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Effect of undergraduate research programs on retention of Hispanic students

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BY

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ABSTRACT

The Hispanic population in the United States has been increasing, which is affecting the number of Hispanic student population in the higher education. In spite of the rapid increase of Hispanic student population, little empirical research has been conducted on the Hispanic student's college success. This study investigated the effect of participating in holistic undergraduate research programs on retention outcome of Hispanic students at The University of New Mexico. UNM is a public Hispanic-Serving Institution where 47.3 percent of undergraduate students are Hispanic in 2016.

The Vincent Tinto's theory of student departure and the five critical factors of retention developed by Demetrious and Schmitz-Sciborski were used as the framework of the research model. The predictor variables included demographic characteristics, academic attributes, and research participation, and the dependent variable was the retention outcome. Propensity score matching was used to remove the concern of multicollinearity. The retention outcomes of two groups, Hispanic students who participated in research programs and who did not participate, were compared. The results indicated that research participation had a statistically significant positive effect on student's retention outcome.

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Chapter 1: Background

Introduction

This research project investigated the effects of participating in undergraduate research programs on retention among Hispanic students in The University of New Mexico. The enrollment of Hispanic students is anticipated to rise 42 percent between 2010 and 2021 (National Center of Education Statistics, 2010). Higher education institutions must be preparing for this rapid increase of Hispanic student population to successfully retain and graduate them. The concern is that educational attainment of Hispanic students is lower than other minority groups historically. As the number of Hispanic students has been growing nationwide, higher education institutions must ensure their successful completion of college.

Vincent Tinto's (1975) theory of student departure and the five factors of retention by Demetrious and Schmitz-Sciborski (2011) were used to create the research model. The factors included academic preparation, demographic characteristics, academic engagement, social engagement and financing college. This study examined how holistic undergraduate research programs help Hispanic students retain in university based on the research model. I argue the holistic undergraduate research program is a key element in higher education to enable academic achievement and degree attainment among Hispanic students by offering the opportunities for academic and social integration, and financial support.

The purpose of this research is to examine the effect of participating in such undergraduate research programs on retention among Hispanic undergraduate students at The University of New Mexico. In this Chapter I discuss the recent shift in college

student population and the important role of the Hispanic-Serving Institutions to better serve the rapidly increasing number of Hispanic students.

Hispanic Population

The percentage of Hispanics in the U.S. population has steadily increased since 1960. According to the 2014 U.S. Census Bureau, Hispanics made up 3.5 percent of the total U.S. population in 1960 and the number increased to 17.3 percent in 2014. The U.S. Census Bureau predicts the number of Hispanics will reach 28.6 percent by 2060 (Colby & Ortman, 2015). The projected number of Hispanic population in 2060 is 119 million which is more than 200 percent increase from 55.3 million in 2014 (Colby & Ortman, 2015). The state of New Mexico has the highest Hispanic population rate (48.5 percent) in the United States followed by Texas (39.1 percent) and California (38.9 percent) according to the 2017 census (U.S. Census Bureau, n.d.). New Mexico is currently a minority majority state consisting of 41.7 percent White Non-Hispanic, 44.9 percent Hispanics, 8.6 percent Native Americans, 2.1 percent African Americans, and 1.2 percent Asians (U.S. Census Bureau, n.d.).

The increase of Hispanic population is reflected in the student demographic in higher education institutions. While the rate of White students enrolling in college is expected to increase 4 percent and 20 percent for Black and Asian students, enrollment of Hispanic students is anticipated to rise 42 percent between 2010 and 2021 (National Center of Education Statistics, 2010). There is some discrepancy in different minority groups on the degree attainments. Asian and White adults have much higher education attainment rates compared to underrepresented minority population; about 33 percent of U.S. adults (25 years of age or older) had at least a bachelor's degree in 2015, including

54 percent of Asian/Pacific Islander adults, 33 percent of White adults, 22.5 percent of Black adults, and 15.5 percent of Hispanic adults (Ryan & Bauman, 2016). Higher education needs to be prepared for the 42 percent increase of Hispanic students from the group of traditionally lower college degree attainment. The number of higher education attainment rate implies that many of the Hispanic students have parents without college degrees as only 15.5 percent of Hispanic adults possess postsecondary degrees. Anticipating the rapid increase of Hispanic students, the higher education needs to reassess the services and programs we offer for underserved students in order to help their success in college.

Hispanic-Serving Institutions

With the rapid growth of the Hispanic population in higher education, the U.S. Congress formally recognized such institutions with high Hispanic enrollment as federally designated "Hispanic-Serving Institutions" in 1992. This effort was led by the Hispanic Association of Colleges and Universities (HACU) in order to target federal appropriations to those institutions (Hispanic Association of Colleges and Universities, n.d.). A Hispanic-Serving Institution is defined by the U.S. Department of Education as an institution of higher education where at least 25 percent of the enrollment of undergraduate full-time students are Hispanic (National Center of Education Statistics, 2010). Hispanic-Serving Institution is currently the fastest growing sector of Minority Serving Institutions (John & Stage, 2014). According to the report by Excelencia in Education, the number of institutions that meet the threshold enrollment criteria of Hispanic-Serving Institution has almost doubled; 135 institutions met the Hispanic-

Serving Institution enrollment criteria in 1995-96, and the number of institutions had increased to 265 by 2006-07 (Santiago, 2010).

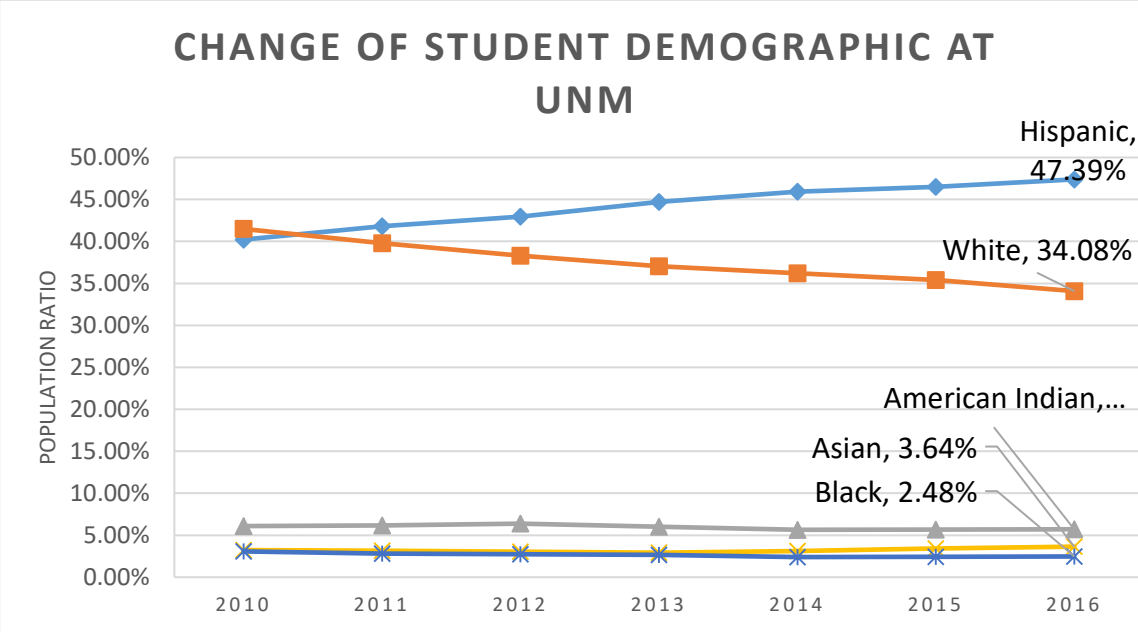
The eligibility of becoming a Hispanic-Serving Institution has been raising a concern whether those institutions are actually making efforts for Hispanic student's success after they enroll in these institutions (Contreras & Contreras, 2015; Medina & Posadas, 2012). Serving Hispanic students goes beyond enrolling them, and the services and programs have to be offered to ensure their successful retention and completion of the degree (Garcia & Okhidoi, 2015; Oseguera, Locks, & Vega, 2009; Santiago, 2010). People cannot assume the higher enrollment of Hispanic students automatically promotes the institutional effort for initiating programs to support new emerging student population. These concerns have developed as we have not seen the significant improvement of successful retention and completion rates among Hispanic students in Hispanic-Serving Institutions (Contreras & Contreras, 2015; Garcia & Okhidoi, 2015; Medina & Posadas, 2012). Over sixty-six percent of Hispanic students enroll in the Hispanic-Serving Institutions even though only 10 percent of higher education institutions in the U.S. are designated as Hispanic-Serving Institution (Murphy. 2013). Thus, examining the effectiveness on Hispanic student success in a Hispanic-Serving Institution is critical to improve the services and programs tailored towards Hispanic student college success.

The University of New Mexico as Hispanic-Serving Institution

The enrollment of Hispanic students at The University of New Mexico reflects the national trend of Hispanic population (see Figure 1.1). The University of New Mexico is a public Hispanic-Serving Institution with 19,648 enrolled undergraduate students in the

fall semester of 2016 which consists of 47.39 percent Hispanic, 34.08 percent White, 5.7 percent American Indian, 3.64 percent Asian, and 2.48 percent African American students (Office of Institutional Analytic, n.d.). As you can see in Figure 1.1, the number of Hispanic students has exceeded the number of White students and has been the largest ethnic group enrolled at The University of New Mexico since 2011.

Figure 1.1. Student Population by Race/Ethnicity at The University of New Mexico 2010 – 2016

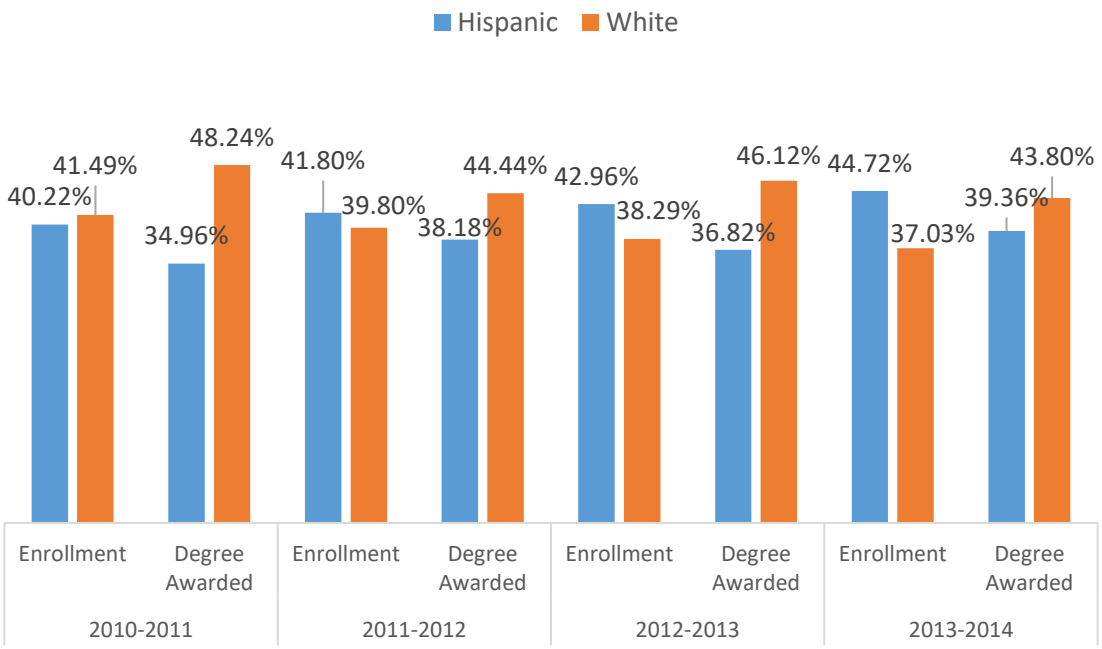


Some scholars argue that lower educational attainment among Hispanic population is not due to the access to higher education, rather, the challenge for Hispanic student population is academic success and completion of degree after they enroll into college (Contreras & Contreras, 2015; Medina & Posadas, 2012). This is also the case at The University of New Mexico. The Hispanic student enrollment is the largest percentage in the institution since 2011, however, the completion of their degrees has not been increasing as fast as the enrollment rates. Figure 1.2 indicates the change in the

ratios of undergraduate enrollment and degree recipients by two largest ethnic groups, Hispanic and White undergraduate students at The University of New Mexico.

The bars in Figure 1.2 represent Hispanic student population while the line indicates white students. Even when more Hispanic students are enrolled than White students (2011-2014), the rates of degree awarded by White students are much higher than Hispanic students. Although we have been successfully enrolling more Hispanic students, the degree completion rate among Hispanic students remains lower than White students. While the enrollment into higher education depends on access, the academic success and successful retention of students rely on the support the institutions provide (Medina & Posadas, 2012; Tinto 1993). Hispanic-Serving Institutions must find more effective way to support and retain this growing population of underserved students (Medina & Posadas, 2012; Oseguera et al., 2009; Pascarella, 2006).

Figure 1.2. UNM Undergraduate Enrollment & Degree Awarded Ratio (Office of Institutional Analytics, n.d.)



It is important for the public Hispanic-Serving Institutions like The University of New Mexico to examine the most effective support for Hispanic students to improve their successful retention within their enrolled-institutions. Among students enrolled in college in 2008, about 81 percent of Hispanics chose to attend public institutions, higher than the percentages of Whites (73 percent), Blacks (68 percent), and Asians/Pacific Islanders (75 percent) who enrolled in public colleges (National Center of Education Statistics, 2010). More than half of Hispanic college students (60 percent) are also enrolled in the Hispanic-Serving Institutions (Excelencia in Education, 2014). Thus, Hispanic students are more likely to attend public Hispanic-Serving Institutions. In fact, Maestas, Vaquera, & Zehr (2007) state that The University of New Mexico is an ideal institution to better understand the factors of success among Hispanic students in higher education because of the large number of Hispanic student population and being the public research university in the state. There is a potential that "the University [of New Mexico] and the state [of New Mexico] could serve as a model for those states in the country that have a large or growing population of Hispanics" (Maestas et al., 2007, p.239).

Student Retention

For decades, the research on retention in higher education has been conducted by various scholars to explain student persistence to stay in or leave from college (Astin, 1993; Bean & Metzner, 1985; Pascarella, 2006; Swail, Redd, and Perna, 2003; Tinto, 1975, 2012). The retention issue is an important topic to be investigated in higher education as it has a significant financial implication (Noel-Levitz Retention Codifications, 2008). Higher education institutions invest time, money, and resources to recruit and admit students into their institutions. Student attrition means a loss of his or

her tuition, fees, housing, food, and other purchases for institutions to support the operations (Raisman, 2013). According to Raisman (2013) who analyzed 1,669 higher educational institutions, the public universities lose significant amount of money annually from student attrition. To protect the investment, institutions must examine and explore the best practice to provide the resources and better environment for their enrolled students. Retention is a primary concern of higher education institutions (Hess, Schneider, Carey & Kelly, 2009; Raisman, 2013), and examining ways to improve Hispanic student retention is critical mission of their future success.

Demetrious & Schmitz-Sciborski (2011) summarized into five categories of the factors related to undergraduate student retention from more than 40 years of research done by different scholars: (1) Academic Preparation, (2) Academic Engagement, (3) Social Engagement, (4) Financing College, and (5) Demographic Characteristics. Students have to be academically prepared to become successful in higher education. The preparedness of students prior to college enrollment including their educational experience and performance is an important predictor of future academic performance of the students (Astin, 2005; Eaton & Bean, 1995; Nora, Barlow, and Crisp, 2005; Tinto, 1993). Thus, inferior schooling prior to college can increase the student's chance of departure (Swail et al., 2003).

Academic and social engagements, the second and third categories, are core concepts of Tinto's integration retention model (Tinto, 1975), and are well established factors by multiple empirical research (Bai & Pan, 2009; Baker, 2013; Berger & Braxton, 1998). Student's persistence is connected to their academic performance and intellectual development (Tinto, 1975, 2006). A strong indicator of student's academic engagement

is the student-faculty interactions (Braxton, Brier, & Steele, 2007; Nora et al., 2005; Tinto, 1993). Such academic interactions and mentorship are more likely to create student's commitment to the institution leading to higher possibility of retention (Bean and Easton, 2000; Nora et al., 2005). Thus, academically involved students have higher satisfaction rate with all aspects of college life (Astin, 1999).

Tinto (1975) describes social engagement as "a person's integration into the social system of the college" (p. 107). The social system includes peer students, faculty, and administrative personnel on campus, and the social engagement can be accomplished by interacting with them through various extracurricular activities. Social integration refers to a successful adaption to the social environment, and it is confirmed to promote students to stay and complete college (Bai & Pan, 2009; Bean & Eaton, 2000). Some researchers emphasize that it is critical for student's academic success to remove cultural barriers underrepresented students experience in college life and promote engagement to campus community (Braxton et al., 2007; Oseguera et al., 2009).

The affordability of college education has been debated in recent years. Even if the students are well-prepared and engaged academically and socially, financial factors can prevent them from successful retention (Robb, Moody, & Adbel-Ghany, 2012; Swail et al., 2003). Financial need tends to push students to work long hours and live off-campus, which can have a negative influence on retention (Tinto, 2006). Need-based aid, thus, has positive effects on student's persistence (Astin, 1993). Financial support is an especially important factor for Hispanic college student retention (Oseguera et al., 2009). According to the U.S. Census Bureau report, 23.2 percent of Hispanic population in the United States are living below poverty compared to the U.S. total poverty rate of 14.3

percent (Macartney, Bishaw, & Fontenot, 2013). The ability to finance college is a critical factor for students to remain in higher education. The socioeconomic status of student's family is directly related to the ability to finance college (Oseguera et al., 2009).

Student's demographic characteristics influence their persistence to pursue a college degree (Astin, 2005). Individual student's age, gender, and ethnicity can have effects on retention according to multiple research outcomes (Ma & Cragg, 2013). Family background is an important factor on the child's educational attainment and performance in college, such as parent's level of education and socioeconomic status of family (Tinto, 2006). First-generation college students are more likely to struggle because it is the first experience for both students and their parents to maneuver through higher education (Ishitani, 2016; Tinto, 1993).

Undergraduate Research

Since the report by the Boyer Commission on Educating Undergraduates in the Research University in 1998, the role of undergraduate research in higher education has been widely discussed (Bauer & Bennett, 2008; Fechheimer, Webber, & Kleiber, 2010; Hu, Kuh, & Gayles, 2007; Kilgo & Pascarella, 2016). The report encouraged research universities to implement undergraduate research activities in their institutional commitment to enrich student's academic experience (Boyer Commission on Educating Undergraduates in the Research University, 1998). There are a wide range of research activities mentioned in the report, from independent study with faculty to more organized research programs with a holistic approach to help students succeed academically, personally, and professionally.

Past literature have listed a number of benefits undergraduate students receive from undergraduate research activities. Research experiences teach students to think critically and analytically (Bauer & Bennett, 2008; Kardash, 2000; Pascarella & Terenzini, 2005). Students who participate in undergraduate research programs achieve higher GPA and retention rates (Chang, Sharkness, Hurtado & Newman, 2014; Cole & Espinoza, 2008; Nagda, Gregerman, Jonides, von Hippel, & Lerner, 1998). The interaction with faculty during their research activities enriches student's academic experiences and enhances their pursuit in graduate studies (Hathaway, Nagda, & Gregerman, 2002; Lopatto, 2004; Pascarella & Terenzini, 2005; Webber, Laird, & BrckaLorenz, 2013).

Undergraduate research experiences have even more positive effect on students from underrepresented population (Jones, Barlow, & Villarejo, 2010; Jonides, von Hippel, Lerner, & Nagda, 1992; Kinzie, Gonyea, Shoup, & Kuh, 2008; Lopatto, 2007). The University of Michigan created an Undergraduate Research Opportunity Program (UROP), to improve academic achievement and retention among underrepresented student population. Their research found that the UROP was significantly more effective for minority students for academic accomplishments (Jonides et al., 1992). According to their data (Jonides et al., 1992), minority students who were involved in UROP became more engaged in academics and more likely to seek help when they perform poorly in class.

Since then, some researchers have examined the benefits of undergraduate research on underrepresented student population (Jones et al., 2010; Chang et al., 2014; Kinzie et al., 2008), but there is not enough research focusing on Hispanic students

(Haeger, BrckaLorenz, & Webber, 2014). Hispanic-Serving Institutions, such as The University of New Mexico, could be the pioneer in developing programs and services resulting in successful retention and degree completion of Hispanic students.

Undergraduate Research Opportunities at The University of New Mexico

There are different ways for undergraduate students to get engaged in research activities at research universities. At The University of New Mexico some students enroll in the departmental honors programs that require a thesis or a research paper. Some students can individually create a research course with faculty's supervision to conduct a research project. Others may apply for a job or a volunteer opportunity as research assistants. There are also some comprehensive programs that focus on undergraduate research activities along with mentorship, graduate school preparation, and financial support. Such research programs aim to provide the participants with academic, professional and personal developments. I included five research programs for undergraduate students at The University of New Mexico in this research: Initiative for Maximizing Student Development (IMSD), Maximizing Access to Research Careers (MARC), Mellon Mays Undergraduate Fellowship (MMUF), Research Opportunity Program, and Ronald E. McNair Scholars Program because of their holistic approach to the student's experience. They provide academic integration, social engagement, and financial support by promoting their research activities.

The Initiative for Maximizing Student Development Program and Maximizing Access to Research Careers Program have been funded by the National Institute of Health to promote educational activities in biomedical research to prepare underrepresented students for doctoral programs and the biomedical workforce (National

Institute of Health, n.d.a & n.d.b). Both programs at The University of New Mexico have been managed by the Biology Department. The program participants engage in individual research activities with faculty mentors and receive academic and professional development through seminars and conferences. The participants meet regularly during semesters and are engaged in research activities during the academic year and summer with faculty mentors. The programs provide financial support by hiring the participants as research assistants. The students are required to present their research in the annual Biomedical Research Symposium and the Biology Day on campus.

The Mellon Mays Undergraduate Fellowship (MMUF) program funded by the Andrew W. Mellon Foundation has been coordinated by the UNM Honors College since January 2015. The program's mission is to increase diversity among faculty in higher education by promoting undergraduate scholarly activities among underrepresented students. The program recruits students who plan to pursue a doctoral degree in the MMUF designated fields in mainly Humanities and Social Sciences and a career as a professor. The MMUF fellows receive the opportunities for research experience, faculty mentorship, graduate school preparation, conference attendance, and professional development. The program provides stipends each semester and summer, conference travel allowance, and GRE preparation workshop during junior and senior years. They meet regularly during semesters and present their research projects at the annual MMUF Regional Conference and the UNM Undergraduate Research Opportunity Conference.

Both the Ronald E. McNair Scholars Program and the Research Opportunity Program have been housed under the Division of Student Affairs at The University of New Mexico since 1999. The Ronald E. McNair Postbaccalaureate Achievement

Program is funded by the U.S. Department of Education to prepare undergraduate students from disadvantaged background for doctoral programs through research and scholarly activities (U.S. Department of Education, n.d.). The program is offered at 151 institutions for first-generation college students with financial need, or members of underrepresented populations in graduate education (U.S. Department of Education, n.d.). The Research Opportunity Program is supported by the state of New Mexico to increase the diversity among graduate students who are pursuing a career in university teaching and research (UNM McNair, n.d.). The programs provide the scholars with opportunities to get involved in research projects under faculty mentors, the preparation for Ph.D. programs, and the peer mentoring. The participants meet regularly during semesters and engage in research activities during summer. The summer research participants are compensated as a research assistant. The scholars also travel together to attend conferences and visit graduate programs.

All five programs described above provide common benefits for the selected scholars. Their scholarly activities are planned around research activities with faculty members, the scholars' cohort meet regularly for academic and professional development, and students are encouraged to pursue graduate degrees. They all have cohort system which offers the opportunity to learn, travel, and build a community together. Another common benefit is financial support, which attracts those who would otherwise have to work and therefore, possibly not be engaged in research activities. I selected specifically these five programs because they incorporate three out of five retention factors – academic integration, social engagement, and financing college – supported by Demetrious and Schmitz-Sciborski (2011).

Purpose of My Study

In this research, I focused on the holistic research programs at The University of New Mexico that utilize the three factors of successful retention including academic engagement, social engagement and financing college. These programs recruit students with commitment to academic engagement since the participants must be involved in the research activities for one or two years. The participants are required to meet with faculty mentors for their research projects which enhance academic integration of the students. The integrated cohort system in the programs helps the participants interact among peers and create social engagement opportunity. The participants also receive financial support through stipends by engaging in the research activities and workshops in the programs, which are mandated. The programs focus on underrepresented populations through identifying their ethnicity, parents' education level, and/or family income.

My research investigated the effect of undergraduate student retention by participating in these holistic research programs. The hypothesis examined in this research is that Hispanic student participants of the undergraduate research programs are more likely to be remained in The University of New Mexico than Hispanic students who did not participate. The programs are implemented to support student's academic, personal, and professional success. This study focused on whether the program's objectives were effectively improving the retention for Hispanic students. As a public Hispanic-Serving Institution, it is our mission to improve the success among Hispanic students.

The independent variables include student's demographic information (ethnicity, parent's postsecondary degree, financial needs, age and gender), academic information

(ACT/SAT scores, GPA, scholarship and year in college), and participation in undergraduate research programs. The dependent variable is a retention of individual student from the fall semester of 2015 to the fall semester of 2016. These variables are available from the data in the Registrar's Office under the UNM's Division of Enrollment Management and from the five research programs at The University of New Mexico.

In the next chapter, I will present the literature review on undergraduate student retention and undergraduate research, the findings from past empirical research, and the research model for this study.

Chapter 2: Literature Review

Introduction

This chapter reviews the literature on student retention, student participation in undergraduate research programs, and its impact on student retention. I illustrate an undergraduate retention model, which is taken from the work of Demetrious & Schmitz-Sciborski (2011). They developed five factors of retention by synthesizing student retention theories produced by multiple scholars in the last forty years, which include Tinto's theory of student departure. The proposed five categories of variables are critical factors of student retention: academic preparation, demographic characteristics, academic engagement, social engagement and financing college. I present a literature review of past empirical research on the relationship between the benefits of participating in undergraduate research programs and undergraduate student retention. My specific focus is to better understand how these variables impact Hispanic student retention. Even though the Hispanic student population is rapidly growing in higher education, little empirical research has been conducted on college success of Hispanic students (Oseguera et al., 2009).

This research examines the effect of undergraduate research participation on the retention behavior among Hispanic students at The University of New Mexico. The benefits of undergraduate research experience have been discussed frequently (Bauer & Bennett, 2008; Kilgo & Pascarella, 2016), but this study is particularly focused on the impact on Hispanic students. More than half of Hispanic college students are enrolled in the Hispanic-Serving Institutions (Excelencia in Education, 2014), and more than 80% of Hispanic students attend public institutions (National Center of Education Statistics,

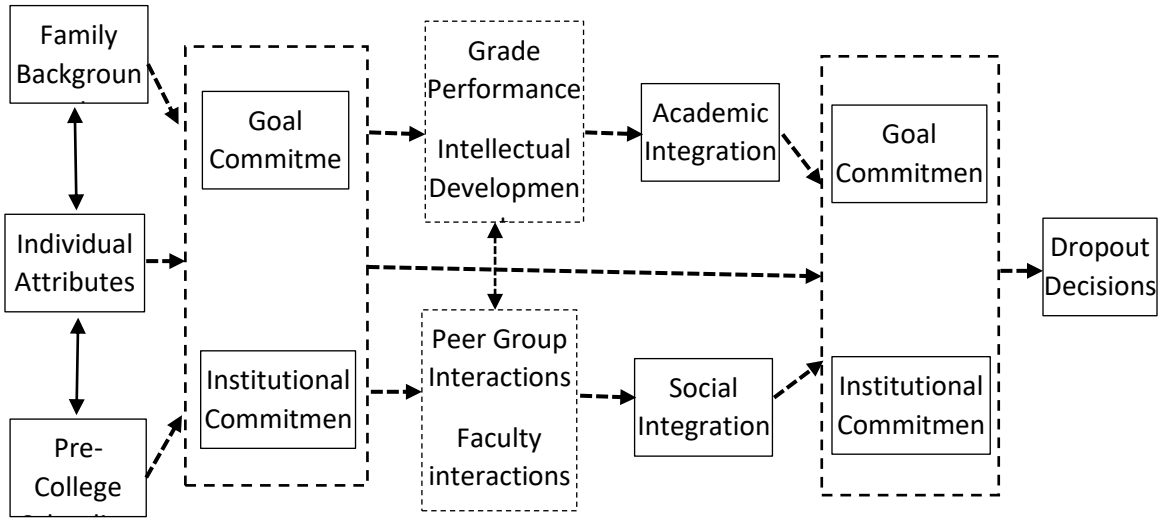
2010). The findings from this research at The University of New Mexico could have significant implications for Hispanic-Serving Institutions and other higher education institutions whose number of Hispanic students are rapidly increasing.

Tinto's Theory of Student Departure

The best-known and the most widely used theoretical model for explaining student departure from higher education was developed by Vincent Tinto (Aljohani, 2016; Attewell, Heil, & Reisel, 2011; Ishitani, 2016; Seidman, 2005) even though it was introduced over 40 years ago. Tinto (1975) emphasizes the importance of academic and social integration after a student enters college. The departure from higher education is heavily influenced by student's commitment to the goal of completing college and the individual's commitment to the institution. As you can see in Figure 2.1, these commitments are formed by academic and social integration along with individual characteristics such as family background, individual attributes, and prior educational experience (Tinto, 1975). The academic integration can be measured by student's academic performance (grades) and intellectual development, while the social integration can be assessed by the student's interaction with college communities (Tinto, 1975). Over time, the commitments are strengthened or weakened by the level of student's integration in academic and social domains of the institution during his/her college years (Tinto, 1975). The student's decision to complete college is more likely to increase when he/she integrates into both academic and social systems of a college.

Tinto (1975) also explained the external factors that may promote student's departure from higher education by using the theory of cost-benefit analysis. A student is

Figure 2.1. A conceptual Schema for Dropout from College (Tinto, 1975)



more likely to withdraw from college if he/she perceives "the costs" such as financial, time, dissatisfactions, and academic failures are greater than "the benefits" such as academic attainments, personal satisfactions, and friendships (Tinto, 1975, p. 98). In the recent literature, Tinto (2004) described the impact of student financial characteristics on a student's departure especially among low-income student population.

Bai and Pan (2009) investigated the influence of different intervention programs on undergraduate student retention following Tinto's model. The intervention includes the four different types of special programs including advising, academic help, first year experience, and social integration. All of the intervention strategies included 2-day seminars and tutoring services throughout academic year. The objectives of these programs are to help facilitate student's academic and social integration in their college life. The results indicated that the intervention programs improved student retention. Their study confirmed the Tinto's (1993) integrational model in which student's

involvement in social and intellectual life on college campus increased the retention rate (Bai & Pan, 2009).

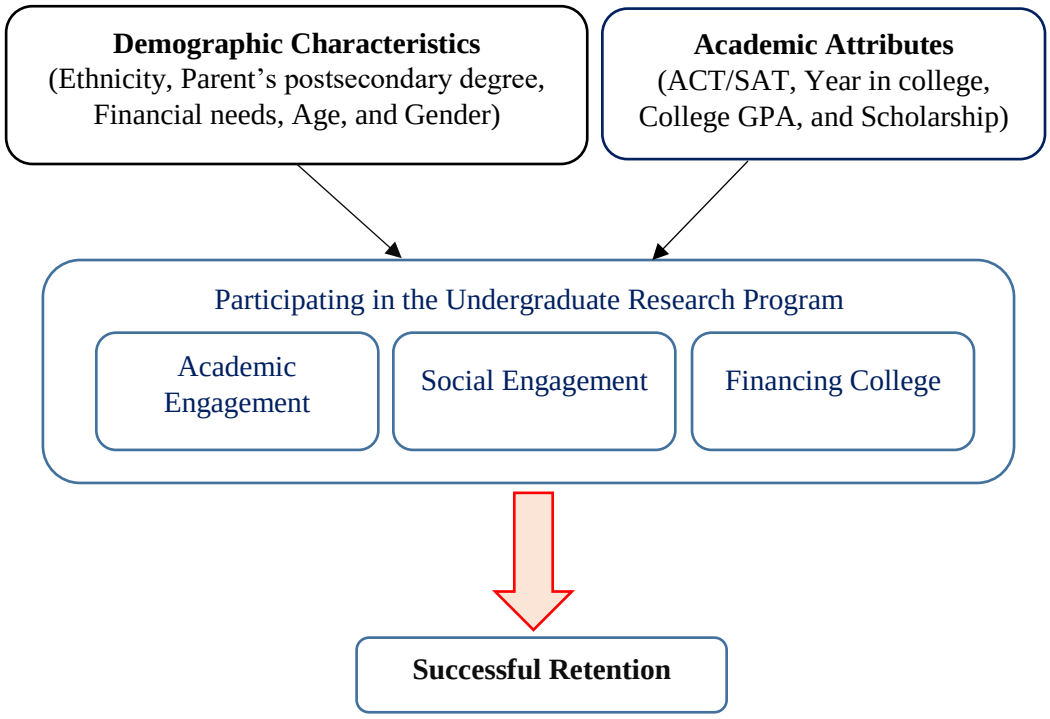
Baker (2013) examined the retention success of African American and Hispanic college students using Tinto's integration model. The campus peer support program and ethnic centers represented the variables of social integration, while study group and interaction with professors were considered as the academic integration variables. The study found that faculty-student interactions has a significant impact on the academic success among African American and Hispanic college students (Baker, 2013). The interaction with faculty helps develop the student's confidence to succeed and complete college (Baker, 2013).

Research Model

Demetrious & Schmitz-Sciborski (2011) reviewed the retention literature published in the last 40 years to identify primary variables of undergraduate retention. As a result of their effort, five factors stood out as the most cited variables that influenced undergraduate retention: Demographic Characteristics, Academic Preparation, Academic Engagement, Social Engagement, and Financing College (Demetrious & Schmitz-Sciborski, 2011). As I mentioned above, Tinto's retention literature specifically emphasizes the academic and social integration. Based on the five factors summarized by Demetrious & Schmitz-Sciborski (2011), the model (Figure 2.2) was applied to investigate the impact of undergraduate research participation on student retention in this study.

Undergraduate research has been identified as one of highly effective activities that leads toward students successfully completing their degrees (Hu et al., 2007;

Figure 2.2. Research Model



The model was arranged based on the summary of retention theories done by Demetrious & Schmitz-Sciborski (2011).

Lopatto, 2004). For this study, I selected five undergraduate research programs in The University of New Mexico that serve students from underrepresented populations. The selected programs are Initiative for Maximizing Student Development (IMSD), Maximizing Access to Research Careers (MARC), Mellon Mays Undergraduate Fellowship (MMUF), Research Opportunity Program and Ronald E. McNair Scholars Program. Those programs have eligibility requirements and criteria for admission, such as the applicant's grade points average, essay writing skills, parent's educational attainment, financial needs, and/or racial/ethnic background. For example, the MMUF applicants are limited to students from specific underrepresented ethnic and racial groups including African American, Hispanic, and Native American students because the

primary mission of MMUF is to increase the ethnic and racial diversity among faculty members. The MMUF also requires the applicant's intention to pursue a Ph.D. in the specific disciplines as the Mellon Foundation believes there is a significant lack of diversity in the fields of humanities and non-STEM social sciences. All of these research programs require at least 3.0 grade point average and the applicants are expected to enroll in graduate programs in future.

Once they are accepted into the programs, they have opportunities to foster academic and social integration through research activities, faculty mentors, and through cohort system, and the students also receive financial support. These programs provide research opportunities, professional development, graduate school preparation, faculty mentors, cohort building, and financial support. These opportunities are directly connected with the three retention factors mentioned above: Academic Engagement, Social Engagement and Financing College.

Demographic Characteristics

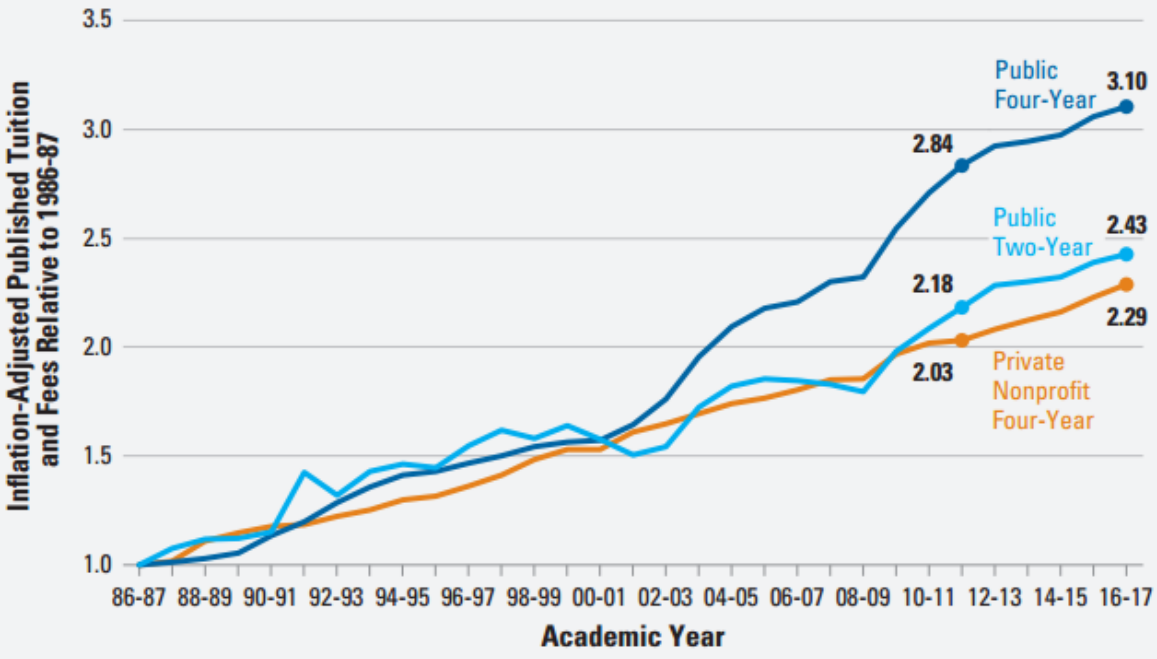
This study included ethnicity, parents' educational attainment, financial needs, age, and gender as the variables of demographic information. Student's demographic characteristics, such as parents' educational attainment and socioeconomic status, influence their persistence to pursue a college degree (Ishitani, 2016; Tinto 1975, 1993). Family background is an important factor on the child's educational attainment and performance in college (Tinto, 1975). The first-generation college students whose parents did not earn college degrees may struggle because their parents do not have the same amount of resources as the parents with college degrees can offer. The socioeconomic

status of student's family may be directly related to the ability to finance and eventually complete college (Oseguera et al., 2009).

Ishitani (2016) examined the retention factors with the national data of Beginning Postsecondary Students Longitudinal Study. He learned that first-generation students were 55 percent more likely to leave college during their second year than students with both parents who had college degrees. According to the National Education Longitudinal Study, 43 percent of first-generation college students did not complete college, while only 20 percent of students with college educated parents dropped out (Chen, 2005). The parents with college experience are more likely to support and encourage students based on their own first-hand knowledge of college. They may be more familiar with navigating the college life from completing a college application form to integrating in academic and social domains (Demetrious & Schmitz-Sciborski, 2011).

The family income and financial status influence students' decision to stay college (Oseguera et al., 2009; Robb et al., 2012; Tinto, 2006). The college tuition and fees have been increasing every year since the academic year of 1986-1987 even after adjusting inflation rate (College Board, 2016). Public four-year colleges have raised their tuition and fees the most since the academic year of 2000-2001 (see Figure 2.3). The University of New Mexico is no exception, as it increased its tuition 2.5 percent in 2016, 3 percent in 2015, 13.2 percent in 2013 and 3.75 percent in 2012. The increase of college cost makes the college less affordable for more people. This also increases the likelihood for needing more financial support to enroll and complete college degrees.

Figure 2.3. Inflation-Adjusted Published Tuition and Fees Relative to 1986-87, 1986-87 to 2016-2017 (1986-89=1.0)



NOTES: Figure 5 shows published tuition and fees by sector, adjusted for inflation, relative to 1986-87 published prices. For example, a value of 3.10 indicates that the tuition and fee price in the public four-year sector in 2016-17 is 3.1 times as high as it was in 1986-87, after adjusting for increases in the Consumer Price Index. Average tuition and fee prices reflect in-district charges for public two-year institutions and in-state charges for public four-year institutions.

SOURCES: College Board, Annual Survey of Colleges; NCES, IPEDS.

The impact of the hike in college cost is especially significant in lower income family. The income in the lowest 20 percent household in the United States decreased 3 percent between 2005 and 2015 (College Board, 2016). Lower income families have experienced a reduction in take-home pay. Many families in the state of New Mexico have financial hardship as being the sixth lowest average income in the United States; New Mexico's average household income was 19.9 percent less than the national average in 2015 (New Mexico Department of Workforce Solutions, 2017). Moreover, New Mexico has had the second-highest poverty rate in the United States after Mississippi

with its 20.4 percent poverty rate in 2016 which largely exceeds the national poverty rate of 14.7 percent (U.S. Consensus Bureau, n.b.). The financial burden to stay in college forces students to work more hours, and as a result, students have less time to engage in the campus communities and study for classes and thus integrate academically and socially (Tinto, 2006).

Chen and DesJardins (2008) examined the relationship between student persistence and family income level using the data from the Beginning Postsecondary Students Survey provided by the National Center for Educational Statistics. Analyzing the survey results from 6,733 participants, they found that low-income students had higher risk of leaving college compared to high-income students, 38 percent and 22 percent respectively (Chen and DesJardins, 2008). In this research they also found the first-year college GPA and parent's educational attainment were significant factors of student persistence (Chen and DesJardins, 2008).

Those who work more to finance college have less time to study and to get involved, and they are more likely to struggle academically (Walpole, 2003). In fact, supporting oneself with part-time job off-campus shows a negative effect on degree completion (Robb et al., 2012). Fischer (2007) examined the differences in campus life by race and ethnicity using survey data from 3,924 first year students in 28 institutions. According to her research, 55 percent of Asian and 65 percent of White students were from households earning $75,000 or more while only 40 percent of African American and Hispanic students had the same family income. Hispanic families can help on average with 43 percent of college expenses for their students compared to 60 percent for Asian and White students (Fischer, 2007). Therefore, Hispanic students may face more

challenges to stay and complete college due to their socioeconomic status than Asian and White students.

Academic Attributes

The undergraduate research programs selected for this research have criteria and eligibility requirements for the applicants. The programs have specific missions and objectives to target undergraduate students with the certain academic backgrounds. Most of the requirements are specified by the grant providers. The model suggested by Demetrious & Schmitz-Sciborski (2011) included pre-college academic attributes, such as high school GPA and ACT/SAT scores, in their Academic Preparation category. In this study the college academic variables such as college GPA, year in college, and merit-based scholarship are included in the category as academic information since these college academic attributes are important pre-existing conditions for the research participants to enroll in the programs. A student's academic preparation and demographic characteristics are pre-determined elements for participating in the undergraduate research programs. The variables of academic information collected for this study include ACT/SAT scores, year in college, grade point average, and merit-based scholarships.

College retention research often includes pre-college academic achievement such as high school grade point average and ACT/SAT scores as critical factors of student retention (Fischer, 2007; Tinto, 1993). At the same time, the grades in college play an important role for student retention (Ishitani, 2016; Tinto, 1993). Grades are generally determined by individual student's academic performance relative to other students, and is viewed by some researchers as "hardly a perfect measure of learning and intellectual development" (Pascarella & Terenzini, 2005). In spite of the limitation, student's college

GPA has been one of the most consistent predictors of college completion (Pascarella & Terenzini, 2005).

Ishitani (2016) examined the retention factors of the first- and second-year college students using the national data from the 2004-2009 Beginning Postsecondary Students Longitudinal Study. His study included 7,571 students who were enrolled in four-year private and public institutions. According to his findings, the first-year college GPA impacts the retention during both the first- and second-years (Ishitani, 2016). The probability of leaving college decreased by 20 percent in the first year and 44.6 percent in the second year when the GPA increases by one point (Ishitani, 2016). The results of another study confirmed that college GPA also has an effect on the third-year retention as one tenth of rise in student's college GPA increased the probability of student retention by eight percent (Titus, 2004).

Academic Engagement

A number of empirically based studies have suggested that student participation in undergraduate research programs promotes academic engagement (Bauer & Bennett, 2008; Chang et al., 2014). The data from National Survey of Student Engagement indicates that students attain learning skills, synthesis of ideas, and critical thinking through the undergraduate research experiences (Kinzie, 2010). The participants in research programs gained skills such as the ability to develop intellectual curiosity, acquire information independently, understand scientific finding, analyze literature critically, speak effectively, act as a leader, and possess clear career goals more than those who did not participate in the undergraduate research programs (Bauer & Bennett, 2008; Lopatto, 2007). Moreover, the participants in undergraduate research programs

experienced significantly greater overall satisfaction with their undergraduate experience than non-participants (Bauer & Bennett, 2008).

Academic integration, measured by participating in study groups and interacting with academic advisor and faculty member, is a positive indicator for first-year student's persistence according to Ishitani's (2016) research findings. Fischer (2007) analyzed the data from the National Longitudinal Survey of Freshmen to examine student success and involvement in college. Her findings indicate academic engagement through tutoring, mentoring, study group, and interaction with professors contributed to adapting to the academic realm of college life (Fischer 2007). Compared to Asian and White students, African American and Hispanic students are more likely to integrate academically through interaction with professors (Baker, 2013; Fischer, 2007). The close working relationship with faculty positively influences a student's academic engagement and enhancement (Kardash, 2000; Kilgo & Pascarella, 2016; Webber et al., 2013). The interaction with faculty outside of the classroom helps students understand the values and attitudes of academia and develops the connection between the student and institution (Pascarella & Terenzini, 2005). Such bond to the institution motivates students to stay and complete college (Tinto, 1993).

A few research studies explored how the undergraduate research experience would promote academic engagement and increase retention rate among the different underrepresented student populations (Lopatto, 2007; Nagda et al., 1998). The research by Lopatto (2007) suggests that students from underrepresented groups are more likely to increase academic engagement by participating in undergraduate research programs. The Undergraduate Research Opportunity Program at the University of Michigan found that

engaging in intellectual relationships with faculty helped the retention of African American students the best (Nagda et al., 1998). African American and Hispanic students who have closer ties to faculty are likely to have higher satisfaction with the university (Fischer, 2007). Unfortunately, there is not enough research focusing on Hispanic students' experience in the undergraduate research programs (Haeger et al., 2014).

The undergraduate research programs examined in this study assign a faculty mentor to each participant. The students who work closely with their faculty mentors acquire research techniques, explore future academic careers, and develop professionalism. The individual attention from a faculty creates self-efficacy and motivation to excel in their academic achievements.

Social Engagement

The participants of the undergraduate research programs also receive an opportunity to engage socially through the program activities. Students accepted into the research programs attends seminars, conferences, and workshops as a cohort. Some programs require the members to participate in team-building activities such as overnight retreats. Developing social interaction through cohort-building activities promotes students' sense of belongings to the institution (Fischer, 2007), which encourages them to stay and complete their college degrees. Socially engaged students with the campus community are more likely to possess stronger commitment to academic success (Tinto, 1975, 1993). Thus, social engagement is another critical component to improve retention rates. Making connections with peers through activities and working toward the same goals with fellow students increase the probability of staying and completing college (Bean & Eaton, 2000).

Hispanic students have more difficulty developing social ties on campus according to some research (Fischer, 2007; Witkow, Gillen-O'Neel, & Fuligni, 2012; Fuligni & Witkow, 2004). Witkow et al. (2012) collected data from 601 students who attended one of three public schools in Los Angeles and enrolled in 2-year or 4-year institutions. According to their results, Hispanic and Asian students were less likely to have college friends from the same high school, more likely to live at home, and less likely to be involved in extracurricular activities on campus compared to White students (Witkow et al., 2012). The less social engagement on campus indicates less sense of belongingness to the institution (Baker, 2013; Witkow et al., 2012), which may lead to a lack of motivation to stay and complete college (Campbell & Mislevy, 2012; Tinto, 2006).

Lopatto (2004) examined the benefits of undergraduate research including educational enhancement and retention by surveying undergraduates from 41 institutions. According to his research, the social relationships among research group members have a strong impact on the student's plan for continuing his/her education in the research field. For some students, interpersonal relationship with peer students in the research setting is the most valuable experience to enhancing their academic success (Lopatto, 2004). Thus, engagement and interaction among peers is an important factor for student's retention (Pascarella & Terenzini, 2005).

Fischer's (2007) research shows that Hispanic and Asian students are more likely to have off-campus connections rather than social ties with campus community. They tend to live off-campus with their families because of financial constraints and closer family ties (Fuligni & Witkow, 2004). The Fischer's study (2007) shows that Hispanic

and African American students who are engaged with campus community are more likely to succeed academically and less likely to leave college. Thus, it is crucial for underrepresented students to be engaged and involved socially with the campus community.

Financing College

One of the benefits of participating in the undergraduate research programs is financial support. All of the programs I included in this study provide the participants with stipends to cover the student's academic and personal expenses. This is particularly helpful for students from low-income families, as college affordability is a primary barrier to college retention (Long & Riley, 2007). The financial support from the undergraduate research programs contributes to higher rate of retention by allowing students to work less and to provide more time to engage academically and socially (Boartman & Long, 2016).

Ishitani's (2016) retention study of first- and second- year students indicates that students are more likely to stay in college when they receive financial aid. Students who have received one source of aid were 18 percent less likely to leave college than those who did not receive any financial aid (Ishitani, 2016). When students receive two sources of financial aid, the likelihood of staying college increases to 23.6 percent (Ishitani, 2016). The type of financial aid has different effect on student retention as well. Robb et al. (2012) analyze student's perceptions of debt and their persistence from online survey completed by 3,008 students in the United States. Their findings confirm that family income is a strong indicator of student retention behavior (Robb et al., 2012). Even though financial aid has a positive impact on student persistence, it may not be always the

case if it is the form of debt that student needs to repay. Robb et al. (2012) found students with more than $10,000 in student loan debt were more likely to leave college. Financial aid is awarded in different forms such as scholarships, grants, loans, work-study, etc. Thus, it is important to note that not all forms of financial necessarily improve student retention rates (Robb et al., 2012; Swail et al., 2003). It is important to note that the financial support from the undergraduate research programs is provided in the form of scholarships, awards, or stipends which students are not required to repay in future.

Undergraduate Research and Retention

As I discussed above, undergraduate research programs include three critical factors of student retention proposed by Demetrious & Schmitz-Sciborski (2011): Academic Engagement, Social Engagement, and Financing College. With opportunities to be integrated into the academic and social domains and to receive financial support, the participants of undergraduate research programs are theoretically less likely to leave college. This research examined the retention rates of participants and non-participants of undergraduate research programs at The University of New Mexico especially focusing on Hispanic students.

The research by Haeger et al. (2014) shows that first-generation Hispanic students who work are less likely to engage in research at both predominantly White institutions and minority serving institutions. The research programs in this study intentionally target students from underserved groups based on parent educational attainment, ethnic/racial background, and family income. Thus, the results of this study will reveal the benefits of undergraduate research participation among student populations who were historically less engaged in research programs.

Chapter 3: Method

Introduction

This study investigates the impact of student participation in holistic undergraduate research programs on retention by comparing the retention rates of the participants and non-participants. This chapter presents the hypothesis, variables, data collection, and statistical tools utilized to answer the research question. The independent variable categories include demographic information, academic attributes and research program participation. The dependent variable is the student's retention status. This study used a secondary dataset which were collected by the UNM Division of Enrollment Management and from the five undergraduate research programs previously described. The Statistical Package for the Social Sciences (SPSS) software was used to analyze the collected data. The analytical tools used for this study include descriptive statistics, multiple imputation, correlations, collinearity statistics, logistic regression, and propensity score matching.

Hypothesis

The purpose of this study is to examine the impact of undergraduate research participation on student retention in the Hispanic-Serving Institution based on the retention factors synthesized by Demetrious & Schmitz-Sciborski (2011). Tinto's (1993) theory of student departure emphasizes academic and social integration as the critical factors for student retention, which added different aspects to understand the retention behavior beyond the academic and demographic factors. Demetrious and Schmitz-Sciborski (2011) stressed the academic and social integration as important retention factors, and they also included finance variables as another significant predictor of the

student retention. The hypothesis in this research project is that Hispanic students who participated in holistic undergraduate research programs have higher retention rate than Hispanic students who have not participated in research programs. The literature indicates that there is not enough empirical research focusing on Hispanic students to investigate the effect of undergraduate research participation on their retention behavior (Haeger et al., 2014). As Hispanic students are more likely to attend public Hispanic-Serving Institutions, The University of New Mexico is an ideal institution to study the association of undergraduate research participation and Hispanic student retention.

Data Collection

The data were collected from two sources: the campus-wide data from the Registrar's Office at the Division of Enrollment Management at The University of New Mexico and participant lists from the selected undergraduate research program offices at The University of New Mexico. The campus-wide data were pulled from the UNM Banner system database managed by the Registrar's Office which contains student's demographic and academic information. The collected data included all undergraduate students who were enrolled during the fall semester of 2015 at the UNM Main Campus.

According to the collected data, 20,378 undergraduate students were enrolled in the fall semester of 2015. The data from the Registrar's Office included these students' demographic information (ethnicity/race, age, gender, parent's educational attainment, and Pell grant eligibility), academic information (ACT/SAT score, year in college, grade point average, and scholarship), and retention status. There are more variables I hoped to include such as student's household income for socioeconomic status, actual scholarship

amount students received, etc. Unfortunately, some data were not available for me to access due to the privacy regulation by the Registrar's Office.

The research programs selected for this study are Initiative for Maximizing Student Development (IMSD), Maximizing Access to Research Careers (MARC), Mellon Mays Undergraduate Fellowship (MMUF), Research Opportunity Program, and Ronald E. McNair Scholars Program. All of these programs provide three components for the participants as I described in the research model in Chapter 2. The components are academic integration, social engagement, and financial support. The research program participants receive opportunities to work on their research projects with faculty mentors, to develop community with peer students, and to earn stipends.

The directors of the five undergraduate research programs provided me with the list of students who had participated in their research programs before or during the fall semester of 2015. The list from the programs contained only student's UNM IDs, which were 9-digit numbers unique to each student. These identification numbers were sent to the data analysists at the Registrar's Office and they identified those students as research participants in their dataset. There were 167 students who participated in the research programs among the enrolled students in the fall semester of 2015. After identifying the research participants in the dataset, the UNM IDs were removed from the database. Thus, the data I received from the Registrar's Office did not include any identifiable data of the UNM students.

In this study, the three components of the research programs including academic integration, social engagement, and financial support are not included as variables. The five programs require the participants the activities to integrate academically and socially,

and provide stipends in return. It was assumed that the students gained the integration and financial support joining in the research programs.

Description of Institution

This study focuses on the undergraduate students enrolled during the fall semester of 2015 at The University of New Mexico (UNM) located in the Albuquerque, New Mexico. The UNM is a public flagship university in the state of New Mexico with R1 Carnegie Classification which indicates the institution possesses at least 20 research doctoral degrees and extensive research activity (The Carnegie Classification of Institutions of Higher Education, n.d.). As a Hispanic-Serving Institution, Hispanics are the largest racial/ethnic group on campus making up 43.1 percent (11,313) of the undergraduate student population out of 26,278 students enrolled in the fall semester of 2017 (Office of Institutional Analytic, n.d.). There are 1,178 full-time faculty and 3,501 staff members who support over 200 degree programs at the UNM main campus. There are four brunch campuses in Gallup, Los Alamos, Taos, and Valencia which enrolled 6,710 students in the fall semester of 2017 (Office of Institutional Analytic, n.d.).

Conducting the research study on Hispanic student retention at The University of New Mexico is important and meaningful due to the characteristics of the institution. As previous research suggests, Hispanic students are more likely to attend public institutions and Hispanic-Serving Institutions, and the enrollment of Hispanic student population is anticipated to rise forty-two percent between 2010 and 2021 (National Center of Education Statistics, 2010; Excelencia in Education, 2014). The University of New Mexico already met such conditions which many higher education institutions will experience in near future. The successful practice at The University of New Mexico

could serve as a model for other institutions with growing population of Hispanic students (Maestas et al., 2007).

Variables

The collected data contained three categories of independent variables: (1) demographic information, (2) academic information, and (3) research program participation. The demographic background variables include ethnicity/race, age, gender, parent's postsecondary degree attainment, and Pell grant eligibility. The variables of academic background consist of ACT/SAT score, year in college, grade average point (GPA), and scholarship. The last independent variable is the participation in the holistic undergraduate research programs, which were identified by the lists collected from the five undergraduate research programs. The dependent variable is student's retention status in the fall of 2016. The data contained students who enrolled in the fall semester of 2015 and whether they returned to the fall semester of 2016, graduated or dropped out prior to the fall semester of 2016. Table 3.1 describes the variable types, descriptions and metrics.

Demographic Information

All demographic variables are usually gathered by the application form, which is filled out by prospective students at the time of application for admission to The University of New Mexico. The ethnicity/race question is broken down into two tiers in which applicants are asked if they consider themselves to be Hispanic/Latino(s) first. Then, they have the options to select their racial categories which are American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Pacific Islander, White, and Non-Residence Alien. The system will categorize "Two or more" if more

than one racial category are selected. “Unknown” is assigned if none of options are selected. If the students claim they are a Hispanic/Latino(a) in the first-tier question, they were coded as Hispanic.

Table 3.1. Variable Descriptions

Variable Type	Variable Description	Variable Metric
Demographic	Ethnicity/Race	Categorical: 1 = Hispanic 2 = American Indian or Alaska Native 3 = Asian 4 = Black or African American 5 = Native Hawaiian or Pacific Islander 6 = White 7 = Two or more 8 = Unknown 9 = Non-Resident Alien
	Age	Continuous: 15 – 81
	Gender	Categorical: 0 = Female, 1 = Male
	Parent’s postsecondary degree attainment	Categorical: 0 = No, 1 = Yes
	Pell grant eligibility	Categorical: 0 = No, 1 = Yes
Academic	ACT	Continuous: 11 – 36
	SAT	Continuous: 560 – 1600
	Upper class	Categorical: 0 = No 1 = Yes
	Year in college	Categorical: 1 = Freshman (0-26 hours) 2 = Sophomore (27-59 hours) 3 = Junior (60-89 hours) 4 = Senior (90 hours and beyond)
	Grade point average	Continuous: 0 – 4.33
	Grade point average	Categorical: 1 = 0 – 1.49 2 = 1.50 – 1.99 3 = 2.00 – 2.49 4 = 2.50 – 2.99

		5 = 3.00 – 3.49 6 = 3.50 – 4.33
	Scholarship received	Categorical: 0 = No, 1 = Yes
Research participation	Participant	Categorical: 0 = No, 1 = Yes
Dependent Variable	Retention Status	Categorical: 0 = Dropped out 1 = Returned or Graduated

Student's age was calculated by the date of birth. The collected data included the undergraduate student's age at the beginning of the fall semester of 2015 at The University of New Mexico, and raged from 15 to 81 years old. Student's gender was also included in the data in which students choose either female or male. I coded female as 0 and male as 1.

The UNM's application form asks the highest level of the applicant's each parent's educational attainment. The multiple choice includes (1) No High School, (2) Some High School, (3) High School Diploma or GED, (4) Some College, (5) Associate's/2-year Degree, (6) Bachelor's/4-year Degree, (7) Graduate/Professional Degree, and (8) Unknown. The U.S. Department of Education defines the first-generation students as those whose both parents' highest degree received is a high school diploma or less (National Center of Education Statistics, 1998). Therefore, the data was recoded into two categories whether at least one parent has postsecondary degree or not. If one of parents had Associate's/2-year Degree, Bachelor's/4-year Degree, or Graduate/Professional Degree, they were coded as "Yes" (1). If the answer for both parents is No High School, Some High School, High School Diploma or GED, or Some College, they were categorized as "No" (0) for the parent's postsecondary degree attainment variable.

The student's socioeconomic status influences their persistence to pursue a college degree (Ishitani, 2016; Tinto 1975, 1993). The previous retention research used parent's income as the indicator of student's socioeconomic status (Ishitani, 2016; Oseguera, et al., 2009; Robb et al., 2012). The students' eligibility for the Pell grant were collected for this study and used as a proxy for socioeconomic status and financial need because the student's household income data in the UNM Banner system was not provided to me. The Federal Pell Grant program is funded by the U.S. Department of Education to provide access to postsecondary education for low-income populations. Once students submit the Free Application for Federal Student Aid (FAFSA), the university financial aid office determines the eligibility for the Pell grant based on their expected family contribution, the cost of attendance, and their enrollment status. I coded students who are eligible for a Pell grant as Yes (1) and the others as No (0). Since the submission of FAFSA is not mandatory, some students may fail to file the form even though FAFSA is required to receive any financial aid through The University of New Mexico. Thus, the data from the Registrar's Office does not capture all Pell grant eligible students at The University of New Mexico.

Academic Information

Data for the academic variables (ACT/SAT score, year in college, grade point average and scholarship) were also collected from the Banner database. The ACT/SAT score is an important variable because the pre-college academic preparation has been identified a critical factor for academic success in college (Fischer, 2007; Tinto, 1993). The University of New Mexico accepts both ACT and SAT scores. Seventy-two percent of students in the dataset submitted their ACT scores, while only 16 percent listed their

SAT scores. Therefore, all SAT scores were converted to ACT scores. The highest score was selected if multiple test scores were listed in the dataset. The conversion table created by the Office of Research and Development of the College Board was used to convert SAT scores into ACT equivalents (College Board, 2009). The ACT score ranges from 11 to 36 and SAT from 560 to 1600 (see Appendix A).

Year in college is determined by the earned credit hours toward their degree completion including credits earned during high school and transferred credits earned at other higher education institutions. Undergraduate students are divided into four different levels: freshman, sophomore, junior and senior. Students with 0-26 earned credit hours are identified as freshman, sophomore with 27-59 credit hours, junior with 60-89 hours and senior with 90 hours and beyond. Thus, this classification does not exactly reflect the number of years students studied in college. Some first year students who entered The University of New Mexico right after graduating from high school can be categorized as sophomore when they have more than 26 approved college credit hours taken during their high school years. Most of the research programs in this study recruit students during their sophomore and/or junior years, and they enroll in the programs during their junior and/or senior years. The year in college variable was recoded into a dichotomy variable, Upper class, to avoid creating four different variables with dummy variable. Freshman and sophomore were coded as No (0) and junior and senior, Yes (1).

College grade point average (GPA) is an important factor for student retention behavior (Ishitani, 2016; Tinto, 1993). The University of New Mexico has a GPA scale of 4.33 rather than 4.00 scale, ranging from A+ (4.33 points) to F (0 point). The cumulative GPA is calculated by dividing quality points by earned credit hours. The

quality points are the sum of the grade points multiplied by the credit hours. The grade points at The University of New Mexico include A+ (4.33), A (4.00), A- (3.67), B+ (3.33), B (3.00), B- (2.67), C+ (2.33), C (2.00), C- (1.67), D+ (1.33), D (1.00), D- (0.67), and F (0). The student's college GPA in the dataset indicates their cumulative grade point average at the end of their 2015 fall semester enrollment. College GPA has been one of the most consistent and highly significant predictors of college completion (Pascarella & Terenzini, 2005). In the frequency table was created by recoding GPA into 6 categories (Table 3.1), so that the influence of GPA on retention can be observed easily.

Research Participation

The variable of undergraduate research participation was determined by the data collected from the five research programs on campus: Initiative for Maximizing Student Development (IMSD), Maximizing Access to Research Careers (MARC), Mellon Mays Undergraduate Fellowship (MMUF), Research Opportunity Program, and Ronald E. McNair Scholars Program. Each program provided a list of student IDs who participated in their research programs prior to the fall semester of 2016. The intent of this study is to find out how research participation influenced their retention status on the fall semester of 2016. Thus, they had to be engaged in the programs prior to the fall semester of 2016. The new cohort in all these programs starts their activities every fall semester. Thus, the research participants in this study started their cohort year in the fall semester of 2015 or before. After the research participation was added to the data, I found a total of 167 students including 104 Hispanic students who participated in these research programs and who were also enrolled in the fall semester of 2015.

As mentioned in the research model, the undergraduate research programs selected for this study provide academic integration, social engagement, and financial support for their scholars. The program's emphasis is on the students engaging in research with faculty members. The participants learn their subject matter through their research projects and the interactions with the faculty mentors. For example, some programs require the participants to submit their articles to a journal prior to completing their fellowship. Other programs require the participants to work as research assistants for their mentors throughout the summer. The research activities also provide the participants with learning skills, synthesis of ideas and critical thinking (Kinzie, 2010). The research program activities are intentionally facilitating the participant's academic integration.

The research programs also provide social interaction among the student participants. They spend a lot of time together through program events and activities. All of these research programs require that the participants attend regular seminars and workshops throughout academic year and/or summer. The participants also travel together to visit graduate schools and/or attend conferences. These occasions provide opportunity to discuss about their research projects, academic goals, personal struggles, and professional careers with each other. Such experiences develop the sense of belongingness and build a community among the program participants.

The five selected programs also provide significant financial support for the participants. The programs promote underrepresented students to pursue graduate studies. The financial support usually includes stipends, varying levels, during academic year and/or summer, travel expenses for conference attendance, and graduate school

preparation. As these programs are targeting underserved students, it is necessary to support the participants financially so that they can focus on research activities rather than working to support themselves and pay their academic expenses.

As you can see in the research model in the previous chapter, the participation of the five research programs comes with academic integration, social engagement and financing college. These elements of programs were all written in their grant contracts and also explained in the participants' application forms, and on their websites.

Dependent Variable

The dependent variable in this research study is the student's retention behavior. The retention variable included three categories; students who returned to the fall semester of 2016, graduated prior to the fall semester of 2016, or did not return to enroll in the fall semester of 2016. The total of 16,802 students returned to the fall semester of 2016 or graduated after the fall semester of 2015. On the other hand 3,479 undergraduate students left and did not return to enroll in the fall semester of 2016. Among Hispanic undergraduate students, 7,792 (82.8 percent) out of 9,415 students were retained or graduated. The students who returned or graduated are coded as "Yes" (1) for the retention, while those who did not return as "No" (0). My hypothesis predicts undergraduate research program participants are more likely to be successfully retained as compared to the non-participant group.

Statistical Methods

All data analysis were conducted with the IBM Statistical Package for the Social Sciences (SPSS) version 25. To solve the issue of missing cases, multiple imputation was conducted through SPSS. Descriptive statistics were run to determine trends in the

dataset. Correlation and multicollinearity were analyzed from multiple tests to investigate the interdependency of the predictor variables. For the regression analysis, logistic regression was chosen due to the binary nature of the dependent variable. Finally, propensity score matching function was conducted to remove the multicollinearity concern among independent variables.

Missing Data

The number of undergraduate students who were enrolled in the fall semester of 2015 at the main campus of The University of New Mexico was 20,378. First, the missing data were examined. There were three variables with some missing cases – GPA, parent's postsecondary degree attainment, and ACT score. The GPA variable had 97 cases of missing data. The potion of missing cases was only 0.48 percent of the entire data and none of them were Hispanic research participants. Therefore, those cases were removed from the data. The sample size is now 20,281 after removing the 97 missing cases.

There were two more variables with missing data, parent's postsecondary degree attainment and ACT score. The question on parent's education level is optional on the UNM application form. Thus, it is not surprising some people did not fill out the question. The missing cases of ACT scores may be caused by transfer students or international students who are not required to submit the scores of the college entrance exams. There were 3,288 students, 16.7 percent, out of 20,281 cases who did not fill out the parent's education level on their UNM application forms. Twenty-two percent, 4,099 cases, of the sample did not submit the ACT or SAT test scores.

The missing data in parent's postsecondary degree attainment and ACT/SAT score were dealt with through multiple imputation. The multiple imputation theory was developed by Rubin (1987, 1996) in which imputation is repeated multiple times to calculate the average value for each missing cases. The multiple imputation function works by specifying a parametric model for the complete data, applying the existing distribution to the unknown model parameters, and assigning the observed value from the conditional distribution of the missing data (Laaksonen, 2016). To provide the observed data in the missing cases, the multiple imputation examines the existing data distribution of parent's postsecondary degree attainment and ACT/SAT score by the relation with other variables. The existing data used to impute were ethnicity/race, age, gender, parent's postsecondary degree attainment, Pell grant eligibility, ACT, GPA, scholarship, and year in college.

By using the independent variables, the multiple imputation finds the best-matched value for missing data estimated by repeated imputations (Loong & Rubin, 2017). The single imputation is acceptable when the missing data is small such as less than five percent (Schafer, 1999). Multiple imputation fill in more accurate data due to its persistency to seek more accurate value by repeating imputation pulled from predictive distribution of the missing values (Rubin, 1987). The SPSS multiple imputation tool repeats the imputation five times and assign the average values to the missing cases which are estimated from the analysis of other independent variables.

Descriptive Statistics

The descriptive statistics show summaries of the sample by investigating the central tendency and features of the collected data. The frequency table provides

demographic and academic background of the entire UNM undergraduate students, Hispanic students, and Hispanic research participants who were enrolled in the fall semester of 2015 (See Tables 2, 3, & 4 in Chapter 4). The descriptive statistics help identify the unique characteristics of each group compared to the other groups. The data analysis included frequencies, percentage, mean, and standard deviation.

Correlation and Collinearity Statistics

The correlation were run for all of independent variables and collinearity statistics were conducted. It is important to examine the correlation and collinearity among predictor variables because the high correlations and interdependency among variables can cause difficulty to get good estimates of its distinct effects on the dependent variable (Midi, Sarkar, & Rana, 2010). The strength and significance of the correlations were examined to see the level of correlation between two variables. The collinearity statistics investigate the interdependency among multiple variables.

The correlation was tested by using SPSS bivariate correlation tool which examines the direction and strength of linear relationships between two variables (Sirkin, 2006). The strength ranges from 0 to $\pm$1, in which 0 indicated no relationship between the two variables while 1 or -1 means the variables have perfect positive or negative linear relationship (Sirkin, 2006). The significance test was also included in the result to find out the correlation is statistically significant or not.

To further explore the multicollinearity in the research model, collinearity statistics were calculated using the SPSS Linear Regression tool. Collinearity diagnostics function under statistics tab calculates the tolerance, variance inflation factor (VIF),

eigenvalue, and variance proportion to determine if multicollinearity exists among any of the variables used in this study.

Each variable's tolerance is calculated by $1 - R^2$. The small value in tolerance indicates the variable has multicollinearity issue with other independent variables in the equation (Midi et al., 2010). The variance inflation factor (VIF), on the other hand, measures the impact of multicollinearity by calculating $1/\text{Tolerance} = 1/(1- R^2)$ (Midi et al., 2010). The higher number of VIF is interpreted as the existence of multicollinearity and therefore considered a threat in the model. If the value of VIF exceeds 10, there is a serious threat of multicollinearity (Allison, 2001).

Eigenvalue and variance proportion are also appear in the collinearity statistics output. The eigenvalue, condition index and each variable's variance proportion are calculated in multiple times (ten dimensions in SPSS). If there is no collinearity, eigenvalues should have similar values throughout the dimensions (Midi et al., 2010). Small number of eigenvalues and larger value of condition index values indicate multicollinearity problem (Midi et al., 2010). There is no official rule, but "if the condition index is 15, multicollinearity is a concern; if it is greater than 30, multicollinearity is a very serious concern" (Midi et al., 2010, p. 261).

Logistic Regression

After correlation and collinearity statistics were analyzed, the effect of independent variables on retention was investigated by using binary logistic regression tool in SPSS. Logistic regression was introduced in 1970s as an extension of ordinary least squares regression for dichotomous outcomes (George & Mallery, 2003, Peng & So, 2002). This study has a dichotomous dependent variable, Yes (retained) or No (not

retained). The fundamental concept of logistic regression is the logit, "the natural logarithm of an odds ratio" (Peng, Lee & Ingersoll, 2002, p. 3). The logit, odds ratio, is calculated from dividing the probability of Yes by the probability of No. For example, let's assume that the odds ratio of retention (No = 0; Yes = 1) between research participants and non-participants is 4.00. That suggests that participating in research programs has 4 times more likelihood to retain the students.

The regression was run by entering the predictor variables in a set of blocks. The first block included the demographic variables (age, gender, parent's postsecondary degree attainment, and Pell grant eligibility). The second block consisted of the academic variables (ACT, GPA, year in college, and scholarship). These two groups of variables have been supported by multiple empirical research outcomes as important predictors of retention. Then, the predictor variable, research participation, was added to the third block as the primary testing variable in this research. By entering the three groups of variables in blocks, SPSS allows me to control for the effect of the demographic and academic variables so that I can measure the effect of research participation on retention. The regression coefficients (β), wald values, significance of wald, odds ratio, Nagelkerke R^2 and goodness-of-fit Hosmer & Lemeshow test were examined to analyze the effect of independent variables to retention and to test the research model of this study.

Propensity Score Matching

With the concerns of multicollinearity among certain independent variables, the propensity score matching was applied to further test the effect of research participation on retention behavior. The propensity score matching tool helps select a matching control group which has the similar observed values with treatment group, so that the certain

variable's distinct effect on the dependent variable can be observed (Rosenbaum & Rubin, 1983). The matching method is utilized to eliminate pre-existing differences in two groups other than the testing variable, so that the outcome is solely focused on the effect of one independent variable (Melguizo, Kienzl, & Alfonso, 2011). In the case of this study, the propensity score matching was used to create a subgroup of Hispanic students who did not participate in research programs by matching the demographic and academic attributes with the Hispanic research participants.

For example, the propensity score matching was used to examine the effect of participating in honors program on student's ability, motivation, and intellectual curiosity (Kool, Mainhard, Jaarsma, van Beukelen, & Brekelmans, 2017). The scores of ability, motivation and intellectual curiosity was measured among most of incoming freshmen and before students entered in Honors program (pre-test). The same test (post-test) was conducted during the third semester for the honors students and non-honors students. Using the SPSS propensity score matching, the non-honors students were selected by matching the pre-test scores of the honors students. Therefore, the analysis is primarily focused on the effect of the treatment, participating in the honors program, on the dependent variable.

The research programs have selection criteria to accept their participants in the research programs. As I mentioned before, these programs require the certain GPA, the certain year in college, and some other criteria for the program admissions. Thus, people may conclude the high retention rate is due to the pre-selection criteria rather than the effect of research participation. Propensity score matching helps remove the observed pre-selection influence on the retention by creating a non-participant group by matching

the pre-existing condition. The matched groups, research participants and non-participants, make it possible to emphasize the effect of the research participation on the retention behavior.

After matching their existing characteristics such as age, gender, parent's education, Pell grant edibility, ACT, GPA, year in college, and scholarship, the test result became mainly focused on the variable of research participation and its effect on the retention behavior. The chi-square test was utilized to examine the association of two variables, research participation and retention. Then, logistic regression was used to see the effect of predictor variables on retention among 104 research participants and 104 matched non-participants identified through the propensity score matching process.

In the next chapter, I will present the results of the statistical methods I discussed in this chapter.

Chapter 4: Results

Introduction

This chapter reports the findings of the study. First, the descriptive statistics are presented by three different student's groups to understand the unique characteristics of Hispanic research participants by comparing with the entire undergraduate students and Hispanic undergraduate students general. Second, the effects of independent variables on retention are presented by three categories including demographic characteristics, academic attributes, and research participation according to the research model shown in Chapter 2. The outcomes of correlation and collinearity statistics, logistic regression, and propensity score matching are included in this chapter.

The research results and the implications are discussed in the next chapter along with the limitations and future studies. One thing to remind while reading this chapter is the limitation of generalization. The findings of this study are drawn from the data of one institution which also included a small size of treatment group (104 Hispanic research participants). Thus, the results presented here are only applied to the sample students at The University of New Mexico.

Demographic Characteristics

The demographic characteristics of three student groups at The University of New Mexico are presented in this section: the entire undergraduate student population, the Hispanic student population, which is the largest ethnic/racial group at UNM, and the Hispanic students who participated in the research programs. Understanding the unique demographic characteristics of each student group helps understand the results of this study better.

Undergraduate Students

There were 20,281 undergraduate students enrolled in the UNM main campus in the fall semester of 2015. Table 4.1 presents the descriptive statistics of the entire undergraduate student population. Over 46 percent of the undergraduate students are Hispanic and the second largest ethnic/racial group is White (35.1 percent). All other racial groups are significantly smaller than Hispanic and White student populations. The mean age is 23 years old, in which 77.7% are at the traditional college age (under 25 years old). More than half of undergraduate students are female (55.7 percent). About 46 percent of student population are first-generation college students, and 56.6 percent are eligible to receive the Pell grant.

The mean ACT score is 22.14. The mean score is higher than the ACT national average scores which ranged from 20.8 to 21.1 between 2012 and 2016 (Jaschik, 2016). Students in junior and senior years are 61.6 percent of the entire student population. The number of students increases when the year in college increases: freshman (17.5 percent), sophomore (20.8 percent), junior (24.9 percent), and senior (36.7 percent). The GPA mean is 3.17 which is higher than I expected, and 70 percent of students received scholarships. The participants in the five research programs are only 0.8 percent of the undergraduate population; 167 students out of 20,281 participated in the research programs selected for this study. The overall undergraduate retention rate is 82.8 percent.

Table 4.1. Descriptive Statistics of Undergraduate Students (N = 20,281)

Variable Description	N	Percent	Mean	S.D.
Ethnicity/Race				
1 = Hispanic	9,415	46.4		
2 = American Indian or Alaska Native	1245	6.1		
3 = Asian	681	3.4		
4 = Black or African American	496	2.4		
5 = Native Hawaiian or Pacific Islander	36	.2		
6 = White	7,124	35.1		
7 = Two or more	699	3.4		
8 = Unknown	293	1.4		
9 = Non-Resident Alien	292	1.4		
Age (15-81)			23.03	7.473
Gender			.44	.497
0 = Female	11,287	55.7		
1 = Male	8,994	44.3		
Parent's postsecondary degree attainment			.54	.498
0 = No	9,312	45.9		
1 = Yes	10,969	54.1		
Pell grant eligibility			.57	.496
0 = No	8,792	43.4		
1 = Yes	11,489	56.6		
ACT (11-36)			22.14	4.743
Year in college				
1 = Freshman (0-26 hours)	3,550	17.5		
2 = Sophomore (27-59 hours)	4,224	20.8		
3 = Junior (60-89 hours)	5,058	24.9		
4 = Senior (90 hours and beyond)	7,449	36.7		
Grade point average (0-4.33)			3.17	.665
Scholarship received			.70	.457
0 = No	6,031	29.7		
1 = Yes	14,250	70.3		
Research Participant			.01	.090
0 = No	20,114	99.2		
1 = Yes	167	.8		
Retention Status			.83	.377
0 = Dropped out	3,479	17.2		
1 = Returned or Graduated	16,802	82.8		

Hispanic Students

This research is focused on the retention behavior of the Hispanic students. Table 4.2 shows the characteristics of Hispanic undergraduate students at The University of New Mexico. There are 9,415 Hispanic students enrolled in the fall semester of 2015. The mean age is 22.13, and 82.3 percent of the undergraduate Hispanic students are at the traditional college age which is higher ratio than the overall undergraduate students. The gender ratio (58 percent female) are similar with the undergraduate population. More than half are first-generation college students (55.9 percent) and 61.5 percent are eligible to receive Pell grant. The ratios of first-generation and Pell grant eligibility among Hispanic students are higher than the entire population (45.9 first-generation, 56.6 Pell grant).

The mean ACT score (21.37) is lower than the entire student group (22.14) and the mean difference is statistically significant. However, it is still higher than the national average (Jaschik, 2016). Students in junior and senior years are 58.4 percent that is smaller number than the entire undergraduate students. However, similarly, the number of students increases when the year in college increases: freshman (19.4 percent), sophomore (22.1 percent), junior (24.9 percent), and senior (33.5 percent). The GPA mean is 3.12 which is slightly lower than the entire undergraduate population (3.17), while the ratio of scholarship recipients (72.8 percent) among the Hispanic students is slightly higher than the overall population (70.9 percent). There are 104 Hispanic students who participated in the research programs, only 1.1 percent of the Hispanic population. The small sample size is one of the limitations of this study as it makes it difficult to generalize the results of this study. The retention rate of Hispanic

undergraduate students is 82.2 percent, the exactly same ratio as the entire undergraduate population.

Table 4.2. Descriptive Statistics of Hispanic Undergraduate Students (N = 9,415)

Variable Description	N	Percent	Mean	S.D.
Age (15-81)			22.13	6.260
Gender			.42	.494
0 = Female	5,459	58		
1 = Male	3,956	42		
Parent's postsecondary degree attainment			.44	.497
0 = No	5,261	55.9		
1 = Yes	4,154	44.1		
Pell grant eligibility			.62	.487
0 = No	3,621	38.5		
1 = Yes	5,794	61.5		
ACT (11-36)			21.37	4.392
Year in college				
1 = Freshman (0-26 hours)	1,826	19.4		
2 = Sophomore (27-59 hours)	2,085	22.1		
3 = Junior (60-89 hours)	2,349	24.9		
4 = Senior (90 hours and beyond)	3,155	33.5		
Grade point average (0-4.33)			3.12	.657
Scholarship received			.73	.445
0 = No	2,563	27.2		
1 = Yes	6,852	72.8		
Research Participant			.01	.105
0 = No	9,311	98.9		
1 = Yes	104	1.1		
Retention Status			.83	.378
0 = Dropped out	1,623	17.2		
1 = Returned or Graduated	7,792	82.8		

Hispanic Research Participants

The number of Hispanic students who participated in the research programs are 104 which is 62 percent of the overall undergraduate research participants. Table 4.3 presents the descriptive statistics of this student group, however, it is easier to identify the

unique characteristics of the Hispanic research participants in the comparison table (Table 4.4) which allows us to compare five different groups of students. The five student groups in the comparison table are (1) all undergraduate students, (2) Hispanic undergraduate students, (3) Hispanic students who did not participate in the research programs, (4) all participants of the five research programs, and (5) Hispanic research participants.

Table 4.3. Descriptive Statistics of Hispanic Research Participants (N = 104)

Variable Description	N	Percent	Mean	S.D.
Age (18-48)	104		22.53	5.761
Gender			.30	.460
0 = Female	73	70.2%		
1 = Male	31	29.8%		
Parent's postsecondary degree attainment			.42	.496
0 = No	60	57.7%		
1 = Yes	44	42.3%		
Pell grant eligibility			.69	.464
0 = No	32	30.8%		
1 = Yes	72	69.2%		
ACT (11-36)			24.12	4.571
Year in college				
1 = Freshman (0-26 hours)	4	3.8%		
2 = Sophomore (27-59 hours)	13	12.5%		
3 = Junior (60-89 hours)	27	26.0%		
4 = Senior (90 hours and beyond)	60	57.7%		
Grade point average (0-4.33)			3.65	.333
Scholarship received			.90	.296
0 = No	10	9.6%		
1 = Yes	94	90.4%		
Retention Status			.97	.168
0 = Dropped out	3	2.9%		
1 = Returned or Graduated	101	97.1%		

Table 4.4. Undergraduate Students Characteristics by Different Groups

	UG Students	Hispanic Students	Hispanic Non-Participants	Research Participants	**Hispanic Participants**
N	20,281	9,415	9,311	167	**104**
Retention rate	82.8%	82.8%	82.6%	96.4%	**97.1%**
Traditional age (<25)	77.7%	82.3%	82.3%	78.4%	**84.6%**
Female	55.7%	58.0%	57.8%	65.3%	**70.2%**
First-generation	45.9%	55.9%	55.9%	53.3%	**57.7%**
Pell grant eligible	56.6%	61.5%	61.5%	73.7%	**69.2%**
Upper class	61.6%	58.4%	58.2%	82.6%	**83.7%**
ACT Mean	22.14	21.37	21.33	24.42	**24.12**
GPA (>3.0)	65.9%	63.2%	62.9%	94.1%	**96.2%**
Scholarship Recipient	70.3%	72.8%	72.6%	89.2%	**90.4%**

The Hispanic research participants, the treatment group of this study, has the highest retention rate among all groups. The retention rates of the entire undergraduate students and the overall Hispanic students are both 82.8 percent, while the Hispanic student research participants have 97.1 percent retention rate. The Hispanic research participant group has the highest ratio of traditional age students (84.6 percent) of all. The proportion of female in the research participants is much higher (70.2 percent) than the general population (55.7 percent) and the other groups. The Hispanic research participant group has the highest ratio of first-generation college students (57.7 percent). The research participants general have the largest proportion of the Pell grant eligible students (73.7 percent). The Hispanic research participants are the second highest (69.2 percent) in the Pell grant eligibility.

The Hispanic research participant group had distinctive academic attributes. Almost 84 percent of Hispanic research participants are either junior or senior. Their ACT mean (24.12) is higher than the entire undergraduate students (22.14) and the

Hispanic students in general (21.33). The differences between the means of these three groups are statistically significant at the .001 level. About 96 percent of them have GPA 3.0 or above. As 63.2 percent of the entire Hispanic undergraduate students received GPA 3.0 or above, the Hispanic research participants have much better academic record than those who are not in the research programs. The majority of the Hispanic research participants (90.4 percent) receives scholarships, which is the largest proportion of scholarship recipients of all groups. Since the research programs require the participants to be in upper class and have the certain GPA, these results reflect the pre-selected characteristics of the research participants. Thus, the Hispanic research participants are more likely to be female, scholarship recipients, under 25 years old in junior or senior year, and have higher scores on ACT and GPA.

Correlation and Collinearity of the Variables

The data of the research sample, 9,415 Hispanic undergraduate students, are examined for their correlations and multicollinearity. It is important to present the results of correlations and collinearity test before examining the regression outcomes. Table 4.5 shows many of the independent variables in this study are correlated and the correlations are statistically significant. The strong relationships among independent variables can make it hard to determine their distinct effect on the dependent variable (Midi et al., 2010).

Correlations

The correlation table indicates that 29 pairs of variables out of 36 have significant correlation coefficients, and the correlations of 27 pairs are significant at the 0.001 level.

Although the degrees of correlation coefficient vary from .026 to .414, which are not extremely strong, the level of significance is high.

The correlations between research participation and the academic variables (ACT, GPA, and scholarship) are statistically significant at the 0.001 level. They are all positive correlations, which means students in upper class with scholarships and higher ACT's and GPA's are more likely to participate in the research programs. Thus, research participation is associated with the student's academic achievement. On the other hand, the age has negative correlations with those three variables. Being older is associated with lower ACT and GPA, and less scholarship opportunity. Being female and in upper class also has significant correlation with research participation, which is understandable as more than 70 percent of Hispanic research participants are female and 83.7 percent are junior or senior students.

ACT and GPA are considered critical factors of student college success (Fischer, 2007; Tinto, 1993; Pascarella & Terenzini, 2005). The correlation result shows that ACT and GPA have relatively strong correlation (.294), and they are positively related with receiving scholarship and participating in the research programs. On the other hand, being first-generation college students and Pell grant eligible is negatively correlated with ACT and GPA. Interestingly, being a male is positively correlated to ACT, while being a female has positive correlation with GPA.

Table 4.5. Correlation Table for Hispanic Population (N=9,415)

		Age	Gender	ACT	GPA	Parent's degree	Scholarship	Pell grant	Research	Upper Class
Age	Pearson Correlation Sig. (2-tailed)	1	.002 .845	-.252** .000	-.012 .261	-.121** .000	-.299** .000	.066** .000	.007 .510	.414** .000
Gender	Pearson Correlation Sig. (2-tailed)		1	.110** .000	-.110** .000	.041** .000	-.078** .000	-.027** .008	-.026* .011	-.015 .154
ACT	Pearson Correlation Sig. (2-tailed)			1	.194** .000	.241** .000	.105** .000	-.162** .000	.066** .000	-.041** .000
GPA	Pearson Correlation Sig. (2-tailed)				1	.077** .000	.294** .000	-.038** .000	.087** .000	.076** .000
Parent's postsecondary degree	Pearson Correlation Sig. (2-tailed)					1	-.001 .919	-.232** .000	-.004 .708	-.24* .017
Scholarship	Pearson Correlation Sig. (2-tailed)						1	.178** .000	.042** .000	-.143** .000
Pell grant eligibility	Pearson Correlation Sig. (2-tailed)							1	.017 .105	.026** .000
Research	Pearson Correlation Sig. (2-tailed)								1	.054** .000
Upper Class	Pearson Correlation Sig. (2-tailed)									1

** Correlation is significant at the 0.001 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Multicollinearity

The results of collinearity test indicate some concerns of multicollinearity. Linear regression offers the diagnostics of multicollinearity with the option tolerance, variance inflation factor (VIF), eigenvalues, condition indices and variance proportions (Midi et al., 2010). The tolerance and VIF were examined among nine predictor variables (Table 4.6). The value of tolerance being close to zero or smaller than 0.2 indicates the threat of multicollinearity. The lowest number of the tolerance in Table 4.6 is 0.712 which is not small enough to be concerned. The VIF shows how much the variance of the coefficient estimate is being inflated by multicollinearity (Midi et al., 2010). If the value of VIF exceeds 10, there is a strong thread of multicollinearity (Allison, 2001). In the case of logistic regression, values above 2.5 cause some concerns as a weak research model (Allison, 2001). According to my results (Table 4.6), the highest value is 1.405 which is not considered as threat of multicollinearity.

Table 4.6. Collinearity Statistics: Tolerance and VIF

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
	B	Std. Error	Beta	t	Sig.	**Tolerance**	**VIF**
Age	-.006	.001	-.095	-8.556	.000	**.712**	**1.405**
Gender	016	.007	.021	2.170	.030	**.965**	**1.036**
ACT	-.001	.001	-.001	-1.117	.264	**.831**	**1.203**
GPA	.206	.006	.359	35.332	.000	**.844**	**1.185**
Parent's degree	.011	.007	.015	1.480	.139	**.898**	**1.113**
Scholarship	.084	.009	.099	9.331	.000	**.778**	**1.285**
Pell grant	.029	.008	.037	3.754	.000	**.888**	**1.127**
Research	.000	.034	.000	.010	.992	**.986**	**1.015**
Upper class	.088	.008	.115	11.089	.000	**.815**	**1.227**

Other tests for multicollinearity were also performed to measure the interdependency of multiple predictor variables including eigenvalues, condition indices and variance proportions of each variable. Table 4.7 reports the results. The small eigenvalue means that the variances of the regression coefficients are dependent (Midi et al., 2010). When eigenvalues decrease, the condition indices increase. There is multicollinearity problem if eigenvalues are close to zero and the condition index is 15 or higher by an informal rule of thumb (Midi et al., 2010). The bottom two rows, dimensions 9 and 10, have low eigenvalues of .029 and .011. The numbers of the variance proportion of both ACT (.30, .47) and GPA (.84, .12) are higher in those rows, and age (.35) has higher value in the dimension 10 as well. That indicates that there is a problem of multicollinearity with some of the variables in this research model.

The interdependency between ACT, college GPA is reasonable as pre-college test score is often identified as a predictor of college academic success (Fischer, 2007; Tinto, 1993). This does not prove that a higher ACT score is a cause of higher GPA, but these two predictors have a significantly high degree of association with each other. The multicollinearity causes difficulty in getting good estimates of each variable's distinct effects on dependent variable (Midi et al., 2010). Thus, the results of multicollinearity tests provide evidence to consider removing these variables from the logistic regression.

Table 4.7. Multicollinearity Test: Eigen Value, Condition Index, and Variance Proportion

Dimension	Eigen Value	Condition Index	Variance Proportion									
			Constant	Age	Gender	ACT	GPA	Parent's degree	Scholarship	Pell grant	Research	Year
1	6.848	1.000	.00	.00	.01	.00	.00	.01	.00	.00	.00	.00
2	.989	2.631	.00	.00	.00	.00	.00	.00	.00	.00	.97	.00
3	.623	3.316	.00	.00	.09	.00	.00	.48	.13	.13	.01	.01
4	.558	3.503	.00	.00	.80	.00	.00	.15	.00	.00	.01	.00
5	.442	3.936	.00	.00	.00	.00	.00	.00	.07	.07	.00	.51
6	.266	5.076	.00	.00	.00	.00	.01	.28	.72	.72	.00	.00
7	.180	6.161	.01	.05	.06	.01	.01	.04	.01	.01	.00	.36
8	.054	11.243	.00	.54	.01	.21	.02	.05	.03	.03	.00	.08
9	.029	15.283	.01	.05	.03	**.30**	**.84**	.00	.00	.00	.00	.00
10	.011	25.222	.99	**.35**	.00	**.47**	**.12**	.00	.03	.03	.01	.02

Logistic Regression

Binary logistic regression was run with the Hispanic student population (N=9,415) to predict the relationship between independent variables and dependent variable. Logistic regression is the preferred statistical technique to use for dichotomous criterion variables (Hosmer and Lemeshow, 1989). As prescribed in the research model, the demographic variables (age, gender, parent's postsecondary degree, and Pell grant eligibility) are entered in block 1, the academic variables (year in college, scholarship, GPA, and ACT) in block 2 and the testing variable (research participation) in block 3. I chose to enter the independent and dependent variables in blocks to control for the impact of the demographic and academic variables so that I can measure the true effect of participating in research on retention.

The results of logistic regression are summarized in Table 4.8. The beta symbol, β, represents the effect of each independent variable on the dependent variable, and the standard error (S.E.) shows a measure of the dispersion of β (George & Mallery, 2003). Wald presents the significance of β in which the higher values indicate the significance (George & Mallery, 2003). Exp(β), odds ratio, shows the odds that the effect of each predictor variable has on the dependent variable (George & Mallery, 2003). When the odds ratio is greater than 1, the variable has a positive relationship with retention. On the other hand, the variable has a negative relationship with retention when the odds ratio is lower than 1. For example, age's odds ratio is under 1 (Exp(β) = .960), which means the age has a negative relationship with retention and that is also confirmed with β being negative (-.041). Gastwirth (1988) suggested odds ratio would be meaningful to discuss when the number was 1.4 or higher, or .71 or lower.

Table 4.8. Logistic Regression Results for Hispanic Students (N=9415)

Dependent Variable = Retention					
Block 1 Predictor	**β**	**S.E.**	**Wald**	**Sig**	**Exp(β)**
Age	-.027	.004	50.089	.000	.973
Gender	-.167	.055	9.087	.003	.847
Parent's postsecondary degree	.239	.058	17.122	.000	1.270
Pell grant	.268	.057	21.892	.000	1.308
-2 Log likelihood = 8563.702, Nagelkerke R Square = .016 Goodness-of-fit Hosmer & Lemeshow test: Chi square=42.485, df=8, Sig=.000					
Block 1 & 2 Predictor	**β**	**S.E.**	**Wald**	**Sig**	**Exp(β)**
Age	-.041	.005	66.592	.000	.960
Gender	.074	.062	1.389	.239	1.076
Parent's postsecondary degree	.096	.065	2.212	.137	1.101
Pell grant	.171	.066	6.702	.010	1.186
Upper class	.649	.069	88.900	.000	1.914
Scholarship	.614	.069	78.192	.000	1.848
GPA	1.390	.051	744.516	.000	4.016
ACT	.005	.008	.453	.501	1.005
-2 Log likelihood = 7073.240, Nagelkerke R Square = .257 Goodness-of-fit Hosmer & Lemeshow test: Chi square=8.503, df=8, Sig=.386					
Block 1, 2, & 3 Predictor	**β**	**S.E.**	**Wald**	**Sig**	**Exp(β)**
Age	-.041	.005	66.822	.000	.960
Gender	.075	.062	1.460	.277	1.078
Parent's postsecondary degree	.097	.065	2.259	.133	1.102
Pell grant	.170	.066	6.601	.010	1.185
Upper class	.646	.069	88.041	.000	1.908
Scholarship	.612	.069	77.645	.000	1.844
GPA	1.386	.051	739.345	.000	3.999
ACT	.005	.008	.370	.543	1.005
Research	.811	.593	1.869	.172	2.250
-2 Log likelihood = 7070.838, Nagelkerke R Square = .258 Goodness-of-fit Hosmer & Lemeshow test: Chi square=9.120, df=8, Sig=.332					

Research participation, the variable tested in this model, was not a statistically significant factor of the retention behavior (Sig = .172). The statistically significant predictors for Hispanic student retention in this model include age (Sig = .000), Pell grant eligibility (Sig=.010), year in college (Sig = .000), scholarship (Sig = .000), and GPA (Sig = .000). When student's age increase one year, the likelihood of retention decrease slightly (β = -.041). It is interesting to note that Pell grant eligibility has positive effect on the retention. Five thousand seven hundred ninety-four Hispanic students are eligible for Pell grant, which is 61.5 percent of Hispanic student population. Surprisingly, Pell grant eligible Hispanic students (83.3 percent) have better retention rate than those who are not eligible for Pell grant (81.1 percent). In the case of Hispanic students at The University of New Mexico, we are successfully retaining Pell grant eligible students even though the past research results indicate that students from lower socioeconomic families are more likely to drop out.

Three academic variables – year in college, scholarship and GPA – were statistically significant. The frequency table (Appendix C) presents the upper class (junior and senior) students have higher retention rate. The retention rate goes up as the year in college increases (freshman 76.6 percent, sophomore 80.6 percent, junior 83.4 percent, and senior 87.2 percent). Scholarship also affects retention positively (β = .612). Receiving scholarship is associated with 1.8 times more likelihood for Hispanic students to be retained in school. College GPA has a positive effect on retention (β = 1.386) and the highest odds ratio of 3.999, which means as one unit increase in GPA, Hispanic students are approximately four times more likely to be retained.

The results of logistic regression also provide the assessment of the research model with Nagelkerke R^2 and goodness-of-fit Hosmer & Lemeshow test. R^2 explains the proportion in the dependent variable that can be explained by the independent variables in the model (Peng & So, 2002). SPSS provides two results of R^2 in the logistic regression analysis; one suggested by Cox and Snell (1989), and the other by Nagelkerke (1991). The issue of Cox and Snell's R^2 was that their R^2 does not attain 1.0 mathematically (Thompson, 2006). Nagelkerke's R^2 is a modified version of Cox and Snell's R^2 to solve the issue. Therefore, Nagelkerke's R^2 indicates what percentage of the dependent variable may be accounted for by the independent variables (Thompson, 2006). In the analysis of this study, Nagelkerke's R^2 was used to easily understand the effect of the predictor variables on the retention behavior. The Nagelkerke's R^2 increased when more predictor variables were added (Table 4.8). After adding all predictors, 25.8 percent of the retention behavior were explained by the nine variables (Nagelkerke R^2 = .258).

The goodness-of-fit statistics were calculated by using the Hosmer-Lemeshow test, which "assess the fit of a logistic model against actual outcomes" (Peng et al., 2002, p.6). The test shows how well the data fit the model by calculating if the observed outcome matches the estimated expected frequencies (Hosmer & Lemeshow, 2007). The non-significant test proves that the model is a good fit while the significance in the test indicates that it is not a good fit. The block 1 with the demographic variables was not a good fit (Sig = .000), but the goodness-of-fit improved once the academic variables were added to the model (Sig = .386 & Sig = .332) in the blocks 2 and 3.

The results of collinearity tests concluded that there were some concerns of multicollinearity of the two variables, GPA and ACT. There is no rule of which variables should be removed from the model to solve the multicollinearity issue. Thus, logistic regression was run twice; one without ACT (Table 4.9) and the other one without GPA (Table 4.10) in the model. When the ACT variable is removed from the model, the logistic regression model is a good fit (Sig = .259) to the data, but the testing variable, research participation, was not significant (Sig = .165). The results were pretty similar with the one in Table 4.8 as the same predictor variables (age, Pell grant eligibility, year in college, scholarship, and GPA) were significant factors for the retention.

Table 4.9. Logistic Regression with ACT Removed

Dependent Variable = Retention					
Block 1, 2, & 3	**β**	**S.E.**	**Wald**	**Sig**	**Exp(β)**
Age	-.041	.005	73.587	.000	.959
Gender	.081	.062	1.706	.191	1.084
Parent's postsecondary degree	.104	.064	2.654	.103	1.109
Pell grant	.166	.066	6.384	.012	1.181
Upper class	.648	.069	88.808	.000	1.912
Scholarship	.612	.069	77.785	.000	1.845
GPA	1.390	.051	753.607	.000	4.014
Research	.822	.593	1.925	.165	2.276
-2 Log likelihood = 7071.208, Nagelkerke R Square = .258 Goodness-of-fit Hosmer & Lemeshow test: Chi square=10.092, df=8, Sig=.259					

Next, the ACT was added back to the logistic regression and GPA was removed from the model (Table 4.10). Finally, the research participation variable was statistically significant (Sig = .016) and participating in the research programs was estimated to increase the likelihood of retaining students by four times (Exp(β) = 4.157). However, Nagelkerke R^2 decreased to .112 from .258, which means the set of variables only explain 11.2% of the retention behavior by omitting GPA variable, instead of 25.8% with

GPA in the model. The Hosmer & Lemeshow test also shows the data do not fit the model (Sig = .006). Omitting the variables with multicollinearity issue did not solve the problem to support my hypothesis that participation of the research programs increases the likelihood of retaining Hispanic undergraduate students. As a next step, the propensity score matching tool was utilized to examine the distinct effect of research participation on retention.

Table 4.10. Logistic Regression with GPA Removed

Dependent Variable = Retention					
Block 1, 2, & 3	**β**	**S.E.**	**Wald**	**Sig**	**Exp(β)**
Age	-.022	.005	21.801	.000	.978
Gender	-.106	.058	3.369	.066	.899
Parent's postsecondary degree	.167	.060	7.588	.006	1.181
Pell grant	.046	.061	.571	.450	1.047
Upper class	.831	.064	166.484	.000	2.295
Scholarship	1.186	.063	356.857	.000	3.274
ACT	.034	.007	23.223	.000	1.035
Research	.058	.591	5.812	.016	4.157
-2 Log likelihood = 7997.807, Nagelkerke R Square = .112 Goodness-of-fit Hosmer & Lemeshow test: Chi square=21.552, df=8, Sig=.006					

Propensity Score Matching

I analyzed 104 research participants and 9,311 non-participants using logistic regression previously. Propensity score matching selects students in a control group with similar observed characteristics, which helps compare similar students in treatment and control groups who differ mostly in terms of the treatment effect (Rosenbaum & Rubin, 1983; Melguizo et al., 2011). This process potentially removes the multicollinearity concern and enables me to focus on the effect of the research participation on the retention behavior. Among 9,311 Hispanic students in control group, 104 students were

selected who were closely matched in demographic background and academic attributes with 104 students in treatment group. Thus, the hypothesis is that Hispanic students who participated in holistic undergraduate research programs have higher retention rate than Hispanic students with similar demographic and academic background who have not participated in research programs.

Table 4.11 shows the retention of research participants and non-participants after propensity score matching was conducted. Fourteen (13.5 percent) out of 104 Hispanic students who did not participate in the research programs did not return to the fall semester of 2016. On the other hand, only three research participants (2.9 percent) dropped out after the fall semester of 2015.

Table 4.11. Crosstabulation of Hispanic Research Participation and Retention (N = 208)

	Left College		Retained		Total	
Non-Participant	14	13.5%	90	86.5%	104	100%
Research Participant	3	2.9%	101	97.1%	104	100%

To test the effect of the research participation on retention after propensity score matching, Thoemmes (2012) recommends conducting some statistical tests such as t-test, ANOVA, chi-square, etc. As the dependent variable is dichotomous in this study, chi-square test of independence was chosen to analyze the effect of research participation. It is also known as a test of association because the significance in Person's chi-square test means there are association between the two variables. To run the chi-square test, the SPSS crosstabs function was used. Table 4.12 shows the SPSS output of chi-square test of independence. The Person chi-square is significant (Sig = .005) which means research participation and retention have a significant association.

Table 4.12. Chi-Square Test of Independence after Propensity Score Matching

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Person Chi-Square	**7.751**	**1**	**.005**		
Continuity Correction	6.406	1	.011		
Likelihood Ratio	8.357	1	.004		
Fisher's Exact Test				.009	.005
Linear-by-Linear Association	7.714	1	.005		
N of Valid Cases	208				

T-test was also conducted to compare the retention means of the two groups. There was a statistically significant difference between the Hispanic students who participated in the research programs (M = .97, SD = .168) and those who did not participated (M = .87, SD = .343), t = 2.28, p = .005. Thus, there is a difference in retention outcome between Hispanic participants and Hispanic non-participants.

Logistic regression was run with 208 cases including 104 Hispanic research participants and 104 matched Hispanic non-participants with variables entered in 3 blacks as previously described. Table 4.13 presents the results and none of the variables are statistically significant after entering all independent variables in the regression. These outcomes may be the result of multicollinearity among the independent variables. Another reason is probably the unobserved variables as R^2 indicates there are 73 percent of unanswered factors in this research model. Even though the matched two groups have similar academic achievements, for example, student's drive and motivation were not measured as predictor variables of retention outcome.

Table 4.13. Logistic Regression after Propensity Score Matching (N = 208)

Dependent Variable = Retention					
Block 1 Predictor	**β**	**S.E.**	**Wald**	**Sig**	**Exp(β)**
Age	-.085	.039	4.825	.028	.919
Gender	.347	.602	.333	.564	1.415
Parent's postsecondary degree	-.805	.549	2.150	.143	.447
Pell grant	.285	.600	.225	.635	1.329
-2 Log likelihood = 111.476, Nagelkerke R Square = .068 Goodness-of-fit Hosmer & Lemeshow test: Chi square=11.517, df=8, Sig=.174					
Block 1 & 2 Predictor	**β**	**S.E.**	**Wald**	**Sig**	**Exp(β)**
Age	-.085	.050	2.883	.090	.919
Gender	.476	.669	.506	.477	1.610
Parent's postsecondary degree	-1.062	.599	3.144	.076	.346
Pell grant	.150	.680	.049	.826	1.162
Upper class	.920	.654	1.980	.159	2.509
Scholarship	.766	.686	1.247	.264	2.151
GPA	.903	.566	2.546	.111	2.468
ACT	.086	.065	1.755	.185	1.090
-2 Log likelihood = 92.491, Nagelkerke R Square = .264 Goodness-of-fit Hosmer & Lemeshow test: Chi square=7.555, df=8, Sig=.478					
Block 1, 2, & 3 Predictor	**β**	**S.E.**	**Wald**	**Sig**	**Exp(β)**
Age	-.095	.053	3.285	.070	.909
Gender	.529	.677	.610	.435	1.698
Parent's postsecondary degree	-1.038	.604	2.950	.086	.354
Pell grant	.150	.690	.047	.828	1.161
Upper class	.933	.661	1.990	.158	2.541
Scholarship	.705	.701	1.012	.314	2.025
GPA	.956	.568	2.835	.092	2.601
ACT	.007	.104	.005	.946	1.007
Research	1.134	1.223	.860	.354	3.109
-2 Log likelihood = 91.578, Nagelkerke R Square = .273 Goodness-of-fit Hosmer & Lemeshow test: Chi square=3.737, df=8, Sig=.880					

Running the propensity score matching evened out the observed variables of the research participant group and non-participant group, thus, there are not enough variances among the variables to measure the effect on the retention. The primary purpose of using the propensity score matching function is to eliminate the influence of other factors (demographic and academic variables), so that the outcome was primarily focused on the effect of research participation on retention. Therefore, the last logistic regression measured only research participation as independent variable to measure its effect on retention (Table 4.14).

Table 4.14. Logistic Regression – Research Participation & Retention (N = 208)

Dependent Variable = Retention					
Predictor	**β**	**S.E.**	**Wald**	**Sig**	**Exp(β)**
Research	1.656	.653	6.439	.011	5.237
-2 Log likelihood = 109.361, Nagelkerke R Square = .091					

The logistic regression outcome indicates research participation variable is statistically significant (Sig = .011) and has positive relationship with retention (β = 1.656). The odds ratio indicates that Hispanic students in the research programs are 5.2 times more likely to be retained. This outcome supports my hypothesis, Hispanic students who participate in the holistic research programs are more likely to stay college than those who do not participate at The University of New Mexico.

In the next chapter, I will discuss the findings of this study, the limitations of this study, the suggestions in the future studies, and the implications and recommendations based on the findings of this study.

Chapter 5: Discussion

Background

It is critical for higher education institutions in the United States to investigate the retention behavior among Hispanic college students since the Hispanic population is the fastest growing minority group in higher education. The enrollment of Hispanic students is anticipated to rise forty-two percent between 2010 and 2021, while the rate of White students enrolling in college is expected to increase 4 percent, 20 percent for Black and Asian students (National Center of Education Statistics, 2010). The Hispanic population in the United States has a lower rate of postsecondary degree attainment compared to other minority groups. About 33 percent of adults (25 years of age or older) in the United States had at least a bachelor's degree in 2015, including 54 percent of Asian/Pacific Islander adults, 33 percent of White adults, 22.5 percent of Black adults, and 15.5 percent of Hispanic adults (Ryan & Bauman, 2016). Higher education needs to be prepared for the 42 percent increase of Hispanic students who traditionally have lower rates of college degree attainment. Even though the Hispanic student population is rapidly growing in higher education, little empirical research has been conducted on college success of Hispanic students (Oseguera et al., 2009). This research is an attempt to explore the effectiveness of one practice, undergraduate research, to improve Hispanic student's retention in a public Hispanic-Serving Institution.

The research model was created based on the five retention factors proposed by Demetrious & Schmitz-Sciborski (2011) including demographic characteristics, academic attributes, academic engagement, social engagement, and financing college. The effect of research program participation on retention among Hispanic students was examined by

using the five undergraduate research programs which provided academic integration, social engagement, and financial support at The University of New Mexico. The research hypothesis is that Hispanic students who participated in research programs are more likely to be retained in college that Hispanic students who did not participate.

Examining the Hispanic student retention at The University of New Mexico has important implications. About 81 percent of Hispanic students enrolled in college chose to attend public institution in 2008 (National Center of Education Statistics, 2010). About 60 percent of Hispanic students in the U.S. were enrolled in the Hispanic-Serving Institutions in 2013 (Excelencia in Education, 2014). The University of New Mexico is a public institution and a Hispanic-Service Institution. Furthermore, at The University of New Mexico Hispanic student population is the largest ethnic/racial group (47.39 percent in 2016) on campus. Thus, The University of New Mexico is an ideal institution to better understand the effect of high impact practices on retention for Hispanic students.

In this section, I will discuss the key findings of this study, the limitations of this study, the future research suggestions, and the implications and recommendations drawn from the findings.

Discussions of the Findings

Retention and Research Participation

The five undergraduate research programs were selected for this study based on the services they provided for the participants. All five programs provide the participants with academic integration, social engagement, and financial support as their programs' component. One hundred four Hispanic students participated in either one of the five programs and enrolled in the fall semester of 2015. The subgroup of non-participants in

the research programs was selected by matching the demographic background and academic attributes with the research participants through the propensity score matching. The result of chi-square test indicated that there is statistically significant association between research participation and retention. A logistic regression test performed on a matched sample also indicated that Hispanic students who participated in research programs were more likely to be retained in The University of New Mexico than those who do not participate.

Ninety-seven percent of Hispanic research participants were retained while the Hispanic students who did not participate in the research programs had 86.5 percent retention rate. Participating in the holistic research programs is impacting the retention behavior among Hispanic undergraduate students at The University of New Mexico. Thus, the hypothesis I proposed for this study was supported. However, the results of this study should not be generalized to other higher education institutions because the findings were drawn from limited sample from a single institution.

Hispanic Research Participants

The Hispanic students who participated in the research programs have some distinctive characteristics compared to the other undergraduate student population at The University of New Mexico. The summary of the comparisons among different student groups can be found in Table 4.4. Undergraduate Students Characteristics by Different Groups. I would like to discuss the unique attributes the Hispanic research participants possess in this section.

The Hispanic research participant group had the lowest number (42.3 percent) of parent's postsecondary degree attainment compared to the whole undergraduate

population (54.1 percent) and the entire Hispanic student population (44.1 percent). The first-generation college students whose parents do not have postsecondary degrees are more likely to drop out according to some empirical studies (Ishitani, 2016; Chen, 2005). This study result shows that the Hispanic first-generation college students in the research programs have a higher retention rate (98.3 percent) than the Hispanic first-generation students who did not participate (81.2 percent). Thus, Hispanic first-generation college students are more likely to be retained in college when they participate in the research programs based on the results of this research. Integrating academically and socially into the institution through the activities offered by the research programs may compensate for the lack of resources the first-generation college students often experience.

The data included two financial variables, Pell grant eligibility and scholarship. The Pell grant is a need-based federal fund and reflects the socioeconomic status of the students. On the other hand, the scholarship is merit based and reflects the academic achievement of the students. A larger portion of students in the Hispanic research participant group are eligible for Pell grant (69.2 percent) than in the overall undergraduate population (56.6 percent) and in the overall Hispanic students (61.5 percent). The larger percent of the Hispanic research participants also received scholarships (90.4 percent) than in the overall undergraduate population (70.3 percent) and in the overall Hispanic students (72.8 percent). Since the family income and financial status influence students' decision to stay college (Oseguera, et al., 2009; Robb et al., 2012; Tinto, 2006), in the case of Hispanic research participants at The University of New Mexico, Pell grant and scholarships seem to be offsetting the financial need of

students. The impact of financial variables on the Hispanic student retention is discussed in the Implication section later in this chapter.

The research participants in this study had pre-selected characteristics due to the programs' admission requirements such as GPA, year in college, parent's education, socioeconomic status, etc. It will be valuable to find out how the research programs impact the retention behaviors of the students who do not qualify for these research programs in the future studies. Since research participation has a positive influence on the Hispanic student retention in this study, the undergraduate research programs may be equally or more beneficial for students with lower GPA's who are in the first or second year. The further discussion on this topic is found in the Implication section of this chapter.

Retention and GPA

Grade point average (GPA) was one of the strong factors for retention among Hispanic students. According to the logistic regression result, GPA is a statistically significant factor of retention ($p<.001$). The marginal effect of higher GPA in the probability of retention is estimated by $Ext(\beta) = 3.999$. After running the logistic regression with GPA as continuous variable (0 – 4.33), I recoded the variable into six different categories in Table 5.1 so that the influence of the levels of GPA on the student retention can be observed better. The numbers indicate that the Hispanic students with higher GPA are more likely to be retained. On the other hand, the majority of the Hispanic students with below 2.00 GPA dropped out or were suspended. This finding confirmed the previous research findings in which the college GPA is one of the most consistent predictors and plays an important role for student retention (Pascarella &

Terenzini, 2005; Ishitani, 2016). Unfortunately, this study could not analyze the effect of research participation for lower GPA students because all research participants had GPA of 2.5 or above (see Appendix D). It was expected as the five research programs have high minimum GPA requirements to be accepted into their programs.

Table 5.1. Retention Rates by GPA

	Hispanic			Undergraduate		
GPA	**Retained**		**Total**	**Retained**		**Total**
0 – 1.49	35	17.2%	204	60	15.0%	399
1.50 – 1.99	63	25.3%	249	138	28.5%	484
2.00 – 2.49	591	64.0%	924	1,226	63.6%	1,928
2.50 – 2.99	1,693	81.2%	2086	3,305	80.5%	4,107
3.00 – 3.49	2,734	88.5%	3088	5,604	88.3%	6,348
3.50 – 4.33	2,676	93.4%	2864	6,469	92.2%	7,015
Total	7,792	82.8%	9,415	60	15.0%	399

Retention and Year in College

The third semester retention or first year persistence is one of the most commonly studied issues in higher education and this is where most colleges and universities see the largest dropout rates of their students (Kuh, 2008; Trosset & Weisler, 2010). Institutions often struggle to retain students on their third semester after completing the first year, therefore, multiple high impact interventions have been recommended and implemented to improve the third-semester retention (Kuh, 2008). The Hispanic population at The University of New Mexico is not an exception. Table 5.2 shows the retention rates by year in college among Hispanic students and non-Hispanic students.

Four hundred twenty-seven Hispanic students did not return after the first year which means the institution failed to retain 23.4 percent of Hispanic students from the first year to the second year. This study could not measure the effect of research participation for the third semester retention because being in upper class (junior and

senior years) was one of the eligibilities for the research programs. Based on the result of this study, implementing research participation early as freshman and sophomore may result in overcoming third semester retention challenge.

Table 5.2. Retention Rates by Year in College

	Hispanic			**Non-Hispanic**		
	Retained		Total	Retained		Total
Freshman	1,399	76.6%	1,826	1,333	77.3%	1,724
Sophomore	1,681	80.6%	2,085	1,743	81.5%	2,139
Junior	1,960	83.4%	2,349	2,251	83.1%	2,709
Senior	2,752	87.2%	3,155	3,683	85.8%	4,294
Total	7,792	82.8%	9,415	9,010	82.9%	10,866

The University of New Mexico recently developed two research programs for students in the first- and second-year students. Those programs were not included in this study due to the significantly low amount of the financial support for the participants compared to the five selected programs. Further research is needed to investigate the effect of the research participation in these programs on their retention outcomes. I discuss more about these research programs in the Implications section in this chapter.

Retention and Parent's Educational Attainment

First-generation college students are often considered disadvantaged in terms of college success as mentioned before. This research, however, indicated that parent's educational attainment beyond high school was not statistically significant factor in their retention (Sig = .133). This phenomenon may be unique to The University of New Mexico where more than half of the Hispanic students are first-generation college students. The retention rate of the Hispanic first-generation college students (81.4 percent) was only slightly lower than the Hispanic students who were not the first-generation college students (84.5 percent) at UNM.

The past empirical research shows that first-generation students were 55 percent more likely to leave college (Ishitani, 2016). Another research result also found that 43 percent of first-generation college students left college, while only 20 percent of students with college educated parents dropped out (Chen, 2005). It seems that the previous research on first-generation college students do not necessarily apply to the Hispanic students at UNM. I believe this outcome is the result of multiple intervention programs UNM has in place. The student service programs in the Division of Student Affairs provide multiple services to improve the retention among high risk students such as TRIO, Student Support Service, College Prep Program, and Upward Band. All these programs help underrepresented high school and college students to succeed in college.

Table 5.3. Parent's Educational Attainment

	Undergraduate Population (N = 20,281)		Hispanic UG Population (N = 9,415)		Hispanic Research Participants (N = 104)	
Fist-generation	9,312	45.9%	5,261	55.9%	60	57.7%
Retained	7,505	80.6%	4,283	81.4%	59	98.3%
Non First-generation	10,969	54.1%	4,154	44.1%	44	42.3%
Retained	9,297	84.8%	3,509	84.5%	42	95.5%

Limitations & Future Studies

There are some limitations in this research which may be considered in future studies. There was the limitation in data collection as I was using the secondary data which were collected by the Registrar's Office at The University of New Mexico. I could not obtain all variables I originally planned because some data were not collected by the office and others were not accessible due to privacy restrictions. Another limitation was the sample selection and size. This study did not capture all undergraduate students who

had similar research experience consisting of academic and social integration and financial support. Thus, the sample size was small and the selection of sample was limited. Lastly, the student's experience of academic and social integration need to be verified to the research program participants in future studies. This study assumed that the research participants experienced the same academic integration and social engagement through the research programs. However, the actual levels of academic and social integration by the students were not measured. The further studies need to be done to confirm the integrations by the research participants and explore how the level of integrations influence their retention behavior.

Secondary Data

The data were drawn from the university's student database managed by the Registrar's Office at The University of New Mexico. Thus, I had to choose variables from the existing data which matched the variables in my research model, and some variables were not available. For example, the dollar amount of received scholarships were not accessible for me to include in this study. Instead, my data included simply yes or no regarding receiving scholarships. It would be interesting to investigate how the amount of scholarship students receive influences their retention behaviors. Student's household income was another critical data I could not obtain to indicate student's socioeconomic status. Thus, Pell grant eligibility was used as the indicator, which provided only dichotomy answers rather than the level of their socioeconomic status. Using the secondary data provides for cleaner data with less missing cases, while it limits the research variables compared to conducting my own survey.

Undergraduate Research Participants

The second limitation is my sample selection and size. This study included the five research programs coordinated at The University of New Mexico. However, I suspect there are other research programs which offer the three components of academic integration, social engagement, and financial support. For example, there may be a large research lab on campus where several undergraduate students work together under research faculty mentors. Those students have probably received academic integration from intellectual research activities and the interaction with faculty, social engagement by working as a team for the same goal, and financial support from a research assistant salary. If more research programs are identified for future research, the sample size will be increased to more than 104 cases. At The University of New Mexico numerous research projects are occurring every day. It is hard to monitor all research activities in which undergraduate students are involved. It will be ideal to have the centralized office for undergraduate research to capture detailed records on undergraduate student research activities on campus.

Academic and social integration

The third area to explore in the future is the investigation of all students' experiences through research program participation. As mentioned, I chose the five research programs in this study because they provide the three components including academic integration, social engagement, and financial support for the program participants. The five programs require the students to participate in activities to integrate academically and socially, and provide stipends in return. In this study these three components were not included in predictor variables. It was assumed that the students

gained the integrations by joining in the research programs. However, requiring some activities do not necessarily mean that participants actually integrated academically and socially through the program activities. It may help understand the degree of integration by surveying participants about their experiences through the research and cohort activities. It will be useful to examine what activities promote academic and social engagements to better understand the best practices for the Hispanic student population.

The results of this study only explains 25.8 percent of the retention factors (R^2 =.258). This study covered only a quarter of the variables which influence Hispanic student retention; 74.2 percent of factors are still unanswered. To capture the phenomenon of Hispanic student retention behavior at The University of New Mexico, the more factors need to be included to further explore the best practices for their college success.

Implications and Recommendations

Higher education institutions invest time, money, and resources to recruit and admit students into their institutions. Student's attrition cause a significant amount of loss for the institutions. The public universities lose large amount of money annually by students leaving from their institutions (Raisman 2013). The institutions need to proactively investigate the intervention programs, which help retain the rapidly growing number of Hispanic college students. As a public Hispanic-Serving Institution, it is our mission to serve and provide assistance for Hispanic students to attain college degree.

In this section, the implications and recommendations are discussed based on the findings of this research. The implications and recommendations are focused in the areas

of recruitment, student support programs, undergraduate research office, Hispanic-Serving Institutions, and the New Mexico state funded scholarship.

Recruitment

The results of this study show being a female, at the traditional college age, eligible for the Pell grant, and in the upper class are the indicators of higher retention rates (Appendix C). One of the strategies of increasing the overall retention rate is to enroll students who are more likely to be retained. Being a Hispanic female under 25 years old is also significantly correlated with receiving higher GPA. Since GPA is a strong factor of the Hispanic student retention, it is a desirable group of students to enroll in the institution. The Pell grant eligibility positively influences the Hispanic student retention at UNM. Including this finding in the UNM's recruitment material will probably attract the prospective Hispanic students and their parents from lower socioeconomic households. The lowest retention rate occurs at the third semester, from freshman to sophomore. The retention rate rises as the year in college increases. Thus, recruiting more transfer students may increase the overall retention rate of the institution. However, the study of the transfer student retention at UNM is necessary prior to implementing the recruitment strategy.

Student Support Programs

Once students are enrolled, it is institution's responsibility to provide necessary assistance for their retention. The intervention programs targeting the specific student groups with lower retention rates would be beneficial. The study outcomes suggest that students at the age of 25 or older, freshmen, students without scholarship, and students with low GPA are less likely to be retained. The low retention rates of these student

groups are not unique to the Hispanic population, and the same student groups among non-Hispanic students are also showing lesser retention rates.

The older students ($\geq$ 25) have lower retention rate (76.7 percent) than students at the traditional college age (84.1 percent). Over 20 percent of the Hispanic undergraduate students and about 35 percent of the entire undergraduate students at UNM are at the non-traditional college age. Improving their retention rate will be significant improvement for the overall retention outcome. There are some existing programs for non-traditional students, such as the orientation for non-traditional student and a student organization for non-traditional students, but more institutionalized support for non-traditional students may be beneficial to increasing their retention rates. Some institutions have established the Office of Non-Traditional Students to support and enrich the college life for this specific group of students.

The high-impact practices to improve the third-semester retention have been discussed for the decades (Kuh, 2008). The data of this study indicate 23.4 percent of the Hispanic freshmen did not return to their second year at UNM. The UNM's First-Year Experience and First Year Research Experience encourage freshmen to integrate academically and socially into the institution through enrolling them in the specific courses. Mandating freshmen to enroll in such high impact programs during the first and second semesters at the UNM may improve their third-semester retention.

Receiving scholarships is one of the strong retention factors among the Hispanic students at UNM. Almost 73 percent of the Hispanic undergraduate students received some kind of scholarships in the fall semester of 2015. While 87.7 percent of the Hispanic scholarship recipients were retained, the retention rate of the non-scholarship

recipients was 69.2 percent. There is a large gap in their retention rates between the recipients and non-recipients. Providing more scholarship opportunities may promote the student's retention rates considerably. Creating more scholarship opportunities in the university, colleges, and departments will help increase the student's retention rate.

The lower GPA is a strong factor of student's dropout according to the findings of this study. Out of the Hispanic undergraduate students with below 1.5 GPA, 82.8 percent did not return to the following fall semester. About 65 percent of those dropouts were freshmen. Thus, the intervention programs need to be implemented at the beginning of student's freshman year, which may prevent them from receiving the low grades and leaving college. Offering participation in the research programs to incoming freshmen may help the transition to the college and integrate academically and socially into the institution.

The Undergraduate Research Opportunity Program (UROP) at the University of Michigan, implemented in 1991, provided the opportunity to engage in research activities for incoming first year students (Jonides, et.al., 1992). The report shows that the UROP was significantly more effective for minority students (Jonides, et.al., 1992). Rather than waiting till student's third or fourth year at The University of New Mexico, providing incoming freshmen with research opportunities can improve the third-semester retention and their college GPAs.

The students who have GPA's below 2.0 are placed on probation at the end of each semester at UNM. Among the Hispanic students on probation, only 22 percent were retained according to this study. It will be important to know what helped them stay and continue their academic career at this institution. Such information could be valuable for

creating innovative intervention program for this specific group of students who struggle to stay in college.

Undergraduate Research Office

In this study the positive association between retention and research participation was confirmed among Hispanic students at The University of New Mexico. As this study assumed, participating a research program can stimulate academic integration and social engagement. The interaction with research mentors and research activities promotes a student's academic integration and improves their academic accomplishments (Chang, et al., 2014; Bauer & Bennett, 2008). Such can help improve the GPA among first year students who may be at risk of leaving college before their third semester. The social interaction with peers through research programs develops the commitment and the sense of belongingness to the institution among first year students.

However, providing students with a research program experience can be expensive and requires institutional effort. The five programs selected for this study are funded by public and private grants. Even though the funding is provided by an outside institution, it will not be successful without the institutional endorsement. The institution can embrace undergraduate research programs as a tool for improving undergraduate student retention, and develop a centralized office dedicated to undergraduate research. The report by the Boyer Commission on Educating Undergraduates in the Research University (1998) emphasized the importance of undergraduate research activities for student academic success. Twenty years have passed since that report, and The University of New Mexico does not have a centralized undergraduate research office. By

establishing a campus-wide undergraduate research office, UNM can create a culture of integrating research activities in undergraduate student's college life.

The implementation of the institutionalized undergraduate research office will emphasize the institutional commitment to enhance and enrich undergraduate student's experience at UNM. This may also allow the institution to establish an institutional-wide intervention research program, which will not be limited to students in upper class with higher GPA.

Hispanic-Serving Institutions

The eligibility to become Hispanic-Serving Institutions is to enroll the minimum of twenty-five percent of Hispanic undergraduate full-time students in an institution (National Center of Education Statistics, 2010). It is a significant amount as a quarter of the student body are Hispanic. Thus, implementing changes and interventions for Hispanic student's college success could greatly increase the overall institutional retention rates. This research examined the Hispanic student' retention to prepare for the expected rapid increase of Hispanic enrollment in higher education.

The Hispanic-Serving Institutions can learn from the findings of this study, even though the results of this study apply only to UNM Hispanic Students and thus, caution should be used when generalizing my results to Hispanic student populations at other universities. The unique characteristics of Hispanic student population include the higher ratios of first-generation college students and Pell grant eligible students at The University of New Mexico. Although the past research findings indicate the lower retention among these groups of students, those students at UNM have high retention rate (81.4 percent and 83.8 percent). As I mentioned above, UNM offers multiple service

programs for the first generation college students and the students from the lower socioeconomic households. In order to retain Hispanic students, it is critical to find the unique characteristics of the Hispanic student population in an institution and provide the appropriate services for their needs.

State Funded Scholarship

The New Mexico Higher Education Department provides the Legislative Lottery Scholarship Program to New Mexico residents to support their college education by paying for a portion of the tuition. As discussed above, scholarship in general highly influences the Hispanic student's retention outcome. It is essential that the state government continues to provide scholarships for the college degree attainment for New Mexico residents. According to the New Mexico Department of Workforce Solutions (2017), there is a need of more employees with a college degree in the New Mexico labor force. Investing in the college students, a future workforce, will eventually contribute back to the state labor force in the future.

As this study presented, many factors of retention are significantly related to each other. Although it makes it harder to identify the effect of individual variable on retention, a single intervention could influence multiple variables and eventually improve the retention rates of Hispanic students.

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APPENDICES

Appendix A SAT-ACT Conversion Table (College Board, 2009)

SAT	ACT	SAT	ACT	SAT	ACT
1600	36	**1250**	26	**900**	17
1590	35	**1240**	26	**890**	16
1580	35	**1230**	25	**880**	16
1570	35	**1220**	25	**870**	16
1560	35	**1210**	25	**860**	16
1550	34	**1200**	25	**850**	15
1540	34	**1190**	24	**840**	15
1530	34	**1180**	24	**830**	15
1520	34	**1170**	24	**820**	15
1510	33	**1160**	24	**810**	15
1500	33	**1150**	23	**800**	14
1490	33	**1140**	23	**790**	14
1480	32	**1130**	23	**780**	14
1470	32	**1120**	22	**770**	14
1460	32	**1110**	22	**760**	14
1450	32	**1100**	22	**750**	13
1440	31	**1090**	21	**740**	13
1430	31	**1080**	21	**730**	13
1420	31	**1070**	21	**720**	13
1410	30	**1060**	21	**710**	12
1400	30	**1050**	20	**700**	12
1390	30	**1040**	20	**690**	12
1380	29	**1030**	20	**680**	12
1370	29	**1020**	20	**670**	12
1360	29	**1010**	19	**660**	12
1350	29	**1000**	19	**650**	12
1340	28	**990**	19	**640**	12
1330	28	**980**	19	**630**	12
1320	28	**970**	18	**620**	11
1310	28	**960**	18	**610**	11
1300	27	**950**	18	**600**	11
1290	27	**940**	18	**590**	11
1280	27	**930**	17	**580**	11
1270	26	**920**	17	**570**	11
1260	26	**910**	17	**560**	11

Appendix B Retention Rates in Undergraduate Students

Retention rates in each variable of the undergraduate students who were enrolled in the fall semester of 2015 at The University of New Mexico (N=20,281)

	Retained		Total
Total	**16,802**	**82.8%**	**20,281**
Hispanic	7,792	82.8%	9,415
American Indian or Alaska Native	913	73.3%	1,245
Asian	593	87.1%	681
Black or African American	398	80.2%	496
Native Hawaiian or Pacific Islander	29	80.6%	36
White	6,028	84.6%	7,124
Two or more	574	82.1%	699
Unknown	225	76.8%	293
Non-Resident Alien	250	85.6%	292
Not Traditional Age	3,414	75.5%	4,519
Traditional Age (<25)	13,388	84.9%	15,762
Female	9,443	83.7%	11,287
Male	7,359	81.8%	8,994
First-generation College Student	7,505	80.6%	9,312
Non-First-generation	9,297	84.8%	10,969
Pell Grant Eligible	9,525	82.9%	14,250
Pell Grant Not Eligible	7,277	82.8%	6,031
Freshman	2,732	77.0%	3.550
Sophomore	3,424	81.1%	4.224
Junior	4,211	83.3%	5.058
Senior	6,435	86.4%	7.449
Received Scholarship	12,518	87.8%	14,250
Did not receive Scholarship	4,284	71.0%	6,031
GPA 0 – 1.49	60	15.0%	399
GPA 1.50 – 1.99	138	28.5%	484
GPA 2.00 – 2.49	1,226	63.6%	1,928
GPA 2.50 – 2.99	3,305	80.5%	4,107
GPA 3.00 – 3.49	5,604	88.3%	6,348
GPA 3.50 – 4.33	6,469	92.2%	7,015
Research Participants	161	96.4%	167
Non Research Participants	16,641	82.7%	20,114

Appendix C Retention Rates in Hispanic Students

Retention Rates of each variable in Hispanic undergraduate students (N=9,415) and Non-Hispanic students (N=10,866) who were enrolled in the fall semester of 2015 at The University of New Mexico

	Hispanic			Non-Hispanic		
	Retained		Total	Retained		Total
Total	**7,792**	**82.8%**	**9415**	**9,010**	**82.9%**	**10,866**
Not Traditional Age	1,278	76.7%	1,666	2,136	74.9%	2,853
Traditional Age (<25)	6,514	84.1%	7,749	6,874	85.8%	8,013
Female	4,571	83.7%	5,459	4,138	82.1%	5,038
Male	7,792	81.4%	3,956	4,872	83.6%	5,828
First-generation Student	4,283	81.4%	5,261	3,222	79.5%	4,051
Non-First-generation	3,509	84.5%	4,154	5,788	84.9%	6,815
Pell Grant Eligible	4,857	83.8%	5,794	4,668	82.0%	5,695
Pell Grant Not Eligible	2,935	81.1%	3,621	4,342	84.0%	5,171
Freshman	1,399	76.6%	1,826	1,333	77.3%	1,724
Sophomore	1,681	80.6%	2,085	1,743	81.5%	2,139
Junior	2,752	83.4%	2,349	2,251	83.1%	2,709
Senior	2,752	87.2%	3,155	3,683	85.8%	4,294
Received Scholarship	6,019	87.8%	6,852	6,499	87.8%	7,398
Did not receive Scholarship	1,773	69.2%	2,563	2,511	72.4%	3,468
GPA 0 – 1.49	35	17.2%	204	25	12.8%	195
GPA 1.50 – 1.99	63	25.3%	249	75	31.9%	235
GPA 2.00 – 2.49	591	64.0%	924	635	63.2%	1,004
GPA 2.50 – 2.99	1,693	81.2%	2,086	1,612	79.8%	2,021
GPA 3.00 – 3.49	2,734	88.5%	3,088	2,870	88.0%	3,260
GPA 3.50 – 4.33	2,676	93.4%	2,864	3,793	91.4%	4,151
Research Participant	101	97.1%	104	60	95.2%	63
Non Research Participant	7,691	82.6%	9,311	8,950	82.8%	10,803

Appendix D Retention Rate in Hispanic Undergraduate Research Participants

Retention rates of each variable in Hispanic undergraduate research participants (N=104) and Hispanic non-participants (N=9,311) who were enrolled in the fall semester of 2015 at The University of New Mexico

	Participants			Non-Participants		
	Retained		Total	Retained		Total
Total	101	97.1%	104	7,691	82.6%	9311
Not Traditional Age	14	87.5%	16	1,264	76.6%	1,650
Traditional Age (<25)	87	98.9%	88	6,427	83.9%	7,661
Female	71	97.3%	73	4,500	83.5%	5,386
Male	30	96.8%	31	3,191	81.3%	3,925
First-generation Student	59	98.3%	60	4,224	81.2%	5,201
Non-First-generation	42	95.5%	44	3,467	84.4%	4,110
Pell Grant Eligible	70	97.2%	72	4,787	83.7%	5,722
Pell Grant Not Eligible	31	96.9%	32	2,904	80.9%	3,589
Freshman	4	100%	4	1,395	76.6%	1,822
Sophomore	13	100%	13	1,668	80.5%	2,072
Junior	27	100%	27	1,933	83.2%	2,322
Senior	57	95%	60	2,695	87.1%	3,095
Received Scholarship	91	96.8%	94	5,928	87.7%	6,758
Did not receive Scholarship	10	100%	10	1,763	69.1%	2,553
GPA 0 – 1.49			0	35	17.2%	204
GPA 1.50 – 1.99			0	63	25.3%	249
GPA 2.00 – 2.49			0	591	64.0%	924
GPA 2.50 – 2.99	3	75.0%	4	1,690	81.2%	2,082
GPA 3.00 – 3.49	23	92.0%	25	2,711	88.5%	3,063
GPA 3.50 – 4.33	75	100%	75	2,601	93.3%	2,789