RUNNING HEAD: Minority students committed to sciences

Minority Students Committed to the Biomedical and Behavioral Sciences:

Intention to Make a Contribution to Scientific Research

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Abstract

The study examines the characteristics and pre-college experiences of Black, Latina/o and Native American students who demonstrate a personal commitment to scientific research upon college entry. Using data from the Cooperative Institutional Research Program (CIRP), the study explores factors that contribute to the career aspirations of racial/ethnic minority populations, uncovering findings that may be essential to predicting their subsequent participation in scientific research. Regression analyses on a national sample of close to 30,000 students reveals that key skills, dispositions and behaviors beyond traditional measures of high school grades and test scores help shape student's commitment to scientific research. Specifically, coursework and experiential learning in the sciences during high school and students' sense of self-efficacy are important contributors to later aspirations. These findings have implications for institutions and federal agencies as they plan curriculum and programs to recruit and retain underrepresented minorities in the biomedical and behavioral sciences.

For over 30 years, agencies within the National Institutes of Health have supported pre-college and college programs to diversify the pool of research scientists and to increase research in fields that will ultimately improve the health and well-being of underserved communities (www.nigms.nih.gov/minority). Racial/ethnic minority students have made important inroads in accessing higher levels of the educational pipeline, yet they remain underrepresented in a multiplicity of fields and disciplines, including the biomedical and behavioral sciences. Even as their numbers have increased as a whole, racial/ethnic minority students have among the lowest levels of matriculation in these critical fields and even lower rates of representation in research science careers (NSF, 2003). While federal support remains critical to building institutional capacities and support for individual students, perhaps the most immediate challenge is exploring how postsecondary institutions can best recruit, retain, and support underrepresented students' aspirations to become research scientists in these important fields. Although there is strong interest in preparing students for professional fields, the focus has now turned to replacing the current faculty and research scientists at universities and research institutes with a diverse group of young biomedical and behavioral scientists.

Institutions may find a renewed focus on these efforts may prove fruitful in the future due to a number of trends. First, shifting demographic realities point to large increases in racial/ethnic minority high school graduates seeking college entry by 2015 (Carnavale & Fry, 1999). Second, national data on college freshmen suggest that more students are aspiring to postgraduate degrees, and while the proportion of students interested in becoming a physician has remained relatively stable, student interest in biological science majors has nearly doubled since the mid-1980s (Sax, Hurtado, Lindholm, Astin, Korn, & Mahoney, 2004). The next few years represent an important time to investigate how the demographic changes across the higher

education landscape will impact student interest in biological and behavioral science research careers, especially among underrepresented minority populations.

The present study examines the characteristics and pre-college experiences of underrepresented minority (URM) students who demonstrate a personal commitment to scientific research upon college entry. Using data from the Cooperative Institutional Research Program (CIRP), the study explores factors that contribute to the career aspirations of racial/ethnic minority populations, uncovering findings that may be essential to predicting their subsequent participation in science research careers (Mau, 2003). In addition to high school grades and test scores, there are other key skills, dispositions and behaviors of Black, Latina/o and Native American (or URM) students that can shape their commitment to scientific research. The specific research question guiding this study is: What are the characteristics and pre-college experiences of URM students who show an initial commitment to scientific research? The findings from this study will have implications for institutional practice that may build upon students' entering dispositions and ensure their long-term retention and success in the health-related scientific research fields.

Literature Review

Students naturally gravitate toward academic areas where they feel the greatest degree of self-efficacy before and during college. Their initial predispositions can be accentuated in college due to choice of peer groups, courses, and presumably choice of major (Feldman & Newcomb, 1969; Laird, Engberg, & Hurtado, 2002). Previous research suggests that programmatic interventions including adequate academic, financial, and social support structures can have a tremendous impact on student persistence (Astin, 1993). Students' extracurricular activities on their campuses can also influence their interests about science and their perspectives

about career choice (Lindner, 2004). Further, college environmental contexts shape student engagement depending on their representation on campus, sense of belonging, and the institutional climate for diversity (Hurtado, Milem, Clayton-Pedersen, 1999).

Previous research has cited high achievement and self-efficacy to be key factors regarding persistence in science career aspirations (Ware & Lee, 1988; Astin 1993; Bonous-Hammarth, 2000). For instance, Mau (2003) found that academic proficiency and math self-efficacy were the two most predictive variables for students to develop science career aspirations starting as early as the 8th grade. Moreover, the number of years of science and math in high school, high school GPA, and SAT math scores have all been positively correlated with choosing a science major (Ware & Lee, 1988) and with retention in these majors during the undergraduate college years (Bonous-Hammarth, 2000).

Yet even after controlling for these academic factors, URM students who begin work toward a science degree are more likely to switch into another field than are Asian and White students (NCES, 2000). As a result, Black, Chicano/Latino, and American Indian students in college are vastly underrepresented in science majors (Fouad, 1995 cited in Lindner, 2004). Common barriers that have been identified to URM persistence in the sciences include poor academic preparation during high school (Oakes, 1990), negative perceptions of careers in science due to lack of role models (Fouad, 1995; Romo, 1998 cited in Lindner, 2004; Gibbons, 2004), preconceived notions about scientists being mainly white males (Porta, 2002), and inadequate support systems or an intimidating learning environment (Mau, 2003).

Moreover, the enrollment of URM students in health profession schools has declined since the 1980s and has failed to keep up with the growth of minority populations in general society (Sullivan Commission, 2004). White and Asian Americans constitute over 90% of the

workforce in the sciences (along with math and engineering) while Blacks, American Indians, and Chicano/Latinos remain underrepresented in these careers relative to their representation in the U.S. population (National Science Foundation, 2000). With people of color representing the majority of students now entering the academic pipeline, the United States is challenged to expand the pool of scientists to include more Blacks, American Indians, and Chicano/Latinos in order to meet the growing demand for these professionals (Thomas, 1992 cited in Bonous-Hammarth, 2000)

There still remain many unanswered questions regarding the nature and contexts of engagement among URM students that lead to high degree aspirations and to retention and preparation for biomedical and behavioral research careers. Since self-efficacy and engagement are key components of academic achievement, it is important to identify the general characteristics of incoming college students that correspond to their future engagement in research fields.

Theoretical Framework

The theoretical framework guiding this study was adapted from Lent, Brown and Hackett's (1996) Social Cognitive Career Theory (SCCT), which has emerged as an important framework to explore career development among student populations. This theory has grown out of Albert Bandura's (1986) social cognitive theory and attempts to address socio-cultural conditions and experiences that influence an individual's career-related choices. This theory postulates that career aspirations and development are influenced by a combination of ones' behaviors, self-efficacy, expectations, and goals, and that these four factors, along with one's past performance, determines future performance outcomes. In an educational context, the theory posits academic self-efficacy as a developmental complement to career interest and choice

(Smith, 2002) and career decision-making behavior during college (Niles, 1997). With a focus on the influence of self-efficacy beliefs and outcome expectations on goals and behavior, SCCT posits that if individuals believe in their ability to succeed and have an expectation to succeed in a particular career, they will behave in a way that will help them achieve their career goal.

The SCCT focuses on the psychological and social effects of race and gender on career development behavior and choice (Gibbons, 2004). For instance, when gender or race affects the self-efficacy or outcome expectations related to specific career interests, these effects may limit or expand one's exposure to various careers or may reinforce biases and role socialization within certain careers (Lent, Brown & Hackett, 1996). However, career interests can also be regulated by high self-efficacy and outcome expectations, meaning a person can form sustained interests in career-oriented activities when they experience personal competency and positive outcomes in spite of perceived limited racial or gender roles (Gibbons, 2004). Thus, according to the SCCT, career choice process emphasizes the connection between interests, goals and actions and the successes and failures that create self-efficacy and outcome expectations.

While a number of studies have used their findings to provide initial support for the SCCT model to the career choice process of the general college student population (Blustein, 1989; Niles, 1997; Gibbons, 2004), few have directly focused on assessing its relevance to underrepresented student populations. As Kerka (1998) noted, women and people of color must face external barriers such as discrimination or bias that may determine outcomes independent of their goals, expectations, and behavior. Moreover, Niles (1997) encouraged researchers to continue examining more racially diverse sub-groups of college students in order to increase understanding of the relationships among their career majors and aspirations, as well as to assess their accomplishments of specific career-development tasks throughout their college years.

Another important theory that can be related to intentions to pursue scientific research and actual behavior involving students' choices directed at becoming a research scientist is the theory of reasoned action (Fishbein & Ajzen, 1975). According to the theory advanced by Fishbein and Ajzen (1975), an individual's behavioral intentions are the most direct and immediate cognitive antecedents of overt behavior. Not only does an individual's intention precede any behavior, but also the strength of the person's intention is directly proportional to the actual behavior performed. The original model posits two main determinants of individual's intention, attitude of behavior and subjective norm. The attitude of behavior is the individual's attitude about the behavior (e.g. enrolling in courses in math and science, seeking and participating in research opportunities), and whether individuals develop positive attitudes about these behaviors will determine their likelihood to continue along the path towards becoming a biomedical or behavioral research scientist. A subjective norm, the second main determinant in the theory of reasoned action, represents peer group social pressures or influences to perform the behavior. In this case, the notion of a supportive peer environment can serve to reinforce behaviors that lead toward becoming a research scientist. In this study, we examine entering first year students' intention to make a contribution to scientific research, behaviors that reinforce their intentions (e.g. course taking in high school and participation in actual research), and peer environments (the proportion of baccalaureate recipients in health science-related fields) that can create positive reinforcement and normative support in particular colleges. Our assumption is that their positive experiences in these early behavioral choices serve to reinforce their intentions of ultimately pursuing a career as a research scientist, and students continue during the college years to accentuate these initial predispositions through additional behavioral choices of courses, peer groups, and activities until they encounter negative experiences that can lower their self-

efficacy, goals, or expectations. The SCCT model and the theory of reasoned action, coupled with accentuation theory, provide a substantive guide for our analysis of early predictors of students' intention to make a contribution to scientific research.

Method

Data source. Data were derived from the Higher Education Research Institute's (HERI) Cooperative Institutional Research Program's (CIRP) annual Freshman Survey, a national survey of college students. The Freshman Survey covers a wide range of student characteristics: parental income and education, ethnicity, and other demographic items; financial aid; secondary school achievement and activities; educational and career plans; and values, attitudes, beliefs and self-concept and is administered in the summer/fall prior to the first year of college. In 2004, items related to students' intentions to pursue scientific research careers were also included on the survey instrument. Overall, 424,808 students completed a Freshman Survey at 720 four-year colleges and universities. Statistical weights were created to reflect the first-time, full time freshmen population at four-year colleges and universities in the U.S. However, only those students who expressed an interest in majoring in a biological or behavioral science were included in the final sample.

Sample. The selected sample used to evaluate the outcome (i.e. intention to make a contribution to scientific research) included 29,769 students from 664 institutions (including American Indian, Black, Latino, White and Asian American students) with an initial interest (i.e., probable field of study at the start of freshman year) in one of the following biomedical or behavioral science majors: biology (general); biochemistry or biophysics; microbiology or bacteriology; zoology; chemistry; medicine, dentistry, veterinary medicine; pharmacy, or psychology. Of these students with an initial interest in a biomedical or behavioral science

major, 11,207 were URM students (Black, Latina/o, or American Indian/Alaskan Native students). The total sample for this study was 68% female and 38% URM students (i.e., 23% Black, 10% Latino, and 5% American Indian/Alaska Native students). The average HSGPA was B+/A- and the mean of students' self-rating on academic ability was 4.01 (on a scale of 5). Twelve percent of the sample had participated in a summer research program. Thirty-seven percent of the students intended to major in a pre-professional health science field, 35% intended to major in a biological science, 23% intended to pursue a behavioral science degree, and 5% intended to major in chemistry. Thirty percent of the sample aspired to a doctorate degree. In terms of institutional characteristics, 48% of the students in the sample attended public institutions. The average freshmen SAT score at instiutions was 1146. Of all the baccalaureate degrees awarded in the sciences (i.e. pre-professional health science, biological science, behavioral science, and chemistry), 19% of them were conferred to URM students. Finally, 7% of the total attended either a Historically Black College or University (HBCU) or Hispanic Serving Institution (HSI), while 7, 16 and 11 percent of American Indian/Native Alaskan, Black and Latino students, respectively, attended these institutions.

Measures. The dependent variable for this study is a scaled index titled, "intention to make a contribution to scientific research" and was constructed by assessing students' response of the personal importance they attribute to four items (alpha =.71): a) the goal of becoming an authority in one's field, b) gaining recognition from colleagues, c) making a theoretical contribution to science, and d) finding a cure to a health problem (see Table 1). Table 2 lists the variable names, types, and scales for the dependent variable and each of the independent variables in the analysis.

—Place Table 1 about here—

—Place Table 2 about here—

Tables 3 through 5 show the means or percentages and significant comparisons on the dependent variable and a select number of independent measures (i.e., participation in a summer research program, participation in a university-sponsored health science research program) to show racial/ethnic differences. Table 3 presents the findings of the Scheffe post-hoc results for the dependent variable of Making a Contribution to Scientific Research. In every comparison, there were significant mean differences between the racial groups on Making a Contribution to Scientific Research. In comparing all four groups, Black students had significantly higher aspirations on the dependent variable than any other racial/ethnic group, including White and Asian American/Asian students. There were, however, no significant differences in aspirations on the dependent variable between Latino/as and American Indians/Alaska Natives or between American Indians/Alaska Natives and Whites/Asian Americans/Asians.

—Place Table 3 about here—

Two-way contingency table analyses were conducted to evaluate whether there were differences in participation rates in summer research programs and university-sponsored health science research programs across the racial groups (Whites and Asians, Blacks, Latino/as, American Indians/Alaska Natives). Race and participation in summer research programs (Pearson χ^2 (3, N = 28,762) = 167.43, p = .000, Cramer's V = .08) and race and university-sponsored health science research programs (Pearson χ^2 (3, N = 28,705) = 235.55, p = .000, Cramer's V = .09) were found to be significantly related. Follow-up pairwise comparisons were conducted to evaluate the differences among these proportions. Tables 4 and 5 present the findings for the pairwise comparisons by race of the participation rates in summer research programs and university-sponsored health science research programs, respectively. The Holm's

sequential Bonferroni method was used to control for Type I error at the .05 across all six comparisons. In five of the six pairwise comparisons, there were significant differences amongst the races in participation rates in both the summer research programs and university-sponsored health science programs. Specifically, Black students had the highest participation rates in both of these science programs (16.1% for summer research programs; 10.9% for university-sponsored health science research programs) as compared to the other racial/ethnic groups. Latino/a students had the next highest participation rates (11.7% and 7.4%), followed by Whites and Asian American/Asians (10.4% and 5.4%), with American Indians/Alaska Natives with the lowest participation rates (9.1% and 5.0%). The only difference in participation rates between racial groups in both types of research programs was the comparison between Whites and Asian American/Asians versus American Indians/Alaska Natives. In other words, both of these groups had similarly low participation rates of both of these research programs as compared to the other racial/ethnic groups.

—Place Table 4 about here—

—Place Table 5 about here—

As previously mentioned, the selection of independent variables was guided primarily by Lent & Brown's (1996) Social Cognitive Career Theory (SCCT) and the theory of reasoned action (Fishbein & Ajzen, 1975). Given the central tenets of these complimentary theories, this study of student intentions to make a contribution to scientific research incorporated high school activities, interactions with peers, perceptions of cognitive abilities, goals and expectations, and high school characteristics. High school behaviors that can reinforce intentions, including such activities as exposure to summer research programs and course selection, were also included in our model. In addition to the theoretical framework that guided this study, researchers continue

to suggest further contextual items to consider in the career choice of multicultural groups such as racial and cultural identity, and social status (Betz & Fitzgerald, 1995; Bingham & Ward, 1996; Hartung, 2002; Osipow & Littlejohn, 1995). As such, this study also incorporated citizenship status, English language proficiency, and time management skills. Finally, given that certain college environments are more productive in producing science baccalaureates and may have strong science programs and peer subjective norms that initially attract students to an institution, we controlled for the production of baccalaureates in the biomedical and behavioral sciences as well as institutional characteristics, such as institutional race, type and selectivity in order to more fully understand the link between student intentions and their environments where they will pursue opportunities to achieve the goal of becoming a research scientist. These institutional variables were adapted from the Integrated Postsecondary Education Data System's (IPEDS) data files on institutional characteristics, including the Survey of Earned Degrees file.

Analyses. Missing data analysis revealed a small range of missing data (less than 1% to 10%) across all variables in the model. In order to maintain statistical power, missing values for all continuous variables were replaced using the EM algorithm. The EM algorithm represents a general method for obtaining maximum likelihood (ML) estimates when a small proportion of the data are missing (McLachlan & Krishnan as cited in Alison, 2001). The EM algorithm consists of two steps, an expectation step and a maximization step, that are repeated multiple times in an iterative process that eventually converges to the ML estimates. Unlike conventional regression imputation, where decisions are made about which variables to use as predictors, the EM algorithm starts with a full covariance matrix and uses all available variables as predictors for imputing missing data.

A series of blocked linear regression analyses were conducted to examine the impact of characteristics and experiences of students on our outcome. First, an overall model with all racial/ethnic groups was employed to evaluate predictors that influenced intentions to make a contribution to scientific research. Three additional analyses were run separately on Black, Latina/o, and American Indian/Alaskan Native students. The blocks were organized according to two theories that guided our model, SCCT and the theory of reasoned action. That is, block 1 contained background and genetically determined characteristics, block 2 contained high school activities related to career goals, block 3 included beliefs about one's self-efficacy, block 4 contained students' goals and expectations and the final blocks controlled for institutional characteristics given that students might select institutions based on their reputation for producing graduates or based on their science programs (or science success).

Results

Table 6 summarizes the regression results of our outcome factor "intention to make a contribution to scientific research" for the overall sample, and Tables 7 through 9 present the findings for the Black, Latina/o, and American Indian/Alaska Native students, respectively. While the variables for all four regression analyses were entered in six blocks, only the betas after the second and in the final blocks are reported in Tables 3 through 6. These two blocks were chosen because they demonstrate significant changes before and after students' self-efficacy, goals and expectations, and institutional characteristics are entered into the equation. The standardized Beta coefficients demonstrated significant changes in some cases. In many instances, suppressor effects were seen in the course of our multivariate analyses. As defined by Pedhazur (1997), a suppressor effect occurs when "a variable that has a zero, or close to zero, correlation with the criterion leads to improvement in prediction when it is included in a multiple

regression analysis. This takes place when the variable in question is correlated with one or more than one of the predictor variables" (p. 186). The term "suppressor" is used to indicate that one variable is "suppressing" the observed relationship between two other variables. When that "suppressor" variable is controlled, the relationship between the other two variables becomes stronger.

Because our data was derived from HERI's CIRP national annual Freshman Survey, we have a relatively large subsample of almost 30,000 students. Smart (2002) realized that the potential problem in studies with very large sample sizes is the mere fact that statistical significance is in large part a function of sample size. In other words, a variable may be highly significant statistically when the sample size is very large, but may be non-significant when the sample size is very small. Thus, the significance level is not very informative when sample sizes are large. As an alternative, effect sizes are being reported as a supplement to statistical significance. Effect sizes are indices that measure the magnitude of a treatment effect. And, unlike significance tests, effect sizes are independent of sample sizes. According to Pedhazur (1997) and Algina and Moulder (2001), when multiple regression is used, the increase in R^2 when a variable (X_j) is added to the model is commonly used as an effect size for the strength of the relationship between X_j and the dependent variable (Y), controlling for the other independent variables in the model. Thus, we also compare selected effect sizes (R^2) when we compare key variables across the racial groups for the underrepresented minority sample.

—Place Table 6 about here—

Multivariate Results for the Overall Sample. Focusing first on the results for the overall sample (see Table 6), a number of background characteristics and high school activities have a significant effect on students' intention to making a theoretical contribution to scientific

research. Female students (as compared to male students), U.S. citizens (as compared to non U.S. citizens), and native English speakers (as compared to non-native English speakers), are all significantly less inclined to make a theoretical contribution to scientific research. Interestingly, while most racial groups (Asians, Blacks, Latina/os, and Native Hawaiian/Pacific Islanders) are significantly more inclined to make a contribution to scientific research as compared to White students, once the influence of high school activities, self-efficacy, goals/expectations, and institutional characteristics are taken into account, only Blacks are somewhat less likely to express an intention to make a contribution to scientific research. The one other exception is that of Asian students who are actually less inclined than White students to contribute to science after all the other variables are included in the model. Both negative indicators are a result of a suppressor effect where other measures in the equation create changes in the relationship between a variable of interest and the dependent variable. A closer examination of the interaction between variables reveals that the association between being Asian and the dependent variable stays positive until students' goals and expectations are accounted for, which appear to be the main explanatory variables for this group.

While parental income, education, or career do not have any effect on students' aspirations, students who are concerned about financing their college education are significantly more likely to intend to make a contribution to scientific research. High school GPA is a significant positive predictor on the outcome goal, however, once self-efficacy is taken into account, that effect becomes significantly negative. Similarly, once other background characteristics, high school activities, and self-efficacy ratings are controlled for, the effect of SAT score becomes significantly negative. These two suppressor effects indicate the importance of self-efficacy as a powerful determinant of entering student intentions to make a contribution to

scientific research. Having self-confidence in one's ability and interest to learn appears more important, with regard to intentions to pursue the sciences, than other academic credentials such as standardized tests and high school grades.

Not surprisingly many high school activities and experiences have a positive effect on the outcome variable. Previous classes in the physical and biological sciences, hours per week studying, tutoring other students, and talking with a teacher outside of class all have positive effects on students' aspirations to making a contribution to scientific research. Other activities such as volunteering for hospital work or other health education type activities, or working for pay during high school are also positive predictors. Amongst all of these high school activities, of particular interest to this study is student involvement in two types of programs: a summer research program and a health science research program sponsored by a university. Participation in one or both of these programs has significant positive effects on students' inclination to making a contribution to scientific research. All of these high school activities remain significant positive predictors on aspirations even after controlling for all the other variables in the model. These findings speak to the importance of having both formal coursework in the sciences and experiential learning opportunities through programs to foster students' interest in contributing to the scientific research. Building this foundation in the pre-college years is a way to reinforce underrepresented students interest in these fields of study and to enhance the capacity to see themselves making an impact through health-related research.

All but two of the self-efficacy ratings (i.e., mathematical ability and time management) have significant positive influence on students' goals in the sciences. Time management is positive initially, but this association becomes insignificant once students' ratings of their drive to achieve are controlled. In fact, the item assessing one's drive to achieve shows the strongest

positive influence on the outcome variable of all the self-efficacy ratings. Ambition and a willingness to achieve despite challenging and competitive circumstances may be important traits to have for those who desire to pursue the scientific research. These characteristics may be especially beneficial in light of the rigorous curriculum and competitive culture commonly associated with science fields (Seymour & Hewitt, 1997).

Similarly, many of the students' goals and expectations also have a positive influence on students' aspirations. The goals to be very well off financially and working full-time while attending college have positive effects on students' aspirations. In comparison to students in pre-professional majors, students pursuing a major in either the biological or chemical science are more likely to aspire to make a contribution to scientific. On the other hand, students majoring in psychology as compared to pre-professional majors are less likely to have these aspirations. It may be that students more commonly associate scientific research with the fields of biology and chemistry and are less familiar with clinical and survey research, which is more typical in the field of psychology. Students aspiring to any post-graduate degree except for a Master's or non-science pre-professional degree (as compared to students who aspire to a Bachelor's degree or lower) are more likely to aspire to make a contribution to scientific research.

While most of the students' goals and expectations have significant positive effects on their aspirations, guesses as to changing their major field or career choice in the future have a negative impact on intent to make a contribution to scientific research. One significant positive predictor of students' aspirations is students' belief that their college's graduates gain admission to top graduate/professional schools, indicating the importance of a peer subjective norm. All of these goals and expectations have a significant effect on their intentions even after all the other variables in the model are controlled for. From this block of variables, we can see that students

who are committed to their choice of majors and seek to continue their education past the baccalaureate are also those who are more likely to want to have an impact on scientific research. These findings seem intuitive since contributing to research generally requires a graduate education and continued development of knowledge, expertise, and experience.

Finally, a few institutional characteristics have initial influence but generally have modest influence on students' intention to make a contribution to scientific research once students' self-efficacy and goals and expectations are taken into account. For instance, students who attended a university (as compared to a four-year college) and students who attended a historically Black or Hispanic serving institution (as compared to a predominantly White institution) are more likely to have this aspiration, but these effects are explained by self-efficacy, goals, and expectations. It is likely that selection of a college is most strongly connected with these factors—a focus of subsequent research with this cohort of entering students. On the other hand, once goals and expectations are taken into account, institutional selectivity has a significant positive influence on students' aspirations demonstrating a unique contribution to the variance in the dependent variable. Finally, the percent of BAs awarded to URM's in any of the science fields assessed (biology, chemistry, psychology or pre-professional health fields) has a significant positive influence on students' intentions initially, but only the proportion of URM students in biology or chemistry shows a unique influence on students' intention to make a contribution to scientific research. These institutional findings suggests that the subjective peer norm, particularly attending a selective college, has a potentially small reinforcing effect on students' intentions and aspirations but additional work is needed to determine how this works within college environments.

Multivariate Results for the Underrepresented Minority Sample. Because we are mainly interested in how background characteristics, high school activities, self-efficacy, goals/expectations, and institutional characteristics affect underrepresented minority students in the biomedical and behavioral sciences, we conducted three separate analyses on these individual groups, that is, Black, Latina/o, and American Indian/Alaska Native students (see Tables 7 through 9). (A separate paper will focus on comparing Asian American and Native Hawaiian/Pacific Islanders). For all three groups of students, female URM students (as compared to males) are less likely to intend to make a contribution to scientific research. However, once self-efficacy is controlled, this gender difference disappears. For Blacks and Latina/os, U.S. citizens (as compared to non-U.S. citizens) are less likely to hold these aspirations. And, while English speakers (as compared to non-native English speakers) are also less likely to hold these aspirations for these two groups, this effect remains significant only for Black students once all the other variables are considered.

—Place Table 7 about here—

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Parental income is a significant negative predictor of students' aspirations for Black students, while concern about financing their college education has a moderate significant positive predictor of intentions for Latina/os. Interestingly, high school GPA has a significant positive effect on students' aspirations to make a contribution to scientific research for Black students. This effect, however, has no effect once self-efficacy and goals/expectations are accounted for in the final equation. For Latino/as, high school GPA become significantly negative once self-efficacy is controlled in the model.

Although the type of high school attended has no significant effect for the three groups, when examining high school curriculum, the years of high school classes in the physical sciences for all URM students, and years of biological sciences have a significant positive influence on students' intention of making a contribution to scientific research for Black and American Indians. Hours per week spent studying or doing homework is also a significant positive predictor for Black students, however, this effect is not significant for Latina/os and American Indians/Alaska Natives once other high school activities and self-efficacy are taken into account. Tutoring another student has a significantly positive impact on students' aspirations for all three groups of students, while talking with a teacher outside of class has a significantly positive influence on students' aspirations for only Blacks and Latina/os. While volunteering in a hospital or other health education type of setting has significantly positive effects on students' aspirations for all three groups initially, only serving in the other health education type of setting remains a significant positive predictor for Blacks and Latina/os. Similarly, both the summer research program and health science research program sponsored by a university initially are positive predictors of students' aspirations for all three groups of students. Once other variables are taken into account, the summer research program persists to have a positive unique effect on Black students' aspirations, and the health science research program sponsored by a university continues to positively influence the intentions of Latina/os.

Turning now to the results of self-efficacy, a few of the different domains prove to have a lasting influence on students' aspirations to making a contribution to scientific research throughout the model. Two key traits are students' intellectual self-confidence and drive to achieve which serve as positive predictors on students' aspirations for all three groups of students. Some differences are also evinced among the groups. Writing ability is positively

associated with students' goal to contribute to scientific research for Black and American Indian/Alaska Native students. Self-rating of computer skills also has a significantly positive effect for Black students but has no unique contribution effect on either Latina/o or American Indian/Alaska Native students' intentions. When examining the change in R^2 as each of these ratings enter the model, the difference in effect size across racial groups is observed (see Table 10). For instance, the impact of intellectual self-confidence is similar for Latino and American Indian/Native Alaskan students ($\Delta R^2 = .044$) and twice the effect as seen for Black students ($\Delta R^2 = .022$). Meanwhile, the effects of writing ability and drive to achieve on the dependent variable are much stronger for American Indian/Native Alaskan students ($\Delta R^2 = .011$ and 0.33, respectively) as compared to Black ($\Delta R^2 = .005$ and .016) and Latino ($\Delta R^2 = .001$ and .013) students.

—Place Table 10 about here—

Many similarities are seen across the three groups when examining students' goals and expectations. Generally, in comparison to students with an interest in pre-professional majors, students pursuing a major in either the biological or chemical science are more likely to aspire to make a contribution to scientific research. This finding speaks to the divergent routes students in the sciences often see between pursuing medicine or professional careers and research in the sciences. This effect of major is consistent across the three groups of students. Best guesses as to changing their major field or career choice in the future have a negative impact on students' intentions in the sciences regardless of race, but the statistical significance of this influence varies by group. Aspiring to an MD or PhD degree (as compared to a BA or less) is a positive predictor of students' aspirations for all three groups of students. Similarly, having the goal to be very well off financially is also a consistently positive predictor across all three racial groups. In

fact, in all of the models, this variable has the strongest positive association with the outcome variable of any of the items entered into the analyses. The effect of this variable was strongest for Black students ($\Delta R^2 = .06$) followed by Latino ($\Delta R^2 = .048$) and American Indian/Native Alaskan ($\Delta R^2 = .041$) students, respectively. This finding is somewhat unexpected and indicates that students may anticipate scientific research to be a lucrative career choice. This association can also be attributable to how the outcome variable is constructed. The outcome variable includes certain status items, including the goals of gaining recognition from colleagues and being an authority in your field of study, which in turn, can be closely related to being financially well-off if it is associated with new drug or treatments in science.

The last variable in the group of goals and expectations assessed, working full-time while attending college, however, is a significant positive factor for Black and Latina/o students. Similar to the findings in the overall model, students' reason for attending college to prepare for graduate/professional schools positively affects their intention to contribute to scientific research for all students regardless of race.

Finally, certain institutional characteristics show influence on the dependent variable for particular groups of students. For African-American students, private, less selective, historically black colleges or universities are positively related to students' aspirations to make a contribution to scientific research. However, once self-efficacy and goals/expectations are controlled, these institutional characteristics no longer have any effect on Black students' aspirations. Also, attending a Hispanic-serving institution does not have a significant effect on Latino students' aspirations. In contrast, for American Indian/Alaska Native students, institutional selectivity is positively related to students' aspirations even after all the other variables are included in the model. Finally, with regards to degrees awarded in the sciences, the

percent of degrees conferred to URM students in the fields of biology or chemistry, psychology, or pre-professional health fields had varying influence for each of the racial groups. While the greater the percentage of degrees awarded to URMs in each of these fields was related to an increase in students' aspirations, the effect of degree conferral in psychology and pre-professional fields remained positively significant only for Latino/a students once the other variables were taken into consideration.

Discussion/Conclusion

The Social Cognitive Career Theory model and the theory of reasoned action, coupled with accentuation theory, provided a useful guide for understanding early predictors of students' intention to make a contribution to scientific research. The findings reveal several key background characteristics, behaviors, and attitudes important in shaping students' intentions that may eventually lead toward becoming a research scientist. Identifying these traits and activities is important as educators, researchers and policy-makers make efforts and take action in bolstering the participation of underrepresented minority students in the biomedical and behavioral sciences.

For one, all of the models reaffirm the importance of enhancing student self-efficacy and specific goals in motivating students, and specifically toward the specific goal of contributing to scientific research. In many cases, students' intellectual self-confidence, ratings of academic abilities and drive to achieve prove to be determining factors in their likelihood to intend to have an impact in science, even though their academic credentials or background characteristics vary. These factors tend to supersede SAT scores and grades, factors that typically reinforce students' tendencies and inclinations to pursue science. These beliefs about themselves matched with a

strong sense of identity as a scientist while in college can effectively translate students' initial aspirations to commitment and achievement.

Another common thread seen in all the models is the need to expose students to the sciences in high school through both coursework and experiential learning. In all cases, studying physical or biological sciences in high school was effective in getting students to think about contributing to scientific research in the future. Interestingly, years studying mathematics did not show a significant relationship with the outcome variable. While mathematics provides necessary foundational knowledge, having direct exposure to science topics may be more influential in fostering interest in scientific research. Also having interaction with others in academic environments in general, and in the sciences specifically, seems to lead students to commit to these fields of study. For instance, talking with instructors and tutoring other students while in high school was important in the experiences of Latino and Black students, respectively. Furthermore, hands-on experiential learning in the sciences through volunteer work in the hospital, health education, and research programs was of value in aspiring students toward scientific research. One of the focuses of this project was examining the impact of research programs geared toward high school students. The findings from this study indicate that these programs are serving as positive motivating experiences for all students, and especially for Latino and Black students (see Tables 7 and 8). These results confirm the need and effectiveness of these funded efforts in bolstering participation in the sciences among underrepresented groups.

An unexpected finding was the strong relationship between the goal of being very well off financially and contributing to scientific research. In most cases, this goal proved to be the strongest positive predictor for the outcome variable. This relationship is especially interesting

in light of some of the other variables that assessed students' concern about finances and past or future need to work while in school. It appears that students who need financial support or are anticipating working while in college are actually those students who are more prone to value making a contribution to scientific research. One reason for this may be that students view scientific research as a lucrative future career that will provide for them financially. Recent and well-publicized research in pharmaceutics or new breakthroughs in the health fields may be contributing to students' perceptions. Their concerns about finances and doing well financially apparently are weighing heavily in students' minds as they seek to impact research in science. It suggests that continued financial support for students may be important to achieve their goal of becoming a research scientist.

Lastly, students' choice of institution did not appear to play a significant role in their aspirations to contribute to the sciences. Except for the selectivity of the institution (and only in some cases), the type, control, race, and degrees awarded in the sciences did not have a unique contribution to intentions to make a contribution to scientific research. Thus, students aspiring to these goals can be found at all types of colleges and universities. Because the sample involved incoming freshmen, this finding should serve as motivation to all higher education institutions to continue to nurture and foster their students' initial interest in the scientific research careers. Understanding how the institutional environment affects students' commitment to scientific research is an important next step in the line of developing research to increase the retention of underrepresented students in biomedical and behavioral science research careers.

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Table 1. Factor Loadings and Reliability of the Dependent Variable

Dependent Variable	Factor loading	Alpha
Intention to Make a Contribution to Scientific Research		.71
Importance of obtaining recognition from my colleagues for contributions to my special field[a]	.78	
Importance of making a theoretical contribution to science[a]	.74	
Importance of becoming an authority in my field[a]	.72	
Importance of working to find a cure to a health problem[a]	.70	

[a] Four-point scale: From 1 = not important to 4 = essential.

Table 2. Description of Items/Variables Used in the Regression Analysis

Variable Name	Variable Type	Scale Range
Dependent Variable		
Intention to Make a Contribution to Scientific Research	Scaled index, 4 items	1 = not important to 4 = essential
Background Characteristics		
Gender	Dichotomous	1 = male, 2 = female
White/Caucasian	Dummy-coded	1 = not marked, 2 = marked
Asian American/Asian	Dummy-coded	1 = not marked, 2 = marked
Black	Dummy-coded	1 = not marked, 2 = marked
Latino/a	Dummy-coded	1 = not marked, 2 = marked
American Indian/Alaskan Native	Dummy-coded	1 = not marked, 2 = marked
Native Hawaiian/Pacific Islander	Dummy-coded	1 = not marked, 2 = marked
U.S. Citizen	Dummy-coded	1 = no, 2 = yes
English as a native language	Dummy-coded	1 = no, 2 = yes
Mother's education	Single-item, categorical	1 = grammar or less, 2 = some HS, 3 = HS graduate, 4 = postsecondary, 5 = some college, 6 = college graduate, 7 = some graduate school, 8 = graduate degree
Parent(s) has a science career	Dummy-coded	1 = non-science career, 2 = science career
Parental Income	Single-item, categorical	1 = < $10,000 to 14 = $250,000+
Concern about ability to finance college education	Single-item, categorical	1 = none, 2 = some, 3 = major
High School GPA	Single-item, categorical	1 = D to 8 = A or A+
SAT composite	Single-item, continuous	Combined math and verbal SAT score or converted ACT score (400-1600 scale).
High School Activities		
Private independent (referent group)	Dummy-coded	1 = no, 2 = yes
Public high school	Dummy-coded	1 = no, 2 = yes
Public magnet high school	Dummy-coded	1 = no, 2 = yes
Private religious/parochial	Dummy-coded	1 = no, 2 = yes
Years studied in high school: Mathematics	Single-item, categorical	1 = none to 7 = 5+ years
Years studied in high school: Physical science	Single-item, categorical	1 = none to 7 = 5+ years
Years studied in high school:	Single-item, categorical	1 = none to 7 = 5+ years

Biological science		
Hours per week: Studying/ homework	Single-item, categorical	1 = none to 8 = over 20
Acts in past year: Studied with other students	Single-item, categorical	1 = not at all, 2 = occasionally, 3 = frequently
Acts in past year: Tutored another student	Single-item, categorical	1 = not at all, 2 = occasionally, 3 = frequently
Hours per week: Talking with teachers outside of class	Single-item, categorical	1 = none to 8 = over 20
Civic activities in high school: Hospital work	Dummy-coded	1 = not marked, 2 = marked
Civic activities in high school: Other health education	Dummy-coded	1 = not marked, 2 = marked
Participation in: A summer research program	Dummy-coded	1 = no, 2 = yes
Participation in: A health science research program at a university	Dummy-coded	1 = no, 2 = yes
Hours per week: Working (for pay)	Single-item, categorical	1 = none to 8 = over 20
Self-efficacy		
Self ratings:		
Self confidence (intellectual)	Single-item, categorical	1 = lowest 10% to 5 = highest 10%
Academic ability	Single-item, categorical	1 = lowest 10% to 5 = highest 10%
Mathematical ability	Single-item, categorical	1 = lowest 10% to 5 = highest 10%
Writing ability	Single-item, categorical	1 = lowest 10% to 5 = highest 10%
Computer skills	Single-item, categorical	1 = lowest 10% to 5 = highest 10%
Drive to achieve	Single-item, categorical	1 = lowest 10% to 5 = highest 10%
Time management	Single-item, categorical	1 = lowest 10% to 5 = highest 10%
Goals/expectations		
Majoring in a pre-professional science degree (referent group)	Dummy-coded	1 = no, 2 = yes
Majoring in a biological science	Dummy-coded	1 = no, 2 = yes
Majoring in a behavioral science	Dummy-coded	1 = no, 2 = yes
Majoring in a chemical science	Dummy-coded	1 = no, 2 = yes
Best guess for future act: Change major field	Single-item, categorical	1 = no chance to 4 = very good chance
Best guess for future act: Change career choice	Single-item, categorical	1 = no chance to 4 = very good chance
Reason for attending this	Single-item, categorical	1 = not important, 2 = somewhat

college: to prepare for graduate school		important, 3 = very important
Degree aspiration:		
Bachelor's or lower (referent group)	Dummy-coded	1 = no, 2 = yes
Master's/non-science pre-Professional (Master's, Law, or Divinity)	Dummy-coded	1 = no, 2 = yes
MD/DO/DDS/DVM	Dummy-coded	1 = no, 2 = yes
PhD or EdD	Dummy-coded	1 = no, 2 = yes
Personal importance: being very well off financially	Single-item, categorical	1 = not important, 2 = somewhat important, 3 = very important, 4 = essential
Best guess for future act: Work full-time while attending college	Single-item, categorical	1 = no chance to 4 = very good chance
Institutional Characteristics		
Institutional type	Dummy-coded	1 = university, 2 = 4-year college
Institutional control	Dummy-coded	1 = public, 2 = private
Selectivity	Single item, continuous	Combined math and verbal SAT score of entering freshmen
Historically Black College or University	Dummy-coded	1 = no, 2 = yes
Hispanic Serving Institution	Dummy-coded	1 = no, 2 = yes
Minority Serving Institution	Dummy-coded	1 = no, 2 = yes
Institutional Characteristics: degrees awarded in the health sciences		
Percent of URM BA/BS's awarded relative to total BA/BS's awarded in the health science fields:		
Pre-professional science	Single item, continuous	Range 0 to 99%
Biology and chemistry	Single item, continuous	Range 0 to 96%
Psychology	Single item, continuous	Range 0 to 70%

Table 3. Scheffe's Post-hoc test of Mean Differences for Making a Contribution to Scientific Research

(I) Race/ethnicity (Group Mean)	(J) Race/ethnicity	Mean Difference (I-J)	Std. Error
Black (1.98)	Latino/a	.056***	.011
	American Indian/Alaska Native	.091***	.014
	White & Asian	.107***	.007
Latino/a (1.92)	Black	-.056***	.011
	American Indian/Alaska Native	.035	.016
	White & Asian	.051***	.010
American Indian/ Alaska Native (1.89)	Black	-.091***	.014
	Latino/a	-.035	.016
	White & Asian	.016	.013
White & Asian (1.87)	Black	-.107***	.007
	Latino/a	-.051***	.010
	American Indian/Alaska Native	-.016	.013

*p<.05, **p<.01, ***p<.001

Table 4. Results for the Pairwise Comparison Using the Holm's Sequential Bonferroni Method for Participation in a Summer Research Program

Comparison (% of those who participated in a summer research program)	Pearson chi-square	p-value	Required p-value for significance	Significance	Cramer's V
Black (16.1%) vs. White & Asian (10.4%)	154.10	.000	.0080	*	.08
Black (16.1%) vs. Am Indian (9.1%)	49.57	.000	.0100	*	.08
Black (16.1%) vs. Latino (11.7%)	30.22	.000	.0125	*	.06
Latino (11.7%) vs. Am Indian (9.1%)	7.24	.007	.0166	*	.04
Latino (11.7%) vs. White & Asian (10.4%)	5.01	.025	.025	*	.02
Am Indian (9.1%) vs. White & Asian (10.4%)	2.40	.121	.05	NS	.01

* p-value exceeds required p-value for significance

Table 5. Results for the Pairwise Comparison Using the Holm's Sequential Bonferroni Method for Participation in a University-Sponsored Health Science Research Program

Comparison (% of those who participated in a health science program)	Pearson chi-square	p-value	Required p-value for significance	Significance	Cramer's V
Black (10.9%) vs. White & Asian (5.4%)	223.54	.000	.0080	*	.10
Black (10.9%) vs. Am Indian (5.0%)	50.31	.000	.0100	*	.08
Black (10.9%) vs. Latino (7.4%)	27.24	.000	.0125	*	.05
Latino (7.4%) vs. White & Asian (5.4%)	17.41	.000	.0166	*	.03
Latino (7.4%) vs. Am Indian (5.0%)	9.66	.002	.025	*	.05
Am Indian (5.0%) vs. White & Asian (5.4%)	.59	.442	.05	NS	.01

* p-value exceeds required p-value for significance

Table 6: Summary of Regression Results for All Students who Indicated a Biomedical or Behavioral Science Major at the Start of Freshman Year (N=24,434)

Block	Variable	r	Block 2	Block 6	Adj. R^2
1	Background Characteristics				3.00
	Gender: Female	-.04 ***	-.07 ***	-.02 **	
	Asian American/Asian	.05 ***	.01	-.04 ***	
	African American/Black	.07 ***	.09 ***	-.02 **	
	Latino/a	.01 *	.03 ***	-.01	
	American Indian/Alaskan Native	-.01	.03 ***	.00	
	Native Hawaiin/Pacific Islander	.01	.02 ***	.00	
	U.S. Citizen	-.10 ***	-.05 ***	-.05 ***	
	Native English speaker	-.10 ***	-.05 ***	-.05 ***	
	Mother's education	-.01	.00	.01	
	Parent(s) has science career	.01	.00	.00	
	Parental income	-.05 ***	.00	-.01	
	Concern about financing college	.05 ***	.03 ***	.03 ***	
	High School GPA	.07 ***	.05 ***	-.03 ***	
	SAT composite	.02 *	-.05 ***	-.02 *	
2	High school activities				9.00
	Public high school (vs. private independent)	.00	.03 **	.01	
	Public magnet high school (vs. private independent)	.03 ***	.01	-.01	
	Private religious/parochial (vs. private independent)	-.02 ***	.00	.00	
	Years studied: Mathematics	.06 ***	.02 *	.00	
	Years studied: Physical science	.07 ***	.04 ***	.03 ***	
	Years studied: Biological science	.11 ***	.07 ***	.05 ***	
	Hours per week: Studying or homework	.11 ***	.06 ***	.02 ***	
	Acts in past year: Studied with other students	.09 ***	.03 ***	.02 **	
	Acts in past year: Tutored another student	.16 ***	.10 ***	.05 ***	
	Hours per week: Talking with teacher outside class	.12 ***	.06 ***	.05 ***	
	Civic activities in high school: Hospital work	.12 ***	.07 ***	.03 ***	
	Civic activities in high school: Other health education	.08 ***	.04 ***	.03 ***	
	Participated in: A summer research program	.13 ***	.06 ***	.05 ***	
	Participated in: A health science research program at university	.10 ***	.04 ***	.03 ***	
	Hours per week: Working for pay	.01	.04 ***	.02 *	
3	Self-efficacy				16.00
	Self rating: Self-confidence (intellectual)	.21 ***	.18 ***	.07 ***	
	Self rating: Academic ability	.17 ***	.17 ***	.03 ***	
	Self rating: Mathematical ability	.14 ***	.10 ***	.01	
	Self-rating: Writing Ability	.13 ***	.12 ***	.06 ***	
	Self rating: Computer skills	.12 ***	.09 ***	.03 ***	
	Self:rating: Drive to achieve	.27 ***	.23 ***	.12 ***	
	Self-rating: Time Management	.12 ***	.09 ***	.00	
4	Goals/Expectations				26.40
	Majoring in biological science (vs. pre-professional science)	.10 ***	.07 ***	.04 ***	
	Majoring in behavioral science (vs. pre-professional science)	-.20 ***	-.15 ***	-.09 ***	
	Majoring in chemical science (vs. pre-professional science)	.02 **	.02 **	.03 ***	
	Best guess for future act: Change major field	-.16 ***	-.13 ***	-.05 ***	
	Best guess for future act: Change career choice	-.17 ***	-.14 ***	-.04 ***	
	Reason for attending this college: To prepare for graduate/prof scho	.23 ***	.19 ***	.11 ***	
	Master's/non-science pre-professional (vs. BA or less)	-.15 ***	-.11 ***	-.02 **	
	MD/DO/DDS/DVM (vs. BA or less)	.14 ***	.10 ***	.04 ***	
	PhD/EdD (vs. BA or less)	.06 ***	.06 ***	.07 ***	
	Personal importance: Being very well off financially	.30 ***	.29 ***	.25 ***	
	Best guess for future act: Work full-time while attending college	.05 ***	.05 ***	.06 ***	
5	Institutional Characteristics				26.40
	Institutional Type: 4-year college (vs. university)	-.05 ***	-.02 **	.00	
	Institutional Control: private (vs. public)	.02 **	.00	.01	
	Selectivity	.04 ***	-.01	.04 ***	
	Historically Black College/University (vs PWIs)	.05 ***	.03 ***	-.03	
	Hispanic Serving Institution (vs PWIs)	.01 *	.02 *	.00	
6	Institutional Characteristics: Degrees awarded in the health sciences				26.40
	Percent of total BAs awarded in the health sciences to URMs: biology or chemistry	.07 ***	.04 ***	.03 **	
	Percent of total BAs awarded in the health sciences to URMs: psychology	.05 ***	.03 ***	.00	
	Percent of total BAs awarded in the health sciences to URMs: pre-professional fields	.04 ***	.03 ***	.01	

DV: Intention to Make a Contribution to Scientific Research (alpha=.71)

*** p < .001

** p < .01

* p < .05

Table 7: Summary of Regression Results for Black Students who Indicated a Biomedical or Behavioral Science Major at the Start of Freshman Year (N=4,409)

Block	Variable	r		Block 2		Block 6		Adj. R^2
1	Background Characteristics							1.70
	Gender: Female	-.02		-.03	*	-.02		
	U.S. Citizen	-.10	***	-.06	***	-.05	***	
	Native English speaker	-.09	***	-.04	*	-.03	*	
	Mother's education	.01		.02		.01		
	Parent(s) has science career	.00		-.01		-.02		
	Parental Income	-.05	**	-.03		-.03	*	
	Concern about financing college	.02		.01		.01		
	High School GPA	.07	***	.03		-.03		
	SAT composite	.01		-.05	**	.00		
2	High school activities							6.30
	Public high school (vs. private independent)	.00		.05		.02		
	Public magnet high school (vs. private independent)	.01		.02		-.02		
	Private religious/parochial (vs. private independent)	.01		.04		.03		
	Years studied: Mathematics	.03	*	.00		-.01		
	Years studied: Physical science	.07	***	.04	*	.03	*	
	Years studied: Biological science	.10	***	.06	***	.04	*	
	Hours per week: Studying or homework	.11	***	.06	***	.04	*	
	Acts in past year: Studied with other students	.10	***	.04	**	.02		
	Acts in past year: Tutored another student	.15	***	.11	***	.06	***	
	Hours per week: Talking with teacher outside class	.10	***	.04	**	.04	**	
	Civic activities in high school: Hospital work	.06	***	.04	*	.02		
	Civic activities in high school: Other health education	.07	***	.04	**	.04	**	
	Participated in: A summer research program	.09	***	.04	*	.04	*	
	Participated in: A health science research program at university	.09	***	.05	**	.02		
	Hours per week: Working for pay	.03	*	.05	**	.02		
3	Self-efficacy							11.60
	Self rating: Self-confidence (intellectual)	.19	***	.15	***	.04	**	
	Self rating: Academic ability	.17	***	.15	***	.04	*	
	Self rating: Mathematical ability	.12	***	.08	***	.01		
	Self-rating: Writing Ability	.14	***	.12	***	.06	***	
	Self rating: Computer skills	.12	***	.10	***	.04	**	
	Self:rating: Drive to achieve	.24	***	.20	***	.10	***	
	Self-rating: Time Management	.11	***	.07	***	.00		
4	Goals/Expectations							22.40
	Majoring in biological science (vs. pre-professional science)	.11	***	.08	***	.04	**	
	Majoring in behavioral science (vs. pre-professional science)	-.18	***	-.15	***	-.09	***	
	Majoring in chemical science (vs. pre-professional science)	.02		.01		.02		
	Best guess for future act: Change major field	-.13	***	-.12	***	-.02		
	Best guess for future act: Change career choice	-.16	***	-.14	***	-.07	***	
	Reason for attending this college: To prepare for graduate/prof school	.19	***	.16	***	.09	***	
	Master's/non-science pre-professional (vs. BA or less)	-.13	***	-.11	***	-.02		
	MD/DO/DDS/DVM (vs. BA or less)	.10	***	.08	***	.05	*	
	PhD/EdD (vs. BA or less)	.05	**	.05	***	.08	***	
	Personal importance: Being very well off financially	.27	***	.28	***	.25	***	
	Best guess for future act: Work full-time while attending college	.06	***	.06	***	.06	***	
5	Institutional Characteristics							22.40
	Institutional Type: 4-year college (vs. university)	-.01		.01		-.01		
	Institutional Control: private (vs. public)	.04	**	.03	*	.02		
	Selectivity	-.01		-.06	**	-.01		
	Historically Black College/University (vs. PWI)	.07	***	.07	***	-.04		
6	Institutional Characteristics: Degrees awarded in the health sciences							22.40
	Percent of total BAs awarded in the health sciences to URMs: biology or chemistry	.08	***	.08	***	.06		
	Percent of total BAs awarded in the health sciences to URMs: psychology	.05	***	.06	***	.01		
	Percent of total BAs awarded in the health sciences to URMs: pre-professional fields	.01		.02		-.01		

DV Factor: Intention to Make a Contribution to Scientific Research (alpha=.71)

*** p < .001

** p < .01

* p < .05

Table 8: Summary of Regression Results for Latino/a Students who Indicated a Biomedical or Behavioral Science Major at the Start of Freshman Year (N=2,297)

Block	Variable	r	Block 2	Block 6	Adj. R^2
1	Background Characteristics				2.00
	Gender: Female	-.02	-.05 *	-.01	
	U.S. Citizen	-.12 ***	-.08 ***	-.08 ***	
	Native English speaker	-.10 ***	-.04	-.02	
	Mother's education	-.02	-.03	-.01	
	Parent(s) has science career	.03	.03	.03	
	Parental Income	-.03	.01	.00	
	Concern about financing college	.05 *	.04	.04 *	
	High School GPA	.07 **	.02	-.07 **	
	SAT composite	.01	-.04	-.02	
2	High school activities				9.20
	Public high school (vs. private independent)	-.01	.04	-.02	
	Public magnet high school (vs. private independent)	.03	.04	-.01	
	Private religious/parochial (vs. private independent)	-.01	.04	.00	
	Years studied: Mathematics	.10 ***	.05 *	.03	
	Years studied: Physical science	.09 ***	.06 **	.04 *	
	Years studied: Biological science	.10 ***	.05 *	.02	
	Hours per week: Studying or homework	.12 ***	.06 *	.02	
	Acts in past year: Studied with other students	.09 ***	.04 *	.03	
	Acts in past year: Tutored another student	.15 ***	.08 ***	.04 *	
	Hours per week: Talking with teacher outside class	.17 ***	.11 ***	.09 ***	
	Civic activities in high school: Hospital work	.10 ***	.07 ***	.03	
	Civic activities in high school: Other health education	.10 ***	.06 **	.05 **	
	Participated in: A summer research program	.11 ***	.04	.02	
	Participated in: A health science research program at university	.12 ***	.07 **	.04 *	
	Hours per week: Working for pay	.03	.06 **	.04 *	
3	Self-efficacy				16.10
	Self rating: Self-confidence (intellectual)	.25 ***	.22 ***	.12 ***	
	Self rating: Academic ability	.18 ***	.19 ***	.05 *	
	Self rating: Mathematical ability	.14 ***	.13 ***	.01	
	Self-rating: Writing Ability	.10 ***	.10 ***	.03	
	Self rating: Computer skills	.09 ***	.09 ***	.02	
	Self:rating: Drive to achieve	.26 ***	.21 ***	.08 ***	
	Self-rating: Time Management	.15 ***	.11 ***	.01	
4	Goals/Expectations				27.70
	Majoring in biological science (vs. pre-professional science)	.11 ***	.09 ***	.03	
	Majoring in behavioral science (vs. pre-professional science)	-.24 ***	-.20 ***	-.14 ***	
	Majoring in chemical science (vs. pre-professional science)	.03	.02	.03	
	Best guess for future act: Change major field	-.21 ***	-.18 ***	-.08 **	
	Best guess for future act: Change career choice	-.20 ***	-.17 ***	-.03	
	Reason for attending this college: To prepare for graduate/prof school	.21 ***	.17 ***	.10 ***	
	Master's/non-science pre-professional (vs. BA or less)	-.15 ***	-.12 ***	-.01	
	MD/DO/DDS/DVM (vs. BA or less)	.16 ***	.13 ***	.08 **	
	PhD/EdD (vs. BA or less)	.06 **	.06 **	.09 ***	
	Personal importance: Being very well off financially	.26	.27 ***	.23 ***	
	Best guess for future act: Work full-time while attending college	.04 *	.05 *	.05 **	
5	Institutional Characteristics				27.60
	Institutional Type: 4-year college (vs. university)	-.03	-.02	.00	
	Institutional Control: private (vs. public)	.01	.00	-.01	
	Selectivity	.03	-.03	.05	
	Hispanic serving institution (vs. PWI)	.03	.04	-.04	
6	Institutional Characteristics: Degrees awarded in the health sciences				28.16
	Percent of total BAs awarded in the health sciences to URMs: biology or chemistry	.07 **	.07 ***	.03	
	Percent of total BAs awarded in the health sciences to URMs: psychology	.05 **	.07 ***	.06 **	
	Percent of total BAs awarded in the health sciences to URMs: pre-professional fields	.05 **	.07 ***	.05 *	

DV Factor: Intention to Make a Contribution to Scientific Research (alpha=.71)

*** p < .001

** p < .01

* p < .05

Table 9: Summary of Regression Results for American Indian/Alaska Native Students who Indicated a Biomedical or Behavioral Sience Major at the Start of Freshman Year (N=1,280)

Block	Variable	r	Block 2	Block 6	Adj. R^2
1	Background Characteristics				.60
	Gender: Female	-.05 *	-.07 *	-.03	
	U.S. Citizen	.01	.02	-.01	
	Native English speaker	.00	.00	.01	
	Mother's education	.02	.03	.02	
	Parent(s) has science career	.06 *	.06 *	.03	
	Parental Income	-.03	-.06	-.04	
	Concern about financing college	-.02	-.04	-.03	
	High School GPA	.07	.03	-.04	
	SAT composite	.02	-.06	-.05	
2	High school activities				5.70
	Public high school (vs. private independent)	.00	.05	.05	
	Public magnet high school (vs. private independent)	.03	.03	.03	
	Private religious/parochial (vs. private independent)	-.01	.03	.03	
	Years studied: Mathematics	.04	-.01	-.01	
	Years studied: Physical science	.07 **	.05	.05 *	
	Years studied: Biological science	.12 ***	.10 ***	.06 *	
	Hours per week: Studying or homework	.07 **	.05	.01	
	Acts in past year: Studied with other students	.07 **	.02	.01	
	Acts in past year: Tutored another student	.15 ***	.12 ***	.06 *	
	Hours per week: Talking with teacher outside class	.04	-.01	-.01	
	Civic activities in high school: Hospital work	.10 ***	.06 *	.03	
	Civic activities in high school: Other health education	.08 **	.06 *	.04	
	Participated in: A summer research program	.13 ***	.09 **	.05	
	Participated in: A health science research program at university	.10 ***	.03	.02	
	Hours per week: Working for pay	.00	.01	.00	
3	Self-efficacy				14.90
	Self rating: Self-confidence (intellectual)	.26 ***	.22 ***	.08 **	
	Self rating: Academic ability	.19 ***	.17 ***	.01	
	Self rating: Mathematical ability	.11 ***	.07 *	.01	
	Self-rating: Writing Ability	.18 ***	.17 ***	.12 ***	
	Self rating: Computer skills	.13 ***	.10 ***	.03	
	Self:rating: Drive to achieve	.31 ***	.27 ***	.15 ***	
	Self-rating: Time Management	.13 ***	.08 **	-.02	
4	Goals/Expectations				25.00
	Majoring in biological science (vs. pre-professional science)	.10 ***	.07 **	.06 *	
	Majoring in behavioral science (vs. pre-professional science)	-.15 ***	-.12 ***	-.08 *	
	Majoring in chemical science (vs. pre-professional science)	-.01	-.02	.02	
	Best guess for future act: Change major field	-.14 ***	-.13 ***	-.04	
	Best guess for future act: Change career choice	-.14 ***	-.12 ***	-.02	
	Reason for attending this college: To prepare for graduate/prof school	.27 ***	.25 ***	.15 ***	
	Master's/non-science pre-professional (vs. BA or less)	-.15 ***	-.13 ***	.00	
	MD/DO/DDS/DVM (vs. BA or less)	.13 ***	.09 **	.06	
	PhD/EdD (vs. BA or less)	.10 ***	.11 ***	.11 **	
	Personal importance: Being very well off financially	.27 ***	.28 ***	.22 ***	
	Best guess for future act: Work full-time while attending college	-.02	.00	.03	
5	Institutional Characteristics				25.30
	Institutional Type: 4-year college (vs. university)	-.01	-.01	.03	
	Institutional Control: private (vs. public)	.04	.02	.00	
	Selectivity	.06 *	.07 *	.09 *	
	Minority serving institution (vs. PWI)	.02	.02	.00	
6	Institutional Characteristics: Degrees awarded in the health sciences				25.30
	Percent of total BAs awarded in the health sciences to URMs: biology or chemistry	.03	.01	-.02	
	Percent of total BAs awarded in the health sciences to URMs: psychology	.00	-.02	-.03	
	Percent of total BAs awarded in the health sciences to URMs: pre-professional fields	.05 *	.06 *	.03	

DV Factor: Intention to Make a Contribution to Scientific Research (alpha=.71)

*** p < .001

** p < .01

* p < .05

Table 10: Incremental change in adjusted R^2 among key variables

	Black	Latino	American Indian/Native Alaskan
Self-efficacy ratings			
Self rating: Self-confidence (intellectual)	.022	.044	.044
Self rating: Academic ability	.007	.008	.003
Self rating: Mathematical ability	.001	.002	-.001
Self-rating: Writing Ability	.005	.001	.011
Self rating: Computer skills	.002	.001	.002
Self:rating: Drive to achieve	.016	.013	.033
Self-rating: Time Management	.000	.000	.000
Goal/Expectation			
Personal importance: Being very well off financially	.060	.048	.041