

To Improve Health and Health Care - Volume IV

Section Three: A Look Back

Improving Dental Care *By Paul Brodeur*

Editors' Introduction

One aim of the *Anthology* series is to provide a retrospective look at the Foundation's work in fields where it made a contribution years ago but that are not among its current priorities. In last year's *Anthology*, for example, Digby Diehl chronicled the Foundation's role in establishing emergency medical services during the 1970s and 1980s. In the 1998–1999 *Anthology*, Terrance Keenan explored the Foundation's early support, also during the 1970s and 1980s, of the emerging professions of nurse-practitioners and physician assistants. Dentistry is another field where the Foundation played a role two and three decades ago but has not remained involved.

At present, the Foundation has just four grants relating to dental care out of a total of more than 2,200 active grants. However, between 1972 and 1991 the Foundation supported seven national programs—and many smaller ones—in the field of dentistry. This chapter explores the variety of approaches taken to improve the delivery and the quality of dental care. These range from scholarships for medical students to large-scale research studies and from programs to increase disabled persons' access to dental services to developing leaders in the field.

This chapter, by Paul Brodeur, a former staff writer at *The New Yorker* who has written previously for the *Anthology*, follows the chronology of the Foundation's work in the field of dentistry. The chronology includes the following: (1) early scholarship and loan programs for dental students; (2) a program to train dentists in how to treat handicapped patients; (3) a major research study testing different ways of delivering fluoride to school children; (4) an initiative to assist hospitals in offering outpatient dental care; (5) a fellowship program to enable young dental school faculty members to study the health care system; and (6) a research program to find ways of predicting which children are at risk of developing cavities.

What emerges is a case example of the strategies the Foundation uses and the way in which they evolve to meet a changing environment. The chapter raises questions about which health concerns the Foundation should address and how long its commitment should last. In the 1970s and 1980s, when the Foundation was supporting the field of dentistry, tooth decay among poor people and lack of access to dental care was a public health problem. It remains so today; the Surgeon General stated in a report issued in May, 2000, that little-noticed disparities in dental care amount to a "silent epidemic of oral diseases" among the nation's most vulnerable citizens. Given the scope and importance of the problem, the Foundation is considering re-entering the field and funding new programs to improve oral health.

Chapter 9

During the First World War, a Colorado dentist named Frederick McKay observed that children in certain communities exhibited severe stains on the enamel of their teeth, and in some cases disfigurement of the enamel. In dental circles, this condition became known as Colorado Brown Stain. Studies were made to determine its cause, but nothing conclusive was found until the early 1930s, when a chemist named H. V. Churchill developed a tool capable of measuring trace levels of fluorides and other salts in drinking water supplies. At that point, H. Trendley Dean, a dentist working for the National Institutes of Health, began to study the dental health status of children and adults

living in more than a dozen communities with differing levels of fluorides. By the end of the decade, he was able to demonstrate that drinking water containing fluoride concentrations of up to one part per million dramatically reduced the incidence of dental caries in the teeth of children, while fluoride concentrations greater than one part per million caused brown staining and pitting that could eventually lead to the disfigurement of tooth enamel.

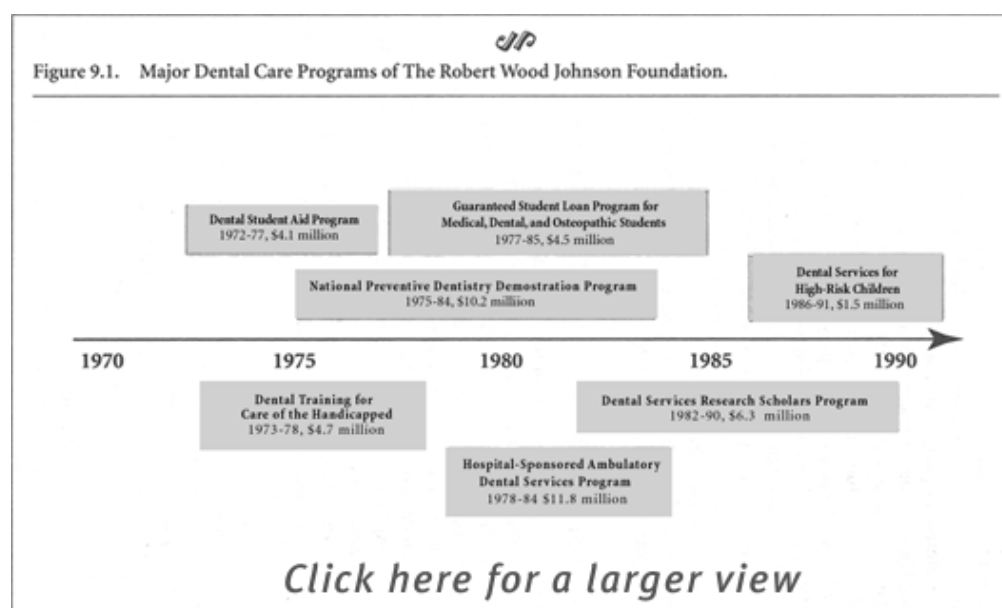
During the late 1930s and the early 1940s Dean published his findings in reports issued by the Public Health Service.¹ Subsequently, controlled experiments comparing the incidence of dental decay in children living in communities having fluoridated water with that of children living in nonfluoridated communities showed that the addition of fluoride to public drinking water supplies could reduce dental caries in children by more than 50 percent. It was the single greatest discovery in the history of dental medicine, and the resulting fluoridation of drinking water supplies in many communities in the nation (starting with Grand Rapids, Michigan, in 1945) is estimated to have saved hundreds of millions of dollars a year in dental restorations.

During the 1950s, Dean's discovery spawned considerable research on the use of fluoride tablets, fluoride mouth rinses, and fluoride-containing toothpaste, in order to further reduce dental caries in children. Subsequently, a number of publicly administered preventive dental initiatives—among them an extensive school-based fluoride mouth rinse program—were instituted by many communities in the nation. By the early 1970s, it was widely assumed that a combination of systemic fluorides, topical fluorides, and sealants—resin coatings to protect fissures in the occlusal surfaces of posterior teeth—could virtually eliminate dental decay in children. At the same time, it was widely recognized that the dental health of Americans could be vastly improved if they were afforded easier access to dental services. Only 25 percent of the population was receiving an annual dental checkup, and three out of every five Americans had received no dental care in the previous five years. As a result, more than half of adults over the age of 45 had begun to lose teeth.²

The First Dental Health Initiatives

In the autumn of 1972, the newly created Robert Wood Johnson Foundation entered the field of dental health by sponsoring and financing a \$4.1 million Dental Student Aid Program—the largest single foundation grant made until then to American dentistry. Under this program, four-year grants were provided to each of the nation's fifty-six schools of dentistry to be used for scholarships or loans to women students, students from rural backgrounds, and students from the nation's black, Mexican American, Native American, and Puerto Rican populations. The program, which was administered by the American Fund for Dental Education (now known as the American Fund for Dental Health), in Chicago, was similar in intent and design to a \$10 million program of student-aid grants that the Foundation had awarded several months earlier to schools of medicine and osteopathy. David E. Rogers, the Foundation's first president, who had been dean of The Johns Hopkins University's School of Medicine, described the purpose of both programs at a press conference held on October 27, 1972, to announce the dental school grants.

"The Foundation believes that the current national effort to expand the nation's output of doctors and dentists will not sufficiently benefit people in inner city and rural areas unless a substantial percentage of new medical and dental school graduates choose to practice in those areas," Rogers declared. "There is much evidence that women students, students from rural communities, and students from minority ethnic backgrounds will elect to practice in these areas more often than students from other backgrounds. Thus, we hope that by aiding schools in increasing enrollment of these students we may help to increase the proportion of students who will eventually practice in areas now sparsely served by health professionals."



In spite of such hopes, the Foundation's initial medical and dental student aid programs were not entirely successful, in part because targeted student aid did not prove sufficient to insure the increased enrollment of particular types of students during a period of tightened budgets and increasing costs. Undiscouraged, however, the Foundation's trustees subsequently authorized the development of a Guaranteed Student-Loan Program for Medical, Dental, and Osteopathic Students. Under this program, which ran from 1977 through 1985, the Foundation provided \$4.5 million to the United Student Aid Funds, Inc., which administered the program and guaranteed the loans. In 1982, the Foundation authorized a \$3 million 10-year interest-free loan to United Student Aid Funds to guarantee the existing loans. This was The Robert Wood Johnson Foundation's first program-related investment, and it was returned to the Foundation over a 10-year period ending in 1995.

Dental Training for Care of Handicapped Patients

During the early months of the Foundation's existence, Rogers and Robert Blendon, an expert in health care delivery at the Johns Hopkins Medical School, who had become vice president of the Foundation in charge of program development, sought advice on how the Foundation might best influence dental health care from John J. Salley, then dean of the University of Maryland's School of Dentistry, and from Alvin L. Morris, vice president of the University of Kentucky and president of the American Fund for Dental Education. Rogers and Blendon were enthusiastic about including dentistry in the Foundation's initial focus, and, as Salley remembers it, this enabled Morris and him "to put an oar in the water for dental programs."

One of the first proposals made by Salley and Morris was for a program aimed at increasing the number of community dentists who were trained with the appropriate skills and attitudes necessary for providing out-of-hospital dental care for handicapped children and adults. (The term "handicapped" is used in dentistry to include elderly persons and people with a variety of medical problems, as well as people who are physically and mentally handicapped.) The magnitude of the problem to be addressed was daunting. About 15 percent of the nation's then 220 million population—some 33 million people—could be classified as physically, emotionally, or mentally handicapped. Of these 33 million people, 15 million between the ages of 25 and 65 were unable to work because they were totally disabled; 6.5 million suffered from mental retardation; 2 million were so limited in mobility that they required special help; and another 2 million were institutionalized.³ Since many members of this large disadvantaged population were suffering from dental neglect, the essential question facing the Foundation was how to identify ways in which the dental profession could provide them with better care.

During the winter of 1973, an eight-member advisory committee established by the American Fund for Dental Education and chaired by John Salley undertook to study the problem. Salley and his colleagues soon determined that dental care for the handicapped was being provided primarily by pediatric dentists, and that most dental schools were not providing adequate instruction in how to treat handicapped people to undergraduate or predoctoral students. As a result, the limited number of trained providers of dental care for the handicapped population was imposing severe restrictions on care available in communities across the nation. Moreover, because of a lack of training and experience in dealing with handicapped people, many dentists were uncomfortable with the prospect of treating them. Others assumed that dental treatment of handicapped persons should be performed in hospitals under general anesthesia. An

additional problem was the fact that, according to one federal government estimate, nearly three quarters of the nation's dental offices were physically inaccessible to the handicapped.

Operating on the premise that making permanent changes in the dental care system could best be accomplished by first making changes in the basic education of dentists, Salley and his colleagues on the advisory committee developed a pilot program designed to improve and expand the training of undergraduate dental students in providing care for ambulatory handicapped people. Such a program could serve as a long-range solution to the problem, and its designers hoped that it would demonstrate its feasibility and the practicality of the rationale behind it.

In May, 1973, The Robert Wood Johnson Foundation authorized \$4.7 million to underwrite grants to eleven schools of dentistry that would introduce courses designed to train undergraduates in the dental treatment of the handicapped. The dental schools selected to receive the grants were those at Columbia University, New York University, the University of Alabama, the University of California Los Angeles, the University of Kentucky, the University of Maryland, the University of Michigan, the University of Minnesota, the University of Nebraska, the University of Tennessee, and the University of Washington. It was hoped that this cross section of institutions, representing about one-sixth of the nation's dental schools, would demonstrate whether or not dental care for the handicapped could be fully integrated into existing dental curricula, and whether or not these efforts could be sustained beyond the time when the Foundation's support would terminate.

The national program of Dental Training for Care of the Handicapped, as this pilot program was known, ran from 1973 to 1978. During that time, members of the advisory committee and other designated experts visited and monitored activities at each of the eleven schools receiving grants to make certain that the schools were complying with the Foundation's grant requirements. In the early stages, difficulties were encountered at some schools in obtaining sufficient curriculum time, in the recruitment of qualified faculty and staff, and in obtaining an adequate number of handicapped patients. In the end, however, the program to assist handicapped patients was deemed a success.

During the four years of its operation, more than 4,000 students were graduated from the full program, and 3,700 more students were taught portions of the new curricula that had been developed by the eleven schools.⁴ An analysis of the program's results conducted by researchers at the Educational Testing Service, in Princeton, New Jersey, concluded that there was a clear increase in the confidence and willingness of most students enrolled in the project to treat handicapped patients.⁵ Also indicative of the program's success was the decision of the American Dental Association's Council on Dental Education to include care for the handicapped as a specific teaching area to be evaluated during accreditation site visits to schools of dentistry, and the decision of the American Association of Dental Schools to develop curriculum guidelines for the care of the handicapped, and to disseminate these guidelines to all schools of dentistry.

In October, 1979, a National Conference on Dental Care for Handicapped Americans, which was designed to encourage dental schools to start programs similar to the Foundation's pilot project, was held in Washington, D.C. Supported by a grant from the Foundation, the conference was sponsored by the American Fund for Dental Health, co-sponsored by the American Dental Association and the American Association of Dental Schools, and attended by 59 representatives of dental schools across the nation, as well as by John Salley and other members of the advisory committee. (By this time Salley had become vice president for research and dean of the School of Graduate Study at Virginia Commonwealth University, in Richmond.) Chief among the topics under discussion were problems associated with implementing educational programs for teaching dental students how to treat the handicapped, such as how to obtain money necessary to set up special clinics equipped for handicapped persons, and how to find qualified faculty to teach the curricula that had been developed.

The dean of one of the schools that had participated in the Foundation's pilot program described how its continued existence had been threatened when legislative cuts in the university's budget had been passed on to the dental school. Other dental educators attending the conference also expressed concern about obtaining adequate financing for such programs. However, Salley pronounced himself optimistic that curricula for teaching young dentists how to treat handicapped people would soon be developed in all sixty of the nation's dental schools. At the same time, he deplored the lack of a clear federal legislative authority to mount a national effort to deal with the general health care of the handicapped, and warned that "the need to provide adequate dental care to 33 million handicapped Americans persists."

During the 1980s, programs for instructing dentists in how to treat handicapped patients were, as Salley had hoped, started in virtually all of the nation's dental schools, with the result that today there is no lack of dentists capable of providing care for such patients. However, the basic necessity—how to provide dental care for disabled people—still looms large more than twenty-five years after Salley and Morris identified it as being worthy of attention by The Robert Wood Johnson Foundation. Perhaps the most serious aspect of the problem is a lack of awareness on the part of state Medicaid officials of the extent of dental disease among the nation's handicapped population, and a corollary

unwillingness to provide adequate fees for services to dentists who agree to treat Medicaid patients. As a result, many dentists are refusing to accept such patients. Another part of the problem is how to get handicapped people to and from the dental office, and how to make sure that they are able to keep their appointments.

Between 1986 and 1988, The Robert Wood Johnson Foundation continued its efforts in behalf of handicapped people by awarding grants to the National Foundation of Dentistry for the Handicapped, a public, nonprofit corporation, based in Denver, Colorado, that was in the process of developing a number of initiatives for dealing with dental disease among needy, elderly, and medically compromised persons. Under one of these projects, the Donated Dental Services Program, dentists were recruited to provide care free of charge to such patients. This program, which was under way in four states in 1986 when it was first supported by The Robert Wood Johnson Foundation, has now expanded into 26 states, and includes 8,000 dentists who are donating their time and effort. Program coordinators interview applicants and, if necessary, arrange for their transportation to and from dental offices.

In most cases, the costs incurred by the National Foundation of Dentistry for the Handicapped in running the Donated Dental Services Program are defrayed by grants from state legislatures. According to Larry Coffee, executive director of the National Foundation of Dentistry for the Handicapped, every dollar of state money spent on this program is returning \$5.80 in pro bono dental services. Moreover, since 1986, some 26,000 patients have benefited from it. Coffee admits, however, that this and similar programs are only scratching the surface. "There are millions of handicapped people out there who need dental care," he says.

The School-Based Preventive Dentistry Program

Although the discovery that the addition of small amounts of fluoride to public water could sharply reduce the risk of dental decay in children was of major importance, 22 percent of the nation's population did not have access to a public water supply in the mid-1970s, and only about 50 percent of the public water supplies were either naturally or artificially fluoridated.⁶ As a result, experts thought that a majority of children were developing caries. Indeed, the best available national data at the time showed that children between the ages of 6 and 11 averaged nearly one and a half decayed, missing, and filled permanent teeth, and that the rate of decay increased with age. (For example, it was estimated that adolescents between the ages of 12 and 17 averaged more than 6 decayed teeth.⁷) However, the widely held assumption that caries in children could be reduced, if not eliminated, through school-based programs using fluoride tablets, fluoride mouth rinses, fluoride-containing toothpaste, and oral health education—an assumption encouraged by the National Institute of Dental Research National Caries Program—had not been adequately tested. In fact, most studies of school-based preventive dentistry had failed to include longitudinal comparison groups—groups whose dental experience had been followed over time, in order to show whether observed changes were the result of the various preventive dentistry procedures being tested or whether the changes resulted from extraneous factors affecting the whole population.

The School-Based Program

In 1974, The Robert Wood Johnson Foundation sponsored a four-year, \$2.6 million program conducted by researchers at the University of Pennsylvania School of Dental Medicine to provide restorative and preventive dental care to more than 1,800 children attending nine schools in a nonfluoridated rural county of Pennsylvania. The results were favorable in terms of reductions in untreated disease, but one of the major preventive measures—oral health education—had no measurable effect at all. In 1974, the American Fund for Dental Education approached the Foundation with the idea of conducting a national demonstration program that would determine the costs and the effectiveness of several types and combinations of school-based preventive dental procedures.

In March of the following year, the Foundation awarded a planning grant to the Fund for the development of such a program, and a separate grant to the RAND Corporation, of Santa Monica, to design data-collection procedures and conduct an independent evaluation of findings. Alvin Morris, who had become executive director of the Association of Academic Health Centers, was selected by the American Fund for Dental Education to serve as chairman of an advisory committee, and Harry M. Bohannon, a former dean of the University of Kentucky School of Dentistry, was selected as project director. The independent evaluation was conducted by Stephen Klein, a senior research scientist at the RAND Corporation, who was a specialist in research design and measurement.

Through the combined efforts of the American Fund for Dental Education and the RAND Corporation, a proposal was submitted to the Foundation for a demonstration program that would test two hypotheses: first, that a combination of fluorides and sealants would eliminate almost all dental caries in children; and, second, that the cost of school-based dental care would be low when compared to the cost of restoring tooth surfaces that would become decayed if the preventive care was not provided. In December of 1976, the Foundation awarded a grant of nearly \$5 million to the American Fund for Dental Education to begin a three-year National Preventive Dentistry Demonstration Program,

which was designed to determine the effectiveness of preventive dental procedures by measuring the number of tooth surfaces in children who developed caries following application of various combinations of procedures. It was also designed to determine the cost of each procedure. The program, which got under way in 1977, was later extended to include a fourth year, and by the time it ended, in June of 1983, it had cost \$10.2 million, and had involved nearly 30,000 children between the ages of 5 and 14, who attended more than 200 schools in ten communities across the nation, making it the largest and most expensive dental study ever conducted.

Schools were eligible to participate in the program only if they had a high student retention rate, if they had not been involved in any previous school-based preventive dental health programs, and if teachers and school administrators had indicated a willingness to participate in the Foundation's demonstration program. To insure geographical distribution, the ten communities selected as sites were in five different regions of the nation—two each in the northeast, the southeast, the northwest, the southwest, and the central heartland. Five of the sites had optimally fluoridated water supplies, and five had been designated as nonfluoridated. Among the fluoridated communities were Chattanooga, Tennessee; El Paso, Texas; Hayward, California; Minneapolis, Minnesota; and New York City. (The study was discontinued in New York City after three years because of the high cost of running the program there.) The nonfluoridated communities included Billerica, Massachusetts; Monroe, Louisiana; Tallahassee, Florida; Wichita, Kansas; and Pierce County, in Washington State.

Enrollment in the demonstration program was open to all children who, in the fall of 1977, were in grades 1, 2, and 5 in the participating schools of each of the ten communities. (These three grades were selected because they were attended by children who were at critical ages in the development of permanent teeth.) The total population under study consisted of 20,052 children in these grades. The children received a baseline dental examination and were then enrolled in a treatment regimen that included one or a combination of preventive procedures:

- ▶ Dental sealants
- ▶ Fluoride toothpaste and gel
- ▶ Fluoride mouthwash
- ▶ Fluoride tablets
- ▶ Oral health lessons plus fluoride toothpaste and dental floss for home use⁸

All of these children received annual dental examinations for the next four years, provided they were still enrolled in the study. At the conclusion of the program, the 9,566 children who remained—children who had received both the baseline and final examination—provided a sample population that was used to measure the effectiveness of the different combinations of treatment procedures.

Children assigned to treatment regimen 6 received annual dental examinations but no preventive care, and thus served as a control group against which to compare the results of the preventive measures that had been provided to children in the other five regimens. The program had two other comparison groups: 4,320 children in grades 3, 4, 6, 7, and 8, who were examined at the beginning of the program to help predict caries levels for other grades, and 4,746 children in grades 1 through 9, who received examinations at the end of the program in order to check the decay rates that had been observed.

Some Unforeseen Results

By early 1980—the end of the demonstration program's second year—investigators comparing visual examination data with baseline data observed a startling and wholly unexpected decline in tooth decay in children of all ages who were under study. At this point, they were forced to revise their projected estimates of expected decay among these children, and to propose extending the program by one year, in part because the unexpected low rates of decay would have made evaluation of preventive efforts difficult in the three-year project originally planned. In July, 1980, The Robert Wood Johnson Foundation authorized an additional year for the program, and in December of 1981 they awarded the American Fund for Dental Health a grant to finance it.

In the same month, the National Institute of Dental Research National Caries Program released the results of a study of caries prevalence in almost 38,000 American children that had been conducted during 1979 and 1980. It showed

that tooth decay in children between the ages of 5 and 17 had dropped nearly 33 percent from rates reported in Health Examination Surveys conducted in the 1960s.⁹ This large decline was found in both fluoridated and nonfluoridated communities, and was thought to be the result of an increased prevalence of fluorides in the food chain, especially the use of fluoridated water in food processing and the increased use of fluoride-containing infant formulas.

As expected, the final results of the Foundation's National Preventive Dentistry Demonstration Program confirmed the general decline in childhood tooth decay levels that had been observed earlier. The study also strongly reaffirmed the value of fluoridated water in reducing dental decay. For example, children in grades 1 and 2 who lived in fluoridated communities but did not receive preventive treatment in the program experienced a 30 percent smaller increase in tooth decay than their counterparts from nonfluoridated communities. Data compiled by the demonstration program revealed that reductions in caries attributable to water fluoridation were about the same as those obtained with the application of sealants—the only school-based procedure that was found to be consistently effective in reducing decay. However, in contrast to the \$23-a-year cost of maintaining a child in a sealant program, the annual per-capita cost (in 1981 dollars) of water fluoridation in five U. S. communities ranged from six cents in Denver, Colorado, to 80 cents in rural West Virginia.¹⁰ The study also showed that the annual cost of a school-based sealant program was far more than the annual cost of restoring tooth surfaces that sealants had prevented from becoming decayed.

One of the most surprising and controversial findings of the National Preventive Dentistry Demonstration Program concerned the lack of effectiveness of fluoride mouth rinsing and fluoride tablets in preventing tooth decay in children. Guides and pamphlets issued by the National Institute of Dental Research National Caries Program had reported that the use of such procedures by schoolchildren in nonfluoridated communities could result in reductions of decay of between 20 and 50 percent, and for only \$.50 to \$1.00 per child per year.¹¹ However, according to data compiled from the demonstration program, school-based weekly fluoride mouth rinsing and daily fluoride tablets were "not consistently effective in preventing clinically significant tooth decay beyond that already prevented by typical home and dental office care."

The conclusion about mouth rinsing was particularly galling to officials of the National Institute of Dental Research, who had strongly recommended a nationwide school-based program of weekly mouth rinsing, and later tried without success to discredit the demonstration program's finding. However, Harry Bohannon, the program director, who had become professor of dental ecology at the School of Dentistry of the University of North Carolina at Chapel Hill, was unequivocal about the matter. "On the basis of our results, we can't make any strong argument that fluoride mouth rinse programs are effective enough to be recommended, considering their cost, attrition rate, and the effort required to maintain them over a long period of time," he declared. "In fluoridated communities, they are not merited at all."

In the end, Bohannon and his colleagues were able to discount the twin hypotheses that the demonstration program had been designed to test, concluding that it was not possible to eradicate tooth decay in a highly comprehensive, school-based preventive program, and that the cost of such a program for all children was prohibitive. At the same time, the data they collected during their four-year investigation led to the highly significant finding that some 20 percent of the children under study were developing fully 80 percent of the dental decay being observed. As a result, Bohannon and his colleagues recommended that the traditional approach of providing equal preventive dental services to all children be reevaluated, and that serious consideration be given to the development of a caries-prediction model that could accurately identify high-risk children and allow preventive measures to be targeted directly at them.

The Hospital-Based Program

Meanwhile, The Robert Wood Johnson Foundation was pursuing other initiatives to deal with problems of dental health delivery that faced the nation. Surveys taken in the early 1970s had indicated that in any given year approximately 90 percent of the population had developed periodontal disease or dental caries requiring treatment. In spite of this, only about one-third of the population was receiving comprehensive dental treatment and preventive measures necessary to avoid serious dental problems. Nearly half of the population was receiving some type of episodic care—either emergency treatment for relieving pain or for treating acute conditions—but no continual care was being provided. About 10 percent of the population, including 30 percent of all children under the age of 17, had never been evaluated or treated by a dentist. Screening programs indicated that as many as 95 percent of the children of low-income families needed dental treatment.

Several factors were thought to lie behind this widespread lack of adequate dental care. First, the general public failed to recognize untreated dental disease as a serious problem. Indeed, many people viewed dental care either as a luxury or as something to be avoided. Second, the lack of insurance coverage for dental care limited the willingness of people to seek dental treatment. And, finally, there was a serious maldistribution of dentists due primarily to the clustering of dental practices in and around relatively affluent neighborhoods.

In 1978, operating on the assumption that teaching hospitals might be able to meet the dental needs of that portion of the population which was not being adequately served, The Robert Wood Johnson Foundation launched a \$11.8 million, four-year, Hospital-Sponsored Ambulatory Dental Services Program that was designed to assist hospitals in undertaking a major expansion of their existing outpatient dental care services by enlarging their existing general practice dental training programs. Under this program, which was directed by John Salley, grants of up to \$500,000 each were made to 25 hospitals—most of them in inner cities or in poor suburbs—to provide 24-hour dental emergency treatment, basic dental treatment on a regular basis for patients who were without a regular source of dental care, and primary prevention and dental education, especially for children. To be eligible to participate in the grant program, a hospital was required to have a general dental care residency program, an organized dental service that provided dental treatment for inpatients and outpatients, and a twenty-four-hour facility for providing emergency outpatient medical services.

At the end of the program, the Foundation asked researchers from the School of Dentistry at the University of California, Los Angeles, and from the Graduate School of Public Health at San Diego State University to evaluate its findings, in order to answer these questions:

- ▶ Did the program improve access to dental care for previously underserved groups—in particular, the medically impaired, the poor, and the elderly?
- ▶ Was the quality of dental care provided by the hospitals comparable to that provided by private dentistry in terms of preventive care and continuing care over time?
- ▶ How did the costs of providing dental care in hospitals compare to the cost of comparable services provided by private dentists?
- ▶ What were the incentives for hospitals and third-party payers to sustain hospital-sponsored general dentistry programs?

The answers to these questions proved, for the most part, to be disappointing. The general conclusion reached by the evaluators was that the program had resulted in an increased volume of patients who were treated in the participating hospitals for dental problems, but not in an increase in the proportion of medically impaired, poor, and elderly patients who were treated. The evaluators also concluded that the program did not increase the continuity of dental care, which they defined as the transition by patients from one stage of treatment to another over time. Since continuity is regarded as the *sine qua non* of appropriate dental care, this finding was especially dismaying.

In their final report, the evaluators of the Hospital-Sponsored Ambulatory Dental Services Program pointed out, "Without prospects for increased economic viability and eventual self-sufficiency, neither public nor voluntary hospitals are likely to commit themselves to expanded dental care programs, and they are particularly unlikely to market them aggressively among the low-income and special populations that need them the most." At the same time, the evaluators warned that it was not advisable to abandon hospital-based dental care entirely, because community dentists were unlikely to be available to treat emergency dental problems among inner-city residents who were not regular patients, and because severely handicapped patients and those in very fragile health could best be treated in the hospital environment. Perhaps most important of all, they called for the expansion of third-party coverage and government funding of dental care. "One clear outcome of this evaluation is the need for such subsidization if the proportion of the nation's population who are without access to dental care is going to be meaningfully reduced," they wrote.¹²

The Dental Scholars Program

By the end of the 1970s, officials of The Robert Wood Johnson Foundation had become aware of the need to develop a group of scholar-clinicians with experience in new areas of health services research that would enable dental school faculty to better understand and deal with the changes taking place in dentistry. Among these changes were the rapid expansion of third-party coverage for dental care, an increase in large group practices, the emergence of hospital-affiliated dental programs, and shifts in the pattern of dental disease. In 1982, the Foundation launched the Dental Services Research Scholars Program, which was designed to enable talented young clinical faculty to study the financing, organization, and delivery of dental health services in the United States. Under this program, five fellows were selected annually for two-year fellowships to be undertaken at the dental schools of Harvard University and the University of California, Los Angeles. Raymond P. White, Jr., former dean of the School

of Dentistry of the University of North Carolina at Chapel Hill, was selected as program director, and a national program office was established at the University's Cecil B. Sheps Center for Health Services Research.

Between 1983 and 1990, when the \$6.3 million program ended, 30 scholars had completed fellowships. By the spring of 1987, the first ten scholars who had completed their studies had written 34 scientific articles that were accepted for publication in refereed scientific journals. Of greater importance was the fact that research undertaken by the scholars led to the development of many innovative policies and procedures among them clinical protocols necessary for the dental treatment of patients with AIDS. Other research drew attention to major problems of clinical decision making. Among these problems were how to determine which of the 85 percent of eighteen-year-olds who have developed wisdom teeth should have them taken out; how important is replacing a missing lower first molar with a bridge in the treatment of relatively young patients, and when and what kind of X-ray examinations should be conducted? However, in spite of general agreement that the Dental Services Research Scholars Program had proved to be of great value, officials of The Robert Wood Johnson Foundation became concerned about the future availability of outside grant funds for dental health services research, and early in 1987 decided not to finance a third round of scholar appointments.

High-Risk Children

One of the most important dental initiatives sponsored by The Robert Wood Johnson Foundation grew directly out of the National Preventive Dentistry Demonstration Program. When the program came to an end, in 1983, researchers who had been involved in it persuaded officials of the Foundation to finance a secondary analysis of its results, in order to determine whether there might be some important collateral findings that could be useful in developing future dental health policy. This effort was led by John Bohannon, the demonstration program's director, and by John W. Stamm, then chairman of the Department of Community Dentistry at McGill University, in Montreal, who had been a principal consultant to the program.

"The finding that twenty percent of the children were developing 80 percent of the dental decay was foremost in our minds," Stamm said recently. "Our hope was that a secondary analysis of the mass of data that had been collected so diligently by Dr. Bohannon and his colleagues would help us combine the most important risk factors in a statistical model with which we might be able to predict with a reasonable amount of clarity just who this twenty percent might be"—in other words, which children were most likely to develop caries.

The secondary analysis, which was carried out in 1983 and 1984, strongly reinforced earlier findings that children living in nonfluoridated communities were at greater risk of developing dental decay than children living in fluoridated communities. It also showed that children with deep pits and fissures in their teeth were more prone to develop caries than children with shallow grooves. In addition, it furnished evidence that a prior history of dental decay was a predictor of future caries development, and that children from poor families were more likely to be at risk of decay than children from more affluent families.

During the secondary analysis, several statistical models for predicting children who were at high risk of dental caries were developed by John Stamm, who had become a professor of dentistry at the School of Dentistry of the University of North Carolina at Chapel Hill, and his colleagues at the School of Dentistry and the University's School of Public Health. In December of 1985, The Robert Wood Johnson Foundation authorized a grant of \$1.5 million to the American Fund for Dental Health for a six-year study that would further test and refine methods of identifying such children. The study, called Dental Services for High-Risk Children, was directed by Bohannon and Stamm, and it involved a series of four successive annual oral examinations of approximately 5,200 first and fifth grade children, who were equally divided between two nonfluoridated areas in the vicinity of Aiken, South Carolina, and Portland, Maine, which previous investigations had shown to be areas with high rates of dental decay and low dentist-to-population ratios. In addition to oral examinations, the study employed newly developed and relatively inexpensive screening methods to determine to what extent certain bacteria found in saliva might be predictors of dental decay. Parent questionnaires were used to collect data on the children's socioeconomic status.

When the investigation was completed, in 1991, the researchers who conducted it found that they were able to predict 65 percent of the children who would develop three caries or more over a period of four years, and 85 percent of the children who would not develop any caries at all. The investigators found that *Lactobacillus*—a bacteria found in saliva—was a stronger predictor of dental decay than *Mutans streptococci*, also found in saliva, which had previously been thought to be the chief bacterial culprit. They also determined that dental hygienists conducting visual examinations with tongue blades and mirrors could make predictions about the dental health of children that were nearly as accurate as those of dentists using dental probes. In addition, they found that first and fifth graders who came from poor and less educated families were considerably more likely to develop caries than children from more affluent and better educated backgrounds.

"One of the greatest impacts of the high-risk children study is that risk factors for dental decay have become part of the dental vocabulary, just as risk factors for various disease had previously become part of the medical vocabulary," Stamm said recently. "The question now is how to create an environment in which poor children with bad teeth can be brought to the dental chair. In my judgment, the dental public health infrastructure of the nation has fallen into disarray. It is critically important that state dental Medicaid funds be increased for less advantaged citizens, and that an educational program be established to encourage the parents of children at high risk of developing dental decay to bring them to the dentist. Equally important, parents of high-risk children must be persuaded to keep any subsequent appointments that may be made."

Conclusion

Evidence that the dental public health infrastructure of the nation has fallen into disarray is not hard to come by. Increasing numbers of dentists are refusing to treat Medicaid patients, on the ground that fees for Medicaid services are too low, and the administrators of state-run Medicaid programs are, for the most part, refusing to set aside more money for dental care. As a result, although the percentage of children who develop tooth decay has remained fairly steady over recent years, the percentage of children who get treatment for caries has dropped. Not surprisingly, tooth decay and the corollary health problems it can cause have become concentrated in the nation's poor and immigrant children, who are estimated to number between 5 and 10 million.¹³

It seems ironic that access to dental care for poor and immigrant children should still be a public health concern more than a quarter of a century after David Rogers announced The Robert Wood Johnson Foundation's first dental initiative—one designed to encourage dental students from rural communities and minority ethnic backgrounds to enter practice in inner-city and rural areas. However, John Stamm is convinced that the Foundation may still have a major role to play in the resolution of such a seemingly intractable problem. He believes that the Foundation should consider supporting a demonstration program that would educate public health officials at the state level to understand the dimensions of the growing dental crisis among the nation's poor and immigrant children, and persuade them to allocate resources from federal block grants to provide dental care for these youngsters. Such a program would also undertake to educate the parents of children who are at high risk of developing dental disease, to bring their children into the dental system.

"First, you have to make the system adequate and functional," Stamm insists. "Then you have to bring the children into it."

Alvin Morris, one of the Foundation's earliest advisers on dental affairs, suggests that the Foundation ask the scholars who were trained in its Dental Services Research Scholars Program to address the problem. "Too many kids are going to bed at night in dental pain," he says. "We need to deal with that."

Notes

1. H. T. Dean, F. A. Arnold, and E. Elvove. "Domestic Water and Dental Caries. Additional Studies of the Relation of Fluoride Domestic Waters to Dental Caries Experience in 4,425 White Children, Aged 12 to 14 Years, of 13 Cities in 4 States." *Public Health Reports*, 1942, 57, 1115–1179. ([return to article](#))
2. M. M. Marx, "The National Preventive Dentistry Program, Foundation Rationale." Paper presented at a meeting sponsored by The Robert Wood Johnson Foundation, Scanticon, Princeton, N.J., July 28–30, 1982. ([return to article](#))
3. J. J. Salley, "Providing Dental Care to the Handicapped." *Journal of Dental Education*, 1980, 44(3). ([return to article](#))
4. *Dental Care for Handicapped Americans*. Robert Wood Johnson Foundation, Special Report Number Two, 1979, pp. 11–12. ([return to article](#))
5. J. T. Campbell, B. F. Esser, and R. L. Flaugh, *Evaluation of a Program for Training Dentists in the Care of Handicapped Patients*. Research Report. Princeton, N.J.: Educational Testing Service, December 1982. ([return to article](#))
6. M. M. Marx, 1982. ([return to article](#))
7. *Preventing Tooth Decay: Results from a Four-Year National Study*. Robert Wood Johnson Foundation, Special Report Number Two, 1983, p. 4. ([return to article](#))
8. Schools, rather than children, were assigned to one of the six treatment regimens, because some of the procedures, such as fluoride mouth rinsing, fluoride tablets, and oral health lessons, could be administered more efficiently to classroom groups. Two of these procedures—sealants and fluoride prophylaxis/gel treatments—were provided by teams of dental hygienists and assistants, who moved from school to school within a study community and worked under the general supervision of a dentist. The remaining preventive measures—fluoride mouth rinsing, fluoride tablets, and oral health lessons with tooth brushing and fluoride dentifrice—were administered by classroom teachers or teaching aides. ([return to article](#))
9. A. M. Miller, J. A. Brunelle, J. P. Carlos, and D. R. Scott. *The Prevalence of Dental Caries in United States*

Children, 1979-1980. U.S. Department of Health and Human Services, NIH Publication No. 82-2245, Washington, D.C., Government Printing Office, 1981. ([return to article](#))

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11. J. A. Disney, H. M. Bohannon, S. P. Klein, and R. M. Bell, "A Case Study in Contesting the Conventional Wisdom: School-Based Fluoride Mouthrinse Programs in the USA." *Community Dental Oral Epidemiology*, 18, 46-56, 1990, p. 47. ([return to article](#))
12. M. H. Schoen, M. Marcus, and A. L. Koch. "An Evaluation of the Robert Wood Johnson Foundation's Hospital-Sponsored Ambulatory Dental Program." *Health Services Research* 22:3 (August 1987) pp. 327-339. ([return to article](#))
13. C. Goldberg. "Poor Children With Bad Teeth Have Trouble Finding Dentists." *The New York Times*, June 26, 1999, pp. A1, A8. ([return to article](#))

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