

UC San Diego

Independent Study Projects

Title

Investigating the efficacy of different models for increasing underrepresented medical student and physician diversity.

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Abstract:

The purpose of this study was to conduct a literature review on the different models that people and organizations have used and are using to increase underrepresented medical student and physician diversity. People have tried for many years to understand and develop ways of increasing diversity in the workforce and medicine has been no different. After the abolition of affirmative action in California, there was a stark decline in the number of underrepresented minorities enrolled in public medical schools. With the new Affordable Care Act, there will be an unprecedented number of people needing healthcare in this country – many of whom will be from underserved communities. This literature review focuses on investigating different models utilized in increasing underrepresented minority enrollment, recruitment and retention through medical school. The effectiveness and outcomes of these different models are discussed, and recommendations are made based on the results of this literature review.

Background:

There has been much discussion and controversy surrounding the efforts that schools (especially public schools) and other parties undertake to try to increase the enrollment of underrepresented minorities in medical school (and other schools of higher education). Since the abolition of Affirmative Action through proposition 209 in 1996, the numbers of underrepresented minorities in overall graduate education have dropped considerably⁵.

In the US (and many other countries), there are very palpable health disparities. In the US, these disparities disproportionately affect African-Americans, Latin-American families and Native-Americans². A main part of the problem is that many physicians will not work in health centers surrounded by these populations because of either cultural differences, or because it is less profitable. Inherent in this problem is that not many physicians from these communities are making it through the educational system to return to serve their communities^{3,4}.

Another reason why increasing diversity is beneficial to the community comes from the AAMC (Association of American Medical Colleges) AMICUS statement regarding Fisher vs. UT-Austin. The AAMC believes that support of affirmative action and the implementation of a “holistic” approach to medical school admissions enriches the educational experiences, and cultural competency of future physicians and thus better serve society as a whole¹.

Recently the Affordable Care Act was passed which will require everyone to have medical insurance – and thus, access to medicine. This will undoubtedly place pressure on the educational system to produce physicians that will serve very needy populations⁶.

This has left medical schools with the problem of finding different models of increasing underrepresented medical student enrollment at their institutions.

There have been many models put in place to try and increase diversity in the biomedical sciences. Some of these models have focused on high school summer programs, and pipeline programs. Others have focused on undergraduate programs and internships, as well as undergraduate mentorship. There are also summer pre-matriculation programs at various universities focused on easing the transition into medical school for underrepresented minorities, as well as tutoring programs.

As we proceed in our efforts to continue to increase the number of underrepresented medical students and physicians, it would be in our best interests to have a working knowledge of these different models of increasing diversity so that we can best focus our efforts and resources and provide quality healthcare to underserved communities as well as contribute to the academic experience of other students and physicians.

Challenges to increase of URM recruitment

Historically, underrepresented minority students (African Americans, Latinos, Native Americans)(URMs) have had a difficult time gaining acceptance into medical school, and have had a harder time than whites and Asians in completing their medical degrees. Prior to the civil rights' movement and the implementation of affirmative action, between 2-3% of medical students were URMs (not counting the historically black medical colleges, ie. Meharry and Howard), even though the underrepresented minority population in various states stood at >11%. Between 1963 -1974, the population of URMs in medical school more than doubled (8-11%), however since then, the numbers have stagnated⁷.

There are many factors that have been identified as barriers to the increased recruitment and enrollment of URMs into medicine. Among those that have been identified are: small pool of qualified applicants, lack of URM faculty, the public school system (and lack of rigorous coursework), current legislation, poor counseling and advising, social factors (lack of mentorship, role models), as well as undergraduate struggles^{8,9,10}.

Reasons for dropping out of sciences during the undergraduate years are noted to be due to: (University of Georgia) 1) loss of interest, 2) fear of difficulty with grades, 3) feeling of inadequate preparation for courses like chemistry, 4) Internships stimulated other interests, 5) recruitment by other fields, 6) scholarships in other fields, 7) time it took to complete degree¹¹.

Of these, the public school system (K-12) seems to be the biggest barrier of all. The public school system directly influences the number of URM students that continue on to college, thereby affecting the current pool of URM medical school applicants. Of note, the “tracking system”, which at an early age (as early as 1st grade) disproportionately segregates URM students into lower tiered classroom settings, many times based on subjective evaluations – is a main culprit of the problem¹⁸. Recruiting URMs into the sciences out of high school is a significant problem that affects many states¹⁹. Another

barrier is also the barrier that the public school system imposes on research. Many public K-12 schools are reluctant to release information about students, making it very difficult to identify turning points and flaws along their educational timeline¹⁸. “Interventions at the high school level, and even at the pre-high school level, are needed as this is where the most severe disparities exist today in American education, and the source of many of the disparities in academic achievement between minority and non-minority students.”¹⁷. It is disheartening to know that studies show that students’ interest in science and attitudes toward achievement decline during middle and high school, before they enter college¹³. The most telling sign of public school system inadequacy is supported by the fact that that only 10% of students of students at top 146 colleges in US are from bottom half of income distribution (students served by the public school system), of which an overwhelming majority are URMs⁹.

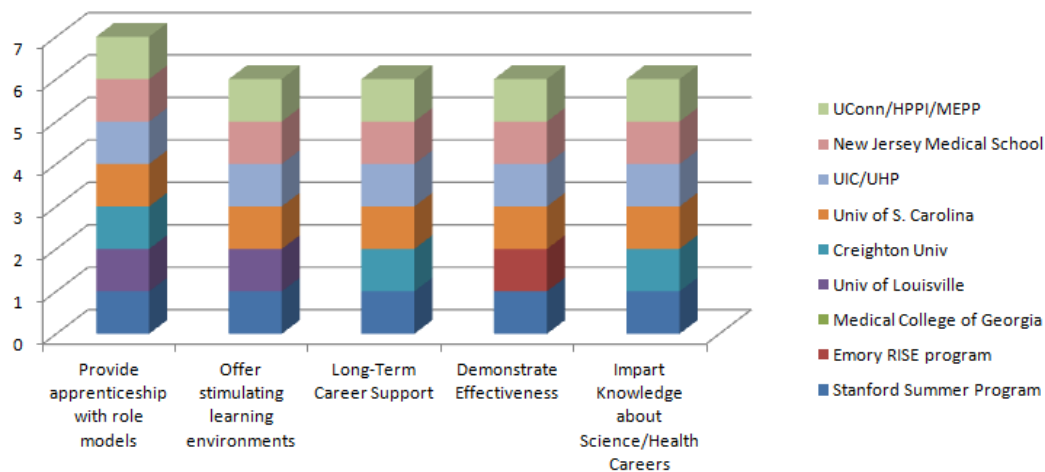
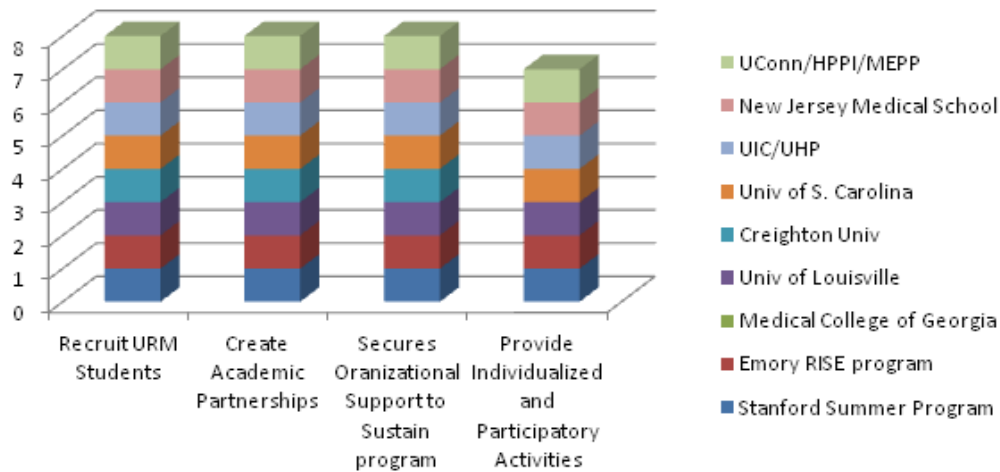
This early elimination of potential URM medical school candidates is illustrated by the problem of having a small pool of strong URM applicants⁹.

Secondly, current legislation has had a big part in decreasing the number of URM students being accepted into medical school. After the abolition of affirmative action in various states, URM matriculants decreased across the nation – especially in California, Texas and Florida (even though the population of minorities in the US is at an all-time high). Many schools find themselves trying to find creative ways to include more URMs into their medical school’s classes by using a “holistic approach” to admissions as well as setting up PRIME programs (Univ of California), but even these have met stifling resistance in the form of suits such as UT –Austin vs. Fisher. Schools are increasingly reluctant to find new ways of inclusion, even though diversity and increasing URMs in medical school is a goal that has been outlined by the AAMC various times. Programs like the Health Careers Opportunities Program (HCOP), Project 3000 by 2000, Title VII – programs that have been put in place to increase URMs in medicine-- have been hard hit in recent times.

As of July 1, 2009, recently adopted Liaison Committee on Medical Education (LCME) standards will require all medical schools to develop programs or partnerships aimed at broadening diversity among qualified applicants for medical school admission. In the new annotation for this standard, the LCME specifically encourages pipeline programs and partnerships with other institutions to make admission to medical education more accessible to potential applicants from diverse backgrounds²⁰.

Approaching the problem of diversifying Medical School/Biomedical sciences: How different schools and Programs approached this problem (Methods)

K-12: As research has shown, the greatest academic disparity between URM and non-URM students happens in K-12. The main goal is to increase the pool of applicants to medical school. Some programs invested in K-12 programs in response to moderate success in undergraduate/Post-baccalaureate programs¹⁶. Most articles reviewed (6 of 9 K-12 programs) involve programs that have multiple pipeline programs directed at different parts of the K- Medical School pathway. Since recruiting and developing any pipeline program is an inexact science, no two programs were the same. Nine programs in total were analyzed and these were components that they incorporated into their programs:



Many programs also offer personalized college admissions preparation and career counseling^{9,14,15,16,17}, provide exposure to college life (usually in the form of a summer residential program)^{9,15,16,17}, science Grade/GPA requirement/Letters of Recommendation^{9,10,11,16}, SAT Prep^{11,15,16}, Lab /Summer Research^{10,15,16}, classroom exchange between high school and college teachers^{12,15,17}, disseminate best practices and resources⁹, Monetary compensation¹¹, Parent involvement in classes¹⁶

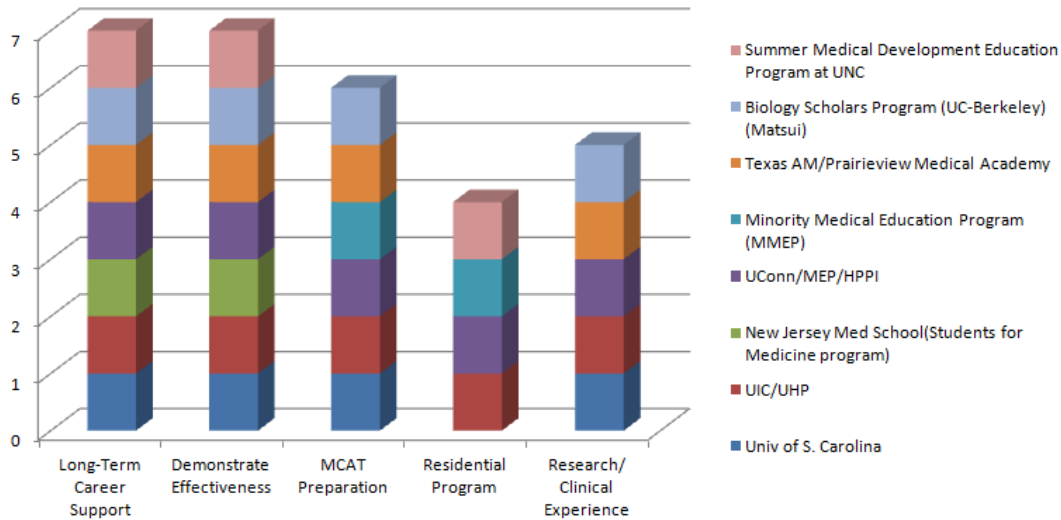
There were some features that made programs particularly unique, such as faculty from the school of medicine and dentistry spending a day a week at the high school as counselors¹², medical role play between faculty and high school students¹², professional development for high school teachers to improve teaching and high school curricula¹², and URM medical students serving as mentors to URM high school students¹⁴.

Undergraduate:

Methods used to increase URM recruitment into the biomedical sciences were much more uniform at the undergraduate and community college level than K-12. The undergraduate level of education is another place that sees a large drop-off in URM students that pursue science and medicine as careers¹⁰. Eight programs and their methods were analyzed during this literature review^{14,15,16,21,22,23,24,25} (many are part of a multitude of pipeline programs in the K-Medical school Pathway previously discussed).

Programs aimed at undergraduate/community college URM recruitment unanimously focus on imparting knowledge about scientific and health careers and career counseling, offer individualized and participatory activities, stimulating and in-depth learning environments, direct interaction and apprenticeships with role models as well as academic partnerships within the university, school of medicine, hospitals and clinics, and scientific facilities' secured organizational support to help sustain the program^{14,15,16,21,22,23,24,25}.

The bar graph below shows some differences among programs:



Only 3 provided prolonged academic support throughout the year^{15,21,24} and two had minimum GPA/Science GPA/Letters of recommendation requirement for participation^{22,23}.

Among the various programs, the Summer Medical Development Education Program (SMDEP) at the University of North Carolina was unique in that their 6 week summer program (which simulated the 1st year of medical school) tracked how well undergraduate participants performed in their program and compared their performance in the first through third years of medical school (for those that continued their education at UNC)²⁵.

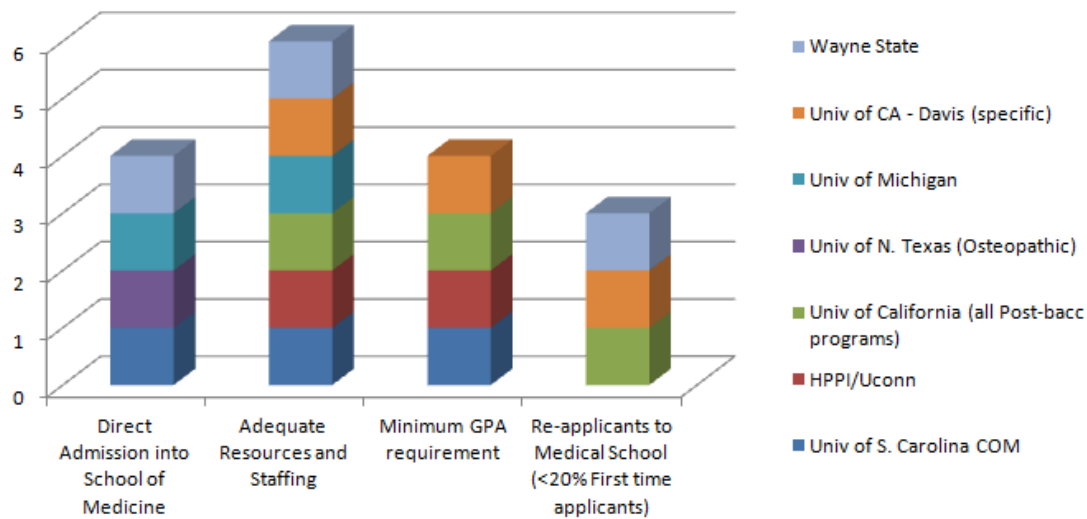
Post-Baccalaureate

Post-Baccalaureate programs are programs that are aimed at increasing the number of “academically fit” URM applicants that have applied to medical school, but who were unsuccessful. The main idea is that this is a one year program that can give immediate results in terms of being able to provide a larger pool of URM applicants that are not considered “academic risks” for medical schools. Seven programs were analyzed in this literature review^{14,21,26,27,28,29,30}.

Common characteristics to all Post-Baccalaureate programs researched are: recruitment of URM students (except the University of N. Texas), a year of undergraduate biomedical science courses,

critical evaluation, securing organizational support to help sustain the programs, academic support^{14,21,26,27,28,29,30}.

The bar graph below illustrates differences in Post-Baccalaureate Programs:



There were also a few programs that provided research,²⁸ clinical experiences^{26,29}, and helped with personal statement and interviewing workshops^{26,29}. The University of N. Texas Post-Bacc also offered an anatomy course (38% of what is covered in 1st year of medical school)– which students found very helpful²⁷.

The University of Michigan also compared the GPA and MCAT of students from their Post-Baccalaureate who matriculated at their school of medicine to non-University of Michigan Post-Baccalaureate students and traditional students to % scores in 1st year medical school classes²⁸.

BA/MD combined Programs:

There were two BA/MD combined eight-year programs in this literature review that focused on increasing URM physicians in their respective states. In brief, the University of New Mexico combined BA/MD was started due to a shortage of URM physicians to serve the rural underserved of New Mexico. They identified seven factors that help determine why someone would want to serve underserved communities: These seven factors are ethnicity, growing up in a rural community, curriculum design, specialized academic advising and tutoring, scholarships, mentoring from community role models, and longitudinal experiences in rural and underserved practice settings¹⁹. They focused their undergraduate/BA portion of the program as follows:

List 1

Premedical Component of the Undergraduate Curriculum of the Combined BA/MD Degree Program of the University of New Mexico School of Medicine, 2007

Year 1	Year 2	Summer	Year 3	Year 4
Seminar 1: Contours of Health in New Mexico	Seminar 2: Literature, Fine Arts, and Medicine	Rural medicine preceptorship	Seminar 3: Health Economics, Politics, and Policy	Seminar 5: Ethics, Medicine, and Health
Precalculus of Calculus	Biostatistics		Seminar 4: Health and Cultural Diversity	Biochemistry
General Chemistry	Organic Chemistry		Physics	
Molecular/Cell Biology	Genetics and Plant/Animal Form and Function		Anatomy and Physiology	

The medical school component of the BA/MD program also had similar requirements for service of the New Mexico underserved communities¹⁹. The University of New Mexico BA/MD program gives credit to various pipeline programs that helped shape their program such as the University of California Post-Baccalaureate Program, University of Texas-Pan American/Baylor College of Medicine and the Sophie Davis model¹⁹.

The Baylor College of Medicine(BCM) / University of Texas-Pan Am BA/MD program was also borne out of the necessity to increase URM physicians in south Texas. The program provides academic support, a rigorous undergraduate curriculum, enrichment experiences, full-tuition/scholarships, and conditional acceptance to BCM on successful completion of the BS degree in biology or chemistry²⁰. Currently, students must maintain a semester and cumulative GPA of 3.4 (on a 4.0 scale) and science GPA of 3.2 and attain a total MCAT score of 28, with no section score less than 8. URM students are carefully selected from high schools in south Texas and have to go through an interview process before being admitted²⁰.

Summer Pre-matriculation Programs

Along with the need to increase the number of URM students that enter the K-12 pipelines and those who graduate from an undergraduate institution and go on to matriculate medical school, there has also been the issue of retaining URM students in medical school. The idea behind summer pre-matriculation programs is to help prevent academic difficulties that many URM students have during medical school. The University of South Florida School of Medicine increased its' URM students from 1991 – 1994 from 4.9% – 10.5%. Although their incoming URM academic statistics were superior to or comparable with URM national statistics, 6 of the 13 URM students (class total of 96) failed one or more of the blocks in 1996. In 1997, the school of medicine instituted a six-week program to better prepare first year medical students for the rigors of the first year. This six-week program included lectures, small-group discussions, computer-aided instruction, and laboratory instruction in biochemistry, human embryology, and gross anatomy³¹.

Other Efforts

The recruitment and retention of URM faculty is another strategy that programs are using to increase their efforts of diversifying their institutions³².

Program Outcomes and limitations: K-12, Undergraduate, Post-Bacc, BA/MD, and Summer Pre-matriculation success rates.

As many of the multi-tiered programs (such as UIC/UHP, S. Carolina School of Medicine, etc) have K-Post-Baccalaureate parts, I will discuss those results and limitations separately from programs that only had K-12, Undergraduate, Post-Baccalaureate or Summer Pre-matriculation programs. Several articles only focused on outcomes of particular portions of multi-tiered diversity programs. Those outcomes and limitations will be discussed. Measures of success can loosely be defined as increasing URM matriculation and retention in medical school, increasing URMs entering general biomedical science professions, and increasing the pool of competitive URM applicants to undergraduate institutions and medical school. Because each program was unique in how they measured success (no standardization), they will be discussed individually.

K-12 Programs

The Stanford Medical School Science Program (SMYSP):

Outcome: the graduation rate from four-year colleges (excluding those still in high school or college) is 73% for African American students, 79% for Latino students, 87% for Asian students, and 86% for white. In contrast, the graduation rate from four-year colleges for 25- to 34-year-old adults in the United States is 15% for African Americans, 10% for Latinos, 55% for Asians, and 31% for white non-Latinos⁹.

Limitations: No control group, case group with longitudinal data. The program selected students that were interested in college (vs. not interested), however students who were chosen were from low socioeconomic backgrounds (which is negatively associated with higher education).

The Emory University RISE (Research Internship and Science Education) program

Outcome: 38/39 students went on to college, and 61% are majoring in science. Based on surveys, students feel positively impacted by the RISE program (many indicated they wanted to pursue a career in science or medicine). Multiple students started winning local and national titles and earning trips to compete at multiple science fair competitions. RISE average SAT scores are 1450 vs 1220 (avg score at their respective high schools), higher GPA and college matriculation rate¹⁰.

Limitations: Students enrolled in RISE were chosen in part due to academic achievement. They were not randomly selected to see whether there was a direct relationship to participation in RISE. The program has only been in effect for 4 yrs so we do not know the impact that RISE has in helping prepare the students for STEM majors (Science, Technology, Engineering, Math). No statistically significant data. Only 39 students and they are all currently undergraduates. Again, there was trouble sharing how students perform vs. their peers because public high schools do not want to release their scores¹⁰.

The University of Louisville Medical School partnership with Jefferson County Public School System

Outcome: From 1987-1994 African American students increased their college numbers by 45%. Over half of high school graduates went on to college and 22% of African-Americans expressed interest in the health science fields. The numbers of URM students enrolled in their school of medicine has

increase from 2.3% prior to 1993 to 10% by 1998. The retention rate in medical school for URM students also increased from 70% to 90% in that time span as well¹².

Limitations: No control group, however their program compared to national rates of high school graduation, college graduation and medical school matriculation for URM students are much higher.

Undergraduate Programs

The Minority Medical Education Program (MMEP) (at 8 different medical schools)

Outcome: In the 1997 medical school application cohort, 223 (49.3%) of 452 MMEP participants were accepted compared with 1406 (41.6%) of 3378 minority nonparticipants (P=.002). Positive and significant program effects were also found in the 1996 (P=.01) and 1992 (P=.005) cohorts. 8% higher chance of acceptance to medical school with an OR of 1.37²².

Limitations: The program does not increase the existing applicant pool-- it just makes applicants better qualified (that leads to increased acceptance). The study does not show what specifically about the program made these applicants more successful. There are no descriptions of those participants who applied but were not accepted to the MMEP program.

Texas A&M/Prarieview Medical Academy

Outcome: Results: First class graduated in 2007 with 64% acceptance rate to Medical school (7/11 students) compared with 24% and 38% acceptance of African-American students in Texas and the nation respectively, this year.

Limitations: Very small sample size, no long-term results yet

Summer Medical Development Education Program (SMDEP) at the University of North Carolina – Chapel Hill

Outcome: 601/817 (73%) SMDEP participants matriculated into a health professions program. 450 (75% of those that continued onto a health professions program) matriculated into a medical school. 70% of URM medical students at UNC were from the SMDEP program. Retention rate was 94-96% for URM students in that time (90% is the national avg). SMDEP students also had lower rates of deceleration, dismissal, remediation than non-SMDEP URM students. SMDEP students in top half of their cohort did better than the lower half on 3rd year clerkships²⁵.

Limitations: Lack of standardized grading for clerkships.

Biology Scholars Program (BSP)/UC-Berkeley

Outcome:

URM students graduating with a biology degree is a measure of success for BSP. BSP followed students in their program (many of them freshmen/first year undergraduates) who were intended Biology majors when enrolling at UC-Berkeley and tracked whether they successfully graduated with a degree in biology.

There was a major difference in BSP Latino INTENDED biology majors who graduated with a degree in

biology (~70%) vs non-BSP Latino INTENDED biology majors who graduated with a degree in biology (~45%). There was also a significant difference in BSP African-American INTENDED biology majors who graduated with a degree in biology (~60%) vs non-BSP Latino INTENDED biology majors who graduated with a degree in biology (~45%). The overall and science GPA was also higher in graduating Latino BSP students than graduating Latino non-BSP students²⁴.

Limitations: There was no mention of what part of their program contributed to the success of its students.

BA/MD combined Programs

University of New Mexico Combined BA/MD

Outcomes (so far): Students are satisfied with the program (2007 only two classes so far). Between 57% - 60% of the students are underrepresented students. Between 65%-70% of students accepted are from rural areas (Outside greater Albuquerque area)¹⁹.

Limitations: Program is its infancy, and there is not enough data to judge its success at this point.

Baylor College of Medicine(BCM)/UT-Pan Am – Premedical Honors College (UTPA-PCH) combined BA/MD:

Outcome: Prior to the program, on average 26 students from south Texas applied to medical school, and only 10 were accepted (6 from UT-Pan American). Now, the BCM/UT-PHC program alone, graduates 12 students per year who go on to medical school directly to BCM. Between 1994 and fall 2008, a total of 242 students entered the PHC. As of 2008, 134 (87% of those who completed the undergraduate portion of the program) have matriculated to medical schools in Texas, 99 at BCM. Among those matriculating to medical schools, 110 (82%) are URM and 106 (79%) are Latino²⁰.

Students that do not meet those cut-offs are encouraged to apply to other Texas medical schools. As of this writing (2008), 31% of PHC students have not met the minimum MCAT score for admission to BCM. Of these, 59% matriculated into other Texas medical schools. Others have pursued degrees in public health, physician assisting, optometry, graduate science, and teaching. There was a clear increase in MCAT score from one year to the next when the minimum was set at 27 (from 24). 88% (119 of 134) of PCH students have graduated or are enrolled in a Texas Medical school. 91% of students at BCM are still enrolled or graduated. Of the 9 that withdrew, 4 were for personal reasons, 5 were for personal/academic reasons. 6 out of 34 students that enrolled in other Medical students withdrew for reasons unknown (academic + personal) for a 84% retention rate. **All but one of 51 PCH students at BCM have received a passing score on USMLE 1**²⁰.

Our preliminary analysis of PHC data supports these findings, demonstrating a relationship between MCAT total score and each of the following: SAT ($r^2 = 0.274$; $P < .001$), GPA ($r^2 = 0.230$; $P < .001$), science GPA ($r^2 = 0.243$; $P < .001$), and high school rank ($r^2 = 0.067$; $P < .011$). The biology subscale of the MCAT (MCAT-B) emerged as the strongest single predictor of USMLE ($r^2 = 0.207$; $P < .001$), exceeding by over 3% the predictive power of MCAT total ($r^2 = 0.172$; $P < .001$)²⁰.

Pipeline success: There was an increase of 10 students from South Texas area matriculating into medical school per year (6 from UTPA) to at least 12 students from PCH to BCM and about 30 Students from UTPA matriculating into other medical schools (students not affiliated with PCH and BCM). Prior to PCH and BCM, there were only 7% Latino students at BCM. Now it is at 13% with PCH/BCM contributing 38% of all matriculants between 1998-2008 (75 of 195)²⁰.

Areas that graduates have chosen to practice: of the 20 graduates who are now in practice, 12 are practicing in or near South Texas: 4 in San Antonio, 2 in Victoria, 2 in Weslaco, 2 in McAllen, 1 in Edinburg, and 1 in Alamo. Another 9 PHC graduates are attending residency programs in South Texas (5 in San Antonio, 2 in Corpus Christi, and 2 in Harlingen)²⁰.

Post-Baccalaureate Programs

University of California Post-Baccalaureate Programs (all programs)

Outcome: After controlling for potential confounding variables in the multivariate model, the adjusted OR for matriculation into medical school among program participants compared with non-participants remained large (OR, 6.30; 95% CI, 4.08-9.72). By 2005, 67.6% of UC Post-baccalaureate students matriculated into a US allopathic medical school vs. 22.5% matriculation rate into US allopathic medical schools of non-UC Post-baccalaureate students. The mean GPA and cumulative MCAT score of matriculating students were significantly higher than those for non-matriculating students²⁶.

Limitations: The study was well done with a control group of students that had statistically similar profiles to the students admitted into the Post-baccalaureate program and they were followed through the AAMC. There was a short follow up time (matriculation as of 2005). They however were not able to track students admitted to Osteopathic or international medical schools. They also did not know what aspect of the post-baccalaureate program produced the best/most desired result of success.

University of N. Texas (Osteopathic) Post-baccalaureate Program:

Outcome: Of the 101 post-baccalaureate students, 70 were accepted to a US medical school (Osteopathic + Allopathic). Of the students that enrolled at the University of N. Texas Osteopathic School of Medicine (TCOM), former Post-baccalaureate students performed better than non-Post-baccalaureate medical students on medical school exams. None of the 48 Post-baccalaureate students that enrolled in TCOM had been reported to the student performance committee for academic difficulty²⁷.

Limitations: Although 23% of the students enrolled at the University of N. Texas Post-baccalaureate program are URM students, this program is not specifically aimed at increasing URM matriculation into medical school. It might be more difficult to predict similar results using their methods since this program was not designed for increasing physician diversity (increased URM matriculation into medical school). There were also no control groups.

University of Michigan Post-baccalaureate Program

Outcome: The University of Michigan compared the 1st year medical student success of its' own Post-baccalaureate students who subsequently enrolled at the School of Medicine to other 1st year medical students who were also former Post-baccalaureate students (at other programs) to traditional (no Post-baccalaureate experiences) 1st year medical students. The results showed no significant differences between the three groups. There was a higher standard deviation in percentage scores in the traditional group. There was correlation between traditional student pre-matriculation Science GPA, Physics MCAT and Bio MCAT and 1st year percentage score as well as Non-University of Michigan Post back and their Bio MCAT score. There was no correlation between UM-Post baccalaureate pre-matriculation GPA (science and non-science) or MCAT²⁸.

Limitations: very small sample size (15 students)

University of California-Davis Post-baccalaureate Program (this program is part of the UC post back consortium)

Outcome: Overall acceptance of 90% (as of the 1999-2000 academic year) for students that were in the program anytime from 1991-2000. Of 115 total participants, 104 were accepted to health professions, 95 were accepted into US Medical schools, 9 were accepted into an MPH, one Physicians' Assistant, and one International Med school²⁹.

Limitations: Like other Post-baccalaureate program, it does not quantifiably increase the total applicant pool of URM students. There was no comparison to other Post-baccalaureate programs.

Wayne State Post-baccalaureate Program

Outcomes: 90% of students who completed their Post-baccalaureate program (students who maintained a B average) successfully matriculated into the School of Medicine. 83% of African-American medical students and 93% of total URMs graduated Medical school³⁰.

Limitations: No comparisons to other direct-admission Post-baccalaureate programs.

Summer Pre-matriculation Program at the University of South Florida School of Medicine

Outcome: One year of data (14 students, 5 URMs). Comparable exam averages with the mean of the class in all disciplines. While no one from the summer course failed any courses, there were several people not enrolled in the summer class that failed courses such as Biochemistry (2 students), Anatomy (2 students), and Embryology (2 students)³¹.

Limitations: There is only one year of data, and the sample size is small.

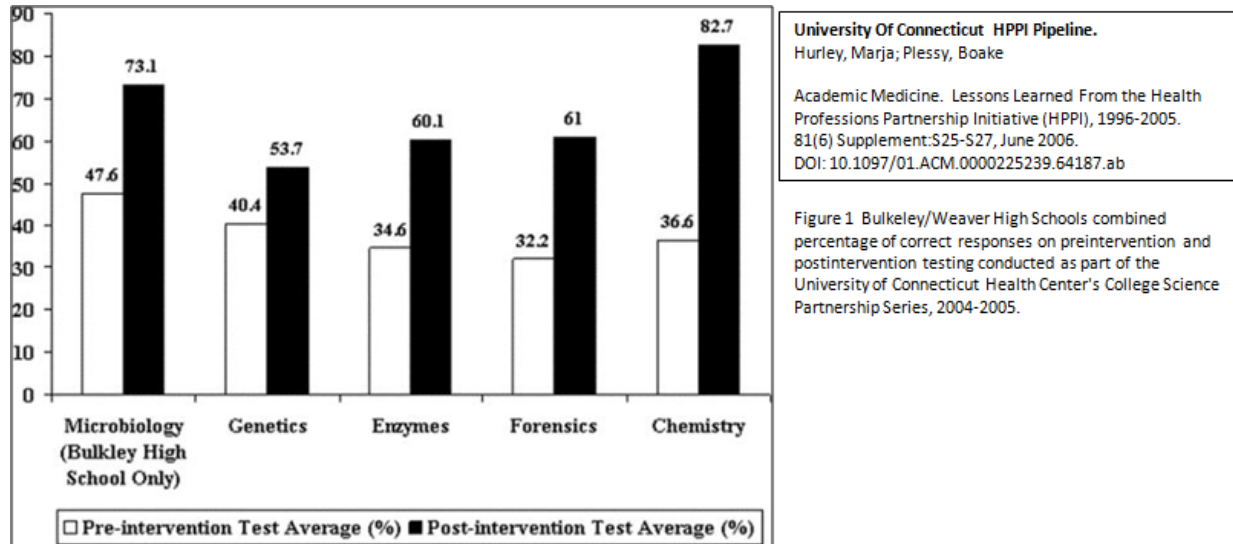
Multi-Tiered Medicine/Health Science Education Pipeline Programs

The University of Connecticut HPPI program (Highlighted Pre-College enrichment and College Science Partnership)(PCEP)

Outcomes:

PCEP: students' success is measured in a variety of ways. PCEP participants have a high rate of retention in college, as evidenced by the PCEP cohorts of 1996–2000 where 88% of student participants graduated from college²¹. (No further information was given in the article)

College Science Partnerships: Students performed better in their courses after the “intervention” see graph below:



The New Jersey Medical School Minority Enrichment Programs

General outcomes: From 1972 to 1998 the numbers of participants in the pre-college, college and pre-matriculation programs were 1722, 1875 and 683 respectively. These students were mostly inner-city African-American students with a growing representation of Latino students in the later years. Data from 1987-1994 show that 36% of the Summer Medical Program (SMP) participants entered health professions schools¹⁶.

Limitations: The article focuses on changes that the New Jersey Medical School provided in response to moderate/marginal success of its undergraduate pipeline programs, and that the program started K-12 programs in the 1990s (this article was published in 1999) so there was not much data on returns from this investment in K-12 programs at the college and especially at the health professions level.

The University of South Carolina School of Medicine (MUSC) (highlighted Post-baccalaureate and “Gentlemen and Scholar Program)

Post-Baccalaureate Program: Satisfactory completion guarantees students a spot in following year’s class.

Outcomes: Of 51 students that enrolled in the Post-baccalaureate program, 46 matriculated in MUSC, 3 are currently enrolled in the program. 5 did not successfully complete the program. 43 of the 46 have graduated, or are currently enrolled – 93% retention rate.

3 withdrew and are pursuing other science related fields. The 26 PREP (Postbaccalaureate Research Education Program) graduates selected the following residency medical areas: internal medicine (9), family medicine (4), obstetrics–gynecology (3), preliminary surgery (3), surgery (2), pediatrics (2), medicine–pediatrics (1), and anesthesiology (1). One has delayed residency training. Eighteen (62%) of these graduates chose a primary care residency, which is noteworthy in contrast to 62/155 (40%) selecting primary care (defined as internal medicine, family medicine, pediatrics, or medicine–pediatrics) in the 2012 graduating class overall. URM students from our PREP program have contributed disproportionately to filling a critical needs area in medicine by choosing primary care. This further underscores the value of the PREP program¹⁴.

Gentlemen and Scholar Program: The mentoring program includes one-on-one meetings between mentors and mentees, monthly on-campus workshops and seminars, and development of test-taking skills, study skills, resume writing, and professional decorum. Each college of medicine African American male medical student serves as mentor to one to three mentees. The program’s philosophy is to accept all applicants if they are motivated to fully participate.

Outcome: Forty-nine students have enrolled to date. Of these, 1 student was admitted to podiatry school, 16 high school graduates are currently enrolled in college, and 1 student was admitted to MUSC COM. The remainder of the students are current participants in the program. In 2009, the “Gentleman and a Scholar” program was featured in the AAMC Reporter as an example of a unique pipeline program¹⁴.

Other General Measures of Success for the University of S. Carolina School of Medicine:

From 2002-2012, the school of medicine experienced an increase of 10% in URM matriculants (from 11%-21% of the total student body) as well as an increase in residency program diversity (from 3%-10%) by 2010. Among the 2010 MUSC medical student matriculants, 49% and 43% cited student diversity and faculty diversity, respectively, as very positive/positive factors for choosing MUSC¹⁴.

The University of Illinois at Chicago (UIC)/ Urban Health Pathway (UHP)

General measures of success for UIC/UHP Outcome: As is the case for all academic programs, the measures of success for the UHP have been recruitment, retention, and graduation rates of URMs in health professions fields. The UHP has exceeded state legislative expectations and has become a national leader in the graduation of underrepresented minority health care professionals across the health professions, second only to historically black colleges and universities and Latino-serving institutions with health professional programs¹⁵. The UIC College of Medicine ranked number 1 in the graduation of Latinos, number 2 in the graduation of all minorities (including Asians), and number 5 in the graduation of African Americans nationwide. In 2010 UIC had 212 enrolled Latino medical students, the highest number in the continental US; more than schools in California, Florida, New York, and Texas, states with much larger Latino populations¹⁵.

Between 1978 and the 2010–2011 academic year, 5,327 degrees were awarded to UHP students in the health sciences at UIC. This is an average of 148 degrees per year. Of the total degrees awarded during this period, the college of medicine awarded 40%, applied health sciences, 17%; nursing, 14%; pharmacy, 7%; graduate college, 6%; and dentistry, 5%. Between 1997 and 2010, UHP students have composed 10,618 (16.3%) of the nearly 65,000 students enrolled in the health sciences programs at the UIC and have received approximately 13% of total degrees earned¹⁵.

Another significant milestone has been the ability to retain UHP students in Illinois. Currently (2011), 70% of UHP graduates remain in the state of Illinois. Many of the state of Illinois' top health care professionals and leaders have been alumni of the UHP, including the commissioner of the Chicago Department of Health, the director of the Cook County Department of Health, and the director of the Illinois Department of Public Health, attesting to the influence of the program¹⁵.

HPPI/UConn Pre-College Enrichment program (PCEP): PCEP participants have a high rate of retention in college, as evidenced by the PCEP cohorts of 1996–2000 where 88% of student participants graduated from college. (Hurley)

Discussion/Recommendations

The medical community (AAMC) agrees that diversity is important for various reasons. As such every school has the responsibility to increase the diversity of its student body and faculty to reflect the population of the state. Many programs reviews here have embarked on various strategies to increase URM in the health science professions since as early as the 1960s.

Since recruitment and retention of populations historically underrepresented and in the lowest social classes is an inexact science that takes many years to develop, this literature review found that while most models that increase diversity, specifically URM recruitment and retention into medical school and health professions proved to have varying levels of effectiveness- because there is no standardization of methods or how to measure outcomes of specific parts of program components- it is very difficult to determine which models were most effective.

That said, because the research indicates saying that students K-12, and Undergraduates have different motivating factors and are influenced differently, there needs to be partnerships in areas that have high school programs, undergraduate programs and post-baccalaureate programs. This allows for additional attention to students at important junctures where there are risks of falling through the “cracks” in the pipeline.

The programs that impressed me the most, not coincidentally were the programs that have either created partnerships with different schools K- undergraduate programs or formed their own pipeline programs at various levels. This seems to allow for students to “safely” transition from one program to another all the way to medical school or another health science professions. Once students graduate or leave individual high school or undergraduate programs, they seem to be more at risk of “falling through the cracks”.

Of course, to be able to have large, multi-tiered programs requires commitment –not only financially, but also from everyone K-Medical School/Health Professions School to also “buy” into the benefits of

diversity. This seems to be done best by the UIC/UHP program as well as the University of South Carolina School of Medicine.

Some of the strategies that these programs quote made them successful (excerpt from the University of South Carolina School of Medicine):

- Attaining a critical mass of URM in medical school, residency and faculty: the existence of a critical mass may suggest that an environment is welcoming, thus enabling recruitment of more URM individuals to that environment¹⁵.
- Specific diversity plans. "Two liaisons from the college of medicine diversity committee worked with individual departments to develop department-specific diversity plans. The departmental diversity plans were congruent with the institution-wide plan but tailored to the unique needs of each department. Associate deans for respective areas also developed targeted diversity plans for undergraduate medical education, medical school admissions, and graduate medical education"¹⁴.
- Demonstrated Institutional Monetary Commitment –monetary: This laid the groundwork for pipeline programs¹⁴.
- Assessment : The COM diversity committee developed an assessment tool to evaluate progress toward diversity goals. The assessment tool included quantitative and qualitative variables, such as number of URM individuals we recruited, number of grand rounds and seminars related to diversity, number of URM speakers who presented, number of activities related to health care disparities and social determinants of health, and the degree to which departments integrated cultural competency training. Each department completes an assessment annually, and results are analyzed and presented to the deans, department chairs, and faculty. The dean reported on the progress toward diversity goals in his State of the College address and to the Council of Department Chairs annually. On an institutional level, diversity became one of the strategic goals used to evaluate the COM and its departments annually. Further, department chairs undergo annual evaluations related to institutional and individual goals, and the extent to which the goals are met may affect the chair's incentive. Therefore, all department chairs were required to develop annual diversity goals linked to their end-of-the-year incentives¹⁴.

As we move forward and continue to try to increase diversity in the medical and healthcare professions in the state of California and admit and graduate a larger number of medical students that reflect the population of the state, we must continue to evaluate the current programs that are in place to help us achieve those goals. As I mentioned, standardizing methods and how we measure results is of great importance, so that we can continue to objectively evaluate said programs. We must also create more partnerships and "diversity program" meetings and conferences, to share the results of the various programs.

Programs and detractors must also exercise patience. Not getting expected or desired results does not mean that we should give up the efforts to increase URM diversity. People and such programs can only fit into the "scientific method" to a certain degree. Parrish succinctly says "We are dealing with people, it's largely a social science, how can we expect hard scientific results? That should not be the point."²³

Disclaimers:

-Program characteristics documented in this paper reflect what was read in said articles, and do not necessarily reflect all the attributes of each program.

- Only articles that I had access to on Pub-Med through my UCSD account were used. There were articles on comprehensive analysis of pipeline programs, but I did not have access to them, and therefore were not mentioned in this paper.

- Did not discuss some programs mentioned in the methods/strategies section in the outcomes section because they were not directly looking at outcomes of success, they were analyzing a different part of their program¹³, or where analyzing a different question¹¹.

References

1. Trinty F, Alarcon H. Brief Amici Curiae Association of American Medical Colleges et al. In Support of Respondents *ASSOCIATION OF AMERICAN MEDICAL COLLEGES*.
<http://www.utexas.edu/vp/irla/Documents/ACR%20Association%20of%20American%20Medical%20Colleges.pdf>
2. Frieden T, MD, MPH. CDC Health Disparities and Inequalities Report — United States, 2011, US Department of Health and Human Services, Center for Disease Control and Prevention.,
<http://www.cdc.gov/mmwr/pdf/other/su6001.pdf>
3. Weissman, J.S et al. J. Urban Health 535 (2001); Residents' Preferences and Preparation for Caring for Underserved Populations *J Urban Health*. 2001 Sep;78(3):535-49.
4. Odom Walker, Karen et al. (2012) The Association Among Specialty, Race, Ethnicity, and Practice Location Among California Physicians in Diverse Specialties. 104 *J. Nat'l Med. Assoc.* 46.
5. Garces, Liliana M. (2012). The Impact of Affirmative Action Bans in Graduate Education Civil Rights Project/*Proyecto Derechos Civiles* 2012
<http://civilrightsproject.ucla.edu/research/college-access/affirmative-action/the-impact-of-affirmative-action-bans-in-graduate-education>
6. Weinick RM, Hasnain-Wynia R (2011) Quality improvement efforts under health reform: how to ensure that they help reduce disparities--not increase them. *Health Aff (Millwood)*. 2011 Oct;30(10):1837-43. doi: 10.1377/hlthaff.2011.0617. RAND Health in Washington, DC, USA. rweinick@rand.org
7. Greysen SR, Chen C, Fitzhugh M. (2011) "A History of Medical Student Debt" Observations and Implications for the Future of Medical *Education Academic Medicine*. 2011;86(7):840-845.
8. Rao V, Flores G. (2007) Why aren't there more African-American physicians? A qualitative study and exploratory inquiry of African-American students' perspectives on careers in medicine. *J Nat'l Med Assoc*. 2007 Sep;99(9):986-93.

9. Winkleby MA. (2007) The Stanford Medical Youth Science Program: 18 years of a biomedical program for low-income high school students. *Academic Medicine*. 2007 Feb;82(2):139-45.
10. Rohrbaugh MC, Corces VG.(2011) Opening pathways for underrepresented high school students to biomedical research careers: the Emory University RISE program. *Genetics*. 2011 Dec;189(4):1135-43. doi: 10.1534/genetics.111.132126. Epub 2011 Sep 16.
11. Thurmond VB, Cregler LL. (1999) Why students drop out of the pipeline to health professions careers: a follow-up of gifted minority high school students. *Academic Med*. 1999 Apr;74(4):448-51.
12. Crump R, Byrne M, Joshua M. (1999) The University of Louisville Medical School's comprehensive programs to increase its percentage of underrepresented-minority students. *Academic Medicine*. 1999 Apr;74(4):315-7.
13. Cooney R, Kosoko-Lasaki O, Slattery B, Wilson MR (2006) Proximal versus distal influences on underrepresented minority students pursuing health professional careers.. *J Natl Med Assoc*. 2006 Sep;98(9):1471-5.
14. Deas D, Pisano ED, Mainous AG 3rd, Johnson NG, Singleton MH, Gordon L, Taylor W, Hazen-Martin D, Burnham WS, Reves JG. (2012) Improving diversity through strategic planning: a 10-year (2002-2012) experience at the Medical University of South Carolina. *Academic Medicine*. 2012 Nov;87(11):1548-55. doi: 10.1097/ACM.0b013e31826d63e0.
15. Toney M. (2012) The long, winding road: one university's quest for minority health care professionals and services. *Academic Medicine*. 2012 Nov;87(11):1556-61. doi: 10.1097/ACM.0b013e31826c97bd.
16. Soto-Greene M, Wright L, Gona OD, Feldman LA. (1999) Minority enrichment programs at the New Jersey Medical School: 26 years in review *Academic Medicine*. 1999 Apr;74(4):386-9
17. Terrell C, Beaudreau J. (2003) 3000 by 2000 and beyond: next steps for promoting diversity in the health professions. *J Dent Educ*. 2003 Sep;67(9):1048-52.
18. Murray-García JL, García JA. (2002) From enrichment to equity: comments on diversifying the K-12 medical school pipeline. *J Natl Med Assoc*. 2002 Aug;94(8):721-31.
19. Cosgrove EM, Harrison GL, Kalishman S, Kersting KE, Romero-Leggott V, Timm C, Velarde LA, Roth PB. (2007) Addressing physician shortages in New Mexico through a combined BA/MD program *Academic Medicine*. 2007 Dec;82(12):1152-7.
20. Thomson WA, Ferry P, King J, Wedig CM, Villarreal GB. (2010) A baccalaureate-MD program for students from medically underserved communities: 15-year outcomes. *Academic Medicine*. 2010 Apr;85(4):668-74. doi: 10.1097/ACM.0b013e3181d27914.
21. Hurley MM, Plessy BL, Clark-Dufner P. (2006) University of Connecticut HPPI pipeline. *Academic Medicine*. 2006 Jun;81(6 Suppl):S25-7.
22. Cantor JC, Bergeisen L, Baker LC. (1998) Effect of an intensive educational program for minority college students and recent graduates on the probability of acceptance to medical school. *JAMA*. 1998 Sep 2;280(9):772-6.

23. Parrish AR, Daniels DE, Hester RK, Colenda CC. (2008) Addressing medical school diversity through an undergraduate partnership at Texas A&M Health Science Center: a blueprint for success. *Academic Medicine*. 2008 May;83(5):512-5. doi: 10.1097/ACM.0b013e31816be5cf
24. Matsui J, Liu R, Kane CM. (2003) Evaluating a science diversity program at UC Berkeley: more questions than answers. *Cell Biol Educ*. 2003 Summer;2(2):117-21.
25. Strayhorn G. (1999) Participation in a premedical summer program for underrepresented-minority students as a predictor of academic performance in the first three years of medical school: two studies. *Academic Medicine*. 1999 Apr;74(4):435-47
26. Grumbach K, Chen E. (2006) Effectiveness of University of California postbaccalaureate premedical programs in increasing medical school matriculation for minority and disadvantaged students. *JAMA*. 2006 Sep 6;296(9):1079-85
27. Reeves RE, Vishwanatha JK, Yorio T, Budd M, Sheedlo HJ. (2008)The post-baccalaureate premedical certification program at the University of North Texas Health Science Center strengthens admission qualifications for entrance into medical school. *Academic Medicine*. 2008 Jan;83(1):45-51.
28. Giordani B, Edwards A, Segal S, Gillum L, Lindsay A, Johnson N. (2001) Effectiveness of a Formal Post-baccalaureate Pre-medicine Program for Underrepresented Minority Students (University of Michigan) *Academic Medicine*. 2001 Aug;76(8):844-8.
29. Blakely AW, Broussard LG. (2003) Blueprint for establishing an effective Postbaccalaureate medical school pre-entry program for educationally disadvantaged students. *Academic Medicine*. 2003 May;78(5):437-47
30. Whitten CF. (1999) Postbaccalaureate program at Wayne State University School of Medicine: a 30-year report. *Academic Medicine*. 1999 Apr;74(4):393-6.
31. Williams MT. (1999) Pre-matriculation program at the University of South Florida College of Medicine. *Academic Medicine*. 1999 Apr;74(4):397-9
32. Merchant JL, Omary MB. (2010) Underrepresentation of underrepresented minorities in academic medicine: the need to enhance the pipeline and the pipe. *Gastroenterology*. 2010 Jan;138(1):19-26.e1-3. doi: 10.1053/j.gastro.2009.11.017. Epub 2009 Nov 26.