

PREDICTIVE FACTORS ASSOCIATED WITH NEWLY GRADUATED  
HIGH SCHOOL STUDENTS' ENROLLMENT IN A REMEDIAL COURSE  
AT A COMMUNITY COLLEGE

by

John C. Whiton

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

Doctor of Education

Liberty University

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## ABSTRACT

The large number of students who graduate from high school inadequately prepared for college is a national problem. For this reason, this study examined the relationship between individual student-level factors during high school and students' enrollment in a remedial course in community college. A correlational design, binary logistic regression analysis, was used. Analysis involved a correlation matrix of predictors, and tests for multicollinearity. A convenience sample of participants readily available to the researcher was employed. The sample consisted of 327 diverse students enrolled on a selected campus. All participants were first time enrollees at the community college and within one to three years of their high school graduation. Two groups of students were surveyed: about half were enrolled in at least one remedial course and the remainder was enrolled in non-remedial-only courses. A questionnaire was administered to the two groups to gather information on their human, cultural, and social capital resources and to gather demographic and socioeconomic data. The instrument employed followed the U.S. Education Longitudinal Study of 2002. Three significant predictor variables were negatively correlated with the criterion variable: taking high school math above Algebra 2; household income above \$50,000 in the final year of high school; and the cultural capital variable, discussing community, national and world events. Findings will help school administrators, teachers, and parents to understand significant factors influencing students' enrollment in a remedial course, and have the potential to inform schools' decisions regarding course enrollment patterns and strategies. Recommendations for future research are provided.

*Keywords:* community college, college readiness, human capital, cultural capital, social capital

### **Dedication**

This work is dedicated to my eternal best friend and wife, Dr. Vasuki Rethinam, who sacrificed substantially, supported and encouraged me, but much more than that, she was the inspiration and reason for me to undertake this research and academic program. She leads me and others forward, with her spirit, her curiosity, encouragement, vision and utmost integrity.

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**List of Abbreviations**

DE	Developmental education
ELS	Educational Longitudinal Study
GPA	Grade point average
NPSAS	National Post-secondary Student Aid Study
OR	Odds ratio
SES	Socioeconomic status

## **CHAPTER ONE: INTRODUCTION**

### **Background**

While not every high school student plans to attend college, college readiness today is almost the same as career readiness (ACT, 2008). Currently, jobs require knowledge and skills, often technical skills, comparable to those expected of a first-year college student (ACT, 2008). In order to prepare high school graduates to be college ready, there has been a national movement to ensure rigorous standards for curriculum, high school graduation, and assessments aligned with readiness for college and career success (Conger & Tell, 2007).

Despite this movement and although two-thirds of high school graduates enter college each year, 68% of those new college students are underprepared academically for college-level work (Greene & Forster, 2003; Sparks & Malkus, 2013). These students are routed into a remedial course at post-secondary institutions, whether they are attending two- or four-year institutions. In general, a remedial course is defined as being below college-level and is offered in reading, writing and math (Lazarick, 1997; Oudenhaven, 2002).

Trends indicate that community colleges already bear the largest share of remediation burden and that burden is likely to grow (Jenkins & Boswell, 2002). For example, even as recently as the turn of the millennium, almost a dozen states had passed some form of law preventing or discouraging public four-year institutions from offering a remedial course to their students, effectively concentrating underprepared students in community colleges in these states (Jenkins & Boswell, 2002). Sparks and Malkus (2013) examined the incidence of remedial course-taking in academic year 2007-08 using data from the National Post-secondary Student Aid Study (NPSAS), a regularly conducted, nationwide federal survey. In that year, the last year

for which the federal government reported data, twenty percent of first-year students who entered two- or four-year degree-granting post-secondary institutions were enrolled in a remedial course.

Prior research has indicated that students who enroll in a two-year college, particularly in a remedial course, are at a greater risk of academic failure than students enrolling in four-year institutions or a non-a remedial course (Adelman, 2006; Hagedorn, Siadat, Fogel, Nora, & Pascarella, 1999). Studies have indicated that students who enroll in a remedial course at a community college are more likely to drop out and delay obtaining a degree than those college students who did not (Adelman, 2006; Strong American Schools, 2008). This delay and drop out pattern has a discernable economic impact for the students and society.

In 2009, almost 400 community colleges, of almost 1,700 nationally, had graduation rates less than 15% (Schneider & Yin, 2012). Schneider and Yin (2011) conducted a study examining economic costs related to retention of students in community colleges over a five year span from 2004 through 2009. Removing data for transfer students, they found that each year 20% of full-time college students did not return for a second year. The economic impact of this loss of students is that community college dropouts earn lower wages throughout their careers, their tax contribution is less than if they graduated, plus dropouts suffer the burden of tuition, fees, and possible debt, often without earning a degree (Schneider & Yin, 2011).

Enrolling in a remedial course, delaying a degree and dropping out of college, do not depend only on high school academic factors. Non-academic factors, including the level of cultural capital and social capital, a student's individual behavioral attributes and attitudes (Bettinger & Long, 2007) and students' access to information through social networks (Perna, 2000), are believed to be involved. These traits are forms of individual capital that are developed through social and cultural connections including students' network of relationships that connect

students with family, friends, school contacts and general social affiliations (Bourdieu, 1986).

The level of these non-academic attributes that a high school graduate possesses may influence their behavior when they enter college, even their persistence in college (Huerta, Watt, & Reyes, 2013).

Studies on factors influencing post-secondary enrollment and course placement have not only looked at students' prior academic performance, but have also examined the effect of "capital" resources (Engberg & Wolniak, 2010; Klasik, 2012; Sommerfeld & Bowen, 2013). Students can form various types of "capital" that can affect college readiness, affect whether they seek to attend college and affect what types of courses they take when they attend college (Engberg & Wolniak, 2010). These forms of capital include human capital, social capital, and cultural capital (Becker, 1994; Bourdieu, 1986; Lin, 1999, 2001; Schultz, 1960, 1971). Forms of human capital are knowledge, skills, achievement, and grade point average (GPA). Examples of cultural capital are language and traditions that are attributes related to a person's social status. Forms of social capital are friendships, social relationships and networks of people (Bourdieu, 1986; Lin, 1999). Capital of these types can be developed by an individual as resources that may benefit the student considering and attending college. Individual attributes such as attitude, communication, and social status can arguably be assigned to more than one category of capital, are related and can overlap, and can be inter-converted (Wells, 2008).

Bourdieu (1986) theorized that individuals tend to prosper in settings when they are familiar with the values and practices of the settings, and when they are accepted among people and have a social network. Individuals can utilize and benefit from that familiarity and acceptance in an educational setting (Sommerfeld & Bowen, 2013). In this way, college readiness can increase when students' human capital is developed by their completion of

rigorous courses in high school and attaining a high final GPA when graduating high school (Engberg & Wolniak, 2010, 2014). GPA not only measures whether students have mastered the material in their classes and developed core academic skills and content knowledge, GPA can also be seen to measure college readiness, a non-academic skill, particularly whether students have demonstrated the work effort and study skills needed to meet the demands of a college environment (Roderick, Nagaoka, & Coca, 2009). College readiness can also be viewed as being dependent on students' development of their social and cultural capital resources. One element of social capital can be realized when a student communicates with family and friends about applying to and attending college. Cultural capital includes an individual's familiarity with cultural knowledge, language style, and specific behavior acquired largely by association with family and friends (Bourdieu, 1986). The family expectations regarding the student attending college, and the family's native language, play a major role in a student's formation of cultural capital (Engberg & Wolniak, 2014). Also a student's cultural capital develops in high school as he discusses community, national and world events with others.

In the most recent decade, the increasing demand by students to enroll in a community college has caused the level of undergraduates in the U.S. attending community college to approach 50%. In fact, the community college student population is growing faster than that of four-year institutions (Jurgens, 2010; Morest, 2013). The cause of this movement to open access higher education involves the potential to attend college provided to those who have been denied access to a four-year college or university, as well as reduced cost education and transfer agreements to four-year institutions. Enrollment in community colleges in the U.S. currently stands at around twelve million students (Jurgens, 2010). The increased volume of community college enrollees and widespread need for remedial education at colleges and universities across



the nation increases costs to students and the public for basic education that students should have completed successfully in high school (Hoyt & Sorensen, 2001, Schneider & Yin, 2012).

Though there has been emphasis on how high schools should prepare students to be college ready, there have been only a few peer-reviewed, published research studies examining the impact of high school factors (high school courses, course rigor and high school grades) on college remediation (Hoyt & Sorensen, 2001; Roth, Crans, Carter, Ariet, & Resnick, 2000). However, these studies focused on the relationship between remedial course enrollment and high school course level, test scores, and course grades, and not community college students' capital resources. The current study expanded on these investigations to include highest level of high school math completed, high school final GPA, as well as demographic and cultural and social capital constructs.

Though remediation is a problem for students of all race/ethnicities, it is more prevalent among minorities and low-income students who are consistently overrepresented in remedial courses (Bahr, 2010), especially in community college remedial courses. For example, in 2005, 76% of Black students and 78% of Hispanic students at U.S. community colleges enrolled in a remedial course (Castro, 2013) compared to 55% of White students (Bailey, Jenkins, & Leinbach, 2005). This overrepresentation of minority and socioeconomically disadvantaged students is due in part to the current, prevalent method of using placement tests to assign students to a remedial course (Crosta, 2013). This method ignores the student's accumulated capital and what it indicates about the student while emphasizing performance in a high-stakes testing environment.

This dissertation used theoretical perspectives including human, social, and cultural capital (Jun & Hampden-Thompson, 2012) on an individual student basis. These broad,

combined conceptual frameworks position high school as the pivotal platform for a student's decision-making regarding college and courses. Researchers who have applied the theoretical framework of individual capital to higher education have indicated that a lack of such capital can be a significant risk factor influencing degree attainment especially for low-income and first generation college students (Corwin, Venegas, Oliverrez, & Colyar, 2004; Tierney & Venegas, 2006; Wells, 2008).

### **Problem Statement**

The problem addressed by this research is the limited understanding of the impact of human, social, and cultural capital characteristics on placement and success of students in remedial courses. The reason for the paucity of information in the literature is that little research has been focused on this problem. Of the few relevant studies found, there was only one that directly connected high school factors to remedial course enrollment (Hoyt & Sorensen, 2001). However, this study looked only at one aspect of capital (human capital) and its relationship to remedial course enrollment, and did not look exclusively at community college work.

### **Purpose Statement**

The purpose of this correlational study was to examine whether student-level factors developed and experienced in high school are related to students enrolling in a remedial course in their first year of community college and within one to three years after high school graduation. Student-level factors fit in four categories in this study: demographics (race/ethnicity, and family income as a proxy for socioeconomic status); human capital (academic achievement); social capital (social network); and cultural capital. This system and the related constructs were employed as the theoretical framework and organizing structure for the predictor variable considered. They made it possible to organize factors known to influence

presence in remedial courses into meaningful groups. The known factors are from the work of Engberg and Wolniak (2010) who identified ten characteristics among many that they studied, that were significantly related to the likelihood of high school seniors enrolling in a two-year college in 2004. These constructs were then employed as items on a survey instrument based on their statistically significant relationships with students' enrollment in a two-year college (Engberg & Wolniak, 2010).

The criterion variable predicted through linear regression was enrollment in a remedial course for students who graduated high school not more than one year prior to enrolling at a community college. This dissertation project explored whether student-level theoretical factors predicted differentiated enrollment in a remedial course in community college including whether minority groups were disproportionately affected. Predictor variables included: race/ethnicity; socioeconomic status (family income); final high school GPA; highest level of high school math taken; college seeking efforts; family/friends network; and native English speaking (cultural capital, binary response anchors of "yes" and "no"). Students were able to identify themselves on a questionnaire as Hispanic or Latino/Latina and/or identify with more than one of standard races used in the U.S. Census. On the instrument, the construct of socioeconomic status (SES) during high school was measured in terms of family income in thirteen increments ranging from "None" to "\$200,000 or more." The reason for including family income in the model as a SES variable was to assess any possible association with students enrolling in a remedial course in a community college.

Predictor variables in the human capital domain were GPA (ranging from about 2.00 up to 4.00) and highest math level (spanning seven levels) (Adelman, 1999; Engberg & Wolniak, 2010; Long, Iatarola, & Conger, 2009). The seven levels of math included were: pre-algebra;

Algebra 1; geometry; Algebra 2; trigonometry; pre-calculus; and calculus. The reason for the human capital variables was to measure the level of these resources that the student could draw upon and the relationship of the predictor variables to enrollment in a remedial course at a community college. For example, Adelman (1999) found, using odds ratios in a logistic regression, that the greatest difference in college degree completion for a representative sample of 8,873 students was related not to taking geometry, but to taking Algebra 2, identifying an optimal breakpoint in math course sequence in high school.

The reason for the cultural capital items was to measure students' engagement with their own families during high school and the presence of any linguistic barrier. This information was gathered using simple response anchors of yes/no and never/sometimes/often for survey items. One item addressed student discussion of community, national, and world events with their parents, another addressed discussion of college going, a third gathered information about discussion of college entrance requirements, and a fourth addressed the potential of a linguistic barrier using classification of status as a native speaker of English. The purpose of including these items to represent the theoretical construct of cultural capital was to assess their relationship with enrollment in a remedial course. Each of the items were statistically significant in Engberg and Wolniak's (2010) model for predicting students' enrollment in two-year and four-year colleges.

Two social capital variables were included in the model as predictors, to assess the effects of students' ability to reference their support network of family, friends, peers and other social connections. These support networks can include friends of the family, school personnel, and other social connections that can be resources for influencing the student's decisions. These social relationships can act as a college-linking network operating on the high school student

who is seeking higher education (Engberg & Wolniak, 2010). The current study employed social capital variables involving the student seeking information from other people, concerning college entrance requirements, and how often they generally discussed attending college (Vesper, Schmit, & Hossler, 1999).

### **Significance of the Study**

It is of national importance to examine and understand factors influencing students' enrollment in a remedial course in community college (Bell, 2010; Hoyt & Sorenson, 2001). The findings from this study can inform policy and programs to potentially reduce the number of students undertaking a remedial course as they enter college. Examination of this problem may identify significant factors helping secondary schools prepare students to be college ready, thereby reducing costs for students and society when students take a remedial course. Students beginning college without being college ready may be a socioeconomic burden if they enroll in a remedial course, as a financial burden to students and taxpayers, as well as a delay and barrier to their college graduation and a risk of not completing college (Schneider & Yin, 2011, 2012).

Most studies of students who took a remedial course in a community college have examined factors influencing persistence, retention, or graduation after enrollment specifically at a community college (Bahr, 2008; Fike & Fike, 2008; Horn, McCoy, Campbell, & Brock, 2009; Kreysa, 2006; Mutter, 1992). Identifying factors influencing students' enrollment in a remedial course can allow high schools to identify students early on who might be at risk of enrolling in a remedial course in college, so that necessary intervention and support can be provided before these students attempt a course in college (Porchea, Allen, Robbins, & Phelps, 2010). Findings can be used to help school administrators, teachers, and parents to understand significant factors influencing students' enrollment in a remedial course, especially for minority, academically

disadvantaged, and low-income students. A better understanding of factors affecting students' academic weaknesses during high school and deriving probable causalities can assist stakeholders in planning for and providing remedies to academic weakness during the high school years. The results of examining how student-level factors affecting remediation possibly differ by students' race/ethnicity could eventually lead to more effective policies and programs. High schools can support students early on who might be at risk of enrolling in a remedial course, by putting interventions and other programs in place during high school. High schools can also assist parents involved in planning their child's educational future. Findings of this study can help schools to examine course placement decisions.

While not unique in the U.S., this county has arranged an innovative, articulated system that employs staff on a collaboration board involving organizations. That is, the community college research site for the current study, as well as the district superintendent's central office both employ full-time, permanent school officials and staff to engage in planning goals and implementing agreements under the collaboration. The mission of the collaboration is, among other things, to maintain a prepared, educated and adaptable workforce to meet the needs of employers in the county: the collaboration effectively supports students through involving county families, educators, employers, and industry leaders. The collaboration includes county industry leaders who advise the public schools and very large community college system on education programs and curriculum development.

A major goal of the collaboration is to ensure a seamless transition from high school to college to the workplace. The program involves data collection and reporting between the organizations. The collaboration means to reinforce a need for rigorous academic and workplace skills preparation, for all students. It also means to enhance communications between the

district's central office, the community college system, and other stakeholder organizations, to advance college readiness and maintain a competitive workforce.

The paucity of literature connecting high school factors and remedial course enrollment in college can be related to the volume of literature in the field of developmental (or remedial) education overall. Preuss (2008) proposed an architecture for developmental education (DE) literature, analyzing and categorizing a large volume articles (763) from four journals (plus 33 dissertations) spanning 24 years of content in the DE field through 2007. According to Preuss' (2008) schema there are three major topics in the field: DE programs (616 articles, 81% of all); perspectives of DE; and resources for DE (92 articles, 12% of all). Much of the literature closely related to the current study would fall under Preuss' (2008) "programs" and "resources" categories and examines high school graduation, policies, early college interventions, college placement, and transition to college but not direct connection of high school factors and subsequent enrollment in a remedial course in college. These two categories would comprise 708 articles in Preuss' (2008) study. A broad reaching, online literature search conducted for the current proposal, using multiple databases for the years 2007-2012 (years since Preuss, 2008) using the terms "high school students," "remedial education," and "college readiness" yielded only ten articles and only four were in academic journals (but were not studies). Thus, there is a paucity of peer-reviewed, published literature directly connecting high school factors and remedial course enrollment in college since more than 700 articles were identified by Preuss (2008) in related fields.

### **Research Question**

The following research question guided this study.

**RQ1:** What student-level factors during high school (race/ethnicity, socioeconomic status, final high school GPA, highest level of high school math, college seeking efforts, family/friends network, native English speaking) best predicted whether first-year community college students enrolled in a remedial course?

### **Null Hypothesis**

The following is the null hypothesis:

**H<sub>0</sub>1:** There was no significant predictive relationship between the criterion variable (enrollment in a remedial course) and one or more combinations of predictor variables (race/ethnicity, socioeconomic status, final high school GPA, highest level of high school math, college seeking efforts, family/friends network, native English speaking) for community college students.

### **Definitions**

The following definitions were applied to variables used in the current study.

1. Human capital is defined as an individual's academic preparation through gains in skills, knowledge, potential productivity and investment returns (Becker, 1994; Bourdieu, 1986; Engberg & Wolniak, 2010; Schultz, 1960, 1971). An individual can invest in himself by developing his human capital through education, with the incentive being the possibility for greater productivity and income (among other benefits and outcomes).
2. Cultural capital is defined as an individual's familiarity with cultural knowledge, language skills, and behaviors acquired largely through family and friends (Bills, 2003; Bourdieu, 1986; Engberg & Wolniak, 2010).
3. Social capital is defined as resources available to an individual through social networks (Bourdieu, 1986; Lin, 1999, 2001).



4. A remedial course, the criterion variable, is defined as any course in reading, writing, or math that is not credit bearing and which has curriculum considered to be below college-level work, but which is taken at a college as a means of preparing to enter credit-bearing, college-level courses (Lazarick, 1997; Oudenhoven, 2002).
5. High school math level is defined as the highest level of math completed by the end of high school (Adelman, 2006).
6. High school grade point average (GPA) is defined as the cumulative, unweighted GPA obtained at the point of high school graduation (Engberg & Wolniak, 2010).
7. A non-remedial course is defined as any college-level, credit bearing course.
8. Disadvantaged is defined as students who experienced academic and/or economic difficulties, often related to family income, having limited English language proficiency, or are migrants (Title 34 – Education, 2009). A student may be considered academically disadvantaged if their secondary school GPA was below 2.0 on a 4.0 scale where grade "A" equals 4.0, and/or they scored below or at the 25th percentile on a standardized aptitude or achievement test (excluding students with learning disabilities).
9. College readiness is a combination of knowledge, skills development, and habits of using one's mind, that are necessary to participate fully in and successfully complete college-level courses. It is the level of preparedness needed for a student to succeed in a credit-bearing, non-remedial course in a post-secondary institution that offers a baccalaureate degree (Conley, 2008).

## **CHAPTER TWO: LITERATURE REVIEW**

### **Background**

The large number of students who graduate from high school inadequately prepared for college is a national problem (Dougherty, 2010). Educators express concern that students' failure to take college preparatory courses, grade inflation, and lack of academic rigor in high school courses contribute to the need for student remediation in college (Hoyt & Sorensen, 2001). Some studies have looked at the sociocultural variables and their influence on post-secondary outcomes in an effort to understand the circumstance (Crisp & Nora, 2010; Person & Rosenbaum, 2006).

College readiness revolves around the strength of academic and behavioral preparation a student possesses when s/he enrolls (Conley, 2008). Success in college can be understood as completing courses conferring college level credit. Some research studies have linked high school academic factors to preparation for college credit bearing courses (Hoyt & Sorenson, 2001; Lang, 2012; Long, Iatarola, & Conger, 2009). These studies examine the academic variables influencing enrollment in a remedial course, though not necessarily in community college. Researchers have attempted to understand sociocultural variables' influence on remediation as well.

Engberg and Wolniak (2010) examined the effects of human, cultural and social capital in high school, and whether high school graduates then enrolled in 2-year college, 4-year college or did not enroll in college. They found numerous significant relationships between cultural and human capital variables. As the extent of the capital assets increased, the likelihood of enrolling in a 2-year college increased for students. In this case, students who discussed college entrance and plans with parents, who had family/friends who expressed a desire for the student to attend college, and who had parents with whom they became involved in cultural activities were more

likely to enroll. Engberg and Wolniak (2014) found that this effect carried over across high schools categorized as low SES, middle, and high SES. Sciarra and Ambrosino (2011) confirmed that other's expectations of the student to attend college had a significant effect as predictors of high school students' college enrollment. Chen and Gregory (2009) also found that parents' expectations of the student's human capital (grades and GPA) was a significant predictor of college readiness and, when parents were encouraging, students realized higher measures of care from their teachers. This occurred without regard to race/ethnicity.

Conley (2008) found that the quality and characteristics of family life affected high school students' preparation for college and impacted students' transition to and success in college. He found that when relationships between students and their parents and teachers were optimal, students were more successful in college as they could navigate financial aid, learning strategies, manage deadlines, form relationships with academics, and realistically understand college expectations (Conley, 2008). A student's family life during high school can prepare them for college, and the level of that preparation has the potential to dramatically impact their transition to college and subsequent postsecondary academic success. This results from development of knowledge and skills in the form of metacognition, analysis and problem solving, and coping skills.

There is a paucity of peer-reviewed literature directly connecting high school factors, other than measures of academic performance, with the need for remedial course enrollment at community colleges. Because there is little research on non-academic high school factors influencing college remediation, this literature review mainly examines which high school factors influence college readiness. A review of this type facilitates a consideration of whether the factors also influence students' enrollment in a remedial course in college since college

readiness and college remediation are closely related (Bettinger & Long, 2007; Hughes & Scott-Clayton, 2011; Long, Iatarola, & Conger, 2009). The literature review presents the historical context and theoretical framework of the study while discussing academic gaps related to race/ethnicity and socioeconomic status in students' post-secondary outcomes.

### **Historical Context**

Throughout their history, community colleges have existed in large part for the purpose of workforce development. The community college platform for education was created out of the Industrial Revolution (Arendale, 2011). Authors on the history of the national proliferation of community colleges provide various perspectives for why the system formed. Futurist leaders in major U.S. universities in the mid-nineteenth century envisioned the schools as junior colleges (Jurgens, 2010). Whereas, in contrast, Dassance (2011) states the community college mission as providing a general education so that people can have meaningful citizenship within democracy.

Some of the growth of the community college educational segment was in response to the return of veterans from various foreign wars, and their need to enter the workforce as skilled workers (Arendale, 2011). Arendale (2011) notes, that throughout the early twentieth century, much of the emphasis of community colleges was on vocational and technical training. Early on, community colleges were also avenues for women to earn a higher education credential, especially to become teachers as some states did not require a Bachelor's degree for teaching in grades K-8 (Morest, 2013). As urbanization advanced throughout the U.S., many high school graduates were not willing to attend a college far from home so the community college served their need for local higher education instead of a distant institution (Jurgens, 2010).

Through much of their history, community colleges have played a multi-faceted role in society, serving large subpopulations of first-generation students, non-traditional, and remedial

students not prepared adequately for the rigors of a credit-bearing college work (Jurgens, 2010; Morest, 2013). Thus, the two-year, open access institutions serve people for whom there is essentially no other means of access to formal higher education (Conley, 2008). A community college brings opportunity to people to fulfill a wide range of educational and training goals, in part because a two-year degree is often a more economical bridge to a Bachelor's degree than starting college in a four-year institution (Boylan & Bonham, 2007).

In the decades of the 1960s and 1970s remediation occurred at community colleges, not four-year institutions (Arendale, 2011). In the 1980s and 1990s demand for remediation grew substantially (Arendale, 2011; Boylan & Bonham, 2007; Markus & Zeitlin, 1998). This was related to lower admission standards, academic standing for admission to community college was not as high as at four-year institutions with many of them having open enrollment (Morest, 2013). The 1965 the Higher Education Act, which provided financial resources allowing greater access to community colleges for academically and/or economically disadvantaged students, also contributed by expanding demand by the disadvantaged for higher education (Morest, 2013).

With demand increasing, the range of institutions offering remediation broadened to include nonprofits and for-profit schools created by entrepreneurs (NCES, 2009, Table 74). With the community college system throughout the country burgeoning, and with conflicts arising within and outside the system of two-year post-secondary institutions, such as the emergence of publically traded companies operating very large for-profit colleges, the need for a centralized system of monitoring and accreditation emerged (Jurgens, 2010; Nevarez & Wood, 2010). Commissions and associations (for example, the American Association of Community Colleges (AACC), Commission on Community College Accreditation, and many state community college associations such as the California Community College Association) were formed to centralize

leadership and governance for the broader community of two-year post-secondary institutions, forming partnerships, including lobbying the federal government and establishing guidelines for accountability and transparency (McArdle, 2013). Centralized oversight of the community college system has allowed more rigorous standards, rules, and agreements within and between state systems for transition from a two-year to a four-year post-secondary school (Jurgens, 2010), because, while a community college grants associate's degrees, to some authors a core purpose of community colleges has always been the possibility of transfer from community college to a four-year institution and the potential of earning a Bachelor's degree.

Currently, student scores on entrance exams predominantly determine whether students must enroll in a remedial course, often SAT®, ACT, and other standardized tests. Student scores on entrance exams, usually the SAT, ACT Compass®, College Board's Accuplacer® or an equivalent standardized test, determines if a student must enroll in a remedial course in their post-secondary curriculum. In fall 2000, most public two-year colleges, 92%, utilized placement tests in their process and decision-making regarding assignment of students to remediation (Parsad, Lewis, & Greene, 2003).

Testing serves as a potentially valuable, though limited, tool for understanding a student's academic strengths and weaknesses as they transition from high school and into college (Madaus & Horn, 2000; Maruyama, 2012). A large percentage of students enter community college without being college ready. Standardized achievement test scores define course level placement at the research site used for the current study. For example, a new enrollee must achieve a score of at least 25 of 36 on ACT to enroll in college level English, and produce a score of at least 551 in math on the SAT to avoid remedial math. Accuplacer and Compass scores and advanced placement coursework can also be used for the course placement decisions for a new enrollee.

For large segments of students, placement tests might be ineffective for various reasons. Community college assessment of students from culturally and linguistically diverse backgrounds, using standardized testing for the purpose of course placement, may include cultural biases (Venezia & Voloch, 2012). Students from first- or second-generation immigrant families, those with limited English proficiency, students of low SES, and race/ethnic minority groups, in general, tend not to possess the level of social and cultural capital that would be a significant boon to them in seeking college admission, persisting in college, and avoiding a remedial course (Oseguera, 2013; Zwick & Sklar, 2005). Placement testing can reduce equity for students who are variously disadvantaged and may lack native-English speaking skills (Oseguera, 2013). Social networks, parental expectations and student aspirations may be lower for students who are economically disadvantaged and minorities. Conversely, high school students and graduates from a higher-level SES level and more affluent means are more likely to have an extended social network established through family connections, and have more cultural capital such as broader general and majority cultural knowledge and native English skills.

Historically, a large number of student in the US take remedial courses. In the year 2000, 22% of freshmen entering college were enrolled in a remedial math course. Of all college freshman taking a remedial course a decade ago, 35% were actively enrolled in math, 23% in writing, and 20% in reading (Wirt, Rooney, Provasnick, Sen, & Tobin, 2004). In 2003-04, half of all first-time post-secondary students in the U.S. took at least one remedial course, most frequently math where 42% of students were enrolled (Radford, Pearson, Ho, Chambers, & Ferlazzo, 2012). Similar to 2000, Sparks and Malkus' (2013) examination of NPSAS information for academic year 2007-2008 determined that 20% of first-year undergraduate students who were enrolled in institutions of higher education also reported taking a remedial

course, (2007-2008 was the latest academic year for which the federal government reported these data.)

Historians offer various perspectives on the community college system, from their growth as junior colleges to a system where, in the past decade, the increasing number of students seeking enrollment has caused the level of undergraduates attending community college to approach 50% of all post-secondary students (Jurgens, 2010). Early on, community colleges responded to the return of veterans from foreign wars, fulfilling their need to enter the workforce with skills in vocational and technical training areas (Arendale, 2011). Community colleges were also avenues for women to receive a higher education credential, especially to become teachers for grades below the post-secondary level. In the 1960s and 1970s remediation occurred at community colleges, not four-year institutions (Arendale, 2011). Community colleges serve people for whom there is no other means of access to formal higher education (Conley, 2008). As a result, they now serve large subpopulations of first-generation students, non-traditional and remedial students (Jurgens, 2010; Morest, 2013). Students from immigrant families, those with limited English proficiency, students of low SES, and race/ethnic minorities, in general, often do not possess the level of social and cultural capital enabling them to seek successful admission to a four-year college and avoid a remedial course (Oseguera, 2013; Zwick & Sklar, 2005). Many find a two-year degree is an economical bridge to transfer into a Bachelor's degree (Boylan & Bonham, 2007). Many agreements now exist between systems for transition from a two-year to a four-year institution (Jurgens, 2010). Because community colleges provide a broad opportunity for students to fulfill such a wide range of educational and training goals, 20% of first-year undergraduates reported taking a remedial course in academic year 2007-2008 (Sparks & Malkus, 2013).



### **Theoretical Framework**

This study uses the capital theoretical perspective which includes human, social, and cultural capital. The constructs for this study were taken from Engberg and Wolniak (2010). Forms of capital considered in the current study includes human capital, cultural capital, and social capital (Becker, 1994; Bourdieu, 1986; Lin, 1999, 2001; Schultz, 1960, 1971). Human capital is academic preparation in terms of gaining skills, knowledge, and experience (Jun & Hampden-Thompson, 2012) making it the strongest predictor of college enrollment (Blundell, Dearden, Meghir, & Sianesi, 1999; Cabrera & La Nasa, 2001; Perna & Titus, 2005). Students who had a higher level of academic achievement in high school were less likely to enroll in a remedial course in community colleges. However, academic achievement alone does not explain enrollment outcome especially for minority and low-income students (Bettinger & Long, 2007; Huerta, Watt, & Reyes, 2013). Evidence suggests that exposure to college information resources and understanding of college choices also influence college enrollment and might partially explain the disparities among minority and low-income students' college enrollment (Ellwood & Kane, 2000; Hill, 2008; Perna, 2006). This may apply to students enrolled in a remedial course, as well. Therefore, the theoretical constructs of cultural and social capital as elements of a college-linking network are central to understanding the impact of these factors on enrollment in a remedial course (Hill, 2008).

Human capital includes an individual's knowledge and skills gained through academic preparation. Human capital is developed as an investment in oneself for potential returns (Becker, 1994). A person can invest in themselves through education. Incentives for development of human capital include the possibility for a person to attain greater income, increase effectiveness and contributions to the community, increase productivity, and improve

quality of life (Schultz, 1960, 1971). Knowledge and GPA (human capital resources) are related to students' access to information and are measurable (Engberg & Wolniak, 2010). College readiness increases when students' human capital is developed as they complete rigorous courses in high school and they attain a high final GPA when graduating high school (Engberg & Wolniak, 2010). Having an advanced level of human capital benefits a student in that it might eliminate or reduce the need for a student to take a remedial course (Conley, 2008). A student's college readiness and college enrollment do not depend entirely based on high school academic factors, rather non-academic factors, including the level of cultural capital and social capital, play a roll.

Cultural capital can involve an individual's familiarity with cultural knowledge, language skills, and behaviors acquired largely through family and friends (Bills, 2003; Bourdieu, 1986; Engberg & Wolniak, 2010). A number of key examples exist in the literature. Study findings have suggested that community college students whose primary spoken language is not English may face additional barriers to remaining enrolled in college (Hawley & Harris, 2005). Also, parents' and friends' expectations for the student's plans for after high school graduation might have an indirect influence on a student's remedial course enrollment: parents' expectations are related to the parents' level of education (Crisp & Nora, 2010).

Social capital is defined as resources available through social networks (Bourdieu, 1986; Lin, 1999). The strength and size of the social network may be associated with the likelihood of enrolling in a remedial course in college (Engberg & Wolniak, 2010). For example, students who discuss college with their parents and friends and seek out information about college entrance exams during high school might be more likely to enroll in college (Engberg & Wolniak, 2010). The assumption is that these students tend to enroll in rigorous courses during high school and

are prepared for college-level courses when they graduate high school (Engberg & Wolniak, 2010).

Social and cultural capital are closely associated so some studies do not assign constructs to either domain (Wells, 2008). Social and cultural capital blend when students and their parents are involved in various types of activities such as plays, musical events and other arts, hobbies, going to museums, and participating in or attending sporting events. Socio-cultural capital is blended capital forming “culturally relevant social experiences” (Crisp & Nora, 2010). The aspirations for the student held by school counselors, teachers, and coaches also blend into both social and cultural capital domains. Because they are alike, cultural and social capital can work together, or they can possibly substitute for each other where one is lacking. They can also lead to or influence changes in each other, as well as lead to changes in other forms of capital including human capital relevant especially to students (Bourdieu, 1986; Wells, 2008). Throughout their educational experiences, students can develop interpersonal relationships and values that initiate, maintain, and increase their own human, cultural, and social capital (Silva, 2001; Wacquant, 2002). Students who have a higher level of cultural and social capital are more likely to enroll and persist in a post-secondary institution because they can build relationships and integrate old and new experiences (Berger, 2000; Conley, 2008; McDonough, 1998).

Students can form various types of capital impacting college readiness, whether they seek to attend college, and what types of courses they take when they enter and attend college (Engberg & Wolniak, 2010). Studies on factors influencing post-secondary placement and enrollment have examined the effect of capital resources (Engberg & Wolniak, 2010; Klasik, 2012; Sommerfeld & Bowen, 2013). Much of an individual’s available capital depends on their connections to others, especially cultural and social capital. College readiness can depend largely

on students' development of their various capital resources. College readiness depends on social and cultural factors, such as a student's individual behavioral attributes and attitudes (Bettinger & Long, 2007) and their access to information through social networks (Perna, 2006). These traits are forms of individual capital developed through social and cultural connections including a student's network of relationships joining the student with family, friends, school contacts and through general social affiliations (Bourdieu, 1986). The level of non-academic capital attributes that a high school graduate possesses may influence their behavior when they enter college, including persistence in college (Huerta, Watt, & Reyes, 2013).

Capital resources of various types function as enabling forces, or influences, for students to approach and attain post-secondary education (Dumais, 2002; Silva, 2001). Cultural capital includes attributes such as language skills, cultural knowledge, and mannerisms acquired in part from parents and family, and they mostly define an individual's class status (Bourdieu, 1986). Social capital is built from social networks and ways in which these networks are sustained (Morrow, 1999). The level of social and cultural capital that a student develops prior to entering college can help the student to understand college as a system and culture (Conley, 2008). Social and cultural capital are closely related, they share connections and have some overlapping boundaries (McNeal, 1999). The level of available capital a student possesses depends on the various relationships an individual can access, as well as the scope of networks they can reference. Individuals' membership in specialized groups tends to afford the individuals benefits and advantages over other people who do not belong to the group (Bourdieu, 1986).

### **Race/ethnicity, and Socioeconomic Gaps**

Despite increasing requirements for high school graduation from federal and state authorities, for example changes in the number of units of math, second languages, and science

courses, almost one-third of students who entered college in the year 2000 required remediation in reading, writing, or math, with the highest need for remediation in math (Parsad, Lewis, & Greene, 2003). As recently as academic year 2007-2008 (for which the federal government last reported), 20% of first-year college students took a remedial course (Sparks & Malkus, 2013). Forty-two percent of the nation's college freshmen are under-prepared for college-level math (Radford, Pearson, Ho, Chambers, & Ferlazzo, 2012). The need for remediation is particularly high among students who are low income and disadvantaged academically, Hispanic, and Black (Long, Iatarola, & Conger, 2009; Roth, Crans, Carter, Ariet, & Resnick, 2000). Studies have examined the differential effects of students' academic and demographic background on course taking patterns in high school and high school graduation. Since there is a dearth of research literature on the differential effects of demographic variables on remediation in college, available research will be reviewed here with an assumption that these factors influence remediation because all these factors are interrelated (Bettinger & Long, 2007; Hughes & Scott-Clayton, 2011; Long, Iatarola, & Conger, 2009).

Examining federal NELS:88/2000 data, O'Connor (2009) found that 58% of White parents expected their children to complete a Bachelor's degree, while 53% of Black parents and 50% of Hispanic parents expected this of their children. But parents' expectations are often not aligned with student academic performance. That is, parental expectations may be high even if student academic performance is low (O'Connor, 2009; Sciarra & Ambrosino, 2011). O'Connor (2009) used a logistic regression model to explore whether SES can explain the overrepresentation of Hispanic students in community college. She found that for Black/African American, White, and Hispanic community college students who are of high SES, SES was correlated positively with students' attainment. But Hispanic students did not derive nearly the

same level of advantage and benefit as the other two groups. O'Connor (2009) surmised that the lack of information influencing Hispanic high school students is linked closely to low expectations, perpetuating an inequity in education and related to SES and race/ethnicity. If parents, family, and a student's social network do not stress early on the importance of academic performance in high school, then student intent to prepare for college appears to be moderated, especially for students who are Hispanic and lower SES.

Access to forms of capital is associated with race/ethnicity (Wells, 2008). Race/ethnic background is tied inextricably with social and cultural capital, which are themselves highly allied, and directly impact information about college attendance, and the availability (or lack thereof) of that information to students. Those families rich in accumulated social and cultural capital might feel an entitlement to post-secondary education. Institutions may unwittingly sustain a pattern of granting greater access to those students who possess abundant capital resources, thereby perpetuating inequity in education by expecting students to understand the college context and process or by assuming the existence of other elements of capital (Wells, 2008).

Academically and/or economically disadvantaged individuals might be unaware of how to navigate the college application process, including finding access to financial resources, and preparation of critical technical details required for a competitive and successful application. When undertaking college application, Conley (2008) suggests that a student benefits significantly from "college knowledge" involving some understanding of how to approach the process and that acquiring the requisite knowledge includes some level of understanding of expectations of college recruiters. Further, when early career college students entered the institution's environment, they might not have the necessary level of social skills for

acculturation to a new and potentially stressful environment. If learned prior to college and from family and their social network, students' coping skills, learning strategies, and management of relationships with instructors can enhance students' success in college (Conley, 2008).

Long, Iatarola, and Conger (2009) estimated the extent to which the gaps in readiness associated with race/ethnicity and poverty are determined by the courses that students took while in high school. Using data on students in Florida public post-secondary institutions, the researchers found that differences among college-attending students in the highest math course taken explained 28-35% of Black/African American, Hispanic, and poverty gaps in readiness and over three-quarters of the Asian advantage. The findings are valuable to policy makers and educators seeking to potentially reduce disparities in college readiness.

Long, Iatarola, and Conger (2009) saw the greatest benefits in terms of college achievement for students who were in the middle quintiles for their Grade 8 assessment test scores and who took Algebra 2. But for students who were Black, Hispanic, or poor only about half were ready for college math – far below the White, Asian and non-poor students' readiness rate. While these researchers stated that their study shows achievement gaps would narrow by ensuring all students take the same courses of higher rigor (thus reducing disparities), they also say that policy which raises curriculum standards has the risk of higher dropout rates then exacerbate existing gaps in college access and success. The current study may expose other disparities and their extent. If the current study finds that taking a remedial course is related to race/ethnicity, SES level, or math course rigor, then the research site and its feeder schools can work together on programs and focused efforts to better prepare high school students for college credit-bearing courses.

Crisp and Nora (2010) examined Hispanic students' persistence and transfer from two-year colleges after a remedial course, and what factors influenced success, including sociocultural capital, high school GPA, and high school course rigor. Using federal data from the Beginning Postsecondary Students Longitudinal Study, and logistic regression, college student persistence in developmental courses was positively related to the level of social capital, higher SES, and high school preparation in math, for Hispanic students. In measuring persistence in the first two years of college, Crisp and Nora (2010) found that enrolling in a remedial course was positively related in their model and was a benefit to Hispanic students. These factors can inform policy and intervention efforts, and can increase equity in higher education among Hispanic students, by providing evidence regarding level of academic preparation and success of newly entering community college students. On the basis of this evidence, policy revision could be explored for interventions such as counseling and bolstering family engagement to build social, cultural, and human capital.

Recent work (Davies, Qiu, & Davies, 2014) pointed to a research and policy implication, that the use of some indicators of SES, such as household income, are not optimal for identifying students who need to widen their participation in higher education. Davies et al. (2014) demonstrated that cultural capital and SES are related and interact, affecting high school students' decisions regarding higher education. Using a survey with sociocultural questions much like the U.S. ELS:2002 high school Student Questionnaire used by Engberg and Wolniak (2010, 2014), with a factor analysis and ANOVA, Davies et al. (2014) found that cultural capital and the perceived reward for investing in a college education to expand human capital were related significantly to enrollment in college. This can be due to a lack of cultural capital where student needs are not met adequately for information and assistance in the process of applying to



college. That is, a relationship between SES and college readiness may be ignored if the effects of cultural capital, parental education level, and student expectations of the potential reward for graduation are considered in an integrated model, in relation to college-going behavior (Davies, Qiu, & Davies, 2014). As an example, Davies, Qiu, and Davies (2014) argue that interventions of free school meals where SES is low, to stimulate students into higher education, are not effective or optimal compared to developing sociocultural capital according to research.

Several studies have looked at the relationship of students' demographic and academic variables with high school graduation. Student background factors—race/ethnicity, gender, and socioeconomic status—were related to graduation (Alexander, Entwisle, & Kabbani, 2001; Rumberger, 2004). However, when researchers included alterable variables, for example GPA and the number of course failures, the variance in the graduation rate explained by the demographic factors became negligible. Allensworth and Easton (2007) indicated that student background variables explained about 12% of the variation in graduation rates in the cohort of students entering Chicago Public School high school; however, when students' Grade 9 GPA and number of courses failed in Grade 9 were included, an additional 39% of the variation in graduation rates was explained by the two variables (Allensworth & Easton, 2007). The above studies suggest that the influence of demographic variables is, in fact, negligible once academic variables are included in a model, thereby indicating that course rigor in high school might reduce the readiness gaps.

Research has shown a correlation between demanding high school course rigor and post-secondary academic success (Adelman, 2006; Attewell & Domina, 2008). However, not all students are exposed to rigorous courses during high school. Asian and White students tend to take more advanced courses than other subgroups, while low-income and minority students have

less access to and lower rates of participation in AP courses and exams (Handwerk, Tognatta, Coley, & Gitomer, 2008; Planty et al., 2007). Disparities in participation by race/ethnic groups in rigorous courses has decreased slowly over recent history, partly because not all high schools offer college preparatory programs and also because of fears that increased access to AP and other advanced courses will cause a drop in the rigor and value of the courses (Duffett & Farkas, 2009; Klopfenstein, 2003). Access to rigorous courses is linked inextricably to prior academic success. High schools seeking to improve all students' success in rigorous course work must attend to the academic preparation of students at all levels and in all grades (Flores & Gomez, 2011; Raphael & Kassissieh, 2010) thereby reducing the number of students enrolling in remedial course when they enter college.

Across the U.S., considerable variability exists in remediation requirements among post-secondary institutions, and what constitutes college-level courses for credit is neither consistent nor clear (Attewell, Lavin, Domina, & Levey, 2006). Each institution can have its own set of practices and conditions so there is not an objective, well-accepted cut-point at which college students require remediation. Use of placement tests varies among colleges and universities (Attewell, Lavin, Domina, & Levey, 2006). Yet, Scott-Clayton, Crosta, and Belfield (2012) found that testing has less value than high school academic performance. They found that for English testing, one-third of students were severely misaligned, either to college-level or a remedial course, and for math testing, one-fourth of students were significantly misaligned. Their research indicates that remediating substantially fewer students would not lower success rates in college-level courses if institutions had higher regard for high school performance rather than placement testing, as testing can misidentify the appropriate course level for students. Placement tests at the time of college entrance are meant to define who attends a remedial course and what

students take courses for college credit. Scott-Clayton (2012) found that placement exams alone do not predict students' likelihood to fail as well as the exams can predict those students who are likely to do well in college. More specifically, these tests predict proper placements in math course level better than English. A significant improvement to the placement process, according to Scott-Clayton et al. (2012), would be to use multiple measures for placement, especially high school transcripts. Scott-Clayton et al. (2012) stated that severe misplacements in respect to a remedial course are common, but including transcripts with test scores would eliminate 15% of severe cases of misalignment while maintaining the overall rate of students assigned to remediation. However, Scott-Clayton et al. (2012) states that the remediation rate could be reduced overall by 8-12% with the optimal use of test scores in combination with transcripts.

Students who are underrepresented minorities and those who are academically disadvantaged are often adversely affected by standardized testing for admission when they seek admission to college (Geiser & Santelices, 2007). Geiser and Santelices (2007) argue that the high school record alone is the best predictor and has less adverse effects on admissions for students who are underrepresented minorities and economically and academically disadvantaged. Castro (2013) argues that the structural system undergirding U.S. education including the use of standardized testing effectively maintains a stratification of power and a racial supremacy.

Using the federal Educational Longitudinal Survey (ELS) panel data, Engberg and Wolniak (2014) sought to determine if differences in high schools categorized by SES levels accentuated academic disadvantages for students' college enrollment patterns. They examined students' college enrollment in two-year and four-year programs depending on high school socioeconomic contexts by using capital constructs as the basis for predicting enrollment in a multilevel linear regression model. In the study, human capital was operationalized as high

school GPA, number of AP courses completed, and highest level of math in high school, while cultural capital involved parents' and friends' aspirations for the student, and social capital involved the extent of peer networks.

Not surprisingly, Engberg and Wolniak (2014) found that students who graduated from low- and mid-level SES schools had significantly greater odds of attending two-year colleges or not enrolling in college, than those at high-SES schools. Relatedly they found that low to middle-level SES schools' students had significantly lower parent involvement, and more peers who enrolled in two-year colleges, with the converse being the case for high-SES high schools' students. Interestingly, low to middle-SES schools' students experienced the lowest level of aspirational influences, but when this force was present it had the greatest effect on whether the student enrolled in college (Engberg & Wolniak, 2014). As for policy implications, the researchers believed that students at the most poorly resourced high schools would benefit from programs and exposure boosting their disposition to attend college, including counseling, parental and peer involvement. Engberg and Wolniak (2014) stated that policies, programs and partnerships can benefit students most when the efforts promote the interconnectedness of high schools with post-secondary schools, individuals and community, while promoting educational aspirations, given that such substantial resource imbalances exist across high schools.

In summary, access to forms of capital is related to race/ethnicity (Wells, 2008). Social and cultural capital are often influenced by race/ethnicity and that progression affects students gaining information on college. For example, O'Connor (2009) concluded that parental expectations are linked to the lack of information possessed by Hispanic high school students. This perpetuates inequity in education, related to SES (Wells, 2008).

When they seek entry to college, students who are underrepresented minorities and academically disadvantaged are often adversely affected by standardized admission tests (Geiser & Santelices, 2007). Geiser and Santelices found that the high school record alone is the best predictor and has less adverse effects on admissions especially for students who are underrepresented minorities and economically and academically disadvantaged. Once academic variables are included in a model, the influence of demographic variables becomes less thereby indicating that course rigor in high school might reduce college readiness gaps (Allensworth & Easton, 2007).

The need for remediation is especially great for students who are Hispanic, Black, low income or disadvantaged academically (Long, Iatarola, & Conger, 2009). Engberg and Wolniak (2014) found that students graduating from low- and mid-level SES schools had significantly greater chances of attending two-year colleges or not attending college, than those at high-SES schools. Low to middle-SES schools' students reported significantly lower parent involvement, and more peers who enrolled in two-year colleges. Policies, partnerships and programs can benefit students most by promoting the connectedness of high schools and post-secondary schools, educational aspirations, individuals and community.

## **Human Capital**

### **Academic Preparation in High School**

Community colleges have historically attracted highly diverse student populations with varied social backgrounds and varying levels of academic preparedness (Morest, 2013). Ever greater numbers of underprepared students have entered community colleges over the past several decades. When considering this population, it has been found that both academic and nonacademic variables relate to student achievement (Bettinger & Long, 2007). In this

consideration, educators and researchers have disagreed about using high school academic performance standards to predict college performance; they also disagree on the strength of the high school record as an indicator of preparedness for college (Smittle, 1995).

Studies have indicated that academic preparation in high school is a key influence on post-secondary outcome. Using college and high school transcripts and ACT test scores in a region of Utah, Hoyt and Sorensen (1999) found that students' high school preparation was a predictor of their need for remedial education in college. Students who earned higher grades and took higher level math and English in high school were less likely to need remedial education. While higher levels of math courses in high school reduced remedial placement rates, more than half of all students who successfully completed intermediate algebra and geometry still required remedial math courses in college, or needed to repeat intermediate algebra in college.

Allensworth and Easton (2007) examined student-level predictors of high school graduation starting as early as Grade 9. The measures readily available during Grade 9, and highly predictive of graduation, included: GPA; number of semester course failures; and days absent during Grade 9. Alexander, Entwisle, and Kabbani (2001) reported that Grade 9 performance (GPA, grade retention), behaviors (student behaviors), and attitudes (parent and pupil attitudes) together explained 44% of the variation in dropout rates; when background factors were added the variance explained increased by just under 6%. Once students' academic performance in Grade 9 is known, additional information about their background does little to improve the prediction of whether they will graduate or drop out. It has been found in the above research studies that once academic variables were included in a model, race/ethnicity had a negligible effect on student outcome (graduation rate). These factors might also influence students' enrollment in a remedial course in college.

Hoyt (1999) found that recent high school graduates were less likely to take a remedial course in college if they completed more advanced math courses successfully in high school. Students also had better test scores for subsequent placement in college math, and higher ACT scores in math, depending on their completion of higher levels of high school math.

In another study, Hoyt and Sorenson (2001) predicted the proper placement of students in a remedial course based on level of preparation in high school, grades in math, gender, race/ethnicity, delayed entrance into college, and attendance at different high schools. Their analyses confirmed that the level of high school math preparation and grades were related significantly to placement in a remedial course.

Hoyt and Sorensen's (2001) research is close in approach to the current study. Also, a recent dissertation study examined the relationship of high school preparation in math to college freshmen enrollment in post-secondary developmental math courses (Lang, 2012). Hoyt and Sorenson (2001) showed that a student's grades and level of math preparation in high school were significant predictors of placement in remedial math. In fact, the models for math fitted the data better than the models for English. Students who did not complete intermediate algebra were almost always placed in remedial math in college. Students completing college algebra, trigonometry, pre-calculus and calculus were less likely to be placed in remedial math. The study further indicated that 25% or fewer students who took calculus in high school were placed in remedial math in college. Further exploration of the data by specific high school indicated a variation in remedial placement rates by high school, indicating the likelihood of differential grading systems and expectations for students in math (Hoyt & Sorenson, 2001).

Long, Iatarola, and Conger (2009) examined data of students in Florida's public post-secondary institutions and found that curriculum taken in high school contributed significantly to

college readiness, with the biggest gains occurring for students who completed Algebra 2. The research also noted that Grade 8 test scores had the greatest effect on the highest math course taken in high school, and college readiness -- more than any other characteristic (educational needs, socio-demographic characteristics, etc.). Roth, Crans, Carter, Ariet, and Resnick (2000) conducted a study to observe what demographic and high school academic factors influenced student performance on a placement test administered upon admission to a community college in Florida. They found that students who completed Algebra 2 in high school performed much better on the Florida math placement exam than all other test takers. Further, even students who took Algebra 2 and did poorly achieved a pass rate of nearly 75% on the math placement test. The authors suggested that students could increase the probability of passing the math placement test if they took more difficult math courses in high school, even at the expense of lowering their GPA.

Studies have shown that Algebra 1 completion has some association with high school graduation and college readiness. Students who took Algebra 1 by Grade 8 were far more likely take calculus in high school and to pursue higher education than those who did not (Riley, 1997; Cooney & Bottoms, 2002).

Fong, Huang, and Goel (2008) examined Grade 12 math courses and math remediation in Nevada's public post-secondary schools. This study examined course level and course grades in math and their relationship with math remediation rates in college. The study population graduated high school in 2006 and enrolled in post-secondary programs in 2006 or 2007. Students were classified in seven groups based on the level of math they successfully completed in Grade 12. The likelihood of a required remedial math course in college was strongly related to the amount and type of math courses taken in Grade 12, and the course grades. Students who did



well in a math course often enrolled in a remedial course at a lower rate than students who took the next level of math course and did poorly. The authors also used logistic regression analyses to reveal a similar relation between remedial math and the highest level of math taken in Grade 12 after controlling for gender, race/ethnicity, and Grade 12 math GPA. The authors concluded that the findings of this study can serve as a starting point for discussion between K-12 and college administrators on what high school math levels are sufficient for college-bound students.

Lang (2012) studied the connection between secondary math preparation and enrollment of college freshmen in a developmental math course. Studying the high school to community college transition in a large school district in the mid-Atlantic region, Lang identified course grades and course-level attainment as impacting students' placement in developmental math. One-third of the district's high school graduates enrolled in the county's community college and half of those took a remedial math course, a substantial percentage. Students who enrolled in a pre-calculus or calculus course in high school were up to 77% less likely to require developmental math in post-secondary work depending on their level of high school preparation and achievement. Further, achieving a course grade of "C" or better in high school math was a strong indicator of whether a student enrolled in developmental math in post-secondary work. Lang (2012) indicated secondary schools should strive to increase the level of math course attainment and the course grades achieved by students to avoid future remedial course placement for the student. This action would have the potential to reduce the large number of students entering developmental math courses in post-secondary education.

Math achievement was also found to be significantly related to entrance into post-secondary education, and whether the student enrolled at a two-year or four-year institution (Lee, 2012). In a study with the goal of benchmarking and assessing college readiness, Lee (2012)

found gaps among racial and social subgroups by employing data from multiple national education databases and linking them. Lee's (2012) study indicated that the gap between actual and desirable math achievement across various high school academic levels impacts meeting national goals for educational outcomes that are based on policy. That is, a federally mandated goal for all students to be ready for at least two-year college study is threatened by gaps in math achievement.

In a study by Adelman (1999), college remediation did not predict college graduation when measures of secondary school academic preparation and performance were added to the model. A key finding of his research was that completion of a course past Algebra 2 in high school more than doubles the chances that the student will complete a Bachelor's degree. More generally, of all pre-college curricula, the highest level of math in secondary school strongly predicted the outcome of completion of a Bachelor's degree.

Other studies or topical papers have indicated that taking rigorous courses, especially, enrollment in AP courses has been shown to be the most significant predictor of college going behavior (Camara, 2003). Even if students do not earn college credit through the AP program, the AP courses offer rigorous curricula that students need to prepare for any post-secondary work. A longitudinal study finding indicated that having just one AP course nearly doubled the likelihood of students graduating from college (Adelman, 1999). A similar finding, that students who took and passed AP exams are much more likely than their peers to complete a Bachelor's degree within four years, resulted from the investigations of Camara (2003) and Hargrove, Godin, and Dodd (2008).

Some students do not perform well in high school math. Perhaps more than English, math courses incorporate a sequential content series during the school years, they build on prior

concepts and knowledge and this is reflected in the literature on students' progress in math achievement throughout their academic career (Spielhagen, 2006a). The earlier in their secondary education that students complete algebra, the more time they have to enroll in advanced courses, in preparation for college (Spielhagen, 2006b). Whether students can gain access to and successfully complete higher level courses such as algebra in middle school may influence their overall academic achievement in high school and beyond (Kurlaender, Reardon, & Jackson, 2008).

Spielhagen (2006b) examined long-term academic outcomes for students who did or did not enroll in algebra in Grade 8 in a district implementing an initiative to increase access to algebra as a higher level course for any student who was ready. Students who completed algebra in Grade 8 remained on the math pathway during high school longer and attended college at a greater rate than students who did not. In the recent past, an algebra course was available to students in middle school only in special cases or to a selected, relatively few students. Spielhagen's (2006a) study indicates that leaders should form education policy promoting enrollment in eighth-grade algebra for students who demonstrate readiness. An opportunity for such advanced study by all students as early as possible could help close an achievement gap spanning race/ethnic groups and SES status, overcoming equity issues and leveling the playing field for minorities and economically disadvantaged students. However, Spielhagen (2006a) noted flaws in students' course placement during middle school, especially when parents overrode schools' and teachers' placement of students in a given level of math. This parental interference was particularly frequent at high SES schools.

The results of Spielhagen's studies (2006a, 2006b) point to benefits of wider access to the study of algebra for all Grade 8 students. Benefits are that students have the opportunity take

more math courses in high school, and to have the potential to enter college at a higher rate than those students who did not take algebra in Grade 8. However, she notes that, for many Grade 8 students, algebra is inappropriate as there will always be some students who need to complete more basic math training prior to algebra (Spielhagen, 2006b). Because of a differential opportunity for developmental gains across race/ethnic groups and the broad range of SES existing in the U.S., "...the question remains...how well individual students who were not in the early access group would have fared given the opportunity to try" (Spielhagen, 2006b, p. 40). As noted earlier, while Long, Iatarola, and Conger (2009) considered that their study showed race/ethnic achievement gaps would narrow by ensuring all students take the same rigorous courses, they also recognized that policy raising curriculum standards runs the risk of higher dropout rates which would then exacerbate existing gaps in college access and success.

In summary, Hoyt and Sorenson's (2001) analysis confirmed that the level of high school preparation and grades were related significantly to placement in a remedial course. Long, Iatarola, and Conger (2009) found that high school curriculum contributed significantly to college readiness, the biggest gains occurring for students who completed Algebra 2. Even students who took Algebra 2 and did poorly realized a pass rate of nearly 75% on the math placement test. Adelman's (1999) key finding was that completion of a course past Algebra 2 in high school more than doubled the chances that a student will complete a Bachelor's degree. Math achievement was significantly related to entrance into post-secondary education, and whether the student enrolled at a two-year or four-year institution (Lee, 2012).

Students who took Algebra 1 by Grade 8 were far more likely take calculus in high school and to pursue higher education than those who did not (Riley, 1997; Cooney & Bottoms, 2002). Spielhagen (2006a, 2006b) found benefits of wider access to the study of algebra by

Grade 8 students. Spielhagen's (2006a) study indicates that leaders should form education policy promoting enrollment in eighth-grade algebra for students who demonstrate a readiness for that. The earlier in their secondary education that students complete algebra, the more time they have to enroll in more advanced courses in preparation for college (Spielhagen, 2006b). However, while studies indicate that academic preparation in high school plays a key role on post-secondary outcome, researchers and practitioners are in conflict about how to use high school academic performance to predict college performance, even about the strength of the high school academic record (Smittle, 1995). This conflict arises, in part, because both academic and nonacademic variables are related to student achievement (Bettinger & Long, 2007).

### **High School Grade Point Average**

For the past thirty years, the two most commonly used predictive measures of college academic performance are standardized tests, administered during high school or upon application to a two-year college, and high school GPA (Noble & Sawyer, 2002; Sawyer, 2013). Even in the early 1990s the majority of community colleges were moving to mandatory assessment of all entering students (Smittle, 1995). In the first half of the 1990s, generally 75% of both urban and rural two-year institutions required some form of testing or submission of test scores, although placement standards were not consistent.

Typically high school GPA is thought to suffer too much inconsistency to be a robust predictor of academic performance in college, because standards of grading can vary greatly across schools and systems, and grade inflation can possibly reduce predictive power. But Geiser and Santelices (2007) found that high school cumulative GPA was a significantly better statistical predictor of college student freshman grades as well as cumulative GPA after four years of college than the most prevalent standardized test (SAT). This was true overall and when

controlling for majors of five prominent types, from the hard sciences to social sciences for hundreds of thousands of students in the University of California system. Geiser and Santelices (2007) found that the high school record is a better predictor of college student freshman grades as well as the outcome of four years of college.

Smittle (1995) conducted a study involving colleges in the Florida community college system. The study was designed to examine the usefulness of assessment models using, among other predictors, GPA for predicting community college students' academic performance. Study results showed strong correlation between college GPA and other independent variables. The study demonstrated that the strongest relationship was between high school GPA and college GPA with a correlation of 0.52 (Smittle, 1995). When the other independent variables were introduced in the larger assessment model, high school GPA was the strongest predictor accounting for 13% of college GPA variance. This relationship demonstrated between high school indicators and college academic performance has implications for policy, strengthening the argument for greater communications between high schools and community colleges (Barnett & Hughes, 2010).

Engberg and Wolniak (2010) indicated that high school grade point average (GPA) was positively related to college enrollment. They used the continuous variable of final high school GPA taken directly from students' official high school transcripts because those data were available from a public but restricted, national dataset. Their results showed that final high school GPA was a leading predictor for enrollment in two-year or four-year post-secondary institutions, but more so for attending a four-year college. Final high school GPA, a human capital factor, can influence and predict college admission as it can indicate the student's level of college readiness (Sawyer, 2013). While GPA can be used to predict success in college (Noble &

Sawyer, 2002), that does not resolve the problem of mixed results regarding whether success in college is related to enrollment in a remedial course (Bettinger & Long, 2005, Calcagno & Long, 2008). Student level of college readiness is related to high school GPA, as a result, high school GPA may influence whether a student enrolls in a remedial course. Operationally, students' transcripts and high school GPA are not routinely considered when assessing students' college-readiness upon enrolling in classes at the community college which is the research site for the current study.

Human capital in the form of final high school GPA was found to be a stronger, significant predictor of enrollment in college than either cultural or social capital by Engberg and Wolniak (2010). These factors were at the student level, but Engberg and Wolniak, found similar effects for high school GPA at the level of the entire high school. The level of GPA had a significant relationship with whether the student enrolled in a two-year or four-year college, and was also related to the number of AP courses taken in high school as well as the highest level of math taken.

In summary, high school GPA is one of the best predictive measures of academic performance in college (Geiser & Santelices, 2007; Noble & Sawyer, 2002; Sawyer, 2013). Engberg and Wolniak (2010) showed that high school GPA was positively related to college enrollment: final high school GPA was a leading predictor for enrollment in two-year vs. four-year post-secondary institutions. Geiser and Santelices (2007) found that high school cumulative GPA was a significantly better predictor of college freshman grades and cumulative GPA after four years of college than the SAT standardized test. Smittle (1995) demonstrated a strong relationship between high school GPA and college GPA with a correlation of 0.52. Human capital in the form of final high school GPA was found to be a stronger significant predictor of

enrollment in college than either cultural or social capital (Engberg & Wolniak, 2010). High school GPA indicating college readiness has implications for policy, that communications between high schools and community colleges needs strengthening (Barnett & Hughes, 2010).

### **Cultural and Social Capital**

Social and cultural capital are closely related (McNeal, 1999). Cultural capital refers to attributes such as language skills, cultural knowledge, and mannerisms acquired in part from parents and defining an individual's social status (Bourdieu, 1986). Social capital focuses on interpersonal networks and ways in which these networks are sustained (Morrow, 1999). The level of social and cultural capital that a student develops prior to entering college helps the student to understand college as a system and culture (Conley, 2008).

Social capital is conceptualized by Coleman (1988) and Bourdieu (1986) in two different ways. Coleman (1988) emphasized social capital as authority, norms, social controls, and trust that must be understood by the student to succeed. Students can build their social capital through their relationship with parents and in turn with the student's parents' relationships with other parents and adults connected to the schools the student attends (Dika & Singh, 2002). Bourdieu (1986), in contrast to Coleman (1988), focused more on how individuals' membership in specialized groups affords them advantages over other individuals. An individual's available capital depends on their connections to others: the amount of available capital depends on the relationships an individual can access, as well as the size of networks they can reference. According to Lin's (2001) interpretation, Bourdieu viewed social capital as a structural element of societal class, a mechanism used by an advantaged class to enable it to maintain its primacy. Social capital can function as a college-linking network (Engberg & Wolniak, 2010) and the



amount of social capital available to the student is a function of the volume of social capital that the individuals the student's accessible network possess.

Cultural and social capital, though distinct, share connections. In fact, social and cultural capital are so closely associated that some studies do not assign constructs measured by variables in research to either domain (Wells, 2008). Cultural capital is typically an inherited or transferred set of attributes serving to define social level and class, or status in society as transmitted from one's upbringing (Bourdieu, 1986). Thus, this capital asset can bestow a high level of social privileges to an individual or, in contrast, can limit families having a low SES making it more likely that they will persist in poor conditions and suffer inequalities including not advancing in education.

Social and cultural capital are often viewed as achievable by middle and upper class socioeconomic classes but may be considered as unavailable to economically and academically disadvantaged individuals (Raines, 2006; Webb, Schirato, & Danaher, 2002). Graduating from high school itself is a means of increasing human and social capital (Bourdieu, 1998; Raines, 2006; Silva, 2001). These capital resources function as facilitators to post-secondary education (DiMaggio, 1982; Dumais, 2002; Silva, 2001). Throughout formal education the student can develop interpersonal relationships and values creating, maintaining, and increasing their own cultural and social capital (Lareau & Horvat, 1999; Silva, 2001; Wacquant, 2002). Knowledge and ability to conduct proper relationships, integrate new experiences, and maintain some level of comfort with the challenges of the first year of college are valuable skills that can be brought forward by the student from their earlier life history (Conley, 2008).

One measure of cultural capital is based in linguistics, the language spoken in the household, and what language a student learns as their native tongue. Also the parents'

expectations of the high school student's ability to enter college can influence student behavior. Family expectations of the student attending college play a major role in a student's formation of cultural capital (Engberg & Wolniak, 2010; 2014). A student's cultural capital can develop in high school as the student discusses community, national and world events with others. (Engberg & Wolniak, 2010). During high school, Hispanic students and students who are minorities may be at greatest academic risk and/or economic disadvantage because they might not get sufficient help with homework during their high school years. Parents might not possess the personal background, a specific form of cultural capital, to discuss high school academic performance, its connection to college, and how that impacts the student's future success. Cultural capital is typically a learned set of attributes that function to define social level and class, or status in society (Bourdieu, 1986).

Social capital is acquired through students' relationship with their parents and also through the student's parents' relationships with other people connected to schools the student attends (Dika & Singh, 2002). Social capital involves interactions with friends and peers, parents' friends and connections in the community. Church and religious connections, teachers, counselors, coaches, and school leaders can all directly influence students' attitudes toward attending college. College-facing social capital can develop if a student communicates with friends and family about what is required to prepare, apply to and attend college and what steps the process involves. Individuals use social acceptance and social familiarity as individual social capital in a variety of settings including the educational setting (Bourdieu, 1986; Sommerfeld & Bowen, 2013). The level of available social capital is partly a function of what other individuals in a student's accessible network possess. Bourdieu viewed social capital as a structural element

of societal class (Bourdieu, 1986 as cited in Lin, 2001).). As such, social capital can be seen as a mechanism used by an advantaged class to enable it to maintain dominance.

Castro (2013) stated that education policy in the U.S. includes structural forces restricting opportunity for students of color and low-income status, while maintaining supremacy for people who are White. He used critical race theory to evaluate intervention programming for college readiness. Intervention programming is meant to remedy key deficits in academic ability, skill sets and understanding of context-specific behaviors often missing for students under-prepared for college. Castro (2013) argued that throughout education, institutional structures provide disparate opportunities to students. Thus, Castro (2013) concludes that as the U.S. advances its college readiness agenda, policymakers must consider that students of color are at a disadvantage in achieving college readiness. The national policy platform should acknowledge and address these issues that cause inequality to prevail.

The culture and environment in which children are raised plays an important role in the achievement gap (Jencks & Phillips, 1998; Lareau, 1987). Many schools tend to place students in different programs as a means of tailoring lesson plans for different types of learners. Students who are Hispanic and/or Black are more likely to be placed into lower tracks (Hallinan, 1994). Once students are in lower tracks, they tend to encounter a less challenging curriculum and few opportunities to advance to a higher level. When students' parents have limited English proficiency, the education system often fails to recognize the need for and/or make provision for adequate assistance to remedy the situation (Suárez-Orozco & Suárez-Orozco, 2009).

Academic preparation and GPA (human capital resources) are related to students' overall level of access to information (Engberg & Wolniak, 2010). Such information can come from students' cultural knowledge developed through their social network (Wells, 2008). Students can

learn about the importance of academic preparation in high school through the values and lessons taught to them by their families and friends. For example, a college educated parent is more likely to have the knowledge necessary to guide a child to be academically prepared to enroll in a college (Klasik, 2012) and take credit-bearing courses. Having an advanced level of human capital benefits a student to the extent that it might eliminate the need for a student to undertake a remedial course (Conley, 2008).

The three dimensions of cultural capital that were considered in the current study are language spoken in the household, the student's discussion of culture-related events, and the level of parents' and/or friends' expectations of the high school student to enter college. Parents' specific expectations can be affected by whether theirs is an English-speaking household. O'Connor (2009) found that 97% of both White and Black students came from English-speaking households whereas only 48% of Hispanic students did. Thus, during high school, Hispanic students may be at greatest academic and/or economic disadvantage because it is possible that they do not get sufficient help with homework during their high school years, and that parents might not possess the cultural capital necessary to discuss high school academic performance, its connection to college, and how that impacts the student's future success.

In order to optimize their chances of success in college, high school students, especially those in lower SES levels, should be informed by their parents about available financial aid, how to apply for it, the process and details of assembling and submitting an application to colleges, and the academic rigors and social changes associated with college life (Tornatzky, Cutler, & Lee, 2002). Without some means of this knowledge being conveyed through sociocultural capital, a large number of students remain at a severe disadvantage in high school and during the transition to college. In a survey "test" involving 1,000 Hispanic parents of high school students,

Tornatzky et al. (2002) found that 96% of the parents expected their child to enter some college but two-thirds of those surveyed failed to answer correctly most questions about financial aid, high-stakes testing and other crucial knowledge about college. This problem may be magnified by the large range of admissions standards, financial aid and course assignment processes across the range of post-secondary institutions (Karen, 2002).

Student aspirations can be heavily influenced by others' expectations that are conveyed to and understood by the student (Oseguera, 2013). Cultural and social capital can work together, or they can possibly substitute for each other where one is low as students are influenced by what their network expects of them. These forms of capital can also lead to changes in each other, can be interconverted, as well as lead to changes in other forms of capital including human capital especially relevant to students (Bourdieu, 1986; Wells, 2008).

For low-income, low SES high school students who lack the cultural capital in their home environment that would enable or ensure their access to college admission information, other mechanisms to inform them about college should exist (Oseguera, 2013). These could include community resources and support, or forms of social capital including other parents with college knowledge, friends/peers, parents' friends and connections in the community, church or religious resources and connections, among other potential resources of social capital. Teachers, counselors, coaches, clergy and school leaders can all directly influence students' attitudes towards attending college. Combined family-neighborhood-school connections can function together as networks or, if some component is missing, another institution might be available to take its place effectively (Oseguera, 2013). The effects of social and cultural capital impacting students' attitudes toward college attendance can include influencers conveying information to

the high school student, telling them the potential for financial rewards, prestige and other benefits following college attendance.

Using federal data and a regression model, Dumais and Ward (2010) examined students who are first-generation college attendees, and whether family cultural capital had a significant effect on them compared to non-first-generation students. They found that for all students enrolled in their first year of four-year colleges, family cultural capital and parents assisting students with applications to college was related significantly to college admission, persistence and graduation. Family cultural capital, however, was not significantly related to students' GPAs.

Person and Rosenbaum (2006) analyzed enrollment patterns and found that for Latino students, established networks of social contacts are important in acquiring information about college. However, there is also an information gap that remains, serving as an obstacle for these students in obtaining access to and realizing success in college. Perez and McDonough (2008) argue that access to strong networks and social capital provide greater exposure to ranges of college options, however, social networks that are limited in scope can reduce a students' post-secondary options. Further, the authors claim there is a need for increased education and resources throughout the Latino community to positively impact students' support networks.

Studies have indicated that access to accurate and timely information is not evenly available across all student groups. This impacts decisions about attending college and paying for education (Vesper, Schmit, & Hossler, 1999; Perna, 2006). The lack of cultural and social capital resources for students who are academically and/or economically disadvantaged contrasts with the resources available to students from higher socioeconomic ranks and affluent households, where at least one parent is usually college educated and thus, will possess a wealth of

information from which alternatives are available and good decisions can be made (Valadez, 1993; Walpole, 2008).

First-generation and lower income students, and racial minorities are more likely to enroll in community colleges (first generation can mean immigrants as they would be the first in their family to attend an American college or simply the first instance of any family member attending a college). Students who are economically, academically, or socio-culturally disadvantaged are often from home environments possessing little or no basic understanding of the system of higher education in general (Engle, 2007), let alone understanding how to approach remediation of academic deficits. These students often have the least access to the basic information and guidance they need to make informed decisions about the college process (Avery & Kane, 2004; Engle, 2007; Horn, Chen, & Chapman, 2003; Kezar & Yang, 2010; Perna, 2006). Students from more affluent socioeconomic backgrounds often enjoy the advantages and benefits of having college-educated parents. Their homes can offer a wealth of information that is valuable and essential in making good decisions about attending and paying for college (McDonough, 1998). Students from these homes often have the advantage of learning different strategies, linguistic codes, and social and cultural competencies helping them transition into higher education (Bourdieu, 1984). Higher SES or affluent groups are accustomed to the behaviors of high achieving students; they understand the significance of competitive practices such as high performance on standardized tests in high school and the importance of performing better on tests than other students, something that may not be emphasized for minority students (Valadez, 1993). The young student in an affluent environment might be more apt to prepare for class and tests, pursue supplemental activities such as after school programs, attend sports or science camps, and engage in cultural activities such as social or hobby clubs.

The dominance of one of the different domains of capital over the others has been a subject of research (Carter, 2003). Based on principles of capital discussed by Bourdieu (1986), Carter illustrated the interplay of cultural and social capital, finding that various educators can place differing values on these two types of capital that students possess, and students need to navigate this varied understanding within the educational environment. Cultural capital may be dominant where status relations exist between, for example, students and educators. Where cultural capital is rich in the context of, for example a socially marginalized community, it is not a dominant force used effectively for influence (Carter, 2003). Whereas, cultural and social capital and their transfer to successive generations can be exploited as a dominant force to maintain a hierarchy and possession of power by a dominant class, with a large part of power being through investment in education (Coleman, 1988). In comparing student persistence in two-year vs. four-year colleges, Wells (2008) investigated the effects of sociocultural capital on students. Using logistic regression, he used parental education, parental education expectations, and several other related constructs of cultural and social capital. While Wells (2008) found that sociocultural capital were significant in having a positive effect in explaining persistence rates for students, the two forms of capital had less effect on community college students than those students transitioning from first to second year in a four year college. This indicates that, in other studies, outcomes at two-year and four-year post-secondary institutions may sometimes be distinct from each other whenever research addresses the effects of social and human capital and students' behavior, especially as it pertains to education recruitment and retention policies (Wells, 2008). Since Wells' study (2008) found that these capital resources had less effect on community college students, perhaps indicating that disadvantaged and first-generation students



who tend to consider two-year colleges would benefit more from support programs that serve to assist these students specifically.

In summary, social and cultural capital are closely related and intertwined, overlapping, and share connections and (McNeal, 1999). Some studies do not assign constructs to either domain and may refer to sociocultural capital (Wells, 2008). However, in this project cultural capital refers to language skills, cultural knowledge, and mannerisms acquired partly from parents and that define class status (Bourdieu, 1986). Social capital, for this project, focuses on social networks and how networks are sustained, and include a college-linking network (Engberg & Wolniak, 2010; Morrow, 1999). The level of social and cultural capital that a student develops prior to entering college helps the student to understand college as a system and culture (Conley, 2008).

According to Lin (2001), Bourdieu viewed social capital as a mechanism used by an advantaged class to enable it to maintain primacy and related social capital to SES. Families with low access to these forms of capital may persist in poor conditions and suffer inequalities especially related to education. Graduating from high school itself is a means of increasing human and social capital (Raines, 2006; Silva, 2001). These capital resources function as enablers to post-secondary education (Dumais, 2002; Silva, 2001) as students with high levels of cultural and social capital are more likely to enroll and persist in post-secondary education (Berger, 2000).

### **Summary**

This correlational study addresses a gap in the literature by examining the relationship between multiple factors related to students in high school and subsequent enrollment in non-college-credit-bearing courses at a community college called remedial courses. Much is known

about high school students' admission rates to two-year post-secondary institutions, their persistence in high school and college, and their graduation from these schools, but little research has been conducted to link specific factors that describe students and their performance in high school with enrollment in a remedial course in community college.

Many behavioral and academic achievement or performance related factors have been studied and have a significant relationship with enrollment behavior patterns. Demographic factors (race/ethnicity and household income), human capital including high school GPA, and students' acquired level of various cultural and social capital resources such as language skills and extent of their social network, can possibly affect students' enrolling in a remedial course. Social capital and cultural capital intersect depending on the student's use of information. An effect or influence related to capital, such as a student's expectations of college going, might not be attributable to only one form of capital. The role of various forms of individual capital and demographic factors have been shown to relate to whether high school graduates enroll in a two-year college (Engberg & Wolniak, 2010), but not yet to whether they enroll in a remedial course.

Since whether factors affecting high school students are related to their subsequent enrollment in a remedial course at a community college, multiple high school-related factors were tested as predictors of the likelihood of student enrollment in a remedial course as part of their first community college experience. Students enrolling in a remedial course in conjunction with their admission to a two-year post-secondary institution is a prevalent problem across the U.S. Its relationship to multiple high school factors, both academic and behavioral, is not well-understood as most research completed in this area has focused on four-year institutions, not two-year colleges, though two-year institutions are one of the most frequently attended post-secondary education platforms.

## **CHAPTER THREE: METHODS**

### **Design**

The research design used for this study was correlational consideration of survey responses, specifically logistic regression. This design was chosen for two purposes: (a) to examine the potential causal relationship between variables; and (b) to predict outcome of a binary variable (remedial course enrollment) based on combinations of other variables.

The rationale for this research method was investigation of the relationship of variables as measured at earlier points in time with a variable measured several years later. This approach allows the researcher to analyze relationships between a several variables in one study (Gall, Gall, & Borg, 2010). Its application in this study allowed the consideration of several variables as predictors of an outcome; using an existing condition to facilitate consideration of the plausibility of a predictive relationship to a current enrollment status (Kerlinger, 1986).

More specifically, the current study's research design addressed student-level factors during high school: race/ethnicity; SES; final high school GPA; highest level of high school math; college seeking efforts (discussing college entrance requirements, and going to college); family/friends network (family/friends' desire for student to attend college, and discussion of community, national, or world events); and whether the student was a native English speaker. These predictor variables were used to predict the criterion variable of community college students' enrollment in a remedial course. The factors were also grouped as interrelated constructs creating forms of capital assets (human, cultural, and social capital) in addition to demographic factors.

### **Research Question**

The following research question guided the study.

**RQ1:** What student-level factors during high school (race/ethnicity, socioeconomic status, final high school GPA, highest level of high school math, college seeking efforts, family/friends network, native English speaking) best predicted whether first-year community college students enrolled in a remedial course?

### **Null Hypothesis**

The following was the null hypothesis:

**H<sub>01</sub>:** There was no significant predictive relationship between the criterion variable (enrollment in a remedial course) and one or more combinations of predictor variables (race/ethnicity, socioeconomic status, final high school GPA, highest level of high school math, college seeking efforts, family/friends network, native English speaking) for community college students.

### **Participants and Setting**

The research setting was a community college campus of a public institution in the state of Maryland. The college was established in 1965 and serves the Washington, DC metropolitan region. It is a large institution with multiple campuses and well over 3,000 total employees including faculty, administrators, temporary and part-time, and support staff. The target population for this study was all first-year students who were enrolled in courses during the period fall of 2012 to spring of 2015, at the research site. All student participants in the study were first time enrollees at the community college.

The largest campus of the institution's three campuses was selected for the study, since it has a student body that is consistently above 16,000 students per semester and is twice as large as either of the two other community college campuses in the system. In 2013, throughout the entire system, there were 24,400 non-credit students, including 1,700 students taking a combination of

credit- and non-credit courses. In fall 2013 there were 3,300 new, first-time freshmen at the selected campus with enrollment growing consistently during recent years. Across all campuses, 40% of students took a remedial course in 2013 so an estimated 1,400 students were in remedial courses at the campus selected as the research site.

In 2013, first-year enrollment were 19.9% of the entire three-campus system. The campus specific to the study has typically enrolled the majority of the 5,200 first-time students each year. Data regarding students' enrollment status (remedial vs. a non-remedial course) and high school graduation year were obtained through questions on a survey instrument. Students enrolled at the research site at a 90% in-county rate so the majority of schools sending students to community college were local. Nineteen percent of students were enrolled in a web-based course.

A convenience sample of 327 students was utilized for this study, as the institution was geographically nearby and readily accessible to the researcher's home, and the institution allowed the researcher access to the study participants (Creswell, 2008). Participants had to meet several simple conditions to be eligible community college student subjects. Participants were recently graduated freshmen students who were enrolled in at least one remedial course and students enrolled in only credit bearing courses. The questionnaire was made available to all eligible participants. A sample size of at least 300 students was needed for a small effect and a finding of statistical significance at the 0.05 alpha level (Gall et al., 2010). To accomplish the appropriate statistical power required a response from at least 150 or more students in each group, remedial and non-remedial course takers. Feasibility of obtaining the required sample was enhanced by the large number of remedial and non-remedial students and basic classes on the campus, daytime and nighttime courses. Classes began January 26 and ended May 17 and typically there were thirty students per classroom.

The sample of participants was similar in composition (race/ethnicity, gender, and age) to the overall first-year students at the selected campus. In 2013, the campus population of new, first-time freshmen was 3,186 students, of which 26.9% were White, 25.6% Black/African American, 8.4% Hispanic or Latino/Latina, 14.0% Asian, and less than 1% Native American or unknown (Table 3.1). An additional 24.1% declared themselves as multi-racial. The sample of 327 students skewed Hispanic, 31.4% more than was the general campus. Conversely, in comparison to the general student population the sample had fewer Black, White, and Asian students, approximately 3, 6, and 3 percentage points respectively. The sample of multiracial students was 20 percentage points lower than the representation in the student population, but this group had a very small total n minimizing the impact of this variation.

The selected campus was slightly more male at 53% for the first-year students in fall, 2013. Nearly one-third of the student body was international (29%). Forty-one percent of students, a plurality, were age 20 years or younger; another 38% were age 21 to 29 years. The majority of students were part-time, daytime students.

Table 3.1

*Number and Percentage of First-Time Freshmen Community College Students in the Population and the Sample.*

	Campus Population	Remedial Sample	Credit Only Sample	Total, Sample	Percent of Sample
Hispanic	8.4%	48	82	130	39.8%
American Indian or Alaska Native	<0.4%	1	0	1	0.3%
Asian	14.0%	21	16	37	11.3%
Black	25.6%	30	42	72	22.0%
Native Hawaiian	0.1%	1	1	2	0.6%
White	26.9%	34	34	68	20.8%
Multiracial	24.1%	6	8	14	4.3%

No response/Unknown	0.5%	0	3	3	0.9%
Total	100%	141	186	327	100.0%

### **Instrumentation**

Since the community college policy excluded providing the researcher with email contact information for students, it was necessary for the survey to include a self-report screening question asking each respondent if they are enrolled in a remedial course. Other screening questions included the year of graduation from high school and whether the student respondent was enrolled as a first-year student in the community college. These three questions determined whether each respondent met the participant criteria.

The survey questionnaire was used to measure all the current study's constructs related to students. The survey items for this study were selected from a study by Engberg and Wolniak (2010) who used data collected by the National Center for Education Statistics (NCES) through the Education Longitudinal Study (ELS) of 2002 (NCES, 2004) to study the relationship between students' experiences in high school and their post-secondary enrollment. The ELS 2002 data set was generated by a national research project that used an extensive questionnaire and was funded by the U.S. Department of Education to examine students' transition from secondary school into post-secondary education or the workforce (NCES, 2004). See Appendix B for the questionnaire defining the research data set. Since the questionnaire was taken from a federal resource and is not proprietary, and consisted of selected items derived from another published study (Engberg & Wolniak, 2010), no permissions were required prior to use of the questionnaire items.

The questionnaire consisted of several self-reported screening questions, and nine self-reported core research questions presented to the respondent, representing four domains: human capital; cultural capital; social capital; and demographics. Human capital was defined as

academic preparation through gains in skills, knowledge, experience, and potential investment returns based on productivity (Engberg & Wolniak, 2010). Human capital was defined operationally in the questionnaire as the highest level of math course completed during high school (Adelman, 2006; Engberg & Wolniak, 2010; Long, Iatarola, & Conger, 2009). The feeder schools for the community college were predominantly the public high schools in the surrounding district. There were 26 public high schools, and the community college had a partnership agreement with the district for recruiting from the high school system across the entire county. The 26 district schools offer math courses in the sequence in which they were listed on the study questionnaire.

Final high school GPA is a continuous variable ranging theoretically from about 2.0 up to 4.00 and was based on students' self-report. Students were asked for their un-weighted GPA. A meta-analysis of self-report GPA studies generally acknowledged that, while GPA self-report data collection is practical and used extensively in research, such data should be used with caution as its accuracy may be moderated somewhat for students with lower levels of school performance or cognitive ability (Kuncel, Crede, & Thomas, 2005). Yet, given that Kuncel et al. (2005) found an overall high level of validity, with a correlation of 0.84 for students who self-reported GPA across studies, self-report GPA was deemed to be a convenient, adequate, readily-available and much-used source of research data and adequate for the current study (Cassady, 2001).

A second domain, cultural capital, was defined for the study as cultural knowledge, language skills, experience, and characteristics that typically are acquired from parents and that might position an individual in a particular cultural status, class, or order (Bills, 2003; Bourdieu, 1986; Engberg & Wolniak, 2010). The three items constituting cultural capital were: "Is English



your native language?” (as a proxy for primary cultural capital, [Perna & Titus, 2005]); “Did your family/friends desire for you to attend college?;” and, “Were your parents involved in cultural activities with students?” The response anchors for the first two items were dichotomous (No = 0 and Yes = 1). The scale for the third item was coded as Never = 0, Sometimes = 1, and Often = 2. The questions on the instrument each included instructions that were used by the original federal student questionnaire.

A third domain, social capital, was defined as resources available through social networks (Bourdieu, 1986; Lin, 1999). Two items used to assess the social capital construct included: “Student sought college entrance information;” and, “Student discussed school and college plans with parents.” The first item was coded dichotomously (No = 0 and Yes = 1). The scale for the second item was coded as Never = 0, Sometimes = 1, and Often = 2.

A fourth domain concerned student ethnicity and socio-economic standing using the seven standard, nominal values defined by the U.S. Census and socioeconomic status (SES) defined as total family income per year during the final year of high school which was self-reported by the student on the survey questionnaire. In U.S. higher education, race is typically coded by standard, long-standing terminology used by the U.S. Census Bureau, as defined by the federal Office of Management and Budget (OMB). In census taking, race is self-reported. According to the federal OMB official schema for Census, Hispanic or Latina/Latino is the only generalized category for ethnicity, but that term encompasses a complex array of cultural subcategories and nationalities. In the late 1990s, the OMB and Census Bureau revised the methodology for collecting data, to allow a respondent who is participating in federal data collection to potentially identify with and select up to all the race/ethnicity categories or any combination of them (U.S. Census Bureau, 2000).

On the questionnaire, the construct of SES during high school was measured in terms of family income in thirteen graded increments ranging from “None” (zero family income) to “\$200,000 or more.” The successive increments of income in the response anchors ranged over the thirteen options in progressive ranges of income, as specified on the federal questionnaire and the survey participant was asked to estimate family income if necessary, because many of the student respondents would know only an approximate family income.

These items were reliable and valid because they were selected for this study from Engberg and Wolniak (2010) who used factor analysis and the federal ELS 2002 data to form the items on the scale. In quantitative research using logistic regression to examine the relationship between a set of predictor variables and the criterion variable, the means to control validity threats are part of the design (Pedhazur & Schmelkin, 1991). Engberg and Wolniak (2010) reported scales having good internal reliability with Cronbach’s Alpha ranging from 0.737 to 0.919 for the items on cultural capital and 0.654 to 0.885 for the social capital items. Thus, the items selected for this study have been shown to have predictive validity in other contexts because these items were tested by Engberg and Wolniak (2010) who used them to examine the relationship between forms of students’ capital in high school contexts and the odds of enrolling in college. Since the observed correlations were statistically significant (Engberg & Wolniak, 2010), the independent factors have the potential for predictive validity (Pedhazur, & Schmelkin, 1991). The current study used the items that were shown to be statistically significant predictors (either  $p < 0.05$  or  $p < 0.01$ ) of the criterion variable of two- vs. four-year college enrollment or no enrollment at all (Engberg & Wolniak, 2010).

### **Procedure**

Prior to data collection, and after the research proposal defense, the researcher obtained Liberty University Institutional Review Board (LU-IRB) approval of the research protocol. See Appendix C for IRB committee approvals. The study involved minimal to no risk to participants since it was an anonymous survey. Further, the survey questions do not ask the subjects for sensitive or confidential information that could be damaging or harmful to their reputation, even if the subjects were identifiable.

The researcher obtained permission to conduct research from the community college research office. See Appendix C for the research site's IRB forms and approval letter. The questionnaire was administered in classrooms on paper. Handwritten responses on survey instruments is the longstanding and accepted method for gathering information. By entering classrooms during the day, the researcher obtained permission directly from instructors by talking to them, to collect data from students in their classes. See Appendix D for the script that was read by the researcher to students in the classroom, requesting student participation including a brief introduction to the purpose and nature of the survey. Students could ask questions of the researcher, for example, to clarify the nature or details of the study purpose and if there were questions regarding consent.

All respondents received the same offer to participate in the study, the same consent language, and questions in the same order (see Appendix A for the official consent form). The introduction thanked the respondents, explained the purpose of the study, estimated the amount of the student's time required to complete the survey at five minutes, and confirmed the voluntary nature of the study. Students were asked to complete the survey immediately and return it by sealing it in an envelope given to each student, then the student placed their

individual envelope in another larger, collection envelope with other students' responses. The researcher removed the completed surveys from the envelopes and entered the data into an Excel spreadsheet prior to data screening and analysis.

In order to increase the response rate, the researcher offered the study participants sweepstakes of \$200 (participants selected randomly to receive an Amazon® gift card online) as an incentive in appreciation for participation. Respondents who chose to be part of the sweepstakes entered their contact information on a separate slip of paper, (see Appendix E for the note to join the sweepstakes). This student information could not be traced back to the individual surveys to prevent the researcher from knowing the identities of the individuals who responded to the initial survey. The recipient of the sweepstakes prize was selected randomly by a third party and the sweepstakes-related data were destroyed immediately after the sweepstakes prize was paid and acknowledged. This protocol ensured anonymity as student names and contact information were not accessible to the researcher (Creswell, 2008).

A brief introductory message informed potential respondents that the purpose of the questionnaire was to collect basic information anonymously from them for academic research involving students enrolled in courses in their community college. The questionnaire included instructions on how to complete the questions, definition of terms such as parent, stepparent or guardian, and a means for the respondent to consent to participation in the study (Creswell, 2008; Fowler, 2013).

The researcher went to the campus on weekdays to recruit student participants in classrooms. Some instructors wanted clearance of the study by the department chair or a school administrator, beyond the IRB approval that the researcher carried for explanation when further details were requested. The researcher requested and received from the chairpersons of the math

and English departments a written, signed note that he could display to instructors when instructors asked if the department leadership had approved and authorized the study to be conducted in their classroom. Over the course of the data collection effort, several instructors declined to allow the survey to be conducted in their classrooms. Classrooms were selected by the researcher for their convenience in timing, on various days of the week and usually during the early or middle part of a weekday, and also where there were at least 25-30 students or more present in the classroom for efficiency of explanation and administration of the survey. The surveys were administered and collected at the beginning of class, and the process usually took no more than ten minutes to complete in each classroom. The researcher entered classrooms in various departments and buildings, from remedial math and English to biology, performing arts, and other subjects. A respondent who began the survey could end their participation at any point in the survey, leaving questions unanswered. Survey participants were asked not to complete the survey more than once on campus, during the weeks that the survey was being administered by the researcher. Data transferred from the paper surveys to the Excel spreadsheet were secured in an encrypted, password-protected file on storage media and will be stored for at least three years (Regulations for the Conduct of Human Research, 2010).

### **Data Analysis**

After the data collection phase, a rigorous data screening process was conducted to detect any missing values (Warner, 2013). For example, student GPA might have mistakenly been reported as zero or unreasonably low for graduation from high school, or a frivolous response or mistake might have been included. Responses consisted of straightforward yes or no, GPA in a standard, typical format and range, high school graduation year, and other simple selections from small menus and scales. The researcher converted all response choices to numerical values or

scores, usually consecutive integers starting with zero, for example, “No” was coded as “0” (zero) and “Yes” is “1” (one).

Descriptive statistics including frequency distributions and simple correlations between all variables were calculated and reported. All statistical data processing was conducted using the most current version of IBM’s Statistical Package for the Social Sciences software, SPSS®. Counts of those who completed all questions on the survey were tabulated. Any survey for which the respondent did not complete every question was analyzed to determine whether responses were usable.

Logistic regression analysis was conducted to examine the research question (Chan, 2004; Howell, 2011). Logistic regression was a useful way of describing the relationship between one or more predictor variables with a binary criterion variable such as “enrolled in a remedial course” versus “not enrolled in a remedial course” at a community college. Logistic regression can illustrate the combined effects of various predictor variables related to high school graduation and related outcomes (Bordens & Abbott, 2008). The regression analysis procedure determines any statistical relationships between groups of students, while holding other predictors and controls constant.

The rationale for using this statistical approach was pursuit of the relationship between student experiences that occurred at earlier points in time with an event that occurred at a subsequent point in time (Gall et al., 2010; Kutner, Nachtsheim, & Neter, 2004). The current study used several variables to predict an outcome. Logistic regression analysis fit this rationale as it is a widely used analysis technique in which the criterion variable is dichotomous (enrolled in a remedial course; not enrolled in a remedial course) and the predictor variables can be categorical or continuous. Logistic regression is similar to a linear regression approach except

that the criterion variable is categorical and so the assumption of linearity in linear regression is violated. Logistic regression involves a logarithmic transformation of the binary criterion variable which allows modeling a nonlinear association as linear.

Binomial or binary, not ordinal, logistic regression employed for this analysis required the criterion variable to be dichotomous or composed of two, mutually exclusive categories where every case belongs to only one group (Menard, 2002). These two categories are coded as “0” (zero) and “1.” Based on the research question, the value of “1” was the desired outcome of the model, enrollment in a remedial course. Enrollment in a remedial course was binary, coded “0” (zero) for “no” and “1” for “yes.” The logistic regression algorithm is based on predicting the probability (or odds) of the event “1” occurring. The two categories (groups) must be mutually exclusive and all-inclusive; any participant must only be in one group, and every participant must be a member of one of the two groups (Menard, 2002). If any respondent did not answer the criterion variable question then that case was expunged from the dataset.

Before conducting the logistic regression analysis, the necessary assumption tests were conducted. Numerous assumptions differ between logistic regression and other forms of regression (Menard, 2002) because the logistic regression applies a non-linear log transformation (rather than an algorithm employing ordinary least squares with no data transformation) to the predicted odds ratio relating each predictor variable to the criterion variable (Menard, 2002). In this study, the odds ratio was the likelihood of enrolling in a remedial course associated with the predictor variable.

Logistic regression does not require assumptions of normality, linearity, and homogeneity of variance for the predictor variables (Menard, 2002). In logistic regression the predictor and criterion variables can have a nonlinear relationship. The predictor variables need not be interval

type, nor normally distributed, nor of equal variance. The test procedure assumes that ordinal and nominal data as predictor variables are sufficient for the model (Menard, 2002).

The predictor variables are assumed to be independent from each other, so the variables were tested for multicollinearity, indicating a redundancy of information in predictors. The predictor variables were tested for high levels of inter-correlation to avoid multicollinearity. Using a variance inflation factor (VIF) based on a simple, ordinary least-squares regression approach, a VIF of 1 for two predictor variables means that the variables are statistically independent (Kutner et al., 2004). The acceptable level of VIF is a “rule of thumb” and any VIF level of 1.8 to 2.5 was considered cause for concern that two collinear variables have redundant predictive value. Further, a simple logistic regression was computed for each independent variable, as well as descriptive plots of each variable by all other variables, as a means to visualize relationships that could be problematic statistically (Kutner et al., 2004).

An assumption was that all important variables were included in the model. This assumption was demonstrated by the selection of all the factors that were significant for high school seniors’ enrolling in a two-year college according to Engberg and Wolniak (2010). The error terms or residuals resulting from the model was tested for independence but a normal distribution was not required (Menard, 2002). A possible drawback for this type of model is that larger samples are usually needed than for ordinary linear regression (Kutner, et al., 2004; Menard, 2002).

Logistic regression assumes a linearity of predictor variables with log odds, requiring that the predictor variables are linearly related to the log odds (Menard, 2002). Otherwise, the test underestimates the strength of relationship and rejects relationships easily, resulting in acceptance of the null hypothesis (in error). Results were reported in terms of *p*-values and



assumed to be significant only if they occurred with a statistical significance level of 95% or better ( $p \leq 0.05$ ). Assumptions for correlation included that the observations within each variable were independent.

The results of the logistic regression analysis is reported in terms of odds ratios (OR), the percentage change in odds relative to the reference group. In this case, students enrolled in a course that was not remedial. An OR was calculated for each predictor variable. A predictor variable had a positive effect if it increased the odds of the “positive” outcome, in this study enrollment in a remedial course, and a negative effect if it decreased the odds of the outcome. The OR, produced by SPSS’ logistic regression algorithm, provides a means of observing the relative importance of each predictor variable, in terms of its effect on the odds of the criterion variable, the odds of enrolling in a remedial course relative to the odds of not doing so. An OR of one (1) means there is no difference in the two grouped outcomes, whereas an OR different than one means there is some difference. The greater the OR number is above one (or less than one), the greater the difference between the two groups based on the predictor variables. However, a standard error (SE) was calculated for the ORs and if the two points of the SE include the exact number of one, then there was no difference in the groups for that predictor. The ORs for each predictor variable was converted into percentages for interpretation (Chan, 2004).

Because this study was not an experimental design, no random assignment of participants was used and causality cannot be assigned as correlation does not indicate causation even should a statistically significant result be found (Gall et al., 2010). A large body of education research on remediation and interventions is correlational and allows at least weak inferences (Levin & Calcagno, 2008). The findings of this study can potentially influence policy and be actionable with only correlational relationships because the constructs of social and cultural capital can be

altered by changing the influences that occur, the majority of the variables consisted of relationships between people. Likewise, high school GPA and highest level of high school math are alterable, through counseling, education programs, and other approaches and mechanisms. Relationships from the data in this study can be used to develop more robust theoretical models for further research possibly using an experimental design that would produce results and findings to inform policy.

## CHAPTER FOUR: FINDINGS

### Research Question

The following research question guided this study.

**RQ1:** What student-level factors during high school (race/ethnicity, socioeconomic status, final high school GPA, highest level of high school math, college seeking efforts, family/friends network, native English speaking) best predicted whether first year community college students enrolled in a remedial course?

### Null Hypothesis

The following is the null hypothesis:

**H<sub>0</sub>1:** There was no significant predictive relationship between the criterion variable (enrollment in a remedial course) and one or more combinations of predictor variables (race/ethnicity, socioeconomic status, final high school GPA, highest level of high school math, college seeking efforts, family/friends network, native English speaking) for community college students.

### Descriptive Statistics

All survey data were entered manually into an Excel spreadsheet by the researcher. A frequency analysis was conducted to examine respondents' data for outlier values or other anomalies. The data were checked for values that were out of range and those cases were removed from further analysis. After the screening process, 428 students responded to the survey in total, and the final, completed sample consisted of 327 first-year community college students. Thus, 101 cases did not meet screening criteria for the analysis. This was almost always because the year of graduation from high school was outside the study boundary of more than three years.

The percentage of first-year students enrolled in one or more remedial courses was 57% (consistent with the population of the campus), leaving the percentage of first-year students enrolled in only credit bearing, college level courses at 43%. The frequency of non-native English speakers in the sample was 43.1%. The sample consisted of 21% White students, 22% Black/African American, 40% Hispanic or Latino/Latina, and 11% Asian students. The remainder consisted of students who reported a combination of races (multi-race) or American Indian or Alaska Native, or Native Hawaiian or Other Pacific Islander, totaling a 6% of respondents.

Table 4.1: *Pearson Correlations of Variables Used in a Logistic Regression Model to Predict Enrollment in a Remedial Course in a Community College*

Variable Name	GPA	Native English	Discussed Entrance Reqts.	Household Income <\$35K	Household Income >\$50K	Below Algebra 2	Above Algebra 2	Never Discussed Events	Often Discussed Events	Never/sometimes Discussed College	Asian	Black	Hispanic or Latino/Latina
Remedial Course-taking	-.068	.003	.024	.056	-.186**	.130*	-.293**	-.010	-.161**	.025	-.098	.016	.102
	(296)	(325)	(325)	(327)	(327)	(327)	(327)	(325)	(325)	(326)	(327)	(327)	(327)
Final High School GPA	1	-.100	.027	-.005	-.013	-.129*	.230**	-.060	.129*	.036	.149*	-.039	-.128*
		(295)	(294)	(296)	(296)	(296)	(296)	(295)	(295)	(295)	(296)	(296)	(296)
Native English Language		1	-.023	-.214**	.293**	-.008	-.081	-.148**	.039	.006	-.177**	.159**	-.132**
			(323)	(325)	(325)	(325)	(325)	(323)	(323)	(324)	(325)	(325)	(325)
Discussed College Entrance Reqts.			1	-.083	.074	-.022	.008	-.213**	.048	-.242**	-.001	.100	-.041
				(325)	(325)	(325)	(325)	(324)	(324)	(325)	(325)	(325)	(325)
Household Income <\$35K				1	-.629**	.205**	-.030	.099	-.107	.009	-.012	.099	.103
					(327)	(327)	(327)	(325)	(325)	(326)	(327)	(327)	(327)
Household Income >\$50K					1	-.206**	.119*	-.109*	.148**	-.048	.040	-.098	-.180**
						(327)	(327)	(325)	(325)	(326)	(327)	(327)	(327)
Highest Math Below Algebra 2						1	-.359**	.088	-.121*	.014	-.098	.061	.037
							(327)	(325)	(325)	(326)	(327)	(327)	(327)
Highest Math Above Algebra 2							1	-.192**	.133*	-.023	.247**	-.044	-.064
								(325)	(325)	(326)	(327)	(327)	(327)
Never Discussed Events								1	-.194**	.184**	-.040	-.100	.113*
									(325)	(325)	(325)	(325)	(325)
Often Discussed Events									1	-.123*	-.028	.095	-.103
										(325)	(325)	(325)	(325)
Never/sometimes Discussed College										1	.039	-.107	.048
											(326)	(326)	(326)

Notes. \*\* Correlation is significant at the 0.01 level (2-tailed).

\* Correlation is significant at the 0.05 level (2-tailed).

Numbers in parentheses are number of cases.

### **Assumption Tests**

To determine the level of multicollinearity, a variance inflation factor (VIF) was computed for each variable using logistic regression. All VIFs were found to be below 3. Thus, multicollinearity was deemed not a concern for the full model (O'Brien, 2007).

Final high school GPA was the only continuous variable in the model. Its distribution was normal (by Kolmogorov-Smirnov test and Shapiro-Wilk test,  $p < 0.01$ ) and its range was wide with a mean of 3.07. There was almost no variation in one variable, "During high school, did your family and/or friends desire for you to go to college?" as only 3% of respondents reported "No" for this cultural capital predictor variable. Thus, this variable was not used in the predictive model. Two other cultural capital predictor variables remained in the model.

### **Results**

A binary logistic regression analysis was used to test the relationships between the predictor variables and the criterion variable. The categorical variables that spanned three or more possible response choices were dummy-coded as explained in the next paragraph, with the reference category coded as zero. The categorical variables that were dummy coded were: race/; total annual family income; highest level of high school math; discuss events (cultural capital); and discuss going to college (social capital).

Race was recoded as Hispanic or Latino/Latina, Black/African American, and Asian, with White coded as the reference group for this variable. A frequency distribution of family income indicated that a plurality of students reported their family's household income to be in the range between \$35,001 and \$50,000, (17.9%). Therefore, this group was used as the reference group for income. Students who reported \$35,000 or below were combined and coded as "below \$35,001" and the students who reported above \$50,000 were combined and coded as

“above \$50,000.” Based on the frequency distribution of highest math level the student studied in high school, Algebra 2 was used as a reference group for this variable (41.7% of students). Students who reported completing a high school math course lower than Algebra 2 as their highest math level were coded as “below Algebra 2” (Pre-algebra, Algebra 1, and Geometry) and students who reported completing high school math beyond Algebra 2 (Trigonometry, Pre-calculus, Calculus) were coded as “above Algebra 2.” The three levels of the cultural capital variable “discuss community, national and world events with parents/guardian” were coded as two values: “never” and “often” were combined (“never discuss events”) and “sometimes” was used as a reference group as it was the majority of cases (65%). The three levels of the variable, “discuss going to college with parents/guardian,” were recoded as one variable: students reporting “never/sometimes” were combined into one group; whereas, students reporting “often” were coded as a reference group.

All thirteen of the predictor variables were entered into the logistic regression model simultaneously. Three variables were found to be statistically significant predictors of remedial course enrollment. Since significance was found, the null hypothesis was rejected: there is a predictive relationship between the between the criterion variable (enrollment in a remedial course) and some combination of predictor variables for community college students.

Table 4.2 displays the results of the logistic regression analysis. The Wald estimates provide the strength of the contribution of each variable, with the higher the relative value, the more strength of the variable to predict the outcome. Of the three significant predictors displayed in Figure 4.1, “above Algebra 2” had the most predictive strength, followed by “annual family income above \$50,000,” then “discuss community, national and world events with parents/guardian often.”

Students whose highest level of math in high school was above Algebra 2 were 73.0% less likely to enroll in a remedial course, compared to students who reported their highest math-level as Algebra 2. There was no significant relationship found for students whose highest level of math in high school was below Algebra 2 (Pre-algebra, Algebra 1, or Geometry) and their enrollment in a remedial course at the community college.

Students who reported that their annual family income in the final year of high school was above \$50,000 were 68.9% less likely to enroll in a remedial course, compared to students whose annual family income in their last year of high school was between \$35,001 and \$50,000. There was no significant relationship found for students who reported that annual family income was below \$35,001 and their enrollment in a remedial course.

Students who often discussed community, national and world events with parents/guardian while in high school were 53.5% less likely to enroll in a remedial course, compared with students who discussed these events only sometimes. There was no significant relationship for students who reported never/sometimes discussing community, national and world events with parents/guardian and their enrollment in a remedial course.

As seen in the first row of Table 4.1 above, the three predictor variables that were significant in the logistic regression were also significantly negatively correlated with the criterion variable.



Table 4.2

*SPSS Output from a Binary Logistic Regression Model Predicting Enrollment in a Remedial Course in a Community College*

Variable Names of Predictors	B	S.E.	Wald	Sig.	Exp(B)	% Change in Odds <sup>a</sup>
Final High School GPA	0.030	0.267	0.013	0.910	1.031	--
Native English Language	0.151	0.313	0.232	0.630	1.163	--
Discussed College Entrance Reqs.	0.378	0.352	1.153	0.283	1.460	--
Hispanic or Latino/Latina	0.463	0.367	1.589	0.207	1.589	--
Asian	0.252	0.500	0.255	0.614	1.287	--
Black or African American	0.141	0.392	0.130	0.718	1.152	--
Household Income Below \$35,001	-0.561	0.355	2.504	0.114	0.570	--
Household Income Above \$50,000	-1.167	0.375	9.674	0.002	0.311	68.9
Highest Math Below Algebra 2	-0.199	0.428	0.218	0.641	0.819	--
Highest Math Above Algebra 2	-1.310	0.298	19.258	0.000	0.270	73.0
Never Discussed Events	-0.548	0.434	1.596	0.207	0.578	--
Often Discussed Events	-0.765	0.330	5.376	0.020	0.465	53.5
Never/sometimes Discussed College	-0.111	0.283	0.154	0.694	0.895	--
Constant	2.168	1.453	2.226	0.136	8.742	--

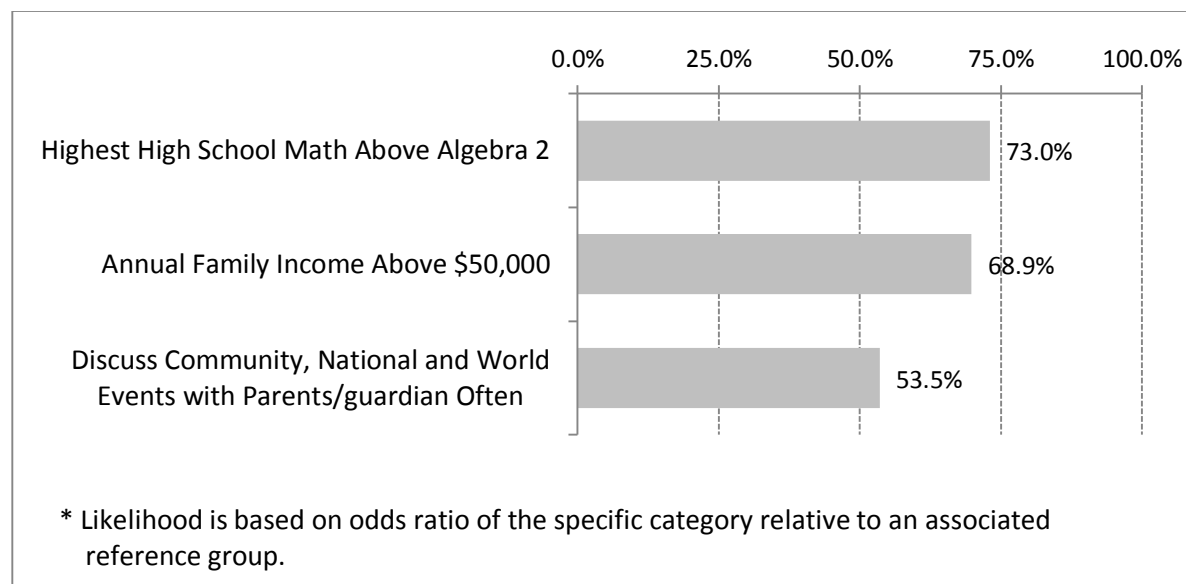
*Notes.* Degree of freedom equals 1 for each variable and the constant.

<sup>a</sup>Percent change in odds =  $(\text{Exp}(B)) - 1 * 100$ . (Chan, 2004).

-- indicates no significance.

Figure 4.1.

*Percent Less Likely\* that Students are to Enroll in a Remedial Course in a Community College by Significant Predictor Variables*



The pseudo-R-squared statistic (Nagelkerke) showed that slightly more than 22% of the variance in the outcome variable (remedial course enrollment) is explained by this model. The model was found to have an adequate fit because the chi-squared goodness-of-fit was not significant (Archer & Lemeshow, 2006).

SPSS logistic regression output provides a table classifying respondents based on how many respondents are expected versus how many are observed, according to the bivariate criterion variable. The overall accuracy of this model to predict enrollment in a remedial course was 68% in the present study.

### **Additional Analysis**

Bivariate chi-squared tests were conducted on the three dichotomous variables that were significant in the logistic regression, as a support of the regression model results (Gall, Gall, & Borg, 2010). The results showed that each of the three variables that were significant predictors

in the regression were also significantly related to the outcome or criterion variable using chi-square analysis (Table 4.3).

Table 4.3

*Chi-square for Three Variables that were Significant Predictors*

Variable	Chi-squared	<i>p</i> -value
Highest Math Level in High School	28.00	.000
Household Income	11.36	.001
Discussed College Entrance Reqts.	8.41	.003

Statistical significance for results is assumed at the 0.05 alpha level (Gall et al., 2010). For students whose highest level of math in high school was above Algebra 2, the chi-square showed significance ( $p < 0.000$ ). For students whose annual family income in the final year of high school was above \$50,000, the chi-square showed significance ( $p < 0.001$ ) when cases were classified by whether students were enrolled in a remedial course. For students who often discussed community, national and world events with parents/guardian, the chi-square showed significance ( $p < 0.003$ ) when classified by remedial course enrollment.

## **CHAPTER FIVE: DISCUSSION, CONCLUSIONS, AND RECOMMENDATIONS**

This study examined high school factors that influenced community college students' enrollment in a remedial course in a community college, and provides new evidence of significant high school factors that predicted enrollment in a remedial course. A review of related research focused on the relationship between high school factors and whether students enrolled in college, persisted, other academic performance measures in college and whether they graduated from college, plus their standing in respect to remedial courses (Allensworth & Easton, 2007; Bettinger & Long, 2007; Huerta, Watt, & Reyes, 2013). As explained in Chapter One, there is a dearth of research on the relationship between high school factors and remedial course enrollment at the community college level.

The variables for this study were chosen based on theoretical considerations and prior research on high school factors and college enrollment. Engberg and Wolniak (2010) examined three types of individual capital resources (human, social, and cultural) and demographic factors and their relationship to students' enrollment in a two- or four-year college. The study under consideration utilized the variables that were found to be significant in Engberg and Wolniak's (2010) study on college enrollment patterns, to examine whether the same variables were significant predictors of remedial course enrollment as college readiness and remedial course enrollment have an inverse relationship.

### **Discussion**

The research question that guided the study was: what student-level factors during high school (race/ethnicity, socioeconomic status, final high school GPA, highest level of high school math, college seeking efforts, family/friends network, native English speaking) best predict whether first-year community college students enroll in a remedial course?

## **Factors that Predict Remedial Course Enrollment**

Student-level factors during high school were used to predict the criterion variable of enrollment in a remedial course in a community college. The variables selected were found to be significant predictors in Engberg and Wolniak's (2010) study on college enrollment patterns. This study examined if the same variables were significant predictors of remedial course enrollment as remedial course enrollment and college readiness have an inverse relationship. Predictors tested were: race/ethnicity; socioeconomic status; highest level of high school math; final high school GPA; college seeking efforts; family/friends network; and native English speaking. The categorical variables that were dummy coded were: race/ethnicity; total annual family income; highest level of high school math; discuss events (cultural capital); and discuss going to college (social capital). After dummy coding there were thirteen predictor variables.

Three of the thirteen predictor variables were found to be significant predictors of remedial course enrollment in a community college. Of the three significant predictors, "above Algebra 2" had the most predictive strength, followed by "annual family income above \$50,000", then "discuss community, national and world events with parents/guardian often."

In the present study, the strongest predictor of remedial course enrollment was completing a high school math class above Algebra 2. This new finding is consistent with prior research which examined the relationship between high school math level and remedial course enrollment (Adelman, 1999; Fong, et al., 2008; Hoyt, 1999; Hoyt & Sorenson, 2001; Lang, 2012; Long et al., 2009; Roth et al., 2000). Further, there was no significant relationship between students whose highest level of math in high school was below Algebra 2 (Pre-algebra, Algebra 1, or Geometry) and their enrollment in a remedial course at the community college.

A recent study (Lang, 2012) examined the connection between math preparation at the secondary level and enrollment of freshmen in a remedial math course in a community college. The findings of the study utilizing a binary logistic regression revealed that students whose highest level of high school math was pre-calculus or calculus were 77% less likely to enroll in a remedial math course at a community college (Lang, 2012). This is consistent with the current study finding that students whose highest level of math in high school was above Algebra 2 were 73.0% less likely to enroll in a remedial course.

Lang's (2012) study examined a more narrowly focused question than the current study, he investigated the level of high school math course enrollment and completion, then its influence on remedial math course enrollment in community college. Lang's (2012) study related only data on the level of high school math courses and the subsequent level of remedial math course enrollment in college, not factors in other areas such as demographics or sociocultural capital. His findings suggested that students who enrolled and successfully completed higher level math courses in high school were prepared for college level math.

Based on these findings, it is important that high school staff focus on preparing students to take higher level math courses in high school. Research studies (Adelman, 1999; Long, Iatarola, & Conger, 2009) have indicated the importance of taking and completing Algebra 1 early on (at least in Grade 8) so students can enroll in a higher level math course in high school which in turn influences the students enrolling in college level courses in community college, depending on their college readiness stemming from their preparation in high school. Even though the present study included other factors such as sociocultural capital and family income, the level of the high school math course students took was statistically the strongest predictor of remedial course enrollment in college.

Whether students have access to and complete higher level courses successfully, such as algebra in middle school, may influence their overall academic achievement in high school and college (Kurlaender, Reardon, & Jackson, 2008). A high school math level of Algebra 2 attained by a student in high school is a rigorous undertaking that lessens the likelihood of their enrolling in a postsecondary remedial course. Access to rigorous courses and higher level math in secondary school is linked inseparably to academic success prior to entering postsecondary study. Spielhagen's (2006a) study of students' math course placement during middle school revealed a connection to SES and parental interference in school staff placement decisions. Particularly at high SES schools, parents pushing students into higher level math could have the unintended consequence of possibly causing students to have less success. Thus, SES and secondary school math level are sometimes related.

Roth et al.'s (2001) study examined the effect of high school course taking and grades, on passing a college placement test. Their findings showed that students' math course performance in high school had a larger effect than GPA on the probability of passing the Math CPT test. Roth et al. (2001) suggested that taking a challenging, rigorous math course, even at the risk of lowering GPA, would benefit most students for their future regarding college readiness. This finding has important implications for placement counselors, tutors, and parents assisting and advising students on preparing for and planning to pursue postsecondary education.

Math courses during the school years prior to college incorporate a sequential series of content, with escalating rigor and requirements for building scaffolded knowledge. To advance in math, students build on understanding prior concepts and this is reflected in the literature on students' progress in math achievement throughout their academic careers (Spielhagen (2006a). The earlier in their secondary education that students complete a course in Algebra, the more

time they have to enroll in the series of more advanced math courses, in preparation for college (Spielhagen, 2006b). Even taking Algebra 1 early enough in high school is the gateway to college readiness, because it allows taking more advanced math courses such as Algebra 2 and above that in turn strengthens students' college readiness. The earlier they take Algebra 2 and beyond in high school, the less likely students might be to enroll in a remedial course in college because Algebra 2 is rigorous.

Historically, algebra has represented students' first, sustained exposure to the abstraction and symbolism that makes mathematics a powerful tool to solve problems (Kieran, 1992). The symbols, terminology, rules and operations used in algebra enable students to consider order and structural relationships between items in sets and systems, quantities that are variable, and orderly situations in which controlled change occurs (Fey, 1990). Algebra involves much more than students simply mastering basic math skills. It involves developing and using higher order cognitive skills, choosing a clear and sensible, systematic strategy to approach quantitative problems, taking a comprehensive view of math expressions, distinguishing between relevant and less relevant properties and interpreting results in a meaningful manner (Arcavi, 2005; Fey, 1990; Zorn, 2002). Algebra can help students define and uncover patterns and to reason logically using these patterns in systems. Algebra education not only helps prepare students for concepts in subsequent courses like physics, chemistry, and engineering, it helps students in their higher education even if students rarely come into contact with mathematics in their future education or profession, and is the gateway to math using concepts of infinite change, or calculus (Drijvers, Goddijn, & Kindt, 2010).

School staff should focus on students' math pathways as early as elementary and middle school. Students who enroll in rigorous courses during high school tend to be prepared for



college-level courses when they graduate high school (Engberg & Wolniak, 2010). At the research site, a new matriculant's score on what is essentially a course placement test is the main criterion used to place them in the most appropriate class level, but not the only means of placing a student.

The second strongest predictor was students' report of their family's annual income during their final year of high school. This finding is consistent the literature which indicates that students who are from low-income families are more likely to need remediation in college (Long et al., 2009; Roth et al., 2000).

Families with greater income would be expected to have greater access to books, technology and tutoring, convenient transportation, plus the ability to purchase Internet access for their home, funds for attendance at cultural events, and provide other educational, capacity-building resources. Further, in the current study there was no significant relationship found for students who reported that annual family income was below \$35,001 and their enrollment in a remedial course. The current study findings are likely affected by a wide range of income and income disparity at the research site. That there was a wide gap between the affluent and the poorer student subpopulations is a good indicator.

In the current study, household income in the senior year had a statistically significant influence on students' remedial course enrollment. It is likely that parents in a low income category might not have the education or cultural and social resources (such as English language skills) and a social network sufficient to advocate for or advise their children on how to approach, prepare and succeed in postsecondary education. These parents are likely to be working at two jobs each to make their financial ends meet and so likely do not have time to attend parent meetings with teachers and/or counselors. They might not feel comfortable seeking

assistance and information from their children's teachers, counselors, tutors or other school staff or administrators.

Students from more affluent SES strata are more likely to possess the benefits and advantages of having college-educated parents. Affluent households often offer a wealth of information that is essential and valuable for students to make good decisions about how to apply and pay for college (McDonough, 1998). Students from these homes often have the opportunity to learn different social and coping strategies, nuanced behavioral cues, and relationship competencies that assist in a smoother transition and entry into postsecondary systems (Bourdieu, 1984). These resources associated with affluence can affect college readiness that is related to taking a remedial course.

Disadvantaged students are less likely than affluent people to be exposed to and access even the most basic information and guidance they need to make informed decisions about the college process (Avery & Kane, 2004; Kezar & Yang, 2010; Perna, 2006). Students who may be disadvantaged economically, academically, and/or socioculturally are often from home environments that do not possess even a basic understanding of the system of higher education, much less how to approach preparation for college (Engle, 2007). This lack of perspective extends to problems with proper placement in college and remediation of an academic deficit.

Higher-wealth groups are accustomed to certain expected behaviors of higher achieving students. An affluent high school student is generally more likely to prepare for tests and class work, pursue volunteerism and after-school programs, attend science, sports, music or hobby events, and have the opportunity to engage in cultural activities. Whereas, a scarcity of time might put cultural capital development out of reach by a student who is disadvantaged, as they may be caring for siblings and themselves while both parents work. Affluent families are more

likely to understand the significance of academic competition as a means of preparing for college and the need for higher performance on standardized tests during high school. Minority and disadvantaged students may be generally less aware of testing and other academic performance required for college readiness and this may extend to some extent on the likelihood of need for postsecondary remediation.

A third significant predictor of students' enrollment in a remedial course was whether the student "discussed community, national and world events with parents/guardian." This is a form of cultural capital. Conley (2008) indicated that the level of sociocultural capital that a student develops prior to entering college helps the student understand college as a system and culture, thereby likely reducing the likelihood of students' enrollment in a remedial course in college. Conley (2008) discusses students who have college knowledge; that is, contextual skills and awareness. Students who have the information available to apply to college, gain necessary financial aid, and then subsequently matriculate, understand better how the college operates as a system and culture. Conley suggested that these students are more likely to be college ready and so enroll in college level courses. The students with more knowledge and understanding of the nature of the college environment better understand college admission criteria including high school course requirements which in turn reduces their likelihood of enrolling in a remedial course in college.

Cultural capital includes an individual's familiarity with cultural knowledge, language style, and specific behavior acquired largely by association with family and friends (Bourdieu, 1986). College readiness depends in part on students' development of their social and cultural capital resources. A student's cultural capital can develop in high school as the student discusses community, national and world events with others (Engberg & Wolniak, 2010). The level of

available cultural capital is partly a function of what other individuals in a student's accessible network possess in terms of sociocultural capital (Bourdieu, 1986; Sommerfeld & Bowen, 2013). Therefore, in this study, discussing community, national and world events with parents/guardian often was a significant predictor indicating the importance of family communications and its impact on students enrolling in a remedial course.

The cultural capital variable that was statistically significant in the present study was effectively a proxy for family engagement among family members and across a broader social network structure. Talking about cultural events among the family members can lead to strengthening relationships between family members, friends and beyond. This type of family engagement can easily lead to discussion of other areas relevant to a student in high school (or earlier) to gain understanding of the nature of college. Family engagement was not directly measured in the present study, but the frequency and quality of positive family interactions in the form of sociocultural discussion and communications indicates that the children have access to information that might be relevant to college readiness and preparation for college. Relating this to SES, higher SES families might have a college educated parent that discusses college with the child, in addition to discussing cultural events (Engberg & Wolniak, 2010).

The level of sociocultural capital and relationships that a student develops and builds prior to entering college can help the student understand college as a system (Conley, 2008) and thus, have a lower likelihood of enrolling in a remedial course. This cultural capital development and relationships with other people that a student builds in high school might influence what they know about: the level of human and sociocultural capital necessary to take college level courses; the application process for financial aid; and in general what the approach is to college application. Teachers, counselors, coaches and involvement with people in after school activities,

school leaders and administrators, mentors, church leaders and affiliation with organizations based on spiritual faith, can all directly influence students' attitudes toward attending college, and their preparedness to take college level courses.

### **Factors that were not Significant in Predicting Remedial Course Enrollment**

Some predictor variables used in the current study were not statistically significant predictors, in part because they were selected based on a study that predicted a different outcome. Predictive variables selected for the current study were chosen solely on the basis that they were found to be statistically significant predictors in Engberg and Wolniak's (2010) study on college enrollment patterns, specifically predicting enrollment in a two-year college. The current study examined whether these statistically significant variables in Engberg and Wolniak's (2010) study were significant predictors of remedial course enrollment because college enrollment, college readiness and remedial course enrollment are all related (Bettinger & Long, 2007; Hughes & Scott-Clayton, 2011; Long, Iatarola, & Conger, 2009). The other student level variables that were used in the Engberg and Wolniak (2010) study to predict enrollment in a community college, but were not significant in their study, might be relevant to prediction of enrollment in a remedial course in community college or four-year college which this study did not test.

Other reasons may exist for the lack of statistical significance in the present study. For example, highest math level and final high school GPA might have been confounded. If highest math level were removed from the model, GPA might become a significant predictor. Similarly, race/ethnicity was not significant. Once academic factors such as math level and GPA are included in such a model, the influence of race/ethnicity often becomes less important when predicting factors associated with college readiness (Allensworth & Easton, 2007) and this

might logically extend to enrolling in a remedial course in college, as it does to academic performance in college and graduation (Sawyer, 2013). There might be other variables that both studies have not addressed that might influence this studies' outcome. Future studies should explore other factors that may influence the outcome of enrollment in a remedial course in a community college.

### **Conclusions**

A limited volume of peer-reviewed literature directly connects high school factors with the need for remedial course enrollment at community colleges. The current study utilized statistically significant variables from Engberg and Wolniak's (2010) study as the student-level factors during high school: race, socioeconomic status, final high school GPA, highest level of high school math, college seeking efforts, family/friends network, native English speaking. Engberg and Wolniak (2010) examined three types of individual resources (human capital, social and cultural capital) and demographic factors, and their relationship with students' enrollment in a two- or four-year college. They found that there were variables under all three forms of capital and demographics that were significant predictors of enrollment. The current study found three variables that were significant predictors of enrollment in a remedial course in a community college, that were also constructs in the domains of human capital, cultural capital, and SES. The three significant variables were: highest level of high school math (human capital); household income in the senior year of high school (SES indicator); and the cultural capital variable of the high school senior discussing community, national, and world events with the parent or guardian.

The variables in the current study are interrelated in the sense that students who do not take more challenging math courses including those beyond Algebra 2 during high school have a greater likelihood of enrolling in a remedial course in postsecondary education. Algebra 1 taken

early on in high school or earlier is a gateway course and even if students are prepared for enrolling in math courses that are higher level than Algebra 2 in high school, some students, especially those underrepresented students would not have the resources (sociocultural and financial) to do so thereby decrease their chances of enrolling and succeeding in a math course higher than Algebra 2 in high school. This situation might lead these students who are not highly prepared to also be unprepared for college-level courses and taking remedial courses in college.

Family income is another factor that influenced students' enrollment in remedial courses. Students from low-economic households might also have limited socio-cultural capital because these students might not have financial resources to attend after-school programs, tutoring or otherwise take advantage of opportunities afforded by more affluent students. Also, some of these students might have a need to contribute to taking care of their younger siblings after high school days if both parents are working two or more jobs. Such factors related to demographics and socioeconomic status might hinder a student's knowledge of the importance of enrolling in rigorous courses, in math and English, in high school thereby influencing their postsecondary enrollment. Family income is not a variable that high school staff can alter. However, staff and administrators at both the school district level and at community colleges can assist students depending on their limited access to income, in students' course placement and seeking postsecondary education. High school staff can assist students in course selection.

### **Implications**

First-year college students would benefit if their high schools had focused on developing students' human capital before they enroll at a community college. Academic support programs, counseling, and mentoring have been shown to boost students' college readiness (Engberg & Wolniak, 2014; Porchea, Allen, Robbins, & Phelps, 2010). These results could provide

information useful to policy makers and other education leaders who seek to form and finance programs enabling more support structures to bolster students' human capital, especially to take a math course above Algebra 2 in high school.

Sociocultural capital development occurs largely outside of a student's time spent at the high school. All parents must become aware of the influence of family culture on college readiness, such as discussing community, national and world events with the student often while the student is in high school. Schools could provide training and education to parents to advance students' capital resources formation. Students' level of motivation, though not measured directly in the current study, can be influenced by the factors measured here, including the influence of peers, parents, and social networks. Students are influenced by other people through social networks and cultural capital-building while they are in secondary education. Current study findings indicate that if parents can share their knowledge of the importance of taking higher math, thereby influencing the student to achieve higher than Algebra 2, and provide an environment where the student experiences cultural exchange of information such as discussing community, national and world events, then the student at the research site would be less likely to enroll in a remedial course.

SES and capital constructs (for example, taking math above the Algebra 2 level), influence or predict students' enrollment in a remedial course in community college can be easily measured. If measures of various forms of capital possessed by the student were examined at the individual student level for placement upon entering college, proper initial placement in course level in community college might be possible without such heavy reliance on national assessment instruments.



### **Limitations**

One limitation of this study was related to using the variables that were significant predictors in the Engberg and Wolniak's (2010) study. The outcome variable used in Engberg and Wolniak's (2010) study was enrollment in a two- or four-year college and not enrollment in a remedial course in a community college. The significant predictors of Engberg and Wolniak's study were not all significant for the present study. There might be other variables that were not measured in the current study and such variables might account for additional explanation of the variance in the outcome. Measuring variables such as levels of reading and writing skills development, high school physical resources, counseling and tutoring, and the quality of peer networks might bolster the predictive strength of the model. Another limitation of this study is that there are many factors influencing students' enrollment in a remedial course, some of which this study did not take into account such as student motivation, levels of self-efficacy and persistence, writing skills and, high school physical resources, counseling and tutoring, quality of peer networks, and interaction of factors.

The research variables were limited to the items that were significant in the Engberg and Wolniak (2010) study. Other variables that were not significant predictors in Engberg and Wolniak's (2010) study might be significant in the present study if they had been measured, including institutional characteristics, variables under the forms of capital, and more demographic variables describing SES. That is, just because variables were not significant in Engberg and Wolniak's (2010) study does not mean they would not be significant predictors in the present study if applied within the model.

Another limitation of this study exists in relation to generalizability. Convenience sampling was used to find students who were freshman in a community college and had

completed high school in the past three years. Isolating these students within the large general student population to ask for their cooperation would have been nearly a practical impossibility. In fact, the sample size was limited to 327 students on campus with a population of almost 16,500 students. That is one in approximately every 200 students. Because the study was based on a convenience sample of students enrolled on one campus of a community college system, the results are not generalizable to other campuses.

A limitation of this study was the use of self-reported data. Some of the items in the survey required students to recall information from up to three years ago, when they were completing high school. Some information reported on the surveys was based on students' perceptions and so might not be accurate.

### **Recommendations for Future Research**

It is suggested that future research should be focused on math; examining students' high school factors and enrollment in a remedial math course at a community college because the percentage of students enrolled in math remediation is substantially higher than students enrolled in remedial English (Wirt, Rooney, Provasnick, Sen, & Tobin, 2004). Results might have been different if the study was specific to math remediation, because the factors that affect math remediation may be different than factors that affect English remediation. For example, GPA might possibly be more predictive of math level, whereas sociocultural capital could be coupled with remedial English. If this study were focused on math remediation, the hypothesis would be more narrowly focused, and data would have been collected only in remedial math courses (though some respondents might also be taking remedial English). A focus on math remediation would allow a better understanding of factors affecting math remediation that occurs at a higher frequency than English remediation.

Future researchers should also consider modifying the survey instrument. A revised instrument could address more areas and constructs and do so based on the present study results and findings that were significant in similar studies predicting college readiness. For example, if the instrument collected information on whether each respondent was taking only remedial math, or only remedial English, or both types of remedial courses, more research questions could be addressed and a couple more-focused models could be derived based on higher level groupings of research participants. Knowing the area of remediation for each participant would allow formation of comparison groups. Removing variables that are likely to have no variation, such as the cultural capital question on family and friends' desire for you to go to college may lead to a more effective and robust predictive model (possibly employing a multinomial logistic regression).

Future researchers should examine other related survey instruments on college enrollment and college readiness, and pilot test revised survey instruments on a group of community college students before administering it to the whole sample. There are benefits of conducting a pilot study using a complete survey instrument and a small-sized sample, to detect and remedy technical and logistical problems, such as with the sample frame that may be present before field testing with a large audience of potential respondents (Fowler, 2013). A pilot study can increase the reliability of results, potentially eliminating bias. For example, if non-native-English speakers do not have a clear understanding of language used in the items or scales used on the instrument, then a cultural bias may exist in results. A preliminary study can lead to increased clarity of language of instructions and definitions, optimizing respondents' understanding. Piloting an instrument could prevent questions from being used if the responses have no variance, thus increasing efficiency.

Future researchers could establish a partnership with a community college and the local school district. Data sharing based on the partnership would allow the researcher to obtain more reliable data from high school transcripts, including GPA and highest math level, and also obtain remedial course enrollment status (remedial vs. non-remedial) from the community college and connect these data.

Since the current study did not find a significant relationship between ethnicity and remedial course enrollment, future researchers should examine interaction between race variables, other demographic predictors, and capital resource variables and their relationship to remedial course enrollment.

In summary, future researchers can improve content and process affecting study results. A modified survey instrument could be more efficient and reliable, leading to a stronger instrument and more robust and significant results. A pilot study can provide many benefits: efficiency; reliability; clarity; and reduce bias in the sample frame. Data sharing through a partnership between the researcher and a community college might lead to more reliable data from high school transcripts, and provide better data on remedial course enrollment status in the community college. Future researchers could also examine interaction between variables.

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## Appendix A: Consent Form

The Liberty University Institutional  
Review Board has approved  
this document for use from  
2/19/15 to --  
Protocol # 2093.021915

### CONSENT

The title of this study is "Predictive Factors Determining Newly Graduated High School Students' Enrollment in a Remedial Course at a Community College"

Principal Investigator: John Whiton  
Liberty University School of Education

You are invited to be in a research study of community college students who graduated from high school in the most recent year. You were selected as a possible participant because you are currently enrolled at this community college and can provide data that are important to advance research findings in the field of education. I ask that you read this form and ask any questions you may have before agreeing to be in the study.

John Whiton, a doctoral candidate in the School of Education at Liberty University is conducting this study.

#### Background Information:

The purpose of this study is to examine whether student characteristics in high school are related to students then enrolling in a remedial course or not in their first year of community college.

#### Procedures:

You must be at least age 18 years to participate in this study. If you agree to be in this study, you are asked to simply complete the twelve (12) brief questions on the attached survey. This survey will take you five minutes or less to complete. This survey is not timed. *Do not complete this survey if you already completed it in another class.*

#### Risks and Benefits of being in the Study:

The study presents minimal risks to you if you participate; that is, they no more risk than daily activities. You can stop taking this survey at any time and skip questions without any penalty if you prefer not to answer.

There are no direct benefits to you if you decide to participate.

#### Compensation:

There is no compensation provided for your response to this survey. However, one person who completes this survey will be selected randomly to receive a \$200 Amazon gift card.

#### Confidentiality:

Your response to the survey is anonymous. The records of this study will be kept private. In any sort of report I might publish, I will not include any information that will make it possible to identify a participant. Research records will be stored securely and only the researcher will have access to the records. Information collected from this survey will be stored for three years per standard operations and procedures, then paper will be shredded and any digital media destroyed physically.



## Appendix B: COMMUNITY COLLEGE STUDENT SURVEY

Do not complete this survey if you are less than 18 years of age (per the approved research protocol). You can stop taking this survey without any penalty or skip questions that you prefer not to answer.

During which calendar year did you graduate from high school? (SELECT ONE)

- ☐ 2012
- ☐ 2013
- ☐ 2014
- ☐ 2015
- ☐ Other\_\_\_\_\_

Are you currently enrolled as a first-year student at this community college?

- ☐ Yes
- ☐ No

Are you currently enrolled in at least one course at Montgomery College that will **NOT provide college credit** to you upon course completion (a developmental or remedial course)?

- ☐ Yes
- ☐ No

Select **one or more** of the following choices that best describes your race/ethnicity.  
(MARK ALL THAT APPLY)

- ☐ Hispanic or Latino/Latina
- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ Black/African American
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ White

What was your family's total income from all sources during your last year of high school? (**If you are not sure** about the amount, **please estimate.**)

Total Family Income during Final Year of High School:

- ☐ None
- ☐ \$ 1,000 or less
- ☐ \$ 1,001-\$ 5,000
- ☐ \$ 5,001-\$ 10,000
- ☐ \$ 10,001-\$ 15,000
- ☐ \$ 15,001-\$ 20,000
- ☐ \$ 20,001-\$ 25,000
- ☐ \$ 25,001-\$ 35,000
- ☐ \$ 35,001-\$ 50,000
- ☐ \$ 50,001-\$ 75,000
- ☐ \$ 75,001-\$100,000
- ☐ \$100,001-\$200,000
- ☐ \$200,001 or more

OVER →

What was your final high school GPA on a four-point scale? (IF YOU DO NOT KNOW, **ESTIMATE** YOUR FINAL OVERALL HIGH SCHOOL GPA. IF YOUR FINAL GPA WAS GREATER THAN 4.00, USE 4.00)

Final GPA: ---- . ---- ----

What was the highest level of math that you completed in high school?  
(Mark **only one**)

- ☐ Pre-algebra
- ☐ Algebra 1
- ☐ Geometry
- ☐ Algebra 2
- ☐ Trigonometry
- ☐ Pre-calculus
- ☐ Calculus

Is English your native language, (the first language you learned to speak when you were a child)?

- ☐ Yes
- ☐ No

During high school, did your family and/or friends desire for you to go to college?

- ☐ Yes
- ☐ No

As a high school student, how often did you discuss community, national and world events with either or both of your parents or guardians? (PARENT CAN MEAN GUARDIAN, OR STEPPARENT WITH WHOM YOU LIVED MOST OF THE TIME WHILE IN HIGH SCHOOL)

- ☐ Never
- ☐ Sometimes
- ☐ Often

As a high school student, did you talk to family and/or friends for information about the entrance requirements of a college or colleges? (EXAMPLES OF COLLEGE INFORMATION ARE CLASSES, SUBJECTS, GRADES, GPA, ACT OR SAT TESTS)

- ☐ Yes
- ☐ No

As a high school student, how often did you discuss going to college with either or both of your parents or guardians? (PARENT CAN MEAN GUARDIAN, OR STEPPARENT WITH WHOM YOU LIVED MOST OF THE TIME WHILE IN HIGH SCHOOL)

- ☐ Never
- ☐ Sometimes
- ☐ Often

## **Appendix C**

### **IRB Protocols, Applications for Approval, and Findings of the IRB Committees after Review**

1. Liberty University IRB (principal investigator's institution)
2. Community College IRB (research site for data collection)

# LIBERTY UNIVERSITY

## INSTITUTIONAL REVIEW BOARD

February 19, 2105

John Whiton

IRB Exemption 2093.021915: Predictive Factors Determining Newly Graduated High School Students' Enrollment in a Remedial Course at a Community College

Dear John,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study to be exempt from further IRB review. This means you may begin your research with the data safeguarding methods mentioned in your approved application and no further IRB oversight is required.

Your study falls under exemption category 46.101(b)(2), which identifies specific situations in which human participants research is exempt from the policy set forth in 45 CFR 46:101(b):

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless:  
(i) information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Please note that this exemption only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued exemption status. You may report these changes by submitting a change in protocol form or a new application to the IRB and referencing the above IRB Exemption number.

If you have any questions about this exemption or need assistance in determining whether possible changes to your protocol would change your exemption status, please email us at [irb@liberty.edu](mailto:irb@liberty.edu).

Sincerely,

**Fernando Garzon, Psy.D.**  
Professor, IRB Chair  
Counseling

(434) 592-4054

**LIBERTY**  
UNIVERSITY

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<b>[Community College Name]</b> <b>Institutional Review Board (IRB)</b>		
<b>IRB ACTION FORM</b>		
<b>IN RESPONSE TO AN APPLICATION FOR THE CONDUCT OF RESEARCH INVOLVING HUMAN SUBJECTS</b>		
<b>Name of Principal Investigator (P.I.):</b>	John Whiton	
<b>Project Title:</b>	Predictive Factors Associated with Newly Graduated High School Students' Enrollment in Remedial Coursework at a Community College	
<b>IRB Project #:</b>	201511	
<b>Project Proposed BEGIN and END Dates:</b>	2/2/2015	4/10/2015
	<i>Proposed Beginning Date</i>	<i>Proposed Ending Date</i>
<b>Review Date:</b>	2/2/2015	
<b>IRB Reviewer (s)</b>	R L	
<b>Outcome of Initial IRB Review</b>		
<input type="checkbox"/> Application requires additional information. Please submit information or materials requested below:		

**Application has been APPROVED as follows:**

As "exempt", specifically per 45CFR46.101(b)

Category

(b) (2)



As the result of an "expedited review"

Please note the following conditions or restrictions

1. Any changes in the protocol (research design, data collection, consent forms, etc.) form that contained in the Application must be communicated to the MC IRB
2. A Continuing Review Questionnaire must be submitted to the IRB no later than one (1) year after the review date on this form if the study is still underway
3. Other: **Consent form needs to include instruction that students agree they are 18 years of age or older**

**Application forwarded for Full IRB Review within three (3) weeks. Please provide the following information to assist the IRB in its review:****Application has been disapproved for the following reasons. Included are directions for your appeal or request for further consideration:**

## Appendix D

### Script for Community College Instructors and Researcher to Recruit Participants

The script below was read to students in classrooms of remedial courses and credit courses, asking students to complete the questionnaire. The classroom instructor or the researcher can read the script:

“A doctoral student wants you as students to answer a very brief and simple, ten-question survey that only takes a few minutes of your time. The responses are anonymous so you cannot be identified. This survey is voluntary so you do not need to participate in it. If you do complete the survey, you can write an email address on a card and you will be eligible for a \$200 Amazon® gift card in appreciation for your answers, to be randomly selected two weeks from the end of the survey and the winner will be notified immediately. Please complete the questionnaire on paper and seal it in the envelope and put that in this envelope or you can take the survey online using the link listed at the top of the questionnaire. This study has been reviewed by this community college and poses no risk to you if you participate. The data you can provide will enable the doctoral student to complete his research using a statistical model. The student is most grateful for your time and participation. If you don’t want to participate, there is of course no penalty. Any questions can be directed to the researcher. Please take a minute now to look at the survey in case you want to provide answers to the simple questions.” (*End of Script.*)

Time to read the above aloud is 45 seconds. The researcher or instructor collected and retrieve all used and unused materials related to data collection prior to leaving the classroom.

## **Appendix E**

### **Offer to Participate in Sweepstakes**

*[Text on a 3 inch by 5 inch index card or slip of paper]*

Thank you for completing the questionnaire. If you would like to participate in a sweepstakes in appreciation for your contributing data to this research study, and if you are selected for a gift card, please record the email address to which a digital Amazon® gift card can be sent.

Email address: \_\_\_\_\_