (.189) | .038 | (.201) | .014 | (.220) |
| | -1.075*** | (.101) | 1.046* | (.429) | .965* | (.449) | .946 | (.485) |
| | -1.064*** | (.116) | .648 | (.499) | .879 | (.517) | 1.084 | (.543) |
| **actions** | | | | | | | | |
| ily | .339 | (.179) | .377* | (.185) | .404* | (.194) | .295 | (.208) |
| mily | -.303 | (.339) | -.340 | (.346) | -.407 | (.362) | -.471 | (.387) |
| | .040 | (.306) | -.024 | (.313) | .049 | (.322) | .100 | (.344) |
| y | -.062 | (.551) | .049 | (.573) | .216 | (.575) | .248 | (.619) |
| | | | -.353*** | (.062) | -.226*** | (.066) | -.259*** | (.071) |
| | | | .189** | (.026) | .168*** | (.028) | .141*** | (.030) |
| | | | .915*** | (.031) | .677*** | (.034) | .446*** | (.037) |
| **actions** | | | | | | | | |
| ations | | | -.554*** | (.100) | -.456*** | (.105) | -.457*** | (.114) |
| rations | | | -.438*** | (.120) | -.426*** | (.125) | -.437*** | (.132) |
| **sources** | | | | | | | | |
| | | | | | .021 | (.014) | -.009 | (.016) |
| | | | | | .273*** | (.018) | .230*** | (.020) |
| | | | | | .810*** | (.128) | .599*** | (.138) |
| | | | | | .133 | (.084) | .019 | (.091) |
| **ation** | | | | | | | | |
| | | | | | .416*** | (.018) | .336*** | (.019) |
| | | | | | | | 1.947*** | (.056) |
| | -.278*** | (.034) | -3.700*** | (.129) | -5.276*** | (.159) | -4.962*** | (.177) |
| atio | 381.179*** | | 1855.704*** | | 2887.838*** | | 4186.878*** | |

Sophomore Cohort
p <.05

# Appendix D

**Table 5B Logistic Regression Predicting Baccalaureate Degree in STEM Field: Pooled Analysis (N=6,195)**

| | Model 1 | | Model 2 | | Model 3 | |
|---|---|---|---|---|---|---|
| **Variables** | **b** | **S.E.** | **b** | **(S.E.)** | **b** | **(S.E.)** |
| **Family Structure (ref. 2 par)** | | | | | | |
| Single Parent Family | -.425* | (.210) | -.414 | (.212) | -.462* | (.222) |
| Stepparent Family | -.075 | (.245) | -.018 | (.247) | .332 | (.259) |
| **Gender (Male=1)** | 1.136*** | (.089) | 1.158*** | (.089) | .961*** | (.097) |
| **Family Structure Interactions** | | | | | | |
| Single Parent *Male | .102 | (.249) | .020 | (.250) | .331 | (.277) |
| Stepparent *Male | -.617 | (.340) | -.622 | (.346) | -1.214*** | (.368) |
| **Family Background (ref. white)** | | | | | | |
| Black | -.422** | (.156) | -.386* | (.157) | -.256 | (.168) |
| Latino | -.546** | (.206) | -.430* | (.209) | -.348 | (.222) |
| **Family Dynamics** | | | | | | |
| Turbulence | -.298** | (.108) | -.256* | (.109) | -.176 | (.117) |
| Parental Involvement | .085* | (.042) | .054 | (.042) | .045 | (.046) |
| Parents' Ed. Aspirations | .493*** | (.054) | .367*** | (.056) | .332*** | (.060) |
| **Family Background Resources** | | | | | | |
| Parents' Income | -.076*** | (.022) | -.085*** | (.023) | -.117*** | (.025) |
| Parents' Education | .119*** | (.028) | .083** | (.028) | .065* | (.031) |
| **Prior Academic Preparation** | | | | | | |
| H.S. Coursework | .393*** | (.028) | .322*** | (.029) | .154*** | (.030) |
| **Postsecondary Entry** | | | | | | |
| 4-year institution | | | 1.054*** | (.095) | | |
| Took STEM Coursework 1st year | | | | | 2.579*** | (.092) |
| Intercept 1 | -6.295*** | (.254) | -6.034*** | (.259) | -5.226*** | (.275) |
| Chi-Square Likelihood Ratio | 836.638 | | 973.397*** | | 1727.247*** | |

*Source:* PETS and HS&B: Sophomore Cohort
*** p<.001; ** p<.01; *p <.05

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