

**SUCCESS OF FIRST-GENERATION COLLEGE STUDENTS IN A SELECTIVE
DOCTOR OF OPTOMETRY PROGRAM**

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University of Pittsburgh, 2017

What happens when former first-generation college (FGC) students successfully graduate from college and then aim for post-undergraduate education? The purpose of this dissertation is to compare differences between FGC students and non-FGC admissions profiles regarding end-of-first-year performance at UC Berkeley's School of Optometry. The aims of this research project were to a) compare academic performance of FGC and non-FGC students based on GPAs from the end of their first professional school year, and b) examine the relationships among gender, ethnicity, participation in pre-optometry preparatory programs, undergraduate GPA, undergraduate institutional selectivity, Optometry Admissions Test (OAT) scores, and end-of-year GPAs within these two populations. In 2011, all current students at UC Berkeley's School of Optometry were asked to participate in this research study; surveys from 233 students were collected. A P-value of <0.05 was considered significant for all statistical tests. Comparison of Optometry Degree (OD) GPA as an overall academic performance of optometry academics showed no statistical difference between FGC and non-FGC students ($p=0.37$). Also, comparison of underrepresented status noted no significant difference between FGC and non-FGC students ($p=0.20$). Self-reported ethnicity ($p=0.04$), Carnegie Classification Tier ($p=0.001$) and attendance at Opto-Camp, a preparatory program offered prior to entering the OD program

($p=0.04$), were all significant and associated with a lower OD GPA. Finally, the correlation of Undergraduate GPA and Optometry Admissions Test (OAT) AA Score with OD GPA was examined; undergraduate GPA had a significant positive correlation ($r=0.33$) with OD GPA ($p=.0001$). OAT AA Score also had a significant positive correlation ($r=0.38$) with OD GPA ($p=.0001$). While this study is encouraging that FGC students performed just as well as non-FGC students, future study on Berkeley Optometry students must consider the program's distinct demographics. There is a lack of scholarship pertaining to FGC students who have made it into post-undergraduate studies, often investigating deficiencies in their preparation and look for "traditional" measures of success. Future studies should include metrics that measure factors like resilience as a predictor of persistence, and characteristics like empathy, which is necessary for those who aspire to be in the health professions.

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PREFACE

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1.0 INTRODUCTION

This dissertation compared differences between first-generation college (FGC) students and non-FGC admissions profiles and their end-of-first-year performance at the University of California, Berkeley, School of Optometry. This research involved collecting and comparing data from the classes of 2011 to 2014 that compared the academic performance of FGC and non-FGC students based on their grade point averages (GPAs) from the end of their first professional school year. The secondary study aims included examining the effects of gender, ethnicity, participation in pre-optometry preparatory programs, undergraduate GPA and undergraduate institutional selectivity, and Optometry Admissions Test (OAT) scores on their GPAs.

1.1 FIRST GENERATION COLLEGE STUDENTS

First-generation students, as defined by the National Center for Education Statistics and for the purpose of this study, are those “whose parents’ highest level of education is a high school diploma or less. In cases where parents have different levels of education, the maximum education level of either parent determines how the student is categorized” (U.S. Department of Education, 1998, p.7).

While there are descriptive data on the demographics of FGC students in post-secondary settings related to factors such as race and gender, there is a dearth of information that has looked

specifically at FGC students who have post-undergraduate aspirations. Additionally, questions such as how many FGC students attend college and finish within a reasonable time frame remain largely unanswered because organizations, such as Integrated Postsecondary Education Data System (IPEDS), cannot keep pace with the ever-changing landscape of higher education (Engle, 2016).

The most comprehensive study providing demographic information about undergraduate education pertinent to this project comes from the Higher Education Research Institute (HERI) report published in 2007, “First in My Family: A Profile of First-Generation College Students at Four-Year Institutions Since 1971.” Two major findings from this report are as follows (Saenz, Hurtado, Barrera, Wolf, & Young, 2016, p. 9):

- The proportion of first-generation students within the overall population of first-time, full-time entering college freshman at four-year institutions has steadily declined since 1971, reflecting increasing levels of education among the U.S. population.
- However, differences between racial/ethnic groups are cause for concern. Specifically, since 1975, African Americans show the greatest decline in their representation of first-generation college students—a declining rate that is of concern because it is faster than the relative proportion of African American adults without a college education as well as the decline of first-generation students in other racial/ethnic groups. Hispanics remain the least educated group (69.1 percent of Hispanic adults lacked a college education in 2005) and have the highest proportion of first-generation college students (38.2 percent) at four-year colleges of any racial/ethnic group.

The report also presented gender statistics: “in 2005, 16.9 percent of all women and 14.7 percent of all men among entering college students were first-generation” (p. 23).

As a population, FGC students are more likely to come from low-income households, be part of an underrepresented group, and have lower degree aspirations (Terenzini, Springer, Yeager, Pascarella, & Nora, 1996). Other studies have indicated that FGC students have lower self-esteem (Hurley, 2002) and have difficulties adjusting to higher education because they are unfamiliar with the world of academia (Arredondo, 1999).

Additionally, unlike non-FGC students, FGC students have assimilation issues and often have to straddle two worlds, where new and old cultural norms clash (Rendon, 1992). While spanning multiple cultures creates resiliency in FGC students (Tugend, 2016), it can also create an inner tension whereby FGC students may experience subtle discouragement to become more socially and economically mobile (London, 1996). More controversial is the work of Ogbu, which originally speculated that black students, particularly males, create an oppositional relationship where formal education is concerned in an effort to avoid the stigma of “acting white” (Foley, 2004). Although this theory was later reworked into a model that concurred with earlier research surrounding the inner-conflict of higher education attainment for FGCs, feeling put down for being smart and studious have been cited by FGC students (Fauteux, 2012).

Moreover, in 2010 and according to the U.S. Department of Education, half of the college population is made up of FGC students. Furthermore, again in 2010, the National Center for Education Statistics released data indicating that underrepresented groups made up the largest demographics of students with parents holding a high school education or less: 48.5% Latino/Hispanic students, 45% of Black/African-American students; 32% of Asian students; and 35% of Native Americans. Among Caucasian students, 28% were first-generation college students (Lynch, 2013).

As an example of the growth of FGC students, in 2000, there were 9,073 first-generation applicants to the University of California, Berkeley campus (out of 33,351 total applicants). The campus admitted 11,481 applicants that year of whom 2,676 were FGC students; 4,676 enrolled of whom 1,219 were FGCs. In 2010, there were 14,982 first-generation applicants to the same campus (out of 50,374 total applicants); the campus admitted 12,988 applicants that year and 2,675 were FGC students while 5,024 enrolled and 1,171 were FGCs. For all the University of

California schools in 2001, there were 21,220 FGC applicants in the pool for admission and in 2010, this number reached 35,844 (University of California, Office of the President, 2011).

1.2 FIRST GENERATION COLLEGE STUDENTS POST-UNDERGRADUATE PURSUITS AND ASPIRATIONS

What happens when former FGC students overcome the many hurdles presented in their undergraduate studies, successfully graduate from college, and then aim for post-undergraduate education? Only a limited number of studies have looked specifically at FGC students, whether linked or not to race, and at their performance in graduate school and/or professional degree programs. Most were only speculative on the post-undergraduate pursuits and aspirations of FGC students.

In one study (Tate et al., 2014), 175 McNair Scholars¹, across multiple institutions and multiple class years, were surveyed; factors such as “research self-efficacy” (a FGC student’s confidence in his or her abilities related to research skills, e.g. data analysis and technical writing) and “family values,” which was interpreted in this study as situations wherein FGC students might be driven to honor their families by attaining an education that leads to better career opportunities, were the only factors of statistical significance in FGC students’ choosing

¹ The McNair Scholars Program is a federal TRIO program funded at 151 institutions across the United States and Puerto Rico by the U.S. Department of Education. It is designed to prepare undergraduate students for doctoral studies through involvement in research and other scholarly activities. McNair participants are either first-generation college students with financial need, or members of a group that is traditionally underrepresented in graduate education and have demonstrated strong academic potential. The goal of the McNair Scholars Program is to increase graduate degree awards for students from underrepresented segments of society.

to pursue graduate studies. It was also noted that because McNair participants are actively supported and encouraged to attend graduate school, respondents should skew toward having a goal of pursuing post-undergraduate aspirations.

Another study was found that even when respondents were of the same race and socio-economic status, and had the same undergraduate GPA, FGC students were significantly less likely to apply to graduate school or a professional degree program (Carlton, 2015). In that study, the link to student debt was statistically significant: “First-generation students are less likely to apply to graduate or professional school programs because the amount of money owed to their undergraduate institutions significantly affects their future plans” (p. 5). Furthermore, according to the researcher, it is reasonable to speculate that FGC students are wholly responsible for paying off their undergraduate loans, accumulating more debt for additional education is daunting, and they want to start earning a paycheck upon graduation.

A study by Seay, Lifton, Wuensch, Bradshaw, and McDowelle (2008) found that FGC students enrolled in graduate programs (excluding medicine) at a public research university in the southeast differed from non-FGC students on five characteristics: they didn't enter their graduate studies straight from their undergraduate education, they were significantly more likely to be enrolled as a part-time student, they were employed full-time, they self-reported being financially independent, and they had a higher probability of having children. While these characteristics have been used to explain attrition risks in undergraduate FGC students, this study didn't examine the retention and persistence of the graduate students who were surveyed.

Finally, a Master's candidate at San Jose State University thoughtfully chronicled the experiences of six FGC students who were pursuing graduate degrees and concluded that all of his subjects reported needing “emotional support, reality confirmation, and listening support

more than anything” (Lancaster, 2010, p. 69). He also reported that peer-to-peer interactions became increasingly more important due to the shared experience of being an FGC student, now a graduate student, and he observed that all of the students struggled with time management (Lancaster, 2010).

Because of the dearth of scholarly work on former FGC students and how they perform as graduate students, this dissertation research is all the more meaningful a contribution toward ensuring their success. It can also open conversations among professionals in enrollment management; admissions committees strive to select incoming classes that are not only academically prepared, but also diverse and reflective of students’ varied life experiences, which can be an even more consequential endeavor when thinking about supporting former FGC students. According to Brus (2006), “Retention means that a nontraditional student navigated successfully through graduate school; retention also measures the cumulative impact of many successful interventions and support services provided by the institution” (p. 43).

2.0 OPTO-CAMP

With over 25 years of experience in higher education, in roles spanning admissions, academic advising, student affairs, financial aid, and career services in five distinct academic settings, I have been passionate about equipping students with a firm foundation for managing their lives inside and outside of the classroom. I am equally engaged in creating climates that are thoughtfully inclusive, particularly in my role over the last 10 years in admissions and student services at the School of Optometry at the University of California, Berkeley. Part of my responsibilities has included finding ways to improve diversity in the student body.

In 2005, the Association of Schools and Colleges of Optometry (ASCO) spearheaded a diversity mini-grant program to support creative and novel ways to attract underrepresented students to the profession of optometry. With the intention of building a pipeline of underrepresented and/or FGC students, I created a program called Opto-Camp; this program targeted both underrepresented and FGC students to open up pathways more broadly and to ensure that the program would not violate California Proposition 209, which, although far-reaching, could have implications for the Opto-Camp program if selection was race-based.

My grant proposal was selected for funding and was funded through the next six cycles until the diversity mini-grant program ended. By then, the program had gained enough attention from corporations in the field of vision and eye care services that Vision Service Plan (VSP) became the sponsor of Opto-Camp at Berkeley Optometry. Since the inaugural Opto-Camp

cohort in 2006, 600 prospective students have attended this unique summer program. Details on the program can be found in Appendix A.

In 2011, a brief outcomes survey of the program was conducted and it was found that 87% of Opto-Camp attendees were pursuing a career in the health sciences. However, there hasn't been a more in-depth analysis of how former Opto-Campers perform in our program, and overall, how FGC students perform at Berkeley Optometry. Given the efforts that have been made to create a program to support FGC students on their trajectory into optometric programs, how do end-of-year GPAs for those who participated in Opto-Camp and the overall academic success of first-generation college and non-FGC students at Berkeley Optometry compare after the first year?

Again, in order to address disparities in the profession on optometry, in 2006, Berkeley Optometry launched Opto-Camp. The goal was, and remains, to introduce FGC pre-health science majors to optometry as a potential career track and to prepare them to be successful applicants to optometry school. Opto-Camp is also open to undergraduate students outside of UC Berkeley.

The objective of Opto-Camp is to provide a residential experience with opportunities for the participants to learn about the profession of optometry and the process of becoming an optometrist. Additionally, by enjoining key faculty and staff members to participate in this program, we hoped to heighten diversity awareness within Berkeley Optometry.

Furthermore, regardless of where Opto-Campers ultimately choose to pursue their graduate studies, this program strives to increase diversity within the healthcare professions in order for Berkeley Optometry to reach its own goal of a more inclusive program and to raise awareness of optometry as an excellent profession.

The Opto-Camp program has served as a template for other schools to replicate with the collective end-goal of increasing diversity across all optometry programs. In fact, the Illinois College of Optometry, The Ohio State University College of Optometry, and Pacific University College of Optometry have developed their own summer programs using Berkeley Optometry's innovative start as a model. As a result, these programs are now gathered into a Consortium for Optometry Summer Enrichment Programs to promote developing and implementing activities/programs to recruit and/or retain underrepresented students, the financially disadvantaged, and FGC students pursuing the profession.

An underlying principle of Opto-Camp is that there is a huge benefit in bringing prospective optometry students on campus to experience what pursuing an OD degree entails. From Berkeley Optometry's perspective, Opto-Camp continues to be a successful program; the participants enjoy the social aspects of Opto-Camp, acquire knowledge regarding the field of optometry, learn about the admissions process, and complete the program with new skill sets in interviewing and time and stress management.

Opto-Camp also provides a great opportunity for Berkeley Optometry to rally around a significant outreach program for underrepresented and/or first-generation college students, as noted by the number of faculty, staff, and students who volunteer and continue to participate in many of the modules spread out over the program.

Given the statistics that indicate that FGC students are significantly less likely to graduate (Ishiyama & Hopkins, 2003), and that FGC students, who are also low-income, have even lower chances of doing so (Choy, 2000), is the Opto-Camp program at UC Berkeley a success?

Because participants are linked by taking the same seminars and participate in team building activities, it would appear that the program fosters a strong learning community (Tinto,

1998) The structure of Opto-Camp is beneficial: “Learning communities not only promote shared and connected learning among students, but they also help students form supportive peer groups that extend beyond the classroom, become more actively involved in the classroom learning even after class, and increase the quality of their learning” (Ishiyama & Hopkins 2003, p. 396). The proposition of creating learning communities on a campus, such as UC Berkeley’s Opto-Camp, can be imperative when *all* students experience a sense of being “lost” at such a large academic institution. This is surely compounded for FGC students who “enter a world where they are less likely to experience many of the conditions that other research indicates are positively related to persistence, performance, and learning” (Terenzini et al., 1996, p. 18).

Furthermore, Opto-Camp participants create virtual learning communities and supportive networks through Facebook groups; every cohort that has gone through the summer program has created its own associated Facebook group, and the participants continue to support each other by offering advice on prerequisite courses, bolstering the confidence of others through the application process to optometry programs as well as other health science programs, and stay connected as a network for life, which affirms the notion that peer-to-peer relationships sustain these students as they navigate applying, matriculating, and persisting in schools and colleges of optometry or other graduate programs.

This is aligned, too, with Weidman’s (1989) notion of academic and non-academic experiences being key to persistence and is echoed by a finding from the Biology Scholars Program at UC Berkeley; “We found repeated evidence in the interview transcripts, with African American students as well as with students from other racial and ethnic groups, that the Biology Scholars Program is viewed by these students as a crucially important bulwark of support as they

go through the demanding, and often discouraging, early premedical curriculum” (Barr & Matsui, 2008, p. 9).

Additionally, the commitment to engaging faculty as mentors, either through structured research projects or more informally through panel discussions, promotes career pathways. It has been well documented that encouraging high-risk students, who again are often FGC students, in undergraduate research projects not only helps develop problem-solving skills but can provide a bonding experience through forging student-faculty relationships (Volkwein & Carbone, 1994). In 2015, a highly proactive program was created at the University of California, Irvine. Called the First Generation Faculty Initiative, it aimed to help the entering freshmen, 60% who were identified as FGC students, make an easier transition to college life by connecting students to supportive mentors. From the Dean of Students at UC Irvine: “We wanted to do something that would really show how many faculty and students we have who were the first in their family to go to college...students can see their experiences are normal. They are not on their own” (Freeling, 2015, n.p.).

Particularly on the UC Berkeley campus, where prerequisite courses for health science majors are crowded and, for an FGC student, potentially daunting (Lunceford, 2011), these efforts towards retention at the undergraduate level and future promotion into a graduate school are indeed impactful. Additionally, because FGC students have what is termed an “accumulated disadvantage,” that is, a “lack of access to social and cultural capital that would have informed them of the importance of academic prestige” (Holley & Gardner, 2012, p. 88), Opto-Camp, as a preparatory program, means to level this disadvantage.

Finally, but of utmost significance are the opportunities to de-mystify the “Berkeley brand” and the cost associated with attending a program in the health professions. Prior to

attending this preparatory program, attendees self-report feelings of insecurity and anxiety about attending a program at UC Berkeley; Berkeley is far too prestigious for them to imagine attending someday for a doctoral degree in optometry or being able to even afford an advanced degree, regardless of whether at Berkeley or somewhere else. At the end of the program, they feel welcomed by the School of Optometry community at UC Berkeley, report being less intimidated about applying to our institution, and feel more confident about being able to finance an advanced degree due to the comprehensive “Financing Your OD Degree” workshop they attend, which helps them overcome the fear of incurring more debt, which is a typical barrier to FGC students pursuing post-undergraduate education.

While Opto-Camp has been lauded, there are obviously some skewed results given that the participants are motivated to attend a health professional program. As noted by Goss (2014):

The national focus on elite and other selective post-secondary institutions obscures the enormity of the positive work other institutions provide and undermines the valuable information they can share about successful strategies for first-generation college students...stated differently, we need to develop solutions for the 90 percent of the students who are not in the top 10 percent of the class (Goss, K. 2014, n.p.).

3.0 FGC STUDENTS IN OPTOMETRY PROGRAMS

As noted earlier, most FGC students are from an underrepresented population. Consequently, it is urgent that more of these students be encouraged to pursue professional degrees in the health sciences in order to improve care among disadvantaged populations. As Strayhorn (2000) observed, “Underrepresented minority physicians are more likely to provide medical care to minority, economically disadvantaged and sicker patients and to practice in physician-shortage areas where access to medical care is limited” (p. 355).

In Optometry, the total number of full-time students enrolled during academic year 2012-2013 was 6,555; the percentage of Black or African American full-time students was 3.1% and Hispanic/Latinos was 4.6%. American Indian/Alaskan Natives were not highlighted data in the 2012 report (Association of Schools and Colleges of Optometry, Annual Student Data Report, 2013). Unfortunately, aggregate data on FGC students isn’t included in these annual reports.

Data from the inaugural Optometry Admissions Test (OAT) newsletter in 2016 disclosed demographic information regarding OAT test-takers. The majority of test takers identified as White (59%), followed by Asians (35%) (Damari, 2016).

Over the past two decades, Berkeley Optometry has gradually transformed into a program that predominantly consists of students from a single ethnicity and gender group. During the five years between 2008 and 2012, 334 students entered the OD program; 79% were female, 67% were Asian, 16% were Caucasian, 6% were Hispanic, and 1% (4 students) were

African American. While the high percentage of female students is shared among optometry schools, the skew toward Asian students is more pronounced for Berkeley. Nationwide, in 2011, 64% of enrolled OD students enrolled in an OD program were female, 56% of enrolled students were Caucasian, and 28% were Asian (Association of Schools and Colleges of Optometry, 2011). Five years later, these numbers have remained constant; in the 2015-2016 ASCO Students Data Report, 67% of the pool was female, 54% were Caucasian, and 28% Asian (Association of Schools and Colleges of Optometry, 2016).

The lack of gender diversity has raised concerns for its impact on the optometry profession. There is a prevalent notion that female optometrists tend to prefer working in a retail setting that allows for schedule flexibility rather than opening their own practice. This could lead to fewer private practices nationwide as retail chains grow to dominate the industry, leading to a decline in perceived quality of service by customers (Arunkumar et al., 2012).

However, the lack of racial diversity, which is also a link to FGC status, is even more concerning. Cultural differences can create communication barriers between patients and doctors. The alarmingly few students from underrepresented communities could, in the long run, affect the overall ocular health of these groups. As summarized by a Berkeley Optometry African American alumna, “The quality of eye care eventually comes down to how effectively a doctor communicates with a patient. If there is a communication gap, it doesn’t matter how good the doctor’s technical expertise is, there will be problems either in executing the service or in patients following the instructions, and the service will fall apart” (Arunkumar et al., 2012, p. 4).

As optometry is one of the fastest growing professions in the United States, Berkeley Optometry’s admissions team and admissions committee are tasked with recruiting, matriculating, and graduating arguably the most competitive pool of optometrists in the nation.

Most schools and colleges of optometry utilize GPAs, OAT scores, and on-site assessments, such as interviews and essays, to predict admissibility and the ability to persist in optometric training (Craig et al., 2008).

In 2006, and again in 2008, teams of Berkeley Optometry students, as part of an OD thesis (*Predictors of Performance in Optometry School: A Study at the University of California, Berkeley* and *Predictors of Performance in Optometry School, A Study at the University of California, Berkeley, Part Two*), analyzed data from the classes of 2004 and 2005, and then from the classes of 2004 to 2007, to look at predictors of performance in this rigorous optometric training program. From the study in 2006:

Data analyzed included pre- and post-admissions criteria for the graduating classes of 2004 and 2005, these being the most complete data set available for analysis at the start of the study. Pre-admission criteria analyzed included GPA in prerequisite courses, OAT Academic Average scores, interview scores, and on-site essay scores. Post-admissions criteria analyzed were clinic GPA (grades received in clinic during the third and fourth year) as well as cumulative GPA (grades received during all four years of optometry school). Didactic GPA (grades in 'non-clinical courses') could not be included because these data were unavailable for analysis (Kang et al., 2006, p. 4).

In this study, the student researchers obtained statistically significant data validating the predictive power of pre-admissions criteria to optometry school with some slight positive correlation. Highest correlation to post-admission GPA, specifically cumulative GPA for the Class of 2005, was found when prerequisite GPA and the total science score on the OAT were combined. Combined scores on both pre-admission interviews yielded a significant correlation to a lesser degree to the clinic GPA for the Class of 2004. Positive correlation was also found

between prerequisite GPA, OAT score, interview score, and essay to clinic GPA for the Class of 2005 as well as essay score to cumulative GPA of the Class of 2004, but to a lesser degree. (Kang et al., 2006, p. 6).

A subsequent project examining Berkeley Optometry's admissions data was performed shortly thereafter with new findings:

Although the results of Part One demonstrated that the admissions process was in fact functioning correctly, Part Two of the study was initiated to determine if the results would remain true with a larger data set. Because the size of each incoming class is approximately sixty students, the previous study had a limited amount of data for analysis. (Craig et al., 2008, p. 2)

The data set used in the 2008 study included 224 Berkeley Optometry graduates from the classes of 2004-2007; the data set in 2006 included 109 graduates.

The results of the study conducted in 2008 added new insight into the admissions process and the selection of students:

Part Two revealed that the subjective components of candidate's profiles – the on-site essay and interview – are the strongest predictors for clinical GPA. This finding emphasizes the notion that it takes more than high test scores and GPA to succeed in optometry school. Oral and written communication skills, along with ethical values, and professionalism are some of the essential skills necessary in clinical settings that are not readily apparent in an applicant. (Craig et al., 2008, p. 8)

The University of Houston College of Optometry (UHCO) conducted three studies, published in *Optometric Education*, in 1985, 1990, and 1992, all concerned with predicting academic success. In 1985, the researcher concluded:

Preoptometry GPA, which provides the most comprehensive measure of intellectual achievement over time, was the best forecaster of GPA after two years at the UHCO. The conclusion is a well-documented one: past (academic) performance is the best predictor of future (academic) performance, as long as the predicted activity is similar to the past activities. (Kegel-Flom, 1985, p. 905).

This study also found correlations between academic success and how well the UHCO students performed on the standardized test for optometry school admissions (Optometry College Admissions Test/ OCAT) as well as results from the California Psychological Inventory (CPI). Kegel-Flom (1985) concluded:

The prediction of grades in optometry school, and indeed all professional schools, will derive from these three factors: preprofessional grades, standardized achievement test scores, and a quantitative measure of personal traits which relate to academic achievement. Whereas the exact weighting of each variable in a predictive equation depends upon the individual school, maximum predictive validity will be based upon these three factors. (p. 901)

Demographic information was not included as part of this study.

Kegel-Flom subsequently looked at data from 1981-1986 at UHCO to predict the academic performance of Asian, Black, and Hispanic optometry students. After looking at academic records for 567 students, there were some concerning results: “Academic drop-out rates for non-minority students was 4.6%; for Asian students, 15.2%; for Black students, 40%; and for Hispanics, 28.6%” (1990, p. 201). She went on to say:

Asian students, although academically similar to nonminority entrants, differed significantly in lower OCAT scores on verbal ability and in lower scores on the

personality inventory. These differences may help us understand why Asian students were overrepresented among academic drop-outs despite their strong academic qualifications, as a group, at entry...Black and Hispanic students scored significantly lower than Asian and nonminority students on nearly all academic ability and achievement measures at admission; thus, their overrepresentation in the dropout pool was not unexpected. Hispanic student dropouts had particularly low scores on OCAT physics, verbal ability, quantitative ability, and study/reading as well as low personality inventory scores. And, as a group, they had earned their undergraduate grades at less competitive institutions than did the average student. (pp. 211-212).

This study's discussion section advocated for remediation and deceleration programs to allow underrepresented students to persist in optometric degree programs.

Finally, in 1992, Kegel-Flom was interested in looking at leadership qualities and success in UHCO's program. Personality inventories of 269 students entering University of Houston College of Optometry (UHCO) from 1988 through 1990 were analyzed for personality type according to Gough's two-vector system (V1 = extroversion/introversion; V2 = norm-favoring/norm-doubting, which results in four types or life styles: Alpha, Beta, Gamma and Delta. Although some sex and ethnic differences were found {not statistically significant}, most (71%) optometry students were Alphas (extroverted/norm-favoring), accepted leaders who strive to maintain and advance consensual values. Alphas achieved well in classroom and clinic and were student leaders. A lesser number (10%), mostly women, were Gammas; extroverted but norm-questioning, Gammas can provide creative and progressive leadership. Remaining types were Betas (15%) and Deltas (4%), both introverted types who avoid leadership positions. (p. 991). This study found that at UHCO, students identified as Alphas received the highest

percentage of clinical accolades and awards and were more likely to be in student leadership roles within the program.

In 2013, after the advent and adoption of a centralized application service for all schools and colleges of optometry, “OptomCAS,” the Michigan College of Optometry (MCO) conducted a study looking at 37 variables calculated by the OptomCAS application and found that, in this order, these variables were the greatest predictors of grades over the four-year course of study at MCO as well as graduation: “1) OAT academic average score, 2) OAT reading comprehension score, 3) math GPA, 4) biology GPA, 5) undergraduate non-science GPA, 6) sophomore non-science GPA, 7) sophomore total GPA, and 8) junior non-science GPA” (Buckingham & Bush, 2013, p. 98).

While previous research efforts have been useful for examining the quantitative and qualitative factors that are predictors of success in optometric programs, the main findings all point to the same factors, OAT scores and undergraduate GPAs, as being the strongest predictors of success, academically and clinically. FGC status has never been a consideration in any of these studies. Given the rise of FGC students into post-secondary education, their rise into the health professions is inevitable and also poses newer (and potentially revised) conversations around what constitutes success as an optometry student. Also, unique to Berkeley Optometry is the highly Asian and highly female student population, which differs from previous studies that had demographic data that included more white and male optometry students.

4.0 METHODOLOGY

While the research projects in 2006 (Kang et al., 2006) and 2008 (Craig et al., 2008) were useful to the admissions committee at Berkeley Optometry and helped hone the overall review process into one that now has 13 independent evaluators providing insight into an applicant's candidacy, arguably the most holistic and thorough review process among all schools and colleges of optometry, there hasn't been a study conducted at the school, or within any other program, to assess how well FGC students fare as first-year students. Such a study can offer insight into how well underrepresented students perform and how well students who attended one of the handful of summer preparatory programs offered by some OD programs perform.

I received Institutional Review Board (IRB) approval in 2011 to conduct a comparative study examining data between FGC and non-FGC students. I also received internal approval at Berkeley Optometry from the former dean, Dr. Dennis Levi, who headed the departmental research review committee. The purpose of this study was to compare differences between FGC and non-FGC admissions profiles and their end-of-first-year performance at Berkeley Optometry for those in classes of 2011 to 2014.

This study considered applicant data, which were collected when the subjects initially applied to Berkeley Optometry. Specifically, their undergraduate prerequisite GPA and their OAT academic average score, AA, which averages scores among these subject areas: Biology, General Chemistry, Organic Chemistry, Reading Comprehension, Physics, and Quantitative

Reasoning and is part of the standardized testing required of all optometry school applicants.

Additionally, the names of the undergraduate institutions where the study participants received their degrees were collected and then assigned a “tier” as per the Carnegie Classifications of Institutions of Higher Education², using these subclassifications: *More Selective, Selective, and Inclusive*.

Table 1. Carnegie Classifications Tiers, using these subclassifications: More Selective, Selective, and Inclusive

FT4/I	Full-time four-year, inclusive	Inclusive
FT4/MS/HTI	Full-time four-year, more selective, higher transfer-in	More Selective
FT4/MS/LTI	Full-time four-year, more selective, lower transfer-in	More Selective
FT4/S/HTI	Full-time four-year, selective, higher transfer-in	Selective
FT4/S/LTI	Full-time four-year, selective, lower transfer-in	Selective
MFT4/S/HTI	Medium full-time four-year, selective, higher transfer-in	Selective

² The Carnegie Classification™ has been the leading framework for recognizing and describing institutional diversity in U.S. higher education for the past four decades. Starting in 1970, the Carnegie Commission on Higher Education developed a classification of colleges and universities to support its program of research and policy analysis. Derived from empirical data on colleges and universities, the Carnegie Classification was originally published in 1973, and subsequently updated in 1976, 1987, 1994, 2000, 2005, and 2010 to reflect changes among colleges and universities. This framework has been widely used in the study of higher education, both as a way to represent and control for institutional differences, and also in the design of research studies to ensure adequate representation of sampled institutions, students, or faculty.

Finally, as the literature indicates, FGC students are also more than likely to be from an underrepresented population; therefore, participants' self-reported racial identity, from their admissions application, is included.

In 2011, all current students at Berkeley Optometry, the classes of 2011, 2012, 2013, and 2014 (n=255) at that time, were asked to participate in this research study, which was supported by my department of employment, the Admissions and Student Affairs Office (ASAO). Participants were contacted during class and in person. Preempting the students' classes with prior permission from the instructor(s), I provided an explanation of the study to them (see Appendix B). The consent forms and surveys were then administered (see Appendix C and D).

The Class of 2011 was contacted during their Old Home Week, an event leading up to graduation, and also via email through the class listserv. Those who agreed to participate were instructed to reply individually to my email and attach their signed consent and survey. The survey asked all participants to disclose their parents' educational levels, if known, and also inquired if they had attended any preparatory programs designed to enhance their candidacy for admission to graduate school.

In 2008, when OptomCAS was launched, I was one of five on the steering committee to create the centralized application. This centralized, common application specifically asks if prospective optometry students are FGC students and, as schools and colleges of optometry are permitted to ask up to 10 supplemental questions, Berkeley Optometry asks applicants to share information regarding their preparation to attend the OD program at UC Berkeley. Thus, I already had access to relevant data (students' names, entering undergraduate GPA, parental higher educational attainment and if they attended any preparatory programs for graduate school studies) in individual student records as this information was collected through the OptomCAS

application and downloaded into our secured database.

Following IRB procedures, I requested consent from students in the classes of 2013 and 2014 to use information from their OptomCAS applications as well information from their UC Berkeley student records, specifically their first year Optometry GPAs. I also asked them to complete a consent form and corresponding survey.

For the Classes of 2011 and 2012, I collected students' names, parental higher educational attainment, and attendance at any preparatory programs for graduate school studies, as well as their consent to use information from their UC Berkeley student records and their first-year Optometry GPA. I also asked them to complete a consent form and the same survey that the Classes of 2013 and 2014 were asked to complete to ensure consistency across all four optometry classes. There wasn't a waiting period between informing the prospective participants about the study and obtaining consent, as this was a minimal impact study.

The data generated from the collected surveys from those who consented (names, FGC status, attendance at preparatory programs for graduate school studies, entering undergraduate prerequisite GPA, OAT AA score, undergraduate institution and tier, race and gender, and first-year Optometry GPA) were migrated into a secured Excel spreadsheet. Additionally, names were replaced and coded by a random number generator to ensure greater confidentiality.

I administered the in-person surveys during their normal class time with respective instructors' permission. Non-participating subjects were advised that they could work quietly on something else during the time allotted (5 minutes) to complete the survey. All subjects were asked to bring the survey to the front of the room after five minutes. For the Class of 2011, in addition to meeting in person, I sent an email via the class listserv requesting their participation and noted they would have a week's time to reply. School records indicated 255 who were

eligible to participate; I successfully gathered survey from 233 students (91.4% response rate).

The respondents were distributed as follows: for 2011: n= 53 (8 FGC), 1 declined to answer, so this participant's data were removed; 2012: n=59 (18 FGC); 2013: n= 55 (16 FGC), 1 declined to answer, so this participant's data were removed; 2014: n= 66 (19 FGC,) 3 declined to answer so the participants' data were removed. Additionally, five students had obtained their undergraduate degrees from outside of the United States and were removed from the study: Class of 2011, two students from Canada; Class of 2012, one student from China; Class of 2014, two students from Canada.

4.1.1 Study Respondents

As Table 2 indicates, there were 224 participants in this study, with 31% self-reporting as FGC students. In this demographic snapshot, 80% of the participants were female and the largest self-reported ethnicity was Chinese/Chinese American, 38%, followed by White/Caucasian at 17.9%; the smallest self-reported ethnic populations were American Indian/Native, Latino/Latino America, Polynesian/Pacific Islander and Puerto Rican, all were a n=1. Overall, underrepresented populations, which for this study were African American, American Indian/Native, Latino/Latino America, Mexican American, and Puerto Rican represented only 5.8% of the total population.

Responses from all four classes were fairly evenly distributed, with 22.3% respondents from the Class of 2011, 25.9% from the Class of 2012, 24.1% from the Class of 2013 and 27.7% from the Class of 2014. With regards to the participants' Carnegie Classification of their respective undergraduate institutions, a majority, 92%, of the students in this study attended a "More Selective" college or university to earn their Bachelor's Degree, with almost equal

representation between FGC and non-FGC students. Again, to simplify the Carnegie Classifications, six categories were collapsed into three tiers, using these subclassifications: “More Selective,” “Selective,” and “Inclusive.”

Of the 224 participants, 58%, reported taking an OAT preparatory class, which was again fairly divided between the groups, 54% of the FGC students and 59% of the non-FGC status students, respectively. A total of 21 students reported having attended the summer Opto-Camp program; 9.4% of the total population for this study attended Opto-Camp and eight were FGC students, thirteen were non-FGC status.

Comparison of undergraduate GPAs noted 3.48 ± 0.27 and 3.51 ± 0.30 for FGC versus non-FGC and showed no statistical difference ($p=0.25$).

Comparison of OAT AA scores noted 355 ± 0.18 and 360 ± 17 for FGC versus non-FGC and showed no statistical difference ($p=0.10$).

Comparison of end-of-year OD GPA as an overall indicator of first year academic performance noted 3.60 ± 0.28 for the FGC students compared to 3.63 ± 0.27 for non-FGC students and showed no statistical difference ($p=0.37$).

Table 2. Study Respondents: Demographic Results for the Classes of 2011-2014

	FGC	Non-FGC	ALL	<i>P Value</i>
N	70 (31.3%)	154 (68.8%)	224 (100.0%)	
Gender				
Female	54 (77.1%)	124 (80.5%)	178 (79.5%)	
Male	16 (22.9%)	30 (19.5%)	46 (20.5%)	
Ethnicity				
African American	2 (2.9%)	0 (0.0%)	2 (0.9%)	
American Indian/Native	0 (0.0%)	1 (0.6%)	1 (0.4%)	
Chinese/Chinese American	25 (35.7%)	59 (38.3%)	84 (37.5%)	
Declined to State	0 (0.0%)	5 (3.2%)	5 (2.2%)	

Table 2 (continued)

East Indian/Pakistani	0 (0.0%)	4 (2.6%)	4 (1.8%)	
Filipino/Filipino American	1 (1.4%)	7 (4.5%)	8 (3.6%)	
Japanese/Japanese American	1 (1.4%)	5 (3.2%)	6 (2.7%)	
Korean/Korean American	3 (4.3%)	8 (5.2%)	11 (4.9%)	
Latino/Latino American	0 (0.0%)	1 (0.6%)	1 (0.4%)	
Mexican American	4 (5.7%)	4 (2.6%)	8 (3.6%)	
Other	4 (5.7%)	8 (5.2%)	12 (5.4%)	
Other Asian	2 (2.9%)	7 (4.5%)	9 (4.0%)	
Polynesian/Pacific Islander	0 (0.0%)	1 (0.6%)	1 (0.4%)	
Puerto Rican	0 (0.0%)	1 (0.6%)	1 (0.4%)	
Vietnamese/Vietnamese America	19 (27.1%)	12 (7.8%)	31 (13.8%)	
White/Caucasian	9 (12.9%)	31 (20.1%)	40 (17.9%)	
Underrepresented Populations	6 (8.6%)	7 (4.5%)	13 (5.8%)	
Class Year				
2011	17 (24.3%)	33 (21.4%)	50 (22.3%)	
2012	18 (25.7%)	40 (26.0%)	58 (25.9%)	
2013	17 (24.3%)	37 (24.0%)	54 (24.1%)	
2014	18 (25.7%)	44 (28.6%)	62 (27.7%)	
Carnegie Classification Tier				
Inclusive	2 (2.9%)	1 (0.6%)	3 (1.3%)	
More Selective	65 (92.9%)	141 (91.6%)	206 (92.0%)	
Selective	3 (4.3%)	12 (7.8%)	15 (6.7%)	
OAT Review	38 (54.3%)	91 (59.1%)	129 (57.6%)	
Opto-Camp	8 (11.4%)	13 (8.4%)	21 (9.4%)	
Undergraduate GPA	3.48 ± 0.27	3.51 ± 0.30	3.50 ± 0.29	0.25
OAT Academic Average Score	355 ± 18	360 ± 17	358 ± 18	0.10

Data are mean ± SD, or n (%).

4.1.2 Statistical Methods

Because data were not necessarily “normally distributed” the data were analyzed using nonparametric methods. In comparing two groups such as FGC students and non-FGC students, a Chi-square analysis was used to compare nominal data such as ethnicity or participation in Opto-Camp and Fisher’s exact test used for comparison of interval or ordinal data. When comparing more than two groups, a Kruskal-Wallis statistic was used for the interval and ordinal data. For association between interval variables such as Undergraduate GPA versus OD GPA, or OAT AA Score versus OD GPA, a Spearman rank correlation was used rather than linear regression, as the data could not be assumed to be normally distributed. A P-value of <0.05 was considered significant for all statistical tests.

5.0 RESULTS

While the primary aim of this study was to compare academic performance of FGC and non-FGC students based on GPAs from the end of their first professional school year (see Table 2), the secondary aim was to examine the effects of gender, ethnicity, participation in pre-optometry preparatory programs, undergraduate GPA, undergraduate institutional selectivity, and OAT scores on end-of-year GPAs within these two populations.

In Table 3, the participants have been categorized based on their parents' educational attainment to align with the National Center for Education Statistics guidelines for defining a FGC student whereby "In cases where parents have different levels of education, the maximum education level of either parent determines how the student is categorized" (U.S. Department of Education, 1998, p. 7). FGC status here is applied when neither of the participants' parents had attended any college. "Mom" meant their mother attended college. If their father attended college, the participant was in the "Dad" category. If both parents were college educated, the participant was in the "Both" category, non-FGC. This analysis shows that 31% of the participants had parents who neither attended college (n=70), 6% had a mother who attended college (n=13) and 14% had a father who attended college (n=32). Almost half of the participants reported that both parents had attended college (n=109), 49%. Comparison of OD GPA as an overall academic performance of optometry academics noted no statistical difference among these four groups (p=0.63).

Table 3. Subanalyses Based upon Parents' Educational Attainment

	FGC	Mom Attended Some College	Dad Attended Some College	Both Parents Attended College	All
N	70 (31.3%)	13 (5.8%)	32 (14.3%)	109 (48.7%)	224 (100%)
Gender					
Female	54 (77.1%)	12 (92.3%)	26 (81.3%)	86 (78.9%)	178 (79.5%)
Male	16 (22.9%)	1 (7.7%)	6 (18.8%)	23 (21.1%)	46 (20.5%)
Ethnicity					
African American	2 (2.9%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	2 (0.9%)
American Indian/Native	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.9%)	1 (0.4%)
Chinese/Chinese American	25 (35.7%)	1 (7.7%)	11 (34.4%)	47 (43.1%)	84 (37.5%)
Declined to State	0 (0.0%)	0 (0.0%)	0 (0.0%)	5 (4.6%)	5 (2.2%)
East Indian/Pakistani	0 (0.0%)	0 (0.0%)	1 (3.1%)	3 (2.8%)	4 (1.8%)
Filipino/Filipino American	1 (1.4%)	3 (23.1%)	1 (3.1%)	3 (2.8%)	8 (3.6%)
Japanese/Japanese American	1 (1.4%)	0 (0.0%)	1 (3.1%)	4 (3.7%)	6 (2.7%)
Korean/Korean American	3 (4.3%)	0 (0.0%)	1 (3.1%)	7 (6.4%)	11 (4.9%)
Latino/Latino American	0 (0.0%)	1 (7.7%)	0 (0.0%)	0 (0.0%)	1 (0.4%)
Mexican American	4 (5.7%)	1 (7.7%)	2 (6.3%)	1 (0.9%)	8 (3.6%)
Other	4 (5.7%)	2 (15.4%)	0 (0.0%)	6 (5.5%)	12 (5.4%)
Other Asian	2 (2.9%)	2 (15.4%)	0 (0.0%)	5 (4.6%)	9 (4.0%)
Polynesian/Pacific Islander	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.9%)	1 (0.4%)
Puerto Rican	0 (0.0%)	0 (0.0%)	0 (0.0%)	1 (0.9%)	1 (0.4%)
Vietnamese/Vietnamese America	19 (27.1%)	0 (0.0%)	8 (25.5%)	4 (3.7%)	31 (13.8)
White/Caucasian	9 (12.9%)	3 (23.1%)	7 (21.9%)	21 (19.3%)	40 (17.9%)
Underrepresented Populations					
	6 (8.6%)	2 (15.4%)	2 (6.3%)	3 (2.8%)	13 (5.8%)
Class Year					
2011	17 (24.3%)	3 (23.1%)	6 (18.8%)	24 (22.0%)	50 (22.3%)
2012	18 (25.7%)	2 (15.4%)	13 (40.6%)	25 (22.9%)	58 (25.9%)
2013	17 (24.3%)	3 (23.1%)	7 (21.9%)	27 (24.8%)	54 (24.1%)
2014	18 (25.7%)	5 (38.5%)	6 (18.8%)	33 (30.3%)	62 (27.7%)

Table 3 (continued)

Carnegie Classification Tier					
Inclusive	2 (2.9%)	0 (0.0%)	1 (3.1%)	0 (0.0%)	3 (1.3%)
More Selective	65 (92.9%)	12 (92.3%)	27 (84.4%)	102 (93.6%)	206 (92.0%)
Selective	3 (4.3%)	1 (7.7%)	4 (12.5%)	7 (6.4%)	15 (6.7%)
OAT Review	38 (54.3%)	9 (69.2%)	18 (56.3%)	64 (58.7%)	129 (57.6%)
Opto-Camp	8 (11.4%)	3 (23.1%)	4 (12.5%)	6 (5.5%)	21 (9.4%)
Undergraduate GPA	3.48 ± 0.27	3.51 ± 0.30	3.50 ± 0.29	0.25	
OAT Academic Average Score	355 ± 18	360 ± 17	358 ± 18	0.10	
OD GPA	3.60 ± 0.28	3.63 ± 0.27	3.62 ± 0.27	0.37	

Data are mean ± SD, or n (%).

In Table 4, irrespective of FGC status, subanalyses were performed of OD GPA based on gender, self-reported ethnicity, underrepresented populations, class year, Carnegie Classification Tier, OAT review (attending an OAT prep course), and attendance at Opto-Camp. Within these data sets, self-reported ethnicity (p=0.04), Carnegie classification (p=0.01), abbreviated Carnegie classification (p=0.001), and attendance at Opto-Camp (p=0.04) were all significant and associated with a lower OD GPA.

Table 4. OD GPA Compared to Study Factors

	Mean \pm SD (n)	N	<i>P Value</i>
Gender			0.47
Female	3.61 \pm 0.28 (178)	178 (80%)	
Male	3.65 \pm 0.24 (46)	46 (20.5%)	
Ethnicity			0.04
African American	3.59 \pm 0.00 (2)	2 (0.9%)	
American Indian/Native	3.98 \pm N/A (1)	1 (0.4%)	
Chinese/Chinese American	3.66 \pm 0.24 (84)	84 (37.5%)	
Declined to State	3.62 \pm 0.29 (5)	5 (2.2%)	
East Indian/Pakistani	3.54 \pm 0.32 (4)	4 (1.8%)	
Filipino/Filipino American	3.54 \pm 0.50 (8)	8 (3.6%)	
Japanese/Japanese American	3.76 \pm 0.20 (6)	6 (2.7%)	
Korean/Korean American	3.71 \pm 0.18 (11)	11 (4.9%)	
Latino/Latino American	3.44 \pm N/A (1)	1 (0.4%)	
Mexican American	3.40 \pm 0.22 (8)	8 (3.6%)	
Other	3.38 \pm 0.34 (12)	12 (5.4%)	
Other Asian	3.59 \pm 0.27 (9)	9 (4.0%)	
Polynesian/Pacific Islander	3.91 \pm N/A (1)	1 (0.4%)	
Puerto Rican	3.67 \pm N/A (1)	1 (0.4%)	
Vietnamese/Vietnamese America	3.55 \pm 0.26 (31)	31 (13.8%)	
White/Caucasian	3.66 \pm 0.25 (40)	40 (17.9%)	
Underrepresented Populations			0.07
Yes	3.50 \pm 0.25 (12)	12 (5.4%)	
No	3.63 \pm 0.27 (212)	212 (95%)	
Class Year			0.17
2011	3.57 \pm 0.34 (50)	50 (22.3%)	
2012	3.58 \pm 0.24 (58)	58 (25.9%)	
2013	3.67 \pm 0.23 (54)	54 (24.1%)	
2014	3.65 \pm 0.26 (62)	62 (27.7%)	

Table 4 (continued)

Carnegie Classification Tier			0.001
Inclusive	3.25 ± 0.11 (3)	3 (1.3%)	
More Selective	3.64 ± 0.26 (206)	206 (92%)	
Selective	3.42 ± 0.29 (15)	15 (6.7%)	
OAT Review			0.13
Yes	3.59 ± 0.29 (129)	129 (57.6%)	
No	3.65 ± 0.24 (95)	95 (42.4%)	
Opto-Camp			0.04
Yes	3.52 ± 0.24 (21)	21 (9.4%)	
No	3.63 ± 0.27 (203)	203 (91%)	

Since the number of underrepresented students within this study was low, in Table 5, another analysis was run comparing two groups: the *majority groups*, (Group 2), which were Chinese/Chinese American, Japanese/Japanese American, Korean/Korean American, Vietnamese/Vietnamese American, and White/Caucasian (n=172), compared to the *minority groups*, (Group 1) composed of those students who self-identified as African American, American Indian/Native, Declined to State, East Indian/Pakistani, Filipino/ Filipino American, Latino/Latino American, Mexican American, Other, Other Asian, Polynesian/ Pacific Islander, and Puerto Rican (n=52). When the data were grouped this way, 77% of the participants fell into the majority group, while 23% of the participants fell into the minority group.

Comparison of undergraduate GPAs revealed 3.49 ±0.31 and 3.50 ±0.29 for Group 1 versus Group 2 and showed no statistical difference (p=0.97). Comparison of OAT AA scores revealed 3.50 ±0.19 and 3.61 ±0.17 for Group 1 versus Group and showed a statistically significant difference (p=0.0005). Comparison of end-of-year OD GPA as an overall indicator of

first-year academic performance revealed 3.52 ± 0.233 for Group 1 compared to 3.65 ± 0.24 for Group 2 students and showed a statistically significant difference ($p=0.009$).

Table 5. Data Based on Two Groups: Minority and Majority

	Minority Group	Majority Group	ALL	<i>P Value</i>
N	52 (23.2%)	172 (76.8%)	224 (100.0%)	
Gender				0.33
Female	44 (84.6%)	134 (77.9%)	178 (79.5%)	
Male	8 (15.4%)	38 (22.1%)	46 (20.5%)	
Ethnicity				
African American	2 (3.8%)	0 (0.0%)	2 (0.9%)	
American Indian/Native	1 (1.9%)	0 (0.0%)	1 (0.4%)	
Chinese/Chinese American	0 (0.0%)	84 (48.8%)	84 (37.5%)	
Declined to State	5 (9.6%)	0 (0.0%)	5 (2.2%)	
East Indian/Pakistani	4 (7.7%)	0 (0.0%)	4 (1.8%)	
Filipino/Filipino American	8 (15.4%)	0 (0.0%)	8 (3.6%)	
Japanese/Japanese American	0 (0.0%)	6 (3.5%)	6 (2.7%)	
Korean/Korean American	0 (0.0%)	11 (6.4%)	11 (4.9%)	
Latino/Latino American	1 (1.9%)	0 (0.0%)	1 (0.4%)	
Mexican American	8 (15.4%)	0 (0.0%)	8 (3.6%)	
Other	12 (23.1%)	0 (0.0%)	12 (5.4%)	
Other Asian	9 (17.3%)	0 (0.0%)	9 (4.0%)	
Polynesian/Pacific Islander	1 (1.9%)	0 (0.0%)	1 (0.4%)	
Puerto Rican	1 (1.9%)	0 (0.0%)	1 (0.4%)	
Vietnamese/Vietnamese America	0 (0.0%)	31 (18.0%)	31 (13.8%)	
White/Caucasian	0 (0.0%)	40 (23.3%)	40 (17.9%)	
FGC	13 (25.0%)	57 (33.1%)	70 (31.3%)	0.31

Table 5 (continued)

College/FGC				<0.0001
FGC	13 (25.0%)	57 (33.1%)	70 (31.3%)	
Mom	9 (17.3%)	4 (2.3%)	13 (5.8%)	
Dad	4 (7.7%)	28 (16.3%)	32 (14.3%)	
Both	26 (50.0%)	83 (48.3%)	109 (48.7%)	
Class Year				0.62
2011	10 (19.2%)	40 (23.3%)	50 (22.3%)	
2012	12 (23.1%)	46 (26.7%)	58 (25.9%)	
2013	16 (30.8%)	38 (22.1%)	54 (24.1%)	
2014	14 (26.9%)	48 (27.9%)	62 (27.7%)	
Carnegie Classification Tier				0.60
Inclusive	0 (0.0%)	3 (1.7%)	3 (1.3%)	
More Selective	48 (92.3%)	158 (91.9%)	206 (92.0%)	
Selective	4 (7.7%)	11 (6.4%)	15 (6.7%)	
OAT Review	30 (57.7%)	99 (57.6%)	129 (57.6%)	1.0
Opto-Camp	6 (11.5%)	15 (8.7%)	21 (9.4%)	0.59
Undergraduate GPA	3.49 ± 0.31	3.50 ± 0.29	3.50 ± 0.29	0.97
OAT Academic Average Score	350 ± 19	361 ± 17	358 ± 18	0.0005
OD GPA	3.52 ± 0.33	3.65 ± 0.24	3.62 ± 0.27	0.009

Data are mean ± SD, or n (%). Comparison by chi-square or Fisher's exact test, or Wilcoxon Rank Sum.

Finally, I examined the correlation of undergraduate GPA and OAT AA Score with OD GPA. Undergraduate GPA had a significant positive correlation ($r=0.33$) with OD GPA ($p=.0001$). OAT AA score also had a significant positive correlation ($r=0.38$) with OD GPA ($p=.0001$).

Table 6. OD GPA Correlations

	Mean \pm SD, or r	N	<i>P</i> Value
Undergraduate GPA	0.33	224 (100.0%)	< 0.0001
OAT Academic Average Score	0.38	224 (100.0%)	< 0.0001

Analysis by Wilcoxn Rank Sum, Kruskal-Wallis, or Spearman rank correlation.

6.0 DISCUSSION

Based upon a sampling of Optometry students from the Classes of 2011 through 2014, there was no significant difference in academic performance based on FGC status, as indicated by the end-of-year GPA for first-year students. Additionally, there was no significant difference in academic performance, as indicated by underrepresented population status ($p=.07$). However, there may have been a difference in this latter finding with a larger sample size, which is a possibility that underscores the larger issue of preparing and recruiting underrepresented students to the profession of optometry.

Admission to Berkeley Optometry is highly competitive. Thus, as in the 2006 (Kang et al., 2006) and 2008 (Craig, et al., 2008) OD thesis studies, the prerequisite GPAs and OAT scores of the incoming students were very similar and quite strong, particularly when compared to the overall applicant pools in those particular admissions cycles. For example, in the Fall of 2010, there were 274 applicants and the average GPA of those prospective students applying to Berkeley Optometry was a 3.34, whereas for admitted students, the average GPA was a 3.45. Nationally, of the 14 schools and colleges of optometry reporting OAT AA scores, the average was a 3.09 (Association of Schools and Colleges of Optometry, 2010-2011).

Table 6 shows Berkeley Optometry's applicants for the classes of 2011-2014.

Table 7. Admissions Data, Classes of 2011-2014

	Applicants	Interviews	Acceptances	Matriculants	Average GPA	Average AA OAT
2011	191	121	69	61	3.50	373
2012	246	124	78	66	3.53	361
2013	273	129	77	67	3.55	363
2014	274	122	83	67	3.45	352

Overall, OAT scores and undergraduate GPAs were significantly correlated with Optometry GPAs at the end of the students' first year in the professional degree program, which reaffirms the predictive validity of standardized tests and undergraduate GPAs as predictors of success (Kuncel & Hezlett, 2007; Mitchell, 1990), and also it replicates the findings of the earlier studies from 2006 and 2008.

Despite a small number of students (n=21) who attended Opto-Camp, having been part of this preparatory program was associated with a lower optometry GPA. It's possible that these optometry students, with whom some of the admissions committee members were familiar as prospective students, were granted more favorable admissions status (Mitchell, 1990). This finding also highlights the holistic review process used by the committee. While attending Opto-Camp did not provide a big advantage in end-of-year GPA for the participants, having attended the program certainly was not a disadvantage to them. If anything, it helped level the playing field for these FGC students.

While this study is encouraging in that FGC students performed just as well as non-FGC students, future studies on Berkeley Optometry students also need to consider the nature of this distinct academic population, which is highly Asian and highly female, and the impact of these demographics as related to FGC status (Gurin et al., 2002; Hirschman & Wong, 1986).

Moreover, unlike other studies of graduate students who were formerly FGC students, our population has a very limited number of students who are parents or who work full-time in addition to attending their optometric studies. The optometry program is a full-time course of study; there isn't an option of attending part-time.

Over half of the FGC students did take an OAT prep course, which could indicate a high level of motivation and investment and/or a high level of test anxiety and apprehension; future studies that capture information regarding standardized testing preparatory courses should ask if the subjects received a fee waiver to assess the impact of such programs on entrance and success in health professional programs. Research shows that “the utility and value of commercial test preparation courses in medicine have not been demonstrated, and that evaluation apprehension in the medical profession and aggressive marketing practices are most likely responsible for commercial course prosperity” (McGaghie et al., p. 203). At our Opto-Camp program, we have vacillated between having representatives from a test preparation company give presentations on taking the OAT to not including them in the program. Some of the participants reported an appreciation for learning more about study techniques and hearing about the fee waiver program the company offers, while others reported that these presentations have been too much of a “sales pitch.”

Other limitations from this study include a relatively small sample size and the homogeneity of students in Berkeley Optometry's program. Overall, FGC students were only 31% of the group and underrepresented students were only 5.4%. This project wasn't a randomized trial, rather a narrow study of an elite program. While this assertion does not diminish this research study, it does emphasize the need for a larger longitudinal study. By expanding to a multi-institutional study, in partnership with other schools and colleges of

optometry that host summer preparatory programs for FGC students, limitations from this study could be mitigated and allow for a more meaningful subanalysis for comparison of FGCs to non-FGCs.

Furthermore, the OptomCAS's centralized admissions applicant service is in its eighth year and since FGC status is collected, a wealth of data remains untouched regarding the success of FGC students at gaining admission into OD programs and the outcomes when they are admitted.

Overall, there is such a lack of scholarship pertaining to FGC students who have been accepted into post-undergraduate studies that it raises the possibility of an assumption that these students have negotiated the problems they faced as undergraduate students, negating further study. If further studies are pursued, it would be useful to have a term that better defines this category, such as *Former First-Generation College (FFGC)*, which is more appropriate and descriptive.

Finally, the measures used to look at FGC students and, when applicable, FFGC students, often investigate deficiencies in their preparation and look for "traditional" measures of success. It would be useful instead to look at metrics that measure the impact of factors critical to success in the health professions: resilience as a predictor of persistence as well as personality characteristics, such as empathy, both of which are critical for those who aspire to be in the health professions, like optometry.

APPENDIX A

OPTO-CAMP DETAILS

- Participants must be enrolled for the fall at an accredited four-year college or university, or a junior college.
- Preferential consideration will be given to those applicants who will be entering into their senior year of college, then to those who will be juniors, and then to those who will be sophomores.
- We also consider applications from those who have already completed their undergraduate studies so that “non-traditional” students are also able to participate.
- Out-of-state prospective Opto-Campers are welcomed and encouraged to apply.
- A declared, or anticipated, major in the Sciences is preferred, but not required.
- Preferential consideration will be given to applicants who are the first in their family to pursue post-high school education.
- Preferential consideration will also be given to applicants who have a 2.8, or higher, cumulative GPA.

Finally, financial aid information and/or parental information, when applicable, is collected with the objective of providing scholarships for those candidates who are economically disadvantaged – Pell grant recipients are given the highest consideration.

APPENDIX B

PITT STUDY SCRIPT

Study Scripts

In-person explanation by PI to the Classes of 2012, 2013 and 2014, and the survey administered in students' classes with prior permission from the Instructor to interrupt class for the first five minutes. Email sent to the Class of 2011, via the class listserv, and administered in-person during Old Home Week (a week of planned activities leading up to Graduation).

Classes of 2013 and 2014:

"Good morning, students. As some of you may know, I am completing my doctoral degree through the University of Pittsburgh, in Pittsburgh, Pennsylvania. My research is focused on first-generational students and their rise into graduate school. Specifically, the purpose of this study is to compare differences in admissions profiles and subsequent academic progression through UC Berkeley's School of Optometry.

I will compare GPAs of those who have already been identified as first-generation college students, as per your OptomCAS application to Berkeley Optometry, versus those who did not identify as first-generation college students and also compare academic performance, as per your first year Berkeley Optometry GPAs in the OD program.

Although my position as the Director of Admissions and Student Affairs already affords me access to this information, it would be inappropriate for me to conduct research utilizing your personal information without your consent. Therefore, I am asking for your consent to collect and use data such as your name, parental higher educational attainment and if you attended any preparatory programs for graduate school studies, as well as your Optometry GPA.

If you agree to participate, please complete the consent form that I will pass out momentarily and the corresponding survey.

There is little risk involved in this study. The major potential risk is a breach of confidentiality, but I will do everything possible to protect your privacy by migrating all

collected data into a secured database to be accessed only by myself and all participants' names will be recoded as numbers determined by a random number generator. The survey data will be retained for a minimum of seven years.

Furthermore, your identity will not be revealed in any description or publications of this research. Results will not be shared with your instructors or University administrators, and will have no effect on your standing at this University. It is possible that authorized representatives from the University of Pittsburgh Research Conduct and Compliance Office (including the University of Pittsburgh IRB) may review your data for the purpose of monitoring the conduct of this study. In very unusual cases, your research records may be released in response to an order from a court of law.

Your participation in this study is completely voluntary, even after signing the consent form. You may refuse to take part in the study, or choose to voluntarily withdraw, prior to data analysis, which in that case, your information will be removed from the data set. Your decision will not affect your relationship with the School of Optometry. If you choose not to participate, simply return the consent form and survey blank when I call time after 5 minutes."

Classes of 2011 and 2012:

"Good morning, students. As some of you may know, I am completing my doctoral degree through the University of Pittsburgh, in Pittsburgh, Pennsylvania. My research is focused on first-generational students and their rise into graduate school. Specifically, the purpose of this study is to compare differences in admissions profiles and subsequent academic progression through UC Berkeley's School of Optometry.

I will compare entering undergraduate GPAs of those who identify as first-generation college students, versus those who are not and also compare academic performance, as per your first year Berkeley Optometry GPAs in the OD program.

Although my position as the Director of Admissions and Student Affairs already affords me access to some of this information, it would be inappropriate for me to conduct research utilizing your personal information without your consent. Therefore, I am asking for your consent to use information from a survey I will distribute momentarily that will collect your name, parental higher educational attainment and if you attended any preparatory programs for graduate school studies, as well as access to your undergraduate entering and first year Optometry GPAs.

If you agree to participate, please complete a consent form and the corresponding survey that I will pass out momentarily.

There is little risk involved in this study. The major potential risk is a breach of confidentiality, but I will do everything possible to protect your privacy by migrating all collected data into a secured database to be accessed only by myself and all participants' names will be recoded as numbers determined by a random number generator. The survey data will be retained for a minimum of seven years.

Furthermore, your identity will not be revealed in any description or publications of this research. Results will not be shared with your instructors or University administrators, and will have no effect on your standing at this University. It is possible that authorized representatives from the University of Pittsburgh Research Conduct and Compliance Office (including the University of Pittsburgh IRB) may review your data for the purpose of monitoring the conduct of this study. In very unusual cases, your research records may be released in response to an order from a court of law.

Your participation in this study is completely voluntary, even after signing the consent form. You may refuse to take part in the study, or choose to voluntarily withdraw, prior to data analysis, which in that case, your information will be removed from the data set. Your decision will not affect your relationship with the School of Optometry. If you choose not to participate, simply return the consent form and survey blank when I call time after 5 minutes."

E-mail to Class of 2011:

"Dear Class of 2011.

Congratulations again on your recent Graduation!

As some of you may know, I am completing my doctoral degree through the University of Pittsburgh, in Pittsburgh, Pennsylvania. My research is focused on first-generational students and their rise into graduate school. Specifically, the purpose of this study is to compare differences in admissions profiles and subsequent academic progression through UC Berkeley's School of Optometry.

I will compare entering undergraduate GPAs of those who identify as first-generation college students, versus those who are not and also compare academic performance, as per your first year Berkeley Optometry GPAs in the OD program.

Although my position as the Director of Admissions and Student Affairs already affords me access to some of this information, it would be inappropriate for me to conduct research utilizing your personal information without your consent. Therefore, I am asking for your consent to use information from a survey, attached to this message, that will collect your name, parental higher educational attainment and if you attended any preparatory programs for graduate school studies, as well as access to your Optometry GPA.

If you agree to participate, please complete a consent form and the corresponding survey, both pieces are attached as one document. Please return these items within a week's time from today's date.

There is little risk involved in this study. The major potential risk is a breach of confidentiality, but I will do everything possible to protect your privacy by migrating all collected data into a secured database to be accessed only by myself and all participants' names will be recoded as numbers determined by a random number generator. The survey data will be retained for a minimum of seven years.

Furthermore, your identity will not be revealed in any description or publications of this research. Results will not be shared with your instructors or University administrators, and will have no effect on your standing at this University. It is possible that authorized representatives from the University of Pittsburgh Research Conduct and Compliance Office (including the University of Pittsburgh IRB) may review your data for the purpose of monitoring the conduct of this study. In very unusual cases, your research records may be released in response to an order from a court of law.

Your participation in this study is completely voluntary, even after signing the consent form. You may refuse to take part in the study, or choose to voluntarily withdraw, prior to data analysis, which in that case, your information will be removed from the data set. Your decision will not affect your relationship with the School of Optometry. If you choose not to participate, simply disregard this message from me. If I do not hear back from you within a week's time, I will assume that you have chosen not to participate."

APPENDIX C

PITT CONSENT FORM

CONSENT TO ACT AS A SUBJECT IN A RESEARCH STUDY

TITLE: First-Generation College Students Progression Into Graduate School

PRINCIPAL INVESTIGATOR: Sharon T. Joyce, Department of Administrative and Policy Studies, Graduate Student, University Of Pittsburgh, School Of Education, sharon_joyce@berkeley.edu, 415.377.2483

FACULTY MENTOR: John C. Weidman, Professor of Education and of Sociology, University Of Pittsburgh, School Of Education, Department of Administrative and Policy Studies, 5910 Wesley W. Posvar Hall, Pittsburgh, PA 15260, weidman@pitt.edu, 412.648.1772

The purpose of this study is to compare differences in admissions profiles and subsequent academic progression through UC Berkeley's School of Optometry. I will compare entering undergraduate GPAs of those who are first-generation college students, versus those who are not and also compare academic performance (first year Berkeley Optometry GPAs) in the OD program of all who agree to participate in this project; students/graduates in the Classes of 2011, 2012, 2013 and 2014 will be asked to participate in this research study.

If you agree to participate, you will complete a brief survey that will take less than five minutes to complete. The survey will ask you to disclose your parents' educational levels, if known, and also ask if you attended any preparatory programs designed to enhance your candidacy for admission to graduate school. While this information was already collected for the Classes of 2013 and 2014 through the OptomCAS application, it would be inappropriate for me to use information gathered from OptomCAS applications without prior consent. Therefore, I am asking all participants to complete the same consent form and survey to ensure consistency across all respondents. Additionally, as I plan to use entering undergraduate GPAs and first year Optometry GPAs as part of my data analysis, I am further asking for the consent of all participants to use these individual GPAs.

There is little risk involved in this study. The major potential risk is a breach of confidentiality, but I will do everything possible to protect your privacy. All information pertaining to your involvement in this study will be kept confidential and data from those who have agreed to participate (name, class year, entering undergraduate GPA as per your application record, parental higher educational attainment, if you attended any preparatory programs for graduate school studies and your first year Optometry GPA), will be migrated into a password protected Excel file that only I will have access. Additionally, participants' names will be replaced and coded by a random number generator to ensure greater confidentiality and again, only I will have access to the coded names in another password protected Excel file.

Furthermore, your identity will not be revealed in any description or publications of this research. Individual results will not be shared with your instructors or University administrators, and will have no effect on your standing at this University. It is possible that authorized representatives from the University of Pittsburgh Research Conduct and Compliance Office may review your data for the purpose of monitoring the conduct of this study. In very unusual cases, your research records may be released in response to an order from a court of law.

Your participation in this study is completely voluntary, even after signing the consent form. You may refuse to take part in the study, or choose to voluntarily withdraw, prior to data analysis, which in that case, your information will be removed from the data set. Your decision will not affect your relationship with the School of Optometry. If you choose not to participate, simply return the consent form and survey blank.

There are no costs to you for participating in this study, and you will receive no direct benefit from participating in this study. When my research has concluded, a copy of my dissertation will be available for review at the School of Optometry Fong Library.

If you have questions about this research study, you may contact the investigators listed at the beginning of this consent form. If you have questions about your rights as a research subject, please contact the Human Subjects Protection Advocate at the University of Pittsburgh IRB Office, 1.866.212.2668.

SUBJECT'S CERTIFICATION

- I have read the consent form for this study and any questions I had, including explanation of all terminology, have been answered to my satisfaction. A copy of this consent form will be provided to me.
- I understand that I am encouraged to ask questions about any aspect of this research study during the course of this study, and that those questions will be answered by the researchers listed on the first page of this form.
- I understand that my participation in this study is voluntary and that I am free to refuse to participate or to withdraw my consent and discontinue my participation in this study at any time without affecting my future relationship with this institution. To withdraw your consent, simply email Sharon Joyce at sharon_joyce@berkeley.edu and your collected data will be removed from the study prior to data analysis.
- I agree to participate in this study.

Subject's Printed Name

Subject's Signature

Date

APPENDIX D

PITT SURVEY

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • MERCED • RIVERSIDE • SAN DIEGO • SAN FRANCISCO



SANTA BARBARA • SANTA CRUZ

First-Generation College Students Progression Into Graduate School

Survey Questions

Subject's Printed Name

Graduation Year

Have your parents graduated from a four-year college or university?

- Yes, my **mother** graduated from a four-year college or university.
- No, my **mother** did not graduate from a four-year college or university.
- Information unknown.

- Yes, my **father** graduated from a four-year college or university.
- No, my **father** did not graduate from a four-year college or university.
- Information unknown.

Have you attended any preparatory programs designed to enhance your candidacy for admission to graduate school?

Undergraduate Programs

- Biology Scholars Program (BSP)
- Illinois College of Optometry, Focus on Your Future
- OAT Review Course, Kaplan
- OAT Review Course, Other

Please List: _____

- The Ohio State University, I-DOC
- Pacific University, InSight
- Science, Technology, Engineering, and Mathematics Education Program
- Stanford Summer Health Careers Opportunity Program (SSHCOP)
- University of California, Berkeley, School of Optometry, Opto-Camp
- The University of Houston, Texocop Summer Program
- Other, please list: _____

High School Programs

- Faces for the Future
- National Student Leadership Conference (NSLC)
- National Youth Leadership Forum (NYLF)
- Upward Bound
- Other, please list: _____

Figure 1. Pitt Survey

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