



An Annotated Bibliography:
Evaluations of Pipeline Development Programs
Designed to Increase Diversity in the Health Professions

BIBLIOGRAPHY



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**An Annotated Bibliography:
Evaluations of Pipeline Development Programs
Designed to Increase Diversity in the Health Professions**

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INTRODUCTION

Health disparities in the United States are being addressed by multiple strategies. One strategy is to increase the racial/ethnic diversity of the health professions. Currently, the percentage of minority health professionals in the Nation falls far below the percentage of minorities in its population. Attempts to increase minority student interest in, and academic preparation for, health professions training and programs in the educational “pipeline” (education prior to health professions training) have been employed for many years. This document provides an annotated bibliography of a comprehensive review of the research literature that evaluates the effectiveness of health career oriented pipeline programs for minority students.

Domain

This bibliography covers articles (published and unpublished) that document studies of interventions to improve educational performance of minorities in programs designed to increase the numbers of minorities entering the health professions.

Scope

Searches of the computerized MEDLINE/HealthSTAR, Educational Resource Information Center (ERIC), and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases were conducted. Since each bibliographic database has a different subject focus, search terms were adjusted accordingly. Search terms in MEDLINE included: minority, diversity, education, attrition, premed, applicants, admissions, health professions applicants, student diversity, and minority education. In the ERIC database search terms included: health professions, minority health, minority education, and minority programs. For CINAHL, following terms were used: diversity programs, diversity education, minority program, minority education. Searches were conducted for the years 1980-2005, with the exception of the CINAHL search which commenced in 1982. Additionally, bibliographies at the back of many of the selected articles were reviewed to identify additional evaluations that may not have surfaced in the electronic subject search or that were not catalogued in the bibliographic databases. Also, individuals who were familiar with diversity programs were queried about other possible evaluations that may not have been found in the library databases, including unpublished work.

Selection

Documents were included in the bibliography if they: (1) evaluated interventions at the high school, college, or post-baccalaureate level, (2) evaluated interventions that were specifically targeted to health professions outcomes or outcomes in health professions “gateway” courses in science and math, (3) included interventions that targeted minority and disadvantaged students, (4) had study methods that included a control group, and (5) analyzed quantitative data on outcomes. Included studies examined outcomes that were short-term or intermediary (e.g., improvement in grade point average or MCAT scores) as well as those measuring “harder” outcomes such as actual matriculation in a health professions school. Although the search terms identified hundreds of articles, the vast majority of these publications were descriptive reports

that did not meet the inclusion criteria for formal review. This annotated bibliography includes the 24 controlled evaluations that met the inclusion criteria.

Organization

The evaluation study articles are organized alphabetically by author. There is also an alphabetical title listing on page 10.

Citation Format

Citation format follows the *National Library of Medicine Recommended Formats for Bibliographic Citation*, produced by the U.S. Department of Health and Human services, National Institutes of Health, National Library of Medicine.

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Evaluation Study Articles

1. Barlow EL, Villarejo M. Making a difference for minorities: evaluation of an educational enrichment program. *Journal of Research in Science Teaching* 2004 Nov;41(9):861-881.

This study compared minority participants in the Biology Undergraduate Scholars Program (BUSP), University of California, Davis (UCD) to a cross-section of matched biology contemporaries, as well as to matched students pre-BUSP. The BUSP program included academic enrichment, financial aid, and 4-week summer program. Outcomes for the study were chemistry and calculus grades, and the number of science graduates with grade point averages (GPAs) 3.0 or higher.

BUSP students were more likely than control students to successfully complete general chemistry, calculus and biology, and to earn higher grades in calculus and chemistry. BUSP students were significantly more likely to graduate with a degree in biology, and also had a non-significant trend towards a greater likelihood of graduating from UCD and a non-significant trend towards graduating as a biology major with a $GPA \geq 3.0$. Among the BUSP students, those who actively participated in the supplemental workshops earned higher calculus and chemistry GPAs than those who did were less engaged in the program.

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2. Bediako MR, McDermott BA, Bleich ME, Colliver JA. Ventures in education: a pipeline to medical education for minority and economically disadvantaged students. *Academic Medicine* 1996 Feb;71(2):190-192.

This study addressed the program “Ventures in Education”, a high school enrichment program for minority students which incorporated a challenging academic curriculum, educational enrichment in general health science, and tutoring to increase success in professions. The pre/post design compared Ventures graduates outcomes to school-wide rates before program implementation. The outcomes measured included health professions school applications and matriculation. Prior to the implementation of the Ventures program, no students at the five participating high schools took the Medical College Admission Tests (MCATs), applied, were accepted, or matriculated into medical school. After 5 years of this enrichment program, these numbers increased, resulting in 72 students matriculating into medical school.

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3. Campbell PB, Wahl E, Slater M, Iler E, Moeller B, Ba H, Light D. Paths to success: an evaluation of the gateway to higher education program. *Journal of Women and Minorities in Science and Engineering* 1998;4(2&3):297-308.

The Gateway to Higher Education, a multi-component high school program in New York City, was designed to improve minority students’ academic success in math and science. This retrospective cohort study with matched controls showed that the program was associated with increased rates of high school graduation, taking of Statewide Regents

Exams and SAT tests, achieving higher mean SAT scores, and increased matriculation into college.

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4. Cantor JC, Bergeisen L, Baker LC. Effect of an intensive educational program for minority college students and recent graduates on the probability of acceptance to medical school. *JAMA* 1998 Nov;280(9):772-776.

The Minority Medical Education Program (MMEP), a 6-week residential summer educational program for undergraduates and recent graduates, focused on training minority students in the sciences and improvement of writing, verbal reasoning, studying, test taking, and presentation skills. The program focused on enrichment rather than remediation. This cohort study compared participants to non-participant minority applicants to medical school, measuring the outcome as the probability of acceptance to at least 1 medical school. The results showed a significant increase of MMEP participants accepted to medical school compared with minority non-participants.

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5. Carline JD, Hunt DD, Patterson DG, Garcia C. Participation in enrichment programs and its effect on interview scores of applicants to the University of Washington School of Medicine. *Academic Medicine* 1999 Apr;74(4):360-362.

This retrospective cohort study compared minority student applications to University of Washington School of Medicine 1993-1995, assessing whether any enrichment program participation was correlated with interview scores. The results showed no effect of participation on an applicant's interview scores. There was a small, but not statistically significant effect that applicants were more likely to get interviews if they had participated in enrichment programs.

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6. Fletcher A, Williams PR, Beacham T, Elliott RW, Northington L, Calvin R, Hill M, Haynes A, Winters K, Davis S. Recruitment, retention and matriculation of ethnic minority nursing students: a University of Mississippi School of Nursing approach. *Journal of Cultural Diversity* 2003 Winter;10(4):128-33.

Designed to increase minority representation in nursing, the Minority Recruitment and Retention Initiative study compared the number of ethnic minority students and faculty in the University of Mississippi, School of Nursing. Numbers of minority students and faculty showed an increase in a pre/post program analysis.

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7. Fullilove R, Treisman PU. Mathematics achievement among African-American undergraduates at the University of California, Berkeley: an evaluation of the mathematics workshop program. *Journal of Negro Education* 1990 Summer; 59(3):463-478.

This study addressed the effectiveness of the Mathematics Workshop Program at the University of California, Berkeley, assessing whether this academic enrichment program had an impact on the African-American participants. Outcomes included students' final grade in Math 1A and improved persistence and graduation compared with African-American non-participants. Participants were additionally compared with a historical control group. Results showed that workshop students were significantly more successful

in earning a B- or better and persisting in school and graduation than both the non-participants and the historical controls.

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8. Hesser A, Pond E, Lewis L, Abbott B. Evaluation of a supplementary retention program for African-American baccalaureate nursing students. *Journal of Nursing Education* 1996 Oct;35(7):304-309.

The Minority Academic Advising Program (MAAP) at the Medical College of Georgia included supplementary retention activities and special advising efforts to address academic, personal, social and financial issues for undergraduate nursing students. This pre/post evaluation for underrepresented minority students looked at retention to graduation rates, GPA, and rate of board-passing on the first try. The study also compared the MAAP students to a pre-MAAP cohort. The mean grade point average for African American students increased significantly and the GPA gap between African Americans and other students narrowed. Graduation rates for African American nursing students, which were already high (92 percent) in the pre-intervention period, increased somewhat to 97 percent, a change which did not reach statistical significance. Passing rates at first sitting for nursing board exams increased from 49 percent to 64 percent over the pre- and post-intervention periods, although this difference also did not achieve statistical significance due to the small sample size.

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9. Hesser A, Lewis L, Abbott B, Vericella B. Evaluation of a supplementary retention program for Black allied health sciences students. *Journal of Allied Health* 1993 Spring;22(2):175-182.

This study addressed the impact of the Minority Academic Advising Program (MAAP) at the Medical College of Georgia's retention program. MAAP provided advising help for academic, personal, social, financial, vocational and other concerns. The pre/post study design compared retention variables of African-American undergraduates across two time periods, pre-MAAP, 1978-1982, and MAAP time period, 1984-1988, looking at the program's impact on retention in school. Graduation rates for African American students increased from 72 percent before the intervention to 83 percent after the intervention. Graduation rates for non-African American students remained relatively constant during the same period.

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10. Hesser A, Lewis L. Evaluation of a summer prematriculation program for Black and ... nontraditional students. *Academic Medicine* 1992 Apr;67(4):270-272.

The Medical College of Georgia Summer Pre-matriculation Program (SPP) provided an introduction to basic science courses taken in the first year, developed medical and learning skills, and supported academic and social interactions with classmates and faculty. In this cohort study comparing entering African-American medical students and nontraditional students deemed at risk who chose to participate in SPP vs. those who chose not to participate, researchers compared medical school grades, pass rates, and retention rates. Both intervention and control students had over 90 percent retention rates for the first year of medical school, although there was a slight trend for intervention students to be less likely to leave, withdraw or repeat the first year. There was also a non-significant trend of higher biochemistry grades for intervention students. The sample sizes were small, limiting the study's statistical power.

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11. Jackson EW, McGlinn S, Rainey M, Bardo HR. MEDPREP—30 years of making a difference. *Academic Medicine* 2003 Apr;78(5):448-53.

During the 30 years included in this retrospective uncontrolled cohort study of a post-baccalaureate program at Southern Illinois University School of Medicine, 688 minority students who participated in the post-baccalaureate Medical /Dental Education Preparatory Program were accepted to a health professions school, 578 matriculated and have either graduated or are expected to graduate. NOTE: In the 1999 article on this program (see Reference Item Number 15 below), the authors included measures of improvements in MCAT scores; those analyses were not included in this article.

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12. Latino Center for Medical Education and Research, University of California San Francisco at Fresno. (2005) An evaluation of the Sunnyside High School Doctors Academy. Unpublished report.

Doctors Academy, a high school program in Fresno designed to improve minority students' success in pursuing medicine and other health professions, was assessed through a retrospective controlled cohort study. This academic, mentoring, experience and skills-based program resulted in increased grade point average and cumulative credits. Program participants were more likely to graduate on time.

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13. Lewis CL. A state university's model program to increase the number of its disadvantaged students who matriculate into health professions schools. *Academic Medicine* 1996 Oct;71(10):1050-1057.

The evaluation of San Diego State University's Health Careers Opportunity Program (HCOP) compared pass rates for entry-level competencies, GPA and applications and acceptance to health professions schools for disadvantaged students who participated in the multi-component program vs. those who attended the University prior to having an HCOP program on campus. The aggregate GPA of HCOP students was compared to

minority pre-health students in the years before HCOP implementation. The number of minority applicants and acceptances to health professions schools (not counting those to nursing or public health) were analyzed as well.

Summer Academic Program participants had higher pass rates for the math and writing entry level competency tests compared to other SDSU students. Mentoring journals (that mentors kept, recording interactions with protégés) indicate that students' feelings of confidence and success were correlated with a higher GPA. The GPA of minority pre-health students steadily increased after the advent of HCOP on campus and continued to increase over the 5 years analyzed. Underrepresented minority applicants to health professions schools doubled over the 5 years post-HCOP when compared with 5 years pre-HCOP; acceptance rates remained virtually the same.

14. Maton KI, Hrabowski FA, Schmitt CL. African-American college students excelling in the sciences: college and post-college outcomes in the Meyerhoff Scholars Program. *Journal of Research in Science Teaching* 2000 Sep3;7(7):629-654.

This evaluation of the Meyerhoff Scholars Program at the University of Maryland, Baltimore County assessed effectiveness of the program which focused on increasing the number of African-American Ph.D. level researchers in science, engineering and math (SEM). In a controlled cohort study, the authors compared Meyerhoff students to those who were accepted to the program but declined and went to another university. The researchers also compared students in the first three Meyerhoff Program cohorts to a pre-Meyerhoff sample of African-American students who met the entrance requirements of the program. A sample of matched controls were used, as well. Outcome included GPAs; grades in "gateway" courses; science and engineering GPAs; and graduation rates in science, engineering or math (SEM) disciplines.

Meyerhoff students were nearly twice as likely to graduate in SEM majors as those who declined the program, and achieved significantly higher SEM GPAs than either the declined or historical sample. There were no significant differences between the two groups in terms of overall GPA. Meyerhoff students were more likely to attend SEM graduate school. Relatively equal numbers attended medical school. Adjusted overall GPAs were higher in the Meyerhoff group than in the historical African-American group or the current Asian or Caucasian group.

15. McGlenn S, Jackson EW, Bardo HR. Postbaccalaureate medical/dental education preparatory program (MEDPREP) at Southern Illinois University School of Medicine. *Academic Medicine* 1999 Apr;74(4):380-382.

The Medical/Dental Education Preparatory Program (MEDPREP) at Southern Illinois University School of Medicine was a post-baccalaureate program to assist minority students in improving their credentials to health professions schools. This study compared changes in MCAT scores of MEDPREP participants to all others repeating the MCAT April 1993 to August 1994. On each section of the MCAT, repeater testers who participated in MEDPREP achieved larger gains on average than all repeaters. No tests of significance were conducted.

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16. Nagda BA, Gregerman SR, Jonides J, von Hippel W, Lerner JS. Undergraduate student-faculty research partnerships affect student retention. *Review of Higher Education* 1998 Fall;22(1) 55-72.

The Undergraduate Research Opportunity Program's major goal was to broker intellectual relationships between faculty and first-year and sophomore undergraduates through research partnerships at the University of Michigan. This prospective randomized trial with stratification showed positive impact—higher retention rates for African American students, especially “low-GPA” African American students. Non-significant or moderately significant improvements in retention were found for Hispanic, White, and high-GPA African-American students.

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17. Philips BU, Mahan JM, Perry RR. Minority recruitment to the health professions: a matched comparison six-year follow-up. *Journal of Medical Education* 1981 Sep;56(9 pt 1):742-747.

University of Texas Medical Branch Area Health Education Center (AHEC) conducted a summer program that focused on exposure to health settings, allowing minority participants to rotate through hospitals and teaching facilities. The program focused on academic, communication, and interpersonal skills.

This cohort study was a 6-year follow-up of participants and non-participants who had applied to the program, but who had not been accepted (because of space constraints.) Outcomes measured included employment in a health profession, location of employment (Texas AHEC area or not), and attainment of career choice. A greater proportion of participants were employed in health professions than the control group. While not statistically significant, the results also suggest that respondents employed in health professions tended to be employed in the Texas area.

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18. Pisano JC, Epps AC. The impact of a medical-school-based summer program on the acceptance of minority undergraduate students into health professional schools. *Journal of the National Medical Association* 1983 Jan;75(1):17-23.

The Medical Education Reinforcement and Enrichment Program (MEdREP), Tulane University School of Medicine prepared minority undergraduate sophomores and juniors for careers in medicine and other health care fields through a 10-week summer program, academic enrichment clinical exposure and preparation for the MCAT and preceptorship experience. The study compared 1976 participants to 1976 nonparticipating applicants as well as comparing application rates of all participants (1972-1979) with respect to application and acceptance rates to medical and allied health profession schools.

Overall, MEdREP participants had higher GPAs and acceptance rates to health professions schools than non-participants. No adjustment for potential underlying differences and no tests of significance were done between groups.

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19. Pisano JC, Epps AC. The impact of MCAT intervention efforts on medical student acceptance rates. *Journal of the National Medical Association* 1983 Aug;75(8):773-777.

This second study of the MEdREP program compared MCAT scores of minority students before and after a MEdREP MCAT review. Among MEdREP participants who had taken the MCAT prior to the intervention, scores improved when they retook the exam after the intervention. However, sample sizes were small, there was no comparison group to adjust for possible effects of simply taking the exam for the second time, and no tests of statistical significance were performed.

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20. Slater M, Iler E. A program to prepare minority students for careers in medicine, science, and other high-level professions. *Academic Medicine* 1991 Apr;66(4):220-225.

The Gateway to Higher Education program, a comprehensive high school academic enrichment and support program for minority students, was evaluated with New York State Regents subject test scores, PSAT, and SAT scores as the outcome when comparing Gateway students to peers in their schools.

Gateway students had higher pass rates than their peers on the New York State Regents examination. Comparing outcomes to national averages, the Gateway seniors as a whole had an average SAT score that was 75 points higher than the national average. Of African-American students, Gateway students exceeded the national average for African-American students by 237 points. (974 vs. 737). As Gateway selects higher achieving students, no comparison to a similar group was available.

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21. Strayhorn G. A pre-admission program for underrepresented minority and disadvantaged students: application, acceptance, graduation rates and timeliness of graduating from medical school. *Academic Medicine* 2000 Apr;75(4):355-361.

This 9-week intensive academic program, the Medical Education Development Program (MEDP) at University of North Carolina at Chapel Hill, was studied using a prospective cohort design. Outcomes included medical school application, acceptance, graduation and years of medical school. Students with better MEDP performance rating had increased odds of application, acceptance, and graduation from medical school. Additionally, the MEDP participant acceptance rate was significantly higher than national underrepresented minority and non-underrepresented minority rates.

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22. Thomson WA, Denk JP, Miller LM, Ochoa-Shargey B, Jibaja-Rusth M. Results of a summer academy to increase minority student access to allied health and other health professions. *Journal of Allied Health* 1992 Spring;21(2):79-93.

Baylor College of Medicine held a Health Professional Summer Academy, a 3-week summer program for entering ninth grade minority students at two Texas high schools.

Students were eligible for the program if they were in the bottom one-third of academic ranking.

In a pre/post test study design, the authors compared scores on the Middle Grades Integrated Process Skills (MGIPS) Test administered to participants before the summer program to scores after the program. The MGIPS test is designed for students in middle school to measure student knowledge of science skills. The average scores for two academy sites were reported, with significant improvement after the program.

23. Thomson WA, Ferry PG, King JE, Martinez-Wedig C, Michael LH. Increasing access to medical education for students from medically underserved communities: one program's success. *Academic Medicine* 2003 May;78(5):454-459.

The Premedical Honors College Program (PHC), University of Texas-Pan American (UT-PA) and Baylor College of Medicine partnership conducted an intensive minority undergraduate intervention paired with conditional acceptance to Baylor College of Medicine. The PHC was evaluated through a retrospective controlled cohort comparing college attendee medical school application and matriculation for students in the South Texas region before and after PHC implementation.

This study showed that the odds of medical school matriculation were seven times higher for PHC students than for non-PHC students. Additionally, PHC appears to have influenced the culture of UT-PA, increasing the health-related interests generally. Since PHC was established, the number of freshman biology majors declaring themselves as premedical students has more than doubled. UT-PA is now contributing significantly more students to the pool of medical school matriculants, not simply only PHC graduates, but the number of non-PHC students matriculating to medical school has been increasing as well.

24. Ugbolue A, Whitley PN, Stevens, PJ. Evaluation of a pre-entrance enrichment program for minority students admitted to medical school. *Journal of Medical Education* 1987 Jan;62(1):8-16.

Pre-entrance Enrichment Program (PEP) at Boston University was a 6-week prematriculation academic enrichment for minority and disadvantaged students admitted to Boston University School of Medicine. This cohort study compared first-year performance of minority participants to minority non-participants, with the outcomes being first-year grades and retention rates. After participation in PEP, participants had significantly higher proportions of pass and honors grades than minority non-participants.

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