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The Dental Pipeline program's impact on access disparities and student diversity

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In 2001, the Robert Wood Johnson Foundation (RWJF), Princeton, N.J., funded a five-year grant to develop a program to reduce dental access disparities. This program—Pipeline, Profession & Practice: Community-Based Dental Education (Dental Pipeline)—was developed in response to an increase in grant requests to meet the oral health care needs of the poor and to the surgeon general's report on oral health in America.¹ The RWJF wanted to have an immediate and long-term impact on reducing access disparities. After investigating several options, the RWJF decided to work with dental schools in a national demonstration program (a program that shows ways to achieve a goal and identifies best practices in achieving objectives).

With an overall goal of reducing disparities in access to dental care, the objectives of the Dental Pipeline program were to have senior students spend an average of 60 days in community clinics and practices treating underserved patients; provide students didactic courses and clinical experiences to prepare them for treating diverse, disadvantaged patients; and increase the number of underrepresented minority (URM) students enrolled in Dental Pipeline schools.

In terms of program rationale, the RWJF expected community experiences to have an immediate

ABSTRACT

Background. The Robert Wood Johnson Foundation, Princeton, N.J., the W.K. Kellogg Foundation, Battle Creek, Mich., and The California Endowment, Los Angeles, collaborated in funding a five-year (2002-2007) national demonstration program (Pipeline, Profession & Practice: Community-Based Dental Education [Dental Pipeline]) to reduce dental care access disparities. Fifteen dental schools were selected to participate in the Dental Pipeline program. The goals were to have senior students spend more time in community sites providing care to underserved patients; to prepare students to treat diverse, low-income patients; and to increase enrollment of underrepresented minority (URM) students.

Methods. A national program office at Columbia University in New York City administered the Dental Pipeline program. The participating dental schools developed networks of community clinics and practices for student rotations, established courses in cultural competency and public health and implemented new programs to recruit URM students.

Results. The average time senior students spent in community clinics and practices increased from 10 to 50 days; all schools developed courses in cultural competency and public health; and enrollment of URM students increased 54.4 percent (excluding two of the schools) versus 16 percent in non-Dental Pipeline schools.

Conclusions. On average, the participating dental schools were successful in meeting program goals.

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effect on increasing care to underserved patients. Senior students are able to see substantially more patients in community sites (six to eight patients per day) than in dental school clinics (two to three patients per day) because they work with experienced dental assistants and administrative staff. Also, the RWJF hoped that the community experiences would influence some dental school graduates to work in community sites or treat more underserved patients in their private practices.

Curriculum changes needed to be made to prepare students for their community experiences. To treat diverse patients, students needed to be knowledgeable about multicultural communities (cultural competency) and to have a basic understanding of public health and patient management. The recruitment of more URM students (African-American, Hispanic and Native American) was another strategy we used to reduce access disparities, since study results indicate that minority medical and dental practitioners are more likely to care for minority patients,^{2,4} and minority patients' compliance and satisfaction with care are improved when they are treated by practitioners with the same cultural and linguistic backgrounds.^{5,6} There also is evidence that more diversity in the classroom improves the education of all students.⁷

After the RWJF made an announcement about the Dental Pipeline program, the W.K. Kellogg Foundation (Kellogg), Battle Creek, Mich., joined the program and contributed financial aid for recruited URM students. Another foundation, The California Endowment (TCE), Los Angeles, also decided to participate and provided funds to four California dental schools so that they could participate. The collaboration of three foundations in the same program is unusual and reflects the importance of the access issue.

In this article, we describe the results of the Dental Pipeline program.

SUBJECTS, MATERIALS AND METHODS

A national program office (NPO) was established at the Columbia University Medical Center, New York City, to direct the Dental Pipeline program. The NPO provided schools with advice and technical assistance, and it encouraged the schools to use best practices. It accomplished these activities through site visits, conference calls, project meetings and written progress reports. The RWJF appointed a national advisory committee to select applicants and to oversee the entire pro-

BOX

Participating dental schools.

- Boston University, Goldman School of Dental Medicine
- Howard University, College of Dentistry, Washington
- Loma Linda University, School of Dentistry, California
- Meharry Medical College, School of Dentistry, Nashville, Tenn.
- Temple University School of Dentistry, Philadelphia
- The University of North Carolina at Chapel Hill, School of Dentistry
- The Ohio State University, College of Dentistry, Columbus
- University of Connecticut Health Center, School of Dental Medicine, Farmington
- University of California at Los Angeles, School of Dentistry
- University of California at San Francisco, School of Dentistry
- University of Illinois at Chicago, College of Dentistry
- University of the Pacific, Arthur A. Dugoni School of Dentistry, San Francisco
- University of Southern California, School of Dentistry, Los Angeles
- University of Washington, School of Dentistry, Seattle
- West Virginia University, School of Dentistry, Morgantown

gram.⁸ The RWJF and TCE also selected an independent team of researchers from the School of Public Health at the University of California at Los Angeles to evaluate the Dental Pipeline program.⁹

The three foundations provided \$26.3 million for the Dental Pipeline program (RWJF \$19.0 million, TCE \$6.3 million and Kellogg \$1.0 million). Participating dental schools received an average of \$1.3 million over five years (one year of planning and four years of implementation).

Forty-two of the 56 dental schools accredited in the United States at the time of the study submitted preliminary applications, and we asked 21 schools to prepare full applications. Fifteen dental schools received grants (Box).

The RWJF and TCE collaborated on implementing the Dental Pipeline program, but each had slightly different requirements regarding the students they wished to see gain community-based experience. The schools supported by the RWJF required that senior students be in the group participating in the Dental Pipeline program. The schools in California, however, were required by TCE to include residents in general dentistry or pediatric dentistry, as well as senior

ABBREVIATION KEY. **Dental Pipeline:** Pipeline, Profession & Practice: Community-Based Dental Education. **Kellogg:** The W.K. Kellogg Foundation. **NPO:** National program office. **RWJF:** The Robert Wood Johnson Foundation. **TCE:** The California Endowment. **URM:** Underrepresented minority.

students, in the Dental Pipeline program. TCE believed that including the residents in the Dental Pipeline program would expand the workforce beyond senior students.

The primary sources of data we used in our study were annual progress reports from the participating schools, site visits and conference calls, as well as American Dental Association and American Dental Education Association reports on all dental schools. The annual progress reports included descriptions of the schools' major achievements and shortfalls; the number of days students spent in community sites by site; changes in the cultural competency curriculum; and detailed information on the number of URM student applicants and students interviewed, accepted and enrolled. Site visits took place every other year and involved a one-day meeting with the dean and other administrators, project staff members, relevant faculty members, selected community site dental directors, students and residents. In addition, we gathered data at biannual conference calls with the project staff members. Andersen and Davidson¹⁰ prepared an independent assessment of the Dental Pipeline program in which they presented detailed descriptions of the data collection instruments.

RESULTS

In this section, we describe the major operational challenges and outcomes of each program objective.

Community-based education and curriculum change. Operational challenges.

Faculty member support. Some faculty members were reluctant to allow senior students to spend 60 days in community sites because they were concerned about the quality of the community-based experiences. To make clinical faculty members more comfortable with off-site education, schools gave community-based faculty members academic appointments, gave them training and calibration in evaluating students using dental school policies and procedures, scheduled school faculty members to visit community sites, and organized educational and social events so that the community-based and school faculty members had the opportunity to interact. By the end of the program, most clinical faculty members were strong supporters of community site rotations.

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Credit. Some schools' clinical departments refused to give students credit for procedures they performed in off-site facilities. However, as faculty members became more familiar with community programs and received positive feedback from students on the value of their community experiences, the schools gave students credit for the procedures they provided. Schools handled the awarding of credit differently; some schools gave full credit, some gave partial credit, and some required that a new course awarding credit be created.

Management. In general, at the beginning of the program, schools had limited experience developing and managing a network of community sites, designing student rotations, assigning students to community sites and monitoring students' performance. Within a few years, the schools became skilled in managing student rotations, and many developed operating manuals that described students' and community faculty members' roles and responsibilities.

Length of rotations. Most schools assigned students to the same site for two to 10 weeks. Both schools and community sites reported that the educational value of rotations increased as students spent more time at the same facility, and we found that spending more time at a facility allowed students to become better integrated into the sites' operations and to complete more complex procedures.¹¹

Patient continuity at dental schools was a problem when students were at a community site for three or more weeks. Two options for dealing with this issue were organizing students into teams so that students could care for each other's school patients and assigning students to community sites for two days a week for several months.

Assignments. Most schools gave students some choice in selecting community sites to accommodate the needs of those who were married, had children or other personal obligations. The cost of housing and travel to sites that were beyond commuting distance usually was paid by the school, the site or, when available, a state area health education center program.

Reports. Students completed encounter forms to record the services they provided to patients. To transfer the encounter data, one school developed a sophisticated Web-based data collection

system, but most schools used laptop computers or personal data assistants to digitize the data.

Instruction. With one or two students per community faculty dentist, students were closely supervised during their rotations even as the dentists treated their own patients. Students reported that the dentists were excellent mentors. Furthermore, they perceived that the quality of care provided in community sites was high. Almost all students were enthusiastic about their experiences, and schools reported that students had greater confidence in their clinical abilities after their rotations.

Courses. Schools developed course materials regarding cultural competency, epidemiology and patient communications to prepare students for their experiences in the community sites. In most instances, this material was added to existing courses' curricula. Many schools required students to write an essay describing a patient experience that affected them personally or professionally.^{12,13} These essays were discussed in seminars attended by other students and faculty members after the rotations ended. These "reflective assignments" enriched the community experience beyond clinical skill development.

Outcomes. The schools were affiliated with an average of 21 community sites; 82 percent were urban and 18 percent were rural. On average, sites had two full-time-equivalent dentists. Eighty-eight percent of sites were community and hospital dental clinics, private practices and other sites as listed in Table 1. The remaining 12 percent of sites (data not shown) were public or parochial schools, nursing homes, armed forces facilities, prisons, jails and the Indian Health Service.

Schools increased the time senior students (and, in California, general and pediatric dentistry residents) spent in community sites from an average of 10 days at the beginning of the program to 50 days at the completion of the program. Six schools met the goal of students' having 60 days of training in community sites. One school did not make adequate progress in increasing students' off-site training time beyond the number of days assigned at the beginning of the program. We dropped this school from this part of the program. The figure shows the distribution of days students spent in the community at the beginning and end of the study. All but three schools made significant progress

TABLE 1

Community clinical sites for student and resident rotations.	
TYPE OF COMMUNITY CLINICAL SITE	PERCENTAGE*
Federally Qualified Health Center	29
Community Hospitals	12
Community Clinic (Non-Federally Qualified Health Center)	11
Private Practice	10
Dental School Community Clinic	8
State, County, Municipal Health Department	6
Veterans Affairs Hospital/Outpatient Clinic	6
Other Dental School/University	6
* The percentage totals 88; the 12 percent not shown were less commonly reported sites: public or parochial schools, nursing homes, the armed forces facilities, prisons, jails and the Indian Health Service.	

and increased the time students spent in community sites.

Recruitment of URM students. Operational challenges. Strategies and programs. Nine of the 15 schools had little experience in recruiting URM students. At baseline, two schools had no URM students in their first year class, and seven schools had five or fewer. To overcome these challenges, under the leadership of their respective deans, these schools hired experienced personnel to head up their diversity initiatives. They expanded and integrated student outreach, admissions, student affairs, financial aid and pre-professional enrichment programs. Furthermore, two sets of schools formed "collaboratives" to work together in recruiting URM students.¹⁴ A California collaborative included all five California schools (Loma Linda University, University of California at Los Angeles, University of California at San Francisco, University of the Pacific and University of Southern California) and a northeast collaborative included Boston University, Temple University, University of Connecticut Health Center, Howard University, West Virginia University and Columbia University. Although the latter school was not one of the funded schools, it helped the NPO with recruitment and admissions matters as part of the collaborative.

Many schools implemented one or more of the following recruitment activities while working as part of a collaborative or solo.

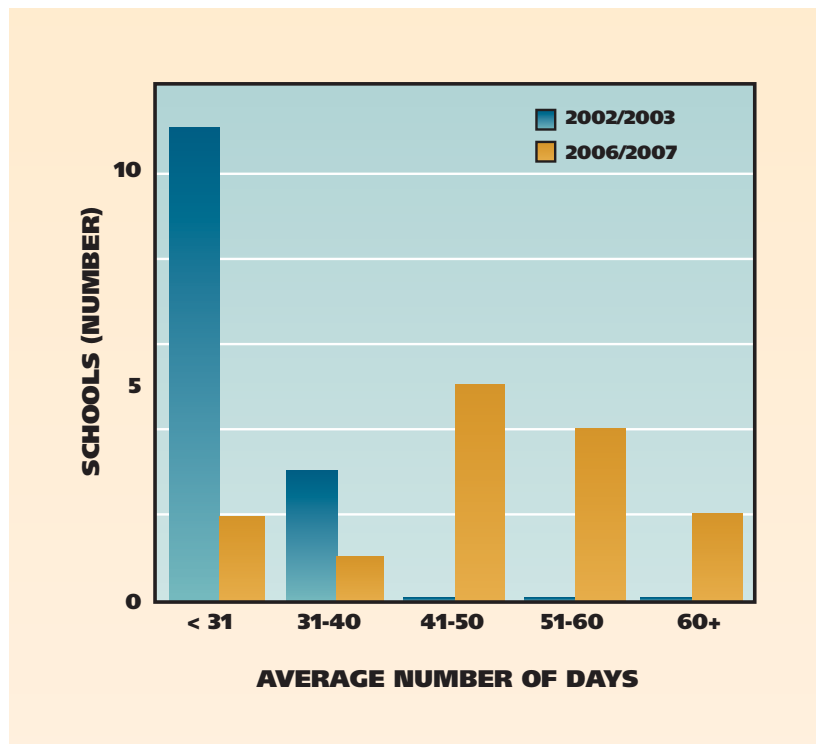


Figure. Distribution of schools by the average number of days senior students and general and pediatric residents in California spent in community sites providing care to underserved patients at the start (2002/2003) and end (2006/2007) of the Pipeline, Profession & Practice: Community-Based Dental Education program.

- Established summer enrichment programs. Promising URM college students spent two to six weeks receiving additional instruction in the basic sciences, preparing for the Dental Aptitude Test and receiving experience in clinical dentistry. At the start of the Dental Pipeline program, there were three summer enrichment programs; by the end, there were seven.
- Developed or expanded postbaccalaureate programs for URM students who applied to dental school but were not accepted or who had not applied because they had weak academic records or had not taken the required courses. These students spent 12 months taking advanced science courses, improving their study skills and preparing for the Dental Aptitude Test. At the start of the Dental Pipeline program,² there were two postbaccalaureate programs; by the end of the program, there were six.
- Created new recruitment materials directed to URM college students.
- Held meetings involving preprofessional health advisers from key feeder colleges.

Institutional policies. Institutional policies related to admissions, internal school environ-

ments for student diversity, mentoring programs and scholarship funds required change to increase the diversity of the student body. Schools addressed these issues via the following strategies.

- All schools received Kellogg or TCE grants of \$100,000 to spend on URM student scholarships. No more than \$10,000 per year was awarded to any student.
- The NPO held several national and school-specific admission workshops on how to conduct a whole-file review of candidates (a review of quantitative scores such as grade point average and Dental Aptitude Test, as well as other screening attributes such as leadership roles, service-related accomplishments and overcoming hardship) and to use other “best practices” to improve student diversity.
- A few schools had internal environments that limited their ability to attract URM students. These schools conducted diversity climate studies and worked with consultants to change their internal environments.

- Four schools (University of Illinois at Chicago, Meharry Medical College, University of Connecticut Health Center and University of Southern California) received additional grants of \$50,000 to establish mentoring programs with minority dental organizations and alumni to help in their URM student recruitment efforts.

Outcomes. When we excluded Meharry Medical College; Howard University; and University of Puerto Rico, School of Dental Medicine, San Juan (schools that traditionally enroll a majority of URM students) from our analyses, we found that the percentage of Dental Pipeline schools’ URM student applications and enrollment increased 76.9 percent and 54.4 percent, respectively (Table 2), and that the percentage of non-Dental Pipeline schools’ URM student applications and enrollment increased 83.7 percent and 16.0 percent, respectively. For reasons we do not know, both Dental Pipeline and non-Dental Pipeline schools experienced large increases in applications from URM students. However, Dental Pipeline schools were more successful in increasing the number of URM students enrolled. The increase in URM student enrollment in

non-Dental Pipeline schools was due primarily to one school (Texas A&M Health Science Center, Baylor College of Dentistry, Dallas). When we omitted this school from our analysis, the increase was 3.6 percent.

The enrollment of URM students at six of the 15 Dental Pipeline schools more than doubled for at least one year of the program, URM students made up 20 percent or more of the freshman classes at four schools, and URM student enrollment at two schools did not change (data not shown). There was substantial variability in URM freshman enrollment within schools; for example, the number of URM students at one school decreased from 15 to two over two years. This variability was linked to changes in faculty, deans and federal scholarship funds for URM students.

DISCUSSION

Disparities in access to dental care are a significant issue for the dental profession, the public health community, legislators and the general public. This problem may receive even more attention in the future as the large demographic changes taking place in the United States increase the political influence of underserved populations. On the basis of the results of the Dental Pipeline experience, we believe that dental schools can have a meaningful short- and long-term impact on reducing access disparities through community-based dental education, cultural competency training and recruitment of URM students.

The Dental Pipeline program resulted in a substantial increase in the average time that students spent at sites in underserved communities known as “safety-net clinics” providing care to patients. The participating schools had little difficulty finding community sites interested in having students provide care to patients, so the time spent in community sites could be expanded easily. If all dental schools assigned senior students or general or pediatric dentistry residents to community sites in which they could provide care to seven patients a day for 70 days per year, almost 2.0 million underserved patients could receive care. To put this number in perspective, in 2005 the 800 federally qualified health center

TABLE 2

Underrepresented minority student applications and freshman enrollment in Dental Pipeline* program and non-Dental Pipeline program schools: two-year averages at the start and end of the program.†

SCHOOL	NO. AT START OF PROGRAM (2002/2003)	NO. AT END OF PROGRAM (2006/2007)	INCREASE (%)
Applications			
Dental Pipeline	1,238	2,191	76.9
Non-Dental Pipeline	3,073	5,647	83.7
Enrollment			
Dental Pipeline	90	139	54.4
Non-Dental Pipeline	281	326	16.0

* Dental Pipeline: Pipeline, Profession & Practice: Community-Based Dental Education.
 † Howard University, College of Dentistry, Washington; Meharry Medical College, School of Dentistry, Nashville, Tenn.; and University of Puerto Rico, School of Dental Medicine, San Juan, were excluded from the analyses since they traditionally enroll a majority of underrepresented minority students.

dental clinics provided care to 2.14 million patients.¹⁵

In addition to providing care to thousands of patients, the community experience may have a long-term impact on reducing access disparities. Several schools reported an increase in the number of students taking positions in safety-net clinics after graduation. At The University of North Carolina, senior students signed a pledge to spend at least four hours a month once they were graduated and in practice treating underserved patients. These are encouraging signs that community rotations influence long-term student career choices.

The fact that community sites were interested in having students and residents provide care at them also is a positive finding. Site representatives reported that students were well-accepted by patients, and that they increased the total number of patients treated. There is evidence that community rotations enhance clinical education. Dental schools reported that students were more technically skilled, self-confident and productive after completing their off-site rotations. The results of a recent study showed that students completed as many procedures in the off-site facilities as they did in their schools' on-site clinics but in one-half the time.¹⁶ This most likely is because at the community sites dental assistants worked with the students, and the sites operated as service delivery systems rather than

as teaching laboratories.

In terms of curriculum changes, the schools provided students, residents, faculty members and staff members with cultural competency training to prepare them to care for patients with different cultural backgrounds. The schools' faculties readily accepted this curricular innovation, since most dental school clinics already were treating patients from diverse backgrounds.

The Dental Pipeline program had a significant affect on the recruitment of URM students; first-year URM student enrollment increased by 54.4 percent. This increase occurred despite a challenging environment in which there was a surge in competitive dental school applicants, rapidly increasing tuition, an end to federal URM student scholarships and a decline in state support for dental education. This environment made it more difficult to recruit URM students and may account for the limited increase in URM students' enrollment in non-Dental Pipeline schools.

Building and running effective recruitment programs for promising URM college students were the primary reasons that the Dental Pipeline program achieved positive results. Summer enrichment and postbaccalaureate programs and whole-file review of applicants were the bedrock of the Dental Pipeline program. Most schools experienced steady increases in URM student enrollment over the period we studied; three schools experienced major fluctuations over the previous two years. The support of dental school deans and university and faculty leaders and the availability of scholarship funds appear to be key factors in the success of URM student recruitment programs.

The Dental Pipeline schools had more than a twofold percentage increase in URM student enrollment than did non-Dental Pipeline schools (Table 2). There is a long way to go, however, before all dental schools implement practices similar to those that the Dental Pipeline schools used to increase URM student enrollment and until the dental profession reflects the diversity in the general population. Furthermore, the problem is not just one of racial diversity; there has been a decline in applicants from low-income families. The rapid rise in dental education expenses may be one reason that there are fewer students from this segment of society.

The Dental Pipeline program has received the support of organized dentistry. The American Dental Association and the California Dental

Association provided financial support for the recruitment programs, and the National Dental Association, Hispanic Dental Association and the Society of American Indian Dentists had presentations about the Dental Pipeline program at their national meetings. The American Dental Education Association operated the scholarship program and held symposia on the Dental Pipeline program at their annual and council of deans meetings.

Since the Dental Pipeline program experience has been positive, the RWJF has provided additional support to advance the goals of the Dental Pipeline program. Four new schools have received three-year grants to improve their community-based dental education programs, and four other new schools have received three-year grants to increase the recruitment and enrollment of URM students. All five of the California dental schools in our study have received new grants from TCE to continue their off-site programs and URM student recruitment efforts. A new development is that the California schools and community sites are planning to share net revenues generated by students and residents.

CONCLUSIONS

Dental education plays an important role in dealing with access to care issues. Community-service learning programs increase the amount of care provided to underserved populations, and it gives students the knowledge and skills needed to deal with access issues after they graduate. The link between oral health and URM practitioners was stressed in the surgeon general's report on oral health in America. The results of our study show that collaborative recruitment strategies, summer enrichment programs, postbaccalaureate programs and whole-file review of applicants can increase URM student enrollment.

In the long term, dental school leaders will need to convince state and federal legislators to provide them and their community site partners with additional financial support to treat more underserved patients and to recruit more URM students. State and federal support for dental education has declined dramatically in the past several years, and schools are hard-pressed to maintain the quality of their education, research and service programs. This is a high-priority issue that deserves a concerted and organized effort by all organizations that are concerned about oral health. ■

Disclosures. Ms. Stavisky previously was employed by the Robert Wood Johnson Foundation, Princeton, N.J., one of the founders of the Pipeline, Profession & Practice: Community-Based Dental Education program, and was the senior program officer for the program initiative. Dr. Treadwell was a program officer, the W.K. Kellogg Foundation, Battle Creek, Mich., and was responsible for the scholarship program awarded through the American Dental Education Association for the Pipeline, Profession & Practice: Community-Based Dental Education program. Dr. Formicola, Dr. Bailit, Ms. D'Abreu, Dr. Bau and Mr. Zamora did not report any disclosures.

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