Questioning the Premedical Paradigm

Barr, Donald A.

Published by Johns Hopkins University Press

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Questioning the Premedical Paradigm: Enhancing Diversity in the Medical Profession a Century after the Flexner Report.

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The 1950 graduating class of U.S. medical schools included 55 black students, 8 Latino students, and 1 Native American student, representing about 1 percent of graduates nationally.\(^1\) By 1968, the number of graduates from these underrepresented minority groups had risen to 3.6 percent of all medical students. However, more than half of these URM graduates were enrolled at either Howard University College of Medicine or Meharry Medical College, schools founded to educate black physicians.\(^2\) Among other U.S. medical graduates, fewer than 2 percent were from URM groups.

By 1980, largely the result of affirmative action programs initiated in the late 1960s and early 1970s, students from URM groups had grown to 8.4 percent of medical graduates nationally and included 704 black students, 473 Latino students, and 40 Native American students.\(^3\) By relaxing to a certain extent the stringent premedical requirements that had existed for decades, U.S. medical schools were able to evaluate affirmative action applicants using a somewhat different metric than that used for other applicants, thereby substantially increasing the racial and ethnic diversity of medical graduates and ultimately of the U.S. medical profession.

In 1966 the University of California (UC) opened a new medical school at its Davis campus. Consistent with the affirmative action policies nationally and with policies at other UC campuses, the UC Davis medical school set aside 15–20 percent of its admission slots for URM students and created a special admissions committee to fill these. Using traditional measures of academic performance coupled with an assessment of applicants’ noncognitive strengths, the medical school was able to accept the best of the URM applicants for the URM-designated slots and the best of the non-URM applicants for the remainder.

Allan Bakke was a white male in his early thirties who applied to the UC Davis medical school in 1973. As a white student, his application was reviewed by the main admissions committee. Based both on his age (relatively older than his fellow non-URM applicants) and his grades and MCAT scores (relatively lower than his fellow non-URM applicants), he did not receive an offer of admission. Bakke applied again
in 1974 and again was rejected. In that same application cycle, the special admissions committee admitted URM candidates who had somewhat lower MCAT scores and premedical grades than Bakke’s. Bakke sued UC Davis for racial discrimination. His case was eventually heard by the U.S. Supreme Court, which in 1978 found for Bakke. The court determined that the medical school’s allocation of a fixed number of slots for URM students created a type of racial quota that is prohibited by the Constitution. Bakke was admitted to the UC Davis medical school and, despite his relatively low grades and MCAT scores, successfully completed his training.

The effect of the Bakke case on the subsequent medical school admission of URM students is clear. After increasing sharply between 1970 and 1982 (students graduating in 1982 were admitted to medical school in 1978, the year of the Bakke decision), the number of URM graduates of U.S. medical schools remained essentially flat for the next decade.

In the decade leading up to the Bakke case, hundreds of URM applicants were admitted to medical school despite somewhat weaker premedical preparation in the sciences as measured by grades and MCAT scores. Did these students with lower grades and MCAT scores turn out to be weaker medical students? What was the impact of affirmative action policies on professional quality—did affirmative action students turn out to be less competent as physicians? These questions were raised repeatedly in the decade of race-based affirmative action and in the decades following the Bakke decision.

Evans and colleagues addressed these questions in their analysis of the effect of the affirmative action program at Case Western Reserve School of Medicine (CWR). Before 1970, CWR had admitted few URM students, typically fewer than 2 percent of any entering class. Beginning in 1970, CWR began to admit substantially more URM students, many of whom had lower grades and MCAT scores than the non-URM students who were admitted. Evans and colleagues evaluated the performance of 43 of the 66 URM students admitted between 1970 and 1973 on a comprehensive examination given to all medical students at the end of the first year. Consistent with the research described in chapter 4, affirmative action students, many of whom had lower MCAT scores, tended also to score lower on the first-year medical school exam. The researchers also looked at the scores of 26 of these students on the NBME-I licensure examination given at the end of the second year of medical school. Again consistent with earlier research, the URM students with lower MCAT scores tended to score lower on the NBME exam.

However, the authors found no association between the affirmative action students’ undergraduate grades and either of these exam scores. Rather than grades, the selectivity of the college or university from which the student graduated, measured
on a numeric scale called the Astin index, was found to have a significant association with success on these exams, leading the authors to comment that “the single most valuable criterion for prediction of success among minority medical students at CWR is the competitiveness of the undergraduate college attended as measured by the Astin index.” Those URM students coming to CWR from less-competitive colleges were at “significant risk for having academic problems,” although the authors emphasized that many of the URM students from these less-competitive colleges were nonetheless able to successfully complete the first two years of medical school and move into their clinical training, where they had much less difficulty.

Addressing these same questions in the decade following the Bakke decision, Dawson and colleagues looked at performance on the NBME-I exam for more than 30,000 students who took the exam in 1986, 1987, or 1988. About 9 percent of these students were from URM groups. In their analysis, the authors were able to include each student’s MCAT scores, undergraduate grades, gender, and racial/ethnic group. They found two consistent patterns of association: URM students had lower NBME-I scores than non-URM students; and women had lower scores than men, regardless of race/ethnicity. When the authors then controlled for MCAT scores and undergraduate grades, they found that the difference in NBME-I scores between URM and non-URM students was greatly reduced; however, the difference between men and women remained. For some reason women of any race or ethnicity tended to score lower on the exam regardless of MCAT scores and undergraduate grades, while URM students’ scores were largely predicted by these measures.

Based on the results of these studies, one can reasonably conclude that URM students with lower MCAT scores and undergraduate grades admitted to medical school as part of affirmative action programs would, on average, score lower in the first two years of medical school. However, Dawson was careful to point out that attaining lower scores in the first two years of medical school did not necessarily imply lower clinical quality for these URM students once medical education was completed. She cautioned, “Few studies of physician performance in practice settings have been reported, and comparisons of examination results with performance in medical school, residency training, and practice are clearly needed. . . . [T]ests of knowledge base cannot assess many important clinical skills.”

How did URM students, admitted under affirmative action programs despite relatively low grades and MCAT scores, ultimately perform in clinical practice settings? The answer to this question is crucial to defining the ultimate effect that affirmative action programs had on clinical and professional quality. A series of studies has given us a fairly clear answer.
Keith and colleagues analyzed data on all U.S. medical graduates in 1975, looking at how URM students, most of whom were admitted to medical school as part of affirmative action programs, compared to non-URM students in choice of specialty, board certification rates, practice location, and patient populations served. They identified several key findings:

- More URM students (12%) than non-URM students (6%) practiced in locations designated as “health manpower shortage areas” by the federal government.
- More URM students (55%) than non-URM students (41%) chose primary care specialties.
- URM physicians were more likely to treat poor patients, minority group patients, and patients on Medicaid.
- Fewer URM students (48%) than non-URM students (80%) were board certified in their specialty ten years following graduation.

The authors questioned whether the lower rate of board certification among URM physicians might be related to the finding that these physicians tended to treat more poor patients and patients on Medicaid, since board certification “is relatively unimportant in the medical marketplace in which they practice.”

Davidson and Montoya also addressed this issue in a study of URM and non-URM students graduating from medical schools in California in either 1974 or 1975. They confirmed that, as with the national sample in the study by Keith and colleagues, the URM graduates in California were more likely to practice in a health manpower shortage area and more likely to provide care to patients who were poor, minority, or on Medicaid. In a follow-up study, the authors found that, 12–13 years after graduation, fewer URM students (64%) than non-URM students (90%) were board certified in their specialty. To determine the reason for the lower rate of board certification among URM graduates, they conducted a phone survey of the physicians who were not board certified, both URM and non-URM, and asked them the reason for their lack of board certification. The authors found no difference in the responses given by the URM physicians and the non-URM physicians, reporting that “their responses generally indicated that they perceived no benefit to their practice to compensate for the extra effort needed to attain board certification.”

Indeed, for the first eight years of my career as a physician (1974–1982), I saw no need to become board certified. I practiced as a solo primary care physician in a rural, health manpower shortage area. Since I was the only physician within a 20-mile radius, most of my patients were not concerned that I was not board certified.
It was only when I moved my practice to a large managed care organization in an urban setting that I perceived the need to become board certified and took the steps necessary to obtain that certification.

Perhaps the most convincing study of the effect of affirmative action programs on clinical and professional quality was reported by Davidson and Lewis. They were able to identify all students admitted to the UC Davis School of Medicine between 1968 and 1987 who did not meet the ordinarily applied minimum academic standards required for admission. Such students admitted between 1968 and 1978 (the year of the Bakke decision) would have been admitted mostly under the school’s affirmative action program. Students admitted between 1978 and 1987 had been considered on a case-by-case basis and offered admission if special circumstances warranted an offer of admission despite substandard grades or MCAT scores. The 356 students admitted in this manner made up 20 percent of the 1,784 students admitted to the medical school during the period of 1968–87.

For each of the special-admit students, the researchers were able to randomly identify a matched regular-admit student for comparison. They then compared the special-admit students with the regular-admit students in a number of areas. The differences identified below were statistically significant, unless otherwise noted.

- **URM status.** 152 of the 356 special-admit students (42.7%) were from URM groups; 58 of all regular-admit students for the period (4%) were from URM groups.
- **Undergraduate grades.** The special-admit students had an average undergraduate GPA of 3.06 on a 4-point scale; the regular-admit students had an average GPA of 3.50.
- **MCAT scores.** The special-admit students entering between 1968 and 1981 had a mean MCAT score (old MCAT) of 544; the control group of regular-admit students entering during this period had a mean score of 613. The special-admit students entering after 1981 had a mean MCAT score (new MCAT) of 9.0; the regular-admit students entering during this period had a mean score of 11.0.
- **Graduation rate.** The special-admit students had a graduation rate of 94 percent; the regular-admit students had a graduation rate of 98 percent. For those students who graduated, the mean time to graduation was the same for both groups (4.2 years).
- **NBME scores.** The mean score for NBME-I was 444 for the special-admit students and 530 for the regular admit students. The mean score for NBME-II was 437 for the special-admit students and 527 for the regular admit students.
Residency training. For both special-admit and regular-admit students, 82 percent of graduates completed their initial choice of residency. Three-fourths of both groups selected primary-care residencies. There was no difference between the two groups in the number of residents who were identified as having academic problems. There was also no difference between the two groups in the number of residents who received special honors, such as being identified as the “best resident” or being selected to be chief resident.

Board certification. 80 percent of special-admit graduates and 85 percent of regular-admit graduates were board-certified in their specialty, a difference that was not found to be statistically significant.

Involvement in teaching health professions students. 51 percent of special-admit graduates and 57 percent of regular-admit graduates reported involvement in teaching health professions students as part of their practice, a difference that was not found to be statistically significant.

Professional and personal satisfaction with a medical career. Both groups of students were satisfied with having chosen medicine as a career, with their current specialty, and with their current practice situation. However, when asked to rate their overall satisfaction with their current life, the special-admit students reported a significantly higher level of personal satisfaction than their regular-admit classmates.

The results of this study by Davidson and Lewis, when combined with the results of the other studies described above, offer a well-supported conclusion about the ultimate effects of the affirmative action programs created to increase the racial and ethnic diversity of the medical profession before many of these programs were prohibited by the Bakke decision. Students admitted under affirmative action programs came to medical school with somewhat lower grades and MCAT scores than their regular-admit classmates. Consistent with the research described in chapter 4, these students also tended to have lower grades early in medical school and lower scores on the licensure examinations. A few more of the special-admit students failed medical school, although the overwhelming majority—well over 90 percent—of both groups graduated successfully. By the time the affirmative action students entered residency training, whatever academic differences they once had were largely dissipated, as reflected in a level of clinical and professional quality that was essentially identical to their classmates admitted under the traditional program.

The decade or so of affirmative action admission that preceded the Bakke decision added substantially to the racial and ethnic diversity of the medical profession, brought a substantial number of new practitioners to underserved communities that
were largely poor and minority, and did so without any decrement in clinical skill or professional quality. These conclusions are further supported by the results of a series of smaller studies confirming that many URM students admitted to medical school with lower grades or MCAT scores relative to their classmates were nonetheless fully capable of completing medical school and demonstrating complete clinical competence.\footnote{sedlacek1990}

Writing in 1990, Sedlacek and Prieto reviewed the literature available at that time that addressed factors that predicted success in medical school for URM students. They looked both at success in the first two years of medical school and success in the clinical years of medical school, concluding: “First, traditional predictors such as MCAT scores and college GPAs appear to have some validity in predicting the success of minority medical students. Second, nontraditional predictors also appear to have some validity in predicting minority students’ success.” From their review, they identified a series of noncognitive characteristics, such as positive self-concept, realistic self-appraisal, and successful leadership experience that appeared to predict success in medical school at least as well as MCAT scores and GPAs. They suggested that “minority students’ potential cannot be evaluated completely and fairly without measuring noncognitive areas.”\footnote{tekian1997}

Tekian published a similar review of the literature in 1997, coming to similar conclusions: “While these studies have determined that URM students’ scores on cognitive tests may be lower than majority students’ scores, these students do eventually pass, with little difference in clinical grades. Consequently, many high-risk minority students who are admitted to medical school become excellent physicians.”\footnote{aamc1998}

In 1998 researchers at the AAMC looked at how well MCAT scores predicted outcomes in medical school across racial and ethnic groups, evaluating the scores of more than 12,000 students. Their conclusions only underscore what seems to be the principal conclusion from our consideration of the policy implications of affirmative action programs and other similar programs intended to increase the diversity of the medical profession: “All too often, easily attainable quantitative data, such as test scores and grades, are taken as infallible measures of skill levels. In reality, the best available predictors of achievement do not even approximate perfect prediction.”\footnote{aamc1998}

**Efforts to Increase the Diversity of Medical Students after Bakke**

While affirmative action programs seem to have been consistently successful in drawing more URM students into the medical profession without a resulting decrement in clinical or professional quality, the constraints on the process with which these
programs select students that resulted from the Supreme Court’s Bakke decision had a clear impact on the number of URM students entering medical school. As described above, that number remained essentially flat from 1978, the year of the Bakke decision, through the early 1990s. However, the 1990s saw a pattern of increasing numbers of URM medical students, largely the result of a series of programs that targeted URM students but did not use race or ethnicity as the principal selection criterion. These programs were typically of three general types, each of which is discussed below: (1) programs to encourage high school students to consider a health professions career and offering academic support in pursuit of that goal; (2) programs to offer academic enrichment and other types of support to URM college students who are considering a health professions career; and (3) post-baccalaureate programs to offer students who have graduated from college additional instruction and support to encourage and enable their application to medical school.

Programs to Encourage High School Students to Consider a Health Professions Career

The AAMC has focused considerable attention on the issue of increasing the racial and ethnic diversity of students entering medical school. However, that goal still remains problematic, as Anderson reported in 2003 in the AAMC’s newsletter: “While gains have been made in encouraging students who are members of underrepresented minority (URM) groups to apply to medical school, the primary reason for minority under-representation in medicine—the limited number of academically well-prepared students with diverse backgrounds in the applicant pool—remains. . . . Critical to ensuring more diversity in medical education are the numerous health sciences professions ‘pipeline’ programs.”

In response to the leveling of the number of URM students entering medical school, in 1991 the AAMC established its “3000 by 2000” program. Supported by medical schools throughout the country, the program “sought to increase the number of underrepresented racial/ethnic minority students matriculating annually in medical school from what was then 1,584 students to 3,000 students by the year 2000.” As a core component of this effort, and in collaboration with the Robert Wood Johnson Foundation, the AAMC began its Health Professions Partnership Initiative (HPPI) in 1996. The initiative provided funding for health professions schools and colleges or universities to partner with K–12 school systems to target students from URM or other disadvantaged groups. The program’s goals were to help these students improve their academic achievement, encourage them to attend college, and encourage them to consider a health professions career following college.
In 2006 a special issue of the AAMC’s journal, *Academic Medicine*, contained a series of reports on the success attained and problems faced by some of the more successful HPPI initiatives. Slater and Iler reported on the partnership between the Mt. Sinai School of Medicine, the City University of New York, and the New York City school system. As part of this initiative, two new magnet schools were opened, one in Queens and one in Manhattan. Each targeted children from grades 6–12; each had an enriched program of science education. In addition, the school in Manhattan, focusing on children from East Harlem, included the participation of residents in internal medicine and pediatrics from Mt. Sinai. While the program had a number of successes, the inability of the New York City school system to provide the needed resources substantially limited both the enrollment in the schools and the success of the program in achieving its goals.

A second HPPI initiative, described by Flores and Dominguez, was launched in 1996 by the University of California, San Francisco’s School of Medicine at its branch in Fresno, located in a large agricultural region in California’s San Joaquin Valley. Working with local schools, UCSF created a strong academic program within a local high school, focusing on strengthening students’ preparation in math and sciences. Referred to as the “Doctors Academy,” the program enrolled 255 students over a several-year period. From its first two cohorts completing high school, all of the students graduated from high school and entered a four-year college or university. Based on the success of the Doctors Academy, the program established a second program in a local junior high school, fondly referred to as the “Junior Doctors Academy.” Realizing the rigor and resulting academic challenge of its high school program, the Junior Doctors Academy hopes to prepare students for their entry into high school.

Beyond AAMC’s HPPI initiative, a number of medical schools throughout the country have created and maintained similar programs targeting students in the pre-college years. Among the most successful of these has been the Stanford Medical Youth Science program (SMYSP) at Stanford University. As described by Dr. Marilyn Winkleby, the founder and faculty advisor to SMYSP, the program is “based on the premise that there are large numbers of low-income students who are interested in the health sciences but lack the academic preparation, career-building skills, peer and academic support, and understanding of the college admissions process to succeed in higher education.” Since its inception in 1988, SMYSP has brought 20–25 high school students from low-income families to the Stanford campus for a five-week summer residential program, where they receive instruction and direct participation in sciences, direct mentoring by Stanford students, college admissions preparation, and the establishment of a long-term relation with SMYSP staff to as-
sist them in subsequent career counseling. Over the 18 years of the program, 405 students have completed SMYSP, 59 percent of whom were from URM groups. Of these students, 100 percent graduated from high school and 99 percent were admitted to college. Of students admitted to college (and not still in college), 81 percent earned a four-year degree. Of these college graduates, 44 percent either are or are training to become health professionals, including 32 students admitted to medical school. While this record of success seems clear, Winkleby points out that there is no comparison group of similarly qualified students not participating in SMYSP, thus making it difficult to evaluate the actual effect of the program on these students.

A similar program, referred to as the Summer Medical program (SMP), was established in 1972 by the New Jersey Medical School. Targeting high school students from socially or economically disadvantaged families who were college-bound, SMP worked with these students during the summer to provide them “with previews of college science courses and help in developing their noncognitive skills.” Between 1972 and 1998, 1,722 high school students were involved in the program. Of the students who have participated in the various programs offered by SMP, 36 percent eventually entered health professions schools. As with the data from Stanford’s SMYSP program, these data have no comparison group, so it is difficult to assess accurately the specific effect the program had on the academic and professional paths these students followed.

Bediako and colleagues reported on the success of the Ventures In Education (VIE) program, an independent, nonprofit organization funded by the Josiah Macy Foundation. First established in 1985, VIE provided academic enrichment to economically disadvantaged high school students from several different areas of the country, with an emphasis on strengthening science and math skills in preparation for college and eventually for a health career. Of the 981 graduates of VIE between 1985 and 1989, 136 (13.9%) had taken the MCAT, 109 (11.1%) had applied to medical school, 75 (7.3%) had been accepted, and 72 (7.3%) had entered medical school. Of the 72 students entering medical school, 60 (83%) were from a URM group. Not surprisingly, the 72 students entering medical school had higher grades in high school and higher SAT scores than other students in the program. As with the previous studies, it is difficult to tell from these data the extent to which the program had a direct effect on the career trajectories of the students entering medical school, as there was no comparison group.

Carline, Patterson, and colleagues published two separate reviews of the literature on pre-college enrichment programs targeting minority or other disadvantaged students with the goal of encouraging them to enter a health profession. In 1998 they
reviewed 19 different articles describing 27 programs. From this review the authors concluded: “Most evaluations depended on measuring the percentages of program participants who went on to complete college or who entered health-related fields. . . . The lack of comparison groups severely limits the ability to state that program participation significantly contributed to academic success or career choice. . . . Without clarification of how an activity is expected to affect an outcome, evaluation activities are too general to clearly assist in the interpretation of program outcomes.”

In 2006, Patterson and Carline again reviewed the available literature on the success of partnerships between health professions schools and public schools in encouraging minority or otherwise disadvantaged students to go to college and enter a health professions school. They concluded that the optimal strategies for such programs focus on general academic enhancement and targeted instructional enhancement in science and math. Echoing the conclusion from their earlier review, they again point to a pattern of apparent success but inadequate outcomes measures to be able to evaluate the actual contributions of these pipeline programs to the ultimate success of their students.

Did these pre-college pipeline programs work? This was the question posed in 2006 by Charles Terrell, the chief diversity officer of the AAMC and the director of the HPPI. Terrell acknowledged that the AAMC’s “3000 by 2000” initiative did not meet its goals. Rather than having 3,000 URM students in medical school in the year 2000, there were only 1,700, an increase of fewer than 200 URM students over the period of a decade. Funding for the HPPI initiative expired at the end of 2005. “Did the HPPI projects work?” Terrell asks. He goes on to say, “Unfortunately, we will be joining the long line of researchers and educators saying that little research has been conducted to evaluate the effectiveness of these educational interventions. Without rigorous research and outcomes, it is difficult to determine any program’s effectiveness and to identify the specific intervention strategies that were most effective for supporting underrepresented minority students interested in entering the health professions.”

It appears that a conclusive answer to the question of efficacy—did the programs actually change the career trajectory of the students they supported, or did they rather simply serve to support the strongest students who were headed to health professions schools anyway?—will need to await more carefully thought out research and evaluation methodologies. We do, however, have some data about those students for whom the programs did not work. In 1999 Thurmond and Cregler reported on the results of their survey of 123 students who, between 1984 and 1991, had completed the Student Educational Enrichment Program, a high school “pipeline”
program operated since 1978 by the Medical College of Georgia. Of the students they surveyed, 96 percent indicated that, at the time they participated in the program as high school students, they had hoped to be physicians. While nearly all attended college, only 26 of the 123 (21%) students had attended or were attending medical school. When the researchers asked those students who had not attended medical school why they had changed their minds, two of the principal responses were “fear of problems with grades” and “feeling of inadequate preparation in science (chemistry most frequently cited).”

The numerous “pipeline” programs created throughout the decades following the Bakke decision have had substantial success in getting talented but disadvantaged high school students into the health professions pipeline and into college. However, for many of these students that pipeline leaks badly somewhere during the college experience. As Thurmond and Cregler concluded, a major contributor to that leakage is inadequate preparation of students for the rigors of the college chemistry classroom, the first step toward entry to medical school. These authors suggest that in order to stem this leakage “public schools, colleges, and medical schools need to work in concert to reach students interested in medicine early for extra courses in chemistry and other basic sciences.”

As described in chapter 1, the premedical pipeline continues to leak badly, even at highly competitive universities such as Stanford and the University of California, Berkeley. It is not clear, however, that the appropriate solution is to give disadvantaged high school students more instruction in chemistry. Such an approach takes as given the pedagogical approach and curricular content of college chemistry courses, assuming that if problems develop, they lie with the students.

Programs to Offer Support to URM College Students

Beyond encouraging more URM students to consider a health career while they are still in high school, a range of programs have been created by universities and professional schools that instead target URM students who are already in college. I describe three of the most long-standing and successful of these below.

Health Careers Opportunity Program (HCOP)

In 1972 the federal government established Health Careers Opportunity Program (HCOP) with the goal of “increas[ing] the number of individuals from disadvantaged backgrounds in the health and allied health professions.” By “disadvantaged backgrounds” the government meant “from an environment that has inhibited the individual from obtaining the knowledge, skills, and abilities to succeed in a health
profession . . . and/or a student from a family with an annual income below a level based on low-income thresholds according to family size.” By focusing on students from low-income families or educationally disadvantaged backgrounds, the program had the goal of increasing the racial and ethnic diversity of the medical profession and other health professions without specifically focusing on race. Because URM students are statistically more likely to come from such a disadvantaged background, programs targeting disadvantaged students generally will likely be more racially and ethnically diverse than the general population of medical school applicants. While HCOP has included pipeline programs focusing on K–12 education, many of the programs have specifically targeted students in college. For the programs funded during fiscal years 2004 and 2005, about two-thirds of the nearly 24,000 students participating in HCOP programs were in colleges or universities. HCOP programs often included recruiting disadvantaged college students into a health professions pathway as well as supporting those students already in such a career path. Programs used strategies such as offering counseling and mentoring, strengthening students’ academic preparation, offering students research opportunities, and exposing students to community-based primary health care settings.

**Centers of Excellence Programs (COE)**

Centers of Excellence (COE) was created by Congress in 1988 with the goal of “strengthen[ing] the national capacity to train students from minority groups that are under-represented in the health professions and build a more diverse health care workforce.” It targets medical, dental, and other health professions schools that typically enroll a higher percentage of URM students than the national average. The program also explicitly includes certain historically black colleges and universities. A principal focus of the program is for health professions schools to work with preprofessional undergraduate students to enhance their academic performance so as to create a more competitive applicant pool. The program supports schools in efforts to address minority health issues, to foster both faculty and student research in this area, and to support community-based clinical training.

**Minority Medical Education Program (MMEP)/Summer Medical and Dental Education Program (SMDEP)**

Responding to the dampening effect the Bakke decision had on the enrollment of URM students in medical schools, in 1988 the Robert Wood Johnson Foundation (RWJF) established the Minority Medical Education Program (MMEP). Its purpose was to “provide a summer enrichment experience for minority college students who possess the academic qualifications that would gain entrance to medical
school.” As described by Bergeisen and Cantor, “The purpose of the program was not to expand the overall applicant pool but, rather, to increase the acceptance rates of those individuals with the requisite credentials.” To achieve this goal, MMEP focused on the development of summer enrichment programs for URM college students who already were interested in applying to medical school and who had an academic record that appeared to make them competitive for medical school. It offered these students academic enrichment in biology, chemistry, and physics; help in preparing for the MCAT; and mentoring and counseling support to assist students with the process of applying to medical school. From its inception, MMEP was designed, not as a remedial education program, helping students who had had difficulty in the premedical sciences, but rather as an enrichment program, helping students who had previously demonstrated success in the sciences to become more competitive applicants. Thus MMEP was not strictly designed as a “pipeline” program intended to increase the number of URM students interested in medical school or other health professions schools.

Responding to the success of MMEP, in 2003 the RWJF expanded and extended the program to include premedical students who were economically, socially, or educationally disadvantaged. In 2005 the program was further extended to include students interested in becoming dentists and was renamed as the Summer Medical and Dental Education Program (SMDEP).

A crucial issue for medical educators has been to get some assessment, using valid indicators of outcomes, of the success of the programs described above. To this end, the results of two research studies evaluating these programs were published in 1998. Cantor and colleagues reported their study of the effectiveness of the MMEP in increasing the chances of its participants being accepted to medical school. (Recall that all MMEP participants had previously identified medicine as their career goal.) The researchers looked at all URM applicants to medical schools in the 1997 application cohort. Of 3,830 URM applicants nationally, 452 had participated in an MMEP summer program. The rate of acceptance to medical school for the MMEP participants was 49.3 percent, compared to 41.6 percent for non-participants. Since MMEP participants were selected from among those students with the highest undergraduate grades, the authors evaluated the effect of program participation in a multivariate format, controlling for grades, test scores, and demographic variables. Controlling for these factors, the odds of MMEP participants gaining acceptance to medical school were greater than those of non-participants.

While Cantor and colleagues looked specifically at one admissions cohort of the MMEP program, Carline and colleagues took a somewhat broader view, reporting
their review of all published studies evaluating enrichment programs that had the goal of increasing the number of URM students entering medicine. They were able to identify eighteen articles published between 1966 and 1996 that reported on the outcomes of enrichment programs targeting URM college students. A number of these programs received funding from HCOP, described above. The strategies most commonly used by these programs included academic enhancement, admission preparation, and mentoring. The outcome most frequently reported was, “the percentage of participants that subsequently entered medical schools.” Most of the programs reported acceptance rates in the 70–80 percent range, suggesting a high level of success. However, the authors also underscored an important finding: “While the medical school matriculation rate was quite high, these results were difficult to interpret as the studies did not use control groups. The evaluations could not demonstrate, therefore, that the programs were responsible for increased admission of minorities to medical schools. . . . Without this type of public discussion, enrichment programs for underrepresented minorities may continue to appear to be worthwhile endeavors, but lacking solid support and foundation and vulnerable to losing funding.”

Without clear evidence that the programs actually increased the number of URM students applying to and accepted by medical school, it is difficult to know how much value was returned by the financial investment in them. It is entirely possible that program participants had a high level of medical school acceptances, not because the programs added to the “pipeline” of URM students interested in a medical career, but rather because they selected as participants students who brought with them levels of academic attainment and personal strengths that made it more likely they would be accepted to medical school. That these programs are vulnerable to losing funding based on the weakness of the evidence showing that they increased the pipeline of qualified applicants was reflected in the fact that between Fiscal Year 2004 and Fiscal Year 2008 federal funding for COE was cut from $33.7 million to $12.8 million, and funding for HCOP was cut from $36.2 million to $9.8 million.

**Post-baccalaureate Premedical Programs**

Not every student who hopes to attend medical school is successful in gaining admission, despite having completed the premedical requirements as an undergraduate. Weak or incomplete training in the premedical sciences may make a student less competitive for a coveted medical school slot and result in rejection rather than admission. For such students who have graduated from college yet who still hope to attend medical school, a number of colleges and universities have organized formal
programs that provide additional training in the premedical sciences as well as mentorship and support (e.g., MCAT test preparation). Referred to as post-baccalaureate premedical programs (PBPM), they assist students in completing or strengthening their premedical science preparation and in becoming more familiar with the process of applying to medical school. In 2008 a Web site maintained by the AAMC listed more than 100 such programs.\(^{41}\)

Different PBPM programs focus on different target groups. Some look for students who have had a strong academic record but who came to the decision to apply to medical school later in the process. Such students simply need the coursework they are missing plus general assistance with the application process. One such program is at Bryn Mawr College, a highly selective women’s college in Pennsylvania. Bryn Mawr’s program, founded in 1972, is described as “designed for women and men like you who are highly motivated to pursue a career in medicine but have not taken the required premedical courses as undergraduates. . . . We are highly selective and typically accept no more than 75 women and men per year.”\(^{42}\) Given the highly competitive nature of the students selected for Bryn Mawr’s program, it is not surprising that they report a greater than 98 percent success rate for their students’ gaining admission to medical school.

In contrast to Bryn Mawr’s program, the seven PBPM programs offered by the University of California’s medical schools have the specific mission of, “increasing the number of physicians who practice in shortage areas of California, by assisting capable and dedicated students from disadvantaged backgrounds in gaining admission to medical school.”\(^{43}\) To this end, many of the PBPM programs offered by the University of California focus on applicants who have previously applied to medical school but were not accepted by any school. Many of the applicants to these programs have a relatively weak academic record in the premedical sciences and need to strengthen their scientific knowledge and their preparation for the MCAT.

One of the first PBPM programs in the country was established in 1969 at Wayne State University School of Medicine. The program was designed with a specific focus on African American students who had applied to medical school but had been rejected.\(^{44}\) As part of the pre-Bakke affirmative action era, the Wayne State program brought between five and ten African American students to campus for an intensive ten-month program that helped them to strengthen their science preparation, their overall academic skills, and their personal commitment to a career as a physician. The program was structured such that every student who maintained a B average throughout the program was guaranteed admission to the Wayne State School of Medicine. After the Bakke decision in 1978, the program shifted its focus to disadvantaged students without specific regard to race or ethnicity.
Between 1969 and 1992, 192 of 214 African American students (90%) admitted to the program successfully completed it and entered medical school; 160 of the 192 medical school matriculants (83%) completed medical school. Of the 58 non-African American disadvantaged students admitted after the Bakke decision, 54 (93%) entered medical school and 51 (94%) completed medical school. The program has contributed substantially to the professional success of hundreds of disadvantaged students who otherwise would not have had the opportunity to attend medical school. The university continues to offer a PBPM program, maintaining its focus on “disadvantaged medical school applicants from Michigan who have been denied admission, but who appear to have the potential for academic success.”

In the early years of the Wayne State program, a number of students who had done well in the PBPM science courses still had difficulty in the first-year biochemistry course in the medical school. As described by the program’s administrator, “When students who had successfully completed the postbaccalaureate program nonetheless did not perform well in the medical school’s first-year biochemistry course, the university’s survey courses in inorganic chemistry and biochemistry were analyzed. This analysis revealed that in each course some covered material had little value in preparing students for the medical school’s biochemistry course. Thereafter, better focused inorganic chemistry and biochemistry courses were developed and taught by medical school faculty.”

The program’s response to the problems students encountered in the medical school’s biochemistry course holds particular relevance for our discussion of the optimal pedagogy of premedical science courses. Recognizing that a student’s lack of success may reflect a combination of academic weakness on the part of the student and pedagogical weakness on the part of the university, the program was able to increase students’ success by focusing simultaneously on both.

The School of Medicine at Southern Illinois University at Carbondale (SIU) was founded in 1970 and accepted its first entering class in 1972. In addition to its standard medical curriculum, SIU also offered a special program titled the Medical Education Preparatory Program, referred to by its acronym MEDPREP. From its inception, MEDPREP had as its goals to “train . . . primary care physicians who would establish rural and inner-city practices” and to “assist minority medical students and other students with disadvantaged backgrounds to prepare for admission and success in medical school.” As described on its Web site, “MEDPREP was designed as a two-year postbaccalaureate program for disadvantaged students. It provides an environment in which students can hone their test-taking skills and enhance their academic record before matriculating in a health professional school.” In order to be eligible for the program, an applicant must be from an educationally
or economically disadvantaged background and must have completed all or most of the math and science prerequisites for medical school with a grade of C or above. MEDPREP defines as “science prerequisites” two years of chemistry with lab, two years of biology, and one year of physics with lab. The program targets students who meet these requirements who are not currently competitive for medical school admission. Those students accepted into the program complete a two-year post-baccalaureate curriculum. The first year provides additional instruction in chemistry, biology, and physics as well as courses to improve general verbal and learning skills. The second year, during which students apply to medical school, incorporates enrichment courses and additional science courses intended to prepare the student for the first year of medical school.

In its more than 30 years of existence, MEDPREP has enrolled over 1,000 students, more than three-fourths of which are from URM groups. Sixty-three percent of its graduates have successfully enrolled in medical school, with an additional 5 percent enrolling in other health professions schools. Of its students accepted to a health professions school, 87 percent have graduated. A study of students graduating from MEDPREP in the period 1972–1992 found that, of those students achieving board certification in a medical specialty, 70 percent were certified in a primary care specialty. Even though there is no comparison group by which to evaluate these outcomes, it nonetheless appears that MEDPREP has attained its dual goals of training more primary care physicians and increasing the diversity of the medical profession.

The University of California at Davis (UCD) established its PBPM program in 1991, targeting students from educationally, socially, or economically disadvantaged backgrounds who had previously applied to medical school but failed to gain acceptance. The program acknowledged that “although grades and test scores have some relevancy, they are not nor should they be the sole indicators of an applicant’s success in the program or in medical school.” Accordingly, the program considered grades and MCAT scores but also looked at a student’s motivation, personal background, previous experience, and potential for practicing in an underserved community in California. In addition, the program looked carefully for possible explanations and appropriate solutions for a student’s previously weak academic performance.

Unlike the Wayne State program, in which all students who meet certain academic goals are guaranteed admission to medical school, the UCD program helps its students prepare for re-application to medical school but does not guarantee admission. The program has had considerable success in placing its students in medical school, with 95 of 115 participating students (83%) having gained acceptance to major medical schools in the United States.
Cognizant of the previous criticism of early pipeline programs and college enrichment programs—that the programs had no comparison group to validate the actual effect of the program on students’ success—Grumbach and Chen undertook a study of five separate PBPM programs operated by University of California medical schools, one of which was at UCD. They evaluated the outcomes for 265 participants in these programs, comparing their success in gaining admission to medical school to that of 396 college graduates who had applied to one of these programs but not been accepted. They found that 67.6 percent of PBPM participants gained admission to medical school, while only 22.5 percent of non-participants gained admission, leading them to conclude, “Postbaccalaureate premedical programs appear to be an effective intervention to increase the number of medical school matriculants for disadvantaged and underrepresented groups.”

Will students who have experienced academic weakness in the traditional premedical sciences and who then go on to take additional science courses after graduation be able to be successful in medical school? This question is of course crucial in evaluating PBPM programs as a means to increase the diversity of the medical profession. Hojat and colleagues looked at students entering Jefferson Medical College between 1985 and 1987, comparing 133 students who had taken some form of extra preparation in the sciences with 463 students who had not taken extra work. They found that the students electing to take extra courses following graduation had lower grades, both as undergraduates and in the first two years of medical school.

Most of the students in the Hojat study had taken the extra post-baccalaureate science courses on their own, not in a formally structured PBPM program. Giordani and colleagues looked at the success of 15 URM medical students at the University of Michigan who had completed the university’s formal PBPM program, comparing their success with 48 other medical students who had taken independent post-baccalaureate science courses and with 443 medical students who had only the traditional premedical science courses. The students from the formal PBPM program had lower undergraduate GPAs (both science and non-science) and lower MCAT scores than either the traditional students or the students with independent post-baccalaureate work. Despite these differences, there were no significant differences in their performance in the first year of medical school, with most of the PBPM students scoring close to the class mean.

Interestingly, while undergraduate grades and MCAT scores predicted first-year grades for the traditional students, these predictors of early medical school success had no significant association with the first-year scores of the PBPM students. Despite what looks initially like a substantially weaker undergraduate preparation for
medical school, the PBPM students “perform with little difference in academic achievement and have the potential to become excellent physicians.”

These results again call into question the assumption that weak academic performance in premedical sciences is principally a reflection on the student. That many of these students, often coming from disadvantaged backgrounds, can succeed in an appropriately structured PBPM program, and subsequently in medical school, suggests that the pedagogy of premedical science education is every bit as much a factor in the students’ early academic difficulties as is the student’s inherent academic abilities. In a series of interviews with URM students from a disadvantaged background who were selected for a PBPM program, Frohna confirmed that, given positive attitudes, realistic self-assessment, and clear personal commitment, these students can be fully successful when offered science preparation in an appropriately structured pedagogy.

Connecting Research on Diversity to Research on Professional Outcomes

For the four decades between 1968 and 2008, a variety of programs were put into place nationally, with one consistent goal: to increase the racial and ethnic diversity of students entering medical school, and ultimately of the medical profession. During the first ten years of this period, the principle focus was on affirmative action programs that explicitly targeted students from URM groups. When in 1978 the Supreme Court’s Bakke decision prohibited explicit racial or ethnic preferences, the programs broadened their focus to include students from a range of disadvantaged backgrounds, including social, educational, and economic disadvantage.

The effort to get more students from disadvantaged backgrounds into medical school included three principal thrusts: increasing the pipeline of students entering college with the goal of entering medicine or another a health profession, strengthening and enriching the experience of disadvantaged students in four-year colleges or universities so as to make them more competitive in the medical school application process, and offering formally structured post-baccalaureate education to strengthen the premedical preparation of disadvantaged students who had not been successful in gaining entry to medical school.

The associations between undergraduate science performance and subsequent performance in medical school identified in chapter 4 are quite consistent with the outcomes of the research evaluating the impact of affirmative action admissions, both the pre-Bakke programs that explicitly targeted URM groups and the post-Bakke programs that targeted disadvantaged students more broadly. Programs that offer ad-
mission to students with lower premedical grades and MCAT scores report that these students often score somewhat lower in their early medical school classes and their initial licensure examination (NBME I or USMLE I). However, the vast majority—typically substantially more than 90 percent—of students admitted to medical school under the various special admissions considerations successfully completed the first two years of medical school and moved on to their clinical training.

Once in their clinical training, we again see a pattern that is consistent with the research summarized in chapter 4. Performance in the first two years of medical school has little association with performance in a clinical context. Whether measured as evaluations by clerkship directors, reports of residency directors, or national licensure exams that test clinical skills, students admitted under special considerations and students admitted under traditional review methods become largely indistinguishable as clinicians, and the quality of the professional practice of the two groups is essentially the same. There simply is no evidence that four decades of special admissions programs targeting students from disadvantaged backgrounds has had an adverse effect on the clinical or professional quality of the physicians trained through these programs.

While there is no evidence of a quality decrement resulting from special admissions programs, there is evidence of one effect that is worth noting, especially in the context of the medical manpower needs of the twenty-first century. Students admitted under the special consideration programs were significantly more likely to select a primary care profession, to locate their practice in medical manpower shortage areas, and to provide care to low-income or poor patients. Especially in states such as California, where assuring adequate medical manpower for an increasingly diverse population is a state policy priority, the positive impact of affirmative action and other diversity enhancement programs holds particular relevance.

Given the positive effect that the special admissions programs have had without a corresponding decrement in clinical quality, we should ask whether the various pipeline programs described above have been a major contributor to the success we have had in training a more diverse medical profession. Here it is difficult to give a reliable answer. While it certainly appears that the various programs working with high school students or enriching the college experience of premedical students have had a positive effect on the number of qualified students applying to medical school, the research that documents this success in a reliable and valid manner is largely missing. Usually due to the lack of a comparison group in the analysis of program outcomes, it has not been possible to determine whether program activities or pre-selection bias accounted for the high rates of reported success. Future research on these types of programs must keep this issue always in mind.
Finally, research presented in this chapter has underscored a concern identified in chapter 1. As described above, Thurmond and Cregler surveyed minority college students identified as gifted in high school who had participated in a pipeline enrichment program but nonetheless had dropped out of premedical studies. When asked why they had lost their interest in becoming a physician, these students cited low grades and bad experiences in their early premedical science courses, principally chemistry. The very same explanation was given by the students we interviewed at Stanford University and the University of California, Berkeley. Those students from disadvantaged backgrounds who successfully complete the premedical science curriculum, even if they do not do as well as students toward the top of the distribution, will almost certainly be successful in medical school. However, substantial numbers of other students, most of whom are just as talented as those who persist and succeed in entering medical school, never submit an application to medical school. Their early college experience in chemistry and other premedical sciences has convinced them, rightly or wrongly, that dropping out of the premedical pipeline was the appropriate thing to do. In thinking about how best to organize the teaching of premedical science, we must always keep these students in mind and seek to find ways to stem this unnecessary leakage of otherwise qualified students.