

An Evaluation Study of the Biomedical Careers Program at Robert Wood Johnson Medical School

By

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AN EVALUATION STUDY OF THE BIOMEDICAL CAREERS PROGRAM

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Abstract

Problem

The Biomedical Careers Program (BCP) began 35 years ago at Robert Wood Johnson Medical School as an effort to provide a pipeline to medical school for students from racial, ethnic, and economic groups that are underrepresented in medical careers. Over the years, the program has expanded to include preparation for admission to a wide variety of health professions careers, but the primary purpose was and continues to be preparation for matriculation into medical school. This evaluation is the first empirical study of the medical school matriculation outcomes of the BCP program and will provide a foundation for further exploration and program improvement.

Sample

The evaluation study looks at the medical school enrollment outcomes for 456 students who are receiving support from the Educational Opportunity Fund of New Jersey and applied for admission to the BCP program from 1990-2010.

Research Questions

1. Do medical school matriculation outcomes vary for EOF students based on BCP attendance?
2. Do medical school matriculation outcomes for EOF students who applied to BCP vary based on race and gender?

Methodology

The research design was a quasi-experimental retrospective examination of documentary data on the medical school matriculation outcomes of EOF students who applied to BCP, were accepted and either enrolled in BCP or declined admission. This data was collected over the life

of the program as part of the ongoing tracking of academic outcomes for the applicants to the program. Additional information about student outcomes was obtained from the National Student Clearinghouse. The analysis was conducted using descriptive and regression model statistical methods.

Findings

The study showed that Black and Hispanic women who attended the program matriculated into medical school at a statistically significantly larger percentage than those who did not attend BCP. Medical school matriculation outcomes for Black and Hispanic males were not statistically significant. Medical school matriculation outcomes were lower for males from racial categories of White, Asian and Other that attended BCP. Limitation of sample size and parameters of the study affected the results since the study looked at medical school matriculation rate and not medical school acceptance rate.

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Dedication

This dissertation is dedicated to faith that sustained me and to family and friends, who gave untiringly of their encouragement and support. My husband Joe, who always helped me to see the long term goals and not the short term problems; my daughter Nia, son Michael and granddaughter Madison who frequently reminded me how proud they were of my endeavor; my friends Joan, Kathy and Toni who pushed me forward when I wanted to quit because they “knew I could do it”. Words cannot express my gratitude for your help, support and love.

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Introduction

I must confess. I am a product of the 1960's. I was a black, female child growing up in Appalachia where my educational options were limited by the poverty that surrounded me. By participating in Great Society educational programs designed to provide access to education for poor and minority children, I found a pathway to college, to a career and ultimately to administering educational access programs. The history of the civil rights movement and the expansion of educational opportunity is my story and my commitment to equal opportunity has continued throughout my professional career. I began working with an access to medical school program, the Biomedical Careers Program (BCP), 24 years ago and over the years I have seen many students with backgrounds similar to mine reach their educational goals. I have also seen the systematic dismantling of opportunity programs and pronouncements that programs to ensure access are wasteful and ineffective.

Although I am committed to educational access, I am skeptical that all educational programs designed to provide opportunity actually have done what they were intended to do. I also am skeptical of the criticism that all opportunity programs are a waste of public and private funding. To assess the effectiveness of the program I work in, I have conducted an outcome evaluation study of the Biomedical Careers Program at Robert Wood Johnson Medical School. I have used a quantitative research design to examine the medical school matriculation outcomes for former participants and non-participants and explore the variation in outcomes based on demographic characteristics of gender and race.

Chapter One: Problem Statement

Social History of Enrichment Programs

At the dawn of the 20th century, medical education was undergoing a radical shift from a collection of unstandardized, mediocre efforts to a model with a formal, analytic curriculum that derived from scientific inquiry. In a landmark 1910 report commissioned by the Carnegie Foundation for the Advancement of Teaching, Abraham Flexner, a Carnegie scholar, researched the deficiencies in existing medical education and proposed sweeping changes that have continued to be the framework for successfully training physicians (Irby, Cooke, & O'Brien, 2010).

Flexner's legacy also reflected the prevailing prejudice of the day through his recommendation that Black students were intellectually inferior and unfit to be physicians (Flexner, 1910). This not only restricted the aspirations of students desiring to enter the medical profession, but also adversely affected support for medical schools at Historically Black Colleges and Universities (HBCU), which were the primary pathway for Black students to pursue medical training. During the next 50 years, the number of medical schools at HBCUs declined from 7 to 2. In addition, admission standards were developed at majority-serving universities that limited educational and career opportunities for Black, Hispanic and American Indian students. By 1960, Black students made up only 2.2 percent of the medical student population, while Mexican Americans, Mainland Puerto Ricans and Native Americans comprised less than 0.2 percent of the medical student population (Sullivan & Mittman, 2010). From 1990-2010, the mean percent of accepted Black students was 3.5 percent and 1.02 percent for Hispanic students (American

Association of Medical Colleges, 2012). Year by year counts of applicants and admissions are found in Appendices E and F.

During the civil rights era of the 1960's, the American Association of Medical Colleges (AAMC) and civil rights organizations lobbied for more racial and ethnic diversity in the physician population. During the same period, health care policy advocates warned of an impending shortage of health care providers to treat the growing population in the United States. To address these issues, the 1963 Health Professions Education Assistance Act (PL 88-129) was passed to amend Title VII of the Public Health Services Act to authorize federal funding for the development of programs to increase the number and racial diversity of the pool of physicians, dentists and other health care professionals. Part of this funding was allocated to support the Health Careers Opportunity Program (HCOP) to provide grants to develop programs to increase diversity in their student population (Reynolds, 2008; Strelnick et al., 2008).

History of the Biomedical Careers Program

The Biomedical Careers Program (BCP) began 36 years ago at Robert Wood Johnson Medical School as an effort by three female scientists to provide a pathway to medical school for motivated, bright minority and financially disadvantaged students. The program grew from 7 students in a single class to a three-level program with 6 classes serving 40 students by the time I was hired 10 years later. Over the years, the program has expanded to include preparation for admission to a wide variety of health professions careers, but the primary purpose was and continues to be preparation for allopathic and osteopathic medical school acceptance. Since inception, 1388 BCP students have participated in the program, 439 are physicians and 79 are in

medical school (Robert Wood Johnson Medical School (2013) *Program tracking database. Piscataway, New Jersey: Office of Multicultural Affairs and Special Academic Programs*).

There have been revisions in the operation of the program. From 1979 to 2006 the program was 8 weeks long with 75 students. In 2007 the duration was reduced to 6 weeks, and enrollment was lowered to 50 students.

The program was funded by a combination of federal HCOP, NJ EOF and private foundation grants from 1979 until 2011. After the loss of federal grant funding in late 2011, Robert Wood Johnson Medical School assumed support of the program as part of their efforts to increase diversity in the medical student population.

Part of the success of the program is in the ongoing collection of student outcome data. This tracking system has developed from the early years of the program when phone calls and inquiries were made about the academic progress of a few students to the current computerized tracking data base that holds records from all past and present pipeline programs for over 2000 pre-college, college and graduate students. The academic and career progress of former students is followed for 15 years after their attendance. Student records are stored in a secure MS Access database containing information on college graduation and post graduate admission status as well as graduate degrees completed and current employment. The majority of students' records are from those who participated in the undergraduate Biomedical Careers Program.

Even with this long history and extensive collection of historical data, the program has never been formally evaluated. Although grant reports were prepared for funders and anecdotal evidence of the program's effectiveness was frequently cited, there has not been an empirical

examination of the enrollment and outcome data that has been collected over the years about the characteristics and educational outcomes of former participants.

The program is designed to be a pipeline to graduate education. It is designed for students to build skills over participation in a summer program for one, two or three years. However, this strategy has not been examined to determine how many students follow the pipeline and how their graduate admission rates compared to the graduate admission rates of equally qualified students who were admitted to BCP but did not attend. This study is the first empirical examination of admission outcomes for participants and non-participants in the BCP. Since the program was originally designed for educationally and economically disadvantaged students, this study is limited to the outcomes of students who were eligible for funding from the NJ Educational Opportunity Program.

Theoretical Framework of the Biomedical Careers Program

The framework of the Biomedical Careers Program theorizes that through participation in targeted enrichment programs designed to deliver academic and social preparation for medical school, students who have been disadvantaged by poverty will be more likely to apply and be accepted to medical school. The methods employed in the program are based on empirical research about the target populations and factors that influence their motivation, persistence, and social engagement and the assessments of health care disparities in the U.S. and the practice patterns of minority physicians (Komaromy, M., et al. 1996).

The program is designed to enhance academic skills through six week previews of sciences courses that include lectures, small group work and laboratory experience. These courses help to strengthen social engagement with peers and with the Robert Wood Johnson

Medical school community by providing opportunities for interaction through learning communities and mentoring. Students also develop an understanding of medical practice and its impact on the health of the medically underserved through informational clinical seminars and discussions and direct observation of health care delivery in a urban setting (Cohen, Gabriel &Terrell, 2002). The logic model for the program is presented in Appendix A.

Academic foundation of BCP.

The program is divided into 3 levels to meet the needs of students at different points in their college careers. Students may attend the program sequentially for 3 years or enter at any level. As a result, we have attendance variations of 1, 2, or 3 years. To be able to meet the differing needs of students the prerequisite courses are associated with years of college attendance and are designed to match the premedical course progression in most undergraduate colleges. The pre-requisite years of college and courses completed are explained in Figure 1.

BCP Levels	College Years Completed	College level courses completed
Level 1	1 year	1 semester- Biology or Chemistry 1 semester- college math or statistics
Level 2	2 years	2 semesters Biology lecture and lab /or microbiology lecture and lab 1 semester Organic Chemistry, preparing to take graduate admissions tests
Level 3	3 years	Genetics, Physics, preparing or have taken graduate admission tests

Figure1. Program Levels and Prerequisites

Eligibility for BCP.

From 1978 to 2000, eligibility for the program was determined by under-represented racial/ ethnic group identification. The American Association of Medical Colleges (AAMC) defined the racial/ethnic groups that were under-represented in medicine (URM) nationally in proportion to their percentage in the population as being Black, Puerto Rican Mainland, Mexican or Chicano, Alaskan Native or Inuit and American Indian or from families having incomes at or below the poverty level as set by the USDA. In 2000, the AAMC's definition of under-representation was changed to allow each medical school to determine the racial, ethnic or economic group that was under-represented in their local area. The Admissions committee at Robert Wood Johnson Medical School has continued to use the previous guidelines to determine URM status as these groups have continued to be under-represented in New Jersey. In 2000 all HCOP programs were advised to eliminate race as a category, preferring to determine eligibility based on educational or economic disadvantage. For purposes of admission to BCP, students who resided in Abbott or disadvantaged schools districts as determined by the NJ Department of Education or were eligible for support from the NJ Educational Opportunity Fund Program (EOF) are eligible. EOF eligibility requirements are in Appendix B.

Admission process for BCP.

Students apply to the program from January to March of the program year. The process consists of an application form to collect student's demographic, family and educational history. The student is asked to submit transcripts from all colleges attended. If the student has completed less than one year of college at time of application, the high school transcript is required. An essay and 2 references are also required.

After being reviewed for completeness and eligibility, the completed application is sent electronically to two members of the admission committee for independent review. The reviewer rates the application based on academic qualification and likelihood to benefit from the program.

The review scale is: High Priority Accept

1. Low Priority Accept/wait list
2. Discuss
3. Reject

The review sheets are submitted to the Office of Special Academic Programs where they are sorted based on review and placed on the admission committee agenda. If the two reviewers agree, the committee votes to accept the reviewers' recommendation. If the reviews do not agree or if one or both reviewers requests discussion, the application is discussed and a final decision is made. Students are notified of the committee's action and asked to decline or accept the offer of a place in the program. If placed on the wait list, students are given an approximate date when they can expect to be offered a place in the program.

BCP Population.

From 1990-2010, 2097 students applied to the Biomedical Careers Program. Their application and enrollment status is explained in Table 1.3.

Table 1

<u>BCP Applicants by EOF Status</u>			
<u>Status</u>	<u>%Non-EOF</u>	<u>% EOF</u>	<u>Total</u>
Completed applications	65	35	2097
Rejected applications	14	4	407
Enrolled Applicants	38	25	1335
Withdrawn/Waitlisted Applicants	10	4	313
Late or incomplete applications	01	05	41

Note. Source: (Robert Wood Johnson Medical School (2013) *Program tracking database*. Piscataway, New Jersey: Office of Multicultural Affairs and Special Academic Programs).

Research Questions

This study was conducted with a quantitative research design to evaluate the medical school enrollments outcomes of a subset of students attending the Biomedical Careers Program over a 20 year period. The medical school enrollment outcomes of former BCP participants have been statistically compared with the outcomes of students who were accepted to the program but did not attend because they declined admission or where placed on the waiting list. The study focused on undergraduate students who are eligible for support through the Educational Opportunity Program (EOF). The research questions are:

1. Do medical school matriculation outcomes vary for EOF students based on BCP attendance?
2. Do medical school matriculation outcomes for EOF students who applied to BCP vary based on race and gender?

A quantitative design was used since this evaluation is an observational study of the effects of treatment (BCP attendance) on the outcome of matriculation into medical school. Since the study employed a non-randomized sample selection, a two- step statistical analysis was used to control for bias.

Limitations

This study is an examination of previously collected data of the medical school enrollment outcomes from EOF applicants to the Biomedical Careers Program. The scope of the study is limited to the subset of students who were in EOF programs however, this was a small sample of the program's most academically vulnerable students and represents the most consistent economic indicator of financial disadvantage that could be examined over 20 years. Nonetheless, the findings demonstrate the long term effectiveness of the program for disadvantaged students. Over the twenty year period examined, social and economic mobility has increased the number of the minority applicants from middle and higher economic classes, while educational attainment for students who are poor and minority has increased at a much lower rate. The program was designed to help educationally and economically disadvantaged students and is focused on the outcomes for those students.

The study is also limited by the information provided in historically collected data. The purpose of the tracking system was to collect outcome data for funders and organizational supporters who were seeking to increase the number of students who matriculated and graduated from medical school. As a result, data was collected on medical school matriculation outcomes, not application or acceptance status.

Importance of the study

This study represents the first empirical examination of the outcomes of the program for disadvantaged students. In the past, the evaluations of the program were limited to survey data that was collected each year from students. Data from faculty about their assessment of curriculum and student progress was collected through exit interviews at the end of the program. This data was used in planning for future programs but the bottom line data about the outcomes has not been examined. The data provided in this study will serve as the basis for continued evaluation of the program effectiveness for all BCP students.

Definition of Terms

Since this study is examining the medical school matriculation outcomes for EOF students who applied to BCP it is important to differentiate the acceptance categories that will be discussed. Students who applied to BCP, were reviewed, approved for admission, offered admission and attended the program are referred to as enrolled students. Students who applied to BCP, were reviewed, approved for admission, offered admission but declined the offer are referred to as withdrew. Students who applied, were reviewed, approved for admission but were not offered a place due to lack of space in the program are referred to as wait-listed. Students, who applied to medical school, were accepted and began their medical education as first year students are referred to matriculates. This terminology to describe entry into medical school as matriculation is consistent with the terminology used by the American Association of Medical Colleges (AAMC). Comparisons of medical school matriculation outcomes for BCP/ EOF students with national matriculation outcomes are based on medical school matriculation data for

students with similar demographic characteristics from data from the AAMC Diversity in Medical Education: Facts & Figures 2012(Association of American Medical Colleges, 2013).

Chapter Two: Review of Literature

Introduction

This literature review will examine the empirical research that supports the use of pipeline programs to enhance admission to medical school, the educational attainment issues for the population to be studied and the strategies employed in the program to assist these students to prepare for medical school. What has been learned from previous evaluation studies of similar programs and the ways in which this research will build on their recommendations for further study is discussed in the methodology chapter.

Pipeline Programs to Increase Minority/Disadvantage Student Access to Medical School

Pipeline programs are one of the most utilized strategies to address the issue of access to medical education by underrepresented groups. These programs are based on the idea that a coordinated series of educational enrichment interventions for minority and low income youth will assist them to become competitive applicants to medical and health professions schools. A wide variety of pipeline intervention programs exist, from those that target elementary students with additional help in science and math, to programs that offer post-baccalaureate study for college graduates who applied unsuccessfully to medical schools (Grumbach & Chen, 2006). Numerous studies conducted about the outcome results of the pipeline programs sponsored by the Health Careers Opportunity Program and Minority Medical Education Program have shown that enrichment pipeline programs have had a positive association with increased medical school acceptance (Strayhorn, 1999b; Carline, Patterson, & Davis, 1998).

Grumbach (2006) conducted a retrospective cohort study that examined the admission outcomes of five University of California post-baccalaureate premedical programs and found

that students from disadvantaged and under-represented minority groups participating in this enrichment program had a higher probability of being accepted and enrolled in medical school. Sixty-six percent of the students participating in the program were accepted into medical schools as compared to 22.5 percent of the control students. Strayhorn & Demby (1999) examined the negative effects on medical school admissions by the successful challenges to affirmative action in the mid- 1990s. By looking at the percent of change in first year enrollment of the minority students before and after the challenges, he was able to conclude that schools with premedical enrichment programs were more likely to experience positive changes in the numbers of minority and disadvantaged students than were those schools without enrichment programs. While this may indicate the commitment to diversity associated with sponsoring enrichment programs, the results do support the notion that enrichment programs help students prepare to be competitive medical school applicants and can help to retain diversity in medical school admissions even with less than optimum societal support.

In a commentary published in the journal of the Minnesota Medical Association, Skorin (2013) builds a case for the positive contribution of diversity programs to society, students and medical and health professions schools. Drawing from data supplied by the U.S. Department of Health and Human Services centralized data base, he found that 70 percent of students participating in HCOP programs were accepted into medical professional schools and former HCOP participants are 10 times more likely to practice in areas that are medically underserved. He concludes that these programs have been successful in increasing diversity in the health professions.

While many programs differ in their focus, the overarching strategy of pipeline programs is to provide academic enrichment and to support mentorship with the goal that students will

increase their feelings of self-efficacy, persistence and motivation to continue their education. To examine the empirical support for this strategy we must first look at the issues effecting educational attainment for disadvantaged and minority students.

Racial/Ethnic Categories and Educational Attainment

The racial and ethnic classification of the students considered to be minority by Robert Wood Johnson Medical School follows the guidance provided by the AAMC and is based on the percentage of physicians from a racial, ethnic or socio-economic category compared to their percentage of the US population. The current categories that are considered under-represented in medicine (URIM) are: Black, Hispanic ethnicity regardless of race, Native American, Alaskan Native and Pacific Islander. The economic classification for under-representation is a family income at or below the U.S. poverty level. In addition to these categories the Biomedical Careers Program accepts those students having attended schools in New Jersey Abbott Districts or districts designated disadvantaged by the NJ State Department of Education. This evaluation focused on studies examining the educational challenges specifically facing Black and Hispanic students as compared to their white and Asian counterparts. Research that looked at the educational challenges faced by students at or below poverty was also included since students from these racial and income groups are more likely to have lower educational attainment and more difficulty being admitted to medical school (Association of American Medical Colleges, 2013; Harper, Patton, & Wooden, 2009; Jolly, 2008). From 1987-2005, not only had median family income of medical school students doubled, but the percentage of students from the highest income groups had grown from 48.1 percent to 56.9 percent (Jolly, 2008).

The pathway from college to medical school is long, arduous and highly competitive requiring preparation for many years before reaching the application process. Minority and poor students are often at an academic disadvantage due to inadequate primary and high school preparation in science and math. The lack of a strong foundation in the sciences can cause students to question their ability. Minority and disadvantaged students are also more likely to drop out of an undergraduate pre-medical curriculum due to doubting their ability. This lack of confidence can limit student persistence (Alexander, Chen, & Grumbach, 2009). Research has shown the strength of the high school preparation for higher level science courses as important and performance in high school science courses is one of the most reliable predictors of medical school acceptance (Butler, 2011). In addition to lower academic readiness and higher dropout rates, minority/disadvantaged students are also more likely to attend more than one undergraduate school prior to application to medical school (Allen, 1999; Nora & Cabrera, 1996). Poor students or students from the targeted racial groups who have attended multiple undergraduate schools also tend to have lower MCAT scores. Studies conducted by AAMC have shown that these students are more likely to have a lower rate of medical school acceptance (Grbic & Garrison, 2012).

Minority students are more likely to be poor and are also more likely to have attended sub-standard schools staffed by inexperienced teachers (Darling-Hammond, 2000). Even minority students from more affluent backgrounds may still face difficulty in undergraduate and graduate school due to issues of social class and barriers to upward mobility (Cole & Omari, , 2003). Although there may be multiple reasons affecting the aspirations of students of color and poor students, the disparity is clear and can be seen in the lower numbers of students of color applying and matriculating into medical school. An analysis of the 2011 U.S. medical school

class shows only 2percent of the applicants were Native American and 48 percent of these applicants were accepted; 8 percent of the applicants were Black and 40 percent of them were accepted and 6 percent of applicants were Hispanic and less than 30percent were accepted. As for students who matriculated, the numbers of Black, Hispanic and Native American students combined made up only 15 percent of the total population of incoming medical students. (Association of American Medical Colleges, 2013)

The primary strategy to increase diversity in medical education has been through programs that provide educational and social enrichment to minority high school and undergraduate students (Shields, 1994; Strayhorn, 1999a). These programs are usually offered by medical schools and are part of their pipeline approach to minority recruitment. In the 2012 report on diversity in medical education, the AAMC recommended that the disparity in enrollment be addressed through more support of effective pipeline programs (Association of American Medical Colleges, 2013). Since pipeline programs provide academic and social preparation for medical school, it is important to examine the empirical evidence that supports this strategy.

Motivation, Persistence and Academic Achievement

Significant research has been done on the effect of motivation and effort on educational attainment however, less work has looked at motivation as being predictive of educational outcomes specifically for Black and Hispanic students in undergraduate settings (Allen, 1999). Even less study has focused on factors that specifically effect outcomes for minority students in medical school. As a result, scholars must rely on contemporary theories of personal identity and social and cultural capital to explain the experiences of minority and disadvantaged students

as they develop the desire to practice medicine and the skills to complete the curriculum (Greenhalgh, Seyan, & Boynton, 2004).

Since eligibility for medical school requires a college degree and since the students attending the program to be evaluated are undergraduates, it is important to examine the factors that affect motivation and academic achievement in college. Research has shown that student mindsets about the ability to learn have an effect on their achievement (Dweck, 2010; Allen, 1999). Students who believe in their ability to master a topic are more likely to persist in their search for solutions when faced with obstacles in developing a skill (Elliott & Dweck, 1988) as contrasted with the behavior of students who believe they lack the ability to learn (Dweck, 2010). Unfortunately, many of the early educational experiences of minority and disadvantaged students have reinforced the notion of deficit ability through lower expectations of achievement and lower quality instruction (Cooper, 2003; Darling-Hammond, 2000; Tettgah, 1996). This deficit model also affects student perceptions about their academic suitability for medical school and their social acceptability in a professional school environment (Greenhalgh et al., 2004).

Academic assistance while an undergraduate has been shown to have a positive effect on persistence and motivation for minority students. In addition, even poor academic performance prior to college can be ameliorated with appropriate interventions in college (Tinto, 1987; Allen, 1999). Academic improvement can help increase student's feeling of efficacy and can increase persistence in the face of obstacles. Academic preparation and the mastery of tasks promote the development of attitudes and behaviors that permit students to choose effective problem solving strategies that support their feelings of self-efficacy (Elliott & Dweck, 1988).

Offering the most useful courses to minority students in enrichment programs is also important. Even though Black, Hispanic and financially disadvantaged students show the same interest in medicine as their non-minority peers, they often have poor academic performance in the medical school gateway courses of higher level biology, chemistry and calculus as well as the prerequisites for these courses. This lower academic performance frequently results in their dropping out of the pre-medical curriculum. However, minority and disadvantaged students who complete four or more of these gateway courses have higher rates of persistence to medical school (Alexander et al., 2009). Many of the health professions preparatory programs concentrate on science gateway courses or their prerequisites while others focus on reading, communication and test taking skills (Carline et al., 1998). The Biomedical Careers program includes both previews in prerequisite and gateway sciences course as well as verbal reasoning and test taking instruction.

Academic improvement does not stand alone in affecting student persistence. In a study examining the motivation of white and non-white college freshman, Allen found that non-minority student persistence was related strongly to high school academic rank while minority students reported the non-academic component of desire to finish college as the primary driver of persistence (Allen, 1999). For these reasons, academic preparation must be coupled with the non-academic components of social engagement, learning communities and mentoring.

Social Engagement, Learning Communities and Mentoring

Research on motivation and goal formation has shown that the process of developing an educational goal and the motivation to achieve it is not as simple as once thought (Warikoo & Carter, 2009). Motivation is affected not only by academic skill development but also by a wide

variety of social forces. Student motivation has been shown to be influenced by beliefs about their social affiliation, approval and responsibility (Dowson & McInerney, 2003). This is also supported by research on how minority and disadvantaged students see themselves functioning in a medical school environment and its importance in their desire to attend medical school. Minority/disadvantaged students' perceptions of their ability to fit in at medical school will affect their aspirations. If they perceive medical school as being unattainable or only for those who are culturally different, they will choose not to pursue the goal of attending (Cooper, 2003; Greenhalgh et al., 2004) but students who perceive the medical school environment to be accepting are more likely to persist with their educational aspirations to attend (Pittman & Boggiano, 1992).

Minority and disadvantaged students can become more comfortable with the medical school environment through opportunities for social engagement and interaction with peers and mentors (Baker & Velez, 1996). For these reasons, the Biomedical Careers Program relies on social interaction to foster the feeling of belonging and efficacy through the use of peer interaction in learning communities and through the interaction with medical students, medical school faculty and physician mentors.

Learning is a social process that involves the personal interaction both in and out of the classroom (Bransford, 2000) and the peer social engagement of learning can be enhanced by involving students in learning communities in pre- medical preparation programs (Carline et al., 1998). Although research on learning communities in higher education is less common than in elementary and secondary schools, Tinto's (2003) research supports the idea that college students involved in learning communities tend to spend more time together and are more engaged in and out of classroom learning activities. Students participating in college learning

communities had more positive perceptions of their learning environment and these perceptions were a stronger predictor of graduation outcomes than previous academic achievement (Lizzio, Wilson, & Simons, 2002). In a prospective survey evaluation of learning communities at the University of Iowa Roy J. and Lucille A. Carver College of Medicine (UICCM), Rosenbaum Schwabbauer & Krieter (2007) found learning communities in medical school contributed to a more positive assessment of the institutional climate as well as promoted communication, networking and collaboration between students and faculty. While most students perceived benefits from participating in learning communities, the younger students were more likely to find involvement in them to be difficult due to the heavy academic load in the first year of medical school. However, acceptance of the communities grew over time and as students became more accustomed to the academic pace they found learning communities to be useful (Rosenbaum, Schwabbauer, & Krieter, 2007).

Learning communities for minority and disadvantaged students in some colleges are formed by block scheduling that allows groups of students to take a sequence of courses together. In an undergraduate residential setting, time constraints can be addressed by out of classroom activities in housing as well as through project based classroom instruction (Tinto, 2003). Learning communities are encouraged in the Biomedical Careers program through block scheduling and small group assignments as well as through study sessions that occur with medical student mentors during and after class activities.

Mentor relationships have been shown to have a specific positive effect on the persistence and success of minority and disadvantaged students and mentor experiences are frequently included in preparatory programs (Carline, Patterson, Davis & Irby, 1998; Crisp & Cruz, 2009). These relationships are an effective way to lessen the feelings of isolation often felt

by minority students in predominately white institutions and can assist with student adjustment by giving minority students the opportunity to interact with role models that share their racial and ethnic backgrounds. Cross cultural mentoring is also important and most likely to happen in majority institutions that have a commitment to cultural diversity (Bensimon, 2005). When cross cultural mentoring is incorporated in a school's cultural competency educational programs, these activities can promote trust and feelings of acceptance for minority students (Grant-Thompson & Atkinson, 1997). While older student and peer mentors are important in combating isolation and promote feelings of acceptance, it is also important for minority students to have the opportunity to develop mentor relationships with faculty and physicians in a variety of clinical and academic settings (Kreuter et al., 2011). In a study of programs designed to recruit minority students in the health professions, the authors found that although presentations from senior scientists were impressive, students desired to meet more entry level health professionals and those in clinical practice. In addition to the positive influence of mentors from range of clinical specialties, students benefit from multiple levels of mentorship at different stages of their academic careers. The comfort with seeking mentors throughout their careers can be enhanced by the mentorship experiences in an undergraduate enrichment programs (Kreuter et al., 2011).

The Biomedical Careers Program provides mentorship opportunities through the interaction of participants with medical student teaching assistants, faculty instructors and clinical mentors. Cross cultural and same cultural mentorships is encouraged by the commitment of the medical school and through the active recruitment of an occupationally and racially diverse pool of mentors and instructors.

Awareness of Health Care Issues

Although the goal of the pre-medical preparatory programs is not to relegate minority and disadvantaged students to caring only for poor and minority patients, it is important to recognize that physician practice patterns show that minority physicians of all socio-economic backgrounds are more likely to treat minority patients as a result of practice location and patient preference (Saha & Shipman, 2008). Studies have also shown that patient trust and satisfaction improve when their providers are of similar racial and linguistic background (Sullivan & Mittman, 2010; Komaromy et al., 1996). The consideration of the practice patterns of minority physicians is important given that the assessments of the U.S. healthcare system have shown that health care is unevenly available to people based on racial and socio-economic factors. Black and Hispanic people from all SES backgrounds and poor people regardless of race or ethnicity have difficulty obtaining high quality health care. Fewer physicians are accessible in minority neighborhoods and even in more affluent areas where care is accessible many physicians are inexperienced in treating patients from diverse cultural backgrounds (Fiscella & Williams, 2004).

A disparity in commitment to minority health between practitioners of different racial and ethnic groups is supported by the self-reported practice intentions of medical students. The American Association of Medical Colleges' report on Diversity Medical Education suggests that the commitment to patient care in underserved areas is disproportionately held by Black and Hispanic students. Fifty-four percent of Black students and 36 percent of Hispanic students reported they planned to practice in underserved areas as compared to 21 percent of White students and 19 percent of Asian students (Association of American Medical Colleges, 2013).

The importance of diversity in the medical workforce has resulted in efforts of medical and health profession schools to provide improved access to the underserved and to broaden the research agenda to include a variety of points of view and life experiences to help find solutions to healthcare problems and to ensure the optimal management of the healthcare system (Cohen, Gabriel, & Terrell, 2002). Diversity in the workforce is seen to improve the overall problem solving capacity of teams in medicine and research by offering unique points of view about the cultures of the patients (Page, 2008). Student and curriculum diversity in medical education is also seen to strengthen the educational process, as well as the institution providing the education and the patient care available in their affiliated clinical sites (Association of American Medical Colleges, 2013).

In response to health care disparities, increasing numbers of medical schools are moving toward a curriculum that supports culturally competent health care that includes knowledge of the culture, language and environment experienced by their patients (Cohen et al., 2002). As a result, the admissions process at many medical schools including at Robert Wood Johnson, involves assessing a potential applicant's knowledge of health care issues both from the scientific base of treatment but also from the awareness and comfort with discussing health care issues affecting underserved communities.

As part of the Biomedical Careers Program, students are taught about the health care disparities that exist in minority and underserved communities as well as participate in on-site clinical shadowing experiences to observe health care delivery in medically underserved areas. This effort is designed to prepare students for the medical school admission process and to inform them about the importance of providing culturally competent healthcare as physicians.

Chapter Three: Methodology

This section will explain the literature that shaped the research design, the components of the design, data collection and analysis and the elements of design used for validity.

Research base for the design

The selection of the research design used in this evaluation study is guided by the scholarly work of Rossi, Freeman & Lipsey (2003) who suggested that regular outcome monitoring can be the basis for developing measures for evaluation and that outcome indicators should be used to examine the program effects on the population receiving the services for the measures to be reliable and valid. The outcomes measures of medical school matriculation were used to examine program effects on students from demographic groups that traditionally had lower rates of medical school admission. By using data from a twenty year period, the study was able to examine the overall effectiveness of the program.

Quantitative design was used to examine student outcomes because it was supported in the literature as having been used frequently to examine program effectiveness in pipeline programs. Tekian & Hruska (2010) reviewed medical school records from 1990-94 at the University of Illinois at Chicago College of Medicine to look at the outcomes of former pipeline students and their success in completing the first step of medical licensure, the USMLE-step1 as well as the incidences of academic difficulty during medical school. This study found that students from pipeline programs had higher rates of passing the USMLE and fewer academic difficulties than those with similar MCAT scores who did not participate in pipeline programs. Pipeline programs were also examined quantitatively by Cantor, Bergeisen & Baker (1998) in a non-concurrent prospective cohort study of medical school admission rates for 8 medical schools

participating in the Minority Medical Education Program (MMEP). The Minority Medical Education Program is funded by Robert Wood Johnson Foundation and administered by the American Association of Medical Colleges (AAMC) to increase the likelihood of medical school acceptance for disadvantaged and under-represented minority students. The study found that participation in the MMEP increased the probability of medical school acceptance for the participants and concluded that participation in intensive summer education is a strategy that can be used to increase diversity in the medical school student population and ultimately, the physician workforce. Grade point average (GPA) data was also examined quantitatively by Skorkin (2009) in a prospective cohort study of college students participating in the federally funded Health Careers Opportunity Programs at four California State University campuses to determine the potential effect on students participating in the program intervention. Their research found that students participating in these programs are more likely to have a Grade Point Average (GPA) of 3.0 or better than the students in the control group who did not participate in the HCOP programs. Since most medical schools require a GPA of 3.0 or better for applicants, this finding supports the notion that HCOP program intervention is helpful in preparing students for medical school.

A small scale study that looked at the admission outcomes at Florida State Medical School for students participating in the Florida State University Undergraduate Science Students Together Reaching Instructional Diversity and Excellence (USSTRIDE) found that program participation was associated with increased medical school acceptance rates for Black and Hispanic students. The authors examined the MCAT scores, grade point averages and medical school acceptance rates for these students. Although MCAT scores were lower for the program

students in USSTRIDE, their medical school acceptance rate was higher (Campbell, Berne-Anderson, Wang, Doremeus, & Rodriguez, 2014).

From a leadership perspective, the focus on student outcomes is supported by research on ways to improve the management of enrichment programs through organizational systems in medical schools. This organizational research suggests the need to analyze the impact of the program on the students so they can be supported within the medical school environment (Murphy & Redden, 1982).

This study was an internal evaluation. Patton (2002) discusses the challenges facing internal evaluators and suggests that internal evaluation is usually considered a leadership function in organizations and that it requires the management of relationships between staff and administrators. Written approval to use previously collected outcome tracking data was secured from my immediate supervisor, the Assistant Dean for Student Affairs, at Robert Wood Johnson Medical School and he also followed the progress of the evaluation. Permission to examine student records was obtained from the Rutgers Institutional Review Board (IRB).

Merriam (1998) suggests that documentary evidence is advantageous because it is stable, objective and unobtrusive. Creswell (2013) cites the work of Glazer and Strauss (1967) as noting that analysis of documentary evidence is also helpful in building theory, which will be helpful when trying to look at outcomes in relation to program goals. By using documentary data for students participating and not participating in the Biomedical Careers Program, this study provided an examination of the outcome results for a previously unexamined cohort of the Biomedical Careers Program students.

Research design

The research design was quasi-experimental and focused on the demographic subset of students participating in New Jersey EOF programs at their undergraduate institutions. The goal was to quantitatively compare the medical school matriculation outcomes for BCP participants and similarly qualified non participants. While a randomized control study is best to assess the effect of an educational intervention, in a field setting control group and experimental group assignment is often impossible, but quasi-experimental studies can yield as much information as control group experiments if proper attention is paid to matching subjects from each group during the analysis (Gall, Gall & Borg, 2010). Therefore this design used regression analysis to compare medical school matriculation outcomes of students who attended BCP with those who applied, were accepted and did not attend. This method is useful in lessening bias inherent in non-randomized observational studies.

The admission process in BCP prevents random assignment. Students decide if they will apply to attend and their acceptance is based on the admission committee's determination of their potential to benefit from the program. The admission criteria for each level of BCP and the admission process are described on pages 7-8. The program admission guidelines are in appendix C and the admission committee reviewer rating sheet is in appendix D. Since all students in this study have met the academic and SES pre-requisites for BCP enrollment and have been determined to have potential to be accepted to medical school and to benefit from attending the program, a comparison of their medical school matriculation outcomes can be made. The experimental group was composed of students who were accepted and attended BCP and the control group was composed of students who were accepted but did not attend. Medical school matriculation outcomes for all EOF students who applied to BCP from 1990-2010 was the

dependent variable and the demographic characteristics of race/ethnicity and gender were the independent variables used to compare outcomes for Black and Hispanic students with those of the total group.

Sample Selection

There were changes made in the sample selection from the dissertation proposal to the final evaluation study. Sample size presented a problem since the proposed study would use the medical school enrollment outcomes for only Black and Hispanic students. This selection would have resulted in a sample of 244 students who attended BCP and 58 students who did not. Such a sample size would not have been sufficient to have statistically significant results. After consultation with a committee member and review of studies that had been conducted on similarly small samples of students in pipeline program, it was determined to increase the sample size by including all EOF students applying to the program from 1990-2010. This change in the sample selection increased the number to 291 enrolled students and 165 who were admitted but did not attend for a total of 456 students. While it is possible for students to have attended the program 3 times, only the outcomes for the students during their first exposure to the program were examined. The sample included data on the first exposure for 170 EOF students who attended the program more than once. The data did not include information for 6 applicants for whom application and participation records could not be verified.

Previous outcome tracking has shown that it is not unusual for minority and financially disadvantaged students to delay medical school application for at least 6 months to a year after graduation from college. This finding is supported by research that found in 2011, 61 percent of Black students and 59 percent of Hispanic students entering medical school delayed application

so they could work between college graduation and entry into medical school (Association of American Medical Colleges, 2013). Medical school matriculation outcomes are more likely to be captured for those students who delayed application by looking at results over 20 years. By limiting the research to financially disadvantaged students using EOF as the criteria; this study was able to look at the effectiveness of the program for the demographic for which the program was designed.

Site selection

The research occurred at RBHS- Robert Wood Johnson Medical School using the tracking data collected for the Biomedical Careers Program. Part of my job over the years has been to direct the collection of longitudinal tracking data on the educational and professional outcomes of students who have participated in the program. Therefore the site and records were accessible.

Data Collection Methods

Data on both BCP attendees and non-attendees was obtained from past student reported responses to requests for medical school matriculation status. This information was verified by enrollment status reports from the American College Application Service (AMCAS) and data from the National Student Clearinghouse. This data had been collected over the life of the program as part of the ongoing tracking that occurs during the academic year. For this study, student enrollment status and GPA data already in the database were verified by manually searching yearly program rosters and by reviewing hard copies of application forms, admission committee rating sheets and college transcripts to insure the accuracy of the database entries. Data was then blinded using applicant ID numbers from the tracking database. Since students

were assigned an ID number after attending the program, a system of ID numbers for non-attendees was developed and matched to the student name. The code sheet linking the ID numbers with names was stored on a password protected computer. Program ID was used as the numeric identifier and demographic data was coded for use in SPSS-22.

National data used for comparison and presented in Appendices E and F was collected in 2014 from the American Association of Medical Colleges Data FACTS tables. All national data was aggregate (American Association of Medical Colleges, 2013).

Data was collected and coded for SPSS using the following variables:

- BCP Enrollment status- the variables were enrolled, withdrew and wait-listed
- Cumulative grade point average (GPA) for each student at time of application to BCP
- Student self-identified racial and/or ethnic classification
- Gender
- Allopathic and Osteopathic medical school enrollment outcomes for each student

Only the GPA data from the first exposure to BCP was used. Medical College Admission Test (MCAT) scores were excluded since at the time of BCP attendance, students had not taken the test. Although a six week MCAT preview course is offered in BCP, it is not an exhaustive preparatory course and is used only to acquaint students with an overview of the material and introduce test taking strategies.

Data Analysis

This evaluation of the Biomedical Careers Program focused on the medical/osteopathic school enrollment outcomes for 456 students from the NJ Educational Opportunity Programs who applied to BCP from 1990 to 2010. Historical records and data from the National Student Clearing house were combined for the analysis. Each of the variables used in the analysis is described below. Analyses were conducted to address two research questions. The first research question asked whether medical school enrollment was associated with BCP attendance. The second research question asked if the association between medical school matriculation and BCP enrollment varied by race and gender. This essentially asked if BCP's effects on medical school matriculation varied within the sample.

The data was analyzed using SPSS. Descriptive statistics were produced for all variables prior to conducting analyses to address the research questions. These analyses informed the inferential statistical analyses performed to address the study's questions, particularly the consolidation of some categories because of the small number of cases and empty cells that affected the results when looking at interactions between gender, ethnicity and BCP status. Analysis of Covariance (ANCOVA) was employed to estimate the effects of BCP participation on medical school matriculation. This approach was guided by methods used in three previous studies that examined medical school admission outcomes for students in pipeline programs, Strayhorn (2000), Campbell et al. (2014) and US Department of Health and Human Services (*Evaluating programs to recruit minorities in the health professions: Report of two evaluation studies.*, 2009)

Descriptive Statistics

Descriptive statistics were compiled to present an overall picture of the sample being studied. Since all students in the sample are eligible for support from the NJ Educational Opportunity Fund and are therefore economically disadvantaged (appendix B), the variables used to describe the sample included gender, racial/ethnic classification and GPA at time of BCP application. Results for gender (percent female) and race/ethnicity are presented in table 4.1. Results for GPA are presented in Table 4.2. Roughly equal percentages of males and females were accepted; however females accounted for 73.5 percent of the enrolled students. Overall, 35 percent of the students self-identified as Black, 28 percent Hispanic, 17.5 percent as Asian, 19.2 percent as White and Other. Black and Hispanic students were more likely to enroll in BCP than Asian or Other students. The mean GPA was 3.17 with a low of 1.37 to a high of 4.00 with a standard deviation (sd) of .464. An ANOVA that tested for differences in mean GPA by BCP enrollment status indicated that GPA was slightly lower for students who entered BCP than for those who withdrew or were wait-listed.

Table 4.1

<u>BCP Gender, Race/Ethnicity and Status</u>				
<u>Gender</u>	<u>Enrolled</u>	<u>Withdrew</u>	<u>Wait-listed</u>	<u>Total</u>
Percent Female	169(73.5%)	43(18.7%)	18(7.8%)	230(50.4%)
<u>Race/Ethnicity</u>				
Percent Black	132(83.5%)	24(15%)	4(2.5%)	160(35%)
Percent Hispanic	111(86.7%)	13(10.2%)	4(2.5%)	128(28%)
Percent Asian	19(23.8%)	56 (70%)	5(6.3%)	80(17.5%)
Percent White/Other	29 (33%)	49 (55.7%)	10(11.4%)	88(19.2%)
Total	291(63.8%)	142(31.1%)	23(5.0%)	456(100.0%)

Note. Hispanic=Categories include Puerto Rican Mainland(16), Puerto Rican Commonwealth(1), Mexican-American(2), Other Hispanic(109). Other= categories include other(36), American Indian(1), unknown(22).

Table 4.2

GPA and BCP Enrollment Status				
<u>GPA</u>	<u>Enrolled</u>	<u>Withdrew</u>	<u>Waitlisted</u>	<u>Total</u>
Mean GPA	3.10	3.29	3.92	3.168
sd ^a	.472	.430	.399	.465
n ^b	290	136	23	449 ^c

Note. GPA=grade point average; Enrolled=attended program;

Withdrew=accepted and refused admission; Waitlist = not offered place in program.

sd^a= standard deviation; n^b=number of students, ^c= number in analysis, 11 students excluded for lack of data.

Chapter Four: Findings

The next step of the analysis was to investigate the effects of BCP participation, controlling for GPA, gender and ethnicity using ANCOVA on the dependent variable of medical school matriculation status. Matriculation into Allopathic and Osteopathic medical training was combined to create a single variable of MESCEN. Allopathic and Osteopathic medical schools have similar admission requirements and both are considered to produce primary care physicians. In the full sample, 30.6 percent, or 138 of 456 students, matriculated in medical school. The primary independent variable of interest was BCP enrollment. This data was recoded into a binary NEWSTATUS variable. BCP enrollment status originally consisted of three categories of students: those who enrolled, those who declined admission after having been selected (withdrew) and those who were wait listed and did not attend. As the descriptive statistics indicated that the number of wait listed students was very small, and those who withdrew and were waitlisted were relatively similar (compared to those who attended), NEWSTATUS combined those who did not attend into a single category for analysis.

Results of the ANCOVA are presented in Table 4.3. No overall effects of BCP status on medical school matriculation were found. However, the ANCOVA suggested that the effects of BCP enrollment on medical school matriculation might differ by gender and ethnicity. Although these interactions are significant only at the .10 rather than .05 level, each of the categories is quite small. An inspection of results by race/ethnic group indicated that effects were limited to Black and Hispanic students and were quite similar for both groups. To further illuminate the results by gender, cross-tabs with Chi-square tests were conducted separately for each gender among a combined variable of Black and Hispanic students. This provides greater statistical power than testing for effects separately for Black and Hispanic students. These results are

presented in Tables 4.4 and 4.5. For males, there was no significant difference associated with BCP enrollment (37.3percent v. 30.0 percent $p = .65$). For female Black and Hispanic students, those having attended BCP were significantly more likely to matriculate in medical school ($p = .01$): 28.6 percent who attended BCP matriculated compared to 8.6 percent of those who did not attend BCP.

Table 4.3

ANCOVA of Medical School Enrollment with GPA as covariate and BCP Status Gender and Ethnicity as factors.					
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	7.785 ^a	6	1.297	6.532	.000
Intercept	2.884	1	2.884	14.518	.000
Gender	.488	1	.488	2.454	.118
ETHCAT4 ^a	.112	3	.037	.188	.905
GPA	6.915	1	6.915	34.811	.000
NEWSTATUS2 ^b	.078	1	.078	.395	.530
Error	87.801	442	.199		
Total	138.000	449			
Corrected Total	95.586	448			

Note .^a ETHCAT 4= Black, Hispanic, Asian, Other. ^b NEWSTATUS2=BCP enrolled is 1, BCP not enrolled is 0.

R-Squared = .081. Adjusted R-Squared = .069.

Table 4.4

Medical School Matriculation by BCP Enrollment for Male Black and Hispanic students					
BCP Enrollment			Medical school Matriculation		Total
			No	Yes	
Attended BCP	Yes	Count	47	28	75
		%	67.2%	37.3%	100.0%
	No	Count	7	3	10
		%	70.0%	30.0%	100.0%
Total		Count	54	31	85
		%	63.5%	36.5%	100.0%

Note. Chi-square not significant at $p = .65$

Table 4.5

Medical School Matriculation by BCP Enrollment for Female Black and Hispanic students					
BCP Enrollment			Medical School Matriculation		Total
			No	Yes	
Attended BCP	Yes	Count	120	48	168
		%	71.4%	28.6%	100.0%
	No	Count	32	3	35
		%	91.4%	8.6%	100.0%
Total		Count	152	51	203
		%	74.9%	25.1%	100.0%

Note. Chi-square significant at $p = .01$

Summary of Findings

The answer to Research Question One: *Do medical school matriculation outcomes vary for EOF students based on BCP attendance?* The overall answer is no. Medical school matriculation rates were about 30 percent for the sample. No significant effect of BCP participation is found on medical school matriculation, controlling for pre-existing differences among students.

The answer to Research Question Two: *Do medical school matriculation outcomes for EOF students who applied to BCP vary based on race and gender?* The answer is yes. When ethnic groups are separated, BCP attendance is associated with a significantly higher rate of medical school matriculation for female Black and Hispanic students. No significant effects were found for male Black and Hispanic students or for students of either gender who self-identified as White, Asian or Other.

Chapter Five : Conclusions and Recommendations

Conclusions

This evaluation study was an examination of the effectiveness of one pipeline program to promote racial/ethnic and economic class diversity in the medical schools. My interest in this topic stemmed from personal experiences as a student benefiting from Civil Rights Era educational access programs and as a professional working as the Program Director with the program studied. While this study represents the examination of a problem of practice, I see it as much more. Much of my doctoral study has been devoted to looking at the ways effective leadership can ameliorate some of the issues that have created and continue to support the educational achievement gap that affects poor and minority students. In higher education, we see the glaring results of the inability of many schools systems to academically and socially prepare these students for college and professional schools. These disturbing trends are most evident in medical schools even after years of diversity and pipeline programs. While these programs may have continued to provide access, the educational achievement gap has resulted in a stratification of minority populations that, from my observation, is based largely on economic and social class.

Studies conducted by educators, universities and the American Association of Medical Colleges have been able to document that medical schools have become a little more racially diverse. However, the gains have been small and have gradually been diminishing during the economic and political constraints that have occurred in the last decades. Gains in enrollment for poor students have not improved over the years and are especially low for those groups of students of color that have traditionally been under-represented in medicine.

Jolly (2008) found that less than 10 percent of all accepted medical school students came from low income families and that 75 percent of the accepted students came from high income families. The historical picture is similar for Black and Hispanic students, with their enrollment comprising less than 10 percent for these groups. Beginning in 2014, the AAMC has mandated that all medical schools assess their admission processes to increase economic diversity in the medical student population. (Grbic,D.,Jones,D.J,&Case,S.T.,2013). The economic diversity of medical schools is becoming a cause for concern and has provided the organizational need for this study at Robert Wood Johnson Medical School.

This study represents my attempt to determine if the program I have believed to be helpful to poor and minority students really fulfills its mission. It was also is a way for me to provide credible evidence of the effectiveness of the program to the medical school community. This research supports the notion that the Biomedical Careers Program is a pipeline program that can help those students whose potential has been limited by substandard educational preparation.

Through this study I found that the program most successful with medical school matriculation outcomes for EOF Black and Hispanic women. While BCP admitted men and women in equal numbers, women were more likely to attend BCP. These findings follow national enrollment trends for medical education. In 2011, women represented 65.6 percent of the Black medical school applicants. Matriculation followed the same pattern with women making up 62.4 percent of Black first year students. While Black women are the majority of minority first year students, the Black and Hispanic combined applicant pool has remained around 15 percent of the total applicants to medical school (American Association of Medical Colleges, 2013). This may be a result of some demographic shifts in career preferences and college graduation outcomes for poor and minority students. The numbers of Black and

Hispanic women graduating with baccalaureate degrees has increased but these women overall have been less likely to apply to medical school. The numbers of Black and Hispanic males earning baccalaureate degrees has seen very small increases while interest in medical school among Black and Hispanic males has steadily declined since the softening of most affirmative action efforts and the elimination of many pipeline programs (Cooper, 2003).

From my point of view as the Program Director there are several factors that explain the results of this study in addition to the size of the national applicant pool of poor and minority applicants. The first factor explaining my results is the selection of the sample. Had I choose to look at the matriculation outcomes for all BCP students the larger samples size may have increased significance for ethnic groups other than Black and Hispanic. By restricting the sample to EOF students, the study did not include those students who were from families with moderate or higher incomes. As Jolly (2008) found in his examination of the relationship of income to medical school matriculation, students with higher family incomes are more likely to be in medical school. The current trend of higher income students matriculating in medicine, I believe, is due to the increase in the cost of college and medical education. As is always the case, economic shifts of increased cost and decreased scholarship and grant aid has negatively affected lower income students as they now must rely more heavily on loan to finance their undergraduate as well as professional education.

I believe a second factor in the findings has come as a result of the changing focus of the program reflecting changes in societal and university priorities. As part of the civil rights era programs, BCP was developed to solve the original problem of educational access for Black people. The recruitment efforts were targeted to this population. As time passed and the move toward gender equity eclipsed racial equity, our program attempted to model gender diversity by

making sure we had women instructors and teaching assistants. The medical school also reached out to women students of all ethnicities and in the most recent entering class is over 50 percent female for the first time in the history of the school. I believe this study shows the impact of the change in societal priorities from the focus on racial equity to gender equity. From the time I started work with the program, we have maintained relationships with EOF programs that are in areas serving larger populations of Black and Hispanic students. Since BCP had gained a reputation for being a program that is welcoming to Black and Hispanic students, we have continued to attract larger numbers of these students and since we have expanded our focus to include gender equity we have recruited larger number of Black and Hispanic women.

Economic factors are affecting undergraduates as well and are preventing the poorest students from being able to benefit from educational access programs. While smaller numbers of poor Black and Hispanic students are in college and pre-professional programs, these economic factors are preventing them from continuing in pipeline programs. Large debt burdens coupled with ever increasing living expenses in the Northeast result in students being admitted to summer programs but having to decline so they can work during the summer to support their academic year studies.

When I began work at the program, we offered stipend support that would offset any out of pocket expenses for housing and course credit so students could focus on the program. In the late 1990s and early 2000s we were able to obtain enough stipend support to not only offset costs but to replace what would have been earnings from summer jobs. We were able to provide three course credits from Rutgers for all students because the University saw support of all students attending BCP as an important part of the educational pipeline, even for non-Rutgers students. Over time stipend support has dwindled for all students. Although the NJ EOF has continued to

support student stipends, the allocation has remained the same for 20 years while the cost for the out of pocket expenses of housing, parking and course credit has increased. Rutgers University has adopted the policy of only supporting students who are part of the Rutgers Office of Success in the Sciences at Rutgers. Unfortunately, most of the EOF students are not in this Rutgers program. I have tried in the last two years to adjust the EOF allocation to shift more of the instructional costs to RWJMS so we could provide additional direct assistance to students. However, it is not enough and I believe more poor students are declining to come to the program because they cannot afford it.

Due to the declining grant support for pipeline programs, BCP now enrolls fewer students each year than in the past. Our demographics are changing and the numbers of Hispanic and Asian EOF students are increasing. For the last decade, the BCP admission committee was “encouraged” by the medical school administration to focus on admitting students with higher GPAs and a greater likelihood of scoring well on the MCAT since these would be the students most likely to go to medical school. This has had a negative effect on the number of EOF and lower income students we have been able to enroll. Immediate gains in enrollment of students with higher GPAs and MCAT scores at Robert Wood Johnson Medical School appear to be more important than a more difficult sustained long term increase access for students disadvantaged by poverty and racial discrimination. This shift in policy reflects many of the external pressures being brought to bear on high education in general. Even though I feel some frustration with the policies, I must credit Robert Wood Johnson Medical School for continued, albeit very limited, support of the program. Sadly, many HCOP and pipeline programs at other medical schools were closed when the federal and private funding ran out.

However there are hopeful signs on the horizon. Since mandating medical schools to examine their student populations for economic diversity as well as racial diversity, the AAMC has developed a series of SES indicators to assist medical schools in assessing an applicant's socio-economic status. Indicators include the applicants' family educational history, their eligibility for public assistance and the parental job category i.e. service, laborer, managerial etc. (Grbic, et al 2013). Since the report was issued, I have noticed more organizational interest in BCP and support for small expansions to the program. In April 2015, the Health Resources Services Administration (HRSA) announced the issuance of a request for proposals for new grants seeking support from HCOP. This RFP requires all HCOP programs to admit only economically disadvantaged students. This recent development has increased the interest in BCP and in this evaluation study as we prepare our grant application.

This study was not a theoretical exercise for me, but was a deeply personal and professional exploration for information that tests beliefs that I have long held about the effectiveness of enrichment programs. The study also highlights some of the challenges facing educational leaders who are working for social and economic justice. While the results for women are positive, outcomes for Black and Latino men still lag behind and will need greater outreach and support. Although it would be gratifying to believe that a student's attendance in a 6 week summer program could guarantee their academic improvement and result in their meteoric rise to the top of the professional school applicant pool, I know this is not the case. Gains in opportunity come slowly and in fractions of inches not miles. This study has provided me with hope that although our effectiveness should be improved we may be on the right track in some areas. Our success with Black and Hispanic women is a positive step and recent HCOP funding priorities lay the groundwork for continued expansion. Perhaps with continued

evaluation and more targeted recruitment we will be able to increase our medical school matriculation outcomes for all disadvantaged students.

Implications for Practice

This study has shown that BCP can be effective in increasing the numbers of Black and Hispanic women entering medical school. Even as this study was being done, efforts have begun in the Office of Special Academic Programs, to implement some of the following recommendations for improvement in the record keeping and program outreach.

The recommendations for practice are:

- Expand the current tracking system to collect information on numbers of students applying to medical school and acceptance outcomes as well as GPA and, if applicable, MCAT scores in the academic year following attendance in the program.
- Involve the IT department at RWJMS to standardize the database so that consistent S.E.S. and demographic information is collected on students.
- Increase BCP recruitment by expanding outreach to EOF programs and programs for financially disadvantaged students.
- Increase recruitment and support for male participants.
- Provide additional academic year support from Robert Wood Johnson Medical School to undergraduate EOF programs to maintain the interest and skill development of potential students.
- Promote the effectiveness of the BCP program and the value it provides to Robert Wood Johnson as being the primary recruitment tool for disadvantaged under-represented students.

Implications for Further Research

Comparative studies would be useful to look at admission outcomes for similar pipeline programs at other universities. A larger evaluation on the outcomes of a pool of pipeline programs could help to determine if the same results are occurring in other locations. Also, evaluation of the strategies that are used in BCP to determine if this program is especially well suited to helping female participants or is this really part of the trend that has supported the educational aspirations for female Black and Hispanic students to the detriment of male students.

This study was hampered by small sample size and the design that looked only at program attendance and demographic differences in the outcomes of medical school matriculation. With improvement of the data collection efforts for the program, additional studies should be conducted in the future to examine the changes in GPA after attending the program, MCAT scores and medical and health professional school application, acceptance and matriculation outcomes for students.

Qualitative research is also important to examine the components of the program that students find most useful. Interviews and focus groups can supplement some of the survey data already compiled to improve the quality of the program. Additional work also needs to be done to determine the reasons disadvantaged students do not apply or even if accepted, do not attend medical school. Although it can be supposed that financial considerations are to blame, empirical studies should be conducted to determine if this really the cause or are other social and cultural factors intervening.

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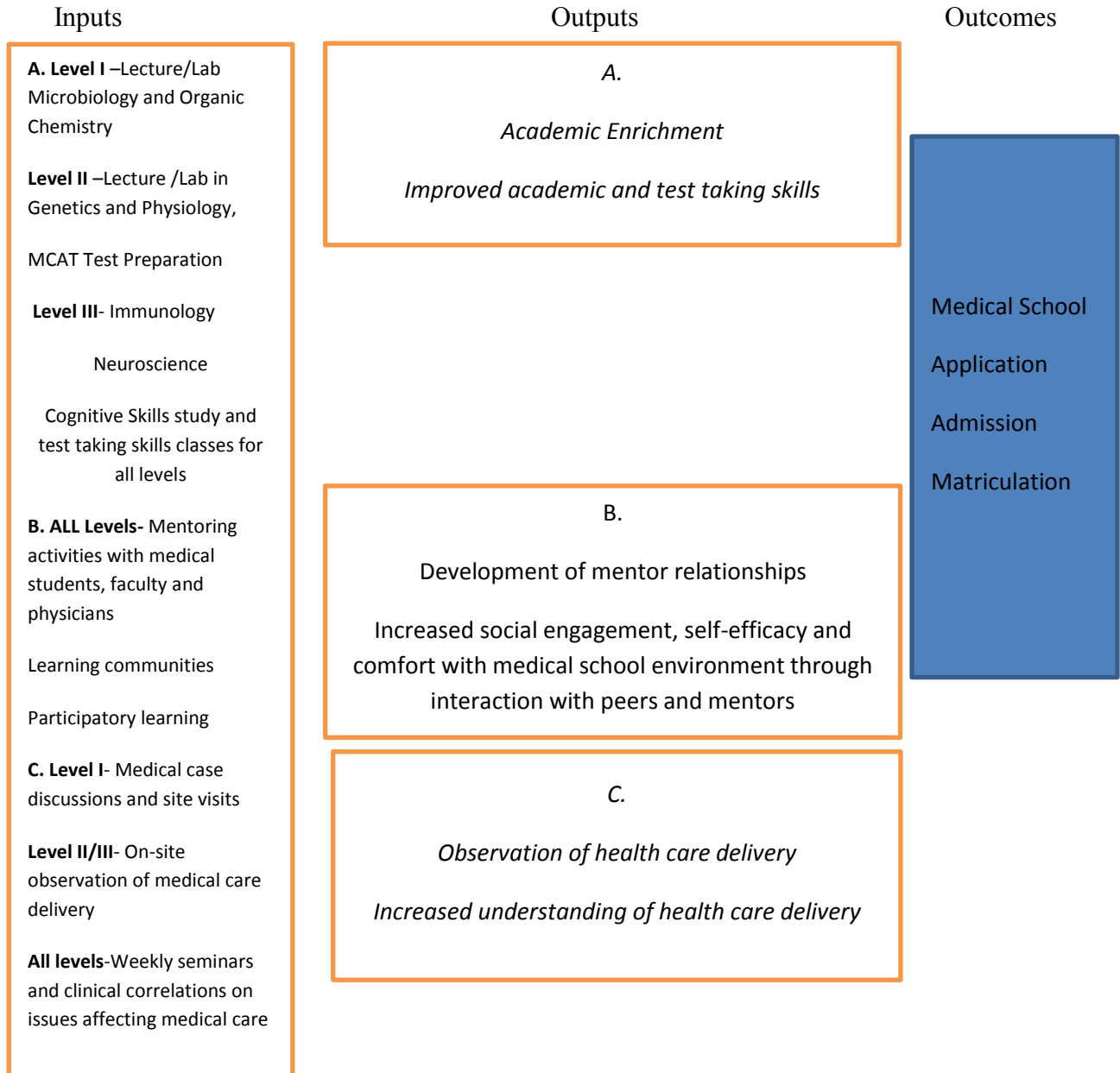
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Appendix A

BCP Logic Model



*Appendix B***EOF Eligibility Guidelines**

Undergraduate Eligibility:

1. Must demonstrate an educationally and economically disadvantaged background
2. Must be a New Jersey resident 12 consecutive months prior to receiving the award
3. Must apply and be accepted to a participating New Jersey college or university
4. Must meet the academic criteria as set by the institution of choice
5. Must file a Free Application for Federal Student Aid (FASAA)
6. Gross Income must fall within the criteria shown:

Academic Year 2013-2014			Academic Year 2014-2015		
Applicants with a Household Size of	Gross Income Not to Exceed		Applicants with a Household Size of	Gross Income Not to Exceed	
1	\$22,340		1	\$22,980	
2	\$30,260		2	\$31,020	
3	\$38,180		3	\$39,060	
4	\$46,100		4	\$47,100	
5	\$54,020		5	\$55,140	
6	\$61,940		6	\$63,180	
7	\$69,860		7	\$71,220	
8	\$77,780		8	\$79,260	
**	For each additional member of the household add \$7,920		**	For each additional member of the household add \$8,040	

http://www.nj.gov/highereducation/EOF/EOF_Eligibility.shtml

*Appendix C***2014 Biomedical Careers Program (BCP) Admission Guidelines****Overview of BCP**

The Biomedical Careers Program was designed to provide educational enrichment for promising students who, due to educational background and/or financial circumstance, are not highly competitive for admission to professional school. Students with strong GPAs are less likely to need our help than others; therefore, these students are not our core group. Our core group demonstrates:

- an interest in the health professions, and
- an academic record that shows progress in achievement, while possibly needing some improvement, and
- a desire to attend the program.

GPA Requirements

Since it is important to give students a realistic picture of their educational options, a few general guidelines have been put in place. No applicant with a GPA of less than 2.0 will be admitted to any level of BCP. GPA requirements for Level I and II applicants are flexible, with the primary concern being the student's potential for success. Level I and II applicants with strong applications, personal statements and recommendation letters but a GPA of less than 3.0 may be admitted; however, if admitted, these students will be scheduled for counseling (see below). Level III applicants with GPAs of less than 3.0 will not be admitted but maybe contacted with suggestions on how they could improve their academic performance and/or information about alternative careers. The Admissions Committee members are encouraged to make suggestions that will be forwarded to the student and their counselor.

Counseling Component

An academic and career counseling component will be implemented for students with below average academic records. These students will be advised regarding how to improve their chances of admission to medical school and pathways to alternative careers.

Application Review

Applicants will be pre-screened for eligibility prior to being sent to a reviewer. New, non-Access Med applicants will be reviewed by 2 committee members. In the event of a difference between the 2 ratings, the applicant will be reviewed by a third committee member or by the entire committee. Since Access Med students have been pre-screened by a committee at Rutgers (ODASIS) or Seton Hall, they will be reviewed by only 1 BCP Admissions Committee member. Former BCP participants will also be reviewed by only 1 committee member, since we have records of their past performance in the program. Grade reports for former students will be available to reviewers.

Level III Access Med Track

Students admitted to the Access Med Transition Year will attend the BCP Level III Access Med Track. This track will provide preparation for medical school Biochemistry, including a lab component consistent with the requirements for 3 lab credits at Rutgers.

Level III Regular Track

Students in the Level III Regular Track will study neuroscience or medical genetics and will participate in a clinical project. All Level III students will deliver a presentation based on their project at a symposium to be held at the conclusion of the program.

Appendix D

BCP REVIEWER RATING SHEET

Date: _____

Applicant: _____

Reviewer: _____

High School Academic Record (if applicable)
--

College Academic Record

Most Recent

Most Recent

GPA: _____ **Semester:** _____

GPA: _____ **Semester:** _____

SECTION I: Please score the application areas on the following scale:		
1. Above Average	2. Average	3. Below Average

Areas	Score	Comment
1. Academic performance in the sciences	_____	_____
2. Academic performance in non-sciences	_____	_____
3. Rigor of course work	_____	_____
4. Potential to benefit from BCP	_____	_____
5. Recommendation from teacher	_____	_____
6. Personal statement from applicant	_____	_____

Other relevant factors that should be considered (e.g., work during school year, family and other obligations, extracurricular activities, health of applicant, questions regarding ethnic self-identification or disadvantage status.) Please list and/or explain:

SECTION II: Please rate the applicant overall, using the following scale:

- High-priority accept** is to be used for highly competitive applicants

- Low-priority accept (wait-list)** is to be used for applicants who would be acceptable, but are not viewed to be among the strongest candidates. Typically, these applicants will have an area or area(s) of relative weakness; please specify any such area(s).

- Discuss** is to be used for applicants who the reviewer thinks should be discussed by the entire committee. Typically, this rating is prompted by a reservation or a concern about the applicant. Please specify the topic(s) on which the discussion should focus. If you think additional information might be helpful, please specify the information you would like to request.

- Reject** is to be used for applicants who appear unsuitable or ineligible under any circumstances. Please specify the basis for unsuitability and/or ineligibility.

Explanation/Comments:

Appendix E

AAMC National Application and Acceptance Data 1990-2010					
Black					
Year	Number of applications	Percent of total applications	Number of acceptances	Percent of applicants accepted	Percent of national applicants
1990-91	2261.00	7.70	1102.00	48.70	3.75
1991-92	2564.00	7.70	1146.00	44.70	3.44
1992-93	2885.00	7.70	1263.00	43.80	3.37
1993-94	3393.00	7.90	1439.00	39.80	3.14
1994-95	3539.00	7.80	1386.00	39.20	3.06
1995-96	3489.00	7.50	1366.00	39.20	2.94
1996-97	3527.00	7.50	1268.00	36.00	2.70
1997-98	3186.00	7.40	1214.00	38.10	2.82
1998-99	3171.00	7.70	1282.00	40.40	3.11
1999-00	2959.00	7.70	1208.00	40.80	3.14
2000-01	2947.00	7.90	1177.00	39.90	3.15
2001-02	2887.00	8.30	1230.00	42.60	3.54
2002-03	2858.00	8.50	1284.00	44.90	3.82
2003-04	2963.00	8.50	1228.00	41.40	3.52
2004-05	3004.00	8.40	1264.00	42.10	3.54
2005-06	3013.00	8.10	1228.00	40.80	3.30
2006-07	3073.00	7.90	1280.00	41.70	3.29
2007-08	3322.00	8.50	1282.00	38.60	3.28
2008-09	3165.00	7.50	1265.00	40.00	3.00
2009-10	3313.00	7.80	1293.00	39.00	3.04

Source: AAMC DW: AMF, Contact AAMC FACTS, facts@aamc.org; Association of American Medical Colleges, (2013).

Appendix F

AAMC National Application and Acceptance Data 1990-2010					
Hispanic					
Year	Number of applications	Percent of total applications	Number of acceptances	Percent of applicants accepted	Percent of national applicants
1990-91	638.00	2.20	307.00	48.10	1.06
1991-92	746.00	2.20	335.00	44.90	0.99
1992-93	815.00	2.20	303.00	37.20	0.82
1993-94	907.00	2.10	302.00	33.30	0.70
1994-95	978.00	2.20	330.00	33.70	0.74
1995-96	1042.00	2.20	326.00	31.30	0.69
1996-97	1064.00	2.30	338.00	31.80	0.73
1997-98	929.00	2.20	298.00	32.10	0.71
1998-99	917.00	2.20	334.00	36.40	0.80
1999-00	943.00	2.50	381.00	40.40	1.01
2000-01	879.00	2.40	339.00	38.60	0.93
2001-02	794.00	2.30	338.00	42.60	0.98
2002-03	909.00	3.00	404.00	44.44	1.33
2003-04	1013.00	3.00	401.00	39.58	1.19
2004-05	1062.00	3.00	448.00	42.18	1.27
2005-06	1111.00	3.00	463.00	41.67	1.25
2006-07	1023.00	3.00	458.00	44.77	1.34
2007-08	1083.00	3.00	456.00	42.10	1.26
2008-09	1132.00	3.00	495.00	43.72	1.31

Source: AAMC DW: AMF, Contact AAMC FACTS, facts@aamc.org; Association of American Medical Colleges, (2013).